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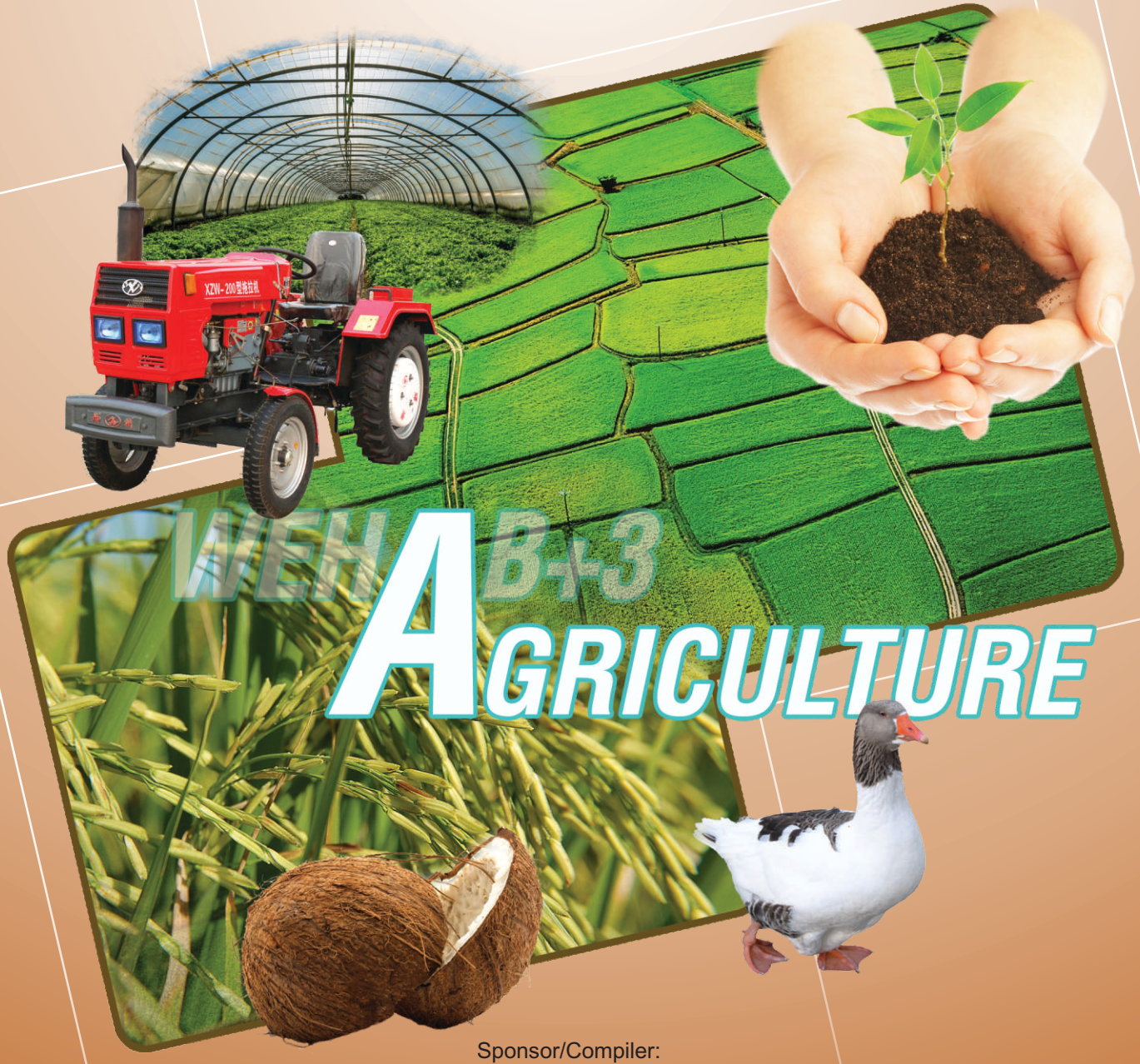
South East Asia Sustainability Network

A SELECTED COMPENDIUM OF SEASN MEMBERS' RESEARCH PUBLICATIONS ON WEHAB+3



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CENTRE FOR GLOBAL SUSTAINABILITY STUDIES

A SELECTED COMPENDIUM OF SEASN MEMBERS' RESEARCH PUBLICATIONS ON WEHAB+3: AGRICULTURE

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Foreword

The establishment of South East Asia Sustainability Network (SEASN) has provided a platform to support higher education institutions and other related sustainability organisations in South East Asian countries for exchanging ideas, findings, information, and good practices in teaching, research, community engagement and institutional arrangement that relate to their work. In order to expedite this process the SEASN Secretariat at Universiti Sains Malaysia has taken the initiative to publish a compendium entitled '*A Selected Compendium of SEASN Members' Research Publications on WEHAB+3*', in order to share information and best practices in sustainability studies.

This publication will be a medium to exchange research findings in sustainability and to promote sustainability at the global level for the benefit of the wider community of higher educational institutions.

The focus of this book is on the sectors, Water, Energy, Health, Agriculture, Biodiversity (WEHAB); and cross-sectors, Climate Change and Disaster Risk Management, Consumption and Production, and Population and Poverty; collectively represented as WEHAB+3. The compendiums of Water (W), Energy (E) and Health (H) have been successfully published and in this forth compendium will focus on Agriculture (A).

Incidentally, WEHAB was launched at the World Summit on Sustainable Development by Kofi Annan in 2002 as a priority set of sectors for sustainability implementation. When we add the three cross sectoral issues, the approach becomes very comprehensive and a broad treatment WEHAB+3 would cover almost all major sustainability challenges.

In this sense, the current compendium will help promote better understanding of sustainable management of Agriculture and create knowledge societies that ensure improved quality of life for the present and future generations.

I would like to extend my deepest appreciation and gratitude to all the contributors, authors and editors for their hard work in materializing this compendium. The dedication and tireless efforts of the CGSS staff for the success of the compendium is fully recognized and acknowledged.

Professor Dato' Dr. Omar Osman

Chairman
South East Asia Sustainability Network (SEASN)

Preface

The South East Asia Sustainability Network (SEASN) is an alliance of higher education institutions and other related sustainability institution in South East Asian countries committed to promote, engage and integrate sustainability in their mission areas in a systematic way. In this regards, '*A Selected Compendium of SEASN Members' Research Publications on WEHAB+3*' and is in line with the vision and objectives of SEASN.

This book is seen mainly as a means to build a platform for the sharing of research findings in the form of abstracts of published papers. Our survey has revealed that there is enough scope for eight volumes of valuable information that has already been published in the eight areas of WEHAB+3. We have selected the abstract, including reference details, in the hope that it will make life easier for prospective researchers to focus on critical sustainability issues that matter most to their respective countries or the global community at large.

In compiling the abstracts we are mindful of the Intellectual Property Rights of original authors, and in properly acknowledging them CGSS declares that we do not make any claim on IP issues whatsoever.

We do hope that this effort will provide a tangible and inspiring example of publication to address sustainability challenges quickly and more cost effectively. It is also hoped that this book will contribute towards development and progress that is best for the environment, individuals and the economy without compromising the ability of future generations to meet their needs and ultimately ensuring a sustainable future for all.

Professor Dr. Kamarulazizi Ibrahim

Secretary
South East Asia Sustainability Network (SEASN)

Introduction

This book entitled A Selected Compendium of SEASN Research Publication on Agriculture consists of compilation of abstract of SEASN's sustainability research output and the resulting publications related to Agriculture from member of South East Asia Sustainability Network (SEASN) which includes of South East Asia higher education institutions, other related sustainability organisations, agencies, NGOs and industries in South East Asia countries with an interest in sustainability.

Land degradation affects perhaps as much as two thirds of the world's agricultural land. As a result, agricultural productivity is declining sharply, while the number of mouths to feed continues to grow. We must increase agricultural productivity, and reverse human encroachment on forests, grasslands and wetlands. Research and development will be crucial, as will implementation of the UN Convention to Combat Desertification. Agriculture has changed dramatically, especially since the end of World War II. Food and fibre productivity soared due to new technologies, mechanization, increased chemical use, specialization and government policies that favoured maximizing production.

A growing movement has emerged during the past two decades to question the role of the agricultural establishment in promoting practices that contribute to these social problems. Today this movement for sustainable agriculture is garnering increasing support and acceptance within mainstream agriculture. Not only does sustainable agriculture address many environmental and social concerns, but it offers innovative and economically viable opportunities for growers, labourers, consumers, policymakers and many others in the entire food system.

This book aims to share information and best practices in sustainability studies focused in the 8 known areas of sustainability (WEHAB+3), to exchange ideas, concepts and research findings in sustainability and to promote sustainability at the global level for the benefit of the wider higher educational community. There are three books have been published previously which focus on sustainability research on Water (W), Energy (E) and Health (H). Meanwhile, this fourth book will focus on sustainability research on Agriculture (A). In addition to this, there will be a following book on sustainability research on Biodiversity (B) as well as three major cross-sectoral areas, which include Climate Change and Disaster Risk Management (CC+DRM), Production and Consumption (PC) and Population and Poverty (PP) which will be published soon.

This fourth book comprises of compendium which combines knowledge on Agriculture from many primary sources of member of SEASN into a single publication. Some of the primary sources were given by the organization and some of them were extracted from Sciencedirect, Scopus and Thomson Reuters ISI. It is hoped that this book will provide a quick and relatively understand to overview regarding sustainability research output on Agriculture. Thus, it will hopefully provide a foundation for further studies, and catalyse for new research in South East Asia region.

In the following pages, we would like to give a brief account of SEASN's sustainability research, in the form of compendium, with a special focus on Agriculture.

1.0 AIMST University

1.1 World Applied Sciences Journal, Volume 16, Issue 3, 2012, Pages 362-369

Genetic transformation of the American oil palm (*Elaeis oleifera*) immature zygotic embryos with antisense Palmitoyl-acyl carrier protein thioesterase (PATE) gene

Bhore S.J., Shah F.H.

The Palmitoyl-acyl carrier protein thioesterase (PATE) gene is one of the key genes involved in plastidial fatty acid biosynthesis and known to regulate the accumulation of the $C_{16:0}$. In American oil palm (*Elaeis oleifera*) fruit mesocarp, $C_{16:0}$ content can be minimized by post-transcriptional PATE gene silencing. In this study, 12 weeks old immature zygotic embryos (IZEs) of *E. oleifera* were transformed with a construct carrying 619 bp long antisense PATE (antiPATE) gene driven by oil palm mesocarp-tissue-specific promoter. The particle bombardment-mediated method of plant transformation was used. Selection of the transformed IZEs was carried out using hygromycin (HYG) as a selection marker. Plantlets were regenerated from the HYG resistant IZEs. A total of 56 HYG resistant plantlets were regenerated successfully. Five out of 56 were identified as putative transformants by using polymerase chain reaction (PCR) analysis and the nucleotide sequencing of the PCR products. Southern hybridization of genomic DNA of 5 putative transformants further confirmed presence of T-DNA. We hypothesize that the post-transcriptional PATE gene silencing in *E. oleifera* fruit mesocarp tissue may increase the level of palmitoleic ($C_{16:1}$), stearic ($C_{18:0}$) and oleic ($C_{18:1}$) acids up to some extent at the expense of $C_{16:0}$. The successful integration of antiPATE is reported in this paper.

Keywords

American oil palm, Genetic engineering, Palm oil, Palmitoyl-ACP thioesterase, Palmitic acid ($C_{16:0}$), Particle bombardment

1.2

Microbiological Research, Volume 168, Issue 9, 7 November 2013, Pages 569-579

Macrobrachium rosenbergii cathepsin L: Molecular characterization and gene expression in response to viral and bacterial infections

Jesu Arockiaraj, Annie J. Gnanam, Dhanaraj Muthukrishnan, Muthukumaresan Kuppusamy Thirumalai, Mukesh Pasupuleti, James Milton, Marimuthu Kasi

Cathepsin L (*Mr*CathL) was identified from a constructed cDNA library of freshwater prawn *Macrobrachium rosenbergii*. *Mr*CathL full-length cDNA is 1161 base pairs (bp) with an ORF of 1026 bp which encodes a polypeptide of 342 amino acid (aa) long. The eukaryotic cysteine proteases, histidine and asparagine active site residues were identified in the aa sequence of *Mr*CathL at 143–154, 286–296 and 304–323, respectively. The pair wise clustalW analysis of *Mr*CathL showed the highest similarity (97%) with the homologous cathepsin L from *Macrobrachium nipponense* and the lowest similarity (70%) from human. Phylogenetic analysis revealed two distinct clusters of the invertebrates and vertebrates cathepsin L in the phylogenetic tree. *Mr*CathL and cathepsin L from *M. nipponense* were clustered together, formed a sister group to cathepsin L of *Penaeus monodon*, and finally clustered to *Lepeophtheirus salmonis*. High level of ($P < 0.05$) *Mr*CathL gene expression was noticed in haemocyte and lowest in eyestalk. Furthermore, the *Mr*CathL gene expression in *M. rosenbergii* was up-regulated in haemocyte by virus [*M. rosenbergii* nodovirus (*Mr*NV) and white spot syndrome baculovirus (WSBV)] and bacteria (*Vibrio harveyi* and *Aeromonas hydrophila*). The recombinant *Mr*CathL exhibited a wide range of activity in various pH between 3 and 10 and highest at pH 7.5. Cysteine proteinase (stefin A, stefin B and antipain) showed significant influence (100%) on recombinant *Mr*CathL enzyme activity. The relative activity and residual activity of recombinant *Mr*CathL against various metal ions or salts and detergent tested at different concentrations. These results indicated that the metal ions, salts and detergent had an influence on the proteinase activity of recombinant *Mr*CathL. Conclusively, the results of this study imply that *Mr*CathL has high pH stability and is fascinating object for further research on the function of cathepsin L in prawn innate immune system.

Keywords

Cathepsin L, *Machrobrachium rosenbergii*, Nodovirus, Baculovirus, Bacteria, Enzyme activity

1.3

Fish & Shellfish Immunology, Volume 34, Issue 1, January 2013, Pages 109-118

Crustin, a WAP domain containing antimicrobial peptide from freshwater prawn *Macrobrachium rosenbergii*: Immune characterization

Jesu Arockiaraj, Annie J. Gnanam, Dhanaraj Muthukrishnan, Ranganath Gudimella, James Milton, Arun Singh, Saravanan Muthupandian, Marimuthu Kasi, Subha Bhassu

Crustin (*Mr*Crs) was sequenced from a freshwater prawn *Macrobrachium rosenbergii*. The *Mr*Crs protein contains a signal peptide region at N-terminus between 1 and 22 and a long whey acidic protein domain (WAP domain) at C-terminus between 57 and 110 along with a WAP-type 'four-disulfide core' motif. Phylogenetic results show that *Mr*Crs is clustered together with other crustacean crustin groups. *Mr*Crs showed high sequence similarity (77%) with crustin from Pacific white shrimp *Litopenaeus vannamei* and Japanese spiny lobster *Panulirus japonicas*. I-TASSER uses the best structure templates to predict the possible structures of *Mr*Crs along with PDB IDs such as 2RELA and 1FLEI. The gene expressions of *Mr*Crs in both healthy *M. rosenbergii* and those infected with virus including infectious hypodermal and hematopoietic necrosis virus (IHHNV) and white spot syndrome virus (WSSV) and bacteria *Aeromonas hydrophila* (Gram-negative) and *Enterococcus faecium* (Gram-positive) were examined using quantitative real time PCR. To understand its biological activity, the recombinant *Mr*Crs gene was constructed and expressed in *Escherichia coli* BL21 (DE3). The recombinant *Mr*Crs protein agglutinated with the bacteria considered for analysis at a concentration of 25 μg/ml, except *Lactococcus lactis*. The bactericidal results showed that the recombinant *Mr*Crs protein destroyed all the bacteria after incubation, even less than 6 h. These results suggest that *Mr*Crs is a potential antimicrobial peptide, which is involved in the defense system of *M. rosenbergii* against viral and bacterial infections.

Keywords

Crustin, Antimicrobial peptide, *Macrobrachium rosenbergii*, Immune stimulants, Bactericidal assay

1.4

Biochimie, Volume 95, Issue 12, December 2013, Pages 2354–2364

A prawn transglutaminase: Molecular characterization and biochemical properties

Jesu Arockiaraj, Annie J. Gnanam, Rajesh Palanisamy, Venkatesh Kumaresan, Prasanth Bhatt, Muthukumaresan Kuppusamy Thirumalai, Arpita Roy, Mukesh Pasupuleti, Marimuthu Kasi, Akila Sathyamoorthi, Abirami Arasu

In this study, we report the bioinformatics characterization, gene expression, transglutaminase activity and coagulation assays of transglutaminase (TGase) of freshwater prawn *Macrobrachium rosenbergii* identified from the constructed cDNA library by GS FLX™ technology. Even though, TGase have sequence similarity, they differ extensively in their substrate specificity and are thought to play an important in variety of functions such as development, tissue differentiation and immune responses etc. Gene expression studies show that *Mr*TGase is widely distributed in the tissues such as heart, muscle, intestine, brain, etc., but higher amounts are found in hemocyte. Results of TGase mRNA relative expression in hemocyte, before and after infected with white spot syndrome baculovirus (WSBV) and *Vibrio harveyi* show that the gene expression initially increases up to 24 h and then it falls down. Coagulation assay results showed that the endogenous TGase is involved in the rapid assembly of a specific, plasma clotting protein. Structural studies show that *Mr*TGase contains a typical TGc domain between 323 and 424, and two putative integrin-binding motifs at Arg^{180}–Gly^{181}–Asp^{182} and Arg^{269}–Gly^{270}–Asp^{271}. The predicted 3D model of *Mr*TGase contains 47.04% coils (366 amino acid residues), 26.74% extended strand (208 residues), 21.72% α-helix (169 residues) and 4.5% beta turns (35 residues). BLASTp analysis of *Mr*TGase exhibited high sequence similarities with other crustacean TGase, with the highest observed in white shrimp (77.1%). Moreover, the phylogenetic analysis also showed that *Mr*TGase clustered with the other members of crustacean TGase. Overall, these results suggested that *Mr*TGase is a major and functional TGase of *M. rosenbergii* for haemolymph coagulation and also in spread of infection.

Keywords

Transglutaminase, *Macrobrachium rosenbergii*, Pathogen, Gene expression, Coagulation

1.5

Fish & Shellfish Immunology, Volume 35, Issue 5, November 2013, Pages 1511-1522

An unconventional antimicrobial protein histone from freshwater prawn *Macrobrachium rosenbergii:* Analysis of immune properties

Jesu Arockiaraj, Annie J. Gnanam, Venkatesh Kumaresan, Rajesh Palanisamy, Prasanth Bhatt, Muthukumaresan Kuppusamy Thirumalai, Arpita Roy, Mukesh Pasupuleti, Marimuthu Kasi

In this study, we have reported the first histone characterized at molecular level from freshwater prawn *Macrobrachium rosenbergii* (*Mr*His). A full length cDNA of *Mr*His (751 base pairs) was identified from an established *M. rosenbergii* cDNA library using GS-FLX™ technique. It encodes 137 amino acid residues with a calculated molecular mass of 15 kDa and an isoelectric point of 10.5. *Mr*His peptide contains a histone H2A signature between 21 and 27 amino acids. Homologous analysis showed that *Mr*His had a significant sequence identity (99%) with other known histone H2A groups especially from *Penaeus monodon*. Phylogenetic analysis of *Mr*His showed a strong relationship with other amino acid sequences from histone H2A arthropod groups. Further phylogenetic analysis showed that the *Mr*His belongs to histone H2A superfamily and H2A1A sub-family. Secondary structure of *Mr*His showed that the protein contains 50.36% α-helical region and 49.64% coils. The 3D model of *Mr*His was predicted by I-Tasser program and the model was evaluated for quality analysis including C-score analysis, Ramachandran plot analysis and RMSD analysis. The surface view analysis of *Mr*His showed the active domain at the N terminal. The antimicrobial property of *Mr*His protein was confirmed by the helical structure and the total hydrophobic surface along with its net charge. The MFE of the predicted RNA structure of MrHis is –128.62 kcal/mol, shows its mRNA stability.

Schiffer–Edmundson helical wheel analysis of the N-terminal of *Mr*His showed a perfect amphipathic nature of the peptide. Significantly ($P < 0.05$) highest gene expression was noticed in the hemocyte and is induced with viral (WSBV and *Mr*NV) and bacteria (*Aeromonas hydrophila* and *Vibrio harveyi*) infections. The coding sequence of recombinant *Mr*His protein was expressed in a pMAL vector and purified to study the antimicrobial properties. The recombinant product showed antimicrobial activity against both Gram negative and Gram positive bacteria. In this study, the recombinant *Mr*His protein displayed antimicrobial activity in its entirety. Hence, it is possible to suggest that the activity may be due to the direct defense role of histone or its N-terminal antimicrobial property. However, this remains to be verified by detailed investigations.

Keywords

Prawn, Histone, Bioinformatics, Gene expression, Antimicrobial activity

1.6

African Journal of Microbiology Research, Volume 5, Issue 20, 30 September 2011, Pages 3343-3350 © 2011 Academic Journals

Novel isolation and characterization techniques for *Bacillus thuringiensis* strains from the cabbage growing area in Cameron Highlands Malaysia

Kitnamorti T., Rathinam X., Subramaniam S.

Bacillus thuringiensis is a bacterium known for the production of crystal proteins with insecticidal properties. These toxins are widely sought after for controlling agricultural pests due to both their specificity and their applicability in transgenic plants. New approach of the isolation technique and characterization of native *B. thuringiensis* strains from the cabbage growing environment in order to study the expression of crystal (cry) and cytolytic (cyt) proteins were carried out. In this study, candidate *B. thuringiensis* isolates were recovered from soil, cabbage leaves and larvae samples from cabbage growing environment located at Cameron Highlands, Malaysia. Isolates were characterized by Gram staining, phase contrast microscope, coomassie blue staining (CBB), growth curve analysis and SDS-PAGE. A total of 56 samples were collected and 68 colonies was identified and isolated based on colony morphology and the number was reduced to 42 isolates after Gram staining. Total of 24 isolates was confirmed to be *Bacillus* after phase contrast microscopy. Through CBB staining, blue-cap isolates in the sporulation phase and darkly stained oval and bipyramidal shaped candidate of ICP after autolysis phase was observed. SDS-PAGE analysis was carried out to identify the crystal protein and cytolytic toxins.

Keywords

Bacillus thuringiensis, Cabbage farm, SDS-PAGE

1.7

Journal of Food Science and Technology, Volume 49, Issue 3, June 2012, Pages 373-377 © Association of Food Scientists & Technologists (India) 2011

Effect of different cooking methods on proximate and mineral composition of striped snakehead fish (*Channa striatus*, Bloch)

Marimuthu K., Thilaga M., Kathiresan S., Xavier R., Mas R.H.M.H.

The effects of different cooking methods (boiling, baking, frying and grilling) on proximate and mineral composition of snakehead fish were investigated. The mean content of moisture, protein, fat and ash of raw fish was found to be 77.2±2.39, 13.9±2.89, 5.9±0.45 and 0.77±0.12% respectively. The changes in the amount of protein and fat were found to be significantly higher in frying and grilling fish. The ash content increased significantly whereas that of the minerals (Na, K, Ca, Mg, Fe, Zn and Mn) was not affected in all cooking methods. Increased in Cu contents and decreased in P contents were observed in all cooking methods except grilling. In the present study, the grilling method of cooking is found to be the best for healthy eating.

Keywords

Snakehead fish, *Channa striatus*, Cooking methods, Proximate composition, Minerals

1.8 **Journal of Food and Agriculture, Volume 23, Issue 4, August 2011, Pages 330-337**

Effect of different feed application rate on growth, survival and cannibalism of African catfish, *Clarias gariepinus* fingerlings

Marimuthu K., Umah R., Muralikrishnan S., Xavier R., Kathiresan S.

In aquaculture feeding rate is an important factor affecting the growth of fish, and thus determining the optimal feeding rate is important to the success of any aquaculture operation. In the present study aimed to investigate the effect of different feeding rate on the growth, survival, cannibalism and body composition of African catfish, *Clarias gariepinus* fingerlings (initial weight; 1.629± 0.016g). The commercial catfish feed was used and it consists of 38% protein, 5% lipid, 15% ash and 12% moisture. Four feeding rates were evaluated (2%, 5%, 8% and 12%), as a percentage of fish body weight, with three replicates per treatment. The fishes were fed twice per day at 08:30 and 17: 30 hr. At the beginning of the experiment and at 7-day intervals all the fish from each tank were collected, counted, individually measured (nearest mm) and weighed (nearest mg) for four weeks. After each sampling period, the amount of feed given was adjusted according to the biomass in each tank. Final weights were significantly greater ($p< 0.05$) than initial weights in all the feeding rate. At 8% and 12% feeding rate, *C. gariepinus* fingerlings were found to achieve maximum growth. The best feed conversion ratio (1.00±0.086) was observed in 8%, followed by (1.250±0.010) in 12% feeding rate. Significantly the highest specific growth rate (6.590±0.100) was obtained in 12% followed by (6.047±0.291) in 8% feeding rate. Fish survival did not increase by providing more feed. Cannibalism was also not reduced by providing commercial feed. The fish fed at 2% feeding rate had the highest ash contents but lowest lipid content, while the fish fed at 12% feeding rate had the highest lipid content than the other feeding rate. Based on the growth performance, feed efficiency data obtained in the present study suggest that the optimum feeding rate of 8% bw/day for African catfish, *C. gariepinus* fingerlings.

Keywords

African catfish, *Clarias gariepinus*, Feed application rate, Larval rearing, Nutrition

1.9 **Turkish Journal of Chemistry, Volume 35, Issue 6, 2011, Pages 939-950 © TÜBITAK**

The sorption of cadmium(II) ions on mercerized rice husk and activated carbon

Mas Haris M.R.H., Abdul Wahab N.A., Reng C.W., Azahari B., Sathasivam K.

This work describes the removal of Cd(II) ions in aqueous solution by unmodified and base-modified rice husk (RH) as compared to that by activated carbon (AC). Mercerization of RH was carried out by using dilute solutions (0.013 M) of NaOH, KOH, and $Ca(OH)_2$. The experiments were conducted in duplicate under 1-batch and 2-batch treatments. In the 1-batch treatment, a fresh 200 mg of each adsorbent was used to study the sorption of the Cd(II) ions from 100-mL solutions at an initial concentration of 5 mg L^{-1} . The adsorption percentage increased in the order of unmodified RH (80.13 ± 0.46%) < $Ca(OH)_2$ -modified RH (90.74 ± 0.18%) < NaOH-modified RH (93.36 - ±0.23%) ≤ KOH-modified RH (93.78 ± 0.27%) < AC (98.4 ± 0.18%). In the 2-batch treatment, a fresh 100 mg of each adsorbent was placed in 100-mL solutions at an initial concentration of 5 mg L^{-1} of Cd(II) ions for 30 min, and the resulting solutions were filtered. The filtrates were subjected to another fresh 100 mg of each adsorbent for an additional 30 min. The percentage removal of the metal ion using the 2-batch treatment for unmodified RH, base-modified RH, and AC was 97.71%, 98.00 ± 1.00%, and nearly 100%, respectively.

Keywords

Cd(II), Sorption, Mercerization, Base-modified, Rice husk, Activated carbon

1.10 **African Journal of Biotechnology, Volume 10, Issue 59, 3 October 2011, Pages 12653-12656 © 2011 Academic Journals**

A pilot study on the isolation and biochemical characterization of *Pseudomonas* from chemical intensive rice ecosystem

Nathan P., Rathinam X., Kasi M., Rahman Z.A., Subramaniam S.

In recent times, there has been a renewed interest in the search of plant growth promoting rhizobacteria (PGPR) for sustainable crop production. Rice is an economically important food crop, which is subjected to infection by a host of fungal, viral and bacterial pathogens. In this study, an attempt was made to isolate *Pseudomonas* spp., a potent PGPR in the rhizosphere. Through appropriate microbiological and biochemical methods, the study demonstrated the presence of fluorescent and nonfluorescent *Pseudomonads* in the rhizosphere of chemical intensive rice growing environments. Augmentation of such PGPR including, *Pseudomonads* in the rice ecosystems will ensure a healthy micro climate for rice.

Keywords

Plant growth promoting rhizobacteria (PGPR), *Pseudomonas*, Rice

1.11

Asian Journal of Animal and Veterinary Advances, Volume 8, Issue 2, 2013, Pages 139-153 © 2013 Academic Journals Inc.

Inter-specific hybridization and its potential for aquaculture of fin fishes

Rahman M.A., Arshad A., Marimuthu K., Ara R., Amin S.M.N.

Inter-specific hybrids have been produced to increase growth rate, improve productivity through hybrid vigor, transfer desirable traits, reduce unwanted reproduction through production of sterile fish, combine other valuable traits such as good flesh quality, disease resistance and increase environmental tolerances, better food conversion, take advantages of sexual dimorphism and increase harvesting rate in culture systems. Hybrids play a significant role for increase in aquaculture production of several species of freshwater and marine fishes; for example, hybrid catfish in Thailand, hybrid stripped bass in the USA, hybrid tilapia in Israel and hybrid characids in Venezuela. Despite its' wide-spread use in aquaculture, there have been an impression that hybrids do not hold much attraction for aquaculturist. With the expansion of aquaculture sector and the increased number of species being bred and farmed, there are hybrids that now account for a substantial proportion of national aquaculture production and other hybrids may be emerging through further development. As the domestication of fish species increases, the possibilities to increase production through appropriate hybridization techniques is ongoing with a view to produce new hybrid fishes, especially in culture systems where sterile fish may be preferred because of the concern that fish may escape into the open freshwater, marine and coastal environment. Chromosome-set manipulation (polyploidization) has been combined with hybridization to increase the viability and to improve developmental stability of hybrid fishes. Intentional or accidental hybridization can lead to unexpected and undesirable results in hybrid progeny, such as reduced viability and growth performances, loss of color pattern and flesh quality and also raises risks to maintenance of genetic integrity of species if the hybrids escape to the natural habitat and undergo backcrosses with the parental species. The success of inter-specific hybridization can be variable and depend on the genetic structure, crossing patterns, gamete compatibility and gene flow patterns of the parental species.

Appropriate knowledge on the genetic constitution of the broodstock, proper broodstock management and monitoring of the viability and fertility of the progeny of brood fishes is thus very crucial before initiating hybridization experiments. In addition, some non-generic factors such as weather conditions, culture systems, seasons and stresses associated with selecting, collecting, handling, breeding and rearing of broodstock and progeny may greatly influence hybridization success in a wide variety of freshwater and marine fin fishes.

Keywords

Aquaculture production, Desirable traits, Hybrid vigor, Inter-specific hybridization, Stock improvement

1.12 **European Review for Medical and Pharmacological Sciences, Volume 15, Issue 1, January 2011, Pages 53-60**

Dietary administration of *Bacillus thuringiensis* on the cellular innate immune response of African catfish (*Clarias gariepinus*) against *Aeromonas hydrophila*

Reneshwary C., Rajalakshmi M., Marimuthu K., Xavier R.

Aim:

An experiment was conducted to evaluate the use of *Bacillus thuringiensis* (Bt) as a probiotic to enhance the cellular innate immune response of the African catfish (*Clarias gariepinus*) challenged with a bacterial fish pathogen, *Aeromonas hydrophila*.

Materials and Methods:

The bacterium (Bt) was administered orally at three different dietary doses of 0.5 × 10^7 (T2), 1.0 × 10^7 (T3) and 1.5 x 10^7 (T4) cfu/g feed to the fingerlings of African catfish twice daily for 15 days. The positive control group (T1) and negative control group (T5) was fed without Bt for the same period. On the 16th day, blood and serum samples were withdrawn to determine the differential leukocyte count (DLC) and serum bactericidal activity. After 15 days feeding, the treatment groups (T2, T3 and T4) and positive control (T1) were challenged intraperitoneally with the bacterial suspension of 0.2 ml (1 × 10^8 cfu/ml). The negative control group (T5) was injected intraperitoneally with phosphate buffered saline (PBS). On the 3rd day of post challenge, the DLC was assessed in all the treatment groups.

Results:

The fish fed with Bt incorporated diet showed significantly higher ($P<0.05$) bactericidal activity during the pre-challenge compared with the control groups. The highest serum bactericidal activity was observed in T4, the group fed with diet containing highest concentration of Bt. Highest survival rates (90%) were recorded in fish fed with Bt supplemented group (T3 and T4). Granulocyte

counts on the other hand were higher in treatment groups compared to the control in both pre and post challenge.

Conclusions:

The result demonstrates that Bt can enhance certain innate immune responses in African catfish.

Keywords

Bacillus thuringiensis, Immune response, Differential leukocyte count, Serum bactericidal activity, *Aeromonas hydrophila*

1.13 **Journal of Thermal Analysis and Calorimetry, Volume 108, Issue 1, April 2012, Pages 9-17 © 2011 Akadémiai Kiadó, Budapest, Hungary**

Thermal properties of modified banana trunk fibers

Sathasivam K., Haris M.R.H.M.

Thermal decomposition of an agrowaste, namely banana trunk fibers (BTF) were investigated by thermogravimetry (TG) and derivative thermogravimetry (DTG) up to 900 °C at different heating rates (from 5 to 100 °C/min). The BTF was subjected to modification by means of various known chemical methods (mercerization, acetylation, peroxide treatment, esterification, and sulfuric acid treatment). Various degradation models, such as the Kissinger, Friedman, and Flynn-Wall-Ozawa were used to determine the apparent activation energy. The obtained apparent activation energy values (149-210 kJ/mol) allow in developing a simplified approach to understand the thermal decomposition behavior of natural fibers as a function of polymer composite processing.

Keywords

Apparent activation energy, Degradation models, Modified fiber, Polymer composite, Thermal decomposition

2.0 Chulalongkorn University, Thailand

2.1 **Fish & Shellfish Immunology, Volume 34, Issue 4, April 2013, Pages 954-967**

Discovery of immune molecules and their crucial functions in shrimp immunity

Anchalee Tassanakajon, Kunlaya Somboonwiwat, Premruethai Supungul, Sureerat Tang

Several immune-related molecules in penaeid shrimps have been discovered, most of these via the analysis of expressed sequence tag libraries, microarray studies and proteomic approaches. These immune molecules include antimicrobial peptides, serine proteinases and inhibitors, phenoloxidases, oxidative enzymes, clottable protein, pattern recognition proteins, lectins, Toll receptors, and other humoral factors that might participate in the innate immune system of shrimps. These molecules have mainly been found in the hemolymph and hemocytes, which are the main sites where immune reactions take place, while some are found in other immune organs/tissues, such as the lymphoid organs, gills and intestines. Although the participation of some of these immune molecules in the shrimp innate immune defense against invading pathogens has been demonstrated, the functions of many molecules remain unclear. This review summarizes the current status of our knowledge concerning the discovery and functional characterization of the immune molecules in penaeid shrimps.

Keywords

Penaeid shrimp, Innate immunity, Immune molecules

2.2 Journal of Dairy Science, Volume 94, Issue 8, August 2011, Pages 3811-3823

Analysis of the economically optimal voluntary waiting period for first insemination

C. Inchaisri, R. Jorritsma, P.L.A.M. Vos, G.C. van der Weijden, H. Hogeveen

The voluntary waiting period (VWP) is defined as the time between parturition and the time at which the cow is first eligible for insemination. Determining the optimal VWP from field data is difficult and unlikely to happen. Therefore, a Monte-Carlo dynamic-stochastic simulation model was created to calculate the economic effects of different VWP. The model is dynamic and uses time steps of 1 wk to simulate the reproductive cycle (ovulation, estrous detection, and conception), the occurrence of postpartum disorders, and the lactation curve. Inputs of the model were chosen to reflect the situation of Dutch dairy cows. In the model, we initially created a cow of a randomly selected breed, parity, month of calving, calf status of last calving, and expected 305-d milk yield. The randomly varied variables were based upon relevant distributions and adjusted for cow statuses. The lactation curve was modeled by Wood's function. The economic input values in the analysis included: cost of milk production (€0.07 to €0.20 per kg), calf price (€35 to €150 per calf), AI cost (€7 to €24 per AI), calving management cost (€137 to €167 per calving), and culling cost, expressed as the retention pay-off (€118 to €1,117). A partial budget approach was used to calculate the economic effect of varying the VWP from 7 to 15 wk postpartum, using a VWP of 6 wk as reference. Per iteration, the VWP with either the lowest economic loss or the maximum profit was determined as the optimal VWP. The optimal VWP of most cows (90%) was less than 10 wk. On average, every VWP longer than 6 wk gave economic losses. Longer VWP were in particular optimal for the first parity of breeds other than Holstein-Friesian cows calving in winter with low milk production, high milk persistency, delayed peak milk yield time, a delayed time of first ovulation, or occurrence of a postpartum disorder, and while costs of milk production are low and costs for AI are high.

Keywords

Dairy cow, Optimal voluntary waiting period, Milk production, Reproductive performance

2.3 **Ecological Economics, Volume 70, Issue 9, 15 July 2011, Pages 1609-1620**

Context matters to explain field experiments: Results from Colombian and Thai fishing villages

Daniel Castillo, François Bousquet, Marco A. Janssen, Kobchai Worrapimphong, Juan Camillo Cardenas

During the last decade, field experiments regarding the study of common pool resource governance have been performed that replicated earlier findings of laboratory experiments. One of the questions is how the decisions made by participants in rural communities are influenced by their experience. This paper presents the results of field experiments in Colombia and Thailand on fishery resources. Context information is derived from the communities via in-depth interviews, surveys and role playing exercises. The use of different methodological tools allowed to link decisions in field experiments with contextual variables for two fishery villages. Explanation of core variables in social dilemmas is given, the degree of cooperation levels, preferred rules, rule compliance and enforcement. Main findings include: i) fishermen made decisions in the field experiments that reflected their own experience and context, ii) agreements for rule crafting are possible only under specific conditions that guarantees livelihoods and sustainability, iii) the broader context determines cooperation levels at a local level, iv) inequalities in the sanctioning of rule breakers decrease the possibilities of reaching cooperation agreements, and v) high levels of trust among local fishermen is not a sufficient condition for resource sustainability, when trust in external rule makers and enforcers is low.

Keywords

Field experiments, Role games, Fisheries, Rules, Cooperation, Trust

2.4 **Agricultural Systems, Volume 109, June 2012, Pages 65-75**

Field experiments on irrigation dilemmas

Marco A. Janssen, François Bousquet, Juan-Camilo Cardenas, Daniel Castillo, Kobchai Worrapimphong

It is often assumed that irrigation systems require a central authority to solve coordination problems due to the asymmetry in position and influence between those located at the head-end of a system and those located at the tail-end. However, many examples of complex irrigation systems exist that are self-organized without central coordination. Field experiments on asymmetric commons dilemmas are performed with villagers in rural Colombia and Thailand. Our experiments show that there is a dynamic interaction between equality in the use of the common resource, and the level of the contributions to the creation of a common resource. Inequality in the distribution of benefits in one round triggers lower levels of group contributions, reducing efficiency and triggering even more inequality in contributions and distribution of the resource among players.

The upstream players act as "stationary bandits". They take more than an equal share of the common resource, but leave sufficient resources for the downstream players to stimulate them to continue their contributions to the public infrastructure.

After 10 rounds, players can vote on one of three allocation rules: equal quota, random and rotating access to appropriation of the resource. The rotating access is most often elected. The resource dynamics in the second part of the experiment depend on the rule elected. With the quota rule, the stationary bandit metaphor is less relevant since taking equal shares of the resource is enforced. With the rotation access rule, the players act strategically on the rotating position. They invest more when having the first access to the resource compared to less favorable access. And when they have first access they extract the main part of the common resource. The rotation rule led to a reduction of the performance of the groups. With the random access rule there is no such strategic investment behavior and participants remain investing equal and similar levels as in the first 10 rounds.

The experiments show that a necessary condition of irrigation systems to self-organize is the development of norms to allocate fair shares of the water in order to recruit sufficient labor to construct and maintain the physical infrastructure. The different allocation rules do not increase efficiency, but they did increase equality of the earnings.

Keywords

Field experiments, Irrigation, Common pool resources, Asymmetry, Trust

2.5 **Aquacultural Engineering, Volume 44, Issue 3, May 2011, Pages 65-71**

Economical review of *Haematococcus pluvialis* culture in flat-panel airlift photobioreactors

Kerati Issarapayup, Sorawit Powtongsook, Prasert Pavasant

The cultivation of *Haematococcus pluvialis* NIES-144 in a flat panel airlift photobioreactor (FP-ALPBR) was examined based on its economical performance. Several cost-cutting options were proposed with the objective of maximising the profit. The use of natural lighting was inevitable to avoid the high electricity cost and replacing artificial lighting with sunlight was found to decrease the total production cost by as much as 307 US$ per 0.5 kg dry cell in the 50 L FP-ALPBR. Nevertheless, the lack of control of diurnal light intensity resulted in a drop in the growth performance with cell density decreasing from 387×10^4 to 140×10^4 cell mL^{-1}, and specific growth rate from 0.63 to 0.53 day^{-1}. Reactor size appeared to be significant for the profitability of the system, and enlarging the FP-ALPBR from 17 to 200 L required significantly lower total costs of production per year (121 US$ per 0.5 kg dry cell for 200 L culture when compared to 197 US$ per 0.5 kg dry cell for the 17 L system). Unfortunately this had to be compensated by a drop in the growth performance with cell density decreasing from 290×10^4 to 147×10^4 cell mL^{-1} and specific growth rate from 0.49 to 0.47 day^{-1}. Finally the reuse of spent medium with proper replenishment of nutrients (nitrate, phosphate, chromium, selenium and copper) caused an unexpected 30% drop in the growth rate and did not seem to provide an attractive response as the total cost per 0.5 kg dry cell was only saved by 8 US$ a year.

Keywords

Airlift photobioreactor, Microalga, Economical analysis, Bioprocess design

2.6 Scientia Horticulturae, Volume 130, Issue 4, 31 October 2011, Pages 801-807

Changes in antioxidants and fruit quality in hot water-treated 'Hom Thong' banana fruit during storage

Nittaya Ummarat, Tracie K. Matsumoto, Marisa M. Wall, Kanogwan Seraypheap

The effects of hot water treatment on antioxidants and fruit quality were investigated in banana fruit of cv. Gros Michel (*Musa acuminata*, AAA Group, locally called cv. Hom Thong) by immersing fruits in hot water (50 °C) for 10 min, before storage at 25 °C for 10 days or 14 °C for the first 8 days followed by storage at 25 °C for the second 8 days until ripening. Quality parameters including peel color and pulp firmness indicated that hot water treatment helped to delay banana fruit ripening at both storage conditions. Hot water treatment decreased the levels of hydrogen peroxide (H_2O_2) and malonydialdehyde (MDA) during storage at 25 °C. Glutathione (GSH and GSSG) contents and the ratio of GSH/GSSG during fruit approaching ripening were significantly induced in hot water-treated fruits while ascorbic acid (AA) contents were slightly increased. In addition, the combined treatment increased free phenolics and flavonoids during storage. Results suggest that hot water treatment has led to an induction of antioxidants in banana fruits as indicated by an increase of antioxidants and a decrease of H_2O_2 during ripening, and all of which result in a delayed ripening of banana fruit.

Keywords

Banana, Hot water treatment, Low temperature storage, Antioxidants

2.7 **Developmental & Comparative Immunology, Volume 35, Issue 5, May 2011, Pages 530-536**

The possible role of penaeidin5 from the black tiger shrimp, *Penaeus monodon*, in protection against viral infection

Noppawan Woramongkolchai, Premruethai Supungul, Anchalee Tassanakajon

Penaeidin class 5 (PEN5) has so far only been reported in the Chinese shrimp, *Fenneropenaeus chinensis*, and the black tiger shrimp, *Penaeus monodon*. The PEN5 homolog from *F. chinensis* (*Fenchi*PEN5) exhibits antimicrobial activities against both Gram-positive and Gram-negative bacteria as well as fungi. Here, we characterized the PEN5 gene from *P. monodon* (*Penmon*PEN5) and evaluated its potential involvement in antiviral immunity. The deduced open reading frame of *Penmon*PEN5 encodes for a predicted 79 amino acid peptide including a 19 amino acid signal peptide. The gene structure of *Penmon*PEN5 contains two exons interrupted by one intron, whilst the 5′ upstream sequence contains a putative TATA box and several GATA, GATA-3, AP-1 and dorsal transcription factor binding sites. *Penmon*PEN5 mRNA levels in *P. monodon* shrimps following a systemic infection with white spot syndrome virus (WSSV) were significantly induced at 24 h post infection, but was strongly down-regulated at 48 h post injection, compared to those of the uninfected control shrimps. The suppression of *Penmon*PEN5 transcript levels by RNA interference mediated gene silencing led to an increased susceptibility of shrimps to WSSV infection, suggesting a possible role of *Penmon*PEN5 in the shrimp's antiviral immunity.

Keywords

Shrimp, *Penaeus monodon*, Penaeidins, Antimicrobial peptide, White spot virus

2.8 **Journal of Virological Methods, Volume 173, Issue 1, April 2011, Pages 85-91**

Simultaneous and rapid detection of white spot syndrome virus and yellow head virus infection in shrimp with a dual immunochromatographic strip test

Paisarn Sithigorngul, Sombat Rukpratanporn, Parin Chaivisuthangkura, Pattarin Sridulyakul, Siwaporn Longyant

A strip test for the dual detection of white spot syndrome virus (WSSV) and yellow head virus (YHV) was developed using monoclonal antibodies (MAbs) specific to the WSSV major envelope protein VP28 (W1 and W30) and the YHV nucleocapsid protein p20 (Y19 and Y21). The MAbs W30 and Y19 were conjugated with colloidal gold and sprayed onto a glass fiber pad that was placed adjacent to a sample chamber. The MAbs W1 and Y21 and the goat anti-mouse immunoglobulin G (GAM) antibody were sprayed onto a nitrocellulose membrane in strips at positions designated W, Y and C, respectively. These test strips were placed in plastic cases and stored desiccated in a plastic bag. The test strips were assessed for their ability to detect WSSV and YHV simultaneously using pleopods sampled from shrimp. A pleopod homogenate in application buffer 100 μl was applied to the sample chamber to flow through the nitrocellulose membrane strip, and antibody–protein complexes could be observed within 15 min. In sample from shrimp infected with WSSV and/or YHV, viral protein bound to the colloidal gold-conjugated MAbs. These complexes were captured by the MAbs at the W and/or Y test lines, resulting in the appearance of reddish-purple coloured bands. Any unbound colloidal gold-conjugated MAbs migrated pass the W and Y lines would be captured by the GAM antibody, forming a band at position C. When samples not containing WSSV and YHV proteins or containing viral proteins at below the detection limit of the test, only the band at position C was observed. The sensitivity of the test was comparable to dot blot tests using single MAbs, and ~500-fold less sensitive than a 1-step PCR test for WSSV and 1000-fold less sensitive than an RT-PCR test for YHV. Despite this lower sensitivity, the dual strip test has advantages in speed and simplicity in not requiring sophisticated equipment or specialized skills. The ability to co-detect WSSV and YHV provides simultaneously cost savings.

Keywords

Immunochromatography, Monoclonal antibody (MAb), *Penaeus vannamei*, Strip test, White spot syndrome virus (WSSV), Yellow head virus (YHV)

2.9 **Journal of Environmental Sciences, Volume 23, Issue 6, June 2011, Pages 991-997**

Comparative study of heavy metal and pathogenic bacterial contamination in sludge and manure in biogas and non-biogas swine farms

Phitsanu Tulayakul, Alongkot Boonsoongnern, Suwicha Kasemsuwan, Srisamai Wiriyarampa, Juree Pankumnoed, Suwanna Tippayaluck, Hathairad Hananantachai, Ratchaneekorn Mingkhwan, Ramnaree Netvichian, Sutha Khaodhiar

The objective of this study is to determine and compare the heavy metal (Zn, Cu, Cd, Pb) and bacterial *(E. coli,* coliform and *Salmonella* spp.) contamination between swine farms utilizing biogas and non-biogas systems in the central part of Thailand. Results showed that average levels of *E. coli,* coliform, BOD, COD, Zn, Cu and Pb in sludge from the post-biogas pond were higher than the standard limits. Moreover, the levels of *E. coli,* coliform, Cd and Pb were also higher than the standard limits for dry manure. The levels of *E. coli,* coliform and BOD on biogas farms were lower than on non-biogas farms. Following isolation of *Salmonella* spp., it was found that *Salmonella* serovars Rissen was the most abundant at 18.46% (12/65), followed by Anatum 12.31% (8/65), and Kedougou 9.23% (6/65). The pathogenic strains of *Salmonella* serovars Paratyphi B var. java and Typhimurium were present in equal amounts at 4.62% (3/65) in samples from all swine farms. This study revealed that significant reduction in *E. coli* and coliform levels in sludge from covered lagoon biogas systems on swine farms. The presence of *Salmonella* as well as Cd and Pb, in significant amount in dry manure, suggests that there is a high probability of environmental contamination if it is used for agricultural purposes. Thus, careful waste and manure disposal from swine farms and the regular monitoring of wastewater is strongly recommended to ensure the safety of humans, other animals and the environment.

