Faculty of Agro Based Industry (FIAT)

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“Nurturing Talent and High Quality Research”

Abstract Book
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A. Social Science
The impact of social media influencers (SMIs) on the customer purchase decision among youth in Penang

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Social Media Influencers (SMIs) are emerging as a new trend for the marketing industry in the last few years; many companies have started to apply influencer marketing as their new advertising approach. Since SMIs are still not well acknowledged in Malaysia, the theory foundation for the related topic is scarce, fewer studies investigating how SMIs influence the customer purchase intention especially among youth. Therefore, this study aimed to determine the impact of SMIs on customer purchase intention based on the Theory of Reasoned Action (TRA) and source credibility model. The main objective of the study is to identify the factors that lead to the customer purchase intention under the impact of SMIs and the identification of the SMIs’ attributes that likely to influence the customer purchase intention. The factors include attitudes towards SMIs (AT), subjective norm (SN), SMIs’ attractiveness (SA), SMIs’ trustworthiness (ST) and SMIs’ expertise (SE). Non-probability sampling, namely the purposive sampling was used for collecting data among the youth in Penang while the 300 valid data responses were analyzed using the Statistical Package and Social Sciences 21 (SPSS 21). The result showed Youth from Penang tends to have high purchase intention under the impact of SMIs. This study showed that AT, SA, ST and SE have a significant and positive influence towards the customer purchase intention under the impact of SMIs while SN showed an insignificant and negative association. The most influencing factor is SA followed by ST, AT and SE is the weakest factors. SMIs’ attributes include SA, ST and SE in which the result indicated that SA is the most likely SMIs’ attributes to influence customer purchase intention followed by ST and lastly SE. Thus, the results provide important considerations and implication for marketers in creating the right marketing strategies. Both marketing and academia fields can gain benefit from the knowledge obtained from this study.

Keywords: Social Media Influencers (SMIs), customer purchase intention, youth, Theory of Reasoned Action (TRA), source credibility model
Purchasing behavior of UMK students towards natural personal care and toiletries products

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The growth of the natural personal care and toiletries products in Malaysia is still in infancy. The number of conventional personal care and toiletries products is higher in the market compared to natural personal care and toiletries products. Frequent usage of conventional products is contributing to environmental destruction, and it causes an adverse effect on human health. This research aims to (i) study the demographic of respondents in purchasing the natural personal care and toiletries products in UMK and (ii) to determine the main factor that affects the purchasing intention of the respondents towards the natural personal care and toiletries products. This study was conducted using a survey method. Research instrument, namely the Questionnaire was used to collect the data. The target respondents for this study were 368 respondents from UMK students where they were selected by convenience sampling method. The reliability of the questionnaire was tested by using the Cronbach’s Alpha before it was distributed to the respondents. Data gathered were analyzed using the Statistical Package for Social Sciences (SPSS). The descriptive analysis was used to describe the demographic data. The reliability of the questionnaire was tested by using the Cronbach’s Alpha before it was distributed to the respondents. Multiple regression was applied to determine the main factors that affect consumer purchasing behaviour towards natural personal care and toiletries products. This study is beneficial to the future entrepreneurs and manufacturers who intend to venture into the natural personal care and toiletries products industry. This is because the findings of this study enable them to understand and aware of the purchasing behaviour of the consumer towards natural personal care and toiletries products.

Keywords: Natural Personal Care and Toiletries Products, Consumer Purchasing Behaviour, Multiple Regression, Descriptive Test, Reliability Test.
Assessment of consumer perception in Kota Bharu, Kelantan towards restaurant hygiene

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Rapid urbanization coupled with a busy lifestyle and advancement in technology has dramatically changed the way of life of many people. This has caused millions of people away from their homes every day either by necessity or by choice makes them consumed food at the restaurant and catering business. Consumers become more concern about restaurant hygiene due to the dreadful food borne illness. The main aim of this study is to identify which factors affecting consumer perception of restaurant hygiene. This study used a survey method. The questionnaire had been distributed to 384 respondents. This study was carried out in Kota Bharu, Kelantan and the respondent was sampled using a convenience sampling method. The reliability of the questionnaire was checked using Cronbach’s Alpha test. Results showed that the Cronbach’s Alpha value was acceptable. Data had been analysed using SPSS software. The descriptive statistical test was used to analyse the socio-demographic profile of respondents and the general perceptions of restaurant hygiene. Next, exploratory factor analysis revealed six underlying factors for the restaurant hygiene items which were ‘functional clues’, ‘humanic clues’, ‘mechanic clues’, ‘interior of a restaurant’, ‘restroom personal hygiene’, and ‘food outlook’. The three most important factors found are ‘functional clues’, ‘humanic clues’, and ‘mechanic clues’. Here, functional refers to the technical quality of the food and service. Humanic emphasises on the performance, behaviour, and appearance of the employees, while mechanic deals with the ambience and other design and technical elements. Understanding on hygiene factor that triggered the consumer to perceive when evaluating the restaurant hygiene can be beneficial to food marketers who can use the information to increase their restaurant’s quality and to satisfy their consumers.

Keywords: Consumer perception, restaurant hygiene, hygiene factors, food borne illness.
A4

Factor influencing chemical pesticides use among fruits vegetable farmers in East Coast Economic Region (ECER)

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The rapid growth of food demand in Malaysia have caused many fruits vegetable farmers to improve production to meet the demand by using chemical pesticides to control pests attacked towards their crops. The growing issues on effect of chemical worry people and caused them to find another alternatives way for crop protection from pests. The objective of this study is to identify factor influencing chemical pesticides use among fruits vegetable farmers in ECER. The questionnaires were distributed by using purposive sampling method to 105 fruits vegetable farmers in ECER. Descriptive analysis and Spearman correlation were used for analysis methods to achieve the purpose of study. The findings indicated that the most influencing factors of chemical pesticides use among fruits vegetable farmers is the attitude. Generally, there are significant relationship between attitude, subjective norm and perceived behavioral control with factor influencing chemical pesticides use among fruits vegetable farmers in ECER. The future study should be more focus on all type of vegetables farmers to determine the factor influencing chemical pesticides use. Then, this study also can be improved by adding new variable such as knowledge in order to ensure either it has a relationship or not with the factor influencing chemical pesticides use among farmers.

Keywords: Pesticides, attitude, subjective norm, perceived behavioural control, fruits vegetable farmers.
The intention of paddy farmers on converting paddy land for development in Alor Setar, Kedah

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Generally, rice is one of the cereals and is the main food throughout the world including Malaysia. Indeed, rice is the most widely cultivated plant in the immediate vicinity of the title "Jelapang Padi Malaysia". However, rapid development has reduced rice production in Malaysia. This happens to accommodate the pattern of increase in the number of population and the needs of the population as a matter of development of housing, towns and so on. Most paddy lands have converted the status of agricultural land to development land. Many efforts have been made by all parties to ensure that paddy production does not diminish and guarantee the livelihood of paddy farmers. There are several factors that lead to this problem. Firstly, rice farmers face a decline in rice production due to some problems. Secondly, paddy farmers face a natural disaster that destroys rice production because rice can no longer be used as a human food source. Thirdly, it relates to the rapid urbanization that causes the paddy farmers to sell their lands to builders. Therefore, this project is conducted to identify the factors influencing the behaviour of paddy farmers towards converting paddy land to development land in Alor Setar, Kedah using the Theory of Planned Behaviour model. Sampling techniques were used in selecting 101 paddy farmers in Hutan Kampung, Alor Setar. In this study, four methods of analysis that are descriptive analysis, reliability analysis, Chi-square test and factor analysis were used to achieve the study objectives. The findings show that the most influenced factor is the attitude. Generally, farmers have changed their paddy land into development land based on their own attitudes.

Keywords: Farmers, paddy, development, change, paddy production, development land, status change
Smallholder farmers’ intention towards jackfruit contract farming in Pahang

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Pahang has recorded as the highest producer for jackfruit in Malaysia for previous years. However, the production of jackfruit products is insufficient. The idea of contract farming is to overcome the problem that occurred in marketing problem due to excess production plus with the problems in post-harvest handling technology. This contract farming was initiated to overcome the issue of inconsistency of agriculture production and failure to meet the market demand regarding production quality, poor market infrastructure, globalization of hypermarket and uncompetitive farm price set by middlemen. Contract farming is an excellent opportunity for a country to have more yields on jackfruit production and benefits to farmers in it. However, the number of small farmers in jackfruit contract farming in Malaysia and especially in Pahang is still low. This study is to determine the intention level of the smallholder farmers, the relationship between the socio-demographic and the attitude, and the most significant factor influences smallholder farmers towards jackfruit contract farming in Pahang by using Theory of Planned Behaviour (TPB) model. This thesis validates the extended Theory of Planned Behaviour by using 7-points Likert scale and Byrne’s two-item measure of interpersonal attraction measure with Chi-Square. This research study covers the areas in Temerloh, Raub, Bentong, Bera and Maran and the random cluster sampling was used to sample at least 150 farmers. There are four methods of analysis used in this data analysis, which were descriptive analysis, reliability analysis, Pearson correlation analysis and factor analysis. The findings indicate the most significant factor which influences smallholder farmers’ intention towards jackfruit is the attitude factor, and the intention level of smallholder farmers are high due to the attitude variable. The findings show a significant relationship between age and attitude while no significant relationship for education level and the attitude of smallholder farmers towards jackfruit contract farming in Pahang. This study reflecting the behaviour of current smallholder farmers towards jackfruit contract farming in Pahang where the attitude is the main direct factor.

Keywords: contract farming, intention, jackfruit, smallholder farmers, Theory of Planned Behaviour (TPB)
Participation of Pineapple Farmers toward MD2 Clones in Johor

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The research conducted was aimed at the participation level of pineapple farmers in the state of Johor towards MD2 clones. MD2 pineapple was high-quality varieties at present, which the demand for export purposed as fresh fruit was higher, compared to other varieties. However, the production of MD2 is still inadequate to fulfil the export demands from China. Thus, the acceptance of MD2 cultivation among the pineapple farmers has been questioned whether the farmers are willing to accept and adopt this new variety or not. This research was done with the objective to review and to evaluate the acceptance participation level of pineapple farmers in planting MD2 clones in Johor. Then, to analyze the relationship between knowledge, attitude, and practice of pineapple farmers toward MD2 clones. A self-administered survey was conducted using a closed-ended questionnaire to collect data from the survey respondents. Besides, other methods used in this study were interviews directly to farmers who cannot read the questionnaire given to clear up the age factor. A total of 77 respondents were involved in this study. The purposive sampling method was used, and the questionnaire form was designed based on the ‘KAP’ model. The data collected were entered and analyzed using computerized programmed of SPSS version 21.0. The analysis used was ‘Descriptive statistics’, ‘Mean score’, ‘Normality Test’, ‘Spearman’s Correlation’ and ‘Reliability test’. From this study, the results indicated that pineapple farmers in Johor accepted and had a good intention to participate in planting MD2 variety. Additionally, findings of this study prove that there is a significant positive relationship between knowledge, attitude and practical knowledge of pineapple farmers to participate in planting MD2 variety. It can be concluded that all the objectives of the study were achieved.

Keywords: Pineapple farmers, Participation, Knowledge, Acceptance level, MD2 clones.
Consumers' perceptions and attitudes towards farm animal welfare and willingness to pay for welfare friendly meat products

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Malaysians consumed 46.5 kg poultry, 6 kg pork, 4.8 kg beef and 1 kg sheep with per capita in 2017. As the standard of living and education level of consumers increased, so does the concerns and awareness about farm animal welfare which have led to an increase in the availability of welfare-friendly meat products (WFP) in the market. However, little is known about how much more they are willing to pay (WTP) for WFP or about their buying trends specifically in Malaysia. This study focused on the perceptions and attitudes of consumers in Malaysia towards farm animal welfare and their willingness to pay (WTP) more for WFP. Simple random sampling has been used in this survey with 60 students were chosen as respondents, but only 57 questionnaires accepted for this study as the other 3 were considered unusable, thus rejected. This research found that consumers in Malaysia have an overwhelmingly (86%) positive attitude towards WFP, even outdone other European countries such as Latvia and Spain, even though they have relatively low knowledge about the real situation of farm animal welfare in the country. Regarding WTP, 10.5% of the consumers are ready to chip more than 10% of the original price to purchase WFP. The respondents also show very positive empathy not only on animal welfare but also farmers who are willing to invest more in ensuring animal welfare on their establishment. Since the number of respondents is quite small, it is suggested that future research should widen the sampling frame to cover more Malaysian in heterogeneous demographic.

Keywords: Animal welfare, Willing to pay, Welfare friendly product, Student, Malaysia
Postharvest technology acceptance in handling and storage level by fruit vegetable farmers in East Coast Economic Region (ECER)

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Nowadays, many postharvest technologies are introduced to improve productivities and quality of crops yield. Nevertheless, postharvest losses still occurred and based on previous studies, technology acceptance among farmers is still in low level. These phenomena have affected the production of fruit vegetables in Malaysia especially in East Coast Economic Region (ECER) as the higher producer of vegetables in Malaysia. This research objective is to identify postharvest technology acceptance at handling and storage level among fruit vegetable farmers in ECER. A structured questionnaire was designed based on combinations of Technology Model Acceptance (TAM) model and Theory of Planned Behavior (TPB). A purposive sampling technique has been employed to select 105 fruit vegetable farmers in ECER. Descriptive analysis, normality test, correlation and reliability test had been employed as data analysis in order to accomplish the purpose of research study. The independent variables in this study are perceived usefulness, perceived ease of use, and attitude while the dependant variable is postharvest technology acceptance. Based on this study, the results indicate that post harvest acceptance is in moderate level of mean score while perceived usefulness, perceived ease of use, and attitude are in high level of mean score. Besides, there is positive significant between perceived usefulness, perceived ease of use, and attitude toward postharvest technology acceptance but negligible. Fruit vegetable farmers in ECER accept the postharvest technology but do not use and apply the technology. This study is crucial to assist researchers and farmers to understand the factors of postharvest technology acceptance besides helping in reducing the postharvest losses.

Keywords: Postharvest technology, Perceived Usefulness, Perceived Ease of Use, Attitude, TAM
Customer preferences toward interior landscape in urban area

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An interior landscape is one of the high demands for consumer application in Malaysia that has been exposing at the urban area such Kuala Lumpur. The development of the human population is increasing day by day, and most people at urban area spend their time inside the home or office in a building. This study had been identifying the customer preferences towards interior landscape in the urban area. This thesis was using the Theory of Planned Behaviour (TPB) model on the data derived from the customer preferences as the dependent variable and with independent variables such as attitude, subjective norm and perceived behavioural control. Convenience sampling technique had been selected to conduct a qualitative analytical approach, based on empirical data gathered from 120 respondents among the community that living and do business in building or office at that urban area of Kuala Lumpur such as Wangsa Maju, Setapak and Datuk Keramat. Data collected were analysed by using reliability analysis, descriptive analysis and correlation analysis as methods of analysis in order to accomplish the purpose of the research study. The outcome of this study showed that customer preferences had the highest mean score followed by attitude, subjective norm and perceived behavioural control. Besides, the results showed attitude, subjective norm and perceived behavioural control were positive significant with customer preferences. In further, the study should focus on increasing awareness of interior landscapes among communities in the urban area. This study also can be improved by adding variable such knowledge in order to know it has a relationship with customer preferences towards interior landscaping in the urban area or not. Hence, knowledge variable could help them interest and lead to a better healthy lifestyle as this interior landscape has a positive impact in improvising poor ventilation cycle inside places.