Keywords

Pathogenic bacteria, Heavy metal, Manure, Biogas, Sludge, Swine

2.10 **Plant Science, Volume 213, December 2013, Pages 67-78**

Overexpression of a partial fragment of the salt-responsive gene OsNUC1 enhances salt adaptation in transgenic *Arabidopsis thaliana* and rice (*Oryza sativa L.*) during salt stress

Siriporn Sripinyowanich, Nontalee Chamnanmanoontham, Thanikarn Udomchalothorn, Somporn Maneeprasopsuk, Panudda Santawee, Teerapong Buaboocha, Li-Jia Qu, Hongya Gu, Supachitra Chadchawan

The rice (*Oryza sativa* L.) *nucleolin* gene, *OsNUC1*, transcripts were expressed in rice leaves, flowers, seeds and roots but differentially expressed within and between two pairs of salt-sensitive and salt-resistant rice lines when subjected to salt stress. Salt-resistant lines exhibited higher *OsNUC1* transcript expression levels than salt-sensitive lines during 0.5% (w/v) NaCl salt stress for 6 d. Two sizes of *OsNUC1* full-length cDNA were found in the rice genome database and northern blot analysis confirmed their existence in rice tissues. The longer transcript (*OsNUC1-L*) putatively encodes for a protein with a serine rich N-terminal, RNA recognition motifs in the central domain and a glycine- and arginine-rich repeat in the C-terminal domain, while the shorter one (*OsNUC1-S*) putatively encodes for the similar protein without the N-terminus. Without salt stress, *OsNUC1-L* expressing *Arabidopsis thaliana Atnuc1-L1* plants displayed a substantial but incomplete revertant phenotype, whereas *OsNUC1-S* expression only induced a weak effect. However, under 0.5% (w/v) NaCl salt stress they displayed a higher relative growth rate, longer root length and a lower H_2O_2 level than the wild type plants, suggesting a higher salt resistance. Moreover, they displayed elevated *AtSOS1* and *AtP5CS1* transcript levels. We propose that *OsNUC1-S* plays an important role in salt resistance during salt stress, a new role for nucleolin in plants.

Keywords

Salt stress resistance, Nucleolin, Rice, RNA recognition motif, Glycine–arginine-rich repeat

2.11 **LWT - Food Science and Technology, Volume 44, Issue 1, January 2011, Pages 130-138**

Prediction of coliforms and *Escherichia coli* on tomato fruits and lettuce leaves after sanitizing by using Artificial Neural Networks

Suwimon Keeratipibul, Apiniharn Phewpan, Chidchanok Lursinsap

The objectives of this study were to investigate the efficacy of two sanitizers, i.e. hypochlorous and peracetic acids, in reducing coliforms and *Escherichia coli* levels on tomato fruits and lettuce leaves, and to mathematically predict the relationship among the initial bacterial load, type of vegetable/fruit, types and concentration of sanitizer and residual microorganism levels after the sanitizing, by applying artificial neural networks (ANNs). The *E. coli* and coliforms used in this study were isolated from the two food types, and their cultures were activated in Tryptic Soy Broth (ca. 6–7 $\log_{10}$ cfu/ml) before inoculating onto the fruit and vegetable. Both sanitizers reduced the number of the micro-organisms. However, as the hypochlorous acid concentration was increased, the level of viable coliforms and *E. coli* on the tomato fruits was reduced around 2–3 $\log_{10}$ cfu/g ($p \leq 0.05$), compared to only about 1 $\log_{10}$ cfu/g reduction on lettuce leaves ($p \leq 0.05$). Conversely, when the peracetic acid concentration was increased, the coliforms and *E. coli* levels on tomato fruits were reduced by some 3–4 $\log_{10}$ cfu/g ($p > 0.05$) compared to only about 2 $\log_{10}$ cfu/g on lettuce leaves ($p > 0.05$). The best sum square error from the neural prediction of residual coliforms and *E. coli* were 0.50 and 0.84, respectively, and the maximum R^2 of residual coliforms and *E. coli* were 0.85 and 0.72, respectively. Only one hidden layer with three hidden neurons for coliforms and five for *E. coli*, were required to model this data.

Keywords

Sanitizer, Lettuce, Tomato, *Escherichia coli*, Prediction, Artificial Neural Networks

2.12 **Food Control, Volume 22, Issue 12, December 2011, Pages 1893-1899**

The effect of polyesterurethane belt surface roughness on *Listeria monocytogenes* biofilm formation and its cleaning efficiency

Yuphakhun Chaturongkasumrit, Hajime Takahashi, Suwimon Keeratipibul, Takashi Kuda, Bon Kimura

Contamination of surfaces in direct contact with food in the processing line is the major cause of finished product cross-contamination, especially conveyor belt surfaces that transfer food products. Polyesterurethane (PSU) is one of the materials widely used in conveyor belt systems; therefore, the objective of this study was to examine the effect of PSU conveyor belt surface roughness on the ability of biofilm formation by two strains of *Listeria monocytogenes*, i.e. ATCC19114 and ATCC51782. Additionally, the efficiency of a cleaning and sanitizing procedure adopted by a chicken meat plant in Thailand in eliminating biofilm formation on belt surfaces was assessed. The roughness values (Ra) were 0.05 ± 0.00 μm and 1.44 ± 0.01 μm for new (unused) and old conveyor belts (in use for 5 years), respectively. It was found that at 30 °C, both strains of *L. monocytogenes* formed robust biofilms regardless of differences in surface roughness. Conversely, at 15°C, the ability of *L. monocytogenes* to form biofilms decreased with the lower Ra value. Under a simulated processing environment, cleaning and sanitizing reduced *L. monocytogenes* biofilms from both old and new conveyor belt surfaces to certain levels; however, a total reduction could not be achieved. In addition, more highly concentrated cleaning and sanitizing agents resulted in greater reduction. Results from this study clearly illustrate that surface roughness of material is also an important factor which may hinder effective cleaning and sanitizing. Therefore, the roughness value may be used as an indicator for evaluating the life of conveyor belts being used in the food industry.

Keywords

Biofilm, *Listeria monocytogenes*, Conveyor belts

3.0

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3.1 **International Food Research Journal 20 (6) , pp. 3275-3281, 2013**

Polyphenol extracts from low quality cocoa beans: Antioxidant, antibacterial and food colouring properties

Prayoga, R.D., Murwani, R., Anwar, S.

Good quality cocoa beans are well studied and known as rich source of natural polyphenols. On the contrary, little research has been done regarding polyphenol extracts (PE) from low quality cocoa beans i.e. partially fermented dry cocoa beans (PFDCB) and unfermented dry cocoa beans (UFDCB). The following research was carried out to study the antioxidant, antibacterial, and food colouring properties of polyphenol extracts from PFDCB (PE-PFDCB) and UFDCB (PE-UFDCB). Antioxidant activity of PE-PFDCB and PE-UFDCB showed IC50 value of 1.1604 mg/ml and 0.2500 mg/ml respectively. Antibacterial activity of PE-PFDCB and PE-UFDCB was effective at inhibiting the growth of *Staphylococcus aureus* and *Salmonella typhimurium* at 25,000 ppm to 100,000 ppm respectively. As food colouring for yogurt, PE-PFDCB and PE-UFDCB showed the best color stability at 3% in refrigerated storage (2 - 5°C). As food colouring for syrup, 3% of PE-PFDCB and PE-UFDCB showed the best color stability at room temperature storage (24 - 25°C) and refrigerated storage (2 - 5°C) respectively. This study showed that polyphenol extracts from unfermented dry cocoa beans have higher polyphenol contents and stronger antioxidant activity than partially fermented cocoa bean, and can be used at 3% as natural functional food colors.

Keywords

Antioxidant, Antibacterial, Cocoa beans, Natural food color, Polyphenol extracts

3.2 International Journal of Poultry Science 12 (7) , pp. 421-425.2013

The microstructure of egg shell waste treated with H_3PO_4, in vitro solubility in different particle size and the using effect on the egg shell quality of laying hens

Kismiati, S., Yuwanta, T., Zuprizal, Supadmo

The aim of the research was to study the microstructure changes of egg shell waste treated with H_3PO_4 and its effect on in vitro solubility and egg shell quality of laying hens. Egg shell waste was soaked in water with the temperature of 80°C, drained and divided into 4 parts. Part 1 was sun dried (control), part 2 was soaked in H_3PO_4 3%, part 3 was soaked in H_3PO_4 4% and part 4 was soaked in H_3PO_4 5%. Furthermore, egg shells were drained, sun dried and then grinded to a particle size of 1 and 3 mm and used in the feed of laying hens. A total of 96 twenty-five weeks old of laying hens (ISA Brown strain) were divided into 8 experimental dietary treatment in 4 x 2 factorial arrangements with 3 replication. Results of the research showed that the concentration of H_3PO_4 effected on egg shell microstructure changes and interaction of H_3PO_4 3 and 4% and particle size 1 mm was increased in vitro solubility. Concentration of H_3PO_4 and particle size had not significantly effect ($P>0.05$) on calcium intake, egg shell weight and egg shell percentage but significantly effect ($P<0.05$) on phosphorus intake and egg shell thickness. Egg shell thickness was increased at H_3PO_4 5% and particle size 3 mm. The research concluded that H_3PO_4 resulted in microstructure changes and in vitro solubility but did not change the quality of the egg shell, except egg shell thickness.

Keywords

Egg shell waste, H_3PO_4 concentrations, In vitro solubility and egg shell quality, Microstructure, Particle size

3.3 **Journal of Invertebrate Pathology 114 (1), pp. 7-10. 2013**

Replication of white spot syndrome virus (WSSV) in the polychaete *Dendronereis* spp.

Desrina, Verreth, J.A.J., Prayitno, S.B., Rombout, J.H.W.M., Vlak, J.M., Verdegem, M.C.J.

This study investigated whether WSSV replicates in naturally infected *Dendronereis* spp., a common polychaete (Nereididae) species in shrimp ponds in Indonesia. To detect WSSV replication, (i) immunohistochemistry (IHC) using a monoclonal antibody against WSSV VP28 protein and (ii) nested RT-PCR using specific primers set for the vp28 gene to detect WSSV-specific mRNA were applied. WSSV immunoreactive-nuclei were detected in the gut epithelium of the polychaete and WSSV mRNA was detected with nested RT-PCR. This, together with the IHC results, confirmed that WSSV could replicate in *Dendronereis* spp. This is the first report showing that WSSV replicated in a naturally infected non-crustacean host.

Keywords

Dendronereis spp., WSSV, Replication, Immunohistochemistry, RT-PCR

3.4 **Food Chemistry 139 (1-4), pp. 837-844. 2013**

Inhibition kinetics of lipid oxidation of model foods by using antioxidant extract of fermented soybeans

Wardhani, D.H., Fuciños, P., Vázquez, J.A., Pandiella, S.S.

Fermentation by using *Aspergillus oryzae* has been reported to increase antioxidant activity of soybeans significantly. The effectiveness of the extract from fermented soybeans was studied in 3 model foods with different complexities, i.e., linoleic acid emulsion, sunflower oil emulsions and bulk sunflower oil. For the emulsion systems, oxidation at two different pH values (4.5 and 7) was also compared. A reparameterised logistic equation was used to describe and to predict the experimental data. In general, a good agreement between experimental trends and simulated data from the model was found. A crude antioxidant extract (5 mg/g) showed a comparable antioxidant activity to 0.26 mg/g of butylated hydroxytoluene (BHT) in the linoleic acid emulsions. The extract exhibited a better capability to retard primary products in the linoleic acid systems than the secondary products. The opposite effect was observed in the bulk sunflower oil and its emulsion systems.

Keywords

Lipid oxidation, Antioxidant of fermented soybeans, Logistic equation, Linoleic acid, Sunflower oil, Emulsion

3.5 **Journal of Food Science and Technology, pp. 1-6. 2013**

Application of foam-mat drying with egg white for carrageenan: drying rate and product quality aspects

Djaeni, M., Prasetyaningrum, A., Sasongko, S.B., Widayat, W., Hii, C.L.

Drying is a significant step in the production of carrageenan. However, current drying process still deals with too long drying time and carrageenan quality degradation. The foam mat drying is an option to speed up drying process as well as retaining carrageenan quality. In this case, the carrageenan was mixed with egg white (albumin) as foaming agent and methyl cellulose for foam stabilizer. The foam will break the carrageenan gels and creates the porous structure resulting higher surface area for water transfer. This research studied the effect of egg white and methyl cellulose on carrageenan drying at various air temperature, and thickness. As a response, the water content versus time was observed and the drying rate was estimated. Meanwhile, the carrageenan texture was verified by X-RD (X-Ray Diffraction) and TEM (Transmission Electron Microscopy). Results showed that the presence of egg white stablized by methyl cellulose can speed up drying rate as well as retaining the crystalline structure of carrageenan. The higher albumin content, the faster drying rate. However, the addition of albumin and methyl cellulose restricted not more than 30 % in the mixture for keeping carrageenan quality and purity. By adding egg white 20 % and methyl cellulose 10 %, the water diffusion and drying rate can be two fold compared with carrageenan drying without foam. The improvement can be higher at the higher temperature and thinner carrageenan sheets.

Keywords

Carrageenan, Drying rate, Egg white, Foam mat, Quality

3.6 **Journal of Applied Sciences Research 8 (9), pp. 4828-4836. 2012**

Effectiveness of fluorescent lamp on lift net fishery

Puspito, G., Suherman, A.

The research aims to determine the composition of the lift net catch and effectiveness of the fluorescent lift net catches lamp. Three fluorescent lamps that operated on lift net catch is a standard fluorescent lamps, fluorescent reflector lamps and fluorescent lamp dipped into the water. Each fluorescent lamp operated 2 times a night for 10 nights. The results showed that the composition of the catch consisted of *sardinella fimbriata* weighing 95.2 kg, 58 kg of *Rastrelliger* sp., anchovies 44.4 kg, 34.5 kg of *mysis* sp., *Trichiurus* sp. 29.5 kg, 20.5 kg *pampus argentus*, squid 16, 5 kg and 14 kg of cob. Lamp dipped in the water is very effectively operated by the lift net catch floating, aquatic organisms as it can catch weighing 151.10 kg. standard lamps and reflector lamp get the catch weighing 96 kg and 65.50 kg.

Keywords

Effectiveness, Florescent lights, Lift net catch, Palabuhan Ratu waters

3.7 **Research Journal of Applied Sciences, Engineering and Technology 4 (17), pp. 2854-2860. 2012**

Water solubility, swelling and gelatinization properties of raw and ginger oil modified gadung (*Dioscorea hispida dennst*) flour

Kumoro, A.C., Retnowati, D.S., Budiyati, C.S., Manurung, T., Siswanto

The aim of this study was to study the modification of gadung (*Dioscorea hispida Dennst*) flour using ginger oil as cross-linking agent following dispersion method to meet the standard physicochemical properties of wheat flour. For this purpose, effect of gadung starch: ginger oil molar ratio (2 and 3), reaction time (30, 60, 90 and 120 min) and temperatures (30, 40 and 50°C) on the water solubility, swelling and gelatinization properties of the modified gadung flour were investigated. Best modification condition was obtained at modification using gadung starch:ginger oil ratio of 3 at 30°C and 60 min, where the modified gadung flour obtained has a very similar water solubility, swelling and gelatinization properties with American wheat flour, which were 7.28 (g/100g), 7.9 (g/g) and 56.2°C, respectively. One of the drawbacks of the modified gadung flour obtained was only the presence of the remaining ginger aroma.

Keywords

Cross-linking, Gadung flour, Gelatinization, Ginger oil, Swelling power, Water solubility

3.8 **Food Hydrocolloids 28 (1), pp. 189-199. 2012**

Physico-mechanical and antimicrobial properties of gelatin film from the skin of unicorn leatherjacket incorporated with essential oils

Ahmad, M., Benjakul, S., Prodpran, T., Agustini, T.W.

Gelatin films incorporated with bergamot (BO) and lemongrass oil (LO) at various concentrations as glycerol substitute were prepared and characterised. Incorporation of BO and LO at 5-25% (w/w protein) resulted in the decreases in both tensile strength (TS) and elongation at break (EAB) of the films. Water vapour permeability (WVP) were decreased in LO incorporated films, while it was increased in film added with BO at level higher than 5% ($P<0.05$). Film solubility and transparency values decreased, and the films had the lowered light transmission in the visible range when BO and LO were incorporated. Films incorporated with LO showed inhibitory effect in a concentration dependent manner against *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus* and *Salmonella typhimurium*, but BO added film inhibited only *L.monocytogenes* and *S.aureus*. Films containing both BO and LO did not inhibit *Pseudomonas aeruginosa*. Significant change of molecular organisation and higher intermolecular interactions among gelatin molecules were found in the film structure as determined by FTIR. Thermo-gravimetric analysis (TGA) demonstrated that films added with BO and LO exhibited enhanced heat stability with higher degradation temperature, compared with control film. Scanning electron microscopic (SEM) images revealed the presence of micro-pores in the essential oil incorporated films, which contributed to physical properties of the resulting films. Thus, gelatin films incorporated with BO and LO can be used as active packaging, but the properties could be modified, depending on essential oil added.

Keywords

Unicorn leatherjacket skin, Film, Gelatin, Essential oil, Antimicrobial, Mechanical properties

3.9 **Advance Journal of Food Science and Technology 4 (1), pp. 51-55. 2012**

Thin layer drying kinetics of roselle

Suherman, B.F., Satriadi, H., Yuariski, O., Nugroho, R.S., Shobib, A.

This study was performed to determine the most appropriate thin layer drying model and the effective moisture diffusivity of Roselle (*Hibiscus sabdariffa*). Roselle with an Initial Moisture Content (IMC) of 85%, on wet basis (wb) was dried in a conventional tray dryer at temperatures of 40, 50 and 60°C. The drying data were fitted to eleven thin layer models and a thin layer model for the roselle calyx was developed by regressing the coefficients of the best fit model. The newton model was most adequate model for describing the thin layer drying kinetics of the roselle calyx. The drying constant was found to vary linearly with temperature. Also, effective diffusivity was evaluated by using Fick's second law, which varied from 1.405×10^{-10} to 2.283×10^{-10} m^2/s. The dependence of moisture diffusivity on temperature was described by Arrhenius type equation. The diffusivity constant D_0 activation energy Ea could be, respectively, estimated as 4.5×10^{-7} m^2/s and 21.02 kJ/gmol.

Keywords

Activation energy, Diffusivity, Drying, Moisture ratio, Roselle, Thin layer drying

3.10 **Fisheries and Aquatic Science 14 (4), pp. 371-378. 2012**

Performance of three different biofilter media in laboratory-scale recirculating systems for red seabream *pagrus major* culture

Dicky Harwanto, Sung-Yong Oh, Heung-Sik Park and Jae-Yoon Jo

Juvenile red seabream (mean body weight 29.0 g) were reared in recirculating culture systems with three different biofilter media, sand (SF), polystyrene microbeads (PF), and Kaldnes beads (KF). The efficiencies of the three different biofilter media were also tested. The SF was fluidized, and the PF and KF were trickled. All treatments were duplicated. The volumetric removal rates of total ammonia nitrogen by SF, PF, and KF were 193.8, 183.9, and 142.6 g m^{-3} day^{-1}, respectively, and those of nitrite nitrogen (NO_2-N) were 113.4, 105.9, and 85.8 g m^{-3} day^{-1}, respectively. The TAN and NO_2-N removal rates of KF were lower than those of SF and PF ($P < 0.05$), but there was no significant difference in these rates between SF and PF ($P > 0.05$). Among the biofilters used, only KF showed total suspended solid (TSS) removal capacity. The TSS removal efficiencies of SF and PF were negative. The growth rates of fish in SF were significantly higher than those in KF but not higher than those in PF. There was no difference in growth rate between fish in PF and KF. The specific growth rate and feed conversion efficiency of red seabreams in KF were lower than those in SF and PF, but there were no significant differences between SF and PF. These results indicate that sand and polystyrene microbeads are recommended for red seabream culture in a recirculating system.

Keywords

Pagrus major, Recirculation system, Red seabream, Biofilter, Nitrification

3.11 **World Applied Sciences Journal 16 (9) , pp. 1262-1268. 2012**

Preparation of wine from jackfruit (*Artocarpus heterophyllus lam*) Juice using baker yeast: Effect of yeast and initial sugar concentrations

Kumoro, A.C., Sari, D.R., Pinandita, A.P.P., Retnowati, D.S., Budiyati, C.S.

The overproduction of jackfruit (*Artocarpus heterophyllus Lam*) during harvest season and its short shelf-life have caused serious losses for farmers. Fortunately, high sugar content of the fruit pulp makes the juice a potential substrate for wine production. This work was purposed to investigate the effect of yeast and initial sugar concentrations on jackfruit juice wine fermentation. Clarified jackfruit juice of 14 % w/w sugar concentration was fermented using 0.5 to 2.0 % w/v Baker's yeast (*Saccharomyces cerevisiae*) under anaerobic condition at 30°C for 14 days. Samples were collected daily for ethanol and sugar contents analysis. The profile of sugar and ethanol concentration as function of fermentation time, showed that higher yeast inoculums rate and initial sugar concentrations inhibited growth of yeasts. The fermentation of original jackfruit juice of 14 % w/w sugar concentration using 0.5% w/v yeast for 9 days was the best to produce a good quality wine with 12.13% v/v of ethanol and specific jackfruit aroma.

Keywords

Wine, Jackfruit, Yeast concentration, Sugar concentration, Ethanol, Time

3.12 **International Food Research Journal 19 (1) , pp. 119-125. 2012**

Effect of alloe vera (*alloe vera*) and crown of god fruit (*phaleria macrocarpa*) on sensory, chemical, and microbiological attributes of indian mackerel (*restrelliger neglectus*) during ice storage

Tri Winarni, A., Eko, S., Ismail, M.A., Mohammad Shafiur, R.

The effects of Aloe vera (*Aloe vera*) and crown of god fruit (*Phaleria macrocarpa*) on the sensorial, chemical, and microbiological attributes stability of Indian mackerel (*Rastrelliger neglectus*) during chilled storage for 12 days were studied. Treatment with blended 20% blended *Aloe vera* reduced the deterioration rate of the sensorial attributes, but treatment with 1% dried powder from crown of god fruit produced brownish color. Moreover, these treatments reduced total plate count (TPC) and total volatile bases nitrogen (TVBN) during the 12-day storage. This study showed that treaments with *Aloe vera* and crown of god fruit can prolong the shelf-life of Indian mackerel by four days during chilled storage.

Keywords

Chilled, Indian mackerel, Storage, Total plate count, Total volatile bases nitrogen

3.13 **International Journal of Poultry Science 10 (12), pp. 990-997. 2011**

Blood biochemical indices and productivity of broilers on diet supplemented with mannan oligosacharide, baker yeast, or combined baker yeast and Noni leaves extracts

Murwani, R., Indriani, A., Yuliana, I., Wihardani, K., Wahyuningrum, M.A., Tawakal, N.R., Mulyono, Kusumanti, E.

A research was carried out to study the inclusion of MOS, inactivated baker yeast or combined baker yeast and Noni leaves extracts into corn-mungbean basal diet on broilers blood biochemical indices and productivity. Lohman MB-202 day old chicks were randomly assigned into four treatment diets i.e. 1) commercial/control diet (Dc), 2) basal diet plus MOS (DM), (3) basal diet plus inactivated baker yeast (D Y), (4) basal diet plus inactivated baker yeast and Noni leaves extracts (D Y+L). Treatment diets and water were given ad libitum. Whole blood was sampled on day 21 for determination of hemoglobin and haematocrit, Serum Glutamic Pyruvic Transaminases, Glutamic Oxaloacetic Transaminases, creatinine, lipid profile, alkaline phosphatase and lactic acid. Relative organs weight, abdominal fat, productivity were also determined. Feed intake, body weight and feed conversion of broilers fed DM, D Y, D Y+L were the same but they were lower than control diet ($p<0.05$). Serum triglyceride, GPT, creatinine, cholesterol, VLDL+LDLchol and HDLchol were significantly affected by the diets ($p<0.05$). No effect was found for other serum biochemical indices. For relative internal organs weight, a significant effect was found for heart, liver, ileum, duodenum and pancreas. These results were discussed in terms of the possible underlying mechanism. Our results here provide evidence that MOS, inactivated baker yeast alone or its combination with Noni leave extract could produce low serum TG, total cholesterol, VLDL+LDLchol, HDLchol and abdominal fat in broilers fed corn-mungbean basal diet with no negative effect on other serum biochemical indices.

Keywords

MOS, Baker yeast, Noni leaves extract, Mugbean, Biochemical indices

3.14 **African Journal of Microbiology Research, 6 (2), pp 426-430. 2012**

Nano study of antioxidant activities of fermented soy whey prepared with lactic acid bacteria and kefir

M. Monajjemi, A. L. Nurul Aminin, A. R. Ilkhani and F. Mollaamin

This study aims were to test antioxidative activity of supernatant from fermented soy whey to find out their nutraceutical potential. Fermented soy whey was prepared using *Lactobacillus plantarum*, *Streptococcus thermophilus* and Kefir, fermented at room temperature (25-26 degrees C) for 24 and 48 h. Antioxidative properties were assessed by DPPH (2,2-diphenyl-1-picrylhydrazyl) scavenging activity and reducing power. All fermented soy whey extracts exhibited a potentially antioxidant activities, yet extract kefir soy whey with 48 h incubation gave significant highest antioxidant activity compared to others. The results suggest that fermented soy whey formulations could provide a functional food alternative to milk-based fermented products.

Keywords

Soy whey, Fermentation, LAB, Kefir, Antioxidant

3.15 **3RD International Conference on Biotechnology and Food Science (ICBFS 2012), APCBEE Procedia, Volume: 2, Pages: 1-6 ,2012**

Quality characteristic and lysine available of smoked fish

Swastawati, Fronthea, Susanto, Eko, Cahyono, Bambang, et al.

The purpose of this research was to determine the quality of smoked stingray (*Dasyatis blekery*). The fish were divided into two groups; then processed using corncob (CCLS) and coconut shells (CSLS) liquid smoke. All of smoked stingray samples were subjected to sensory and chemical analysis. Sensory analysis on both samples was no statistically different. On the other hand, the lysine availability was different either in the in the raw materials or smoked samples due to smoking process and duration of storage. Different liquid smoke and storage time gave significant effect to lysine availabilty ($p<0,05$). Both liquid smoke gave significant effect ($p<0,05$) to PV (CSLS = 2,816 meq/kg & CCLS = 2,195meq/kg) and TBA (CSLS = 109,685 mg malonaldehide/kg & CCLS = 45,169 mg malonaldehide/kg), but during storage this value were decrease as an effect of antioxidant activities of phenolic compounds consist in each liquid smoke. In contrast, pH values were increase. Both liquid smoke were able to apllied as a method of smoking fish.

Keywords

Stingray, Coconut shells liquid smoke, Corn cob liquid smoke, Quality, Lysine

3.16 **Food and Bioprocess Technology, 4 (8), pp. 1482-1488. 2011**

Influence of Temperature and Solid Concentration on the Physical Properties of Noni (*Morinda citrifolia* L.) Juice

Kumoro, Andri Cahyo, Retnowati, Diah S., Budiyati, Catarina S.

The effect of temperature on the physical properties of fresh noni (*Morinda citrifolia L.*) juice with three different solid concentrations (5, 10, and 15 degrees Brix) was investigated. The flow behaviour index (n) and thermal conductivity (k) were found to increase with the increase in temperature. On the other hand, the juice density (.) and consistency coefficient (K) were found to decrease with increasing temperature. The increase in solid concentration leads to increase juice density and consistency coefficient, but reduce flow behaviour index and thermal conductivity. The experimental data were then correlated with temperature and solid concentration using nonlinear regression equations or empirical models. It was found that the physical properties calculated using proposed equations agree well with the experimental data with coefficient of determinations (R^2) ranged from 0.9897 to 0.9998.

Keywords

Noni, Consistency coefficients, Flow behaviour index, Density, Thermal conductivity

3.17 **Brain Research, 1379, Special Issue: SI, Pages: 206-212, Mar 16, 2011**

Borobudur revisited: Soy consumption may be associated with better recall in younger, but not in older, rural Indonesian elderly

Hogervorst, Eef, Mursjid, Fidiansjah, Priandini, Dewi, Setyawan H., Ismael R.I., Bandelow S., Rahardjo T.B.

Previous reports have suggested that high frequent tofu consumption is associated with worse cognitive function in East Asian elderly. Some studies also found an increased risk of dementia with high tofu consumption in those older than 65 years of age. Tofu and other soy products, such as tempeh, contain high levels of plant estrogens or isoflavones. This study revisited a rural Central Javanese population (56-97 years of age) who were covered by the Borobudur District Health Centers. Data on cognitive performance were available for n=142 participants. Results showed positive linear associations of weekly tofu (beta = .22, $p < 0.05$) and tempeh (beta = .23, $p < 0.01$) consumption with immediate recall, which were significant in those with an average age of 67 years. In those with an average age of 80 years, the earlier reported negative association of tofu with immediate recall was no longer significant. Lifestyle changes (reduction of tofu consumption after dissemination of results) or "healthy survivor effects" may have been responsible for this finding. These findings may be reminiscent of the "Window of Opportunity" theory, which suggests that estrogenic compounds can exert positive effects on verbal memory, but not in older men and women, when no or negative effects of these compounds on brain cells and cognition have been found. Long-term, placebo-controlled treatment studies should investigate whether tempeh, a fermented soybean product that also contains folate, can maintain cognitive function in middle-aged and elderly participants.

Keywords

Phytoestrogens, Isoflavones, Window of Opportunity, Memory, Soy, Dementia

4.0 **Kampus ITS Surabaya, Indonesia**

4.1 **Journal of Theoretical and Applied Information Technology, Vol. 58 Issue 3, pp. 657, 2013**

Intelligent irrigation water requirement system based on artificial neural networks and profit optimization for planting time decision making of crops in Lombok Island

Irawan, M.I., Syaharuddin, Utomo, D.B., Rukmi, A.M.

Cropping pattern is a scheduling for farming time on a certain land in a definite period (e.g. 1 year), including unfilled area. In arranging crop planting patterns, hydrological (rainfall), climatological (temperature, humidity, wind speed, and sunshine), crop (crop coefficient value, productivity and price) and land area data are required. Therefore, a method that can be applied to predict the hydro climatological data is needed. The appropriate method for such prediction is Back Propagation Neural Network (BPNN). Prediction result of BPNN will be used to determine minimum crop water requirements, and it will be associated with planting time (age) of each crop for making cropping pattern. The design of most favorable cropping pattern will obtain the maximum profit and reduce fail harvest problem, which in turns it can contribute to national food resilience. Based on the simulation result, it was known that the BPNN with two hidden layers is able to predict hydro climatological data such as of rainfall, temperature, humidity, wind speed, and sunshine data with an average accuracy rate of 95.72% - 96.61%. Meanwhile, validation of predictions obtained an average percentage error of 1.12% with an accuracy of 99.76%. The results of the optimization of the cropping pattern in Lombok in March 2013-February 2014 revealed an accurateness of profit in each district/city in East Lombok, Central Lombok, West Lombok, North Lombok, and Mataram increased 2.02%, 16.88%, 20, 23%, 21.89%, and 5.58%, respectively. Over all, the increasing average was found to be 13.3% from the previous year.

Keywords

Crop, Rainfall, Back Propagation Neural Network (BPNN), Optimization

4.2 **Soybeans: Cultivation, Uses and Nutrition, pp. 309-332, 2011**

Soybean oil deodorizer distillate: An integrated isolation and analyses system of its bioactive compounds

Gunawan, S., Kasim, N.S., Ju, Y.-H.

Soybean oil is the most consumed vegetable oil in the world, representing 30% of the consumption in the worldwide market. During the production of soybean oil, soybean deodorizer distillate (SODD) is produced as byproduct of a deodorization step. It represent about 3% of refined oil or 0.6% of soybean seed as feed in the refining process. Recent interest in the exploitation of SODD is due to its content of economically-valuable bioactive compounds. It has been suggested as an alternative to marine animals as natural source of squalene and as a good raw material for the production of fatty acid steryl esters (FASEs), free phytosterols, and tocopherols. The aim of this chapter is to discuss the isolation and separation techniques, and analysis methods of these bioactive compounds. SODD typically contains high level of free fatty acids (FFAs) and acylglycerols depending on the conditions of the oil refining process, and the efficient elimination of them is crucial for the enrichment of the bioactive compounds. There are several different methodologies for the elimination of FFAs and acylglycerols: hydrolysis, esterification, transesterification, distillation, crystallization, adsorption, and liquid-liquid extraction. The development of new isolation techniques has gained increasing importance in chemical, food, and pharmaceutical industries, due to the imposed environmental regulations and the necessity of minimizing energy requirement. The analysis methods of the bioactive compounds is also a challenging problem. Few analytical techniques are available to provide a detailed analysis. It will be of great importance if a method to identify individual compounds in SODD can be established.

4.3 **Journal of Food Engineering , Volume: 108, Issue: 2, pp. 290-296, 2012**

Lycopene extraction from tomato peel by-product containing tomato seed using supercritical carbon dioxide

Siti Machmudaha, Zakariab, Sugeng Winardi, Mitsuru Sasaki, Motonobu Goto, Nami Kusumoto, Kiro Hayakawa

This work discusses the extraction of lycopene from tomato peel by-product containing tomato seed using supercritical carbon dioxide. The presence of tomato seed in the peel by-product improved the yield of extracted lycopene. Extraction was carried out at temperatures of 70-90 degrees C, pressures of 20-40 MPa, a particle size of 1.05 +/- 0.10 mm and flow rates of 2-4 mL/min of CO_2 for 180 min extraction time. Oil from tomato seed was extracted under similar operating conditions and analyzed using GC-MS and GC-FID, while carotenoids extracted were analyzed by HPLC. The optimum operating condition to extract lycopene, under which 56% of lycopene was extracted, was found to be 90 degrees C. 40 MPa, and a ratio of tomato peel to seed of 37/63. The presence of tomato seed oil helped to improve the recovery of lycopene from 18% to 56%. The concentration of lycopene in supercritical carbon dioxide as a function of density at various temperatures was determined.

Keywords

Lycopene, Tomato peel by-product, Tomato seed, Supercritical CO_2 extraction

5.0

Mae Fah Luang University, Thailand

5.1

Food and Bioproducts Processing, Volume 90, Issue 3, July 2012, Pages 385-391

Pineapple wastes: A potential source for bromelain extraction

Sunantha Ketnawa, Phanuphong Chaiwut, Saroat Rawdkuen

This study investigates the isolation and characterization of bromelain extract from the wastes of *Nang Lae* and *Phu Lae* pineapple cultivars (economical fruits of Chiang Rai province, Thailand). The waste portions such as the peel, core, stem and crown were 29–40%, 9–10%, 2–5% and 2–4% (w/w), respectively. The extract of crown from both cultivars gave the highest proteolytic activity and protein contents, while the extract from the stem exhibited the lowest values. SDS–PAGE showed that the major protein band in the extracts was ~28 kDa. Activity staining of the crown extracts from both cultivars confirmed that the major protein band showed caseinolytic activity on the casein substrate-gel. All of the crude extracts from both cultivars gave high caseinolytic activity (>80% relative) in a board pH range (3–9). The optimum temperatures for all crude extracts were about 50–60 °C. This study founded that there is much added value into local Thailand pineapple wastes because of bromelain extraction.

Keywords

Bromelain, Extraction, *Nang Lae*, *Phu Lae*, Pineapple, Waste utilization

6.0

Prince Songkhla University, Thailand

6.1

Postharvest Biology and Technology, Volume 61, Issue 1, July 2011, Pages 1-14

Expression of ripening-related genes in cold-stored tomato fruit

Adirek Rugkong, Ryan McQuinn, James J. Giovannoni, Jocelyn K.C. Rose, Christopher B. Watkins

The effects of chilling on fruit ripening and the expression of ripening-related genes have been investigated in M82IL2-2, a wild species introgression breeding tomato line (*Solanum lycopersicum* × *Solanum pennellii*). Fruit harvested at the breaker stage of ripening were stored at 3 °C for 0, 1, 2 and 4 weeks, followed by 20 °C for 0–14 d. Fruit stored for 1 week ripened normally, as assessed by red color development and softening at 20 °C, but those stored for 2 or 4 weeks showed delayed or inhibited ripening. The concentrations of the carotenoids, phytoene, phytofluene, zeta (ζ)-carotene, gamma (γ)-carotene and lycopene, but not lutein and β-carotene, were reduced in chilled fruit. Microarray analysis showed that after storage at 3 °C for 4 weeks, 352 genes were up-regulated by chilling, whereas 321 genes were down-regulated, while after 7 d at 20 °C, 180 and 126 genes, respectively, were up- and down-regulated in chilled fruit. Chilling-induced changes included expression of transcriptional repressors such as a C2H2-type zinc finger protein. Expression of genes involved in color development, including phytoene synthase1 (*PSY1*), carotenoid isomerase (*CRTISO*), geranylgeranyl diphosphate synthase 2 (*GGPPS2*), and 1-deoxy-d-xylulose-5-phosphate synthase (*DXS*), showed reduced expression during and after chilling, as did genes encoding the cell wall modifying proteins polygalacturonase (PG), pectin esterase1 (PE1), β-galactosidase (*TBG4*), expansin1 (*LeExp1*), and xyloglucan endotransglucosylase-hydrolase 5 (*XTH5*). Alcohol dehydrogenase 2 (*ADH2*) and alcohol acyltransferase (*AAT*) gene expression was also reduced by chilling. Alteration of ethylene production correlated with the altered ACC synthases (*ACS2, ACS4*), and ACC oxidase (*ACO1*) expression. The expression of genes involved in the ethylene signal transduction pathway, such as *LeETR1*, *NR*, *LeETR4*, *LeCTR1*, *LeEIL3*, *LeEIL4*, and *LeERF3*, was altered by chilling, suggesting that ethylene perception and sensitivity were affected.

Chilling also reduced gene expression of a ripening-regulated transcription factor, *LeMADS-RIN*. The effect of chilling on ethylene biosynthesis, ethylene perception, the expression of a transcription factor necessary for ripening, and transcriptional repressors may contribute to the alteration of fruit ripening in tomato.

Keywords

Chilling injury, Tomato, Gene expression, Fruit ripening, Ethylene receptor, *Le-MADS-RIN*

6.2 **Food Chemistry, Volume 129, Issue 3, 1 December 2011, Pages 1093-1099**

Effect of legume seed extracts on the inhibition of proteolytic activity and muscle degradation of fresh water prawn (*Macrobrachium rosenbergii*)

Chodsana Sriket, Soottawat Benjakul, Wonnop Visessanguan, Kenji Hara

Trypsin inhibitors in the extracts from soybean (*Glycine max*), adzuki bean (*Vigna angularis*), Bambara groundnut (*Vigna subterranea*) and red kidney bean (*Phaseoulus vulgaris*) varied in amount and molecular weight. The soybean extract had the highest level of trypsin inhibitor with molecular weight (MW) of 21 kDa, followed by bambara groundnut extract possessing trypsin inhibitor with MW of 15 kDa. Both extracts showed a more effective inhibition towards crude protease extract (CE) from the hepatopancreas of fresh water prawn (*Macrobrachium rosenbergii*) than the extracts from adzuki and red kidney beans. Activity staining also reconfirmed the higher inhibitory activity on CE from hepatopancreas by the extracts from both soybean and bambara groundnut. The extracts from all seeds were able to inhibit the degradation of fresh water prawn meat containing CE in a concentration dependent manner. Based on inhibitor study, the extracts from soybean and bambara groundnut can be a potential aid to suppress the muscle softening of fresh water prawn, mediated by trypsin-like proteases released from hepatopancreas, during extended iced storage.

Keywords

Trypsin inhibitor, Legume seed, Fresh water prawn, Protease, Collagenase, Degradation, Muscle proteins

6.3 **Fish & Shellfish Immunology, Volume 32, Issue 1, January 2012, Pages 170-177**

Effect *of Lactobacillus plantarum* isolated from digestive tract of wild shrimp on growth and survival of white shrimp (*Litopenaeus vannamei*) challenged with *Vibrio harveyi*

Khanitta Kongnum, Tipparat Hongpattarakere

Two hundred and two strains of lactic acid bacteria (LAB) isolated from digestive tracts of cultivated and wild adult shrimp, including *Litopenaeus vannamei*, *Metapenaeus brevicornis* and *Penaeus merguiensis* were selected based on their antibacterial activity against *Vibrio harveyi*. LAB strain of MRO3.12 exhibiting highest reduction of *V. harveyi* was identified as *Lactobacillus plantarum* MRO3.12 based on the nucleotide sequence of its 16S rDNA, which showed 99% (780/786 bp) homology to *L. plantarum* strain L5 (GenBank accession number DQ 239698.1). Co-cultivation of *V. harveyi* and *L. plantarum* MRO3.12 showed complete reduction of *V. harveyi* at 24 h under aerobic and anaerobic conditions, whereas *L. plantarum* increased from 5.29 to 9.47 log CFU ml^{-1}. After 6-week feeding trial with *L. plantarum* supplemented diet, white shrimp (*L. vannamei*) exhibited significant differences ($p < 0.05$) in relative growth rate (% RGR), feed conversion ratio (FCR) and survival compared to the control group fed with non-supplemented diet. LAB-fed group showed 98.89% survival, whereas only 68.89% survival was observed in the control group. LAB from the digestive tract of probiotic-fed shrimp showed higher level of 5.0 ± 0.14 log CFU/g than the non-supplemented ones (3.34 ± 0.21 log CFU/g). However, total bacterial and non-fermenting vibrios counts decreased in shrimps fed on *L. plantarum*. Ten days after infection with *V. harveyi* (5.3–5.5 log CFU ml^{-1}), significant survival ($p < 0.05$) of 77% was observed in LAB supplemented shrimp, while only 67% survival was observed in the control.

Keywords

Antibacterial, *Vibrio harveyi*, *Lactobacillus plantarum*, *Litopenaeus vannamei*, Shrimp probiotic

6.4 **Food Policy, Volume 43, December 2013, Pages 306-320**

Potential impact of genetically improved carp strains in Asia

Madan Mohan Dey, Praduman Kumar, Oai Li Chen, Md. Akhtaruzzaman Khan, Nagesh Kumar Barik, Luping Li, Ayut Nissapa, Ngoc Sao Pham

During the past one decade, the WorldFish Center and its research partners have made a systematic attempt to improve the productivity of carps through selective breeding in the major carp-producing countries in Asia. This paper analyses the potential impact of culturing the improved carp strain in five Asian countries (Bangladesh, China, India, Thailand and Vietnam), using a three-step procedure. These steps are: (i) development of a fish sector model for each country, (ii) construction of *ex ante* impact indicators of improved carp strains, and (iii) analysis of the overall potential impact of culturing the genetically improved carp strains by incorporating the technology scenarios into the fish sector model. The results show that the genetic improvement programs of carp strains are highly beneficial to fish farmers, fish consumers and national economies in Asia.

Keywords

Impact assessment, Genetically improved carp, Fish sector model

6.5 **Food Hydrocolloids, Volume 28, Issue 1, July 2012, Pages 189-199**

Physico-mechanical and antimicrobial properties of gelatin film from the skin of unicorn leatherjacket incorporated with essential oils

Mehraj Ahmad, Soottawat Benjakul, Thummanoon Prodpran, Tri Winarni Agustini

Gelatin films incorporated with bergamot (BO) and lemongrass oil (LO) at various concentrations as glycerol substitute were prepared and characterised. Incorporation of BO and LO at 5–25% (w/w protein) resulted in the decreases in both tensile strength (TS) and elongation at break (EAB) of the films. Water vapour permeability (WVP) were decreased in LO incorporated films, while it was increased in film added with BO at level higher than 5% ($P < 0.05$). Film solubility and transparency values decreased, and the films had the lowered light transmission in the visible range when BO and LO were incorporated. Films incorporated with LO showed inhibitory effect in a concentration dependent manner against *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus* and *Salmonella typhimurium*, but BO added film inhibited only *L. monocytogenes* and *S. aureus*. Films containing both BO and LO did not inhibit *Pseudomonas aeruginosa*. Significant change of molecular organisation and higher intermolecular interactions among gelatin molecules were found in the film structure as determined by FTIR. Thermo-gravimetric analysis (TGA) demonstrated that films added with BO and LO exhibited enhanced heat stability with higher degradation temperature, compared with control film. Scanning electron microscopic (SEM) images revealed the presence of micro-pores in the essential oil incorporated films, which contributed to physical properties of the resulting films. Thus, gelatin films incorporated with BO and LO can be used as active packaging, but the properties could be modified, depending on essential oil added.

Keywords

Unicorn leatherjacket skin, Film, Gelatin, Essential oil, Antimicrobial, Mechanical properties

6.6 **General and Comparative Endocrinology, Volume 173, Issue 2, 1 September 2011, Pages 356-363**

RpL10A regulates oogenesis progression in the banana prawn *Fenneropenaeus merguiensis* and *Drosophila melanogaster*

Monwadee Wonglapsuwan, Wilaiwan Chotigeat, Allison Timmons, Kimberly McCall

To develop banana prawn (*Fenneropenaeus merguiensis*) aquaculture, the mechanism of ovarian maturation is under investigation. In a previous study, we reported the RpL10A protein as an ovarian maturation stimulator. To further investigate the function of RpL10A, we turned to the fruit fly (*Drosophila melanogaster*) to take advantage of the genetic tools available. Here, we elucidate the expression and function of RpL10A in the *D. melanogaster* ovary. *RpL10A* is expressed in the cytoplasm of both nurse and follicle cells throughout oogenesis. While shrimp have one *RpL10A* gene, *D. melanogaster* has two genes, RpL10Aa and RpL10Ab. RpL10Ab displays more similarity with shrimp RpL10A and was further investigated. *RpL10Ab* homozygous mutants are lethal and germline clone analysis showed that *RpL10Ab* is an essential gene in oogenesis. Moreover, *RpL10Ab*$^{-}$ germline clones resulted in premature death of the follicle cells. This phenotype is reminiscent of some insulin pathway mutants, suggesting that *RpL10Ab* may be involved in the insulin signaling pathway. In addition, *RpL10Ab*$^{-}$ follicle cells showed abnormal nuclei and membranes. Shrimp RpL10A rescued *RpL10Ab* homozygous mutants, revealing their functional conservation. Surprisingly, we found cell death in multiple tissues when *RpL10A* was over-expressed, suggesting that proper RpL10A levels are important. This research reveals novel findings about the role of RpL10A during oogenesis and may, in the future, lead to new approaches to stimulate ovarian development in shrimp.

Keywords

Fenneropenaeus merguiensis, *Drosophila*, RpL10A, RpL10Ab, Oogenesis, Ovary

6.7 LWT - Food Science and Technology, Volume 44, Issue 4, May 2011, Pages 924-932

Use of tea extracts for inhibition of polyphenoloxidase and retardation of quality loss of Pacific white shrimp during iced storage

Nilesh Prakash Nirmal, Soottawat Benjakul

Green tea and mulberry tea powder with and without prior chlorophyll removal were extracted with water and ethanol (800 mL L^{-1}). Extraction yield and total phenolic content of green tea extract were higher than those of mulberry tea extract, regardless of extraction media ($P < 0.05$). Extracts from green tea with and without prior chlorophyll removal showed the higher polyphenoloxidase (PPO) inhibitory activity, compared with mulberry tea extract, at the concentration used (0.1, 0.5 or 1 g L^{-1}). Additionally, green tea extracts had the higher reducing power, 2,2-diphenyl-1-picryl hydrazyl (DPPH) radical scavenging activities and copper chelating activity, compared with mulberry tea extract ($P < 0.05$). Ethanolic green tea extract with prior chlorophyll removal contained (+)-catechin (C), (–)-epicatechin (EC), (–)-epigallocatechin (EGC), (–)-epigallocatechin gallate (EGCg) and (–)-epicatechin gallate (ECG) at the levels of 242, 33.4, 125.6, 140.6 and 25.2 g kg^{-1} dry extract, respectively. Whole white shrimp (*Litopenaeus vannamei*) treated with ethanolic green tea extract with prior chlorophyll removal at concentrations of 5 and 10 g L^{-1} and stored in ice for up to 12 days had the lower psychrophilic bacterial count and lipid oxidation, compared with the control and shrimp treated with 12.5 g L^{-1} sodium metabisulfite (SMS) ($P < 0.05$). Shrimp treated with 5 g L^{-1} ethanolic green tea extract with prior chlorophyll removal possessed the lower melanosis, compared with the control, and showed similar score to those treated with SMS ($P > 0.05$). Furthermore, ethanolic green tea extract with prior chlorophyll removal had no adverse impact on sensory attributes of treated shrimp.

Keywords

Green tea, Mulberry tea, Antioxidant, Polyphenoloxidase, Pacific white shrimp, Melanosis

6.8 **International Journal of Food Microbiology, Volume 149, Issue 3, 3 October 2011, Pages 247-253**

Retardation of quality changes of Pacific white shrimp by green tea extract treatment and modified atmosphere packaging during refrigerated storage

Nilesh Prakash Nirmal, Soottawat Benjakul

The effect of modified atmosphere packaging (MAP) on the quality changes of Pacific white shrimp (*Litopenaeus vannamei*) treated with or without green tea extract (1 g/L; GTE) in combination with or without ascorbic acid (0.05 g/L; AA) during refrigerated storage of 10 days was investigated. Shrimp without treatment stored under MAP had lowered psychrotrophic bacteria, enterobacteriaceae and H_2S-producing bacteria count ($P < 0.05$) but similar lactic acid bacteria count ($P > 0.05$), in comparison with shrimp stored in air (control). The coincidental lowered rate of increase in pH, total volatile base (TVB) content and thiobarbituric acid reactive substances (TBARS) were obtained in shrimp stored under MAP ($P < 0.05$). However, MAP slightly lowered melanosis formation and improved likeness score to some extent. When shrimp were treated with GTE and stored under MAP, the lower microbiological and chemical changes as well as the lowest melanosis formation were observed, compared to shrimp kept under MAP without treatment and the control ($P < 0.05$). GTE treatment in combination with MAP could retard chemical changes and melanosis formation, regardless of AA incorporation ($P > 0.05$). Nevertheless, GTE in combination with AA had higher inhibition on microbial growth and yielded the shrimp with higher likeness, compared with the other treatments ($P < 0.05$). Therefore, shrimp treated with GTE in combination with AA prior to MAP had the lowest losses in quality during refrigerated storage.