**Keywords:** Interior Landscape, Urban Area, Theory of Planned Behaviour (TPB)
B. Medicinal Plants/ Phytochemistry/ Phytocosmetics/ Phytomedicine
Formulation and physicochemical properties analysis of herbal ointment from *Cymbopogon nardus*

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Natural compounds from herbal plants have been extensively used for the application of various natural care products including ointment. There are twenty-five ointment formulations were formulated in the present study which the ratios of infused oil to beeswax were 1:2, 1:4, 1:6, 1:8 and 1:10. Whereas, infused oil ratios of *Cymbopogon nardus* to virgin coconut oil were 5:95, 10:90, 15:85, 20:80 and 25:75 used. The ointment was analysed for physicochemical properties including colour, hardness, viscosity, pH and absorbance. The commercial ointment was used as control. The ointment resulted light green as visually observed. The colour became darker when the ratio of *Cymbopogon nardus* increased. The hardness, viscosity, pH and absorbance are ranging from 533.00 to 11.00 g, 1510 to 42300 cp, 5.22 to 7.59 and 0.011 to 2.762, respectively. The optimization of the formulation was carried out using Response Surface Methodology (RSM) via Box-Behnken design. Based on the study, the ointment formulation extracted from *Cymbopogon nardus* showed good potential as topical application products.

**Keywords:** Ointment, *Cymbopogon nardus*, virgin coconut oil, oil infusion
Formulation and physicochemical analysis of herbal ointment from *Zingiber officinale* rhizome

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*Zingiber officinale* or commonly known as ginger has been revered as a culinary and medicinal spice in many traditional cultures. *Zingiber officinale* rhizome has widely used as medicinal purposes by ancient China and in India medicine due to containing bioactive components such as α-zingerberene, gingerols, α-curcumine, and sabinene. Essential oil from this plant has been proven to cure diseases especially flatulence and enhancing weight loss. The method used in this study was herbal infused oil, which is the herb was directly soaked in the carrier oil by applying high temperature, 65°C, based on the different ointment ratios, the active ingredient to oil and wax to infused oil. The physicochemical properties such as colour, hardness, viscosity, pH, and turbidity of ointments were measured. For hardness, viscosity, pH and turbidity, the value were 121.00g, 18900cP, 6.08 and 0.948 respectively. The data obtained were compared to the commercial ointment. The purpose of this study is to formulate the ointment product using *Zingiber officinale* rhizome, identifying the physicochemical properties analysis also to determine the optimum based on the physicochemical properties of different ointment ratios.

**Keywords:** *Zingiber officinale* rhizome, herbal infused oil, physicochemical properties, ointment ratios
Potential application of actinomycetes on hydrocarbon degradation

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Hydrocarbon pollutants could exert adverse effects to the polluted surroundings, and its occurrence is often anthropogenic. The presence of hydrocarbon pollutants could endanger the environment if there are no preventive and corrective measures taken. Many previous and current studies were focusing on effective bioremediation of hydrocarbon using microorganisms to reduce or avoid further complications. Fifteen actinomycete strains were used in this study in order to investigate their potential application in hydrocarbon degradation or bioremediation. The degradation and breakdown of hydrocarbon are dependent on the metabolic activities of the bacteria. Kerosene, petrol and diesel were introduced to the actinomycetes in separate media as a source of carbon and energy. Seven actinomycete strains were able to grow well on hydrocarbon growth medium, and they showed notable changes regarding the number and size of colonies formed, the formation of mycelia and the colour of colonies formed. Four actinomycetes that grow well on hydrocarbon medium were further cultivated in MSM liquid media supplemented with hydrocarbon. The optical density of culture media was measured as an indicator of actinomycete growth. Strain D053 and D25.2 showed a higher trend of overall OD measurement. Although OD measurement is lower, the growth of Strain KSJ 12.7 and D13.5 was observed where tiny cell cluster or cellular flocs were formed. The results of both tests showed that part of the 15 actinomycetes was able to grow in media supplemented with hydrocarbon but the difference of growth pattern between them were notable. Kerosene and diesel were found to be a good growth substrate for the actinomycetes. The results of this study showed that Strain D053 and D25.2 are potential to be used as a bacterial agent in hydrocarbon degradation given their ability to grow in hydrocarbon.

Keywords: Actinomycete, hydrocarbon, bioremediation, hydrocarbon degradation
Toxicity evaluation of Tuhau (*Etlingera punicea*) stem extract and hydrosol using brine shrimp lethality test

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Tuhau (*Etlingera punicea*) is an indigenous plant from *Zingiberaceae* family. Tuhau is very famous in Sabah and has been locally commercializing as traditional food and beauty product such as face and body scrub. Tuhau is containing high fibre content and antioxidant effect other than containing antibacterial properties. However, there was a lack of studies on this plant, especially on its toxicity. Toxicity studies are beneficial in order to know the safe amounts for consumption. This study aimed to evaluate the toxicity activity of Tuhau stem extract and hydrosol using BSLT assay. Soxhlet extraction was used to get ethanol crude extract and partition method used to produce fraction which was hexane, chloroform, ethyl acetate and butanol extracts. Meanwhile, hydro distillation Clevenger type apparatus was used to get the hydrosol. The extraction yields for various extracts were ethanol (4.34%), hexane (4.87%), chloroform (1.87%), ethyl acetate (1.21%) and butanol (2.44%), while hydrosol (11%). Then, BSLT assay was conducted to evaluate the toxicity activity of Tuhau various plant extracts and hydrosol at various concentration which were 1000 μg/ml, 500 μg/ml, 250 μg/ml, 125 μg/ml, 62.5 μg/ml, 31.25 μg/ml and 15.625 μg/ml and hydrosol for 1000 μg/ml, 100 μg/ml, and 10 μg/ml. The result later was compared to the Meyer and Clarkson’s toxicity index. The highest LC50 toxicity order were hexane (1774.59 μg/ml), butanol (1194.14 μg/ml), ethyl acetate (1183.77 μg/ml), ethanol (1147.78 μg/ml) and chloroform (1144.78 μg/ml) while, for hydrosol (1407.42 μg/ml). Thus, can be classified as very low toxicity effect. Statistical analysis indicated that interaction between concentration has no significant effect (P>0.05) with various extracts and hydrosol.

**Keywords:** *Etlingera punicea*, extracts, hydrosol, toxicity
Formulation and quality assessments of topical herbal cream incorporated with *Piper sarmentosum* aqueous extract

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Herbal plants are in widespread use for medical purpose and the development of natural products. Yet, the quality of natural products continues to possess a great challenge for the manufacturer. *Piper sarmentosum* aqueous extract has been scientifically demonstrated to have wound healing activity using in vivo model. Hence, this research mainly emphasized the formulation of topical herbal cream with the incorporation of *P. sarmentosum* aqueous extract and natural ingredients. An optimized formulation was further assessed for its quality. Parameters used in the assessments herbal cream formulated included organoleptic and physicochemical characteristic, antibacterial property, total microbial count, stability study and sensory evaluation and sample testing for skin irritation. The result showed that the optimized herbal cream exhibited good physical properties with a strong scent of extract. However, antibacterial activity against *E. coli* and *S. aureus* was not found in the herbal cream formulated. The herbal cream formulated was also found to be highly contaminated with 1.0 x 10^4 cfu/g which was undesirable. One–month stability study showed that herbal cream formulated was considered stable under cold storage (5°C) and room temperature (25°C) with no evidence of phase separation nor significant change of odour, texture and pH values. Significant variation in colour (p<0.05) was observed after 1 week storage at 5°C and after 4 weeks storage at 25°C. The formulation was physically unstable at temperature as high as 40°C. The results of the consumers’ testing (N=50) demonstrated that the herbal cream formulated had a rather high degree of preference among the respondents and it was non-irritant for skin. Future research is necessary to evaluate the efficacy of the cream in wound healing activity. Optimistically, this study will contribute to the future development of natural wound healing cream.

**Keywords**: *Piper sarmentosum*, Topical Herbal Cream, Quality Assessments, Wound Healing.
Phytochemical and toxicity screenings in different parts of *Eleiodoxa conferta*

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The potential of much of the indigenous fruits is still undiscovered. Recently, researchers are giving attention to discover the locally available fruits that may have the potential to use for therapeutic remedies. One of the underutilized fruits which have been consumed by the rural communities in Malaysia is *Eleiodoxa conferta* fruit which is locally known as ‘Buah Kelubi’. This project was conducted to screen phytoconstituent and toxicity activities of different parts of *E. conferta* by using different solvents extraction. Types of solvent used to extract the different parts of this fruit were ethanol, 50% ethanol and water. The total phenolic content (TPC) and total flavonoid content (TFC) were studied by using Folin-Ciocalteu method and Aluminium chloride colorimetric method. Besides, phytochemical screening was done to screen the bioactive compounds which can be further studied for development of medicinal remedies. Moreover, the toxic activity of different parts of *E. conferta* was tested by using Brine Shrimp Lethality Assay (BSLA). The mortality percentage of a simple zoological organism-brine shrimp (*Artemia Salina*) was tested to identify the toxicity of different parts of fruits. All data were analysed using Minitab software version 18.0. The results revealed that the TPC and TFC were significantly different in different parts of *E. conferta*. The ethanol (50% v/v) was found to be the best extraction solvent for extraction yield, TPC, and TFC. The peel extract showed the highest yield at 34.7667% whereas the lowest yield showed in seed extract at 4.890%. Besides, the highest TPC and TFC were found in the peel part of *E. conferta* fruit. Moreover, the presence of bioactive compounds and the level of toxic activity was significantly different in different parts of *E. conferta*. Therefore, it was concluded that *E. conferta* is beneficial for human health and it should be further studied to use it in the development of drugs.

**Keywords:** *Eleiodoxa Conferta, total phenolic content, total flavonoid content, phytochemicals, toxicity, Artemia Salina*
Effect of steaming on antioxidant activity, total phenolic content and total flavonoid content in *Cucurbita pepo* (pumpkin)

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The *Cucurbita pepo* (labu) is traditionally used to treat inflammatory, analgesic urinary disorders, and also antidiabetic. *Cucurbita pepo* flesh rich in antioxidant that can reduce skin damage from the sun. Antioxidant activity, total phenolic content and total flavonoid content for *Cucurbita pepo* at five different steaming times were studied by using ABTS radical scavenging assay, Folin-Ciocalteu and AlCl₃ colorimetric methods respectively. Antioxidant activity ranged from 3.68 mg Ascorbic/ g raw material to 4.71 mg Ascorbic/ g raw material whereas total phenolic content and total flavonoid content ranged from 12.75 mg GAE / g raw material to 16.21 mg GAE / g raw material and 2.80 mg Quercetin / g raw material to 44.76 mg Quercetin / g raw material. The highest antioxidant activity, total phenolic content and total flavonoid content were found in sample 20, 0 and 0 minutes of steaming respectively. There was a significant effect on antioxidant activity, total phenolic content and flavonoid content of *Cucurbita pepo* after steaming. The high antioxidant activity, content of phenolic and flavonoid could provide with their benefits as antioxidant towards society.

**Keywords:** *Cucurbita pepo*, steaming effect, antioxidant activity, total phenolic content, total flavonoid content
Actinomycetes potential application for biological control of Banana Sigatoka disease

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Sigatoka disease of banana caused by Mycosphaerella, the pathogenic fungus. In order to control this disease, farmers usually spray their crop using fungicides. However, controlling approaches are not always well known or adopted by all farmers. This study aimed to isolate fungi from soil samples collected from the infected banana plant. Besides, to determine the antifungal activity of actinomycetes towards isolated fungi. 13 fungi were isolated from the soil samples, and 10 potential fungi were proceeded with the antifungal assay. Five actinomycetes strains were picked as test microorganism where Strain 47, Strain 72 and Strain 108 showed positive antifungal activity against isolated fungi. However, Strain 5 and Strain 56 did not show any activities. Further study on the identification of the fungi isolates by polymerase chain reaction (PCR) amplification and DNA sequencing should be carried out to confirm the species. Moreover, other microorganisms also can be used to test for antifungal activity towards the isolated fungi.

Keywords: Mycosphaerella, Sigatoka disease, actinomycetes, antifungal assay
Compliance of plants phenolic and microbial contaminant limits of commercial stingless bee honey to Malaysian Standard (MS) 2683:2017

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Recently, the commercial stingless bee honey is growing rapidly in the market of Malaysia due to their nutritional and healing properties especially in cosmetic, food and beverage and pharmaceutical industry. However, even the honey is pure; sometimes they did not comply with the specification of the Malaysian Standard (MS) 2683:2017. Thus, the objective of this study aims to determine the quality of 13 samples of stingless bee honey from the selected location in Kelantan in term of plants phenolic content and microbiological analysis of microbial contaminant limits by following the MS 2683:2017 specification. The plant's phenolic contents were evaluated by using High Performance Liquid Chromatography (HPLC) while microbial contaminant limits were determined the total plate count (TPC), yeast and molds (YM), and total coliforms (TC). The result showed the presence of plants phenolic of gallic acid in all of the stingless bee honey samples. No significant differences were found in all sample of stingless bee honey in term of total plate count (TPC) and yeast and mold (YM). There was absent of total coliform in all of the samples. In summary, this study shows all of 13 commercial stingless bee honey do comply to MS 2683:2017 specification in term of plants phenolic and microbial contaminant limits of total plate count (TPC) and total coliform (TC). Meanwhile, there was one sample did not comply with MS specification in term of contamination yeast and mold (YM).

Keywords: Plants phenolic, microbial contaminant limits, stingless bee honey, Malaysian Standard 2683:2017
In vitro antioxidant and anti-diabetic activities of leaves of Sandoricum koetjape crude extract

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This study researched the effect of different percentage of methanol (50%, 70% and 100%) on the antioxidant and anti-diabetic activity of crude leave extract of Sandoricum Koetjape. Antioxidant activity of the plant extract was examined by using quantitative DPPH radical scavenging assay test. Besides that, the total phenolic content also was examined by using the Folin-Ciocalteu method in this study. In different circumstances, the anti-diabetic properties of plant extracts were determined by using the in vitro test, inhibition of the alpha amylase enzyme. The result of scavenging activity of Sandoricum Koetjape leaves extract, 50% aqueous methanol was 18.94±1.736, 70% aqueous methanol was 15.761±0.308 and 100% aqueous methanol was 15.586±0.241. The highest scavenging activity was 15.586±0.241. For the total phenolic content test, the result it can be seen that among the samples 100% had the highest total phenolic content (0.22±0.005), followed by 70% plant extract (0.207±0.0015) and 50% plant extract (0.153±0.001) showed the lowest phenol content. However, the anti-diabetic test was failed to determine.

Keywords: Sandoricum Koetjape, antioxidant, total phenolic content, anti-diabetic
Effect of steaming on antioxidant activity in extracts of *Ipomoea batatas* roots

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*Ipomoea batatas* are one of the vital plant sources in term of their nutritional content which known to have high antioxidant. A heat stable antioxidant is important to ensure their effectiveness for neutralizing the free radical in the human body. The purpose of this study is to determine the effect of steaming on antioxidant activity in *Ipomoea batatas* root extracts. Fresh root was steamed at 0, 10, 20, 30 and 40 minutes respectively. The steamed roots were extract using ethanol. The antioxidant activity, total phenolic and flavonoid content of the extracts were determined by 2,2-diphenyl-1-picrylhydrazyl, Folin-ciocalteu and Aluminium chloride assay, respectively. All results showed a significant difference (p ≤ 0.05) except for DPPH assay. Antioxidant activity shows the highest value at 30 min 17.561 ± 0.211, total phenolic shows the highest value at 20 min 16.802 ± 0.676, and flavonoid shows the highest value at 10 min 27.861 ± 0.621. It can be concluded that steaming increase the antioxidant activity however further increase of steaming time may destroy antioxidant in the samples extracts.