Keywords

Pacific white shrimp, Microbial load, Quality, Green tea extract, Modified atmosphere packaging

6.9 **Food Control, Volume 22, Issues 3–4, March–April 2011, Pages 401-407**

Isolation and screening of lactic acid bacteria from Thai traditional fermented fish (*Plasom*) and production of *Plasom* from selected strains

Noraphat Hwanhlem, Subaidah Buradaleng, Saowakon Wattanachant, Soottawat Benjakul, Akio Tani, Suppasil Maneerat

Lactic acid bacteria (LAB) were isolated from traditional Thai fermented fish, *Plasom* at various fermentation periods. It was found that 138 isolates exhibited a clear zone and growth on MRS agar supplemented with $CaCO_{3;}$ however, only 133 isolates were identified as LAB. Only 14 strains showed excellent inhibition zone diameters on agar when *Salmonella* sp. was used as an indicator for preliminary detection of antagonistic activity. *Staphylococcus aureus* was used for secondary screening for antagonistic activity of these 14 strains. It was found that only 7 strains exhibited good inhibition zone diameters on agar, and all of them could inhibit *E. coli* as the third indicator. The strains which exhibited widest zones of inhibition against *Escherichia coli*, *S. aureus* and *Salmonella* sp. were LPS04, LPS17, and LD219 and LPS18 respectively. Tested pathogenic strains were inhibited by 4 selected LAB. The strain which showed the best lactic acid production and pH reduction ability was LD219. Using 16s rDNA sequence analysis, LD219 was identified as *Streptococcus salivarius*, LPS04, LPS17 and LPS18 were identified as *Enterococcus faecalis*. *Plasom* was produced by using a mixed culture (LD219, LPS04, LPS17 and LPS18) as a starter culture compared with spontaneous and back-slopping processes. Significant differences ($p < 0.05$) in pH, its titratable acidity as lactic acid and number of total viable counts (TVC), LAB and Enterobacteriaceae were found in these *Plasom* at 0 and 8 days. However, no significant difference ($p > 0.05$) was observed in terms of colour, smell, taste, sour, texture and overall acceptance of *Plasom* produced by non-starter cultured, back-slopping and starter cultured processes.

Keywords

Lactic acid bacteria, Fermented fish, Pathogenic bacteria, *Enterococcus faecalis*, *Streptococcus salivarius*

6.10 **Industrial Crops and Products, Volume 42, March 2013, Pages 324-331**

Desmos chinensis: A new candidate as natural antifungicide to control rice diseases

Patimaporn Plodpai, Vasun Petcharat, Samerchai Chuenchit, Suda Chakthong, Nantiya Joycharat, Supayang P. Voravuthikunchai

Nineteen plant extracts from 16 medicinal plants were assayed for their antifungal activity against rice pathogenic fungi on PDA plates containing plant extracts. Among the plants tested, *Aegle marmelos*, *Desmos chinensis*, and *Micromelum minutum* revealed moderate to strong activities against 5 tested fungal species with more than 65.1% inhibition. The dichloromethane extract from *D. chinensis* leaves showed high antifungal activity against all 6 fungi. The dichloromethane extract possessed antifungal activity against *Bipolaris oryzae*, *Pyricularia oryzae*, and *Sclerotium rolfsii* with minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) values ranging from 3.9 to 31.2 µg/ml and 31.2 to 500 µg/ml, respectively. Bioautography assay on TLC plates with *Bipolaris setariae*, *Curvularia lunata*, *Fusarium moniliforme*, *P. oryzae*, and *S. rolfsii* displayed high antifungal activity with *Rf* value ranging from 0.32 to 0.37. Effects of the extract on the morphology of *B. setariae*, *C. lunata*, *F. moniliforme*, *P. oryzae*, and *S. rolfsii* were observed by scanning electron microscopy. The micrographs of mycelia and spores treated with the extract at 4MIC illustrated aberrant surface morphology and reduced conidial formation in 4 fungal species. The results demonstrated that *D. chinensis* extract possess antifungal activity against phytopathogenic fungi and the activity might lead to irreversible cellular disruption.

Keywords

Medicinal plants, *Desmos chinensis*, Rice pathogenic fungi, *Pyricularia oryzae*, Hyphal morphology, Electron microscopy

6.11 **International Journal of Biological Macromolecules, Volume 48, Issue 5, 1 June 2011, Pages 758-767**

Characteristics of film based on protein isolate from red tilapia muscle with negligible yellow discoloration

Phakawat Tongnuanchan, Soottawat Benjakul, Thummanoon Prodpran, Ponusa Songtipya

The properties of film from fish protein isolate (FPI) prepared by prior washing followed by alkaline solubilization process (ASP) from red tilapia muscle were monitored during the storage of 20 days at 50% RH and 25 °C, in comparison with those of films from washed mince. Lipid, heme iron and non-heme iron contents in FPI were decreased by 98.8, 36.8 and 91.9%, respectively in comparison with those of washed mince ($p < 0.05$). Films from FPI had higher tensile strength (TS) and elongation at break (EAB) than those from washed mince for both pH (3 and 11) used for film preparation ($p < 0.05$). Film from FPI at pH 3 showed the highest TS, while that from washed mince at pH 11 had the lowest TS ($p < 0.05$). Nevertheless, films from FPI had higher WVP than those from washed mince for both pH used ($p < 0.05$). At the same pH used for film preparation (3 or 11), films from FPI showed the lower TBARS values than those from washed mince ($p < 0.05$). Nevertheless, films from both FPI and washed mince had the higher TBARS values when pH 3 was used for film preparation, compared with pH 11 ($p < 0.05$). Among all films, those from FPI prepared at pH 3 had the highest transparency and no yellow discoloration was observed during the storage of 20 days, in comparison with other films ($p < 0.05$). Conversely, film from washed mince prepared at pH 3 had the higher increase in b^*-value and ΔE^*-value than other films. Therefore, FPI could serve as a potential material for film preparation with lower contents of lipid and prooxidants, thereby preventing the yellow discoloration of the fish myofibrillar protein-based film during extended storage.

Keywords

Alkaline solubilization process, Film, Yellow discoloratrion, Lipid oxidation, Red tilapia, Fish protein isolate

6.12 **Food Chemistry, Volume 134, Issue 3, 1 October 2012, Pages 1571-1579**

Properties and antioxidant activity of fish skin gelatin film incorporated with citrus essential oils

Phakawat Tongnuanchan, Soottawat Benjakul, Thummanoon Prodpran

Properties of protein-based film from fish skin gelatin incorporated with different citrus essential oils, including bergamot, kaffir lime, lemon and lime (50% based on protein) in the presence of 20% and 30% glycerol were investigated. Films containing 20% glycerol had higher tensile strength (TS) but lower elongation at break (EAB), compared with those prepared with 30% glycerol, regardless of essential oils incorporated ($p < 0.05$). Films incorporated with essential oils, especially from lime, at both glycerol levels showed the lower TS but higher EAB than the control films (without incorporated essential oil) ($p < 0.05$). Water vapour permeability (WVP) of films containing essential oils was lower than that of control films for both glycerol levels ($p < 0.05$). Films with essential oils had varying ΔE^* (total colour difference), where the highest value was observed in that added with bergamot essential oil ($p < 0.05$). Higher glycerol content increased EAB and WVP but decreased TS of films. Fourier transforms infrared (FTIR) spectra indicated that films added with essential oils exhibited higher hydrophobicity with higher amplitude at wavenumber of 2874–2926 cm^{-1} and 1731–1742 cm^{-1} than control film. Film incorporated with essential oils exhibited slightly lower thermal degradation resistance, compared to the control film. Varying effect of essential oil on thermal degradation temperature and weight loss was noticeable, but all films prepared using 20% glycerol had higher thermal degradation temperature with lower weight loss, compared with those containing 30% glycerol. Films added with all types of essential oils had rough cross-section, compared with control films, irrespective of glycerol levels. However, smooth surface was observed in all film samples. Film incorporated with lemon essential oil showed the highest ABTS radical scavenging activity and ferric reducing antioxidant power (FRAP) ($p < 0.05$), while the other films had lower activity. Thus, the incorporation of different essential oils and glycerol levels directly affected the properties of gelatin-based film from fish skin.

Keywords

Gelatin film, Essential oil, Bergamot, Kaffir lime, Lemon, Lime, Antioxidant activity

6.13 Journal of Food Engineering, Volume 106, Issue 4, October 2011, Pages 298-305

Effects of vacuum frying on structural changes of bananas

Ram Yamsaengsung, Thaworn Ariyapuchai, Kulchanat Prasertsit

Effects of oil temperature, frying time, and ripeness on dimensional changes of vacuum fried bananas were studied. Banana slices with cross section diameters of 25–30 mm and a thickness of 3.5–4.5 mm were fried at temperatures of 100, 110, and 120 °C and 8 kPa for 20 min to determine which temperature produced the highest degree of expansion. Using this temperature, the width and thickness of the product were measured at 0, 5, 10, 15, and 20 min to model the dimensional changes as a function of moisture ratio. Sensory evaluation was conducted using a 7-point hedonic scale test to determine the effect of ripeness on acceptability of the product. Scanning electron microscopy (SEM) was used to analyze the structure of the vacuum fried bananas.

The experimental results under this vacuum pressure revealed that frying temperature of 110 °C on bananas at the second day of ripeness yielded the highest volume expansion. Sensory evaluations did not unveil any significant difference ($p > 0.05$) in acceptability of the products based on ripeness. Results from SEM exhibited, as a function of frying time, a dramatic increase in the pore size of the bananas, while the Heywood shape factor indicated an overall increase in the product volume.

Keywords

Vacuum frying, Modeling, Structure, Expansion, Heywood shape factor, Banana ripeness

6.14 **LWT - Food Science and Technology, Volume 44, Issue 1, January 2011, Pages 206-213**

Pink discoloration and quality changes of squid (*Loligo formosana*) during iced storage

Rattana Sungsri-in, Soottawat Benjakul, Kongkarn Kijroongrojana

Pink discoloration and quality changes of squid (6–10 squids/kg) with and without deskinning during iced storage at different squid/ice ratios (1:1 and 1:2, w/w) for 16 days were investigated. The increases in *a** and *b**-values of squid mantle were observed with increasing storage time ($p < 0.05$), indicating the formation of pink color on the mantle. The increase was more pronounced in squid without deskinning with a squid/ice ratio of 1:1 ($p < 0.05$). No changes in *a**-value were observed in deskinned squid throughout the storage, regardless of squid/ice ratio ($p > 0.05$). However, the slight increase in *b**-value was found in the squid with deskinning during the storage. Psychrophilic bacteria counts of squid increased continuously as the storage time increased. Coincidental increases in total volatile base (TVB), trimethylamine (TMA) and ammonia contents were observed during the storage. The rates of increase were greater in the samples with a squid/ice ratio of 1:1 than those found in the samples kept in ice with a squid/ice ratio of 1:2. Pink discoloration, psychrophilic bacteria count, TVB and TMA contents were much lowered when the squid without deskinning was treated with 0.1 g/100 mL sodium azide (NaN_3) prior to storage, suggesting that microbial growth was associated with those changes. Therefore, deskinning together with icing using a sufficient amount of ice as well as the use of safe antimicrobial agent could be a means to lower the pink discoloration and retard the losses in quality of squid stored in ice.

Keywords

Iced storage, Pink discoloration, Quality changes, Sodium azide, Squid

6.15 **Aquaculture, Volumes 338–341, 29 March 2012, Pages 208-215**

The roles of ribosomal protein S3a in ovarian development of *Fenneropenaeus merguiensis* (De Man)

Raphatphorn Navakanitworakul, Panchalika Deachamag, Monwadee Wonglapsuwan, Wilaiwan Chotigeat

Shrimp ovarian development is a pivotal step for aquaculture in order to maintain broodstocks. The molecular processes in the ovaries of *Fenneropenaeus merguiensis* De Man during vitellogenesis were investigated. A quantitative real time PCR (Q-PCR) assay showed a high expression of ribosomal protein S3a (RPS3a) in the early stage of ovarian development and a decline in the later stages. Serotonin (5-HT) increased the expression of RPS3a significantly at 4 h after incubating with the ovarian explants. A full-length RPS3a was amplified by the RACE technique and expressed in *Escherichia coli* BL21 (DE3). Western blot analysis showed that the molecular weight of the recombinant histidine (His)-RPS3a was approximately 33 kDa. Its function was tested by incubating undeveloped ovarian explants with His-RPS3a. In vitro assays indicated that the His-RPS3a stimulated the expression of shrimp ovarian peritrophin (*SOP*) and translational controlled tumor protein (*TCTP*) genes significantly when compared to the untreated ovarian explants. In addition, the *SOP* and *TCTP* genes had been previously reported to be highly expressed during the early stages of ovarian development. In addition, FITC-RPS3a was shown to be imported into the ovarian cells. Therefore, RPS3a may act as a stimulator for the development of shrimp ovaries.

Keywords

Ribosomal protein S3a (RPS3a), Serotonin (5-HT), Shrimp ovarian peritrophin (SOP), Translational controlled tumor protein (TCTP)

6.16 **Trends in Food Science & Technology, Volume 28, Issue 1, November 2012, Pages 33-43**

Haemoglobin-mediated lipid oxidation in the fish muscle: A review

Sajid Maqsood, Soottawat Benjakul, Afaf Kamal-Eldin

Lipid oxidation is a major cause of quality deterioration in muscle-based foods, where flavour, colour, texture and nutritional value can be negatively affected. The presence of haem pigments and trace amounts of metallic ions makes the fish, especially dark flesh fatty fish, prone to lipid oxidation. In contrast to mammalian meat, haemoglobin (Hb) is a major contributor to lipid oxidation in fish and fish products, since the blood is not practically removed prior to processing. Hb is known as an important catalyst of lipid oxidation in fish muscle. Hb can be a source of activated oxygen due to Hb autoxidation, and haem or iron can be released from the protein to promote lipid oxidation. Autoxidation appears to be a critical step in the ability of haem proteins to stimulate lipid oxidation since metHb reacts with peroxides to stimulate formation of compounds capable of initiating and propagating lipid oxidation. Hb-mediated lipid oxidation can be accelerated by reduction in pH and could be due to enhanced autoxidation of Hb at reduced pH. Hb from different fish is known to promote lipid oxidation in fish muscle differently. Thus, the knowledge regarding the pro-oxidative activity of Hb from different fish species can be useful in developing the species-specific antioxidative strategies to retard the lipid oxidation and increase the shelf-life of fish.

Keywords

Activated oxygens, Critical steps, Fish muscles, Fish species, Haemoglobins, Lipid oxidation, Metallic ions, Muscle-based, Nutritional value, Shelf life, Trace amounts

6.17 **Food and Bioproducts Processing, Volume 89, Issue 1, January 2011, Pages 73-80**

The partitioning of protease from *Calotropis procera* latex by aqueous two-phase systems and its hydrolytic pattern on muscle proteins

Saroat Rawdkuen, Punyawatt Pintathong, Phanuphong Chaiwut, Soottawat Benjakul

The protease from the latex of *Calotropis procera* was isolated by an aqueous two-phase system (ATPS). Polyethylene glycol (PEG 1000, 2000 and 3000) at a concentration of 12, 15, and 18% (w/w) with salts ($(NH_4)_2SO_4$, K_2HPO_4 and $MgSO_4$) at a concentration of 14, 17, and 20% (w/w) were investigated. The highest protease recovery (74.6%) was found in the PEG-rich phase of the system ($p < 0.05$), comprising of 18% PEG 1000 and 14% $MgSO_4$. Protein patterns and activity staining showed that the isolated protease had a molecular weight of ~31 kDa without the oligosaccharide attached to the molecule. Degradation of muscle proteins in beef, farmed giant catfish, and squid was observed by the electrophoresis of sodium dodecyl sulphate polyacrylamide gel (SDS-PAGE). The degradation of myofibrillar proteins (myosin heavy chain: MHC and actin: AC) of farmed giant catfish was higher than that of beef and squid muscles as indicated by the degradation proteins with lower molecular weight.

Keywords

Aqueous two phase, *Calotropis procera*, Latex, Protease, Muscle protein

6.18 **Food Chemistry, Volume 124, Issue 4, 15 February 2011, Pages 1354-1362**

Functionalities and antioxidant properties of protein hydrolysates from the muscle of ornate threadfin bream treated with pepsin from skipjack tuna

Sitthipong Nalinanon, Soottawat Benjakul, Hideki Kishimura, Fereidoon Shahidi

Functional properties and antioxidant activities of protein hydrolysates prepared from ornate threadfin bream (*Nemipterus hexodon*) muscle, using skipjack tuna pepsin, with different degrees of hydrolysis (DH: 10%, 20% and 30%), were evaluated. Emulsifying and foaming properties of hydrolysates were governed by their DH and concentrations used. Hydrolysates with 20% DH had the highest scavenging activities for ABTS and DPPH radicals. However, chelating activity of hydrolysates for ferrous ion increased as DH increased. Size exclusion chromatography of the hydrolysate with 20% DH using Sephadex G-25 revealed that antioxidative peptides with molecular weight of approximately 1.3 kDa exhibited the highest ABTS radical-scavenging activity. *In vitro* simulated gastrointestinal digestion indicated that ABTS radical-scavenging activity of the antioxidative peptides was not affected by pepsin hydrolysis, whilst further digestion by pancreatin enhanced the activity. Therefore, protein hydrolysate from the muscle of ornate threadfin bream produced by skipjack tuna pepsin can be used as a promising source of functional peptides with antioxidant properties.

Keywords

Hydrolysates, Pepsin, Functionalities, Antioxidant, Peptides, Fish protein

6.19 **Fish & Shellfish Immunology, Volume 31, Issue 3, September 2011, Pages 415-422**

Stimulating the immune response of *Litopenaeus vannamei* using the phagocytosis activating protein (*PAP*) gene

Umaporn Khimmakthong, Panchalika Deachamag, Amornrat Phongdara, Wilaiwan Chotigeat

High mortality in the shrimp farming industry is caused by several pathogens such as white spot syndrome virus (WSSV), yellow head virus (YHV) and *Vibrio harveyi* (*V. harveyi*). A *PAP* (Phagocytosis activating protein) gene able to activate phagocytosis of shrimp hemocytes was cloned into the eukaryotic expression vector *phMGFP*. *In vitro* expression was confirmed by transfection of *PAP-phMGFP* into CHO (Chinese Hamster Ovary) cells and the expression of the Green Fluorescent Protein (GFP) was observed. In order to activate the phagocytic activity of shrimp, 20, 40 and 80 µg/shrimp of this *PAP-phMGFP* vector were injected into *Litopenaeus vannamei* muscle. After challenged with WSSV, 40 µg/shrimp produced the highest relative percent survival (77.78 RPS). Analysis for the expression of the *GFP* gene in various tissues showed the expression mostly in the hemolymph of the immunized shrimp. The expression level of *PAP* and *proPO* (*Prophenoloxidase*) gene were highest at 7 days after immunization. This agreed with the efficiency of protection against WSSV that also occurred 7 days after immunization with the highest RPS of 86.61%. However there was no protection 30 days after immunization. Hemocytes of shrimp injected with *PAP-phMGFP* had 1.9 folds and 3 folds higher percentage phagocytosis and phagocytic index than the shrimp injected with PBS. Accordingly, copies of WSSV reduced in the *PAP-phMGFP* injected shrimp. In addition, *PAP-phMGFP* also protected shrimp against several pathogens: WSSV, YHV and *V. harveyi*, with RPS values of 86.61%, 63.34% and 50% respectively. This finding shows that the immune cellular defense mechanisms in shrimp against pathogens can be activated by injection of *PAP-phMGFP* and could indicate possible useful ways to begin to control this process.

Keywords

DNA vaccine, Phagocytosis activating protein, Gene, Shrimp, WSSV

6.20 **Phytochemistry, Volume 75, March 2012, Pages 108-113**

Alkaloid and coumarins from the green fruits of *Aegle marmelos*

Suda Chakthong, Paosiyah Weaaryee, Pongsak Puangphet, Wilawan Mahabusarakam, Patimaporn Plodpai, Supayang P. Voravuthikunchai, Akkharawit Kanjana-Opas

Five (1–5) and 15 known compounds (6–20) were isolated from the acetone extract of the green fruits of *Aegle marmelos*. The structure of compounds 1–5, marmesiline (1), 6-(4-acetoxy-3-methyl-2-butenyl)-7-hydroxycoumarin (2), 6-(2-hydroxy-3-hydroxymethyl-3-butenyl)-7-hydroxycoumarin (3), marmelonine (4) and 8-hydroxysmyrindiol (5), were determined on the basis of spectroscopic analyses. Antifungal and antibacterial activities of selected compounds were also evaluated.

Keywords

Aegle marmelos, Rutaceae, Marmesiline, Marmelonine, Smyrindiol

7.0

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7.1 **Food Science and Technology International, Volume 19, Issue 2, April 2013, Pages 109-122**

Optimization of hexametaphosphate-assisted extraction and functional characterization of palm kernel cake protein

Chee K.L., Ayob M.K.

Response surface methodology was applied to study the optimization of palm kernel cake protein (PKCP) hexametaphosphate-assisted extraction. The optimum PKCP yield (28.37%) when extracted using 1.50% sodium hexametaphosphate (SHMP) of pH 10, at 50°C, and the 1:70 (w/v) ratio of cake-to-solvent was significantly ($P < 0.05$) higher than the protein yield from an alkaline (pH 10) extraction (8.12 ± 0.24%). Differential scanning calorimetry (DSC) analysis showed a higher denatured temperature (99.78°C) for PKCP as compared with alkaline extracted one (96.96°C), suggesting that a less denatured protein population is obtained. Electrophoresis of the PKCP revealed that the protein has 11 bands with MW ranging from 2.11 to 83.19 kDa. Relative to soy protein isolate, PKCP showed higher surface hydrophobicity (165.96 vs. 51.51), better solubility at pH 7 (87.65% vs. 41.21%), oil-binding capacity (7.73 vs. 2.96 g/g) and emulsifying activity (178.50 vs. 32.57 m^2/g), but lower water-binding capacity (0.36 vs. 11.70 g/g), emulsifying stability (32.24% vs. 43.08%), foaming capacity (20.8% vs. 100.0%) and foam stability (3.80 vs. 19.20 ml). PKCP contained the highest amount of glutamic acid (16.86 g/100 g protein) and followed by arginine (10.78 g/100 g protein). With respect to the 1991 standard of the FAO/WHO for preschool children, PKCP's essential amino acid profile showed deficiencies. Therefore, it can be used as a complementary protein source by supplementing with a tryptophan-rich source, as this was the limiting amino acid.

Keywords

Amino acids, Extraction systems, Food emulsions, Food proteins, Palm kernel cake, Palm oil

7.2

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Colour, phenolic content and antioxidant capacity of some fruits dehydrated by a combination of different methods

Chong C.H., Law C.L., Figiel A., Wojdylo A., Oziemblowski M.

The objective of this study was to improve product quality of dehydrated fruits (apple, pear, papaya, mango) using combined drying techniques. This involved investigation of bioactivity, colour, and sensory assessment on colour of the dried products as well as the retention of the bio-active ingredients. The attributes of quality were compared in regard to the quality of dehydrated samples obtained from continuous heat pump (HP) drying technique. It was found that for apple, pear and mango the total colour change (ΔE) of samples dried using continuous heat pump (HP) or heat pump vacuum-microwave (HP/VM) methods was lower than of samples dried by other combined methods. However, for papaya, the lowest colour change exhibited by samples dried using hot air-cold air (HHC) method and the highest colour change was found for heat pump (HP) dehydrated samples. Sensory evaluation revealed that dehydrated pear with higher total colour change (ΔE) is more desirable because of its golden yellow appearance. In most cases the highest phenol content was found from fruits dried by HP/VM method. Judging from the quality findings on two important areas namely colour and bioactivity, it was found that combined drying method consisted of HP pre-drying followed by VM finish drying gave the best results for most dehydrated fruits studied in this work as the fruits contain first group of polyphenol compounds, which preferably requires low temperature followed by rapid drying strategy.

Keywords

Antioxidant activity, Apple, Bioactivity, Combined drying techniques, Mango, Papaya, Pear, Polyphenols, Product quality, Sensory assessment

7.3 **Applied Acoustics, Volume 72, Issue 1, January 2011, Pages 35–42**

Analysis of coir fiber acoustical characteristics

Mohammad Hosseini Fouladi, Md. Ayub, Mohd Jailani Mohd Norb

Coir fiber from coconut husk is an important agricultural waste in Malaysia. Acoustic absorption coefficient of the fiber as a porous material is studied in this paper. Two types of fiber are investigated, fresh from wet market and industrial prepared mixed with binder. Moreover two analytical models, namely; Delany–Bazley and Biot–Allard are used for analysis. Experimental measurements in impedance tube are conducted to validate the analytical outcomes. Results show that fresh coir fiber has an average absorption coefficient of 0.8 at f > 1360 Hz and 20 mm thickness. Increasing the thickness is improved the sound absorption in lower frequencies, having the same average at f > 578 Hz and 45 mm thickness. Delany–Bazley technique can be used for both types of fiber while Biot–Allard method is compensated for the industrial prepared fiber considering the binder additive. This form generally shows poor acoustical absorption in low frequencies. Inevitably, fiber has to be mixed with additives in commercial use to enhance its characteristics such as stiffness, unti-fungus and flammability. Hence other approaches such as adding air gap or perforated plate should be used to improve the acoustical properties of industrial treated coir fiber.

Keywords

Coir fiber, Acoustic absorption coefficient, Porous material, Delany–Bazley model Biot–Allard model

7.4

Journal of Food Engineering, Volume 117, Issue 3, 2013, Pages 255-262

Mechanical and gelling properties of comminuted sausages containing chicken MDM

Savadkoohi S., Shamsi K., Hoogenkamp H., Javadi A., Farahnaky A.

The present investigation focuses on the physicochemical properties, rheological behaviors and texture of raw and cooked emulsions containing different mechanically deboned meat (MDM) from chicken. MDMs were produced from the neck, backs and thighs. The texture and mechanical profile analyses were performed using a small deformation dynamic oscillation in a shear and instrumental texture analyzer. The mechanical spectra of the raw and cooked MDM emulsion gels were classified as weak gels based on their frequency sweep and tan δ results. Both the G′ and G″ values increased with increasing frequency in the temperature of 4 and 10°C. The MDM from thighs had the lowest water holding capacity (WHC) and emulsifying (EC) values, while the MDM from backs had significant values of 2.41 and 128.87, respectively. The cooked emulsion containing backs showed the highest hardness and cohesiveness values, while the emulsion containing necks and thighs had the lowest texture parameters.

Keywords

Emulsion, Gel forming, MDM, Tan δ, TPA, Viscoelastic properties

7.5

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A comparative assessment of nutritional composition, total phenolic, total flavonoid, antioxidant capacity, and antioxidant vitamins of two types of Malaysian underutilized fruits (*Averrhoa Bilimbi* and *Averrhoa Carambola*)

Yan S.W., Ramasamy R., Alitheen N.B.M., Rahmat A.

Nutritional composition, total phenolic content, total flavonoid, antioxidant capacity, and antioxidant vitamins of bilimbi (*Averrhoa bilimbi*) and carambola (*Averrhoa carambola*) were determined and compared in this study. Bilimbi was found to contain higher moisture, ash, carbohydrate, protein, fat, and dietary fiber compared to carambola. Total phenolic content was higher in carambola although bilimbi yielded more total flavonoid. Vitamins A, C, and E contents of bilimbi were also higher than carambola. Antioxidant and scavenging activity as determined by β-carotene bleaching assay and DPPH radical scavenging assay of carambola were significantly ($p < 0.05$) higher than bilimbi. These results suggested that carambola was a potent natural antioxidant food and that contribution of phenolic compounds to its antioxidant capacity was greater than that of antioxidant vitamins.

Keywords

Antioxidant capacity, *Averrhoa bilimbi*, *Averrhoa carambola*, Proximate composition, Total flavonoid, Total phenolic content

8.0 Universiti Kebangsaan Malaysia

8.1 **Sains Malaysiana, Volume 42, Issue 10, 2013, Pages 1529-1538. ISSN 0126-6039**

Dry matter yield and chemical composition of sorghum cultivars with varying planting density and sowing date.

Mahmood, A. and Habib Ullah, and Shahzad, A.N. and Ali, H. and Ahmad, S. and Zia-Ul-Haq, M. and Honermeier, B. and Hasanuzzaman, M.

This two-year research was carried out to clarify the effect of varying sowing time, planting density and cultivar on the biomass yield and chemical composition of sorghum. The leaf area index of the sorghum plant stand reached a maximal value of 5.0–5.7 at 97 days after sowing (DAS). Cultivar 'Bovital' was more productive with respect to the number of tillers per plant as well as per m^2. Cultivars had clear impact on most of the quality parameters. Cultivar 'Goliath' (*Sorghum bicolor* × *S. bicolor hybrid*) had a higher biomass yield than Bovital (*S. bicolor* × *S. sudanense hybrid*). Dry matter yield was largely unaffected by the plant density at all sowing times. It was observed that Goliath exhibited higher sugar and neutral detergent fibre, while a greater content of protein was found in Bovital. Plant density had no clear influence on most of the quality parameters.

Keywords

Biomass yield, Neutral detergent fibre, Sowing times, Sugar content

8.2

Sains Malaysiana, Volume 42, Issue 9, 2013. pp. 1231-1235. ISSN 0126-6039

Effects of stocking density on growth performance and production of Mola, *Amblypharyngodon mola*

M., Asadujjaman and M.A., Wahab and M.K., Fatema and Hossain, M. Belal and A.K.M.S. , Azam

An experiment was conducted to determine the effects of stocking density on growth performance and production of Amblypharyngodon mola during 09 July to 09 October, 2011. There were three treatments, each with three replications in nine earthen ponds with an average depth of 1.5 m. Ponds of three treatments T_1, T_2 and T_3 were stocked with mola at the density of 145000; 73000 and 36500 ind. ha^{-1}. The water temperature, transparency, total alkalinity, pH, dissolved oxygen, nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, phosphate-phosphorus and chlorophyll-a of the ponds water were measured weekly. Among the water quality parameters, significant differences ($p<0.05$) were observed in case of temperature and dissolved oxygen. The lowest PO_4-P and chlorophyll-a concentration were observed in T_1. All water quality parameters were in suitable range of fish culture. The number of fishes at harvest were 15633.31±11.5; 84200±4 and 45600±7.21 indi. ha^{-1} in T_1, T_2 and T_3, respectively. The mean weight of mola during harvest decreased significantly ($p<0.05$) with increasing stocking density. The net production of mola was significantly higher in treatment T_3 (43.22±8.66 kg ha^{-1}) than T_2 (34.82±6.53 kg ha^{-1}) and T_1 (32.74±6.53 kg ha^{-1}). Considering the highest net production among the three tested densities, the stocking density applied in T_3 was found the best.

Keywords

Growth performance, Mola, Production, Stocking density

8.3 **Sains Malaysiana, Volume 42, Issue 3, 2013, Pages 279-287, ISSN 0126-6039**

Effects of enzyme concentration, temperature, pH and time on the degree of hydrolysis of protein extract from viscera of tuna (*Euthynnus affinis*) by using alcalase

Salwanee, S. and Wan Aida, W.M. and Mamot, S. and Maskat, M.Y.

Protein from viscera of tuna was extracted by using water at ratio of viscera to water of 1:1 (w/v) and freeze-dried. The protein was found to be high in glycine (9.6%), arginine (9.2%), alanine (7.0%), lysine (7.2%) and leucine (7.0%). A study was then carried out to determine the effect of alcalase concentration, temperature, pH and incubation time on degree of hydrolysis (DH) during hydrolysis by using single factor experiment. The hydrolysis of viscera protein extract (VPE) was carried out at concentrations of 1.0, 1.5 and 2.0%. The DH of hydrolysates was significantly ($p<0.05$) increased when enzyme concentration was increased from 1.0% to 1.5% but became constant at concentration exceeding 1.5%. An enzyme concentration at 1.5% was subsequently used in the study of the effect of the other parameters. It was found that the value of the DH also increased when the temperature was increased from 30 to 40°C. However, the hydrolysis at higher temperature (60°C) produced lower DH. Prolonging the time of incubation from 60 min up to 240 min significantly ($p< 0.05$) increased the DH. As for pH, there were no significant effects observed.

Keywords

Alcalase, Hydrolysis, Tuna, Viscera

Sains Malaysiana, Volume 42, Issue 10, 2013, Pages 1425-1430. ISSN 0126-6039

First record of mixed-species heron colony: cattle egret (*Bubulcus ibis*), Squacco Heron (*Ardeola ralloides*) and Little Egret (*Egretta garzetta*) breeding at Famagusta Freshwater Lake in Cyprus

Charalambidou, I. and Gucel, S

This study constitutes the first record of a mixed-species heron colony and of a breeding population of Squacco Heron (*Ardeola ralloides*) in Cyprus. The colony, located at Famagusta Freshwater Lake, was surveyed from March to June 2007. The survey were terminated after 25 June when it was not possible to boat to the colony due to decreasing water levels. The total number of active nests, i.e. containing eggs and/or hatchlings, was 135 for Cattle Egret (*Bubulcus ibis*); 38 for Squacco Heron and 4 for Little Egret (*Egretta garzetta*). Cattle Egrets started nest building and egg laying at the beginning of March and hatching started by the end of March. Egg-laying and hatching continued throughout June, possibly due to second broods. Mean clutch size was 3.5±0.8 eggs (range 1-5; n=135). Mean hatching success was 2.9±1 hatched egg per nest (range = 1-5; n=54) and mean breeding success was 2.8±1 chick per nest (range = 0-5; n=36) for chicks surviving up to 15 days after hatching. Squacco Herons started nest building and egg laying by the end of May and hatching started by mid June. Egg-laying and hatching continued throughout June and probably in July and August. As surveys were terminated in June, it was not possible to collect sufficient data on the breeding chronology of this species. Mean clutch size was 3.1 ± 0.8 egg (range 2-4; n=38), which was lower than European estimates. A multitude of activities at and around Famagusta Freshwater Lake pose potential threats to the conservation of the colony resulting in an urgent need for management of the wetland.

Keywords

Breeding success, Cattle Egret, Clutch size, Famagusta Freshwater Lake, Hatching success, Squacco Heron

8.5 **Sains Malaysiana, Volume 42, Issue 10, 2013, Pages 1473-1482. ISSN 0126-6039**

Germination physiology and autecology of *Centaurea kilaea* Boiss. from Turkey.

Eskin, B. and Ozyigit, I.I. and Dogan, I. and Altay, V. and Demir, G. and Serin, M.

In this study germination requirements, plant-soil interactions and population biology of *Centaurea kilaea* was studied. The plant and soil samples were collected from Sofular Village (Şile District) and shore of Çatalca District (Istanbul) in Turkey by using standard methods. Methods like Scheibler, Wetdigestion, Kjeldahl and Olsen were employed for measurement of soil texture, structure and other physical and chemical characteristics (pH, total protein and electrical conductivity) using spectrophotometer, flame photometer, calcimeter and ICP. The results showed that ranges of different elements in the soil were 0.007-0.2% for N, 0.0007-0.001% for P, 0.001-0.01% for K, 0.0001-0.0002 % for Na. N, P, K and Na values in the plants were 2.17, 0.005, 0.1 and 0.006%, respectively. The data revealed that germination success of the seeds was influenced by the environmental factors such as pH, germination season and temperature.

Keywords

Centaurea kilaea, Elements, Plant, Plant-soil interactions, Soil

8.6 Sains Malaysiana, Volume 42, Issue 11, 2013, Pages 1599-1603, ISSN 0126-6039

Gene mutation effect of aqueous and methanol extracts of salted fish from Pulau Pinang, Malaysia towards V79 lung fibroblast cells

Ahmad Rohi Ghazali, and Rasyidah Mohamad Halim, and Nor Fadilah Rajab, and Noorain Ramli, and Rozaini Abdullah, and Firdaus Kamarulzaman, and Zaliha Harun

Salted fish is a locally processed raw food which is used in everyday cooking among Malaysians. Previous studies suggested that salted fish intake was a risk of nasopharyngeal cancer. Hence, this study was carried out to evaluate gene mutation effects through the induction of mutagenic effect of aqueous and methanol extracts of salted fish from Balik Pulau, Pulau Pinang, Malaysia. Balik Pulau was chosen for sampling purpose due to its popularity as a commercial centre for local raw fisheries in Malaysia. Evaluation of mutagenic effect was carried out by hprt Gene Mutation Assay towards V79 lung fibroblast cells. It was found that the aqueous and methanol extracts of salted fish were not cytotoxic towards V79 lung fibroblast cells. It was also found that the extracts of salted fish from Balik Pulau were not mutagenic towards hprt gene of V79 lung fibroblast cells as the mutation frequency of the extracts did not exceed 3 times of the value for negative control mutation frequency. In conclusion, both aqueous and methanol extracts of salted fish from Balik Pulau did not have gene mutation effect towards hprt gene in vitro. However, other toxicological profile could be assessed to determine the mechanism of toxicity of salted fish.

Keywords

Cytotoxic, Gene mutation, Hprt, Pulau Pinang, Salted fish

8.7 **Sains Malaysiana, Volume 43, Issue 2, 2014, Pages 169-173, ISSN 0126-6039**

Optimal stocking density for culturing tropical soil-dwelling earthworm, *Pontoscolex corethrurus*

H.Y. , Kok and Nor Azwady, A.A. and Loh, Loh and Muskhazli, M. and Zulkifli, S.Z.

The present study was carried out to determine the optimal stocking density for culturing tropical soil dwelling earthworm, *Pontoscolex corethrurus*. F1 generation earthworms were cultured in four different stocking densities of 1, 4, 7 and 10 worms per vessel, corresponding to field densities of 50, 200, 350 and 500 individuals per m^2. Earthworms were kept under laboratory conditions (25±2°C and 25% moisture) for the 14 weeks study period. The results showed that at higher earthworm densities (>350 individuals per m^2), the earthworm growth was slower and sexual maturation was delayed as compared with their counterparts in lower stocking density. With the high survival rate and parthenogenetic reproduction mode, *P. corethrurus* could potentially be used as tropical soil rehabilitation agent.

Keywords

Cocoon, Culture, Earthworm, Stocking density

8.8 Sains Malaysiana, Volume 43, Issue 1, 2014, Pages 89-94, ISSN 0126-6039

Production of major mycotoxins by *fusarium* species isolated from wild grasses in Peninsular Malaysia

Nor Azliza, I. and Hafizi, R. and Nurhazrati, M. and Salleh, B.

The *Fusarium* species are notoriously known for causing various plants and animal diseases and producing a number of harmful mycotoxins. The mycotoxins production by species recovered from non-agricultural hosts such as wild grasses have hitherto never been given attention. We examined 30 strains representing 12 *Fusarium* species i.e. *F. oxysporum, F. solani, F. semitectum, F. nelsonii, F. compactum, F. equiseti, F. chlamydosporum, F. proliferatum, F. subglutinans, F. sacchari, F. lateritium* and *F. incarnatum-equiseti* species complex isolated from wild grasses in Peninsular Malaysia for the production of four major mycotoxins i.e. moniliformin (MON), fumonisin B1 (FB1), zearalenone (ZEN) and beauvericin (BEA) using TLC and HPLC techniques. BEA was the highest frequency of mycotoxin detected, followed by MON, ZEN and FB1. This study also presented the first report of BEA production by *F. solani, F. compactum and F. chlamydosporum*. All mycotoxins were not produced by *F. nelsonii* and *F. lateritium*. All Fusarium species were isolated from asymptomatic grasses, hence they are likely to exist as endophytes or latent pathogens.

Keywords

Fusarium, Grasses, Mycotoxins, Peninsular Malaysia

8.9 **Sains Malaysiana, Volume 42, Issue 8, 2013, Pages 1109-1114, ISSN 0126-6039**

Rice bran replacement in *Clarias gariepinus* fingerlings diets with *Pleurotus florida* stalk

Hasniyati Muin, and Nurul Nadwa Abdul Fatah, and Mohd Hakimi Mohd Nor, and Shaharudin Abdul Razak

The effect of replacement of ricebran by mushroom stalk (*Pleurotus florida*), an agriculture waste on growth performance of African catfish (*Clarias gariepinus*) fingerlings was investigated for 42 days. Three isonitrogenous (32% crude protein) experimental diets containing 100% (Diet 1), 50% (Diet 2) and 0% (Diet 3) mushroom meal were formulated. Each diet was randomly allocated to triplicate groups of fingerlings in experimental tanks, with each tank stocking 12 fishes. The fishes were fed twice daily to apparent satiation for 6 weeks. Good survival rates were obtained from fish fed with Diet 1 (94%) and Diet 3 (94%). There was no significant differences in body weight gain (BWG), specific growth rate (SGR) and feed conversion ratio (FCR) among all diets ($p>0.05$). The fish fed with Diet 1 showed the best BWG, SGR, FCR and PER compared with Diet 2 and Diet 3. An economic evaluation indicated that Diet 1 gave the lowest production cost at RM2.03/kg followed by Diet 2 and Diet 3 at RM2.18/kg and RM2.38/kg, respectively. This study showed that the best diet was Diet 1 with 100% replacement of rice bran with mushroom stalks costing RM2.03/kg, the cheapest among the three diets.

Keywords

Carbohydrate, *Clarias gariepinus*, Feed utilization, Growth performances, *Pleurotus florida*

8.10 Sains Malaysiana, Volume 42, Issue 10, 2013. Pages 1493-1499. ISSN 0126-6039

Variations of planktonic chlorophyll-a in relation to environmental factors in a Mediterranean Coastal System (Iskenderun Bay, Northeastern Mediterranean Sea)

Polat, S. and Terbiyik, T.

Chlorophyll-a is one of the most widely used parameters to estimate trophic state of an aquatic environment. The purpose of this study was to investigate the changes in the planktonic chlorophyll-a concentrations in relation to environmental parameters in the east part of Iskenderun Bay (Northeastern Mediterranean Sea). Monthly measurements of chlorophyll-a and inorganic nutrients were done on two transects at 6 stations across the Bay. In addition, variations in temperature, salinity and some meteorological factors were also investigated, their correlation with chlorophyll-a were analyzed. The highest chlorophyll-a concentration (3.8 µg L^{-1}) was found on coastal transect nearer to the bay. The first peak in chlorophyll-a occurred in May, a second smaller peak was recorded in September. The correlation of chlorophyll-a was significantly positive for Silicate-Si and Nitrate+nitrite-N but not important for Phosphate-P. No dramatic increase in chlorophyll-a levels was encountered in the area during the study period. It was concluded that, due to the hydrodynamic structure of the area, the land-based effects influence chlorophyll-a dynamics.

Keywords

Chlorophyll-a, Dinorganic nutrients, Eutrophication, Iskenderun Bay, Northeastern Mediterranean

9.0

Universiti Malaya

9.1 **Malaysian Journal of Science Volume 31, Issue 2, 2012**

A parallel assessment of the growth parameters of different legumes grown in clodinafop stressed soils

Munees Ahemad

In modern agronomy, the indiscriminate and ill-advised application of herbicides leads to their accumulation in soils in substantial amounts and deteriorate the soil quality and fertility and in turn, the crop productivity. Earlier studies regarding the effect of herbicides were generally, restricted to a particular legume and studies about the concurrent impact of any specific herbicide on more than one legume are rare. This study was therefore, designed to evaluate the effect of the herbicide clodinafop simultaneously on four commonly grown food legumes (chickpea, pea, lentil and greengram). In this study, the growth of the selected legumes, in soils stressed with the recommended field application rate of clodinafop, decreased significantly. The root and shoot biomass, the symbiotic attributes (numbers, dry weight and leghaemoglobin content in nodules), nutrient-uptake (nitrogen and phosphorus), seed protein and yields of the tested legumes varied considerably in the presence of clodinafop. The toxic impact of clodinafop on nodule biomass, chlorophyll content, nutrient uptake and seed protein was marginal in all the tested legumes. In addition, clodinafop suppressed the root growth and seed yield in greengram, nodule numbers in pea and the shoot growth and leghaemoglobin content of nodules in chickpea. Overall, clodinafop showed the most adverse impact on the growth parameters of chickpea and greengram and the least on those of pea and lentil.

Keywords

Herbicide, Clodinafop, Toxicity, Legume, Soil

9.2 **Australian Journal of Crop Science, Volume 6, Issue 3, 2012, Pages 375-380. ISSN 1835-2693**

Antioxidant activity, phenolic and flavonoid contents in the leaves of different varieties of sweet potato (*Ipomoea batatas*)

Hue, S.M., Boyce, A.N., Somasundram, C.

The study of antioxidants from natural sources has gained popularity in the recent years. Six *Ipomoea batatas* leafy varieties namely Batu Kelantan, Batu Biasa, Biru Putih, Oren, Vitato and Indon were compared to assess the total phenols, flavonoids, reducing power and antioxidant activity. In this study, the Indon variety showed the highest level of total phenolic contents at 5.35 ± 0 g GAE/100 g DW. The flavonoid contents in the leaves ranged from 96 ± 47.6 µg/ g in Indon variety to 263.5 ± 43.5 µg/g in Batu Biasa variety. 1,1-diphenyl-2-picryl hydrazyl (DPPH) was used to determine the radical scavenging activity in leaves, in which the Indon and Biru Putih variety had the highest and lowest scavenging activities of 372.4 µg/ ml (IC_{50}) and 597.61 µg/ ml (IC_{50}), respectively. All varieties, except Biru Putih, showed the high radical scavenging activity compared to the ascorbic acid standard. Besides, all the leaf varieties also showed increment in their reducing power with increasing concentrations. Thus, *Ipomoea batatas* leaves can be used as a potential source of natural antioxidants.

Keywords

Ipomoea batatas, Antioxidant assays, Condensed tannins, Natural antioxidants, Malaysia

9.3 **Malaysian Journal of Science, Volume 31, Issue 1, 2012**

Biodegradation of used lubricating oil by microbes isolated from pristine soil environment

Abioye, O.p., Agamuthu, P., Abdul Aziz, A.R.

Pollution of soil by used lubricating oil is a common phenomenon in most cities in developing countries. This may pose a great threat to the environment and human being at large. Potential of hydrocarbon utilizing bacteria and yeast isolated from pristine (uncontaminated) soil to degrade used lubricating oil was studied in broth culture for 28 days at 30 ± 20C. Four isolates (*Pseudomonas aeruginosa*, *Micrococcus luteus*, *Trichosporon mucoides* and *Candida tropicalis*) were used for the study. The highest percentage (40.6%) of total petroleum hydrocarbons (TPH) and hydrocarbon fractions degradation was recorded by *C. tropicalis* followed by *T. mucoides* throughout the study period, compared to those recorded by *P. aeruginosa* and *M. luteus*. Thus, pointing out the potential of the yeast species (*Candida tropicalis*) in biodegradation of used lubricating oil from soil environment.

Keywords

Used lubricating oil, Biodegradation, Contamination, Hydrocarbon

9.4 **Biotechnol Res Int, 2012. Page 587041. ISSN 2090-3146 (Electronic)**

Biodegradation of used motor oil in soil using organic waste amendments

Abioye, O.P., Agamuthu, P., Abdul Aziz, A.R.

Soil and surface water contamination by used lubricating oil is a common occurrence in most developing countries. This has been shown to have harmful effects on the environment and human beings at large. Bioremediation can be an alternative green technology for remediation of such hydrocarbon-contaminated soil. Bioremediation of soil contaminated with 5% and 15% (w/w) used lubricating oil and amended with 10 % brewery spent grain (BSG), banana skin (BS), and spent mushroom compost (SMC) was studied for a period of 84 days, under laboratory condition. At the end of 84 days, the highest percentage of oil biodegradation (92%) was recorded in soil contaminated with 5% used lubricating oil and amended with BSG, while only 55% of oil biodegradation was recorded in soil contaminated with 15% used lubricating oil and amended with BSG. Results of first-order kinetic model to determine the rate of biodegradation of used lubricating oil revealed that soil amended with BSG recorded the highest rate of oil biodegradation (0.4361 day^{-1}) in 5% oil pollution, while BS amended soil recorded the highest rate of oil biodegradation (0.0556 day^{-1}) in 15% oil pollution. The results of this study demonstrated the potential of BSG as a good substrate for enhanced remediation of hydrocarbon contaminated soil at low pollution concentration.

9.5 **Molecular and Cellular Probes, 2012, Pages 1-4. ISSN 0890-8508**

First molecular characterization of *Giardia duodenalis* from goats in Malaysia

Lim, Y.A.L., Mahdy, M.A.K., Tan, T.K., Goh, X.T., Jex, A.R., Nolan, M.J., Sharma, R.S.K., Gasser, R.B.

In the present study, 310 faecal samples from goats from eight different farms in Malaysia were tested for the presence of *Giardia* using a PCR-coupled approach. The nested PCR for SSU amplified products of the expected size (~200 bp) from 21 of 310 (6.8%) samples. Sixteen of these 21 products could be sequenced successfully and represented six distinct sequence types. Phylogenetic analysis of the SSU sequence data using Bayesian Inference (BI) identified *Giardia* assemblages A, B and E. The identification of the 'zoonotic' assemblages A and B suggests that *Giardia*-infected goats represent a possible reservoir for human giardiasis in Malaysia.

Keywords

Giardia duodenalis, Small subunit of the nuclear ribosomal RNA (SSU) gene, Goats, Malaysia

9.6 **Australian Journal of Crop Science, Volume 5, Issue 12, 2011, Pages 1610-1615. ISSN 18352693**

Influence of elemental sulfur on nutrient uptake, yield and quality of cucumber grown in sandy calcareous soil

Motior, M.R., Abdou, A.S., Al Darwish, F.H., El-Tarabily, K.A., Awad, M.A., Golam, F., Sofian-Azirun, M.

This study was carried out to investigate the effect of elemental sulfur (S^0) and sulfur oxidizing bacteria (*Paracoccus versutus*) on nutrient uptake, yield and quality of cucumber grown in sandy calcareous soils. Both elemental sulfur powder (S^0P) and pellets of sulfur powder-Tiger 90 (S^0T) were applied at rates of 0, 1, 5 and 10 t/ha at Al Hamraneya. On the contrary, S^0P was used at rates of 0, 1, 5 and 10 t/ha combined with or without *Paracoccus versutus* (Pv) at Al Kuwaitat, United Arab Emirates (UAE). Higher concentrations of N, P, S, Mn and Zn in leaves and yield of cucumber at both locations were obtained with application of S^0 at rates of 5 and 10 t/ha. Total soluble sugar (TSS) content and vitamin C was higher with the application of S^0 at rates of 5 and 10 t/ha. Application of *Pv* individually or with varying levels of S^0P had no positive effect on nutrients uptake, yield and quality of cucumber. A positive correlation was observed between shelf life and vitamin C. At Al Hamraneya S^0P performed better than S^0T. The results reveal that application of S^0P at the rate of 5 t/ha in sandy calcareous soils can enhance the nutrients uptake ability, increase yield and superior quality of cucumber at both locations in UAE.