**Keywords:** *Ipomoea batatas*, antioxidant, DPPH, total phenolic, total flavonoid
Evaluating compliance of commercial stingless bee honey according to Malaysian Standard 2683: 2017- Physicochemical properties

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Stingless bee honey is gaining its popularity due to nutritional value and better pollinators than the honey bee. Since stingless bee honey has different composition than *Apis* spp. Honey, further physicochemical parameters are presented according to stingless bee species. Hence, an establishment of Malaysian Standard- 2683 Stingless Bee Honey Specification (MS-2863:2017) in year 2017 was formed as a guideline towards stingless bee honey quality. This current study is focusing on the compliance of commercial stingless bee honey towards this standard. By using procedure and method proposed in MS 2863:2017, all physicochemical properties honey was analysed portrays its quality. Thirteen samples of stingless bee honey around Kelantan was collected, two from blended species of stingless bees, two from *G. thoracica* and nine from *H. itama* species. Samples also including a single heat treatment honey sample and twelve raw honey which undergo physicochemical analysis. The physicochemical analysis in honey includes moisture, ash, hydroxymethylfurfural (HMF) and pH value with results 27.05 % to 32.61 %, 0.08 g to 0.14 g, 8.75 mg/kg to 218.66 mg/kg and 2.32 to 3.22. It represents, moisture and ash content in stingless bee honey is higher than *Apis* spp. with lowest pH value and HMF content. Some of the stingless bee honey were complied with MS-2863:2017 which based on varieties of geographical origin, bee species, flower sources and honey form.

**Keywords:** Stingless bee honey, Malaysian Standard 2683-Stingless Bee Honey Specification, physicochemical properties.
Formulation and physicochemical properties of herbal ointment from *Piper betle* Linn.

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Physico-chemical properties of ointments developed from natural herbs of *Piper betle* Linn. were investigated in this study. It is reported that *Piper betle* Linn. plant possess such good anti-inflammatory, analgesic and antioxidant with cooling properties. Therefore, the benefits of this herbal plant were utilized fully in the development of ointment. Through this work, the study aims to formulate the ointments from the sample of *Piper betle* Linn., comprising of different formulation from different concentration of herbal infused oil used as to investigate the effect for different concentration used to the properties of the developed ointments. The ointments formulated were developed by extracted the leaves of *Piper betle* Linn through the method of infusion and then incorporated the infused oil obtained with beeswax. A total of twenty-five (25) formulated ointments produced were subjected for the evaluation of physicochemical properties including pH, turbidity, viscosity, and texture. The results of physicochemical properties of the ointments showed the results of the ointment colour became more darker as the ratio of plant sample increase. The pH of the ointment developed was in the good range of skin pH which is within 5-7.5 while for the viscosity the result showed in the range between 19.3-25Ps. From the results it showed that the results were good as it is mostly similar to the commercial one, thus the ointments in this study can be considered as natural and safe.

**Keywords:** *Piper betle* Linn, physicochemical evaluation, formulated ointments
Formulation and physicochemical analysis of herbal ointment from Kaffir lime leaves (*Citrus hystrix* *DC*)

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The use of natural herbs in topical medication has been prevalent to mankind since more than thousands of years ago. The abundance of semi-solid dosage forms has been produced with the incorporation of natural herbs including ointments. Herbal ointments have existed since many years ago and are used as emollients, protectants and for a lot of medicinal purposes. However, there is a lack of scientific studies regarding the physicochemical properties of natural herbal ointments. Moreover, as of now, there are no current publications found on herbal ointment that use Kaffir lime leaves (*Citrus hystrix* *DC*) as the main active ingredients. Thus, this study aims to formulate 25 different samples of the herbal ointment made from leaves of *Citrus hystrix* *DC* as well as to identify the optimum formulation among them using response surface methodology by Design-Expert. The physicochemical tests (i.e. texture, viscosity, pH and turbidity) were carried out on all 25 samples and analysed for the purpose. Formulation of 10:90 (active ingredients: virgin coconut oil) with 1:10 (beeswax: extracted oil) was found to be the optimum formulation for ointment made from kaffir lime leaves. The findings of this study will help in improving the database of the herbal formulation with different herbs used, although further detailed studies such as sensory analysis and toxicity test of the herbal ointments should be done.

**Keywords:** Herbal ointment, kaffir lime leaves, *Citrus hystrix* *DC*, physicochemical properties, response surface methodology.
This is a preliminary study on proximate analysis of various variations of cassava, (Manihot esculenta Crantz) tubers at different dosages of gamma irradiation, Cs-137 source (Gamma irradiation Chamber, Biobeam BM8000, Nuclear Malaysia, Bangi) at a dose rate of 0.227 Gy sec\(^{-1}\). All the samples were obtained from Malaysian Agricultural Research and Development (MARDI) in Bachok, Kelantan namely MM109, MM145, MM149, MM156 and MM161. The results obtained showed that proximate composition (moisture content, carbohydrate content, crude fat, crude protein and ash content) is different among varieties. It was observed that moisture content and crude fat were significantly different (p>0.05) while carbohydrate content, crude protein and also ash content were not significantly different. These are prior to the variations of \textit{M. esculenta} and the irradiated dosages. This concludes that the moisture and crude fat content were affected by the irradiation dosages while carbohydrate, crude protein and ash content were not. Moreover, further studies on the nutritional composition of \textit{M. esculenta} should be carried out to diversify the variations that contain high nutrients.

\textbf{Keywords:} Manihot esculenta Crantz, variations, gamma irradiations, proximate analysis
Physicochemical properties and sensory evaluation of soap prepared from *Elaeis Guineensis* (Oil Palm) fruits

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Global demand of soap is increasing rapidly especially in the cosmetic industry. Major productions of commercial soap usually contain a lot of preservative and additive that might cause harm to health. This study aims to determine the physicochemical properties and sensory evaluation of soap samples made from a different ratio of crude palm oil (CPO) and also to determine the best formulation of CPO in soap preparation. This study use research design with five soap samples and three repetition and the data were analysed statistically using ANOVA followed by post hoc test. Five soap samples represented the ratio of CPO in the soap consist of 100%, 75%, 50%, 25% and 0%. The analysis of oil palm soaps was divided into two scopes which are physicochemical properties and sensory evaluation. For physicochemical properties, the pH of soap samples was ranged from 10.18 ± 0.071 to 10.48 ± 0.075 in vary ratio of CPO. The hardness score of the soap samples also varied in a different ratio, which was ranged from 788.89 ± 120.38 to 1083.56 ± 91.63. For colour analysis, the lightness (*L*) of the soap increase as the ratio of CPO decreases. Meanwhile, the value for redness (*a*) and yellowness (*b*) of the soap are directly proportional to the ratio of CPO. Based on the sensory evaluation test with accordance of colour, aroma, texture and lathering attributes, most of the panellist preferred soap D, which contained 25% of CPO + 75% RPO as the best soap formulation.

**Keywords:** Crude palm oil (CPO), refined palm oil (RPO), physicochemical properties, sensory evaluation
C. Food Engineering/ Process Technology/ Catalysis/ Biosorbent/ Biomaterial/ Biorenewable Energy/ By-Product Development/Biotechnology
Development and effect of two different packaging on stability of probiotic drink

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Probiotic drinks contain active bacterial cultures which become one of the most common sources of probiotics that can confer beneficial effect to human. Probiotics usually being incorporated into food and drinks like fermented foods and cultured milk. This study highlights the development of probiotic drinks of two formulations of fresh milk with carboxymethylcellulose as well as the evaporated milk with carboxymethylcellulose. The stability study was conducted to evaluate the effect of two different packaging of the probiotic drinks which were HDPE packaging and pouch packaging (PET materials). Furthermore, the stability study conducted was the chemical analysis that includes pH testing and microbiological analysis which refer to the total plate count. The physicochemical analysis of probiotic drinks determined was the fat determination by Soxhlet method, protein determination using Kjeldahl method and total sugar content by Brix analysis. The result obtained shows that the stability of the probiotics drinks has a significant difference (p<0.05) with pH while not significantly difference (p>0.05) with colony count of the probiotics. At week 3 of storage, the probiotic drinks show pH of lower than 3.5 while colony count shows a higher total viable count of between 10³ to 10⁵ CFU/mL after 8 weeks of storage. The physicochemical analysis of the probiotic drinks shows significant (p<0.05) different in value. The total fat content shows value in the range of between 2.0% to 4.0% with total sugar content in between 8.0% to 14%. Total protein content shows low in value which was in the range of 0.1% to 0.8%. Based on the analytical results, the probiotic drinks show shelf life estimation of 4 to 5 weeks of storage. The probiotic drinks were considered acceptable to be consumed only after 6 weeks of storage as the pH started to record pH of lower than 3.0 which was too acidic for probiotic drinks to be consumed.

Keywords: Probiotic drinks, homogenization, stability test, packaging, physicochemical analysis
Chemical properties and effect of three different packaging on stability of ‘Sambal Pijat’

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‘Sambal pijat’ is one of the unique dishes which consists of ‘pepijat tree’ rhizomes and bird’s eye chillies. At present, this dish can only be found in Jeli, Kelantan. It helps to generate income sources for some retailers in this district. However, ‘sambal pijat’ has a shorter shelf life as it only remains stable for 2 weeks at ambient temperature. The inappropriate packaging conditions have become one the main factors which reduce the product shelf life. This situation has restricted the trade activities in ensuring the sustainability of ‘sambal pijat’. Currently, there are no studies regarding the chemical analysis of ‘sambal pijat’. This project proposed to study the chemical properties and identify the effect of different packaging conditions on the stability of this dish. Relatively chemical analysis, physicochemical analysis and microbial test were conducted in determining the chemical properties, physicochemical and microbiological stability of ‘sambal pijat’ that stored at different packaging conditions. The physicochemical analysis involved colour analysis and determination of moisture content including pH value. The analysis for microbiological stability also conducted to identify the total viable counts of microorganisms which indicate the determination of total plate count. ‘Sambal pijat’ showed a positive result with the presence of protein and fat content. In addition, the study revealed that packaging condition does affect the physicochemical stability of ‘sambal pijat’ during storage. Moreover, different packaging conditions also influence the total viable count of microbes within storage time. The findings of this current study help to provide scientific information about ‘sambal pijat’.

Keywords: ‘Sambal pijat’, packaging conditions, stability.
Physicochemical, antioxidant properties and microbial analysis of fermenting rambutan (*Nephelium lappaceum*) vinegar and rambutan floral vinegars

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Improvement on rambutan vinegar properties by adding local flower Butterfly pea (*Clitoria ternatea*) and Paper flower (*Bougainvillea glabra*) extracts conducted to meet consumer’s preference. The objectives of this study are to investigate the changes of physicochemical properties such as colour, pH, total soluble solid (TSS), alcohol content, acetic acid content, microbial activity and to compare anti-oxidant properties, mineral content and heavy metal content between Rambutan, Rambutan Butterfly Pea (RBP) and Rambutan Paper Flower (RPF) vinegars. Physicochemical properties and total colony count of vinegars were analysed weekly while alcohol content and antioxidant property of vinegars where analysed before and after fermentation. Estimation of mineral element content and heavy mental content of the vinegars were also being carried out. Colour of all three vinegars changed from bright to darker tone after 8 weeks fermentation. The physicochemical analysis for finished Rambutan, RBP and RPF were; pH (3.28, 3.93 & 3.57), total soluble solid (11.07, 2.40, 2.00 °Bx), and acetic acid content (34.00%, 5.00% and 4.10%). For total colony count of rambutan, RBP and RPF vinegar, the highest value on MEA was on week 1, week 2 and week 2-3 which were 2.50 x 10^8, 1.30 x 10^8 and 2.50 x 10^8. While the highest value of their colony count on NA was on week 7, week 3 and week 7 which were 1.90 x 10^9, 9.80 x 10^8 and 4.60 x 10^8. Among three vinegars, RPF had the highest value of antioxidant elements such as phenolic and flavonoids except for anthocyanin. It is recommended to produce RPF in large scale as it has high antioxidant properties. Further research can be done by stopping the fermentation process on week 6 as the vinegars’ properties had met the standard and the colour of vinegars maintained.

**Keywords:** Rambutan vinegar, fermented fruit floral vinegar, physicochemical properties, antioxidant properties, total colony count
Effects of pre-treatment of frozen pears on physicochemical, antioxidative and sensory properties during storage

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Pear is a typical fruit of temperate zones with high nutritive values and organoleptic properties. Two varieties of pear fruit which is Asian pear and Packham pear were analyzed for physicochemical (colour and texture), antioxidative properties (ascorbic acid content, antioxidant activity and total phenolic content) and sensory acceptability. The pears were subjected to different pre-treatments prior to freezing such as blanching and osmotic solution during storage. Freezing could be as a preservative method to maintain quality attributes of pears that change over time. It was found that colour attributes of frozen pears were significantly affected by treatment which in contrast to texture properties of frozen pears during storage. Ascorbic acid content of frozen Packham pear was recorded higher (6.38 ± 0.96) treated in osmotic solution compared to frozen Asian pear (4.62 ± 1.15) in blanching treatment during storage. The antioxidant activity of frozen Packham pear using DPPH assay exhibit (84.61 ± 0.69 mg GAE/g) contains high scavenging activity on day 1 when treated in blanching treatment while for Asian pear (67.63 ± 2.37) in blanching treatment on day 3. Total phenolic content of the frozen pears was found higher in Packham pear (14.77 ± 0.00) in control sample whereas Asian pear (3.79 ± 0.00) in blanching treatment during storage. Sensory acceptability shows that frozen Asian pear treated in osmotic solution was highly rated among consumers with overall acceptance of 5.80 ± 0.85. Thus, combination of pre-treatment and freezing helps to retain the quality of frozen pears during the period of storage. Therefore, this frozen pears may be commercialized in the market.

Keywords: Pear, frozen, ascorbic acid, antioxidant, osmotic solution.
Comparison of microbial and physicochemical analysis of tempoyak fermented from *Durio zibethinus murr.* Hybrid and Kampung Cultivar Pulp

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This study aims to determine the microbial and physicochemical analysis of tempoyak fermented from *durio zibethinus murr.* with different durian cultivar (durian hybrid and durian kampung). This two cultivar pulp mixed with 0 and 2 % salt. The sample was stored at room temperature (28 °C - 30 °C) for 8 days. The LAB population increase up to 3 days of storage and then slightly decrease. When microbial activity (LAB) increase, the production of lactic acid content will become higher and produce sour taste. TPC of tempoyak will have similar trends with LAB count during the fermentation. Durian fermented at room temperature more acceptable, and it is ready to be consumed between Day 4 and 6. The microbial, physicochemical and moisture analysis in tempoyak fermented food are assessed. Tempoyak is a traditional food fermentation that striking product from sensual and cost-effective points of view.