Keywords

Calcareous soil, Elemental sulfur, Nutrients, Quality, Yield.

9.7 **Asia Pacific Business Review, Volume 19, Issue 3, 2012, Pages 381-401. ISSN 1360-2381**

Malaysian investors in the Indonesian oil palm plantation sector: home state facilitation and transboundary haze

Varkkey, H.

This paper analyses the regionalization of Malaysian oil palm plantation firms into Indonesia. These firms have been implicated in starting fires to clear land for planting, which has resulted in transboundary haze. This paper argues that these Malaysian investors have been able to burn with impunity, despite the dire consequences of haze on their home country, because of the close patronage relationships and vested interests of the Malaysian government elites in these companies. Because of this, the home government is inclined to protect and defend the actions of these firms in Indonesia against such allegations, while the Malaysian public continues to suffer the haze.

Keywords

Foreign direct investment, Indonesia, Malaysia, Oil palm, Patronage politics, Regionalization

9.8 Institutions and Economies, Volume 3, Issue 2, 2012

Natural resource industries, 'Tragedy of the commons' and the case of Chilean salmon farming

Jorge Katz, Michiko Iizuka

Chilean salmon farming has been considered as an outstanding example of success after growing at double digit rates for more than twenty years. While the expansion was indeed dramatic, it came at the expense of severe sanitary and environmental deterioration. The outbreak in 2008 of the infectious salmon anaemia, a viral disease that kills salmon, but does not affect humans, has made this utterly clear. The overexploitation of the 'commons' upon which the industry has grown and the lack of an adequate regulatory mechanism to monitor adverse environmental effects contributed to this disaster, which now threatens the future of the industry and the country benefiting from its natural comparative advantage for salmon farming. The paper shows that activities based on the exploitation of a common pool resource require quite a different analytical approach than the one conventional neoclassical theory offers us for the understanding of firm and industry behaviour. This study shows that industries of this sort enjoy unique location-specific conditions requiring specific know how, R&D, and strong public-private cooperation in order to attain environmentally sustainable long term growth.

Keywords

Chilean salmon farming, Common pool resources, Natural resource based industry, 'Tragedy of the commons'

9.9 **Biodegradation, Volume 23, Issue 2, 2012, Pages 277-286. ISSN 1572-9729 (Electronic) 0923-9820 (Linking)**

Phytotreatment of soil contaminated with used lubricating oil using *Hibiscus cannabinus*

Abioye, O.P., Agamuthu, P., Abdul Aziz, A.R.

Soil contamination by hydrocarbons, especially by used lubricating oil, is a growing problem in developing countries, which poses a serious threat to the environment. Phytoremediation of these contaminated soils offers environmental friendly and a cost effective method for their remediation. *Hibiscus cannabinus* was studied for the remediation of soil contaminated with 2.5 and 1 used lubricating oil and treated with organic wastes banana skin (BS), brewery spent grain (BSG) and spent mushroom compost (SMC) for a period of 90 days under natural conditions. Loss of 86.4 and 91.8% used lubricating oil was recorded in soil contaminated with 2.5 and 1% oil and treated with organic wastes respectively at the end of 90 days. However, 52.5 and 58.9% oil loss was recorded in unamended soil contaminated with 2.5 and 1% oil, respectively. The plant did not accumulate hydrocarbon from the soil but shows appreciable accumulation of Fe and Zn in the root and stem of *H. cannabinus* at the end of the experiment. The first order kinetic rate of uptake of Fe and Zn in *H. cannabinus* was higher in organic wastes amendment treatments compared to the unamended treatments, which are extremely low. The results of this study suggest that *H. cannabinus* has a high potential for remediation of hydrocarbon and heavy metal contaminated soil.

Keywords

Hibiscus cannabinus, Used lubricating oil, Organic wastes, Hydrocarbons, Bioaccumulation

9.10 Parasites & Vectors, Volume 5, Issue 1, 2012, Pages 88. ISSN 1756-3305

Prevalence and zoonotic potential of canine hookworms in Malaysia

Mahdy, M.A.K., Lim, Y.A.L., Ngui, R., Fatimah, M.R.S., Choy, S.H., Yap, N.J., Al-Mekhlafi, H.M., Ibrahim, J., Surin, J.

Background:

Canine hookworm infection is endemic in Southeast Asian countries with a prevalence ranging from 70% to 100%, with zoonotic transmission representing a potentially significant public health concern. However, there are limited data available on the prevalence of canine hookworms in Malaysia. This study was conducted to determine the prevalence of hookworm and *Ancylostoma* species among dogs in Malaysia.

Methods:

Faecal samples were collected from 221 dogs living in urban areas, rural areas and animal shelters in Selangor. Faecal samples were processed using the formal-ether concentration technique followed by wet mount preparation and iodine staining for the detection of hookworm eggs. Samples positive for hookworm eggs were examined using PCR, targeting ITS2 and 28s rRNA region, and subsequently sequenced in both directions. The sequences were phylogenetically analysed using MrBayes for Bayesian Inference.

Results:

The overall prevalence of hookworm among dogs was 48% (95%CI; 41.41-54.95). Rural stray dogs had the highest prevalence 71.4% (95%CI; 61.13-81.49) followed by urban stray dogs, recording 48% (95%CI; 34.15-61.85) and lastly dogs in shelters with 28.7% (95%CI; 19.56-37.84). Logistic regression identified rural stray dogs as a high risk group (OR=4.55, 95%; 2.50-8.31) and keeping dogs in shelters as a protective factor (OR=0.24, 95%; 0.14-0.43). Molecular methods identified both *Ancylostoma ceylanicum* and *Ancylostoma caninum* with *A. ceylanicum* being predominant among urban stray dogs. Rural dogs had a higher prevalence of *A. caninum* than *A. ceylanicum*, while both species showed equal distribution among dogs in shelters. Phylogenetic analysis placed *A. ceylanicum* isolated from dogs in one group with *A. ceylanicum* human isolates.

Conclusion:

This study indicates that dogs have the potential to act as reservoir hosts of human hookworm infection in Malaysia. This finding necessitates the inclusion of dogs in any interventions to combat hookworm in the country.

Keywords

Hookworm, Dogs, *A. ceylanicum*, *A. caninum*, Malaysia

9.11 **Australian Journal of Crop Science, Volume 5, Issue 3, 2011, Pages 350-360, ISSN 18352693**

Responses of sulfur, nitrogen and irrigation water on *Zea mays* growth and nutrients uptake

Rahman, M.M., Soaud, A.A., Darwish, F.H.A., Sofian-Azirun, M.

Availability of both native and applied nutrients is one of the major constrains for plants growth in sandy calcareous soils. Elemental sulfur (S^0) is often applied to acidify calcareous soil which increases the availability of nutrients in soils. The present study was sought to examine the effect of S^0 combined with or without N under acidified (pH 6.5) and normal (pH > 7.5) irrigation water on growth, apparent N-use efficiency (NUE) and uptake availability of nitrogen (N), phosphorus (P), sulfur (S), iron (Fe), zinc (Zn) and manganese (Mn) by corn plants grown in calcareous soils. Elemental S at rates of 0, 1, 5 and 10 t ha $^{-1}$ were tested combined with or without N at rates of 0 and 0.34 t ha $^{-1}$ in pots using normal and acidified irrigation water under Al Zaid and Al Semaih soils in evaporative cooled greenhouse conditions. Total dry matter (TDM) accumulation and nutrients uptake had positive relation while soil pH showed negative correlation with TDM and uptake availability of all nutrients. Addition of S^0 at the rate of 5 t ha $^{-1}$ combined with N fertilizer recorded improved NUE, superior TDM and maximum uptake of all nutrients under both types of irrigation water and soils. Collectively, the results indicate that S fertilization is required to improve NUE and thereby maintaining a sufficient availability of nutrients and growth of corn in sandy calcareous soil.

Keywords

Calcareous soil, Corn, Sulfur, Nitrogen, Irrigated water, Nutrients uptake

9.12 **Renewable and Sustainable Energy Reviews, Volume 18, 2013. Pages 583-594. ISSN 1364-0321**

The application of solar technologies for sustainable development of agricultural sector

Mekhilef, S., Faramarzi, S.Z., Saidur, R., Salam, Z.

Solar energy is one of the cleanest sources of alternative energy. Due to high energy demand in one hand and environmental negative impact of fossil fuels, on the other hand, many countries consider the alternative energy sources as a suitable and feasible option in industry and domestic usage. It was discovered that the different applications of solar energy in industries are being accepted more than ever. The present study is a state of art on the numerous new and feasible technologies of solar energy applications in the agricultural sectors. It discusses about the importance of solar energy as environmental clean technologies and the most reliable energy source. This study covers different types of solar energy systems like as solar photovoltaic and solar thermal for pumping water, drying crops, cooling the storages and producing heating/ cooling greenhouses. It has been proven that photovoltaic systems and/or solar thermal system would be the suitable options in agricultural application and especially for the distant rural area.

Keywords

Solar energy, Agriculture, Solar water pump system, Solar drying, Solar cooling storages, Solar greenhouses

10.0

Universiti Malaysia Perlis

10.1 **Flow Measurement and Instrumentation, Volume 31, June 2013, Pages 61–68**

Visualization of recovered palm oil using portable ECT imager in extraction palm oil process

E.J. Mohamad, R.A. Rahim, P.L. Leow, M.H.F. Rahiman, O.M.F. Marwah, N.M.N. Ayob

A portable Electrical Capacitance Tomography (ECT) imager for a palm oil process monitoring system is developed and presented in this work. Intended as a support instrument, the system will enable local and foreign palm oil mills to control efficiently the flow process monitoring of crude palm oil in conveying pipelines during extraction. This monitoring system enables the visualization of the liquid percentage inside the vessel, and the data obtained can then be used to design better mill process equipment or control certain processes. Thus, the quality of crude palm oil can be maximized and the process of palm oil mill effluent treatment improved. In previous studies, ECT was developed rapidly and used successfully for multiphase flow measurements in many applications in the oil and gas industry, gas/solids cyclones, milk flows, and fluidized beds. The present work experimentally investigates the capability of portable ECT sensors with 16 electrodes to identify the concentration, velocity profile, and phase concentration of crude palm oil in related multiphase systems (liquid and gas).

Keywords

Portable ECT imager, Non-invasive, Visualization, Crude palm oil

10.2 **Procedia Chemistry, Volume 6, 2012, Pages 165–174, 2nd International Conference on Bio-Sensing Technology**

Bio-inspired sensor fusion for quality assessment of Harumanis mangoes

F.S.A. Sa'ad, A.Y.M. Shakaff, M.Z. Abdullah, A.H. Adom, M.N. Jaafar, M.J. Masnan, L.M. Kamarudin

In recent years, there have been a number of reported studies on the use of non-destructive technique to evaluate and determine mango maturity and ripeness levels. However, most of these reported works were conducted using single-modality sensing systems, either using an electronic nose (e-nose), acoustics, CCD, IR sensor or by other non-destructive measurements. This paper presents the work on the classification of mangoes (*Magnifera Indica cv*. Harumanis*)* maturity and ripeness levels using data fusion of the electronic nose (e-nose) and acoustic sensor and combine with CCD and IR sensor. A Fourier-based shape separation method was developed from CCD camera images to grade mango by its shape and able to correctly classify 100%. Colour intensity from infrared image was used to distinguish and classify the level of maturity and ripeness of the fruits. The finding shows 92% correct classification of maturity levels by using infrared vision Three groups of samples each from two different harvesting times (week 7 and week 8) were evaluated by the e-nose and then followed by the acoustic sensor. By applying a low level data fusion technique on the e-nose and acoustic data, the classification for maturity and ripeness levels using LDA was improved.

Keywords

Machine vision, Fourier descriptor, Harumanis mango, Grading system, Automated inspection, Acoustic, E-nose

10.3 **APCBEE Procedia, Volume 4, 2012, Pages 79–87, 2nd International Conference on Asia Agriculture and Animal (ICAAA 2012)**

Solar powered automated fertigation control system for *Cucumis Melo* L. cultivation in green house

J.E. Mohd Salih, A.H. Adom, A.Y. Md. Shaakaf

Production of vegetables and fruits in Malaysia using fertigation methods been experiencing accelerated growth. Fertigation allow farmers to automatically deliver adequate nutrient quantity and concentration through drip irrigation to plants active root area throughout the growing season. Conventionally, three separate preset digital timers are used to turn ON/OFF injector and irrigation pumps for fertilizer mixing and setting daily frequency of irrigation. The quality of nutrients solution level is manually checked using Electrical Conductivity (EC) meter to determine quality of the nutrient solution. This project was developed and tested to provide low cost solution for precise control of fertilizer mixing and irrigation to local farmers. A predefined EC value will be used as single input that control all automated processes in *Cucumis melo* L. cultivation using fertigation system. The developed system powered totally by solar power system and tested on its effectiveness to control the nutrient mixing process and injecting nutrient solutions according to plants growth rate and in the same time monitor all key parameters in fertigation system.

Keywords

Fertigation, Electrical conductivity (EC), Time based irrigation

10.4 **Powder Technology, Volume 213, Issues 1–3, 10 November 2011, Pages 188–191**

Characterisation of calcium carbonate and its polymorphs from cockle shells (*Anadara granosa*)

Kh. Nurul Islam, Md Zuki Bin Abu Bakar, Mustapha M. Noordin, Mohd Zobir Bin Hussein, Norshazlirah Shazlyn Bte Abd Rahman, Md. Eaqub Ali

Calcium carbonate and its polymorphs from cockle shells (*Anadara granosa*) and commercial calcium carbonate were characterised using a variable pressure scanning electron microscopes (VPSEM), a transmission electron microscope (TEM), an energy dispersive X- ray analyser (EDX), X-ray diffraction (XRD) and Fourier transmission infrared spectroscopy (FT-IR). Cubic-like calcite crystals of commercial calcium carbonate and rod-like aragonite crystals of cockle shell powders were observed by both SEM and TEM. The EDX results showed that the cockle shells contained more calcium and carbon than the commercial calcium carbonate, whereas the commercial calcium carbonate contained more oxygen than the cockle shells. FT-IR analyses revealed the presence of carbonate groups in both the cockle shells and the commercial calcium carbonate. FT-IR analyses also showed the presence of aragonite in the cockle shells and calcite in the commercial calcium carbonate. XRD analyses showed that the cockle shells powder contained aragonite, whereas the commercial calcium carbonate contained calcite. The cockle shells powder was formed with good quality calcium carbonate and contained calcium carbonate in the aragonite phase.

Keywords

Calcium carbonate, Polymorph, Cockle shells

10.5 **Meat Science, Volume 91, Issue 4, August 2012, Pages 454–459. Published by Elsevier Ltd**

Analysis of pork adulteration in commercial meatballs targeting porcine-specific mitochondrial cytochrome b gene by TaqMan probe real-time polymerase chain reaction

M.E. Ali, U. Hashim, S. Mustafa, Y.B. Che Man, Th.S. Dhahi, M. Kashif, Md. Kamal Uddin, S.B. Abd Hamid

A test for assessing pork adulteration in meatballs, using TaqMan probe real-time polymerase chain reaction, was developed. The assay combined porcine-specific primers and TaqMan probe for the detection of a 109 bp fragment of porcine cytochrome b gene. Specificity test with 10 ng DNA of eleven different species yielded a threshold cycle (Ct) of 15.5 ± 0.20 for the pork and negative results for the others. Analysis of beef meatballs with spiked pork showed the assay can determine 100–0.01% contaminated pork with 102% PCR efficiency, high linear regression (r^2 = 0.994) and ≤ 6% relative errors. Residuals analysis revealed a high precision in all determinations. Random analysis of commercial meatballs from pork, beef, chicken, mutton and goat, yielded a Ct between 15.89 ± 0.16 and 16.37 ± 0.22 from pork meatballs and negative results from the others, showing the suitability of the assay to determine pork in commercial meatballs with a high accuracy and precision.

Keywords

Meatball formulation, Double quenched TaqMan probe, Halal and Kosher foods, Threshold cycle, Ground meat

10.6 **Industrial Crops and Products, Volume 34, Issue 3, November 2011, Pages 1635–1640**

Optimization of alkaline hydrolysis of paddy straw for ferulic acid extraction

Noor Hasyierah Mohd Salleh, Mohamed Zulkali Mohamed Daud, Dachyar Arbain, Muhammad Syarhabil Ahmad, Ku Syahidah Ku Ismail

Response Surface Methodology (RSM) via Central Composite Design (CCD) was used to optimize the alkaline hydrolysis of paddy straw to improve ferulic acid extraction. The parameters involved, namely temperature (°C), concentration of NaOH (M) and duration of extraction (h) are screened by Full Factorial Studies (FFD). The result obtained from FFD was 0.518% (5.18 mg/g). The interactions between each parameters involved were studied using Central Composite Design (CCD). Upon optimization, the percentage of ferulic acid improved from 0.518% to 0.817% (8.17 mg/g). The optimum conditions obtained from this study are 125 °C, 3.90 M, 2.30 h for temperature, concentration of NaOH and extraction time, respectively. This result shows a significant improvement than the previous published work. Details of the experimental design, statistical analysis and interpretation are discussed below.

Keywords

Extraction, Paddy straw, Ferulic acid, Central composite design

10.7 **Procedia Engineering, Volume 50, 2012, Pages 101–109, International Conference on Advances Science and Contemporary Engineering 2012, Published by Elsevier Ltd.**

Thermal analysis and pozzolanic index of rice husk ash at different grinding time

P.J. Ramadhansyah, A.W. Mahyun, M.Z.M. Salwa, B.H. Abu Bakar, M.A. Megat Johari, M.H. Wan Ibrahim

Thermo-gravimetric and differential thermo-gravimetric analyses were performance to study the effect of temperature on the mineralogical compositions of rice husk ash subjected to different grinding time. Eight rice husk ashes with different grinding time, i.e. coarse original rice husk ash (RHA0), RHA1, RHA2, RHA3, RHA4, RHA5, RHA6, and RHA7 were used for the study. The TGA/DTA analysis and X-ray fluorescence (XRF) was used through this investigation. On the other hand, the pozzolanic activity index of the RHA was assessed in accordance with ASTM C 311-11a. From the experiment, it was found that the greater the weight loss, the less the crystallinity of the RHA. In addition, there are no significant differences in chemical compositions of the rice husk ashes with different grinding time. Furthermore, when the grinding time increased from 1 hour and 30 minutes to 5 hours, there was a significant drop in the pozzolanic index.

Keywords

Rice husk ash, Grinding, Thermal analysis, X-ray fluorescence, Pozzolanic index

10.8 **Procedia Engineering, Volume 50, 2012, Pages 305–313, International Conference on Advances Science and Contemporary Engineering 2012, Published by Elsevier Ltd.**

Properties of concrete containing rice husk ash under sodium chloride subjected to wetting and drying

P.J. Ramadhansyah, M.Z.M. Salwa, A.W. Mahyun, B.H. Abu Bakar, M.A. Megat Johari, C.W. Che Norazman

In this study, the influences of different replacement levels of RHA blended cement concrete subjected to 5% NaCl solution with drying-wetting cycles was evaluated. For parametric study, RHA was used as a Portland cement Type I replacement at the levels of 0%, 10%, 20, 30%, and 40% by weight of binder. The water-to-binder ratio was 0.49. The evolution of compressive strength, weight loss, and reduction in strength was monitored for up to 6 months. Generally, the compressive strength test has been shown that use of RHA in blended cement has a significant influence on chloride concentration. When increasing the replacement level of RHA, the strength of concrete also increases in comparison to OPC concrete (except RHA40) even subjected to sodium chloride. In addition, increasing the percentage replacement of RHA tends to reduce the compressive-strength loss due to increased pozzolanic reaction. It is concluded that the incorporation of RHA in cement significantly improved the resistance to chloride penetration of concrete.

Keywords

Rice husk ash, Compressive strength, Sodium chloride, Drying, Wetting

10.9 **Computers and Electronics in Agriculture, Volume 89, November 2012, Pages 18–29, Published by Elsevier B.V.**

Embedded portable device for herb leaves recognition using image processing techniques and neural network algorithm

Z. Husin, A.Y.M. Shakaff, A.H.A. Aziz, R.S.M. Farook, M.N. Jaafar, U. Hashim, A. Harun

Herbs have been widely used in food preparation, medicine and cosmetic industry. Knowing which herbs to be used would be very critical in these applications. Nevertheless, the current way of identification and determination of the types of herbs is still being done manually and prone to human error. Designing a convenient and automatic recognition system of herbs species is essential since this will improve herb species classification efficiency. This research focus on recognition approach to the shape and texture features of the herbs leaves. It aims to realize the computerized method to classify the herbs plants in a very convenient way. Portable herb leaves recognition system through image and data processing techniques is implemented as automated herb plant classification system. It is very easy to use and inexpensive system designed especially for helping scientist in agricultural field. The proposed system employs neural networks algorithm and image processing techniques to perform recognition on twenty species of herbs. One hundred samples for each species went through the system and the recognition accuracy was at 98.9%. Most importantly the system is capable of identifying the herbs leaves species even though they are dried, wet, torn or deformed. The efficiency and effectiveness of the proposed method in recognizing and classifying the different herbs species is demonstrated by experiments.

Keywords

Embedded portable device, Herbs leaves database, Herbs leaves recognition, Neural network algorithm, Singular value decomposition (SVD)

11.0 **Universiti Malaysia Sabah**

11.1 **Harmful Algae, Volume 10, Issue 5, July 2011, Pages 495-502**

Temporal and spatial distribution of harmful algal bloom (HAB) species in coastal waters of Kota Kinabalu, Sabah, Malaysia

Aimimuliani Adam, Normawaty Mohammad-Noor, Ann Anton, Ejria Saleh, Shahbudin Saad, Sitti Raehanah Muhd Shaleh

Development of harmful algal blooms (HABs) in coastal waters of Kota Kinabalu, Malaysia, is a recurring problem. The blooms are caused by *Pyrodinium bahamense* var. *compressum* and *Cochlodinium polykrikoides*. Recently, another potential HAB species, *Gymnodinium catenatum*, was identified. The occurrence of these species is known to be related to a range of factors, including seasonal monsoons, nutrients, physical parameters and geomorphology. To understand the occurrence and distribution of the three species, extensive samplings were carried out over a period of one year, including the South West Monsoon (SWM), North East Monsoon (NEM) and Inter-Monsoon (IM) periods, at 5 stations located in 3 different bays off Kota Kinabalu. Cell density of the three HAB species and in situ physical parameters (salinity, pH and temperature) were recorded. Secondary data such as rain fall and wind speed were obtained from the Meteorology Department, Kota Kinabalu. *C. polykrikoides* and *G. catenatum* occurred year-round with the highest cell densities of 1.54×10^7 cells L^{-1} and 1.24×10^6 cells L^{-1} in December (NEM). *P. bahamense* var. *compressum* was found in low numbers with maximum cell density of 2×10^4 cells L^{-1} in August (SWM). The absence of *P. bahamense* var. *compressum* during the highest peak of *C. polykrikoides* and *G. catenatum* was related to nutrient concentrations and composition. The three species tended to occur at stations near the river and in a sheltered area. The results of the study indicate that the coastal area of Kota Kinabalu may continue to experience HAB problems, unless environmental conditions change significantly.

Keywords

Cochlodinium polykrikoides, *Gymnodinium catenatum*, Harmful algal bloom, *Pyrodinium bahamense* var. *compressum*, Monsoon, Sabah

11.2 **Forest Policy and Economics, Volume 22, September 2012, Pages 60-64**

Sustainable forest management policy and the analysis of convergence effects on timber production

A.S. Abdul-Rahim, H.O. Mohd-Shahwahid

Since the mid-1990s, three Malaysian regions, namely Peninsular Malaysia, Sabah and Sarawak, have implemented sustainable forest management (SFM) certification practices, one of the objectives of which is sustaining timber production per hectare. This paper attempts to examine the level of sustainability attained by these three regions by testing for convergence effects of timber production per hectare with respect to the implementation of SFM practices. Nonlinear unit root was applied to test for nonlinear convergence in the three Malaysian regions in comparison to the national average for the period of 1970 to 2007. The results of linear and nonlinear trends showed that the regions have attained long-run convergence with the national average timber production per hectare. As it stands now, this finding has shown that Malaysia practices timber production with managed sustainability.

11.3 Aquaculture, Volume 321, Issues 1–2, 16 November 2011, Pages 157-165

Experimental evidence of horizontal transmission of *Betanodavirus* in hatchery-produced Asian seabass, *Lates calcarifer* and brown-marbled grouper, *Epinephelus fuscoguttatus* fingerling

Benny Obrain Manin, Julian Ransangan

In the present study we report the experimental evidence of horizontal transmission of betanodavirus in hatchery-produced Asian seabass (*Lates calcarifer*) and brown-marbled grouper (*Epinephelus fuscogutattus*) fingerling. The experiment was conducted by incubating fish fingerlings in aerated sterile natural seawater inoculated with tissue homogenate of betanodavirus infected fish fingerling at 28° C for 30 min and after which they are transferred into the aquarium. Dead fish were collected daily for 10 days and subjected to RT-PCR and histological examinations. The cDNA of coat protein gene of betanodavirus from positive fish specimens were subjected to RFLP-PCR and DNA sequencing analyses. The result showed high fish mortality in treatment than in the control experiment. The RT-PCR and histological analyses showed all fish specimens in treatment groups except for D2 and E2 were successfully infected with *Betanodavirus*. In contrast, all fish specimens in control groups remained uninfected. The result of the present study indicate that mixing of fish fingerlings obtained from different sources and the use of surplus fish eggs for feeding supplement can potentially promote the horizontal transmission of *Betanodavirus* in hatchery. This can threaten the sustainability of aquaculture industry in Malaysia.

Keywords

Betanodavirus, Horizontal transmission, Asian seabass, Brown-marbled grouper

11.4 Food and Bioproducts Processing, Volume 89, Issue 3, July 2011, Pages 217-233

A review of the antioxidant potential of medicinal plant species

Duduku Krishnaiah, Rosalam Sarbatly, Rajesh Nithyanandam

Some researchers suggest that two-thirds of the world's plant species have medicinal value; in particular, many medicinal plants have great antioxidant potential. Antioxidants reduce the oxidative stress in cells and are therefore useful in the treatment of many human diseases, including cancer, cardiovascular diseases and inflammatory diseases. This paper reviews the antioxidant potential of extracts from the stems, roots, bark, leaves, fruits and seeds of several important medicinal species. Synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxylanisole (BHA) are currently used as food additives, and many plant species have similar antioxidant potentials as these synthetics. These species include *Diospyros abyssinica*, *Pistacia lentiscus*, *Geranium sanguineum* L., *Sargentodoxa cuneata* Rehd. Et Wils, *Polyalthia cerasoides* (Roxb.) Bedd, *Crataeva nurvala* Buch-Ham., *Acacia auriculiformis* A. Cunn, *Teucrium polium* L., *Dracocephalum moldavica* L., *Urtica dioica* L., *Ficus microcarpa* L. fil., *Bidens pilosa* Linn. *Radiata*, *Leea indica*, the *Lamiaceae* species, *Uncaria tomentosa* (Willd.) *DC*, *Salvia officinalis* L., *Momordica Charantia* L., *Rheum ribes* L., and *Pelargonium endlicherianum*. The literature reveals that these natural antioxidants represent a potentially side effect-free alternative to synthetic antioxidants in the food processing industry and for use in preventive medicine.

Keywords

Antioxidant, Oxidative stress, Medicinal species, Different countries

11.5 Carbohydrate Polymers, Volume 84, Issue 4, 2 April 2011, Pages 1267-1275

Preparation of Ca-alginate beads containing high oil content: Influence of process variables on encapsulation efficiency and bead properties

Eng-Seng Chan

The encapsulation of model oil in Ca-alginate beads using high oil loading was studied. It was found that the alginate concentration, oil volume fraction and alginate type each have a significant influence on the encapsulation efficiency and on bead properties. The alginate-oil emulsion, comprising an oil loading up to 30 vol% and 25 g/L of high G alginate solution (equivalent to an oil-to-wall weight ratio of up to 15 g/g), was found to be stable and resulted in an encapsulation efficiency of 90% before drying. The oil-loaded, wet beads were spherical. The encapsulation efficiency was dependent on the degree of cross-linking at the surface of the extruded emulsion droplet as well as on the emulsion stability. The oil extraction profile of dried beads may be related to the structural properties of the beads, which are dependent on both the drying method and the oil loading. The overall encapsulation efficiency after freeze-drying and oven-drying were 90% and 79%, respectively, with an oil content of over 85 wt% for both types of dried beads. The freeze-dried beads were non-oily and free flowing, whereas the oven-dried beads were oily and sticky. The results of this work are compared to those in the literature, and the merits and the drawbacks associated with different methods are discussed.

Keywords

Encapsulation, Alginate, Oil, Emulsion stability, Beads

11.6 **Biomass and Bioenergy, Volume 35, Issue 9, October 2011, Pages 3775-3786**

An outlook of Malaysian energy, oil palm industry and its utilization of wastes as useful

F. Sulaiman, N. Abdullah, H. Gerhauser, A. Shariff

Malaysia has an abundance of energy resources, both renewable and non-renewable. The largest non-renewable energy resource found in Malaysia is oil, and second, is natural gas, primarily liquefied natural gas. The production and consumption of oil, gas and coal in Malaysia are given in this paper. The energy demand and supply by source are also shown in relation to the country's fuel diversification policy. In order to reduce the overall dependence on a single source of energy, efforts were undertaken to encourage the utilization of renewable resources. Forest residue and oil palm biomass are found to be potentially of highest energy value and considered as the main renewable energy option for Malaysia.

Palm oil and related products represent the second largest export of Malaysia. The total oil palm planted area in Malaysia has increased significantly in recent years. This paper gives a detailed representation of oil palm planted and produced together with its yield from the year 1976 onwards. The large amounts of available forest and palm oil residues resulting from the harvest can be utilized for energy generation and other by-products in a manner that also addresses environmental concerns related to current waste disposal methods.

Keywords

Energy, Renewable energy, Oil palm, Oil palm wastes, Fast pyrolysis

11.7 **Food and Bioproducts Processing, Volume 90, Issue 2, April 2012, Pages 235-242**

Optimization of extraction time and temperature for antioxidant activity of edible wild mushroom, *Pleurotus porrigens*

Hip Seng Yim, Fook Yee Chye, Sze May Koo, Patricia Matanjun, Siew Eng How, Chun Wai Ho

The extraction time and temperature of *Pleurotus porrigens* were optimized for the maximization of 2,2-diphenyl-1-picryhydrazyl (DPPH) radical scavenging and 2,2′-azino-bis(3-ethylbenzthiazoline-6-sulfonate) (ABTS) radical cation inhibition activities, ferric reducing/antioxidant power (FRAP) and total phenolic content (TPC) using response surface methodology (RSM). A rotatable central composite design consisting of 14 experimental runs with three replicates at the central points was applied and second-order polynomial models were used to describe the experimental data regarding the responses. The experimental results adequately fitted into the second-order polynomial models with significant linear, quadratic and interaction effects of the independent variables. The optimized conditions were 372.8 min/32.0 °C (DPPH); 340.9 min/36.8 °C (ABTS); 240.0 min/38.1 °C (FRAP); and 310.1 min/43.6 °C (TPC) with corresponding yields of 32.66%; 91.21%; 7.91 mM Fe^{2+} equivalent/100 g; and 494 mg gallic acid equivalent/100 g, respectively. The experimental values were close with those predicted values, indicating suitability of the model employing RSM for optimizing the extraction time and temperature on antioxidant activity from *P. porrigens*.

Keywords

Antioxidant activity, Extraction time, Temperature, Total phenolic content, Response surface methodology, *Pleurotus porrigens*

11.8 Bioresource Technology, Volume 130, February 2013, Pages 181-186

The adsorption of heavy metal by Bornean oil palm shell and its potential application as constructed wetland media

H.L.H. Chong, P.S. Chia, M.N. Ahmad

Oil palm shell, a waste from palm oil industry, was cleaned and utilized as adsorbent. Its particle size distribution gave the uniformity coefficient of approximately two indicating that it can be used as filter bed media for continuous operation without resting. Its measured pH_{pzc} of 4.1 is below the common pH of constructed wetland water body suggesting positive adsorption for heavy metal. The effect of various parameters on its adsorption was studied via batch experiments. The adsorption of Cu(II) and Pb(II) ions by oil palm shell showed a slightly better fit with the Freundlich compared to Langmuir. Its monolayer adsorption capacities were found to be 1.756 and 3.390 mg/g for Cu(II) and Pb(II), respectively. High correlation coefficient of over 0.99 given by the pseudo-second-order model suggests that the rate limiting factor may be chemisorption. These findings suggest its potential application as constructed wetland media for the removal of heavy metal.

Keywords

Cu(II), Pb(II), Oil palm shell, Adsorption, Constructed wetland

11.9 **Aquaculture, Volume 315, Issues 3–4, 21 May 2011, Pages 327-334**

Betanodavirus infection in golden pompano, *Trachinotus blochii*, fingerlings cultured in deep-sea cage culture facility in Langkawi, Malaysia

Julian Ransangan, Benny O. Manin, Azila Abdullah, Zuraidah Roli, Erni F. Sharudin

Golden pompano, *Trachinotus blochii* is a new marine fish candidate for aquaculture in Malaysia. The fingerlings of the fish are not yet produced locally but imported from neighboring countries and Taiwan. In the present study we report the first molecular detection of betanodavirus from diseased golden pompano fingerlings cultured in a deep-sea cage culture facility in Langkawi, Malaysia. The virus caused the fish fingerlings to exhibit abnormal swimming behavior, dark skin coloration and loss of appetite prior to mass mortality. Histopathological examination revealed acute cell vacuolation in both brain and retina tissues of the affected fingerlings. Results of viral culture, RT-PCR and DNA sequencing further confirmed the role of betanodavirus infection in the outbreak. Although phylogenetic analysis and mean nucleotide sequence of RNA2 genome of the betanodavirus showed high similarity to RGNNV betanodavirus isolated from Taiwan, origin of infection is difficult to establish since the RGNNV is also commonly reported in the Southeast Asian region and has the widest range of host marine fish species. Nevertheless, the finding of the present study requires a review of procedures in importing fish fingerlings for sustainable growth of the marine aquaculture industry in Malaysia.

Keywords

Betanodavirus, Golden pompano, RT-PCR, DNA sequencing

11.10 **Veterinary Microbiology, Volume 156, Issues 1–2, 23 April 2012, Pages 16-44**

Genome analysis of Betanodavirus from cultured marine fish species in Malaysia (agriculture)

Julian Ransangan, Benny Obrain Manin

Betanodavirus is the causative agent of the viral nervous necrosis (VNN) or viral encephalopathy and retinopathy disease in marine fish. This disease is responsible for most of the mass mortalities that occurred in marine fish hatcheries in Malaysia. The genome of this virus consists of two positive-sense RNA molecules which are the RNA1 and RNA2. The RNA1 molecule contains the RdRp gene which encodes for the RNA-dependent RNA polymerase and the RNA2 molecule contains the Cp gene which encodes for the viral coat protein. In this study, total RNAs were extracted from 32 fish specimens representing the four most cultured marine fish species in Malaysia. The fish specimens were collected from different hatcheries and aquaculture farms in Malaysia. The RNA1 was successfully amplified using three pairs of overlapping PCR primers whereas the RNA2 was amplified using a pair of primers. The nucleotide analysis of RdRp gene revealed that the Betanodavirus in Malaysia were 94.5–99.7% similar to the RGNNV genotype, 79.8–82.1% similar to SJNNV genotype, 81.5–82.4% similar to BFNNV genotype and 79.8–80.7% similar to TPNNV genotype. However, they showed lower similarities to FHV (9.4–14.2%) and BBV (7.2–15.7%), respectively. Similarly, the Cp gene revealed that the viruses showed high nucleotide similarity to RGNNV (95.9–99.8%), SJNNV (72.2–77.4%), BFNNV (80.9–83.5%), TPNNV (77.2–78.1%) and TNV (75.1–76.5%). However, as in the RdRp gene, the coat protein gene was highly dissimilar to FHV (3.0%) and BBV (2.6–4.1%), respectively. Based on the genome analysis, the Betanodavirus infecting cultured marine fish species in Malaysia belong to the RGNNV genotype. However, the phylogenetic analysis of the genes revealed that the viruses can be further divided into nine sub-groups. This has been expected since various marine fish species of different origins are cultured in Malaysia.

11.11 Advances in Agronomy, Volume 124, Chapter 3, 2014, Pages 91-142

Properties and management of acid sulfate soils in Southeast Asia for sustainable cultivation of rice, oil palm, and cocoa

J. Shamshuddin, A. Elisa Azura, M.A.R.S. Shazana, C.I. Fauziah, Q.A. Panhwar, U.A. Naher

Acid sulfate soils occur sporadically in the coastal plains of countries throughout the globe. The soils are characterized by a low pH and the presence of sulfuric horizon, overlying sulfidic materials, mostly pyrite (FeS2). This pyrite is readily oxidized when the soils are drained to make way for development (e.g., agriculture). During the process of pyrite oxidation, a straw-yellow mineral called jarosite is formed and eventually high acidity and toxic aluminum are released into the environment, affecting crop growth. This chapter reviews the studies conducted in Southeast Asia on the management of soils for sustainable crop production. Some of the soils are utilized for the cultivation of rice, oil palm, and cocoa with mixed success because of their inherently low fertility, and Al and/or Fe toxicity. For rice cultivation, lime, basalt, or organic fertilizer can be used to alleviate the infertility of the soils. Application of lime or basalt increases soil pH, resulting in precipitation of inert Al hydroxides. Oil palm can be grown successfully on acid sulfate soils if the proper water management practice is carried out. The drains in the oil palm plantation should be designed in such a way that the excess water is removed from the area, while maintaining the water table level above the pyritic layer. Cocoa grows poorly on acid sulfate soils because of low pH and Al toxicity. However, with adequate liming, using ground magnesium limestone and organic matter, the soils can be utilized productively for cocoa production. In general, acid sulfate soils can be made productive for rice, oil palm, or cocoa cultivation by increasing soil pH with lime or basalt, applying organic matter, or adopting proper water management practices.

11.12 Biological Conservation, Volume 169, January 2014, Pages 268-276

Tropical forest fragments contribute to species richness in adjacent oil palm plantations

Jennifer M. Lucey, Noel Tawatao, Michael J.M. Senior, Vun Khen Chey, Suzan Benedick, Keith C. Hamer, Paul Woodcock, Robert J. Newton, Simon H. Bottrell, Jane K. Hill

In Southeast Asia, large-scale conversion of rainforest to oil palm plantations is one of the major causes of biodiversity declines. Recommendations for reducing species losses and increasing the sustainability of palm oil production advocate the retention of natural forest patches within plantations, but there is little evidence for the effectiveness of this strategy. Here, we examine to what extent rainforest remnants with different characteristics contribute to biodiversity within surrounding plantations. We sampled ground-dwelling ants in Sabah (Malaysian Borneo) using unbaited pit-fall traps along 1 km transects spanning forest-plantation ecotones of 10 forest fragments (area 5 ha–500 ha) and two continuous forest sites which bordered plantations. Ant species richness in plantations varied according to richness in adjacent forest fragments, which increased with fragment size. A trend of declining species richness in plantations with distance from the forest ecotone was consistent with spillover of forest species into plantations adjacent to forest remnants. Ant assemblages in plantations also contained more carnivorous species adjacent to large forest fragments, suggesting large fragments may have benefits for pest control in plantations, as well as benefits for local biodiversity. Our results indicate that large forest fragments support distinctive ant assemblages and increase diversity within the planted area, but small fragments (<~200 ha) contribute little to plantation diversity. Thus retaining large fragments of forest may help mitigate the loss of species within oil palm plantations.

Keywords

Agricultural matrix, Ants, Borneo, Fragmentation, Spillover, Trophic level

11.13 Industrial Crops and Products, Volume 52, January 2014, Pages 457-465

Analysis of potential technological schemes for the development of oil palm industry in Colombia: A biorefinery point of view

Luis E. Rincón, Jonathan Moncada, Carlos A. Cardona

In this work, two biorefineries based on oil palm were designed, assessed and compared in order to establish the best route to transforms this feedstock into biodiesel, alcohols and other added value products. The first integration approach considers the simultaneous production of biodiesel and ethanol from lignocellulosic biomass and glycerol. The second integration approach includes palm oil fractionation, biodiesel production and Biomass Fired Cogeneration using a gasification technology. These two integration alternatives were analyzed according to their potential income (total sales/total production cost ratio), and environmental impact (WAR algorithm). The total sales/total production cost ratio obtained for the integrated approaches were 1.88 and 3.33 respectively. The potential environmental impacts (PEI/tonne) were 90 and 240 respectively. The economic and environmental assessment revealed a better global performance for the second integrated approach. In this sense, a biorefinery with a major number of products and low energy consumption is an important option for the development of oil palm industry. The latter is due to the maximum utilization this feedstock. On the other hand, a food product can be granted with the production of palm olein fraction.

Keywords

Biorefinery, Oil palm, Techno-economic analysis, WAR algorithm

11.14 **Molecular Phylogenetics and Evolution, Volume 73, April 2014, Pages 65-76**

An evaluation of taxonomic concepts of the widespread plant genus *Aglaia* and its allies across Wallace's Line (tribe Aglaieae, Meliaceae)

Melanie Grudinski, Caroline M. Pannell, Mark W. Chase, Joffre A. Ahmad, Alexandra N. Muellner-Riehl

Similar to other species-rich taxa in the Indo-Australian Archipelago, taxonomy of the genus *Aglaia* (mahogany family, Meliaceae) remains problematic. This study aims to evaluate taxonomic concepts within *Aglaia* based on the largest dataset to-date. We analyzed sequences of 237 accessions of *Aglaia* and representatives of all other genera of the tribe Aglaieae, including nuclear ribosomal ITS, the *trnL–trnF* intron and intergenic spacer, the *atpF* intron and the *petD* region comprising the *petB–petD* spacer, the *petD-5′* exon and the *petD* intron (all but the first from the plastid genome). Our analyses were set both in maximum likelihood and Bayesian frameworks, which (1) supported paraphyly of *Aglaia* and *Aphanamixis*; (2) demonstrated polyphyly of previously described sections for *Aglaia*; and (3) suggested delimitation problems with 57% of the morphologically "variable species" and all "complex species". In general, there were more genetic entities than species described, which shows that the taxonomy of this group is more complex than has sometimes been previously assumed. For some species, morphological variation suggests the existence of more variants, subspecies or species within various taxa. Furthermore, our study detected additional phylogenetic entities that were geographically distinct, occurring on either side of Wallace's Line but not on both sides. The delineation of these inter-specific taxa needs further investigation by taking into account the morphological variation within and between populations across the entire distribution.

Keywords

Aphanamixis, Complex species, Phylogenetics, Sapindales, Southeast Asian floras

11.15 **Carbohydrate Polymers, Volume 91, Issue 2, 16 January 2013, Pages 699-710**

Sugar palm (*Arenga pinnata*): Its fibres, polymers and composites

M.R. Ishak, S.M. Sapuan, Z. Leman, M.Z.A. Rahman, U.M.K. Anwar, J.P. Siregar

Sugar palm (*Arenga pinnata*) is a multipurpose palm species from which a variety of foods and beverages, timber commodities, biofibres, biopolymers and biocomposites can be produced. Recently, it is being used as a source of renewable energy in the form of bio-ethanol via fermentation process of the sugar palm sap. Although numerous products can be produced from sugar palm, three products that are most prominent are palm sugar, fruits and fibres. This paper focuses mainly on the significance of fibres as they are highly durable, resistant to sea water and because they are available naturally in the form of woven fibre they are easy to process. Besides the recent advances in the research of sugar palm fibres and their composites, this paper also addresses the development of new biodegradable polymer derived from sugar palm starch, and presents reviews on fibre surface treatment, product development, and challenges and efforts on properties enhancement of sugar palm fibre composites.

Keywords

Polymer-matrix composites (PMCS), Fibres, Mechanical properties, Physical properties

11.16 Comptes Rendus Biologies, Volume 334, Issue 4, April 2011, Pages 290-299

Genetic variability of oil palm parental genotypes and performance of its' progenies as revealed by molecular markers and quantitative traits

Norziha Abdullah, Mohd Rafii Yusop, Maizura Ithnin, Ghizan Saleh, M.A. Latif

Studies were conducted to assess the genetic relationships between the parental palms (*dura* and *pisifera*) and performance of their progenies based on nine microsatellite markers and 29 quantitative traits. Correlation analyses between genetic distances and hybrids performance were estimated. The coefficients of correlation values of genetic distances with hybrid performance were non-significant, except for mean nut weight and leaf number. However, the correlation coefficient of genetic distances with these characters was low to be used as predicted value. These results indicated that genetic distances based on the microsatellite markers may not be useful for predicting hybrid performance. The genetic distance analysis using UPGMA clustering system generated 5 genetic clusters with coefficient of 1.26 based on quantitative traits of progenies. The genotypes, DP16, DP14, DP4, DP13, DP12, DP15, DP8, DP1 and DP2 belonging to distant clusters and greater genetic distances could be selected for further breeding programs.

Keywords

Oil palm, Microsatellite markers, Quantitative characters, Correlation

11.17 International Biodeterioration & Biodegradation, Volume 85, November 2013, Pages 243-253

Composting of oil palm fibres and *Trichoderma* spp. as the biological control agent: A review

Saili Nur Shafawati, Shafiquzzaman Siddiquee

Oil palm production is a main agricultural industry in Malaysia, in which oil palm fibres (trunk, frond and empty fruit bunch) are considered as major waste products. Huge amounts of waste products are created great environmental problems, ecosystem degradation, affect health of the communities and high disposal costs per year. Composting is an alternative way to transform the bulky biomass into a valuable, manageable product for use in plantation or as market product. The aim of this review is to summarize composting process of oil palm fibres especially EFB and in application of *Trichoderma* sp. as the biological control agents. However, more research and review on the information regarding oil palm fibres compost and *Trichoderma* spp. application as the biocontrol agents in oil palm fibres compost needed to exploit their actual potential, which is the outstanding objective of this review.

Keywords

Biological control agents, Composting process, Oil palm fibres, *Trichoderma* spp.

11.18 Cytotherapy, Volume 15, Issue 8, August 2013, Pages 1030-1041

Organotypic culture of human amnion cells in air-liquid interface as a potential substitute for skin regeneration

Simat Siti Fatimah, Kienhui Chua, Geok Chin Tan, Tengku Ibrahim Azmi, Ay Eeng Tan, Hayati Abdul Rahman

Background Aims

The aim of the present study was to evaluate the effects of air-liquid interface on the differentiation potential of human amnion epithelial cells (HAECs) to skin-like substitute in organotypic culture.

Methods

HAECs at passage 1–2 were seeded onto a fibrin layer populated with human amnion mesenchymal cells to form the organotypic cultures. The organotypic HAECs were then cultured for 7, 14 and 21 d in two types of culture system: the submerged culture and the air-liquid interface culture. Cell morphogenesis was examined under the light and electron microscopes (transmission and scanning) and analyzed by immunohistochemistry.

Results

Organotypic HAECs formed a single layer epithelium after 3 wk in submerged as well as air-liquid interface cultures. Ultrastructurally, desmosomes were observed in organotypic HAECs cultured in the air-liquid interface but not in the submerged culture. The presence of desmosomes marked the onset of early epidermal differentiation. Organotypic HAECs were positive against anti-CK18 and anti-CK14 in both the submerged and the air-liquid interface cultures. The co-expression of CK14 and CK18 suggested that differentiation of HAECs into skin may follow the process of embryonic skin development. However, weak expression of CK14 was observed after 2 and 3 wk of culture in air-liquid interface. CK10, involucrin, type IV collagen and laminin-5 expression was absent in organotypic HAECs. This observation reflects the initial process of embryonic epidermal differentiation and stratification.

Conclusions

Results from the present study suggest that the air-liquid interface could stimulate early differentiation of organotypic HAECs to epidermal cells, with a potential use for skin regeneration.

Keywords

Air-liquid interface, Epithelial stem cells, Fibrin, Human amnion–derived stem cells, Organotypic culture, Skin regeneration

11.19 **Food Hydrocolloids, Volume 30, Issue 2, March 2013, Pages 581-588**

Comparative study on the physicochemical properties of κ-carrageenan extracted from *Kappaphycus alvarezii* (doty) doty ex Silva in Tawau, Sabah, Malaysia and commercial κ-carrageenans

Sook Wah Chan, Hamed Mirhosseini, Farah Saleena Taip, Tau Chuan Ling, Chin Ping Tan

κ-Carrageenan is a linear, sulphated polysaccharide that is widely used in the food industry as a gelling agent due to its lack of toxicity and biocompatibility. In this study, the physicochemical properties of κ-carrageenan (TA150) derived from *Kappaphycus alvarezii* (formerly *Eucheuma cottonii*) in Tawau, Sabah were investigated and compared to commercial κ-carrageenan (SeaKem CM611, Gelcarin GP812, Gelcarin GP911 NF, and Grindsted® carrageenan CL220). TA150 exhibited the lowest lightness but highest yellowness, with L^* and b^* values reported as 82.69 and 17.16, respectively. The rupture strength of κ-carrageenan increased significantly with increasing concentration ($p < 0.05$). The water losses from κ-carrageenan gel increased with increasing storage times. TA150 lost the most water within 10 days of storage time. The water-holding capacity (WHC) of κ-carrageenan gel was reported to be excellent (>90%) under all storage temperatures (25 °C, 4 °C and –18 °C). The moisture content, ash, acid-insoluble matter, and sulphate levels of κ-carrageenan samples were reported as 3.65–11.41%, 17.75–33.18%, 0.22–3.74%, and 12.00–19.71%, respectively. These samples were low in fat, protein, and crude fibre contents. The potassium content in κ-carrageenan was highest in Gelcarin GP812 (100.42 g/kg), followed by Grindsted® carrageenan CL220 (61.92 g/kg), TA150 (54.60 g/kg), Gelcarin GP911 NF (40.90 g/kg) and SeaKem CM611 (15.76 g/kg). No heavy metals were detected in TA150 and the other commercial κ-carrageenan samples except for lead. However, the concentration of lead detected in the κ-carrageenan samples fell within the acceptable ranges (<5 mg/kg) set by the Joint FAO/WHO Expert Committee on Food Additives (JECFA).

Keywords

Eucheuma cottonii, κ-Carrageenan, Physicochemical properties, Water-holding capacity, Ash, Minerals

11.20 **Deep Sea Research Part II: Topical Studies in Oceanography, Volume 96, November 2013, Pages 13-18**

The distribution and diversity of sea cucumbers in the coral reefs of the South China Sea, Sulu Sea and Sulawesi Sea

Sau Pinn Woo, Zulfigar Yasin, Siti Hasmah Ismail, Shau Hwai Tan

A study on the distribution and diversity of sea cucumbers in the coral reefs of the South China Sea, Sulu Sea and Sulawesi Sea was carried out in July 2009. The survey was done using wandering transect underwater with SCUBA. Twelve species of sea cucumber were found from four different families and nine genera. The most dominant family was Holothuriidae (five species), followed by Stichopodidae (three species), Synaptidae (three species) and Cucumariidae with only one species. The most dominant species found around the island was *Pearsonothuria graffei,* which can be found abundantly on substrate of dead corals in a wide range of depth (6–15 m). The Sulawesi Sea showed a higher diversity of sea cucumber with seven different species compared to the South China Sea with only six different species and Sulu Sea with only two species. Ordination by multidimensional scaling of Bray–Curtis similarities clustered the sampling locations to three main clusters with two outgroups. Previous studies done indicated a higher diversity of sea cucumber as compared to this study. This can be indication that the population and diversity of sea cucumbers in the reef is under threat.

11.21 Forest Ecology and Management, Volume 310, 15 December 2013, Pages 531-538

Effects of 50 years of selective logging on demography of trees in a Malaysian lowland forest

Toshihiro Yamada, Tetsuro Hosaka, Toshinori Okuda, Abd Rahman Kassim

Species specific tree performance (growth, mortality, and recruitment rates) and population growth rate in a logged forest that was selectively logged in 1958 were compared with those in a primary forest using 10-year forest demographic data (1998–2008) in the Pasoh Forest Reserve in Malaysia. The forests differed in forest structure and the logged forest had brighter understory light conditions than the primary forest. The underlying hypothesis of this study is that the forest structural differences caused by selective logging 50 years ago affects tree performance and demography through increasing forest light environments. Species studied showed significantly faster dbh (diameter-at-breast-height) growth rate in the logged forest than in the primary forest. There was very little difference in mortality rates between the logged and primary forests. Recruitment rates in the logged forest were significantly lower than those in the primary forest. Consequently, population growth rates were significantly higher in the primary forest. These findings support our hypothesis and imply that selective logging approximately 50 years ago was still influencing tree performance and demography of the forest. In the logged forest, populations of early successional species declined more than the other species, although this was not the case in the primary forest. Although there still remains a possibility that the decline was due to a drought event and thus was just temporal, this suggests the species composition of the logged forest is still changing and gaining additional late successional species. Therefore, the logged forest was still in secondary succession after selective logging. We should note that logging cycles shorter than 50 years may not be enough long to recover original species composition before logging.

11.22 **Food Chemistry, Volume 133, Issue 4, 15 August 2012, Pages 1326-1332**

Assessment of concentrations of toxic elements in aquaculture food products in Malaysia

Wen Jye Mok, Shigeharu Senoo, Tomohiro Itoh, Yasuyuki Tsukamasa, Ken-ichi Kawasaki, Masashi Ando

Thirteen species of aquaculture food products, including fresh water and marine fish, prawns, and seaweed were collected from 37 aquaculture farms in Malaysia. Muscle and liver specimens from these species were tested for the presence of As, Cd, Cr, Cu, Hg, Pb, and Zn by using a heat vaporisation atomic absorption spectrophotometer and an inductively coupled plasma atomic emission spectrophotometer. Sea bass from each collected site were comparatively studied, where As concentrations were assumed to be caused by different culture system; and, Hg and Pb concentration were assumed to be due to anthropogenic activities in specific sites. The calculated estimated intake values of Malaysians for total As, Cd, Cr, Cu, Hg, Pb, and Zn in the muscle of the examined species were 3.713, 0.115, 0.113, 4.268, 0.211, 0.738 and 15.863 μg/kg b.w./day. None of the values exceeded the JECFA guideline values and would pose no health hazards for consumers.

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Logistic regression to predict termite cccurrences with environmental variables in primary forest and oil palm ecosystem: The case study in Sabah, Malaysia

Wong Mum Keng, Homathevi Rahman

The aim of this research was to study the relationship between presence of termite and environmental variables in primary forest and adjacent oil palm plantation located in Sabah province, Malaysia. Termite sampling was conducted with manually dug and sorted soil pits (25 cm × 25 cm × 10 cm) at a minimum extent of 64 m and lag of 2 m. Logistic regression technique was used to analyze the collected data. In general, termite species richness and relative abundances are lower in oil palm plantation in comparison with primary forest. The result showed that probability of termite occurrences in primary forest are mainly related to dead woods, trees and non-predatory ants. Likewise, probability of termite occurrences in oil palm plantation was affected with the appearance of dead woods, pruned stacked fronds, non- predatory ants and earthworms. This result indicated that pruned stacked fronds and dead woods play an important role of recovery of termite assemblages in oil palm plantation.

11.24 **Bioresource Technology, Volume 102, Issue 3, February 2011, Pages 3626-3628**

Biosynthesis of poly (3-hydroxybutyrate-co-3-hydroxyvalerate) and characterisation of its blend with oil palm empty fruit bunch fibers

Yoga Sugama Salim, Amirul Al-Ashraf Abdullah,
Coswald Stephen Sipaut @ Mohd Nasri, Mohamad Nasir Mohamad Ibrahim

Poly(3-hydroxybutyrate-co-38 mol%-3-hydroxyvalerate) [P(3HB-co-38 mol%-3HV)] was produced by *Cupriavidus* sp. USMAA2–4 in the presence of oleic acid and 1-pentanol. Due to enormous production of empty fruit bunch (EFB) in the oil palm plantation and high production cost of P(3HB-co-3HV), oil palm EFB fibers were used for biocomposites preparation. In this study, maleic anhydride (MA) and benzoyl peroxide (DBPO) were used to improve the miscibility between P(3HB-co-3HV) and EFB fibers. Introduction of MA into P(3HB-co-3HV) backbone reduced the molecular weight and improved the thermal stability of P(3HB-co-3HV). Thermal stability of P(3HB-co-3HV)/EFB composites was shown to be comparable to that of commercial packaging product. Composites with 35% EFB fibers content have the highest tensile strength compared to 30% and 40%. P(3HB-co-3HV)/EFB blends showed less chemicals leached compared to commercial packaging.

12.0

Universiti Malaysia Sarawak

12.1

Applied Engineering in Agriculture, Volume 29, Issue 6, 2013, Pages 953-959

Design and development of a tebaloi processing machine: A preliminary study

Abdullah M.O., Yassin A., Saga J.B., Eden T.

Tebaloi is a traditional snack of the Melanau people of Sarawak, East Malaysia. It is made mainly from the Sago flour extracted from the Sago palm tree. It is produced with traditional methods, which are both tedious and time consuming, and it uses many natural resources like banana leaves in its production. The rare source of available literature on tebaloi processing makes it difficult to find out more information about tebaloi mechanization, except that all tebaloi manufacturers are using machines that are not designed for tebaloi processing. To date, there is no available machine in the market to manufacture tebaloi from the dough. Therefore, the present study aimed to design, build, and test a novel tebaloi machine. Unlike other foods such as noodle and pasta, tebaloi dough contains different ingredients and has a different viscosity making it difficult to process in conventional machines. Also, the mechanization processing requirements are significantly dependent on production size, cost, and benefits. In the present study, we came up with suitable design for the tebaloi-making requirements in particular for rolling, compression and cutting applications. For those purposes, the performance of the machine is evaluated at five different motor speeds viz. 217, 380, 470, 520, and 610 revolution per minute (rpm) representing Case I, II, III, IV, and V, respectively. The main outcome from the present research is three-fold: (1) time consumption of rolling and cutting processes reduced about 87% when employing the machine at a wide range of operating speeds; (2) the slices per minute of tebaloi production increases with rpm of the motor speed; and (3) the production rate of the tebaloi processing machine is increased about 22% for each case as compared to the conventional method.

Keywords

Agricultural machinery, Design, Food, Performance tests, Processing, Production

Malaysian Applied Biology, Volume 42, Issue 1, 2013, Pages 61-66

Direct and indirect plant regenerations of pineapple *var.* MD2 (*Ananas comosus* L.)

Hamid N.S., Bukhori M.F.M., Jalil M.

The variety MD2 of pineapple (*Ananas comosus* L.) was used in this study. This variety is highly demanded in the international market and known for possessing harvest quality with aroma, high sugar content (14% Brix), vitamins and longer shelf life. However, shortage of planting material has limited the production in Malaysia. *In vitro* mass propagation using the direct and indirect shoot proliferation techniques was tested on variety MD2. The plantlets were successfully initiated from sucker on solid MS basal medium containing 30 g/L sucrose, 0.1 g/L Myo-inositol and 3 mg/L BAP after one month of culture. The highest direct shoot tips regeneration was obtained on solid MS medium when added with 30 g/L sucrose, 0.1 g/L Myo-inositol, 3 mg/L BAP and 1 mg/L NAA. Indirect shoot regeneration was obtained on medium containing 3 mg/L Zeatin after one month of culture. In average, 10 shoots were regenerated from approximately 1 gram of calli. The techniques can produce 100-200 number of plantlet within 4 to 6 months of culture, and ready for planting after 7 months of culture.

Keywords

Direct micropropagation, Indirect micropropagation, MD2, Pineapple, Plant regeneration

12.3 **Communications in Soil Science and Plant Analysis, Volume 43, Issue 12, June 2012, Pages 1647-1657**

Labile carbon and carbon management index in peat planted with various crops

Nahrawi H., Husni M.H.A., Radziah O.

Changes in soil carbon (C) from forest to agriculture land in Mukah, Sarawak, and Simpang Renggam (SR) Johor were studied. The changes in labile C (CL) (Mukah, 0.7-43%; SR, 0.2-20%) were greater than changes in the total C (CT) (Mukah, 0.5-9%; SR, 0.3-7%) as compared to the forest. In Mukah, oil palm and pineapple ecosystems showed approximately 18% and 6% increases in CL at a soil depth of 0-15 cm, respectively, as compared to the forest, and thus had greater C management index (CMI) values. In the sago ecosystem, the decline in CL was approximately 26% at the soil depth of 0-15 cm as compared to the forest. In SR, oil palm and pineapple ecosystems showed approximately 0.2% and 19% decreases in CL, respectively, at soil depths of 0-15 cm, resulting in low CMI value. The CL and the CMI can be used to monitor the rate of changes in soil C for different land uses on peat.

Keywords

Labile carbon, Oil palm, Tropical peat

12.4 **The Raffles Bulletin of Zoology, Supplement No. 29, 30 Nov. 2013, Pages 225-23**

Roosting and nest-building behaviour of the white-nest swiftlet *Aerodramus Fuciphagus* (Thunberg) (Aves: Apodidae) in farmed colonies

Ramji, M.F.S., Koon, L.C., Rahman, M.A.

The edible-nest swiftlets of the genus *Aerodramus* are amongst the most unusual of birds, being able to navigate in total darkness aided by echolocation and using their own saliva to construct the nest. They are a valuable economic resource, the edible nests being much sought after. Knowledge of nesting and breeding ecology of this species has so far been limited to cave colonies whilst studies focusing on the house-farmed population are lacking. We studied the roosting and nest building behaviour of the white-nest swiftlet *Aerodramus Fuciphagus* (Thunberg) in two separate house-farmed colonies of different age in Miri Division, Sarawak, from Jun.2010 to Jan.2011 (Site-I) and Feb.2012 to Oct.2012 (Site-II). Two types of infrared (IR) cameras were used, namely (i) fixed focal-lens IR to monitor large colony and (ii) Pan-Tilt-Zoom camera for close-up observation. This paper reports new discovery in which three basic activity sessions are described; first emergence period (0600-0700 hours), post-emergence period (0700-1000 hours) and returning period (1800-1900 hours). During the post-emergence period, approximately half of the sampled colony was observed re-entering the swiftlet house to resume nest construction. Ten ethogram categories were developed to describe the roosting behaviours of the white-nest swiftlets: proximity fluttering, random roosting flight, pair switching, parallel shifting, mounting, preening, defaecating, resting, territorial display, and nest building. Our results also revealed that there is a disparity in sexual contribution in nest building, where one partner is twice more hardworking and return more frequently during the post-emergence period to build nest. We hypothesized that it is the male (i.e., Individual-A) that contributes more to nest building, reasons being (i) Individual-A is the one that mounted Individual-B and not the other way around, (ii) Individual-A is nearly twice as hardworking in nest building, correlating with the fact that spermatogenesis is less energy demanding than oogenesis, and (iii) more protective over its partner when their nest reaches full size, a point of time when copulation is expected.

Keywords

Aerodramus fuciphagus, Colony, Edible nests, Nest building, Roosting, Sexual contribution, Swiftlet

12.5 **Fuel Processing Technology, Volume 106, February 2013, Pages 744-750**

Bio-oils from microwave pyrolysis of agricultural wastes

Sharifah Mona Abdul Aziz, Rafeah Wahi, Zainab Ngaini, Sinin Hamdan

Pyrolysis of palm kernel shell (PK), wood chips (WC) and sago wastes (SW) was performed on microwave irradiation at different heating time, at moderate temperature 250–390 °C. Samples were placed in quartz reactor and subjected to microwave heating in inert atmosphere to afford bio-oils (PKO, WCO and SWO). The highest calorific values recorded are 27.19 MJ/kg, 25.99 MJ/kg, and 21.99 MJ/kg for PKO, WCO and SWO. FTIR spectroscopy showed the presence of functional groups such as phenol, alcohols, ketones, aldehydes and carboxylic acids. The GCMS showed that PKO, WCO and SWO consist of significant quantities of potentially high value hydrocarbons such as monoaromatic hydrocarbons and phenolic compounds. Importantly, the bio-oils do not contain carcinogenic polyaromatic hydrocarbons (PAH). Upon further refining, the bio-oils have a potential as valuable source for fuel or chemical feedstocks.

Keywords

Palm kernel shell, Wood chips, Sago waste, Microwave, Pyrolysis

12.6 **Agriculture, Ecosystems & Environment, Volume 178, 15 September 2013, Pages 127–134**

Improved sampling methods document decline in soil organic carbon stocks and concentrations of permanganate oxidizable carbon after transition from swidden to oil palm cultivation

Thilde Bech Bruun, Kelvin Egay, Ole Mertz, Jakob Magid

Oil palm plantations are spreading rapidly throughout Southeast Asia and in some countries, they are promoted as carbon sinks compared to the swidden cultivation systems that they often replace. However, little is known about the impacts of this land use change on soil organic carbon (SOC) stocks or soil quality. This study uses resampling of archived soil samples to investigate the sensitivity of permanganate oxidizable carbon (Pox-C) concentration to a change in land use from swidden cultivation to small-scale oil palm plantation on an Ultisol in Sarawak, Malaysia. Furthermore, the results of two different methods of calculating SOC stocks are compared – namely the fixed depth approach and the equivalent soil mass approach, which is sensitive to changes in soil bulk density. Results show that using a method that is sensitive to changes in bulk density is important as the soil bulk density increases upon establishment of oil palm. Thus, topsoil carbon stocks significantly decreased 3–8 years after oil palm establishment as measured by the equivalent soil mass approach, but only marginally and insignificantly decreased according to the fixed depth approach. After 15 years of oil palm, carbon stocks were 40% lower according to the fixed depth approach but 50% lower when using the equivalent soil mass approach. Importantly, the resampling of geo-referenced soil gives more consistent data, and lends credibility to the observation of large reductions in SOC stocks. The concentration of Pox-C in the 0–10 cm layer declines exponentially as oil palm plantations age and can serve as an indicator of change in the soil ecosystem brought about by the investigated land use transition. Pox-C is not more sensitive to this change than standard SOC analyses, but it may serve as an inexpensive, fast and field-suitable means of estimating the SOC status of different land use systems.

Keywords

Permanganate oxidizable carbon, Early indicator, Soil organic carbon, Equivalent soil mass approach, Land use changes, Sarawak

13.0 Universiti Pendidikan Sultan Idris, Malaysia

13.1 **International Biodeterioration and Biodegradation, Volume 85, November 2013, Pages 571-576**

Cr(VI) reduction in naturally rich growth medium and sugarcane bagasse by *Acinetobacter haemolyticus*

Ahmad W.A., Wan Ahmad W.H., Karim N.A., Santhana Raj A.S., Zakaria Z.A.

The potential of agricultural waste as substitute for rich-growth medium for bacteria during Cr(VI) reduction was investigated using the locally isolated Cr(VI) resistant-reducing strain of *Acinetobacter haemolyticus* and sugarcane bagasse. *A.haemolyticus* showed higher resistance to 100 mg/L Cr(VI) in Luria Bertani (>10^{10} CFU/mL) compared to sugarcane bagasse (10^{6} CFU/mL). Higher Cr(VI) reduction by the SCB-immobilized bacteria (>90%) compared to in LB only (around 25%) clearly indicated the role of SCB in carrying out abiotic reduction of Cr(VI) as well as Cr(VI) adsorption. Nevertheless, Cr(III) was detected on the bacterial surface using Electron Spin Resonance (ESR) and electron microscopy (FESEM-EDX) analysis. The Cr(III) deposition occurred probably via complex formation with either carboxyl, hydroxyl or amide groups present on the bacterial cells surface as suggested from the FT-IR analysis. TEM analysis further showed Cr distribution at the membrane and cytosolic fractions. This work clearly demonstrated the role of bacteria in reducing Cr(VI) to Cr(III) as well as the potential of using agricultural waste material such as SCB to carry out abiotic Cr(VI) reduction.

Keywords

Cr(VI) reduction, ESR, Resistant, Sugarcane bagasse, *Acinetobacter haemolyticus*

13.2 Emirates Journal of Food and Agriculture, Volume 25, Issue 1, 2013, Pages 81-88

Model development for wheat production: Outliers and multicollinearity problem in Cobb-Douglas production function

Enaami M.E., Mohamed Z., Ghani S.A.

Despite the important role that production function has played in growth literature, few attempts have been made to change the methodology to estimate it. The Cobb-Douglas functions are among the best known production functions utilized in applied production analysis. This paper describes development of a new model based on Cobb-Douglas production function with the used of robust method and partial least squares path modeling for parameter estimation. The new model attempted to solve two main problems in modeling namely the issue of multicollinearity and outliers. Each issue was handled separately but using the same method of least square for parameter estimations. This paper goes on to provide an overview of the measurements and structural criteria needed for model development and, also to introduce a robust partial least squares-path modeling for the Cobb-Douglas production function (RPLS-PM-CD). The researcher hypothesizes that utilization of the minimum covariance determinant (MCD) provides an estimate by the measurement model and expresses the structural relationships between the latent variables through the partial least squares-path modeling (PLS-PM). The inputs and outputs of the RPLS-PM-CD were based on agricultural wheat production data pertaining to Al-Kufra Agricultural Production Project. This paper is more theoretical and should be seen as a new way to estimate Cobb-Douglas production function.

Keywords

Cobb-Douglas production function, Multicollinearity, Ordinary least squares (OLS), Outliers, Partial least squares-path modeling (PLS-PM), The minimum covariance determinant (MCD), Wheat production

13.3 **Jurnal Teknologi (Sciences and Engineering), Volume 59, Issue SUPPL.3, 2012, Pages 93-97**

Structural characteristics and field electron emission properties of carbon nanotubes synthesized from waste cooking palm oil

Falina A.N., Suriani A.B., Azmina M.S., Salina M., Dalila A.R., Nor R.M., Rusop M.

In this work, we studied the effect of two different catalyst; nickel (Ni) and cobalt (Co) nitrate on structural characteristic and field electron emission properties of carbon nanotubes (CNT). Thermal chemical vapor deposition method and bio-hydrocarbon precursor namely waste cooking palm oil (WCPO) were utilized for the production of CNT. The surface morphologies of CNT were analyzed using field emission scanning electron microscopy while the crystallinity and the purity of CNT were analyzed using micro-Raman spectroscopy and thermogravimetric analysis. It was found that the density of CNT synthesized by the two catalysts was similar, but the diameters and crystallinity of the CNT synthesized by Ni catalyst were smaller and better as compared to Co catalyst. The field electron emission (FEE) of CNT synthesized by Ni catalyst also demonstrated lower turn-on and threshold field of 6.21 and 7.71 $V\mu m^{-1}$ at 1 μAm^{-2} and 10 μAm^{-2} respectively and maximum current density of 0.132 mAm^{-2}. The FEE measurement confirmed that the structural and crystallinity difference could significantly affect the electron emission properties of the CNT. This work shows the potential of catalytic decomposition of WCPO using Ni catalyst which outperformed Co in growing CNT towards field emission devices.

Keywords

Field emission scanning electron microscopy, Nanotubes, Raman spectroscopy, Thermal chemical vapor deposition, Thermogravimetric analysis, Field electron emission

13.4 **Journal of Food Agriculture and Environment, Volume 11, Issue 1, 2013, Pages 132-135**

Packaged food safety in urban area: An observation from the Malaysian law of tort on negligence

Muhammad Rizal Razman, Nor Azam Ramli, Azrina Azlan and Mohamad Suhaily Yusri Che Ngah

The law of tort on negligence plays an important role in protecting individual from contaminated food. The use of the law of negligence in the area of an individual protection is largely in reply to the necessity of each individual to protect his rights and interests in consuming food, including packaged food. Therefore, the aim of this paper was to examine the use of the law of tort on negligence in relation to the individual protection on the packaged food safety in urban area from Malaysian legal perspectives, identify actions and cases which deal with individual protection on contaminated packaged food from the Malaysian legal perspectives and lastly, discuss the law of tort on negligence as a means to protect individuals from contaminated packaged food in Malaysia in order to achieve sustainable development.

Keywords

Malaysian law of tort on negligence, Packaged food, Safety

13.5 Journal of Food, Agriculture and Environment, Volume 11, Issue 2, 2013, Pages 1509-1513

Effect of azadirachtin and rotenone on *Trichogramma papilionis* (Hymenoptera: Trichogrammatidae)

Sidi M.B., Islam M.T., Ibrahim Y., Omar, D.

The effect of two botanical insecticides- azadirachtin (Neemix 4.5 EC) and rotenone (Rotenone 6.6 EC) were investigated against adult and preimaginal stages (larvae and pupae) of hymenopterans egg parasitoid *Trichogramma papilionis* compared with synthetic insecticide- cypermethrin (Cyper 5.5 EC) by the three different application approaches. Three doses i.e., the recommended dose (RD), its half and its quarter of the insecticides were used. The result demonstrates that cypermethrin was highly toxic and yielded 100% adult mortality with 100% reduction in parasitism for all the tested concentrations. Rotenone was also highly toxic and yielded 100% adult mortality with 100% reduction in parasitism at RD and 0.5 RD; while it was slightly toxic and yielded 63.31% adult mortality with 42.93% reduction in parasitism at 0.25 RD. Azadirachtin was the least toxic and harmless that gave only 13.33% mortality with 15.62% reduction in parasitism of *T. papilionis* at 0.5 RD. When *T. papilionis* was evaluated for the side effects of cypermethrin-treated eggs by allowing the adults to oviposit on cypermethrin-treated eggs, cypermethrin was harmful and performed 100% reduction in parasitism at RD. When adult *T. papilionis* was exposed to rotenone and azadirachtin-treated eggs with all concentrations, they were slightly harmful at RD with 65.43% and 48.21% reduction in parasitism, respectively. This concludes that synthetic pyrethroids might be replaceable by azadirachtin and it might also be the most suitable insecticide in IPM strategies for suppression of insect pest with minimum impact on the egg parasitoid.

Keywords

Agriculture, Botanicals, Egg parasitoid, Environment, IPM, Parasitism

13.6 Acta Horticulturae, Volume 1012, 15 November 2013, Pages 745-754

Screening of *Escherichia coli* O157:H7 from hydroponic and organic 'Butterhead' lettuce after aqueous ozone treatment and its effect on postharvest quality

Siti Fairuz Y., Mahmud T.M.M., Ahmad S.H., Harizul A., Farinazleen M.G.

Escherichia coli O157:H7 is a gram negative bacterium and can cause a bloody diarrhea due to toxins secreted when it infects human intestinal tracts. The effectiveness of aqueous ozone on *E. coli* O157:H7 was studied for improvement in produce shelf life and food safety. Hydroponic 'Butterhead' lettuce were grown under a rain shelter and organic lettuce were grown in an organic-field plot at Taman Pertanian Universiti (TPU), UPM. After 41 days after transplant, both of the hydroponic and organic lettuce heads were harvested and immediately transported to the Postharvest Laboratory, UPM for analysis. The effects of ozone on hydroponic and organic 'Butterhead' lettuce were evaluated by varying aqueous ozone concentrations applied as a potential food sanitizer especially for lettuce which is normally consumed raw. The produce quality was assessed by comparing the changes in weight loss, firmness and chlorophyll content after treatment with aqueous ozone at 0, 3 and 5 mg L^{-1} and stored at 10°C for 12 days. The analysis was conducted on day 0, 4, 8 and 12 of storage. The number of *E. coli* O157:H7 in organic lettuce was found to be higher than hydroponic lettuce. The aqueous ozone treatments were effective in reducing the *E. coli* O157:H7 contamination on the day of treatment applied but the effectiveness decreased as the storage period progressed. The aqueous ozone at 5 mg L^{-1} treatment resulted in the highest reduction of *E. coli* O157:H7 but the quality characteristics were negatively affected. The aqueous ozone at 3 mg L^{-1} was found to be the potential concentration in reducing *E. coli* O157:H7 without compromising the quality.

Keywords

Aqueous ozone, Disinfection, *Escherichia coli* O157:H7, Food safety, Quality

13.7 **IOP Conference Series: Materials Science and Engineering, Volume 46, Issue 1, Article number 012014, 2013, International Conference on Manufacturing, Optimization, Industrial and Material Engineering, MOIME 2013; Bandung; Indonesia,2013, Published under licence by IOP Publishing Ltd.**

Effect of iron and cobalt catalysts on the growth of carbon nanotubes from palm oil precursor

Suriani A.B., Asli N.A., Salina M., Mamat M.H., Aziz A.A., Falina A.N., Maryam M., Shamsudin M.S., Md Nor R., *Abdullah S., Rusop M.*

Catalysts which are typically a transition metal is mandatory and plays an important role in the production of CNT. In this work, the effect of iron (Fe) and cobalt (Co) nitrate catalyst on the growth of carbon nanotubes (CNT) were systematically studied. Green bio-hydrocarbon precursor namely palm oil was used as a precursor. The synthesis was done using thermal chemical vapour deposition method at temperature of 750°C for 15 min synthesis time. The Fe and Co solution were spin-coated separately on silicon substrate at speed of 3000 rev.min^{-1}. The CNT characteristics were analyzed using field emission scanning electron microscopy and micro-Raman spectroscopy. The experimental results revealed that CNT properties were strongly affected by the catalyst type. CNT catalyzed by Co yields large diameter, crooked tube and lower quality, whereas CNT produced by Fe catalyst results in the smallest diameter and reasonably good graphitization. As a conclusion, Fe was considered as the optimum catalyst for better CNT structure and crystallinity. This was due to efficient, uniform and stable Fe catalytic activity as compared to Co catalyst in producing CNT.

Keywords

Chemical vapour deposition, Cobalt catalyst, Crystallinities, Field emission scanning electron microscopy, Large diameter, Micro raman spectroscopy, Silicon substrates, Synthesis time

13.8 **Advanced Materials Research, Volume 545, 2012, Pages 235-239, 2nd International Conference on the Advancement of Materials and Nanotechnology, ICAMN II 2010; Kuala Lumpur; Malaysia**

Physicochemical properties of hydroxyapatite extracted from fish scales

Zainol I., Alwi N.M., Abidin M.Z., Haniza H.M.Z., Ahmad M.S., Ramli A.

In this study, hydroxyapatite (HAp) was extracted from freshwater fish scales and saltwater fish scales using thermal decomposition method at various temperatures. The percentages of HAp in each species of raw fish scales were analysed using thermogravimetry analysis (TGA) whereas Fourier transform infrared (FTIR) was used to confirm the present of HA. The crystallinity of the HAp was studied using x-ray diffractometer (XRD). TGA and FTIR are found to be useful techniques to predict the composition of the HAp present in the fish scales. The results show that the composition of HAp in the fish scales was not significantly dependent on the species of the fish. The percentage of HAp in the fish scales ranged from 40 to 45 wt%. The heating temperature had an effect on the crystallinity and colour of the HAp produced. Results from FTIR and XRD confirmed that the HAp extracted from fish scales was similar to the HAp standard. However, the natural HAp produced from saltwater fish scales was more crystalline than that produced from freshwater fish scales. The HAp produced from this study is relatively cheap and more importantly they are HALAL for four billion Muslims population around the world.

Keywords

Fish scales, Hydroxyapatite, Thermal decomposition

14.0 **Universiti Putra Malaysia**

14.1 **Pertanika Journal of Social Science and Humanities, 21 (S), 2013, Pages 1-10. ISSN 0128-7702**

Factors influencing acceptance of contract farming among youth

Jeffrey Lawrence D'Silva, Azmariana Azman, Bahaman Abu Samah and Hayrol Azril Mohamed Shaffril

Modern farming methods like contract farming have a great potential in ensuring the sustainability of the agricultural sector. Undoubtedly, youth, being the pillar of society, have an important role in ensuring the survival of agriculture globally. Hence, this study attempts to gauge the level of acceptance of youth towards contract farming and to determine the factors that will have an impact on their level of acceptance. A survey using quantitative methodology was the medium used to collect data from a total number of 400 undergraduates from four tertiary institutions in Malaysia. Data obtained were analysed using the SPSS software. Results showed that the respondents had a high positive acceptance of contract farming while further analysis showed that the significant predictorsof acceptance of contract farming were attitude, knowledge and belief. The study also portrayed that education is important in motivating our youth to take up agriculture as a source of livelihood. Relevant exposure to knowledge, information and belief, will enable our youth to participate in the agriculture sector appropriately.

Keywords

Acceptance, Contract farming, Malaysia, Sustainability, Youth

14.2 **Pertanika Journal of Tropical Agricultural Science, Volume 35 Issue 3, 2012, Pages 569-580**

Rural poultry keeping in South Gezira, Sudan

Sayda, A. M. Ali, Mohammed A. Bakheet and Abeer E. El Nazeer

A study on rural poultry production, management and health was conducted at six randomly selected villages in the south district of Gezira state in central Sudan. Hundred rural farmers were interviewed using a set of questionnaire. A scavenging system is commonly practiced by the farmers in all villages. Females contributed significantly the highest percentage of the farmers, with 64% versus 46% (males). The farmers prefer local breeds (77% of farmers). The majority of the farmers who rare local breeds are illiterate or with merely primary education (43/77), and they also do not use proper housing or feeding the chickens, vaccination against diseases, and with no use of medication and are not willing to vaccinate. Moreover, they also do not provide water, and even if they do, it is usually dirty as they do not clean it. Meanwhile, the farmers who keep cross breeds are mainly secondary school or university graduates (13/23). This particular group provide a better managerial aspect in constructing a poultry house that provides poultry rations or household withdrawal plus grains or poultry ration. In addition, they are also vaccinated against Newcastle disease, use medication against external and internal parasites, provide feeders and drinkers and clean them periodically. The highest flock size (more than 70 chicken including young chicks) was found to be owned by more literate farmers who keep cross breeds as compared to the local breed kept by illiterate farmers (13/23 and 3/23 cross breeds were kept by more literate and illiterate farmers, respectively). The farmers keep local breeds mainly for self sustain (eggs and meat) and others keep cross breeds for income and mainly egg production. Hatchability percentage is slightly high in local breeds compared to cross breeds and is preferred during winter.

Keywords

Chickens, Local breeds, Farmers, Scavenging, Questionnaire, Vaccination

JTAS Vol. 35 (3) Aug. 2012 Article ID: JTAS-0276-2010

Development of multifunctional biofertilizer formulation from indigenous microorganisms and evaluation of their N_2-fixing capabilities on Chinese cabbage using 15N tracer technique

Phua, C. K. H., Abdul Wahid, A. N. and Abdul Rahim, K.

Biofertilizer is an alternative to chemical fertilizers to increase soil fertility and crop production in sustainable farming. Most biofertilizer products consist of a single function micro-organism such as N_2 fixing bacteria. This paper discusses the development of multifunctional biofertilizer products, based on indigenous micro-organisms that have all the desired characteristics, including plant growth promoting, phosphate solubilising and antagonistic towards pathogens, and optimisation of the micro-organisms present in the modified "Natural Farming" compost. Composting through the "Natural Farming" method is a simple and cheap method to turn empty fruit bunches (EFB) of oil palm into compost. Indigenous micro-organisms in each stage of composting were isolated and screened for the abilities to solubilise phosphate and produce indole-3-acetic acid (IAA). These indigenous micro-organisms were developed into biofertilizer products. Effects of these products on plant growth of Chinese cabbage and contribution of N_2 to the plants were evaluated using the 15N isotopic tracer technique in a greenhouse trial. Fertilizer treatment using a combination of microbial strains (T7) was found to significantly enhance the growth of Chinese cabbage. All the plants receiving biofertilizer microorganisms showed N_2-fixing effects as compared to the control (T9). The isolated indigenous micro-organisms may enhance plant growth through N_2 fixation, solubilising insoluble inorganic phosphate compounds or hydrolyse organic phosphate to inorganic P or stimulation of plant growth through hormonal action such as produce IAA. Combination of microbial strains could be a good multifunctional biofertilizer for sustainable agriculture.

Keywords

Indigenous micro-organisms, Compost, Multifunctional biofertilizer, Isotopic tracer technique, N-15-labelled fertilizer

14.4 JTAS Vol. 35 (4) Nov. 2012 Article ID: JTAS-0308-2010

Evaluation of nitrogen uptake efficiency of different oil palm genotypes using 15N isotope labelling method

Law, C. C., A. R. Zaharah, M. H. A. Husni and A. Siti Nor Akmar

High demands for palm oil world wide induce the expansion of oil palm plantations in Malaysia. Malaysian soils which are highly weathered require high nitrogen fertilizer input in order to maintain high yield output, resulting in increase in production cost as well as inducing negative impacts to the environment. It is crucial to understand the performance of different oil palm genotypes in taking up nitrogen to increase nitrogen use efficiency, minimize environmental pollution caused by leached nitrate and maximize plantation profit, while maintaining sustainable agriculture practices. 15N labelling method was utilized in a greenhouse study to quantify the nitrogen up-take performance of nine oil palm genotypes at 6 and 9 months after planting. Measurements of total dry matter, total N, and percentage N derived from fertilizer (%NdFF) were carried out during the study. At 6 month old, oil palms of different genotypes did not show any difference in nitrogen uptake with and without P fertilizer applications. However, 9 months old oil palms demonstrated significant differences between the genotypes in total dry matter production and total N taken up, hence, resulting in significant differences in N derived from fertilizer among genotypes. Oil palms at 9 months old also showed significant effects in the N uptake as affected by P fertilizer application. Genotype A (14/34 x 2367/17) demonstrated significantly higher nitrogen uptake compared to other genotypes, except for genotype F (9/103 x 2318/17). Thus, the 15N labelling technique could serve as a useful assessment to the nitrogen uptake abilities of oil palm genotypes.

Keywords

Oil palm, Nitrogen fertilizer, Nitrogen uptake, 15N isotope labelling

JTAS Vol. 35 (2) May. 2012 Article ID: JTAS-0298-2010

Effects of foliar applied copper and boron on fungal diseases and rice yield on cultivar MR219

Liew Y. A., Syed Omar S. R., Husni M. H. A., Zainal A. M. A. and Nur Ashikin P. A.

Long-term intensive cropping on the same piece of land with high-yielding varieties often exhausts the availability of soil micronutrients. Poor management of plant micronutrients has become a hurdle in the effort to increase rice production in Malaysia. The new rice variety, MR 219, was introduced to bring the yield potential up to 10 t ha^{-1}. However, to sustain the high yield, more N-fertilizer input is needed and this will increase incidences of disease. Moreover, nutrients imbalance due to limited micronutrients application may worsen the situation. In this study, two seasons of field experiments were conducted at Sawah Sempadan, Kampung Seri Tiram Jaya, Tanjong Karang (3° 28' 0" North, 101° 13' 0" East) in the off season of 2007 (July 2007 – November 2007) and the main season of 2008 (January 2008 – May 2008), using high yielding cultivar of MR219 to evaluate the effects of copper (Cu) and boron (B) foliar applications on the reduction of fungal diseases, and also to evaluate the effects of foliar Cu and B applications on rice production. Nine combinations of Cu and B treatment at varying levels of Cu (0 – 20 ppm) and B (0 – 20 ppm) were replicated 4 times and applied through foliar spray at three different times, namely, 30, 45 and 60 days after seeding (DAS). The foliar application of Cu and B was found to be able to reduce fungal disease infestation in MR219 rice cultivar and subsequently increase rice yield. Meanwhile, the foliar treatment of Cu and B applied in combination at level T7 (7.53 t ha^{-1}), T9 (7.33 t ha^{-1}), T8 (7.28 t ha^{-1}) and T6 (7.06 t ha^{-1}) produced significantly higher ($P > 0.05$) rice yield as compared with the control, T1 (5.75 t ha^{-1}). A significant reduction in disease scoring was also recorded in the experiment where foliar treatment at level T9 (20 ppm Cu + 20 ppm B) cut down 5% of the disease incidence in MR219 rice plant. Rice yield components such as productive tiller m^{-2}, number of spikelets $panicle^{-1}$, percentage of filled grains and 1,000-grain weight have also shown remarkable increments as a result of the Cu and B foliar treatment.

Keywords

Rice, Micronutrients, Foliar Treatment, Copper, Boron, MR219

14.6 JST Vol. 20 (2) Jul. 2012 Article ID: JST-0285-2011

Geospatial water productivity index (WPI) for rice

Md Rowshon Kamal, Mohd Amin Mohd Soom and Abdul Rashid Mohamed Shariff

A GIS-based user-interface programme was developed to compute the geospatial Water Productivity Index (WPI) of a river-fed rice irrigation scheme in Northwest Selangor, Malaysia. The spatial analysis includes irrigation blocks with sizes ranging from 20 to 300 ha. The amount of daily water use for each irrigation block was determined using irrigation delivery model and stored in the database for both main season (August to December) and off season (February to May). After cut-off of the irrigation supply,a sub-module was used to compute the total water use including rainfall for each irrigation block. The rice yield data for both seasons were obtained from DOA (Department of Agriculture, Malaysia) of the scheme. Then, the Water Productivity Index (WPI) was computed for each irrigation block and spatial thematic map was also generated. ArcObjects and Visual Basic Application (VBA) programming languages were used to structure user-interface in the ArcGIS software. The WPI, expressed in terms of crop yield per unit amount of water used (irrigation and effective rainfall), ranged from 0.02 to 0.57kg/m^3 in the main season and 0.02 to 0.40 in off season among irrigation blocks, respectively. The development of the overall system and the procedure are illustrated using the data obtained from the study area. The approach could be used to depict the gaps between the existing and appropriate water management practices. Suitable interventions could be made to fill the gaps and enhance water use efficiency at the field level and also help in saving irrigation water through remedial measures in the season. The approach could be useful for irrigation managers to rectify and enhance decision-making in both the management and operation of the next irrigation season.

Keywords

Water productivity index, Spatial variability, Rice, GIS User-interface

JTAS Vol. 36 (4) Nov. 2013Article ID: JTAS-0489-2012

Physico-chemical characteristics of Chok Anan mango fruit after hot water treatment

Phebe Ding and Salumiah Mijin

Mango fruit is prone to postharvest disease, especially anthracnose and stem end rot. Hot water dip (HWD) treatment has been used to control postharvest disease in fruit but little information about the response of Chok Anan mango fruit towards HWD treatment. This study was conducted to determine optimum duration of HWD in controlling postharvest diseases. Mature green Chok Anan mango fruit were treated at 26 and 55 °C for 5, 15 and 25 min and fruits at ripening stage 1, 3 and 5 were analyzed for peel colour, flesh firmness, soluble solids concentration (SSC), ascorbic acid, pH, titratable acidity, disease incidence and heat induced injury. HWD treatment did not affect peel colour, SSC, ascorbic acid, pH and titratable acidity and induced heat injury to the fruit. Disease incidence of ripening stage 5 (fully ripened) fruit reduced significantly after HWD. In addition, the fruit underwent normal ripening as ripening progressed. It is concluded that combination of 55°C hot water for 5 min can be used as postharvest disinfestation treatment for Chok Anan mango fruit while maintaining physico-chemical characteristics of fruit.

Keywords

Anthracnose, Disease incidence, Heat injury, Postharvest quality, Peel colour

14.8 JTAS Vol. 35 (4) Nov. 2012 Article ID: JTAS-0294-2010

A retrospective study on post-arrival mortality rate of Australian boer goats in a breeder farm in Malaysia

M. S. Shahrom and M. Zamri-Saad

Post-arrival mortality pattern and the causes of those mortalities were studied in a Boer goat breeding farm in Malaysia. The farm was established in October 2005, following an importation of 597 breeder Boer goats from Australia. Further importations of 534 Boer goats were made in July 2007, and 166 goats in March 2008. Farm records covering the period between October 2005 and December 2008 were analyzed for monthly mortality pattern with special attention on the post-arrival weeks. Upon arrival, goats were provided with vitamins, anti-stress and antibiotic cover. They were fed with cut grasses and supplemented with goat pellets at 350g/goat/day. Drinking water was also available ad libitum. During the study period of 2005 to 2008, there were significantly ($p<0.05$) higher rates of annual mortality during rainy months (7%-14%) as compared to dry months (2%-5%). Meanwhile, the post-arrival mortality showed an average of 27%, ranging between 13% and 43%, of the Boer goats died during the first 6 weeks of post-arrival. In particular, the goats arriving in the rainy months of October 2005 and March 2008 showed higher post-arrival mortality than those arriving in the dry month of July 2007. The post-arrival mortality pattern revealed a gradual but significant ($p<0.05$) increase as early as week 1, with an average of 5% mortality to reach peak at week 3 with 35% mortality before it gradually decreased to 6% at week 6 and 3% at week 7. The major causes of post-arrival mortalities were pneumonic mannheimiosis and helminthiasis, which were associated with the stresses of handling, loading and unloading during shipment.

Keywords

Mortality, Post-arrival, Boer goats

14.9 JTAS Vol. 36 (2) May. 2013 Article ID: JTAS-0385-2011

The effect of extraction methods on fatty acid and carotenoid compositions of marine microalgae *Nannochloropsis oculata* and *Chaetoceros gracilis*

Loh, S. P. and Lee, S. P.

This study was conducted to assess three extraction methods for the determination of fatty acid compositions and carotenoids (lutein, zeaxanthin, ß-carotene, and a-carotene) from marine microalgae, *Nannochloropsis oculata* (NO) and *Chaetoceros gracilis* (CG). For this purpose, three different extraction methods for the determination of fatty acids (dichloromethane:methanol, water:propan-2-ol:hexane and direct saponification-ethanol KOH) and carotenoids (hexane:ethanol:acetone:toluene, methanol:chloroform and methanol:tetrahydrofulran) were used. Two derivatization methods using different types of catalyst (acetyl chloride and boron trifluoride) were also used for the transmethylation of the fatty acids into corresponding methyl esters. The results of the fatty acid compositions showed that NO had a higher amount of n-3 and n-6 polyunsaturated fatty acid (PUFA), particularly eicosapentaenoic acid (EPA) (C20:5). CG was predominantly high in palmitic acid (C16:0) and palmitoleic acid (C16:1). The extraction method 1 (dichloromethane:methanol) and extraction method 2 (water: propan-2-ol: hexane) with acetyl chloride-catalyzed transmethylation were found to be the best methods for the determination of fatty acid compositions in NO and CG, respectively. A significantly higher ($P<0.05$) amount of carotenoids was found in NO as compared to CG using different extraction methods. Extraction method 1 (involving saponification procedure) yielded the best result for NO while extraction method 3 (methanol: tetrahydrofuran with no saponification procedure) generated higher amounts of carotenoids in CG. Overall, this study has shown that significantly high amounts of fatty acids and carotenoids could be obtained from these microalgae using these methods.

Keywords

Carotenoids, *Chaetoceros gracilis*, Extraction, Fatty acid composition, *Nannochloropsis occulata*, Microalgae

JTAS Vol. 35 (1) Feb. 2012 Article ID: JTAS-0156-2009

Characterization and quantification of dragon fruit (*Hylocereus polyrhizus*) betacyanin pigments extracted by two procedures

Nassim Naderi, Hasanah M. Ghazali, Anis Shobirin Meor Hussin, Mehrnoush Amid and Mohd Yazid Abd. Manap

A method for the extraction of betacyanins pigments of dragon fruit (*Hylocereus polyrhizus*) grown in Malaysia was studied. A processing scheme consisting of solvent system selection (ethanolic and aqueous ethanolic)was proposed to study the effect of water in enhancing betacyanin recovery from the pulp of *H. polyrhizus* fruit. Betacyanins, in concentrated extracts from the dragon fruit (*H. polyrhizus*), were identified as betanin,phyllocactin, hylocerenin and their respective C-15 isoforms using High-performance liquid chromatographic(HPLC) analysis. Structural alteration was monitored by using selected solvent systems. As for the relativepeak area ratios, some betacyanins showed a higher stability than others. Betanin, one of the main betacyanin inselected Malaysian *H. polyrhizus* cultivars, displayed the most stable structure. Comparing the peak area ratios of individual betacyanins, it was noticed that ethanolic assay might induce co-occuring of the C-15 isoforms.

Keywords

Hylocereus polyrhizus, Betacyanins, Betanin, Phyllocactin, Hylocerenin

14.11 JTAS Vol. 35 (3) Aug. 2012 Article ID: JTAS-0253-2010

Potential co-application of *Burkholderia cepacia*, calcium and chitosan on enhancement of storage life and quality of papaya fruits

Rahman, M. A., Mahmud, T. M. M., Abdul Rahman, R., Kadir, J. and Begum, M. M.

The fruit of harvested papayas (cv. Sekaki), at colour stage two (mature-green with trace yellow), were treated with fungicide benocide® (0.33 gL^{-1}) or with a combination of *Burkholderia cepacia* B23 (10^9 CFU mL^{-1}) and 0.75% chitosan solution, amended with 3% calcium chloride and stored at 14 ± 0.5°C and 90-95% RH for 28 d. The effectiveness of the treatments was assessed by evaluating their impacts on storability and changes in the quality attributes of fruits. Results indicated that fruit treated with the combination of *B. cepacia* B23-chitosan-$CaCl_2$ showed delayed climacteric ethylene evolution and reduced respiration rate. The combined treatment reduced weight loss by more than 25% to the control. It also markedly slowed down the ripening of fruits, as shown by their retention of firmness 4.17 N after storage. Moreover, a delayed change in external colour and pH without compromising fruit quality was observed in the fruit receiving the combined treatment. The storage life was thus extended up to 15 d compared to the control. In addition, the incorporation of 3% $CaCl_2$ into the combined treatment significantly increased the calcium content (81%) in the fruit compared to the control, resulting in the improved nutritional value of the papaya. This study provided an alternative method for fungicides treatment of papaya at post-harvest.

Keywords

Papaya, Bioactive coating, Natural compounds, Storage life, Quality maintenance

14.12 JTAS Vol. 35 (S) Dec. 2012, Article ID: JTAS-0446-2012

Isolation, fruiting and pathogenicity of *Marasmiellus palmivorus* (Sharples) Desjardin (comb. prov.) in oil palm plantations in West Malaysia

Pong, V. M., Zainal Abidin, M. A., Almaliky, B. S. A., Kadir, J. and Wong, M. Y.

Malaysia's golden crop, oil palm (*Elaies guineensis*), is susceptible to bunch rot disease caused by *Marasmiellus palmivorus* (Sharples) Desjardin (comb. prov.). Nonetheless, there is no published information on the morphology and pathogenicity of the species found in local oil palm plantations in Malaysia. Rhizomorphs and basidiocarps found on dead fronds or trunks were randomly sampled from the plantations located in the states of Perak and Selangor. Isolates were identified based on the morphology and molecular methods as *Marasmiellus palmivorus* and pure cultures subsequently produced similar fruit bodies (basidiocarps) by in vitro methods. Hyphal morphology was examined by light and scanning electron microscopy and found to be septate and produced clamp connections. White spore prints were obtained from each pileus. Naturally grown and induced basidiocarps were similar with diameter of pileus ranging from 1.0-2.8cm, slightly depressed at the centre, smooth, convex, with involute margin, orange-white fading to white and possessed a central, solid, cylindrical, tough, overall whitish stipes with length ranging from 0.8- 2.6cm. The gills were adnate, distant and have a non-distinctive odour. Basidiospores were ellipsoid in shape and spores were found to be viable with percentage germination of 80-85%. Upon germination, they produced germ tubes ranging from 64.3 – 82.5 µm after 24 h incubation at ambient temperature (27 ± 2°C) on water agar. Pathogenicity test of six isolates of *Marasmiellus* sp. positively produced necrotic symptoms on wounded leaves of oil palm seedlings.