**Keywords:** Tempoyak, fermentation, lactic acid bacteria, physicochemical, microbial, traditional food.
Physicochemical analysis of chicken feet gelatine extracted by *Nypa fruticans* Wurmb (Nipah) vinegar

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Major sources for gelatine production are commonly made from bovine, porcine, fish and poultry. However, there are some issues have arisen regarding the halal issue of gelatine sources and occurrence of mad cow disease (Bovine Spongiform Encephalopathy, [BSE]), cause the need to find alternative sources is necessary. From the previous study, gelatin from chicken feet shows excellent properties in term of physicochemical characteristics compared to those reported in fish gelatines. One of the natural fruit vinegars produced traditionally with fermentation method is *Nypa fruticans* Wurmb (Nipa palm) or locally known as Nipah vinegar. Acetic acid was commonly known for its uses to extract gelatin while Nipah vinegar also contains acetic acid, thus suggesting the possibility of using Nipah vinegar to extract gelatine. Therefore, this study was proposed to optimize gelatine extraction from chicken feet skin with different concentrations of Nipah vinegar and to compare the physicochemical properties of chicken feet gelatin in terms of extraction yield, pH, texture, colour, and proximate analysis. The highest yield is obtained from 2% Nipah vinegar concentration which is 9.54% based on wet weight. The highest pH value was obtained in 2% Nipah vinegar concentration which is 6.93. In terms of texture profile analysis, there is significant difference in term of hardness, cohesiveness, springiness, chewiness and gumminess between the concentrations of Nipah vinegar used (p≤0.05). The higher lightness and yellowness value was obtained from 6% in Nipah vinegar concentration but higher redness value was found in 2% concentration. There is a significant difference (p≤0.05) in moisture and ash analysis in all the concentrations of Nipah vinegar used. However, there is no significant difference in term of protein analysis for all Nipah vinegar concentration used. The different pre-treatment method affects the characteristics of chicken feet gelatine and 2% concentration Nipah vinegar showed the best result compared to all concentrations.

**Keywords:** *Nypa fruticans* Wurmb, gelatine, chicken feet, physicochemical properties, and proximate analysis.
Gelatine is a polypeptide produced by partial hydrolysis of collagen derived from animal skin, connective tissue and bones. The gelatine production had been facing some halal issues and disease crisis for gelatine that is made from mammalian. Chicken feet is one of the most potential alternative sources for gelatine production. The research of the gelatine from chicken feet has been carried out through a series of studies. However, the success of the extraction result is only measured by using acetic acid. This research was conducted by using *Lansium domesticum* (Dokong) vinegar for acidulation pre-treatment. The objectives of this study are (i) to optimize gelatine extraction from chicken feet pre-treated with different concentration of dokong vinegar and (ii) to compare the physicochemical properties of chicken feet gelatine using dokong vinegar for acidulation pre-treatment. The gelatine with 2%, 4% and 6% concentrations of dokong vinegar was evaluated based on their properties in terms of pH, colour, yield percentage, texture and proximate analysis (ash, moisture and protein). In this study, 6% of dokong vinegar is the optimal condition in acidic pre-treatment as it produced gelatine with the high percentage yield which is 9.21% based on the wet weight that has better quality in terms of pH, colour and proximate analysis but has lower acceptable quality in terms of texture. Therefore, the gelatine extracted using dokong vinegar had expected to contain comparable quality and physicochemical properties with commercial gelatine extracted using acetic acid.

**Keywords:** Gelatine, chicken feet, *Lansium domesticum*, dokong vinegar, concentration, physicochemical analysis
Physicochemical properties and sensory evaluation of frozen muffin prepared with vegetable oils during storage

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High fat content in muffins has the propensity to get oxidized during storage leading to problems of rancidity and deterioration of sensory value. The physicochemical properties and sensory evaluation of frozen muffin prepared with vegetable oils were conducted in this study. Four muffin formulations were produced using butter, corn oil, palm oil, and sunflower oil. The muffins batters were stored at -21°C for 12 days and evaluated for texture, colour, and sensory properties quality every 3 days intervals. The hardness of control muffin and muffins incorporated with vegetable oils increased throughout frozen storage. Control muffins showed the highest lightness value when compared with muffins prepared with sunflower oil at day 12 of storage. The sensory attributes of muffins prepared with oil at day 0 showed higher acceptability than muffins stored at day 12. Muffins at day 0 showed good scores toward aroma and sweetness of muffins. Frozen muffin incorporated with vegetable oils had good potential in developing high quality of muffin.

Keywords: Frozen muffin, vegetable oil, baking, hardness, quality
Physicochemical analysis of gelatin extracted from African catfish skins using *Nephelium lappaceum* (Rambutan) vinegar

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Gelatin is a biopolymer with a broad range of applications in food, pharmaceutical and photography industries. The main sources of gelatin are from the skins and bones of porcine and bovine. Due to religious sentiments by Muslim and Hindu communities as well as viral diseases such as bovine spongiform encephalopathy (BSE), an alternative was identified to replace mammal-derived gelatin which is from fish sources. In this study, African catfish was chosen for extraction of gelatin due to high content of collagen in its skin. Rambutan vinegar is used as pre-treatment acid in the study in order to identify whether natural vinegar could be a possible alternative to replace the use of synthetic acetic acid in gelatin pre-treatment process. Thus, the objective of this study is to optimize the gelatin extraction from catfish skin pre-treated with Rambutan vinegar and acetic acid of varying concentrations (2%, 4% and 6%). The physicochemical properties of gelatin extracted were evaluated in terms of yield, pH, colour, texture, moisture, ash and protein analysis. The highest yield is obtained from 6% acetic acid which is 17.36%. The pH of the gelatin pre-treated with acetic acid ranged from 4.67 to 4.91 whereas, the gelatin pre-treated with Rambutan vinegar ranged from 5.02 to 5.71. There were significant (p≤0.05) different in colour and texture of gelatin between all the gelatin treatments. All gelatin pre-treated with Rambutan vinegar gave positive results where low moisture (7.80-8.91%), low ash (0.77-0.82%) and high protein content (89.70-95.77%) were obtained compared with gelatin pre-treated with acetic acid. The optimum concentration of Rambutan vinegar that is suitable for gelatin acid pre-treatments was 6% as it obtained the highest yield and better physicochemical properties compared with 2% and 4%. Therefore, Rambutan vinegar can be an alternative to replace acetic acid as gelatin pre-treatments acid.

**Keywords:** Gelatin extraction, African catfish skin, Rambutan vinegar, acetic acid, physicochemical analysis.
Physical properties and sensory acceptability of cracker made from pumpkin (*Cucurbita mochata*) flour during storage

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The purpose of this study was to evaluate the physical properties and sensory acceptability of cracker made from pumpkin (*Cucurbita mochata*) flour during storage. Five different substituted levels of pumpkin in flour (20%, 30%, 40% and 50%) were used compared to control. Physical properties of the cracker which are colour (in $L^*a^*b^*$) and texture (hardness, fracturability and cohesiveness) were evaluated. Results showed that texture and colour were affected by the addition of different levels of pumpkin flour. The higher level of the pumpkin flour substitution, higher value would be the value of both texture and colour properties. Sensory evaluation results showed that cracker with 20% substitution of pumpkin flour got the higher result in all of the terms (colour, aroma, flavour, taste and overall acceptability). Colour of the cracker was affected by the addition of different levels of pumpkin flour. The microbiological evaluation was conducted only on 20% of pumpkin flour substitution (higher result on sensory evaluation) using the Total Plate Count.

**Keywords:** cracker, pumpkin, texture, colour, sensory evaluation
Physicochemical, antioxidative and sensory properties of muffin incorporated with cocoa pulp dried for 12 hours and 24 hours

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There were an abundance of cocoa pulp were discarded to the environment. Then, there were an insufficient amount or little research being explored to utilize edible by-product to incorporate with the muffin. In this study, wheat flour was partially substituted with 10% of commercial cocoa powder, 12 hours and 24 hours of dried cocoa pulp and control. The textural properties, colour analysis and sensory acceptability were studied. The antioxidative properties were analyzed through DPPH and TPC method. The lightness value, L* of muffins without cocoa powder was highest (48.62 ± 0.71) while the darker muffin was (20.92 ± 0.00). 24 hours dried cocoa pulp (41.54 ± 2.12) was lighter than 12 hours dried cocoa pulp (41.07 ± 0.03) where no significant difference (p>0.05) in the value of lightness intensities. The 12 hours dried cocoa pulp has the lowest value in hardness (5021 ± 15.62). Besides, 12 hours dried cocoa pulp exhibited higher antioxidant properties than other muffin formulation (48.58 ± 0.00). Meanwhile, the total phenolic content (TPC) of 12 hours dried cocoa pulp was (14.92 ± 0.94) compared to muffin without cocoa powder (2.23 ± 0.06). For sensory acceptability, 12 Hours dried cocoa pulp showed the highest aroma which was (5 ± 1.64). From this project, it showed that there is potential to utilize the cocoa pulp into muffin in the baking industry. The success of the project depends on the acceptance of the consumers to have new ingredients in the muffin. Cocoa pulp is an innovative idea and can be used to increase the economic use of cocoa. Besides, it provides a solution to the wastage problem occurred during harvesting cocoa fruit.