Keywords

Basidiocarps, Basidiospores, Bunch rot disease, *Marasmiellus palmivorus*, Oil palm

14.13 JTAS Vol. 35 (3) Aug. 2012Article ID: JTAS-0265-2010

Seasonal abundance of *Thrips hawaiiensis* (Morgan) and *Scirtothrips dorsalis* (Hood) (Thysanoptera: Thripidae) in mango orchards in Malaysia

Hamaseh Aliakbarpour and Che Salmah Md. Rawi

Investigation on seasonal abundance of mango flower thrips was carried out during a flowering season of December 2008 - March 2009 in a commercially managed mango orchard and a control orchard, where no pesticide was applied to control mango pests. *Thrips hawaiiensis* (Morgan) and *Scirtothrips dorsalis* (Hood) were the most prevalent species in the commercial and the control orchards, respectively. The highest number of adults was significantly found in flowers on the upper canopy, while more immatures were collected from the lower canopy in both orchards. Three major population peaks were discernible for the two species of thrips in this season. The population of T. hawaiiensis first peaked two weeks after the onset of flowering in both orchards. Meanwhile, the population of S. dorsalis peaked one week earlier in the commercial orchard, but the growth was slower in the control orchard, with the first peak occurring three weeks after the start of the flowering season. Abiotic factors, such as temperature and relative humidity, were found to have significantly influenced the abundance of thrips in this season. The effect of pesticides on the thrips population was also noticeable, with lower abundance recorded in the commercial orchard compared to the control orchard. The findings of this particular research can contribute in improving the management strategies of thrips in mango orchards.

Keywords

Thrips hawaiiensis, *Scirtothrips dorsalis*, seasonal abundance, mangoes

14.14 JTAS Vol. 35 (S) Dec. 2012Article ID: JTAS-0450-2012

Bioefficacy of controlled release formulations of diuron on *Brassica rapa*

Norida, M., Omar, D. and Mohamad, R. B.

Controlled-release formulations (CRF) of diuron were prepared in laboratory using the concept of physical matrix utilizing sodium alginate and kaolin. The release rates of diuron from the formulations were determined by chemical assay its efficacy on plant was tested on *Brassica rapa*. In the chemical assay using high performance chromatography with UV detector, significant differences in the release rate between formulations were observed from 3 to 7 days after the granules had been placed in distilled water. The formulation having a 1:1 ratio of alginate to kaolin with 1mm granule size showed the fastest release of diuron, while release from the 2mm granules was slower. Increasing the proportion of kaolin to sodium alginate in the CRF reduced the release rate of active agent. The bioefficacy using *Brassica rapa* as a bioindicator showed that CRF released slower than the conventional formulation at the beginning of the treatments. In the 3rd week after the treatment (WAT), there was no significant difference in the mortality as compared to the conventional formulation at 16 WAT. The same results were also observed up to 24 WAT, the CRF caused between 40-70% mortality, while the conventional formulation treatment caused only 6% mortality. Among the CRF, the AK-2 with 1:1 ration of alginate:kaolin was found to have given the best result with the highest percentage mortality of the seedlings.

Keywords

Sodium alginate, Slow release, Herbicide, Bioefficacy, Chemical assay

14.15 JTAS Vol. 36 (1) Feb. 2013Article ID: JTAS-0379-2011

Impact of indigenous industrial compost on the growth of coarse and fine rice varieties under saline environment

Mukkram Ali Tahir, Muhammad Ibrahim, Ghulam Sarwar, Yasir Iftikhar, Sang-Keun Ha, Kyung-Hwa Han and Yong-Seon Zhang

Pakistani rice is popular throughout the globe due to its specific aroma. Rice is categorized as salt-sensitive plant as its growth is significantly reduced under salt toxicity. The effect of exogenous application of indigenous industrial compost (IIC) on the coarse (IRRI-9) and fine (Super basmati-2000) rice varieties under salt stress was investigated in this study. IIC was applied at 0, 0.5 and 1.0% of soil weight, along with recommended chemical fertilizers in respective pots. Twenty-day old rice nursery was transplanted in glazed clay pots filled with normal (ECe = 1.70 dS m^{-1}) and saline soil (ECe = 8.0 dS m^{-1}) under flooded condition. Plants were harvested at maturity and different physiochemical parameters were recorded. Salinity stress was found to have significantly ($p<0.05$) reduced both biological and paddy yield of rice, and the reduction was lower in coarse than fine rice. The compost application significantly improved ($p<0.01$) dry matter four times as compared with control. In the same way, paddy yield increased three folds both under normal as well as saline growth medium. Na^+ concentration in shoots at 1% IIC in growth medium had a significant negative correlation ($r=0.90$, $p<0.01$) but potassium concentration proved a significant positive correlation ($r=0.92$, $p<0.01$) in both rice varieties. Enhanced salinity tolerance in rice by IIC application was attributed to increased K^+ uptake, thereby increasing K^+: Na^+ ratio and lower Na^+ translocation towards shoot (sodium exclusion at the shoot level). It was concluded that indigenous industrial compost application improved the growth of rice plant under salt stress.

Keywords

Organo-power, Rice, Salt stress, Sodium and potassium

14.16 JTAS Vol. 36 (4) Nov. 2013Article ID: JTAS-0486-2012

Phylogenetic tree construction in reconfirmation of parasitoid species (Braconidae: Opiinae), reared from fruit flies (*Bactrocera papayae*) infesting star fruit (*Averrhoa carambola*) based on mitochondrial 16S rRNA sequences

Ibrahim, N. J., Shariff, S., Idris, A. B., Md-Zain, B. M., Suhana, Y., Roff, M. N. and Yaakop, S.

Opiinae (Hymenoptera: Braconidae) is an important parasitoid of fruit flies (Diptera: Tephritidae). Accurate identification is needed for them to be effectively used as biological control agents. This study demonstrates the use of molecular phylogenetic analyses to reconfirm the species of Opiinae reared from tephritids infesting star fruit species. A total of 14 specimens were isolated and a 401 bp of mitochondrial 16S rRNA gene was amplified and sequenced from each of them. Three individual tephritids hosts (*Bactrocera papayae*) were also identified based on the mitochondrial ND1 gene. Maximum Parsimony (MP) tree was constructed using PAUP 4.0b10. Three species of Opiinae were successfully identified based on the mitochondrial 16S rRNA gene, namely *Diachasmimorpha longicaudata* (Ashmead), *Fopius arisanus* (Sonan), and *Psyttalia incisi* (Silvestri). These molecular-based findings reconfirmed the parasitoid species of *B. papayae* as recorded by previous studies based on morphology. In fact, the identification of Opiinae individuals have been reconfirmed based on topology and branching pattern of the phylogenetic tree as well as based on genetic distance analyses, which matched morphological-based identification.

Keywords

Opiinae, *Bactrocera papayae*, 16S, Parasitoid, Rearing, Star fruit

14.17 JTAS Vol. 35 (S) Dec. 2012Article ID: JTAS-0448-2012

Review article- effect of silicon on rice blast disease

Farnaz Abed Ashtiani, Kadir, J., Abbas Nasehi, Seyed Reza Hashemian Rahaghi and Hailmi, S.

Silicon is the second most plentiful element in soil and is beneficial for a large variety of plants. It is concentrated in plant tissues in quantities similar to that of macronutrients. Considerable damages to plants caused by abiotic stresses such as drought stress, salinity stress, heavy metal stress and nutrient imbalance, as well as biotic stresses like insect pests and pathogens and even herbivorous attacks, have been reported to be reduced significantly by silicon application. Among rice diseases, blast is recognized as the most devastating one. Silicon fertilization has been reported to be efficacious in controlling and mitigating rice blast severity. Two different hypotheses are proposed for the ability of silicon to lessen disease severity. The first hypothesis emphasizes on silicon function as a mechanical barrier against appressorial penetration, while the second hypothesis is based upon the belief that silicon has some physiological roles in disease resistance.

Keywords

Silicon, Rice, *Magnaporthe oryzae*, Blast

14.18 JTAS Vol. 35 (1) Feb. 2012Article ID: JTAS-0254-2010

Detection of Koi Herpesvirus (KHV) in *Cyprinius carpio* (Koi) Stocks using Enzyme-Linked Immunosorbent Assay (ELISA)

Azila, A., Way, K., Wood, G., Ainol, Y. M. Y., Kamisa, A., Norfauzana, M. A., Jafrizah, A. R. and Sabri, M. Y

Koi herpesvirus (KHV), which is also known as Cyprinid herpesvirus 3 (CyHV-3) infection, is an OIE(international des epizootis) listed disease that caused high losses in common and koi carp in Indonesia and Japan in 2002 and 2003. Since the mid of 2006, the polymerase chain reaction (PCR) has been used in Malaysia for surveillance of koi fingerlings to detect virus nucleic acid, but it has been found to produce unreliable results. Following this, an alternative enzyme-link immunosorbent assay (ELISA) technique for the detection of antibody against KHV was used to find evidence of KHV infection in koi carp stocks on farms that had been sampled for the PCR. For this purpose, a total of 245 serum samples from koi carp stocks were collected and tested for the antibody to KHV by the ELISA at the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) laboratory, Weymouth, UK. Two hundred and eight samples were found to be negative but 37 others were either definitely positive or close to borderline positive and all were retested. The final results showed that 222 (90%) samples were confirmed as negative and 19 (8%) others were definitely positive. Meanwhile, four samples (1.6%) were positive at dilutions of 1:400 or 1:200, but cross reactions with CyHV-1 (causing herpesviral epidermal hyperplasia) could have occurred at those dilutions. Three of the samples were the only positive fish at two sites, but the fourth sample came from a site at which there were 4 definite positive samples (from 20 fish sampled). Thus this study confirmed that Malaysian koi stocks have previously been exposed to KHV. With the lack of bio-security measures and awareness, there was a high probability that the koi carp had been exposed to KHV, leading to subclinical infections and some fish might possibly have become carriers of the virus. Hence, further surveillance needs to be conducted to determine the true situation of the KHV infection in Malaysia.

Keywords

Koi herpesvirus, *Cyprinius carpio*, ELISA

14.19 JTAS Vol. 35 (1) Feb. 2012 Article ID: JTAS-0303-2010

Susceptibility of bagworm *Metisa plana* (Lepidoptera: Psychidae) to chlorantraniliprole

Chua Chin Kok, Ooi Kok Eng, Abdul Rahman Razak, Adzemi Mat Arshad and Paula G. Marcon

Bagworm (*Metisa plana*) is an ubiquitous pest in oil palm plantations. Seven insecticides were evaluated fortheir effectiveness in controlling *M. plana* using a leaf dip bioassay. The evaluation assessed the speeds ofaction, susceptibility of different instars, ovicide and ovi-larvicide activity of chlorantraniliprole. The lowest LC_{50} (0.25ppm) was found with chlorantraniliprole and trichlorfon, followed by thiamethoxam with 0.70 ppm,indoxacarb with 0.72 ppm, cypermethrin with 0.90 ppm, and for monocrotophos with 15.03 ppm. The highest LC_{50} (18.58 ppm) was found for *Bacillus thuringiensis*, which was approximately 74 times larger than trichlorfon and chlorantraniliprole. Meanwhile, the speed of action of these insecticides on *M. plana* larvae was also found to differ. Trichlorfon (1900.0 ppm), chlorantraniliprole (50.0 ppm) and cypermethrin (75.0 ppm) were among the three fastest acting insecticides evaluated, with respective LT_{50} values of 12.66, 17.04 and 28.63 minutes and larval mortality of 19.91, 47.27 and 53.06 minutes after exposure to the chemicals. *Bacillus thuringiensis* (324.0ppm) was the slowest acting insecticide, requiring more than 2000 minutes to kill 50% of *M. plana* larvae. The first three instars of *M. plana* larvae were very susceptible to chlorantraniliprole, with LC_{50} below 1 ppm, as compared to LC_{50} of 1.91ppm and 9.62ppm for the 4th and 5th instar larvae. Chlorantraniliprole had low to moderate ovicidal effects on *M. plana*, which caused egg mortality to range from 27.50% to 72.50%, but it was shown to be highly toxic on the neonates emerging from the eggs.

Keywords

Rynaxypyr®, Chlorantraniliprole, *Metisa plana,* Oil palm.

14.20 JTAS Vol. 35 (S) Dec. 2012 Article ID: JTAS-0449-2012

Histological study of the interaction between *Exserohilum Longirostratum*, barnyard grass, and rice var. MR219

Ng, S. C., Kadir, J. and Hailmi, M. S.

The course of infection and the development of *Exserohilum longirostratum* (Subramanian) Sivanesan on barnyardgrass (*Echinochloa crus-galli* (L.) Beauv. spp. *crusgalli*) and rice (*Oryza sativa* L. var. MR219) were studied under light microscopy (LM) and scanning electron microscopy (SEM). Observation under SEM indicated similarity of the gross anatomy of both rice and barnyard grass leaves. Meanwhile, germination of the conidium of *E. longirostratun* was found to be not influenced by inoculation time as the conidia started to germinate 4 hours after the inoculation on both leaf surfaces. However, the patterns and number of germ tubes and appressoria formation were influenced by host plants. On barnyard grass, the primary infection process consisted of the conidial germination, elongation of the germ tube, formation of the appresorial initials, maturation of the appressoria, and formation of secondary hyphae. Successful penetration was followed by an extensive colonization of the invaded epidermal cell wall. Observation of the cross section revealed that the infection hyphae expanded into a spherical vessel and colonized the cells, causing the collapse of the epidermal cells and resulting in the formation of necrotic lesions of infected and adjacent tissue. Although fungus successfully grew and produced germtube on rice, both the primary infection process and the successful penetration of the cuticle were not observed on rice. The conidia germinated and produced slender and thin germ tube, with occasional appressorium formation. Germ tubes and appressoria formation on the barnyard grass (70% and 92%, respectively) were significantly higher as compared to rice leaves (51% and 10%). It was observed that the mycelium infected barnyard grass much faster (less than 24 h) than the conidia as it immediately formed appressorium without having the need, like the conidia, to germinate first. These results suggest that it may be possible to utilize *E. longirostratum* as a bioherbicide to control barnyard grass under rice production in Malaysia.

Keywords

Barnyard grass, Biological weed management, *Exserohilum longirostratum*, Rice

14.21 JST Vol. 20 (1) Jan. 2012Article ID: JST-0176-2009

Effect of glycerol feed in methanol induction phase for hepatitis B surface antigen expression in *Pichia pastoris* Strain KM71

A. R. Morvarid, N. A. Zeenathul, Y. J. Tam, H. Zuridah, M. L. Mohd-azmi and B. O. Azizon

This study describes expression of HBs Ag in methylotrophic yeast, *Pichia Pastoris* under alcohol oxidase promoter. A single copy number of HBs Ag gene was transformed into *pichia* strain of KM 71, a Muts type, by using pA0815 *pichia* expression vector. The recombinant was cultivated in a shake flask either using methanol or a mixed feed of glycerol -methanol for induction. The HBs Ag gene integrity was justified using direct PCR method. The expressed products in the soluble cell extracts were analyzed by Western blot, SDS page, Bradford assay and ELISA tests. The recombinant HBs Ag was expressed successfully in *Pichia pastoris* strain KM71 at a high level of HBs Ag protein expression. Thus, an addition of glycerol in the ratio of glycerol per methanol 1/1 (g g^{-1}) consistently produced 2-fold increment in both biomass accumulation and HBs Ag productivity.

Keywords

Biomass, Hepatitis B, KM71 strain, pAO815 expression vector, *Pichia pastoris*, Surface Ag

14.22 JTAS Vol. 36 (2) May. 2013Article ID: JTAS-0369-2011

Pelletized feed of different particle sizes: effects on performance, carcass characteristics and intestinal morphology of two strains of broiler chicken

Aderibigbe, O. B., Sogunle, O. M., Egbeyale, L. T., Abiola, S. S., Ladokun, O. A. and Ajayi, O. L.

This study was conducted to determine the effects of feeding pelletized feeds of different particle sizes on the performance, carcass characteristics and intestinal morphology of two strains of broiler chickens. A total of one hundred and eighty (180) birds consisting of 90 birds each of Marshal MY and Hubbard strains of broiler chicken were used in the experiment. They were brooded for 14 days and thereafter divided into two treatment groups, namely, fed with feed of different particle sizes of 1 and 2mm. These were further divided into 3 replicates of 15 chicks and the experimental period was 42 days. The performance of the chicks was monitored weekly. At week eight, 3 birds per replicate were randomly selected, weighed, slaughtered via neck slit, defeathered, singed and eviscerated for carcass evaluation. The intestinal morphometry and histomorphometry of the birds were analysed. Data collected were arranged in a 2 x 2 factorial layout and subjected to 2-way Analysis of Variance. Significant ($P<0.05$) differences were observed in the final weight, weight gain and protein efficiency ratio with Hubbard strain having better values than Marshal. Mortality ($P<0.05$) was lower in the birds fed with feed particle size of 2 mm. In addition, significantly ($P<0.05$) higher values were obtained in the head, drum stick, shank and keel of birds fed with feed with particle size of 2mm. Meanwhile, the highest ($P<0.05$) villus height was recorded for Hubbard fed 2mm feed particle size while Marshal had the least value. Hence,pelletized feed of 2mm particle size was recommended for broiler production.

Keywords

Particle size, Pelletized feed, Performance, Carcass characteristic, Intestinal morphology, Hubbard strain, Marshal strain

14.23 JTAS Vol. 36 (1) Feb. 2013Article ID: JTAS-0378-2011

Biological performance of *Menochilus sexmaculatus* Fabricius (Coleoptera: Coccinellidae) upon exposure to sublethal concentration of imidacloprid

Ibrahim, Y. B. and Kueh, T. F.

The effects of sublethal exposure to imidacloprid (Kendor® 18.3SL) on the biological performance of the ladybird beetle, *Menochilus sexmaculatus* F., the most common coccinellid beetle found feeding on aphids, were studied under ambient laboratory conditions of 27-32°C and 50-75% RH. The corn leaf aphid, *Rhopalosiphum maidis*, was offered as prey. The LC_{50} obtained from the contact bioassay at 24 h post-treatment for the regression slope, b=1.08, indicated that imidacloprid was likely to be selective. Sublethal exposure to imidacloprid caused reduction in survival with the females reaching 50% mortality by the 24th day, while that of the control was the 36th day. Meanwhile, demographic parameters including the net reproductive rate (R_o), generation time (T), innate capacity of increase (r_m) and the finite rate of increase (λ) of the treated females were markedly inferior as compared to the untreated females. The R_o value indicated that the control female was capable of producing 17.59 female offspring but treated female could only produce 2.55 female offspring during their generation time of 25.17 and 23.04 days, respectively. The capacity or instantaneous rate of increase (r_c) declined from 0.114 to 0.041, which was parallel with the decrease in the intrinsic rate of increased (r_m) value from 0.125 to 0.041. The values of λ were 1.133 and 1.042 for the control and treated population, respectively. In the meantime, the doubling time (DT) increased sharply to 16.86 days for the treated population, whereas DT for the control was 6.09 days. The sex ratio was biased towards the female and generally the females survived slightly longer (48 days) than the males (46 days), as observed in the control population.

Keywords

Biological performance, Demographic parameters, Imidacloprid, *Menochilus sexmaculatus*, Sublethal effects

14.24 JTAS Vol. 35 (2) May. 2012Article ID: JTAS-0220-2009

The ranging behaviour of *Tyto alba* in oil palm under baiting with anticoagulant rodenticides, warfarin and brodifacoum and a biorodenticide *Sarcocystis singaporensis* (Zaman & Colley, 1975)

M. Naim, Umar J. and Hafidzi M. N.

This study investigated the ranging behaviour of *Tyto alba* in oil palm under three different rodenticide applications. For this purpose, four treatment plots were established in the FELCRA oil palm plantation in Seberang Perak. Three plots were baited each with warfarin, brodifacoum and a protozoan based biorodenticide, *Sarcocystis singaporensis*, plus a fourth non-baited control plot. For each plot, a pair of *T. alba* was attached with radio transmitters and tracked for three nights with a radiotracking equipment. Radio locations were plotted on a 1:66 scale map. These radio locations were used to determine the home range size, the core area size, the mean distance moved from one radio location to the next and the furthest radio location from the nest box or the centre of activity. Data were analysed with the help of the software BIOTAS. The home ranges were analysed using the method of Minimum Convex Polygon (MCP), the Harmonic Mean (HM) and the Kernel estimator. The home range sizes of the chemical rodenticide areas were consistently larger than the biorodenticide and the non-treated control areas. For males, the home sizes calculated using the MCP method were 60.51 ha; 36.95 ha; 18.19 ha and 15.22 ha for the brodifacoum, warfarin, control and biorodenticide treated plots, respectively. As for the females, the corresponding home range sizes were 69.39 ha, 52.50 ha, 28.80 ha, and 49.85 ha. Meanwhile, the home range sizes of the females were significantly larger than those of the males when calculated using the MCP and HM methods. The core area size, which is conventionally treated as the defended area around the nest box, yielded male core area sizes of 16.43 ha, 9.0 ha, 4.48 ha and 1.39 ha for brodifacoum, warfarin, control and biorodenticide treated plots respectively, based on the MCP method. The corresponding core area sizes for the females were 28.55 ha, 37.17 ha, 11.21 ha and 19.02 ha. The females tend to move over a longer distance compared to that of the males; however, the mean distances travelled by the females and males were not significantly different. The data suggest that the furthest radio locations of the females from the nest box were greater than that of the males in all the treatment plots.

The difference between the furthest radio locations of the females and males were significant. These data suggest that in areas treated with chemical rodenticide, *T. alba* has to engage in greater exploratory flight resulting in larger home range size, core area size and greater distance between the radio locations to secure enough prey to meet their energetic demands.

Keywords

Tyto alba, Rat control, Anticoagulant rodenticides, *Sarcocystis singaporensis*, Radio-telemetry

14.25 JTAS Vol. 35 (1) Feb. 2012Article ID: JTAS-0312-2010

Biocontrol agent *Trichoderma harzianum* strain FA 1132 as an enhancer of oil palm growth

Laila Naher, Soon Guan Tan, Umi Kalsom Yusuf, Chai-Ling Ho and Faridah Abdullah

Agricultural products are mostly and adversely affected by environmental pollution caused by chemicalresidues of pesticides which are used for plant disease management. Consequently, researchers look foralternative approaches of disease control such as biocontrol agents. The results of this study showed thatconidial suspension of the soil borne fungus *Trichoderma harzianum* strain FA 1132 can control *Ganoderma boninense* which causes basal stem rot (BSR) disease in oil palm. The conidial suspension treatment was applied by using *Trichoderma*-incorporated surface mulch. The disease severity index value (DSI) showed that Ganoderma infected the root as early as at week 5, with a DSI value of 8.3%, while physical symptoms appeared in leaf at week 8. However, no disease symptom was observed in *T. harzianum* strain FA1132 treated plants and it also markedly increased oil palm root and leaf weights.

Keywords

Biocontrol effect, *Trichoderma harzianum* strain FA 1132, *Ganoderma boninense*

14.26 JTAS Vol. 36 (2) May. 2013Article ID: JTAS-0409-2011

Desorption isotherm model for a Malaysian rough rice variety (MR219)

M. Nordin Ibrahim, K. Tajaddodi Talab, S. Spotar, Kharidah, M. and Rosnita, A. T.

Moisture desorption model of long grain Malaysian rough rice variety (MR219) was experimentally obtained using the static gravimetric method for different combinations of temperature (40, 45, 50, 55°C) and water activities (0.0507 to 0.9331). Five most commonly used models with three parameters namely modified Chung–Pfost, modified GAB, modified Halsey, modified Henderson and modified Oswin and a four parameters model (Zuritz et al., 1978) were determined for their ability to fit the experimental data using non linear regression techniques. Comparisons between all models were made on the basis of standard error of estimate (SEE), residual sum squares (RSS) and residual plots. Based on the results of this study, the Zuritz et al., modified Chung–Pfost and modified GAB models could be useful to predict the desorption EMC of MR219. The modified Halsey, modified Henderson and modified Oswin presented a poor fitting to the experimental data. In addition, the model by Zuritz et al. was found to be the most appropriate equation for representing the desorption isotherm model for MR219 at the range of temperatures from 40°C to 60°C.

Keywords

Equilibrium moisture content, Desorption, Static gravimetric, Fit ability, Rough rice

14.27 JTAS Vol. 36 (1) Feb. 2013 Article ID: JTAS-0352-2011

Effects of low water input on rice yield: Fe and Mn bioavailability in soil

Jahan, M. S., Khanif, Y. M., Syed Omar, S. R. and Sinniah, U. R.

Soil fertility and water condition are the main concerns in rice production. In order to determine the effects of low water input on rice production and soil chemical properties, the Fe and Mn contents, and soil pH in soil were measured during rice cultivation. It was found that rice yield and yield parameters obtained were not significantly different under different water levels. Soil pH was moderately acidic to near neutral. Meanwhile, iron (II) in soil extract slowly increased throughout the rice growing period but it increased markedly after the water was drained off. Manganese availability significantly increased after flooding, but it decreased at a similar trend followed after that, followed by a stable level. In addition, weekly data showed no significant differences in Fe(II) and Mn in the soil extract of the different treatments. These results suggest that low water input does not affect rice production as well as soil pH and Fe(II) and Mn bioavailability in soil.

Keywords

Rice, Low water irrigation, Plant nutrients, Soil pH

15.0 Universiti Sains Islam Malaysia

15.1 Acta Crystallographica Section F, Structural Biology and Crystallization Communications, Volume 69, Part 12, 2013

Crystallization and preliminary crystallographic analysis of a surface antigen glycoprotein, SAG19, from *Eimeria tenella*.

Ramly, N.Z., Rouzheinikov, S.N., Sedelnikova, S.E., Baker, P.J., Chow, Y.-P., Wan, K.-L., Nathan, S., Rice, D.W.

Coccidiosis in chickens is caused by the apicomplexan parasite *Eimeria tenella* and is thought to involve a role for a superfamily of more than 20 cysteine-rich surface antigen glycoproteins (SAGs) in host-parasite interactions. A representative member of the family, SAG19, has been overexpressed in *Escherichia coli*, purified and crystallized by the hanging-drop method of vapour diffusion using ammonium sulfate as the precipitant. Crystals of SAG19 diffracted to beyond 1.50Å resolution and belonged to space group I4, with unit-cell parameters a = b = 108.2, c = 37.5Å. Calculation of possible values of V M suggests that there is a single molecule in the asymmetric unit.

Keywords

Apicomplexa, *Eimeria tenella*, SAG19

15.2 **Acta Horticulturae 979 , pp. 763-772. 2013**

Effect of postharvest application of calcium chloride on brown rot and quality of red-flesh dragon fruit (*Hylocereus polyrhizus*)

Awang, Y.B., Abdul Ghani, M.A., Sijam, K., Mohamad, R.B., Hafiza, Y.

Brown rot caused by *Monilinia fruticola* is one of most serious postharvest diseases infecting red-flesh dragon fruits. Once infected, the quality of fruits is drastically reduced and the fruits are unlikely to be acceptable within a few days after infection. With the possible mechanism of Ca in controlling the growth of the fungus by reducing the activity of pectolytic enzymes of the causing organism and strengthening the host cell wall, the fruits were treated with four concentration of $CaCl_2$ (0, 1.0, 2.0, 3.0 and 4.0 g L-1) at postharvest stage for 30 min, then inoculated with spore suspensions of *M. fructicola* (106 spores ml-1). Results showed that the severity of brown rot was reduced with increasing $CaCl_2$ concentration and this was supported by a strong negative correlation between fruit peel, Ca and disease severity (r=-95). Overall, the beneficial effects of elevated $CaCl_2$ on quality parameters i.e., soluble solids, acidity and firmness were more apparent on severely infected fruits.

Keywords

Dragon fruits, Fruit quality

15.3 Middle East Journal of Scientific Research 13 (SPLISSUE) , pp. 85-92. 2013

Product recall management for halal product

Shafii, Z., Shahwan, S., Muhamed, N.A., Hashim, H., Amin, M.F.M., Rahim, A.A., Aziz, Y.A., Zaib, S.M.Z.

Product recalls are damaging to companies due to its effects to financial performance as well as the image of the company. Product recall management is the final step of traceability system in a company. When the incidence of product recall happens, a company must have a good recall management system that works as the last defense to the company's image. This study examines the product recall management in two companies operating in Halal industry. The objective of this study is to examine the implementation of Halal traceability measures and recall programs in the companies under the study. This study employed case study method to obtain data from two companies operating in Halal industry; one is a manufacturing of Halal product while another is a slaughterhouse. This study provides analysis on Halal traceability system implemented by two companies and the procedure of food recall produced by Jabatan Kemajuan Islam Malaysia (JAKIM). Findings of the study indicate that both of the surveyed companies practiced seven elements of traceability system to prevent them from involving in the incidence of food recall. The results also imply that food recall management and Halal traceability implementation are important in order to maintain the company from receiving negative impacts of food recall. Future comparative research on the similarities between food recall in Halal food and non-Halal food industry could be conducted to improve the product recall management in the Halal industry.

Keywords

Product recall, Recall management, Halal product

15.4 **Chemical and Biochemical Engineering Quarterly 26 (4) , pp. 399-404. 2012**

Comparison study of hydrogels properties synthesized with micro- and nano-size bacterial cellulose particles extracted from *nata de coco*

Johari, N.S., Ahmad, I., Halib, N.

The effect of different size of bacterial cellulose particles used in the production of hydrogel was investigated. Bacterial cellulose was extracted from nata de coco, a local dessert origin from the Philippines. Micro size particle was prepared by conventional grinding of dried sheet of bacterial cellulose whereas cellulose nanoparticle was prepared by acid hydrolysis treatment. Both were then used in hydrogels formulation with acrylic acid (in ratio of 70% of bacterial cellulose dispersion to 30% acrylic acid) and exposed to electron beam irradiation (40 kGy). TEM observation showed nano cellulose particle, having range of dimension of 80 - 160 nm in length and 13 - 22 nm in diameter. It was found that hydrogel with nano cellulose has higher glass transition temperature (39°C) as compared to micro cellulose hydrogel (32°C). SEM observation revealed that swollen nano cellulose hydrogel has smaller and homogenous pores arrangement while micro cellulose has bigger and irregular pores thus affecting their swelling degree.

Keywords

Bacterial cellulose, Acrylic acid, Electron beam, Hydrogel, Swelling degree

15.5 Research Journal of Applied Sciences 7 (9) , pp. 466-473. 2012

Screening of lactic acid bacteria as biocontrol against (*Colletotrichum capsici*) on chilli Bangi

El-Mabrok, A.S.W., Hassan, Z., Mokhtar, A.M., Hussain, K.M.A., Kahar, F.K.S.B.A.

Chilli (*Capsicum annuum L.)* is one of the major crops, vegetables grown in Malaysia and belongs to family Solanaceae. Pepper is suffering from many illnesses caused by fungi, bacteria and virus. The fungal disease is both seed and air borne and affect the germination of seeds and plant vital to a greater extent. Biological control by antagonistic microorganisms is widely recognized as a promising method for control plant diseases. This study reports the effectiveness of using Lactic Acid Bacteria (LAB) cultures or their supernatant as a biological control against anthracnose disease in chilli caused by fungus *Colletotrichum capsici*. From 324 lactic acid bacteria isolated from different sources, seven isolates showed good inhibition activity against *C. capsici* by Dual Overlay Method. The supernatant from LAB-C5 showed strong inhibition to fungal growth evaluated using microtitter plates. Seeds infected with *C. capsici* followed by treatment with LAB-C5 cells showed better seed germination rate than seed treated with supernatant. Fungi infected seeds fail to grow. The results indicate that LAB-C5 has potential to be used biological control against *C. capsici* to replace the use of chemical fungicide to treat chilli seeds.

Keywords

Chili anthracnose, *Colletotrichum capsici*, Lactic acid bacteria, Infected seeds, Germination percentage

15.6 **Food Chemistry 134 (4) , pp. 2406-2410. 2012**

Optimisation of digestion method for determination of arsenic in shrimp paste sample using atomic absorption spectrometry.

Ngah, C.W.Z.C.W., Yahya, M.A.

The microwave digestion method was developed and verified for the determination of arsenic in shrimp paste samples. Experimental design for five factors (HNO_3 and H_2O_2 volumes, sample weight, microwave power and digestion time) were used for the optimisation of sample digestion. For this purpose, two level half factorial design, which involves 16 experiments, was adopted. The concentration of arsenic was analysed by graphite furnace atomic absorption spectrometry. Design Expert® 7.0 software was used to interpret all data obtained. The combination of 2 mL HNO_3 and 1 mL H_2O_2 volumes, 0.1 g sample weight, 1400 W power and 5 min digestion time was found to be the optimum parameters required to digest the shrimp paste samples. Tests with spiked samples presented good recoveries with relative standard deviations between 0.32% and 5.35%.

Keywords

Microwave system, Optimisation, Half factorial design, As, Atomic absorption spectrometry, Shrimp paste

15.7 **Genetics and Molecular Research 11 (4) , pp. 3629-3641. 2012**

Stability analysis of oil yield in oil palm (*Elaeis guineensis*) progenies in different environments

Rafii, M.Y., Jalani, B.S., Rajanaidu, N., Kushairi, A., Puteh, A., Latif, M.A.

We evaluated 38 *dura* x *pisifera* (DP) oil palm progenies in four locations in Malaysia for genotype by environment interaction and genotypic stability studies. The DP progenies derived from crosses between *pisifera* palms of AVROS, Serdang S27B, Serdang 29/36, and Lever Cameroon were chosen to be the males' parent and Deli *dura* palms designated as females' parent. All the locations differed in terms of soil physical and chemical properties, and the soil types ranged from coastal clay to inland soils. The genotype by environment interaction and stability of the individual genotypes were analyzed for oil yield trait using several stability techniques. A genotype by environment interaction was detected for oil yield and it had a larger variance component than genotypic variance

(σ^2_{gl}/σ^2_g = 139.7%). Genotype by environment interaction of oil yield was largely explained by a non-linear relationship between genotypic and environmental values. Overall assessment of individual genotypic stability showed that seven genotypes were highly stable and had consistent performance over the environments for the oil yield trait [total individual genotype stability scored more than 10 and mean oil yielded above the average of the environment (genotype means are more than 34.37 kg·palm^{-1}·year^{-1})]. These genotypes will be useful for oil palm breeding and tissue culture programs for developing high oil yielding planting materials with stable performance.

Keywords

Oil palm, *Elaeis guineensis*, Stability statistics, Genotype by environment interaction, Oil yield stability

15.8 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 62-66. 2012

Oxidative stability of smoked chicken sausage substituted with red palm mid fraction during chilled storage

Alina, A.R., Siti Mashitoh, A., Babji, A.S., Maznah, I., Syamsul, K.M.W., Muhyiddin, Y.

The effects of rice bran and carboxymethyl cellulose (CMC) on the oxidative stability of smoked chicken sausages were determined. Lipid oxidation was analyzed at several different days of chilled storage (n=3, for all measurements). Thiobarbituric acid (TBA) values and peroxide value (PV) of smoked chicken sausages increased throughout the nine days of storage (4°C). Chicken sausage formulated with Red Palm Mid Fraction (RPMF) showed significantly lower TBA value compared to the samples prepared with chicken fat ($p<0.05$). However,β-carotene content showed the highest significant value ($p<0.05$) in sausage incorporated with RPMF. It was concluded that the utilization of RPMF significantly reduced the oxidation of lipid, which was indicated, by the TBA values. This study also showed that the small amount of dietary fiber (rice bran) also improve the oxidative stability of smoked chicken sausages. It can be suggest that the time for oxidation study need longer storage duration to see the good result plot and changes that occur can be determined clearly.

Keywords

Oxidative stability, Red palm mid fraction, Chicken fat, Chicken Sausage

15.9 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 21-24. 2012

Effect of grilling and roasting on formation of Cholesterol Oxidation Products (COPs) in chicken and mutton

Alina, A.R., Nurul Farah Sakinah, A., Shazamawati, Z.H., Thema Juhana, M.J., Siti Mashitoh, A., Ummi Syuhada, H.S., Nurul Mawaddah, A.H., Nurulhuda, S.

The objective of this paper is to determine the effect of grilling and roasting on cholesterol oxidation products (COPs) in mutton and chicken. Four steps of analysis have been conducted: saponification, extraction, derivatisation and quantification by GCMS-QQQ. The temperature and time used for grilling was 230°C (20 minutes) while roasting was 190°C (25 minutes) using microwave. This study showed that there was no significant difference between raw mutton and raw chicken in the amount of cholesterol. Raw mutton have higher amount of cholesterol than raw chicken due to the high content of SFA and cholesterol. In both of the cooking treatments, there was no significant difference in the amount for most of COPs, but for the grilling process, in β-epoxide were significantly higher. In conclusion, the roasting treatment is better to be applied in meat compared to grilling in term of COPs. It is suggested in the future works that the drip loss during the cooking being analyzed as the cholesterol and COPs might be lost during heat treatment and more reference standards of COPs need to be used.

Keywords

Grilling, Roasting, Cholesterol Oxidation Products, Chicken, Mutton

15.10 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 11-16. 2012

Negotiating interests according to Islamic approach on Halal certifications: Challenges in creating jobs

Norhayati Rafida, A.R., Alina, A.R., Hafiz, H.H., Saifol, B.

Negotiation usually takes place whenever a conflict arises between two individuals or groups over differences of interests. Differing needs and socioeconomic backgrounds may occur when unresolved issues arise, pertaining to the changes of Trade Description Act 1972 to Trade Description Act 2011 Malaysia creating interests among affected Halal industries, government agencies and consumers alike. In order to fill up the gap over interests that are naturally diversified, it raises a question if the interests could be negotiated in order to call for cooperation. This paper therefore focuses on the concept of negotiating interests via "Halal Jobs" or HalJob programme using the Islamic approach. The programme has been introduced to the Muslims who live in Sarawak, Malaysia. It is hoped that this programme will become a platform that create job opportunities to enable constructive development particularly, in the economic growth among the local Muslim communities. This study finds that in order to negotiate their interest, certain challenges that require potential solutions for the HalJob programme needs to be addressed.

Keywords

Negotiation Islamic, Negotiation conflicts, Halal certifications

15.11 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 29-33. 2012

Effect of grilling and roasting on the fatty acids profile of chicken and mutton

Alina, A.R., Nurul Mawaddah, A.H., Siti Mashitoh, A., Shazamawati, Z.H., Nurulhuda, M.S., Ummi Syuhada, H.S., Imtinan, A.K.

The effect of grilling and roasting using a microwave oven on fatty acid profile of chicken and mutton meat was investigated. The lipid content (gravimetric method) and fatty acids composition (gas chromatography) were analyzed in three different treatments and applied on these meats in four replicates and two batches. Cooking losses, internal temperature reached by meat and, consequently, total lipids, increased directly with the cooking time and temperature used. Cooked chicken meat had a lower proportion of monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA) and saturated fatty acids (SFA) than cooked mutton meat. PUFA/SFA ratio decreased in chicken meat and increased in mutton meat by heating. Chicken meat presents more favorable fatty acids profile than in mutton meat. This study implies the great choice for consumer to choose the healthier meat in a better way of cooking. It is recommended that other researchers should study on the nutritional value of chicken and mutton with other different cooking methods to obtain a better comparison data.

Keywords

Grilling, Roasting, Fatty acids profile, Chicken, Mutton

15.12 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 6-10. 2012

The possibility of uniformity on Halal standards in organization of Islamic Countries (OIC) country

Halim, M.A.A., Salleh, M.M.M.

The objective of this paper is to analyse the Halal standards among OIC Country specifically on preparation of food standard. One of the reasons why the Halal industry cannot grow faster, despite rising demands for Halal products worldwide, is because there is no consensus on a Halal standard. Each country has its own certification body, which leads to disagreements over animal feed, slaughtering methods, packaging, logistics and other issues. Indeed, all sectors of the market from inter-government agencies to the smallest trader have recognized the need for one global Halal standard that is recognised by all importing countries. Amidst the growing number of agencies issuing Halal certificates, there is also an increasing trend for local government departments to take charge of Halal certification as a result of the increasing demand for the export of Halal goods. It would be very difficult for countries to collectively agree on one global Halal standard as this would mean surrendering their sovereign rights. As a conclusion, uniformity and consensus especially among OIC Countries is very much important in order to ensure Halal standard for OIC Countries can be develop or otherwise it will be a dream forever. Implication of this paper is to educate people and industry on the importance of having uniformity for Halal standard. Hence, in the future research, it is suggested to study on the establishment of International Accreditation for Halal.

Keywords

Halal standard, OIC country, Halal regulation, Halal certification

15.13 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 34-38. 2012

Detection of blood thrombin enzyme in surimi-based products by using polymerase chain reaction (PCR) method

Alina, A.R., Nur Nadiah Syuhada, A.S., Sharifah, N.R.S.A., Siti Mashitoh, A., Nurul Aqilah, A.S., Nurul Mawaddah, A.H., Nurulhuda, M.S. H.S Ummi Syuhada, K.M.W syamsul, Nurul Farah Sakinah, A.

The detection of blood thrombin enzyme presented in eight samples of surimi based products was investigated by using Polymerase Chain Reaction (PCR) method. Specific primers for chicken *(Gallus gallus)*, cow *(Bos taurus)* and pig *(Sus sucrofa)* blood thrombin enzyme were designed for positive detection. Two primers for chicken blood which are Gal2 and Gal3 showed 98% and 99% in significant identity of *G.gallus* coagulation factor II (thrombin) while two primers from cow which are Bos4 and Bos6 showed 100% significant identity of *B. Taurus* coagulation factor II (thrombin). On the contrary, there were no positive results on pig primers with *S. sucrofa* coagulation factor II (thrombin). PCR amplification with Gal2 and Bos4 primers in surimi based products showed several positive results while Sus5 primer showed none. Further research should be done to verify the consistency of this result and redesign a specific primer for pig's blood thrombin enzymes is vital in order to guarantee the quality of food products to comply with Halal food guidelines and regulations.

Keywords

Blood thrombin enzyme, Surimi-based product, Polymerase chain reaction

15.14 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 39-44. 2012

Detection of non-halal plasma transglutaminase in selected Surimi-based products by using sandwich ELISA method

Alina, A.R., Nur Illiyin, M.A., Salmah, Y., Siti Mashitoh, A., Imtinan, A.K., Juriani, J.

The usage of non-halal plasma transglutaminase to improve the gelling properties of surimi is prohibited for Muslim consumers. The objective of this study is to detect non-halal plasma transglutaminase in surimi products. A total of 12 samples were tested using DEAE, Unosphere Q and BioScale Macroprep High Q columns and further confirmed by Sandwich ELISA method. Three different monoclonal antibody (MAbs) species which were bovine, chicken and porcine were used to observe the reaction against the samples. The reactivity of the antibody against the antigen was defined in a certain range of cutoff value that is very strong, strong, moderate, weak and negative. By using the MAbs of the different species, the result showed S1, S2 and S3 did not contain transglutaminase from bovine while the other samples did. Six samples which were S1, S2, S3, S8, S11 and S12 selected in the ELISA procedure had a very strong reaction with transglutaminase from porcine species. For MAbs of chicken species, S12 has a weak reactivity while other samples showed very strong and strong reaction of transglutaminase. The sandwich ELISA can be a useful method to detect the presence of transglutaminase in surimi-based products, which is derived from blood of different species of mammalian animals. Further study should be done to optimize the specificity of antibody used in the confirmation of TGase in surimi.

Keywords

Surimi, Monoclonal antibody, Textural, Sandwich ELISA

15.15 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 25-28. 2012

Effect of grilling and roasting on fatty acids methyl esthers (FAME) in beef and pork

Alina, A.R., Nurulhuda, M.S., Siti Mashitoh, A., Shazamawati, Z.H., Nurul Mawaddah, A.H., Ummi Syuhada, H.S., Nurul Farah, S.A., Nurul Aqilah A.S, Syamsul K.M.W, Nur Nadiah Syuhada, A.S.

The process of cooking may affect the fatty acids methyl esthers (FAME) content in food. The objective of this study is to determine the effect of grilling and roasting on FAME in beef and pork. Lipids were extracted using the Soxtherm fat extraction instrument. The fats were then methylated by sodium methoxide and being examined by using a gas chromatography. Data was analyzed using a one-way ANOVA. The amount of fatty acids in pork is significantly higher than in beef. The treatments within beef, showed significantly different values between the treatments. However, raw and grilled pork treatments were not significantly different except for the roast treatment ($p<0.05$). Ratio of polyunsaturated to saturated fatty acids (PUFA:SFA) in raw, grilled and roasted beef treatment are 0.03, 0.04 and 0.01. While in pork, raw, grilled and roasted treatments gives ratios 0.37, 0.33 and 0.30. This showed that pork has more PUFA content compared to beef. Further research can be done by changing the metod of extraction to see any difference between the methods.

Keywords

Fatty acid profile, Grilled, Roasted, Beef, Pork

15.16 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 45-50. 2012

Effect of storage on Fatty Acid Methyl Ester (FAME) and Cholesterol Oxidation Products (COPs) in different type of sausages

Alina, A.R., Shazamawati, Z.H., Nor'Atiqah, N., Thema Juhana, M.J., Juriani, J., Syamsul, K.M.W., Siti Mashitoh, A.

Cholesterol oxidation products (COPs) have been shown potentially atherogenic, mutagenic and carcinogenic effects towards human. Storage of food will increase the production of COPs. The objective of this research is to investigate the effect of cold storage (chilled storage, 4°C and frozen storage, -20°C) on fatty acids content and formation of cholesterol oxides in three different lipid sources of sausage products containing chicken fat (CF), Super Olein (SO) and Red Palm Stearin (RPS).Three types of chicken sausages with different lipid sources: CF, SO and RPS were prepared and stored in chiller for zero, first, second and third weeks and stored frozen for zero, fourth and eight weeks. Fatty Acids and COPs in samples were extracted and analyzed using gas chromatography with flame ionization detector (FID). The reduction of unsaturated fatty acids, cholesterol content and formation of cholesterol oxides were found during throughout the storage life. The Red Palm Stearin (RPS) samples showed significant increment of the total saturated fatty acid compared to Super Olein (SO) and chicken fat (CF). It was concluded the saturated fatty acids (SFA) and monounsaturated fatty acids (MUFA) increased in comparison to polyunsaturated fatty acids (PUFA) in all samples during chilled storage and the amount of COPs were in the following order; CF>SO>RPS. It implies that sausages formulated with SO and RPS are effective in reducing COPs formation. The recommendations are to wider the range of COPs reference standards.

Keywords

Cholesterol Oxidation Products (COPs), Fatty Acid Methyl Ester (FAME), Gas Chromatography(GC)

15.17 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 51-56. 2012

Detection of Cholesterol Oxidation Products (COPs) in raw and chilled storage of chicken sausages formulated with chicken fat and red palm mid fraction

Alina, A.R., Fahmi, M.I., Hashari, S.Z., Thema Juhana, M.J., Juriani, J., Siti Mashitoh, A.

The purpose of this paper is to determine the effect of different lipid sources (animal and plant) during chilled storage on the formation of cholesterol and cholesterol oxidation products in sausages formulated with chicken fat and red palm mid fraction. The commercial sample, as represented by the chicken sausage and the mechanical deboned meat sausage was analyzed as a comparison. The sausages were produced in a plant scale for two batches, vacuum packed and stored at -4°C or chilled condition. At time intervals of week 0, 1, 2 and 3, the sausages were analyzed using gas chromatography with flame ionization detector for determining cholesterol and cholesterol oxidations products, which were 25-hyroxycholesterol, α-epoxycholesterol, β-epoxycholesterol and 7-ketocholesterol. This study showed the variable amount of compounds analyzed throughout the period of analysis, 25-hydroxycholesterol detected in PMF at week 3 (0.77 ppm). The significantly high amount of cholesterol was detected in MDM (239.99 ppm) at week 3. The different type of sausages formulated with chicken fat and palm mid fraction which were animal and plant fats, respectively did not show any significant changes towards the formation of cholesterol and COPs throughout the storage period in chilled condition. It is recommended for future works to prolong the period of storage to obtain concrete result at the end of analysis, analyze the compounds using gas chromatography with mass spectrometry to improve the detection limit and to expand the reference standard of cholesterol oxidation products to be used as the compounds may varies.

Keywords

Cholesterol, Cholesterol oxidized products, Sausages

15.18 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 1-5. 2012

Halal traceability framework for halal food production

Shafii, Z., Wan Siti Khadijah, W.M.N.

Muslim consumers are concerned about the status of Islamic religious requirements of products and services. The producers' ability to trace the beginning to end processes will gain the confidence of the consumers that the whole processes from the production, processing and distribution of the products are Shariah-compliant. Halal traceability provides further information about which Halal standards have been applied, allows the consumer to verify the Halal claims and ensures that the product delivered to the customer is thoyyib (wholesome, healthy, safe, nutritious and of good quality). This paper seeks to develop a Halal traceability framework for Halal food producers based on Halal traceability deployments in a Halal certified food production company. The case study method is employed to learn about the initiatives of the company in relation to traceability of Halal food production. Based on the experience of the studied case, a framework is generated that Halal food producers can refer to as a proper guideline to ensure Halal compliance along the production, transportation and distribution system. The framework has theoretical interest for replicability to other Halal food producers.

Keywords

Halal traceability, Halal food production, Halal certification, Syariah compliance

15.19 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 17-20. 2012

Effect of different cooking methods on formation of cholesterol oxidation products in pork and beef

Alina, A.R., Ummi Syuhada, H.S., Syazamawati, Z.H., Thema Juhana, M.J., Siti Mashitoh, A., Nurul Farah Sakinah, A., Nurul Mawaddah, A.H., Nurulhuda, M.S.

Cooking process can lead to the formation of cholesterol oxidation products (COPs) which can give negative biological effects to human. The objective of this work was to study the effect of different cooking methods (grilled and roasted) on formation of COPs in beef and pork. The analysis involved four major steps; saponification, extraction, derivatisation and quantification by GC/MS-QQQ. Five common COPs (5-α-cholestane, 7-ketocholesterol, α-epoxycholesterol, β-epoxycholesterol and 25-hydroxycholesterol) that are generally reported in foods were analyzed to study the differences of their content between raw, grilled and roasted meat. Besides cholesterol, the most abundant compound in both types of samples that can be detected was β-epoxycholesterol. Grilling process for both samples was observed to contain the highest cholesterol and total COPs level. Beef samples contain higher total cholesterol and COPs compared to pork. It implies that consume beef regularly gives bad effect to health. It is recommended to do analysis on the collected drip loss during the cooking methods as the cholesterol and COPs might be lost during heat treatment and more reference standards of COPs need to be used in this study.

Keywords

Cholesterol, Cholesterol oxidation products, Beef ,Pork ,Grilling, Roasting

15.20 World Applied Sciences Journal 17 (SPL.ISS1) , pp. 57-61. 2012

Effect of rice bran and carboxymethyl cellulose addition on the physicochemical quality of chicken sausage formulated with red palm mid fraction

Alina, A.R., Siti Mashitoh, A., Abdul Salam, B., Maznah, I., Muhyiddin, Y., Syamsul, K.M.W.

The objective of this study is to determine the effects of dietary fiber on the sensory properties of cooked chicken sausages by partial substitution of chicken fat (CF) with red palm mid fraction (RPMF). Four sausage formulations with the fat level of 5% were blended with rice bran 1.5% (RB) and carboxymethyl cellulose (CL). Instrumental analysis of water activity (a w), cook loss, pH value and texture (hardness) were performed to measure physicochemical properties. Sensory properties were estimated using a hedonic test. Statistical analysis was performed by using SPSS. The results showed that this fiber is compatible when used with red palm mid fraction (RPMF) fat in chicken sausages. The panelists indicated that all the formulations except the treatment with RPMF+CL were not significantly different to the control in terms of acceptability. In conclusion, the lipid content, when substituting CF with RPMF, with rice bran carboxymethyl cellulose, yielded acceptable chicken nuggets. This indicates the RPMF and rice bran formulations were equally comparable or better than the CF formulation. It is recommended that multiple analyses with different analytical instrumentation (GC, FTIR and UV-Vis) may explain better the antioxidants behaviour and oxidative stability of the products.

Keywords

Rice bran, Carboxymethyl cellulose, Red palm mid fraction ,Physicochemical quality

15.21 American Journal of Applied Sciences 9 (6) , pp. 807-817. 2012

Evaluation on antibacterial activity of *Lactobacillus Acidophilus* strains isolated from honey

Aween, M.M., Hassan, Z., Muhialdin, B.J., Noor, H.M., Eljamel, Y.A.

Problem statement: This study reports the isolation of lactic acid bacteria from 13 honey samples produced in Malaysia, Libya and Saudi Arabia and their antibacterial activity against three Gram negative pathogenic bacteria.

Approach: A modified MRS agar with 0.8% $CaCO_3$ and MRS with 1% glucose was found to facilitate isolation of LAB compared to MRS, tomato juice agar and modified tomato juice agar. 32 isolates were confirmed LAB by catalase test and Gram staining. Six isolates were screened for antibacterial activity and identified as strains of *Lactobacillus acidophilus* 1 by API CH50.

Results: All the isolates showed very good inhibitory activity against target Gram negative bacteria as indicated by the diameter of inhibition zone: *Salmonella Typhimurium* (23-30 mm), *Escherichia coli* (7-18 mm) and *Enterobacter aerogenes* (10-18 mm) after 24 h incubation at 30°C. Supernatants of *L. acidophilus* 1 strains showed good antibacterial activity against all target bacteria. Heating the supernatants at 90 and 121°C for 1 h enhanced the antibacterial activity against all target bacteria except supernatants H006-A and H010-G against *S. Typhimurium*. Antibacterial activity of supernatants were maintained after pH adjustment to 3, but at pH5 supernatants H006-A, H008-D and H010-G lost the activity against *S. Typhimurium* and *E. coli* within 48 h of incubation while at pH 6 all supernatants lost activity except against *E. aerogenes*. Enzymes treatments of supernatants with RNase II and Proteinase K for 1 h inhibited all target bacteria except supernatants H008-D, H008-E and H006-A which were relatively sensitive to both enzymes against *S. Typhimurium* and *E. coli*.

Conclusion/Recommendations: In conclusion, honey from different sources contains strains of *L. acidophilus* 1 that produced compounds with good antibacterial activity which may be responsible for the antibacterial properties of honey.

Keywords

Lactic Acid Bacteria (LAB), Multiple Antibiotic Resistant (MAR), Antibacterial activity, Demonstrated antimicrobial, Antibacterial properties, Intensive Care Units (ICUs)

15.22 World Applied Sciences Journal 12 (2) , pp. 132-138. 2011

Challenges for commercialization of university research for agricultural based invention

Yaakub, N.I., Wan Hussain, W.M.H., Abdul Rahman, M.N., Zainol, Z.A., Mujani, W.K., Jamsari, E.A., Sulaiman, A., Jusoff, K.

This study analyses the challenges for the commercialization of university research for agricultural based invention. It aims at promoting the commercialization of agricultural based research to compete with the existing inventions. From the discussion, it shows that the commercialization of agricultural based invention of university research usually takes a longer time to be marketable, when compared to inventions by agencies such as MARDI and FAMA. The article implies that agricultural based invention of university research should be considered as a significant tool for economic growth. It suggests that a case study and a quantitative analysis will be useful to further formulate propositions and to learn the agricultural based invention of university research.

Keywords

Commercialization, University research, Agricultural based invention, University technology transfer, University-industry interactions

16.0 Universiti Sains Malaysia

16.1 **African Journal of Agricultural Research Vol. 7(4): 577-582, 2012, Academic Journals, ISSN 1991-637X**

Potential decline in soil quality attributes as a result of land use change in a hillslope in Lordegan, Western Iran

Amin Mojiri, Hamidi Abdul Aziz and Amin Ramaji

The aim of the study was to investigate the potential decline in soil quality attributes as a result of land use change in Lordegan area in the Chaharmahal Va Bakhtiari Province, Western Iran. Two of the most important factors associated with soil quality concept are: (1) soil has both inherent and dynamic properties and (2) soil quality assessment must reflect biological, chemical and physical properties. Land use changes, especially cultivation of deforested land may rapidly diminish soil quality. Surface (0 to 30 cm) soil samples were taken from five slope positions (summit, shoulder, backslope, footslope and toeslope) of rangeland and adjacent cultivated land according to randomized complete block design. These results showed that the destroyed, and tillage practices led to an decrease in soil organic matter (SOM), total nitrogen (TN), cation exchange capacity (CEC), extractable manganese (Mn), clay and mean weight diameter (MWD) by 63.04, 61.82, 30.27, 67.71, 59.49 and 10.82%, respectively, while increased soil bulk density (BD) by 21.42%. It could be that rangeland destroyed, land use change and long-term cultivation would decrease soil quality attributes.

Keywords

Bulk density, Land use, Manganese, Organic matter, Rangeland, Soil quality

16.2 **Journal of Malaysian Studies, Vol. 30(2): 45–70, 2012**

Using Environmental Radionuclide, ^{137}Cs to Investigate Soil Re-Distribution in an Agricultural Plot in Kalumpang, Selangor, Malaysia

Zainudin Othman and Wan Ruslan Ismail

Owing to the limitations associated with traditional methods of measuring rates of soil erosion, the fallout radionuclide Caesium-137 (^{137}Cs) technique has been increasingly used in recent years as an alternative approach to estimate rates of soil erosion and soil redistribution in both cultivated and non-cultivated areas. A preliminary study has been conducted using the environmental isotope ^{137}Cs to assess the feasibility of applying this method on Malaysian soils in order to provide a retrospective estimate of medium-term soil erosion rates within the catchment area over the past years. The study plot is situated in Kalumpang Agriculture Station, 90 km northeast of Kuala Lumpur. The site is being used for light agricultural activities and the study area is covered by local fruit trees, shrubs and light bushes. Soil samples for ^{137}Cs analysis were collected at the study and reference sites using a steel core and sampling frame. A local reference inventory for 137Cs is 551 ± 27.6 Bq m^{-2}. The average soil erosion rate estimated using an empirical Proportional Model is 1.69 t ha^{-1} $year^{-1}$. The proportional model of He and Walling is considered more suitable for the study site than the empirical model of Ritchie and McHenry. The minimum rate of erosion from the proportional model was estimated at 17.6 t ha^{-1} $year^{-1}$, while the maximum rate of deposition on the plot was estimated at 4.6 t ha^{-1} $year^{-1}$. The mean for soil re-distribution was 5.7 ± 4.24 t ha^{-1} $year^{-1}$. The nett erosion of the slope found by integrating all data was estimated to be 5.42 t ha^{-1} $year^{-1}$. This study provides a significant contribution to the growing literature on this technique especially from this part of the world.

Keywords

Soil redistribution, ^{137}Cs, Proportional model, Kalumpang, Malaysia

16.3 Plant Omics Journal, Vol. 6(1): 13-17, 2013, ISSN:1836-3644

The effects of glutamate decarboxylase (*GAD*) RNAi knockout in tissue cultured transgenic tomato (*Solanum lycopersicum*)

Bee Lynn Chew, Graham B. Seymour

The amino acid glutamate has commonly been associated with the umami or brothy taste which is classified as the fifth sensation other than sweet, sour, salty and bitter. The production of glutamate in plants is linked to the tricarboxylic acid cycle (TCA) and amino acid metabolism. In this study, the effects of down-regulating the tomato glutamate decarboxylase gene (*GAD*) using an RNAi construct under the control of the 35S promoter are reported. The aim of the experiment was to enhance the levels of glutamate in transgenic tomato plants. The *GAD* gene sequence was isolated from Micro Tom fruit. Tomato cotyledons were transformed with the *GAD* gene fragment using *Agrobacterium tumefaciens* and transformants were observed for the regeneration of transformed plantlets. PCR was performed to confirm the presence of the inserted gene. The infected cotyledons failed to regenerate transformed plantlets using the *GAD* RNAi transgene. A possible explanation is that the construct resulted in altered levels of γ-aminobutyric acid (GABA) and other amino acids known to be essential for plant survival. This work provides further support for the central role of this *GAD* gene in tomato.

Keywords

Gateway cloning, Glutamate, Glutamate decarboxylase, Micro tom, *Solanum lycopersicum*

16.4 Jurnal Biosains, Vol. 17(1): 89–101, 2006

Folivorous Insect Fauna on Two Banana Cultivars and Their Association with Non-banana Plants

Justin N. Okolle, Mashhor M. and Abu Hassan A.

Sampling of leaf-feeding insects and their damage were carried out on two newly planted fields of a common local banana cultivar (Pisang Mas) and a commercial cultivar (Cavendish). In both fields, sampling was done biweekly from the first month after planting till the first fruits emerged. The presence or absence of these insects was also recorded on non-banana crops and weeds. Five folivorous insect species belonging to five families from three orders were recorded on both banana cultivars. The Malaysian locust, *Valanga nigricornis* and the cluster caterpillar, *Spodoptera litura* were the first colonizers. *Spodoptera litura* was most damaging on Pisang Mas, causing 65.4% death of 1–2 month old plants, while *Erionota thrax* was most damaging on Cavendish. The banana skipper, *E. thrax,* was found to complete its entire life cycle on the banana host, with adults feeding on fluids in the flowers. Only *V. nigricornis* and the gold dust weevil, *Hypomeces sqamosus,* were found on non-banana crops and weeds around the field. *Erionota thrax* was never found on any of the weeds and non-banana crops while other *Erionota* species, insect predators and parasitoids were commonly found on *Asystasia intrusa* and *Ipomoea cairica*. *Spodoptera litura* and *E. thrax* are very important pests on young banana plants of 1–5 months old. *Asystasia intrusa* serves as an important weed host for several ants, wasps and lepidopterans other than *E. thrax*.

Keywords

Colonization dynamics, Banana phenology, Folivorous insects, Weeds

16.5 Malaysian Journal of Microbiology, Vol 8(2): 127-130, 2012

Fusarium species Associated with Fruit Rot of Banana (*Musa* spp.), Papaya (*Carica papaya*) and Guava (*Psidium guajava*)

Latiffah Zakaria, Mazzura Wan Chik, Kong Wai Heng and Baharuddin Salleh

A total of 60 isolates of *Fusarium* were isolated from fruit rot of banana (*Musa* spp.), papaya (*Carica papaya*) and guava(*Psidium guajava*). The most common species recovered from the fruit rot of the three fruit crops were *F. semitectum* (40 %), *F. solani* (38.3 %), F. *verticillioides* (11.7 %) and *F. oxysporum* (10 %). *Fusarium semitectum* was isolated from fruit rot of banana, papaya and guava; F. *oxysporum* from banana and papaya; *F. solani* from banana and guava and *F. verticillioides* from banana. From pathogenicity tests, *F. solani* and *F. semitectum* were pathogenic to both banana and papaya and *F. verticillioides* to banana. *F. oxysporum* was not pathogenic to banana and papaya and *F. semitectum* was not pathogenic to guava. The results of the present study showed the presence of several *Fusarium* spp. on fruit rot of banana, papaya and guava and several species are found to be pathogenic causing fruit rot on their hosts.

Keywords

Fusarium spp., Banana, Papaya, Guava, Pathogenicity

16.6 **Tropical Life Sciences Research, Vol. 20(2): 119–125, 2009**

Characterisation of *Colletotrichum* Species Associated with Anthracnose of Banana

Latiffah Zakaria, Shamsiah Sahak, Maziah Zakaria and Baharuddin Salleh

A total of 13 *Colletotrichum* isolates were obtained from different banana cultivars (*Musa* spp.) with symptoms of anthracnose. *Colletotrichum* isolates from anthracnose of guava (*Psidium guajava*) and water apple (*Syzygium aqueum*) were also included in this study. Based on cultural and morphological characteristics, isolates from banana and guava were identified as *Colletotrichum musae* and from water apple as *Colletotrichum gloeosporiodes*. Isolates of *C. musae* from banana and guava had similar banding patterns in a randomly amplified polymorphic DNA (RAPD) analysis with four random primers, and they clustered together in a UPGMA analysis. *C. gloeosporiodes* from water apple was clustered in a separate cluster. Based on the present study, *C. musae* was frequently isolated from anthracnose of different banana cultivars and the RAPD banding patterns of *C. musae* isolates were highly similar but showed intraspecific variations.

Keywords

Colletotrichum, Banana, Anthracnose, RAPD

16.7 Agriculture, Forestry and Fisheries, Vol. 2(1): 1-10, 2013

Effect of nutrient and pre-infested brinjal, *Solanum melongena* by whitefly and aphid on population dynamics of whitefly, *Bemisia tabaci*

Mohd Rasdi Zaini, Che Salmah Md Rawi, Abu Hassan

This study investigated the consequence of nutrient concentration levels and pre-infestation of brinjal (*Solanum melongena*) plant (by whitefly and aphids) on population of whitefly (Aleyrodidae; Hemiptera) over two cropping periods. Both factors, nutrient levels and pre-infestation by pests could also change plant-pest relationship especially with herbivorous insect pests. Variation in nutrient levels applied to the plants could influence different physiological performance of the plants which subsequently affected whitefly population. Populations of whitefly were higher following increasing levels of nutrients in non-pre-infested (control) plants. Lower whitefly populations were observed on whitefly pre-infested brinjal plants compared to aphid pre-infested and control plants. Pre-infested plants were suspected to induce productions of secondary metabolites as a chemical defense system thus lowering the number of whiteflies on them. Considering other management technique in controlling whiteflies on brinjal such as optimum nutrient supplement as plant growth progress and good pest care during seedling stage was proposed.

Keywords

Whitefly, *Bemisia tabaci*, Pre-Infestation, Nutrient, Population dynamic, Brinjal

16.8 **Food Chemistry 147 (2014) 287-294**

Micro-solid phase extraction with liquid chromatography–tandem mass spectrometry for the determination of aflatoxins in coffee and malt beverage

Wejdan Shakir Khayoon, Bahruddin Saad, Baharuddin Salleh, Normaliza Hj Abdul Manaf, Aishah A. Latiff

A single step extraction-cleanup procedure using porous membrane-protected micro-solid phase extraction (μ-SPE) in conjunction with liquid chromatography–tandem mass spectrometry for the extraction and determination of aflatoxins (AFs) B_1, B_2, G_1 and G_2 from food was successfully developed. After the extraction, AFs were desorbed from the μ-SPE device by ultrasonication using acetonitrile. The optimum extraction conditions were: sorbent material, C8; sorbent mass, 20 mg; extraction time, 90 min; stirring speed, 1000 rpm; sample volume, 10 mL; desorption solvent, acetonitrile; solvent volume, 350 lL and ultrasonication period, 25 min without salt addition. Under the optimum conditions, enrichment factor of 11, 9, 9 and 10 for AFG_2, AFG_1, AFB_2 and AFB_1, respectively were achieved. Good linearity and correlation coefficient was obtained over the concentration range of 0.4–50 ng g^{-1} (r^2 0.9988–0.9999). Good recoveries for AFs ranging from 86.0–109% were obtained. The method was applied to 40 samples involving malt beverage (19) and canned coffee (21). No AFs were detected in the selected samples.

Keywords

Aflatoxins, Micro-solid phase extraction, Liquid chromatography–tandem mass spectrometry, Mycotoxins, Food

Journal of Agricultural Science, Vol. 1(1): 27-32, June 2009

Population Ecology of Whitefly, *Bemisia tabaci*, (Homoptera: Aleyrodidae) on Brinjal

Mohd Rasdi, Z., Fauziah, I., Fairuz, K., Mohd Saiful, M.S. & Md Jamaludin, B., Che Salmah, M.R, Kamaruzaman Jusoff

Whitefly, *Bemisia tabaci* (Gennadius), a common insect feeding on plants, belongs to the family Aleyrodidae of the order Homoptera. The quantity of food source especially brinjal, is one of the major factors that has attracted whitefly in the area. In fact, the flight ability of whitefly enables them to search for food quickly. Thus could encourage whitefly to reproduce in great numbers and subsequently cause severe infestation in the fields. Many farmers are not interested to grow brinjal after they have gone through some bad experience due to some whitefly infestations, which have resulted in a total crop loss of brinjal fruits. At present, information on the population dynamics of whiteflies locally on brinjal is still lacking. Henceforth, these studies are indeed appropriate to generate a comprehensive understanding on the insect population, which could support an effective pest management programme and crop improvement strategy. The study was conducted at the Field Laboratory of the Faculty of Applied Science, Universiti Teknologi MARA, Shah Alam. The study on the population of whitefly larvae on brinjal plants covered all the plant strata except for the upper stratum. The populations of whitefly were aggregated (Taylor's Power Law Calculate) in first and second cropping of brinjal plants. It may be concluded that the total number of whitefly larvae were found to be most abundant in the middle stratum of the brinjal plants.

Keywords

Whitefly, *Bemisia tabaci*, Population ecology, Population dynamics

16.10 **Journal of Agricultural and Biological Science, Vol. 8(3): 219-223, 2013, Asian Research Publishing Network (ARPN) ISSN 1990-6145**

Host Related Variation in Carboxylesterase Activity of the Whitefly *Bemisia tabaci* (Gennadius) Populations on Cabbage and Garden Egg

Silas W. Avicor, Vincent Y. Eziah, Ebenezer O. Owusu and Mustafa F. F. Wajidi

The sweet potato whitefly *Bemisia tabaci* is a major pest of several crops including vegetables in Ghana. In this study, the effect of two host crops, cabbage and garden egg on *B. tabaci* carboxylesterase (CaE) activity, a major insecticide detoxification enzyme was observed in three vegetable growing sites. The *B. tabaci* populations on cabbage had higher CaE activity levels compared with garden egg populations. This observed difference in enzyme activity of *B. tabaci* on hosts was significant in two of the three sampled sites. The CaE activity levels of *B. tabaci* from the sampled sites also varied and were also significant. There was also a significant host site interaction effect on the CaE activity of *B. tabaci* populations. This provides useful information for integrated pest management formulation for each host crop in these specific vegetable growing areas.

Keywords

Bemisia tabaci, Carboxylesterase, Host crop, Cabbage, Garden egg

16.11 **Tropical Biomedicine, Vol. 28(1): 188–193, 2011**

Strongyloides stercoralis in common vegetables and herbs in Kota Bharu, Kelantan, Malaysia

Zeehaida, M., Zairi, N.Z., Rahmah, N., Maimunah, A. and Madihah, B.

Transmission of soil-transmitted helminthes infection is by faecal oral route, and is influenced by food preference. Kelantanese love to consume *ulam* which are raw vegetables and herbs. Some of the herbs grow on grounds with high humidity and are abundant near drainage areas, these are also places with higher likelihood of harbouring viable parasite ova. The aim of this study was to determine the prevalence of soil transmitted helminthes in vegetables, herbs and fruits found in our local setting. The results by microscopy showed that there was no helminthes ovum or protozoan parasite in the samples. However, *Strongyloides stercoralis* rhabdatiform larvae were identified in water samples used to wash pegaga, *kesum* and water spinach, and the number of larvae observed were 152, 9 and 16 respectively. Analysis by real-time PCR confirmed the microscopic observation of this helminth. This study highlighted that vegetables and herbs are likely sources of *Strongyloides stercoralis* infection in Kota Bharu, Kelantan. Thus vegetable sellers as well as the food handlers are the two important groups who are at high risk of acquiring the infection.

Tropical Life Sciences Research, Vol. 20(1): 1–6, 2009

Helminthic Parasites of Scavenging Chickens (*Gallus domesticus*) from Villages in Penang Island, Malaysia

Abdul Wahab Rahman, Hasber Salim and Mohd Shafiq Ghause

Sixty scavenging chickens from villages in Penang were examined for their state of nutrition or body condition and the presence of helminthic parasites. The majority of the chickens were of poor body condition. More than 66.7% (females) and 73.3% (males) belonged to the 'below normal' category of general body condition. A total of eight different helminth species were recovered from the trachea and the gastrointestinal tract of the various chickens. Four of the species were nematodes and the rest were cestodes. No trematodes were recovered from the chickens. The highest mean worm burden was recorded for the cestode *Raillietina echinobothrida* while the lowest was the nematode, *Ascaridia galli*.

Keywords

Scavenging chickens, State of nutrition, Body condition, Helminthic parasites

Malaysian Journal of Veterinary Research, Vol. 4(1): 5-12, January 2013

Evaluation of Neem Leaf *(Azadirachta indica)* product for worm control on goats

Chandrawathani P., Zary Shariman Y., Premaalatha B., Rahimah H., Norhafiza N.H., Nurulaini R., Nor Andilla I. and and Wahab A.R.

This study was conducted with the aim of investigating the effectiveness of Neem leaf extracts, *Azaridachta indica*, an indigenous medicinal plant, against helminths of goats. Two extracts were prepared with distilled water using two different techniques; that is, the Neem leaves Water Extract (NLWE) and decoction of Neem leaves (NLD). This study was carried out using 20 goats from a government farm in Perak. The two extracts showed variable degrees of efficacy in naturally infected goats, as measured by faecal egg count. Further evaluation is required to establish the efficacy.

16.14 Jurnal Biosains, Vol. 18(2): 35–44, 2007

Bacteriological Comparison of Cockles from Three Producing Areas in Peninsular Malaysia

Fisal Ahmad, Noryati Ismail, Hamdan Jaafar and Wan Norhana Nordin

Kuala Sg. Jarum Mas, Kuala Sepetang, the river estuaries in the state of Perak and Kuala Juru in Penang have been identified as major cockle producing areas under the Balance of Trade (BOT) program for mollusc. Since the bacteriological assessment of cockles from Kuala Sepetang and Kuala Sg. Jarum Mas has not been carried out before, this study was initiated to compare the bacteriological quality of cockles from these areas as compared to the extensively studied area, Kuala Juru. Cockles were collected in February, April and June 2004 and examined for Standard Plate Count (SPC), total coliform (TC), fecal coliform (FC) counts, *Escherichia coli* (EC) counts and presence of pathogens (*Salmonella* spp., *Vibrio cholerae* and *Vibrio parahaemolyticus*). Sample collection and analyses were carried out according to standard microbiological methods. The results indicated that cockles from Kuala Juru and Kuala Sepetang exceeded the safety level for SPC (5×10^5 CFU/g), FC (< 300 MPN/100 g) and EC counts (< 230 MPN/100 g) while, result from Kuala Sg. Jarum Mas falls below the safety level for the same parameter. Statistical analyses showed significant difference for the three areas ($p < 0.05$) for SPC. Meanwhile significant differences were observed in TC, FC and EC counts between Kuala Juru with Kuala Sepetang and Kuala Sg. Jarum Mas ($p < 0.05$). *Vibrio parahaemolyticus* was present in samples from all locations examined, whereas *cholerae* was only detected in cockles from Kuala Juru in February. Presence of *Salmonella* in samples from Kuala Juru and Kuala Sepetang showed that it does not comply with the safety recommendations. The results from this study strongly recommend that cockles harvested in Kuala Juru and Kuala Sepetang to undergo decontamination before sale and eventual consumption.

Keywords

Anadara granosa, Blood cockles, Bivalve, Total coliform, Fecal coliform, *Vibrio paraheamolyticus, E. coli, Salmonellla*

Journal of research in Biology, Vol. 2(3): 184 -192, 2012, Ficus Publishers

A comparative study of fish population in Temengor Reservoir and Bersia Reservoir, Perak, Malaysia

Muzzalifah Abd Hamid, Mashhor Mansor, Zarul Hazrin Hashim, Mohd. Syaiful Mohammad

A study on fish diversity and community of two reservoirs in Hulu Gerik was carried out from August 2009 to December 2009. The two selected reservoirs were Temengor Reservoir and Bersia Reservoir. The aim of this study is to compare the community structures of freshwater fish population between these two reservoirs. A total of 15 species which comprise of six families were recorded in this study. Twelve species were recorded in Temengor Reservoir whereas 13 species were recorded in Bersia Reservoir. The best represented family in both reservoirs was Cyprinidae with eight species in Temengor Reservoir and seven species in Bersia Reservoir. *Cyclocheilichthys* apogon was selected for the length-weight relationship and condition factor analysis. *C. apogon* showed a better growth in Bersia Reservoir in comparison to Temengor Reservoir.

Keywords

Fish diversity, Reservoir, Length-weight relationship, Condition factor, *Cyclocheilichthys apogon*.

16.16 **Asian Journal of Food and Agro-Industry, Vol. 4(04): 247-254, 2011, ISSN 1906-3040**

Proteolytic action in *Valamugil seheli* and *Ilisha melastoma* for fish sauce production

Ng, Y.F., Afiza T.S., Lim, Y.K., Muhammad Afif, A.G., Liong, M.T., Rosma, A. and Wan Nadiah, W.A.

Protease action on fish protein hydrolysis during the production of Malaysian fish sauce, *Budu*, was studied using *Valamugil seheli* and *Ilisha melastoma* as the fermentation substrate. Results indicated that protease activity and degree of hydrolysis of *Ilisha melastoma* were significantly higher ($p < 0.05$) than in *Valamugil seheli*. The liquid percentages (yield) of fish sauce produced by *Valamugil seheli* were significantly higher ($p<0.05$) than that by *Ilisha melastoma* during the two months fermentation. The pH values of the liquid from *Ilisha melastoma* was 5.83 and decreased with time while the pH values of liquid from *Valamugil seheli* was initially 5.68, but increased with time.

Keywords

Fish sauce, Fermentation, Protease, Malaysia, *Budu*

16.17 Asian Journal of Food and Agro-Industry, Vol. 3(05): 473-482, 2010, ISSN 1906-3040

Chemical composition, colour and linear expansion properties of Malaysian commercial fish cracker (keropok)

Nurul Huda, Ang Li Leng, Chung Xian Yee and Herpandi

The objective of this study was to compare and contrast the physicochemical properties of fish crackers from different producers in Malaysia. About 28 samples of fish crackers from several states in Malaysia were purchased and analyzed. The results showed that the samples were significantly different ($p<0.05$) in their chemical composition, colour and linear expansion. The moisture content ranged between 9.37 and 13.83%, whereas fat and ash content ranged from 0.85 to 3.38% and 3.39 to 5.94%, respectively. However, the protein content, which was 5.53-15.80%, differentiates products with high fish content and those with low fish content. The carbohydrate content varied between 53.62 and 80.43%, reflecting high use of starch in the formulation. The calcium (Ca) content in fish crackers varied between 9.75 and 381.50 mg/100 g, indicating that a small amount of fish was used or that bony fish were used in the crackers. Furthermore, sodium (Na) content was between 1183 and 1888 mg/100 g. The L*, a* and b* values of fish crackers ranged from 18.69-47.99, 1.03-5.89 and 7.77-20.62, respectively. The linear expansion of samples varied between 37.55 and 145.95%, which is inversely proportional to the protein content but linearly correlated with the carbohydrate content. These results showed that Malaysian fish crackers produced by different manufacturers were significantly different in chemical composition, colour and linear expansion properties.

Keywords

Snack Food, Testing, Physicochemical Properties, Protein Content

16.18 **Journal of Microbiology, Biotechnology and Food Sciences, Vol. 2(6): 2403-2406, 2013**

The Prevalence Of *Salmonella* sp., *Listeria* sp. and *Aeromonas* spp. In Catfish (Clarias (*Clarias gariepinus*) and Tilapia (*Tilapia mossambica*) by Pelleting Method

Titik Budiati, Gulam Rusul, Wan Nadiah Wan-Abdullah, Yahya Mat Arip, Rosma Ahmad

The aim of this study was to modify the isolation methods of *Aeromonas* sp., *Salmonella* spp., and *Listeria* sp. in catfish (*Clarias gariepinus*) and tilapia (*Tilapia mossambica*) obtained from wet markets and ponds in Malaysia by pelleting the sample. A total of 108 samples (32 catfish intestines, 32 tilapia intestines, and 44 water samples) were obtained from nine wet markets and eight ponds. The modified method was employed by pelleting the samples and followed by either implementing pre-enrichment or without pre-enrichment on the isolation of *Salmonella* and *Listeria* spp. The modified method (by pelleting the sample in combination with pre-enrichment) was the most efficient for *Salmonella* and *Listeria* isolation. The sensitivity of the modified *Salmonella* isolation method was 0.53 and 0.73 for fish and water samples, respectively. The sensitivity of the modified *Listeria* method was 1 and 0.92 for fish and water samples, respectively. However, the sensitivity of the method by pelleting the sample was similar to those of non-pelleting the sample on *Aeromonas* isolation. Five species of *Aeromonas* spp., seven serovars of *Salmonella* sp., and four species of *Listeria* sp. were observed in catfish, tilapia and water samples. Overall, by pelleting the sample offered the beneficial to isolate *Aeromonas* spp., *Salmonella* sp. and *Listeria* spp. in catfish, tilapia and water.

Keywords

Aeromonas, *Listeria*, Pelleting, *Salmonella*

16.19 International Journal of Agricultural Resources, Governance and Ecology, Vol. 7(6): 450-468, 2008, Inderscience Publishers

Evolving more sustainable agriculture in the Cameron Highlands, Malaysia

Barrow, C.J., Chan, N.W., Masron, Tarmiji Bin

Smallholders in many tropical highlands cause serious environmental damage. The Cameron Highlands of Malaysia offer an excellent opportunity for studying how farmers interact with environment, changing markets, infrastructure development, indigenous peoples, and tourism, and how these shape innovation. Our surveys in 2002-2004, 2006 and 2007 show that farmers have intensified production and in doing so some have adopted less damaging practices. We assess trends and causation of changes; this offers opportunities for more proactive management. These findings should be useful for other tropical highlands and possibly lowland urban and periurban smallholders.

Keywords

Environmental Journals, Environment and Sustainable Development, Infrastructures

16.20 **Malaysian Journal of Environmental Management, Vol. 10(2): 89-114, 2009**

Issues and challenges of sustainable agriculture in the Cameron Highlands

Barrow, C.J., Chan Ngai Weng, Tarmiji Masron

The challenge of producing enough food is increasingly affecting almost all developing countries as they prioritise support for industry ahead of agriculture. However, in recent decades, many countries, including Malaysia, have realised the need for food security and self-sufficiency and have embarked on an intensive agricultural programme. Consequently, many tropical highlands suitable for crops are suffering environmental damage through intensive farming with little or no enforcement and control. The Cameron Highlands of Malaysia is an example whereby large tracts of pristine montane forests have been cleared for intensive farming, both for food crops and flowers. This paper examines how farmers, with little government help, interact with environment, changing markets, infrastructure development, indigenous peoples, tourism, and other factors. The paper is based on detailed observation and interviews with farmers, grower associations, government officers and indigenous people to gather information related to farming, land degradation, threats to production and possible sustainable farming options. The results show that Cameron Highlands farmers, despite being left alone facing great challenges, are adapting well and are often flourishing. Many have intensified production, and some are moving toward less environmentally-damaging sustainable strategies. Pressure from NGOs and civil society with stricter government regulation has led to better control of land clearance and degradation, but this has forced farmers to move to neighbouring states. Organic farming is taking off though only a small percentage of growers are involved. Overall, the farmers have demonstrated great resilience, learnt new techniques, initiated and supported more environmentally friendly farming methods, and adapted well to environmental and socio-economic change with little or no outside help.

16.21 International Journal of Engineering Science and Technology (IJEST), Vol. 3(5): 4358 -4366, May 2011, ISSN : 0975-5462

A review study of the reorganization of agricultural extension toward sustainable agricultural development

Jadalla. A.E. Omar, Abu Hassan Abu Bakar, Hasnah MD. Jais and Faisal Moftah Ibraik

Extension is an essential pillar for research and development. However needing of extension to fundamental reforms, moving away from hierarchical (top-down) transfer of information or advice, towards participation process can help better design of agricultural extension programs, enhanced uptake of technology and more desirable or less disruptive impacts on sustainable agricultural development. The purpose of this research paper is to provide an overview of the extent to which the reorganization of agricultural extension toward sustainable agricultural development. This purpose is carried out through the sustainable benefits. However, in an effort to establish content and background information, the literature review consists of a mixture of research and polemics (i.e. of agricultural extension policy, financial resources, cooperation between public agricultural extension sector and private sector, local leaders, field schools, rural credit).

Keywords

Agricultural extension policy, Financial resources, Sustainable agricultural development, Field schools, Local leaders, Cooperation

16.22 **World Journal of Agricultural Sciences, Vol. 8(4): 340-350, 2012, IDOSI Publications ISSN 1817-3047**

Study the impact of organizational characteristics and support mechanism on the performance of agricultural extension in Eastern Libya: Toward organization for sustainable agricultural development

Jadalla. A.E. Omar, Abu Hassan Abu Bakar, Hasnah MD. Jais and Faisal Moftah Shalloof

Extension is an essential pillar for research and development. However, there is a need for fundamental reforms to extension policies: hierarchical (top–down) transfer of information or advice should be moved away from towards a participation process that can help design better agricultural extension programmes, enhance uptake of technology and more desirable or less disruptive impacts on sustainable agricultural development. To achieve this participation, extension organisations need to formally decentralise and pluralise or transfer the control of specific programme planning and management functions to the system levels of local agricultural extension, private sector organisations, farmers' organisations and education organisations where extension programmes are actually implemented. The objective of this study was to identify the most appropriate mechanisms and organisational characteristics to support agricultural extension performance that can be used in achieving sustainable agricultural development. A quantitative research methodology was adopted in this study. Using a questionnaire developed following an extensive literature review, a cross-sectional survey was undertaken in eastern Libya from June to September 2010. According to factor analysis, the implications for performance of agricultural extension were categorised into two groups: (1) organisational characteristics; and (2) support mechanisms. A total of 46 managers and deputy directors were approached for this study. The study also found a positive association between organisational characteristics, support mechanisms and the performance of agricultural extension.

Keywords

Agricultural extension, Organizational characteristics, Support mechanism Performance, Eastern Libya, Sustainable agricultural development

16.23 **International Journal of Engineering and Management Sciences, Vol. 3(3): 387-391, 2012**

The impact of support mechanism on agricultural extension management in Eastern Libya: Toward reorganization for sustainable agricultural development

Jadalla. A. E. Omar, Abu Hassan Abu Bakar, Hasnah Md. Jais & Faisal Moftah Shalloof

Agricultural extension as a source of information plays an important role for the achievement of sustainable agricultural development. The objective of the study was to identify the most appropriate mechanism to support of agricultural extension management that used in achieving sustainable agricultural development. A quantitative research methodology was adopted in this study. Using a questionnaire developed following an extensive literature review, a cross sectional survey was undertaken in the Eastern Libya areas from June to September 2010. A total of 46 managers and deputy directors, were approached for this study. Based on the results analysis, on the predicator variables set, educational organizations, farmers' organizations, agricultural credit organizations, had the most impact upon sustainable agricultural development. Most of respondents were believed that the important of support mechanism for achieving sustainable agricultural development as follow, Transfer of research results to farmers and agricultural extension staff (87.0 %), Participation in the reform of agricultural markets to stabilize farmers' incomes (80.4 %), Support of micro-credit institutions especially through linkages with commercial banks (84.8 %). Finally, re-thinking in management components is mandatory and we must strive to find new functions, strategies and objectives for agricultural extension systems toward sustainable agriculture development.

Keywords

Support mechanism, Agricultural Extension management, Sustainable Agricultural Development, Eastern Libya.

16.24 Journal of Agricultural Technology, Vol. 8(4): 1171-1183, 2012

The impact of major constraints on agricultural extension in eastern Libya

Jadalla A.E. Omar, Abu Hassan Abu Bakar, Hasnah Md. Jais and Faisal Moftah Shalloof

Sustainable agricultural development is defined as successful management of the resources of agriculture to satisfy changing human needs, to conserve the environment and increase biological resources. The agricultural extension services can play a crucial role in providing this network of information on sustainable agricultural education. However, the effectiveness of public extension has gradually decreased in recent years. Reasons such as budget tightness, lack of training programmers' for farmers on sustainable agricultural development, low number of extension personnel and poor infrastructure, lack of motivation, insufficient coordination with research organizations. The main objectives of the present study of sustainable agricultural development were to determine the impact of major constraints among farmers, managers and deputy directors on agricultural extension in Eastern Libya: To enhance food security; to increase productivity and competitiveness of the sector; to deepen linkages with other sectors; to create new sources of growth for the sector; and to conserve and utilize natural resources in a sustainable basis. A quantitative research methodology was adopted in this study. Using a questionnaire developed following an extensive literature review, a cross sectional survey was undertaken in the Eastern Libya areas from June to September 2010. According to factor analysis, the implications for major constraints were categorized into two groups consisting of: (1) The major constraints of farmers (2) The major constraints of managers and deputy directors of agricultural extension. A total of 300 farmers, and 46 managers and deputy directors, were approached for this study. Most of respondents were believed that the important of major constraints of agricultural extension for achieving sustainable agricultural development as follow, lack of training programs (58.0 %), high cost (67.4 %), lack of appropriate market (56 %), limited budget (78.3 %) , lack of motivation (76.1 %), weak linkages between researchers(60.9 %), insufficient communication (58.7 %).

From this study, it can be concluded that the major barriers hampering adoption of sustainable agricultural development, included little financial returns for farmers, problems of administrative, financial to agricultural extension management, who found that management of agricultural extension needed more solutions with respect to sustainable practices particularly in the area of the economics of sustainable agricultural development.

Keywords

Major constraints, Agricultural extension, Sustainable agricultural development, Eastern Libya

16.25 International Journal of Science and Nature, Vol. 4(1): 34-39, 2013,
ISSN 2229 – 6441

Alternative approaches of agricultural extension for dissemination of sustainable agricultural development in Eastern Libya

Jadalla A. E. Omar, Abu Hassan Abu Bakar, Hasnah Md. Jais & Faisal Moftah Shalloof

Agricultural extension as a source of information plays an important role for the achievement of sustainable agricultural development. The main objectives of the present study of sustainable agricultural development were to determine the impact of alternative approaches on agricultural extension in Eastern Libya. A quantitative research methodology was adopted in this study. Using a questionnaire developed following an extensive literature review, a cross sectional survey was undertaken in the Eastern Libya areas from June to September 2011. A total of 46 managers and deputy directors, were approached for this study. Based on the results analysis, on the variables set, participatory approach, farmers' field schools approach, public– private extension approach, had the most impact upon sustainable agricultural development. Most of respondents were believed that the important of alternative approaches for achieving sustainable agricultural development as follow, Transfer of research results to farmers and agricultural extension staff (87.0 %), Participation in the reform of agricultural markets to stabilize farmers' incomes (80.4 %), Support of micro-credit institutions especially through linkages with commercial banks (84.8 %). Finally, re-thinking in management components is mandatory and we must strive to find new functions, strategies and objectives for agricultural extension systems toward sustainable agriculture development.

Keywords

Agricultural extension, Alternative approaches, Sustainable agriculture development, Eastern Libya.

16.26 **International Journal of eBusiness and eGovernment Studies, Vol. 4(2): 51-60, 2012, ISSN: 2146-0744**

Factors influencing a new information and communication technology adoption in Malaysia's agriculture community: Applying the sustainable livelihoods approach

Lee Heng Wei, Mohd Azam Osman, Rosnah Idrus, Maziani Sabudin, Tan Shiang-Yen

ICT intervention in agriculture sector is creating new challenges and opportunities for promoting sustainable farming in Malaysia. This study draws on a research program which is driven by a top research university in Malaysia collaboration with a local agriculture agency in developing a Mobile Community for Farmers. The Mobile Community is a web-based application that deploys Short Messaging Service (SMS)-based technology to assist the farming community in improving their management of farming activities. This study focused on identifying the factors that influence the adoption of the information and communication technology (ICT). Sustainable livelihood framework is introduced in this study in order to fill the gaps in the existing studies of technology acceptance especially technology that promote sustainable livelihood. Most of the technology acceptance models today are overemphasized on the characteristics of the technology itself rather than understanding the impact of a technology towards the livelihood capital assets (human capital, social capital, finance capital, and natural capital). We used partial least square (PLS) analysis and structural equation modeling (SEM) to examine the relationships of human capital assets with farmers' attitude toward intention to adopt the ICT. The results, besides indicating the suitability of the PLS in statistical analysis, has also contributed to a better understanding of ICT intervention in the agriculture sector in Malaysia which has not been tested. Findings are useful for policy makers, agriculture agencies and information system developers to promote sustainable farming through ICT intervention.

Keywords

Mobile Technology, Technology Adoption, Agriculture Management, PLS Analysis

16.27 American-Eurasian Journal of Sustainable Agriculture,Vol. 7(2): 99-107, 2013, ISSN 1995-0748

Determinants and methods of integrated pest management adoption in Bangladesh: An environment friendly approach

Muhammad Humayun Kabir and Ruslan Rainis

Integrated pest management (IPM) is an environment friendly approach that consider as central to achieve sustainable agricultural development. This paper addresses two aspects of IPM; i) to discuss the factors that influence farmers decision for adoption of IPM, and ii) to critically analyze various methods of determination of IPM adoption level. Based on secondary data, the study revealed adoption of IPM is influenced by economic, social, institutional, and management factors where economic factors have greater influence and management have less. Regarding measurement techniques, proportional measures are more appropriate than others to determine IPM adoption level. After due consideration of different measurement techniques, we proposed a method to determine the level of IPM adoption in Bangladesh. In addition, we suggested a set of determinants for better understanding about the adoption of this environment friendly agriculture.

Keywords

IPM, Determinants, Methods, Adoption, Environmental sustainability

16.28 **International Journal of Agriculture and Forestry, Vol. 2(1): 30-34, 2012, Scientific & Academic Publishing**

Exploring the link between land fragmentation and agricultural productivity

Okezie Chukwukere Austin, Ahuchuogu Chijindu Ulunma, Jamalludin Sulaiman

The traditional land tenure system in Nigeria coupled with increasing population encourages land fragmenta-tion with attendant consequences for agricultural productivity and commercialization. This study quantified the degree of land fragmentation and its consequences on arable food production. The study makes use of data from 125 farm households spread across the 12 communities in Umuahia-North Local Government Area (LGA) of Abia State, Nigeria. Using Janusezwski index, the study quantified the degree of land fragmentation. The Cobb-Douglas (CD) and the Generalized Linear Model (GLM) were used in exploring the impact of land fragmentation on arable crop productivity. The mean fragmentation index is 0.55 with a variance of 0.02. The average farm size cultivated is 2.68 hectares. Majority of the households (71 percent) clustered around the mean fragmentation index. The results of the CD and GLM show the negative impact of land fragmentation on agricultural productivity. Labour in the CD model remained the single most important factor of increasing productivity. The GLM show that cultivating farms further away from the homestead will lead to higher pro-ductivity. The study recommends cooperative farming to enable the farmers to adopt productivity improving farm technologies.

Keywords

Land, Fragmentation, Janususzwski Index, Agriculture, Productivity

16.29 Journal of Malaysian Studies, Vol. 30(1), 21–50, 2012

Risk in Malaysian agriculture: The need for a strategic approach and a policy refocus

Okezie Chukwukere Austin and Amir Hussin Baharuddin

The agricultural sector is exposed to a variety of risks that occur with high frequency. These risks include climate and weather, natural catastrophes, pests and diseases, which combine to cause highly variable production outcomes. The broad objective of this study is to examine these agricultural risk factors and the policies in place for countering them. The approach adopted here includes an in-depth review of literature, government policy documents and Emergency Disasters Databases (EM-DAT) data on disaster occurrences. Inferential statistics were employed in data analysis. Risk management in agriculture ranges from informal practices such as the avoidance of highly risky crops and crop and income-source diversification to formal measures such as crop insurance, a minimum-support price system and a futures market. Statistics show the prevalence of weather-related hazards of cyclone, floods, landslides, earthquake and tsunami. As to the impact of such hazards on human health, statistics for 1980–2010 show that deaths caused by epidemics amounted to 43.4% of all deaths arising from natural disasters. Epidemics accounted for the highest number of deaths against 5.8% the lowest arising from mass movement (dry). Government policy documents show that efforts have been made to manage hazards, such as the construction of the Stormwater Management and Road Tunnel (SMART), the tsunami-recovery plan and the December 2006 flood-recovery plan, among others. Analysis shows, however, that not every economic sector has a specific policy for addressing the effect of global warming on its productivity. The nation urgently needs to strengthen its ability to predict the effects of climate variability and subsequent weather hazards. This study recommends the establishment of a coordination-and-planning committee at the national level to address issues related to climate variability and climate change and to identify and mobilise the national capacity to strengthen research-and-development activities in line with national priorities and needs.

Keywords

Risk, Agriculture, Climate change, Strategy, Policy

16.30 World Applied Sciences Journal, Vol. 22 (5): 672-682, 2013, IDOSI Publications
ISSN 1818-4952

Development of indicators for sustainable rice farming in Bangladesh: A case study with participative multi-stakeholder involvement

Ranjan Roy, Ngai Weng Chan and Ruslan Rainis

Indicators are increasingly recognized as an important decision aid tool to translate sustainability issue from theory into practice. However, indicator development for sustainable community development is rather successful than the agricultural sector due to methodological lacuna. The aim of this study is to develop a methodological framework for indicator development and an essential set of indicators of sustainable rice farming in Bangladesh by adopting participatory multi-stakeholders involvement approach. The study adopted informal discussion with academicians, literature review, online experts' survey and focus group discussion with the farmers of three sub-districts that represent irrigated, rainfed lowland and upland rice growing ecosystems. These exercises yielded a set of indicators of three dimensions: economics (6), society (10) and environment (5), as well as a process of deriving indicator system with requisite information. The paper concludes that by employing a true participatory approach indicator development collectively decisive to extract an essential and representative set of indicators. Moreover, the study indicates the more significance of social indicators in promoting rice farming sustainability is Bangladesh. We highlight sustainability indicator development is a fairly demanding and challenging process. However, a blend with stakeholder's knowledge and local experience enhances the questions of indicator's applicability and practicability.

Keywords

Methodology, Delphi technique, Participatory, Sustainable development, Bangladesh

16.31 Journal of Environmental Protection, Vol. 4: 40-51, 2013, Scientific Research

The vision of agri-environmental sustainability in Bangladesh: How the policies, strategies and institutions delivered?

Ranjan Roy, Ngai Weng Chan, Takehiko Uemura, Hidefumi Imura

Agriculture and environmental change are tightly interconnected in ways that require active roles of policy, strategy, and institution for the promotion of sustainable agriculture development. To explore this issue, this study addresses two questions 1) to what extent is environmental integration reflected in policies, strategies, and institutions? And 2) how do these policies, strategies, and institutions turn ambitions into actions? By adopting two frameworks developed by the OECD and the European Environment Agency as well as critically reviewing policy documents and conducting the key informant interviews, the results revealed that most of the policies and strategies integrated the environmental issue and had stipulated action plans and governance structure for implementation. The results also found that institutions mar- ginally integrated the environmental concerns and faced several problems that hindered turning ambitions into actions. Overall, although policy instruments were good, the vision of sustainability was in difficulty to actualizing into action due to weak institutional setup. This study highlights the interdependence between the dimensions of policy implement tation process. Policy implications should emphasize enhancing institutional capacity, revamping agricultural advisory services, and empowering Bangladesh Agricultural Research Council (BARC) to translate the vision of agri-environ- mental sustainability into action.

Keywords

Policy, Strategy, Institution, Development, Sustainable Agriculture, Bangladesh

16.32 Agroecology and Sustainable Food Systems, Vol. 37: 834–856, 2013

Development at the peri-urban area and its impact on agricultural activities: An example from the Seberang Perai Region, Penang state, Malaysia

Yasin Abdalla Eltayeb Elhadary, Narimah Samat, and Franklin Obeng-Odoom

Urban areas are expanding into the countryside, changing the rural landscape and lifestyle of rural communities, and forming an urban-rural interface at these peri-urban areas. New developments brought about by urbanization have important implications for the livelihoods and socioeconomic conditions of local communities. At the peri-urban area, the future of agriculture, farmland, and farmers, especially in the face of massive urbanization, has become a topic of increasing global debate. Concerns have been polarized between two camps: a pessimistic view that peri-urban agriculture is in danger and an optimistic view that, despite the challenges, agriculture is still in practice and in some cases even growing. Several studies have addressed the current trajectories of agriculture in peri-urban areas; however, most of these studies were undertaken in Western nations. In the context of Asian countries, like Malaysia, agricultural adaptation and persistence at peri-urban areas have not been examined. It has been taken for granted that urbanization always leads to the abandonment of agricultural land. The role of urbanization in generating alternative agricultural enterprises that benefit from nearby urban markets has largely been ignored. This article aims to investigate the challenges and opportunities generated by urbanization and recent developments that have taken place in Malaysia. Using the Seberang Perai region of Penang State as a case study, our analysis reveals that farmers have adopted a range of strategies that could be explained using both positive and negative adaptation of Johnston and Bryant's (1987) model. This study moves forward the literature on the future of agriculture in peri-urban areas, particularly in developing countries.

Keywords

Adaptation, Agriculture, Malaysia, Multifunctional, Peri-urban, Urbanization

16.33 Journal of Phytology, Vol. 2(3): 30–38, 2010, ISSN: 2075-6240

Regeneration of Malaysian indica rice (*Oryza Sativa*) variety MR232 via optimised somatic embryogenesis system

Zuraida Abdul Rahman, Suri Roowi, Wan Zaliha W.S. and Sreeramanan Subramaniam

In vitro studies of indica rice variety MR232 via somatic embryogenesis system was established by using mature seeds. By manipulating various plant growth regulators, the optimum medium was obtained by using MS medium containing 5 mg/L NAA (α- naphthaleneacetic acid) and 1 mg/L 2, 4-D (2,4-dichlorophenoxyacetic acid) without browning effect. This treatment showed higher percentage of callus induction and frequency of embryogenesis at the range of 91-97%, which was further, confirmed with the histology studies. The highest whitish somatic embryos frequency (87%) was initiated by incubating embryogenic calli on media containing 10 mg/L ABA and 9 mg/L gelrite agar for 4 weeks. However, the numbers of regenerated plant on medium containing NAA and that was previously pre-treated with 10 mg/L ABA, 9 mg/L gelrite agar and incubation at 8 weeks was the best treatment for shoots induction with 10 plantlets per 3 gm of somatic embryos.

Keywords

Indica rice MR232, Callus induction, Embryogenic callus, Regeneration

16.34 BioResources, Vol. 6(4): 4537-4546, 2011

Preparation and characterization of nano structured materials from oil palm ash: A bio- agricultural waste from oil palm mill

Abdul Khalil H. P. S., Fizree H. M., Jawaid M., Omar S. Alattas

Oil palm ash (OPA), a bio-agricultural waste from oil palm mills, was subjected to high-energy ball milling for 30 h and was converted into a nano-structured material. The nano-structured OPA was characterized for its particle size and crystallinity index by using Transmission Electron Microscopy (TEM) and X-ray Diffraction (XRD) analysis. The crystallite size obtained from TEM and XRD was found to be 50 nm and 54.32 nm respectively, and the crystallinity index of OPA was 66.54%. The shape and texture of raw and nano-structured OPA were studied using scanning electron microscopy. The raw OPA had an irregular shape with spongy and porous structure, while the nano-structured powder had a mostly irregular and crushed shape. The elemental studies of OPA used Energy Dispersive X-ray (EDX) analysis, XRD, and Fourier Transform Infrared Spectroscopy (FT-IR). The elemental compositions found in OPA were silica, potassium oxide, calcium oxide, magnesium oxide, aluminium oxide, and iron oxide.

Keywords

Oil palm ash; Nano structured materials; X-ray diffraction; Silica

16.35 Industrial Crops and Products, Vol. 26(3): 315–323, 2007, Published by Elsevier B.V., ISSN: 0926-6690

Conventional agro-composites from chemically modified fibres

Abdul Khalil, H. P. S, Issam, A. M., Ahmad Shakri, M. T., Suriani, R., Awang, A. Y.

The effect of chemical modification on the performance of agro-composites made from non-toxic chemically modified MDF fibres from oil palm empty fruit bunches and phenol formaldehyde as matrix were investigated. Four types of composite boards were produced (extracted; non-extracted; acetylated; propionylated) and mechanical and physical properties were compared accordingly. Evidence of modification was indicated by increased of weight and was confirmed by Fourier transform infrared analysis (FT-IR). The modification enhanced the composites properties, while unmodified MDF fibres composite showed lower mechanical properties and higher water absorption. The changes in mechanical properties followed the order: acetylated (highest) > propionylated > extracted > non-extracted (lowest). However, water absorption showed different phenomena, the changes followed in the order: extracted (highest) > non-extracted > propionylated > acetylated (lowest).

Keywords

Agro-composites, MDF fibres, Non-toxic-chemical, Phenol formaldehyde, Acetylation, Propionylation

16.36 **International Journal of Environmental Protection and Policy, Vol. 2(1): 1-11, 2014, Science Publishing Group**

Reuse of treated palm oil mill effluents (POME) and carbon dioxide emissions for microalgae cultivation: A review study

Adlil Rajiah Mohd Nasir, Norhashimah Morad, Norli Ismail, Wan Maznah Wan Omar, Roziawati Mohd Razali

Malaysia is the second-largest global exporter and producer of palm oil. Palm oil mill effluents (POME) are waste products produced in large amounts. It therefore becomes a challenge to ensure that POME is well treated or to make certain that the quantity of biomass in POME has been lowered prior to being discharged. In spite of the biodegradability of POME, it cannot be discharged into a watercourse without first being treated. This is due to its acidity and its extremely elevated biochemical demand for oxygen, which is almost one hundred times higher than that of the sewage. However, POME can be efficiently commercialized as a substitute culture medium for microalgae in fresh water. This review study describes alternative methods of POME management, treatments that are available and that exist in the mills, as well as a few other means that can be employed to reduce the quantity of POME discharged.

Keywords

Palm Oil Mill Effluent, Microalgae, Alternative Culture medium, Carbon Dioxide Emission

16.37 International Journal of Scientific and Research Publications, Vol. 3(3), 2013, ISSN 2250-3153

Palm oil mill wastes utilization; sustainability in the Malaysian context

Asha Embrandiri, Mahamad H. Ibrahim, Rajeev P. Singh

Palm oil contributes about 19% of worldwide vegetable oil production with Malaysia accounting for over 50% of total production. Due to the global rise in crude oil prices, scientists have been forced to look for cheaper alternatives and palm oil has provided the right platform. This in turn led to an increase in the oil plantations and production in countries such as Malaysia, Indonesia and Thailand. Palm oil contains a number of vitamins, carotenes, fatty acids, sterols, pigments, and some other components enabling its wide application in the chemical, food and pharmaceutical industries. Palm oil production is an integrated process with several stages starting from good cultivation practices for fruits of high oil content followed by a number of integrated processes for maximal separation and utilization of each oil fraction. The various processing phases generate several by-products which if not dealt with in a scientific manner could lead to deterioration in the ecosystem. In this paper we shall discuss the various on- going researches regarding the use of Palm mill wastes and suggestions on uses of this valuable crop and its by-products as a future to agriculture and a sustainable environment in Malaysia.

Keywords

Sustainability, Composting, Vermicomposting, POMW, Crop for the future

16.38 International Conference on Environmental, Biomedical and Biotechnology IPCBEE, Vol. 41, 2012, IACSIT Press, Singapore

Environmental sustainability in the palm oil industry; palm waste as nutrient supplement and effects on plant growth characteristics

Asha Embrandiri, Parveen F. Rupani, Shlrene Quaik, Mahammad H. Ibrahim and Rajeev P. Singh

The oil palm industry has turned out to be one of the largest flourishing industries in Malaysia these days. This is owing to the fact that petroleum prices have skyrocketed in the last decade which presented a good opportunity for oil palm as an alternative for fuel. With this increase in demand, environmental management in the palm oil industry is an issue of major concern. In the Palm Oil processing there is a surplus of by-products as utilization rate of these byproducts is low especially for Palm Oil Mill Effluent, Empty fruit Bunch and Decanter cake (DC). This paper takes a brief look at the various uses of these wastes with emphasis on our work on decanter cake. Decanter cake (unamended soil i. e. control, 10, 20 and 30 % w/w DC) was used as an amendment to soil for the growth of vegetables (lady's finger, brinjal and tomato). Effects on seed germination and seedling growth, morphological characteristics and growth pattern among the three plants were studied and results showed that10% DC amendment in all three plants had similar germination pattern (70%) whereas germination in 30%DC amendment was very low for tomato and lady's finger and high for brinjal seedlings. There was significant difference between the shoot lengths in the control of lady's finger as compared to the other treatments (10-30%) unlike the root lengths which showed no significant differences across the 3 plants.

Keywords

Nutrient supplement, Sustainability, Decanter cake, Palm oil mill wastes, Dosage

16.39 **Aquaculture Research, Vol. 32: 895-905, 2001**

Contamination of palm kernel meal with *Aspergillus flavus* affects its nutritive value in pelleted feed for tilapia, *Oreochromis mossambicus*

H. A. Lim, W. K. Ng, S. L. Lim & C. O. Ibrahim

An assessment of the nutritive value of palm kernel meal (PKM) and aflatoxin-contaminated PKM (obtained by fermenting PKM with *Aspergillus flavus*) as a dietary ingredient in pelleted feed for tilapia, *Oreochromis mossambicus* Peters, was carried out in a 12-week feeding trial. Seven isonitrogenous (40% crude protein) and isoenergetic (15.1 kJ g^{-1}) practical diets were formulated and fed close to apparent satiation to triplicate groups of 12 fish (mean initial weight 8.4 ± 0.1 g). The control diet contained 30% fish meal and 10% soybean meal (SBM) proteins. Four other experimental diets containing 20% and 50% of the SBM protein replaced by either PKM or fermented PKM, respectively, were formulated. Two additional diets containing either PKM or fermented PKM supplemented with a commercial aflatoxin adsorber (0.5% Sorbatox™) were also formulated. Measured aflatoxin B_1 levels in the fermented PKM-based diets ranged from 75 to 100 µg kg^{-1} diet. The growth performance and feed utilization efficiency of tilapia fed fermented PKM-based diets were significantly lower than in fish fed the control diet at all inclusion levels ($P < 0.05$). Despite a small reduction, weight gains of tilapia fed PKM-based diets were not significantly different compared with fish fed the control diet. The addition of 0.5% Sorbatox did not produce any beneficial or negative effects to the growth of tilapia. Under the dietary conditions of the present experiment, it was concluded that PKM can substitute up to 50% SBM in practical diets for *O. mossambicus* without much adverse effect to fish growth. However, when PKM was contaminated with *A. flavus*, its' incorporation into tilapia diets resulted in growth depression as a result of decreased diet digestibility and also possibly because of the presence of anti-nutrients found in the contaminated PKM.

Keywords

Palm kernel meal, *Aspergillus flavus*, Aflatoxin, Soybean meal, Tilapia

16.40 BioResources, Vol. 8(2): 1573-1581, 2013

Estimation of the ratio of vascular bundles to parenchyma tissue in oil palm trunks using NIR Spectroscopy

Hisashi Abe, Yoshinori Murata, Satoshi Kubo, Ken Watanabe, Ryohei Tanaka, Othman Sulaiman, Rokiah Hashim, Sitti Fatimah Mhd Ramle, Chunhua Zhang, Shuichi Noshiro, Yutaka Mori

In order to use oil palm trunks more effectively, a new method was investigated to estimate the weight-based ratio of vascular bundles (VB) to parenchyma tissue (PT) in study materials taken from oil palm trunks, by using near infrared (NIR) spectroscopy based on chemical analyses of the composition. The VB and PT were carefully separated by hand from oil palm trunks using a polarizing microscope to ensure purity, and then they were mixed at certain ratios. As the VB ratio was increased, extractives, lignin, hemicellulose, and starch contents decreased, while the alpha-cellulose content increased. By using NIR spectroscopy coupled with partial least squares regression analysis, we could predict the ratio of VB to PT with an accuracy of R^2 = 0.99. Absorption peaks significantly affecting estimation were observed at 1929, 2104, 2276, and 2335 nm, which were assigned to the chemical compositions of cellulose and starch. The NIR absorbance is considered to reflect the ratio of VB to PT, according to the compositions of cellulose and starch in oil palm trunks.

Keywords

Oil palm, Vascular bundle, Parenchyma tissue, Chemical composition, Cellulose, NIR

16.41 Sensors, Vol. 12: 14179-14195, 2012

Intelligent color vision system for ripeness classification of oil palm fresh fruit bunch

Norasyikin Fadilah, Junita Mohamad-Saleh, Zaini Abdul Halim , Haidi Ibrahim and Syed Salim Syed Ali

Ripeness classification of oil palm fresh fruit bunches (FFBs) during harvesting is important to ensure that they are harvested during optimum stage for maximum oil production. This paper presents the application of color vision for automated ripeness classification of oil palm FFB. Images of oil palm FFBs of type DxP Yangambi were collected and analyzed using digital image processing techniques. Then the color features were extracted from those images and used as the inputs for Artificial Neural Network (ANN) learning. The performance of the ANN for ripeness classification of oil palm FFB was investigated using two methods: training ANN with full features and training ANN with reduced features based on the Principal Component Analysis (PCA) data reduction technique. Results showed that compared with using full features in ANN, using the ANN trained with reduced features can improve the classification accuracy by 1.66% and is more effective in developing an automated ripeness classifier for oil palm FFB. The developed ripeness classifier can act as a sensor in determining the correct oil palm FFB ripeness category.

Keywords

Artificial neural network, Principal component analysis, Digital image processing, Oil palm fresh fruit bunch

16.42 **Malaysian Journal of Microbiology, Vol 2(1): 7-14, 2006**

Xylanase production by a local isolate, *Trichoderma* spp. FETL c3-2 *via* solid state fermentation using agricultural wastes as substrates

Pang, P. K., Darah. I., Poppe, L., Szakacs, G.and Ibrahim, C.O.

The production of xylanase by a local isolate *Trichoderma* spp. FETL c3-2 via solid state fermentation system using sugar cane baggase: palm kernel cake as substrates was investigated. The optimized solid state fermentation (SSF) system consists of 5 g of sugar cane baggase: palm kernel cake of ratio 90:10 (%, w/w), moisture content of 75% (v/w), pH of moistening agent of pH 7.0, at 30°C and inoculum size of $1x10^8$ spores/ml. The SSF system was also supplemented with 4% (w/w) dextrin and 6% (w/w) of tryptone as additional carbon and nitrogen sources, respectively. Cellulose at the concentration of 0.2% (w/w) was found to be a significant inducer for xylanase production. Using the optimized SSF system, a maximum xylanase productivity of 75.0 U per mg glucosamine after 4 days of fermentation time at 30°C was obtained. The modifications of the SSF system resulted an increase in xylanase productivity by 180% and growth by 40% compared to the basal SSF system.

Keywords

Xylanase production, solid state fermentation, *Trichoderma* spp., agricultural wastes

16.43 World Applied Sciences Journal, Vol. 10(10): 1190-1201, 2010, IDOSI Publications
ISSN 1818-4952

Review of current palm oil mill effluent (POME) treatment methods: vermicomposting as a sustainable practice

Parveen Fatemeh Rupani, Rajeev Pratap Singh, M. Hakimi Ibrahim and Norizan Esa

The total oil palm cover has increased in the last few years, with a corresponding increase in palm oil production. As a result, palm oil waste which is a by-product of the milling process will also increase. The palm oil production process in mills consists of several unit operations. The processing of fresh fruit bunches of oil palm results in the generation of different types of residue. Among the waste generated, palm oil mill effluent (POME) is considered the most harmful waste for the environment if discharged untreated. Palm oil mill effluent is a thick brownish liquid that contains high solids, oil and grease, COD and BOD values. Several treatment technologies have been used for POME treatment, since the direct discharge of POME adversely affects the environment. Due to the presence of high total solids in POME, attempts have been made to convert this waste into valuable products such as feed stock and organic fertilizer. Although POME is organic in nature, it is difficult to decompose in natural conditions. Earthworms can digest the POME producing valuable products such as vermicompost. Vermicompost is a useful product rich in nutrients that can be used as fertilizer in oil palm plantations. This review discusses the various ongoing treatment techniques of POME. The effective treatment of POME using vermicomposting technique is suggested as a good alternative sustainable management practice of this waste.

Keywords

Oil palm, Palm oil mill effluent, Palm oil mill waste, Vermicomposting

17.0 Universiti Teknikal Malaysia

17.1 **IEEE 1st Conference on Clean Energy and Technology, CET 2011, 2011, Article number 6041482, Pages 311-314, 2011 IEEE 1st Conference on Clean Energy and Technology, CET 2011; Kuala Lumpur; Malaysia; 27 June 2011 through 29 June 2011; Category number CFP1183P-AR; Code 87112 © 2011 IEEE**

Investigation on natural waste fibers from dried paddy straw as a sustainable acoustic absorber

Abdullah Y., Putra A., Effendy H., Farid W.M., Ayob Md.R.

The use of synthetic materials as acoustic absorbers is still applied extensively in building industry. These non-biodegradable materials do not only cause pollution to the environment, but also contribute significantly in increasing the CO_2 causing the effect of global warming. Therefore researchers have now driven their attentions to find sustainable and eco-friendly materials to be an alternative sound absorber. This paper discusses the use of natural fibers from dried paddy straw as a fibrous acoustic material. Since this is one of common natural waste materials found across South East Asia, the usage will also minimize the production cost. A panel sound absorber from paddy straw is fabricated and its acoustic properties are investigated through experiment. Good acoustic performance is found particularly above 2000 Hz and is comparable against that from the classical synthetic absorber.

Keywords

Acoustic performance, Non-biodegradable, Sustainable, Synthetic materials

17.2 **IEEE Symposium on Wireless Technology and Applications, ISWTA , 2012, Article number 6373878, Pages 60-65, 2012 IEEE Symposium on Wireless Technology and Applications, ISWTA 2012; Bandung; Indonesia; 23 September 2012 through 26 September 2012; Category numberCFP1297P-ART; Code 95186 © 2012 IEEE**

Potential of dried banana leaves for pyramidal microwave absorber design

Farhany Z.S., Malek F., Nornikman H., Mohd Affendi N.A., Mohamed L., Saudin N., Ali A.A.

Abandoned agricultural waste pose a risk to the environmental and public health. The polyurethane and polystyrene material for designing pyramidal microwave absorber are expensive and not environmental friendly. Tropical crop residue has potential to be used in the electromagnetic testing area. Nowadays, electromagnetic absorbing materials have been increasingly important in ensuring successful Radio Frequency (RF) anechoic chamber testing performance. New material had been research to reduce the cost of designing pyramidal microwave absorber. In this case, dried banana leaves are mixed with polyester and methyl ethyl ketone peroxide (MEKP) to give the best reflection loss performance to the pyramidal microwave absorber compare to the previous research using rice husk. This pyramidal microwave absorber is operating in the frequency range from 0. 1 GHz to 20. 0 GHz.

Keywords

Agricultural waste, Banana leaves, Dielectric constant, Microwave absorber, Reflection loss

17.3 The Scientific World Journal, Volume 2013, 2013, Article number 545948

Effect of CO_2 flow rate on the Pinang frond-based activated carbon for methylene blue removal

Herawan S.G., Ahmad M.A., Putra A., Yusof A.A.

Activated carbons are regularly used the treatment of dye wastewater. They can be produced from various organics materials having high level of carbon content. In this study, a novel Pinang frond activated carbon (PFAC) was produced at various CO flow rates in the range of 150-600 mL/min at activation temperature of 800°C for 3 hours. The optimum PFAC sample is found on CO flow rate of 300 mL/min which gives the highest BET surface area and pore volume of 958 m^2/g and 0.5469 mL/g, respectively. This sample shows well-developed pore structure with high fixed carbon content of 79.74%. The removal of methylene blue (MB) by 95.8% for initial MB concentration of 50 mg/L and 72.6% for 500 mg/L is achieved via this sample. The PFAC is thus identified to be a suitable adsorbent for removing MB from aqueous solution.

17.4 **Procedia - Social and Behavioral Sciences, Volume 40, 2012, Pages 353-357, Asia Pacific Business Innovation and Technology Management Society**

Problems on commercialization of genetically modified crops in Malaysia

K. Ismail, T.N. Tengku Azhar, C.Y. Yong, A.S. Aslan, W.Z. Omar, I. Majid, A.M. Ajagbe

Modern biotechnology is a potential technology to be developed in Malaysia. Advancement in molecular genetics methods such as the recombinant DNA techniques in genetic engineering improves ways to make use of living organisms to benefit human. From the perspectives of agro biotechnology, the methods which enable the introduction of genetic material to be integrated into plant genome called Plant Genetic Modified Technology (PGMT). Since 1980 s Malaysia enthusiastically worked on the development of Genetically Modified (GM) Crops. However, with certain barriers and hindrances, the successful development seems unattainable. This study was conducted to explore the six critical factors and issues which affect the successful commercialization of GM Crops in Malaysia using face to face and telephone interview which involved ten respondents from eight universities and research institutions in Malaysia. The data was analyzed using NVIVO computer software. The results from findings, recommendations and implications to practitioners presented.

Keywords

Genetically modified crops, Intellectual property, Transgenic, Commercialization, Malaysia

17.5 **IEEE Symposium on Wireless Technology and Applications, ISWTA, 2012, Article number 6373879, Pages 66-70, 2012 IEEE Symposium on Wireless Technology and Applications, ISWTA 2012; Bandung; Indonesia; 23 September 2012 through 26 September 2012; Category number CFP1297P-ART; Code 95186 © 2012 IEEE.**

Investigation of sugar cane bagasse as alternative material for pyramidal microwave absorber design

Liyana Z., Malek F., Nornikman H., Mohd Affendi N.A., Mohamed L., Saudin N., Ali A.A.

Sugar cane bagasse as is potential agricultural waste to produce an alternative and beneficial product for any suitable application such as pyramidal microwave absorber for anechoic chamber testing application. In this work, the dielectric properties (dielectric constant and tangent loss) of the sugar cane baggase had been measured using the dielectric probe measurement. The sugar can bagasse pyramidal microwave absorber had been modelled and simulate in the CST Microwave Studio using the data from the dielectric probe measurement. This pyramidal microwave absorber had been operating in the microwave frequency range between 0. 1 GHz to 20. 0 GHz. The targeting reflection loss of this pyramidal microwave absorber is better than- 30 dB. The reflection loss performance comparison with the rice husk also had been done in this work.

Keywords

Dielectric constant, Microwave absorber, Reflection loss, Sugar cane baggase

17.6 **Progress in Electromagnetics Research, Volume 117, 2011, Pages 449-477**

Rubber tire dust-rice husk pyramidal microwave absorber

Malek F., Cheng E.M., Nadiah O., Nornikman H., Ahmed M., Abd Aziz M.Z.A., Osman A.R., Soh P.J., Azremi A.A.H., Hasnain A., Taib M.N.

Rubber tire dust-rice husk is an innovation in improving the design of pyramidal microwave absorbers to be used in radio frequency (RF) anechoic chambers. An RF anechoic chamber is a shielded room covered with absorbers to eliminate unwanted reflection signals. To design the pyramidal microwave absorber, rice husk will be added to rubber tire dust since the study shows that both have high percentages of carbon. This innovative material combination will be investigated to determine the best reflectivity or reflection loss performance of pyramidal microwave absorbers. Carbon is the most important element that must be in the absorber in order to help the absorption of unwanted microwave signals. In the commercial market, polyurethane and polystyrene are the most popular foam-based material that has been used in pyramidal microwave absorber fabrication. Instead of using chemical material, this study shows that agricultural waste is more environmentally friendly and has much lower cost. In this paper, three combinations of rubber tire dust and rice husk are fabricated to investigate the performance of microwave absorber reflection loss in operating in the frequency range from 7 GHz to 12 GHz.

Keywords

Chemical materials, Commercial market, Environmentally-friendly, Frequency ranges, Innovative materials, Lower cost, Microwave absorbers, Microwave signals, Radio frequencies, Reflection loss, Rice husk

17.7 **World Applied Sciences Journal, Volume 22, Issue 3, 2013, Pages 424-433**

Review on the application of a tray dryer system for agricultural products

Misha S., Mat S., Ruslan M.H., Sopian K., Salleh E.

Application of tray dryer is widely used in agricultural drying because of its simple design and capability to dry products at high volume. However, the greatest drawback of the tray dryer is uneven drying because of poor airflow distribution in the drying chamber. Implementing the proper design of a tray dryer system may eliminate or reduce non-uniformity of drying and increases dryer efficiency. This paper discussed several design of tray dryer system for drying agricultural products and its performance. Most of the dryer systems have been developed are using solar energy because the systems run at low operating cost. Computational fluid dynamics simulation is a very useful tool in the optimization of the drying chamber configuration by predicting the airflow distribution and the temperature profile throughout the drying chamber.

Keywords

Agricultural drying, Solar dryer, Tray dryer

17.8 **Procedia Engineering, Volume 53, 2013, Pages 632-638, 2012 Malaysian Technical Universities Conference on Engineering and Technology, MUCET 2012; Kangar, Perlis; Malaysia; 20 November 2012 through 21 November 2012; Code 101810 © 2013 The Authors.**

Utilizing sugarcane wasted fibers as a sustainable acoustic absorber

Putra A., Abdullah Y., Efendy H., Farid W.M., Ayob M.R., Py M.S.

The use of synthetic materials as acoustic absorbers is still applied extensively in building industry. These non-biodegradable materials do not only cause pollution to the environment, but their production also contributes significantly in emitting greenhouse gas in the atmosphere. Corresponding research has therefore being driven to find sustainable and eco-friendly materials to be an alternative sound absorber. This paper discusses the utilization of natural fibers from sugarcane waste to be an acoustic material. Sound absorber samples from sugarcane wasted fibers are fabricated and their acoustic properties are investigated through experiment. Good acoustic performance is found at 1.2-4.5 kHz with average absorption coefficient of 0.65 and is comparable against that from the classical synthetic absorber.

Keywords

Absorption coefficient introduction, Acoustic material, Natural fibers, Sound absorber, Sugarcane waste

17.9 **Advances in Acoustics and Vibration, 2013, Article number 605932**

Biomass from paddy waste fibers as sustainable acoustic material

Putra A., Abdullah Y., Efendy H., Mohamad W.M.F.W., Salleh N.L.

Utilization of biomass for green products is still progressing in the effort to provide alternative clean technology. This paper presents the utilization of natural waste fibers from paddy as acoustic material. Samples of sound absorbing material from paddy waste fibers were fabricated. The effect of the fiber density, that is, the fiber weight and the sample thickness, and also the air gap on the sound absorption coefficient is investigated through experiment. The paddy fibers are found to have good acoustic performance with normal incidence absorption coefficient greater than 0.5 from 1 kHz and can reach the average value of 0.8 above 2.5 kHz. This result is comparable against that of the commercial synthetic glass wool. Attachment of a single layer of polyester fabric is shown to further increase the absorption coefficient.

17.10 Progress in Electromagnetics Research, Volume 137, 2013, Pages 687-702

Development of pyramidal microwave absorber using sugar cane bagasse (SCB)

Zahid L., Malek F., Nornikman H., Mohd Affendi N.A., Ali A., Hussin N., Ahmad B.H., Abd Aziz M.Z.A.

The need to find ways to effectively utilize the large quantities of agricultural waste that are produced is indicative of the huge potential associated with producing an alternative pyramidal microwave absorber for anechoic chamber-testing applications. We propose the development of a pyramidal microwave absorber that can use sugar cane bagasse (SCB), a byproduct from the production and processing of sugar cane, as the absorbent. In this paper, we report the results of our use of dielectric probe measurement to determine the dielectric constant and loss tangent of SCB. These values were used to model and simulate an SCB pyramidal microwave absorber in Computer Simulation Technology's (CST's) Microwave Studio. This absorber was operated in the microwave frequency range between 0.1GHz and 20.0 GHz.

Keywords

Computer simulation technology, Dielectric probe, Loss tangent, Microwave absorbers, Microwave frequency ranges, Microwave studios, Sugarcane bagasse

18.0 **Universiti Teknologi MARA, Malaysia**

18.1 **Social and Behavioral Sciences, Volume 68, 19 December 2012, Pages 156-163**

Legal implications on sales and purchase, uses and misuses of agro chemicals in smallholders' agro production in Malaysia

Alizah Ali, Roha Mohamed Noah, Shaherah Abd Malik

Purpose of this study is attempted to look into laws and prohibition on sales and purchase, use and misuses of rural farmers' agrochemicals towards the agro food production and conservation of ecosystem in Malaysia. Agrochemical such as artificial fertilizers, fungicides, herbicides and insecticides in manageable of rural farmers' food yielding production could cost human hardship upon consumptions and detrimental to conservation. Economic sustainable minimal or chemical free tropical food yielding agriculture food crop not only will reap in profits in upgrading income and livelihood but will definitely create a good environment in developing countries. There are significant differences on laws and prohibition on sales and purchase, use and misuses of rural farmers' agrochemical application towards the agro food production and conservation of ecosystems in Malaysia and other developing countries with the implementation of laws on agriculture chemicals.

18.2 **Industrial Crops and Products, 37 (1), May 2012, Pages 427-434**

Basic properties of grain by-products and their viability in polypropylene composites

Andrzej K. Bledzki, Abdullah A. Mamun, Noor N. Bonnia, Sahrim Ahmad

The objective was to study the potential of grain by-products (husk) of grains such as wheat (*Triticum aestivum* L; German name is Weizen) and rice *(Oryza sativa)* as reinforcements for thermoplastics as an alternative to or in combination with wood fibres. Prior to composites preparation, the chemical components of fibres such as cellulose, hemi-cellulose, lignin, starch, protein and fat were measured and the surface chemistry and functionality of grain by-products were studied using EDX and FT-IR. Structural constituents (cellulose, starch) were found in wheat husk (W) equal 42%, in rice husk 50% and in soft wood 42%, respectively. Thermal degradation characteristics, the bulk density, water absorption and the solubility index were also investigated. Wheat husk (W) and rice husk were found thermally stable at temperatures as low as 178 °C and 208 °C, respectively. The particle morphology and particle size were investigated using microscopy. Water absorption properties of the fibres were studied to evaluate the viability of these fibres as reinforcements. Polypropylene composites were fabricated using a high speed mixer and an ensuing injection moulding process with 40 wt% fibre. The tensile and Charpy impact strength of the resulting composites were investigated. The tensile elongation at break was found to 75% for wheat husk (W) composites and 23% for rice husk composites better than soft wood composites. Rice husk composites showed 13% better Charpy impact strength than soft wood composites. Due to coupling agent, tensile strength of composites found to improve 25% for soft wood, 35% for wheat husk (W) and 45% for rice husk.

18.3 **Phytochemistry, Volume 85, January 2013, Pages 7-29**

Medicinal property, phytochemistry and pharmacology of several *Jatropha* species (Euphorbiaceae): A review

Carla W. Sabandar, Norizan Ahmat, Faridahanim Mohd Jaafar, I. Sahidin

The genus *Jatropha* (Euphorbiaceae) comprises of about 170 species of woody trees, shrubs, subshrubs or herbs in the seasonally dry tropics of the Old and the New World. They are used in medicinal folklore to cure various diseases of 80% of the human population in Africa, Asia and Latin America. Species from this genus have been popular to cure stomachache, toothache, swelling, inflammation, leprosy, dysentery, dyscrasia, vertigo, anemia, diabetis, as well as to treat HIV and tumor, opthalmia, ringworm, ulcers, malaria, skin diseases, bronchitis, asthma and as an aphrodisiac. They are also employed as ornamental plants and energy crops. Cyclic peptides alkaloids, diterpenes and miscellaneous compounds have been reported from this genus. Extracts and pure compounds of plants from this genus are reported for cytotoxicity, tumor-promoting, antimicrobial, antiprotozoal, anticoagulant, immunomodulating, anti-inflammatory, antioxidant, protoscolicidal, insecticidal, molluscicidal, inhibition AChE and toxicity activities.

18.4 Journal of Agricultural Science, 1 (2), 2009

Soil and agricultural capability of UiTM Sarawak campus farm, Malaysia

Hasmah Mohidin, Radziah Jack, Sulaiman Man, Kamaruzaman Jusoff

An area of 40.5 ha at UiTM Sarawak, Samarahan Campus farm was surveyed at a detailed level. There are three soil major groups, three soil families and six soil series identified in UiTM Sarawak, Samarahan campus. The three soil major groups are Red Yellow Podzolic (RYP), Gley and Organic. The three soil families are BEKENU and MERIT Family of RYP Group, BIJAT and TATAU Family of Gley Group and ANDERSON Family of Organic group. The soil series identified are Bekenu of BEKENU Family, Merit and Jakar of MERIT Family, Daro of BIJAT Family, Tatau of TATAU Family and Gadong of ANDERSON Family. The majority of the area is classified as having agriculture capability of Class 2t, 3te and 4te. Class 2t, 3te, 4te consist of Jakar, Merit and Bekenu series and which are restricted for agriculture due to the steepness of the slope. Class 3wi consists of Daro series soil where wetness and inundation hazard is a moderate limitation for agriculture use. Class 4fw consists of Tatau series soil which is not suitable for agriculture used due to serious fertility and serious wetness. Class 04go consists of Gadong series which is also not suitable for agricultural use due to high groundwater table and undecomposed organic surface layer.

Keywords

Soils, Agriculture, Soil capability, Soil classification, Campus farm, UiTM Sarawak

18.5 **Social and Behavioral Sciences, Volume 68, 19 December 2012, Pages 910-920**

The effects of urbanization towards social and cultural changes among Malaysian settlers in the federal land development schemes (FELDA), Johor Darul Takzim

Noreen Noor Abd Aziz, Wan Haslin Aziah Wan Hassan, Nur Adilah Saud

The Malaysian Government has brought changes in the rural region by creating agriculture projects and re-grouping landless families from rural as well as suburb areas in the planned FELDA scheme throughout the country. Four dimensions were studied, demographic, economic, social and psychological to determine any social and cultural changes due to urbanization in FELDA settlements. The economic dimension was believed to give significant change to settlers while demographic dimension gave little effect. Almost all respondents agreed that urbanization will change their social and cultural lives. Urbanization could benefit all FELDA settlers' current and future generations by improving their living status.

18.6 **Social and Behavioral Sciences, Volume 50, pp 667-674. 2012**

Value of nature in life: landscape visual quality assessment at rainforest trail, Penang

Noralizawati Mohamed, Noriah Othman, Mohd Hisham Ariffin

Interest in recreational activities such as visiting the trail, observe nature and meditation has increased in the Rainforest Trail of Penang Botanical Garden recently. Previous research found that the landscape visual quality is the main reason why people visit the place. A survey was undertaken on visitors to the Rainforest Trail for this purpose. The data was analysed using descriptive statistics, correlations and significant differences tests. This study found that the man-made landscape can be considered contrary to the intended natural characteristic of the Rainforest Trail even despite, attempts to blend in the man made changes with original natural appearance.

19.0

Universiti Tenaga Nasional, Malaysia

19.1 **African journal of business management Vol. 5(22), pp. 9684-9704, 30 September, 2011 Available online at http://www.academicjournals.org/AJBM, ISSN 1993-8233 ©2011 Academic Journals**

Firm entrepreneurial orientation and knowledge/networking of agro-based enterprises in Malaysia: Role of technology and strategy

Amran Awang, Zainal Ariffin Ahmad, Abdul Rashid Said Asghar, Khairul Anwar Subari, Shamsul Anaz Kassim

Resurgence in agricultural-based sectors in Malaysia has recently prompted this study to explore the multi-dimensional entrepreneurial orientation (EO) relationship to knowledge and networking among the Malaysian Bumiputera small and medium agro-based enterprises (BSMAEs). The moderating role of technology and strategy on EO-knowledge-network relationship prompted some interesting findings. Based on 615 observations of BSMAEs, throughout Malaysia, factor analysis, multiple regression analysis and simple slope analysis were performed to substantiate the hypothesis. The findings suggested that EO explained both SMAEs' knowledge and network strategy, and subsequently, interaction of technology development, resources and strategic capability and visionary showed that they were more positively related to higher human capital, tacit knowledge, strategic alliance and social networking proficiency when specific EO dimension was higher than when it was low. The impact is crucial for country's agro-based strategic entrepreneurial policy development in the future. Besides enriching the emerging strategic entrepreneurship body of knowledge, the findings strengthened resource-based view (RBV) social capital and knowledge-based theories. Finally, the paper discusses recommendations to encourage more studies in EO under the purview of strategic entrepreneurship in the future.

Keywords

Bumiputera small and medium agro-based enterprises (SMAEs), Entrepreneurial orientation, Knowledge, Networking, Technology, Strategy, Malaysia

19.2 **International Business Research, 3 (3), July 2010, Published by Canadian Center of Science and Education**

Energy use in agriculture sector: input-output analysis

Hussain Ali Bekhet, Azlina Abdullah

Many sectors rely on energy as input to produce output. Even though the use of energy in agriculture sector is not as high as in other sectors, it is important to study the connectedness between the two sectors as there is no study done so far to show the linkages between them in Malaysia. Input-output analysis has been used to study the connectedness degree between the two sectors using input-output data for 1991-2000. The direct and total backward linkages analyses have shown that there is a significant increase in the use of energy in agriculture sector for the 1991-2000 period but the connectedness is still weak. Among the three energy-related sectors namely; crude oil, natural gas & coal, petrol & coal industries and electricity & gas, it was found that the agriculture sector depends more on inputs from petrol & coal industries as compared to the other two sectors. Based on these results, some policy implications have been proposed to help the decision-makers in economic planning especially on implementing policies related to energy and agriculture sectors.

Keywords

Input-Output, Linkages, Connectedness, Energy, Agriculture

19.3 **African Journal of Economic and Sustainable Development, 1 (4), pp 337-352, 2012**

Scrutinising the influence of the performance of Malaysia agricultural sector on energy use

Hussain Ali Bekhet and Azlina Abdullah

Most sectors rely on energy as input to produce output. Though the use of energy by the agriculture sector is not as high as in other sectors, it is still necessary to study the links between the two. This is vital as there are only few studies that illustrate the bonds between them in Malaysia. This study resorts to input-output analysis to examine the link between the two sectors and assess their economic sustainability using input-output data for 1991 to 2005 period. This analysis and assessment show the existence of linkages between agriculture and energy sectors. However, the linkage is not strong for the named period. Among the three energy subsectors, the agriculture sector relies heavily on inputs from 'petrol and coal industries' as compared to the other two subsectors. As such, the current study introduces some policy implications to further diversify the sources of energy use and to promote the most efficient utilisation of energy in agriculture sector.

Keywords

Input-output, Energy consumption, Agriculture, Sustainability, Performance, Sustainable economy, Malaysia, Sustainable development, Energy diversification

19.4 PROSIDING PERKEM VII, JILID 2 (2012) 729 – 737 ISSN: 2231 – 962X

Foresighting for strategic oil palm industry planning

Mohd Noor M. , Zaimah D., Norshaheeda M.N.

Knowledge of long term outcome possibilities of events is crucial for business and general planning. Previous method of seeing into the future has generally been the statistical forecasting technique. Forecasting technique is only able to see too short into the future and therefore is less useful for strategic planning. Foresighting is a relatively new technique of seeing further into the future and therefore would be more useful for business planning. It is a multidisciplinary approach which first identifies industry key drivers through information gathering from focus group studies. The value addition of this technique is the delivery of breakthrough in thinking. This paper discusses the disadvantages of traditional forecasting and introduces the alternative method of foresighting. With this method, businesses, industries and other sectors of the economy would be able to see 10 or more years into the future and accordingly adjust the present plans to suit the organisational vision.

Keywords

Innovation, Technology, Research projects, Foresighting, Palm oil.

19.5 **The 8th International Conference on Robotic, Vision, Signal Processing & Power Applications Lecture Notes in Electrical Engineering Volume 291, pp 107-117. 2014**

Review of research in the area of agriculture mobile robots

Sami Salama Hussen Hajjaj, Khairul Salleh Mohamed Sahari

Rise in demand for food worldwide has led the agriculture industry to shift towards Corporate Agriculture; major conglomerates operate huge lands with Precision Farming; maximizing outputs and utilization of resources while reduce waste and costs. This efficiency required the introduction of Automation and Robotics in Agriculture, which led to great technological challenges. This in turn sparked interest in research in the area of Agriculture Mobile Robots (AMRs). This paper reviews research in this area for the last 5 years; it highlights examples of robots already in action in fields around the world, identifies trends and important sub-topics, and finally outlines the direction of where research in Mobile Agriculture Robots is heading.

Keywords

Agriculture mobile robots, Mobile robot navigation in agriculture, Image processing for agriculture, Tractor-trailer stability, Agribots

20.0

University Sumatera Utara, Indonesia

20.1 **Research Journal of Seed Science 6 (2), pp. 40-48, 2013**

PEG 6000 Ability test and fungicide efficacy in improving storability of shelled rubber (*Hevea brasilliensis* Muell. Arg) seed

Charloq, Lubis, Z., Siregar, T.H., Elisa, J., Sirait, B.A., Mathius, N.T.

Rubber seeds are recalcitrant seed that are susceptible to fungal attack during storage, therefore it will lose strorability in a short time. The purpose of this study was to test the ability of polyethylene glycol 6000 (PEG 6000) to maintain strorability of shelled rubber seeds and the efficacy of fungicide to reduce fungal attack during storage. Completely randomized design was applied with two factors and three replications, i.e., PEG 6000 (%w/v): 0, 15, 30, 45, 60% and fungicide (active ingredients were Pyraclostrobin+Metiram): g/1 kg of seeds): 0, 10, 20, 30 and 40 g. The results showed that 30% PEG maintained strorability of 12 and 16 days where the fungus attacks were 18 and 42%, respectively. Fungicide of 40 g/1 kg was effectively inhibited the growth of fungal during storage, where at 12 and 16 days had fungal attack of 19 and 40%, respectively. The combination of PEG-6000 30% and fungicide of 40 g/1 kg was effective in improving the seed viability, the seeds were able to stand fungal attack during storage of 16 days to 18 with 96% germination. PEG 6000 and fungicide blended with the right combination as a media store, had significant effect in maintaining seed viability.

Keywords

Rubber seed, Recalcitrant seed, Viability, Storability, Fungicide, Polyethylene glycol 6000.

20.2 **Journal of Physics: Conference Series 435 (1) , art. no. 012040, 2013**

Sustainable multi-product seafood production planning under uncertainty

Simanjuntak, R., Sembiring, M., Sinaga, R., Pakpahan, E.J., Mawengkang, H.

A multi-product fish production planning produces simultaneously multi fish products from several classes of raw resources. The goal in sustainable production planning is to meet customer demand over a fixed time horizon divided into planning periods by optimizing the tradeoff between economic objectives such as production cost, waste processed cost, and customer satisfaction level. The major decisions are production and inventory levels for each product and the number of workforce in each planning period. In this paper we consider the management of small scale traditional business at North Sumatera Province which performs processing fish into several local seafood products. The inherent uncertainty of data (e.g. demand, fish availability), together with the sequential evolution of data over time leads the sustainable production planning problem to a nonlinear mixed-integer stochastic programming model. We use scenario generation based approach and feasible neighborhood search for solving the model.

20.3 Starch/Staerke 65 (3-4) , pp. 312-321, 2013

Preparation and partial characterization of low dextrose equivalent (DE) maltodextrin from banana starch produced by enzymatic hydrolysis

Yusraini, E., Hariyadi, P., Kusnandar, F.

This study was aimed to prepare low dextrose equivalent (DE) maltodextrin from banana starch. Banana starch was extracted from unripe banana fruit var. uli after steeping in 0.045 M sodium hydroxide. This process yielded 42.58% of starch (in dry basis) and produced high purity starch (97.96%, db) and excellent whiteness (99.44%). The gelatinized banana starch was hydrolyzed enzymatically by using α-amylase from *Bacillus subtilis*. Starch hydrolysis used a batch reactor with a four-blade Teflon pitched turbine impeller at 75°C (at initial gelatinization temperature of banana starch) for 10 min to produced maltodextrin with DE ≈ 3.. Particle size of irregularly shaped banana maltodextrin (BM) granules were below and around 5 mm in diameter. This BM produced a fat-like gel texture, which was similar to that of commercial maltodextrin (CM; N-Lite D). This maltodextrin had also a lower in vitro digestibility than that of the commercial one and potato starch.

Keywords

Banana starch, Dextrose equivalent, Hydrolysis, Maltodextrin

American Journal of Agricultural and Biological Science 7 (4) , pp. 461-467, 2012

Examination of chitinolytic bacteria in alginatechitosan encapsulation on chili seed against damping off caused by *Fusarium oxysporum*

Suryanto, D., Indarwan, A., Munir, E.

One alternative in biological control of plant pathogenic fungi is to provide biological agent inoculant in coated seed. This study was to evaluate potential control and viability of two chitinolytic bacteria, *Enterobacter* sp. BK15 and *Bacillus* sp. BK17 of alginate-chitosan encapsulation coated on chili seed against damping off caused by *Fusarium oxysporum*. Chili seed beads were stored at refrigerator and room temperature. Examination of the bacteria ability in reducing seedling off was conducted by growing and treating the seed beads with *F. oxysporum* inoculum. Bacterial cell viability was measured by growing grinded chili bead in minimum salt medium with chitin as sole C source. Re-isolation of infected seedling was done by growing it in potato dextrose agar. The result showed that the bacteria in alginate-chitosan coated seeds reduced chili damping off. Chili seedling height and dry-weight did not differ with those of (-) control, treatment with no bacterial and fungal inoculation and differed with (+) control, treatment of fungal inoculation only. Re-isolation of infected seedling showed similar fungal characterization of inoculated *F. oxysporum*. Bacterial cell viability decreased significantly in 30 days of storage both at refrigerator and room temperature. However, cell viability stored at refrigerator was higher rather than that of room temperature.

Keywords

Bacillus sp., Biological control, Coated seed, *Enterobacter* sp., Seedling off

20.5 Weed Research 52 (2) , pp. 178-186, 2012

Resistance evaluation for herbicide resistance-endowing acetolactate synthase (ALS) gene mutations using *Raphanus raphanistrum* populations homozygous for specific ALS mutations

Yu, Q., Han, H., Li, M., Purba, E., Walsh, M.J., Powles, S.B.

Acetolactate synthase (ALS)-inhibiting herbicide resistance is common in *Raphanus raphanistrum* (wild radish) populations across the Western Australian (WA) grain belt. This study investigates the molecular and biochemical basis of ALS herbicide resistance in five *R. raphanistrum* populations. Five known ALS herbicide resistance–endowing mutations (Pro-197-Ala, Pro-197-Thr, Pro-197-Ser, Asp-376-Glu and Trp-574-Leu) were identified, and their resistance spectrum to ALS-inhibiting herbicides was determined using purified populations individually homozygous for each mutation (except for Pro-197-Ala). Plants homozygous for ALS mutations at Pro-197 were found to be cross-resistant to ALS-inhibiting sulfonylurea (SU) and triazolopyrimidine (TP) herbicides, while plants homozygous for Trp-574-Leu were resistant to SU, TP and imidazolinone (IMI) ALS herbicide classes. The Asp-376-Glu mutation is reported here for the first time in *R. raphanistrum* populations and characterised at both the whole-plant and enzyme level. Plants homozygous for Asp-376-Glu were highly resistant to SU and TP herbicides, based on LD_{50} R/S ratios (>130 and 128 respectively) and I_{50} R/S ratios (170 and >110 respectively). In contrast, these plants were moderately resistant to the IMI imazamox (LD_{50} R/S ratio of 8, I_{50} R/S ratio of 3) and imazethapyr (I_{50} R/S ratio of 8) and susceptible to imazapyr (I_{50} R/S ratio of 0.76). A novel observation in this study is that resistance of homozygous Glu-376 plants is associated with a remarkable growth reduction in the presence of the ALS herbicides tested, making early resistance diagnosis and management difficult.

Keywords

Acetolactate synthase, Herbicide resistance, Target-site mutation, Wild radish

20.6 Asian Journal of Agricultural Research 5 (6) , pp. 292-299, 2011

Physicochemical and functional properties of fermented starch from four Cassava varieties

Julianti, E., Lubis, Z., Ridwansyah, Yusraini, E., Suhaidi, I.

The weaknesses of cassava starch as the raw materials in food industries are low protein content, the ununiform of viscosity and gel forming ability, not resistant to high temperature of heating, acidic conditions and mechanical processes and prone to be syneresis. The purpose of this research was to modify cassava starch by fermentation to produce high nutritional value of starch and better physical and chemical characteristics than those of the native one. Cassava varieties used in this research were the Adira 1, Malaysia, Tahunan and Gunting Saga that are widely grown by farmers in North Sumatera. Starch modification process was done through several methods of fermentation i.e., natural fermentation by soaking in tap water for 16 days, soaking in distilled water for 16 h at 30°C, soaking in 1% lactic acid solution for 16 h at 30°C. After that the fermented starch was dried under the sun or by oven at 50°C. The results showed that different methods of fermentation and drying produced cassava starch of different physicochemical and functional characteristics. The process that produced the good physicochemical and functional characteristics of starch was the natural fermentation by soaking in water for 16 days and dried under the sun based on the color, paste clarity, water and oil absorption of the starch. Starch from Malaysia and Gunting Saga varities had better physicochemical and functional properties if used in making bread or noodles compared to those produced from Adiral and Tahunan.

Keywords

Cassava varities, Modified starch, Fermentation, Starch properties

20.7 African Journal of Microbiology Research Vol.6(9), pp. 2053-2059 , March 2012

A possibility of chitinolytic bacteria utilization to control basal stems disease caused by *Ganoderma boninense* in oil palm seedling

Suryanto, Dwi, Wibowo, Rizky Hadi, Siregar, Edy Batara Mulya, Erman Munir

The utilization of chitinolytic bacterial isolates *Enterobacter* sp. KR05, *Enterobactercloacae* LK08, *Bacillus* sp. BK13, *Enterobacter* sp. BK15, and *Bacillus* sp. BK17 to control basal stem rot disease caused by *Ganoderma boninense* in oil palm seedling was studied. Antagonistic assay of chitinolytic bacterial isolates to *G. boninense* was conducted in minimum salt medium agar with 2% colloidal chitin as sole carbon source. To examine ability of the isolates in reducing basal stem rot disease incidence, the 3 to 4 months old of oil palm seedlings were treated by pouring oil palm seedling growing media with chitinolytic bacterial isolates a day prior infestation of *G. boninense* spores. The result showed that all chitinolytic isolates inhibited the growth of *G. boninense in vitro*. Hyphal abnormalities that is, dwarf, tiny, curled, twisted and bulby hyphae were observed after antagonistic assay. All chitinolytic isolates were able to reduce the disease incidence on the oil palm seedling to some extent. The isolates might infest into the oil palm seedling root as endophytes.

Keywords

Antagonistic assay, Chitinolytic bacteria, *Ganoderma boninense*, Hyphal abnormality, Oil palm.

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