Keywords: Muffin, colour, texture, antioxidative activity, sensory acceptability
Effects of gelatine addition on characterisation, floating and leaching phenomena of Grass Jelly (Cincau)

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Grass jelly is a quite famous dessert for the Asian, especially grass jelly commercial drink. However, food industries have been using many preservatives and additional colourants to maintain the characteristics, floating properties and leaching phenomena of grass jelly. Gelatine is a popular gelling agent used for making jellies and desserts. There are a few studies that focus on gelatine addition in grass jelly thus, either grass jelly with gelatine addition will be stable as the commercial grass jelly is still questionable. This research was done to determine the effect of gelatine addition on characterisation, floating and leaching phenomena of grass jelly. Grass jelly made with gelatine addition will be compared with the commercial one. Gelatine were added at concentration 0%, 5%, 10%, 15%, 20%. It was found that different concentration of gelatine used has significant effects on characteristics, floating and leaching phenomena of grass jelly. Colour analysis showed that 0% gelatine grass jelly has the best colour attributes when compared to commercial. For texture and Brix, 5% gelatine grass jelly has the nearest value to the commercial. 10% gelatine grass jelly showed pH almost the same as commercial. For floating phenomena, 0% and 5% gelatine grass jelly marked the highest duration afloat. 20% gelatine grass jelly showed the least leaching among all grass jelly samples. Overall, grass jelly with 5% and 10% gelatine have characterisation similar to commercial, but for leaching phenomena, 20% gelatine grass jelly has better dye retaining. Further analysis can be done to test the stability and properties of grass jelly with gelatine addition.

Keywords: Grass Jelly, Gelatine, Characterisation, Floating, Leaching
**Consumer acceptance on the aroma of lemongrass (Cymbopogon citratus) using different temperatures of oven drying method**

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This study is to find out the best temperature to prepare dried lemongrass (Cymbopogon citratus) and performed consumer acceptance test toward them. This study was conducted at University Malaysia Kelantan Jeli campus. The problem statement is finding a drying process with a suitable temperature for the drying of lemongrass with the aroma and colour that consumer accepts. Then, the shelf life of the fresh lemongrass is short and to overcome that; preservation methods are used. Drying is the preservation method that is chosen. The aims of this study are to identified the effect of different drying temperatures to the aroma of the dried lemongrass using sensory analysis. Then, to identify the acceptance of the dried lemongrass toward a level of preference of the consumers. Method of preparing the dried lemongrass that involve is collecting a fresh sample, washing, wipe excess water, cutting process and drying. The drying process will be using oven dried method with different temperatures of 40°C, 50°C, 60°C, and 70°C. The drying will continue until the weight of the lemongrass are constant to make sure it dried completely. The dried lemongrass and water samples are tested using questionnaire sensory analysis. The questionnaire is developed according to the aims of the study involving consumer as the respondents. The outcome is analyzed using descriptive analysis. The temperature of the drying process affects the aroma of dried lemongrass. The suitable temperature in drying that preserves the aroma of lemongrass and most are at the lowest temperature used. The drying process can retard the microbial activity and longer the shelf life of the lemongrass.

**Keywords:** drying temperature, aroma of lemongrass, consumer preference, sensory analysis, descriptive analysis.
The effect of addition two different thickening agent (gelatine and carrageenan) for shelf life and physicochemical properties in grass jelly

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Grass jelly agar and drink had been popular because of their nutrition especially high in dietary fibre and carbohydrates. However, some problems can reduce consumer preferences and perception. Because of that, this research was conducted to study the physicochemical analysis and shelf life in grass jelly made with two different thickening agents which are gelatine and carrageenan. This research was to determine the appropriate percentage of addition gelatine and carrageenan. This study also conducted to improve the texture of grass jelly by addition of gelatine and carrageenan. Other than that, physicochemical properties which are pH, brix, colour and texture were analysed by weekly. Furthermore, the shelf life of grass jelly with addition gelatine and carrageenan was also evaluated. Grass jelly agar was prepared with the different percentage which were the addition of gelatine 1%, 2%, 3% and 4% while the addition of carrageenan 6%, 7%, 8% and 9%. The samples were kept at a constant temperature, which was 40°C for 3 months. In order to test the shelf life, the parameters including pH, texture, colour and concentration of brix at week 1 were determined, to select the best percentage of gelatine and carrageenan for microbiological analysis. The shelf life was tested within 3 months on a weekly basis and all parameters were tested weekly. Based on the result, the shelf life of grass jelly addition with gelatine is much longer than carrageenan. Physicochemical analysis showed that grass jelly with the addition of gelatine at the percentage 3% and addition carrageenan at 7% is the most preferable sample. In the future study, another thickening agent can be used to replace with gelatine and carrageenan for another analysis.

Keywords: shelf life, grass jelly, gelatine, carrageenan, parameter
Consumer acceptance on the effect of temperature and aroma on torch ginger flower (*Etlingera elatior*) as food ingredient

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Torch ginger flower and known as *Etlingera elatior* is a species of herbaceous perennial herbs plant. It belongs to the family of Zingiberaceae such as galangal, curcumin, and turmeric. Besides, it also has a different colour such as red, pink and white. Torch ginger flower can found throughout tropical South East Asia such as Malaysia, Thailand, and Philippine. Torch ginger flower is edible, flavorful and contains good aroma. It is one of the herbs and plant is being used a long time ago by the community in the dishes such as in ‘Assam laksa’. It usually uses as an addition in ingredient to give taste, colour and also aroma. The rainy season is a suitable season for the torch ginger flower to be growth. This is due to the torch ginger flower is always required humid condition and cannot expose to dry condition for a long time, make it withered easily. On the other hand, torch ginger flower cannot expose to the room temperature for a long time because of the shelf life of torch ginger flower is short without preservation. Drying is one of the best ways which can extend the shelf life. The temperature used in the drying process is 40°C, 50°C, 60°C and 70°C. The torch ginger flowers were dried until they reached the constant weight. The results show that the temperature influences the weight, moisture loss, colour, and aroma of the dried torch ginger flower. Sensory evaluation is conducted for 80 respondents to find out the consumer acceptance of dried torch ginger as a food ingredient.

**Keywords:** Torch ginger flower (*Etlingera elatior*), drying, shelf life, moisture loss, consumer acceptance
Nutritional, texture and sensory properties of pasta incorporated with pumpkin (*Cucurbita moschata*) and sweet corn (*Zea mays* L.) powder

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Pumpkin and corn are commercially planted in the East Coast of Peninsular Malaysia. Pasta which is favourable due to the texture and flavour is often eaten as the main meal of the day in certain countries. In Kelantan, pumpkin and sweet corn are abundantly found in the market but limited use of these fruits and vegetables. The aim of this study was to evaluate the effects of different level of pumpkin and sweet corn powder incorporation on nutritional composition, texture and sensory properties compared to control pasta. The pumpkin and sweet corn powders were incorporated in pasta formulation at the level of 0-25% included (25:0), (20:5), (12.5:12.5), (5: 20) and (0: 25) while the 100% of wheat flour served as (0:0) control. All pasta were analysed for proximate compositions according to AOAC methods, texture properties using instrumental analysis and the sensory properties of pasta were identified by using 7 hedonic scale. Based on the result the fat content was significantly higher (p<0.05) in pasta containing an increased level of sweet corn than control. Ash content was significantly higher (p<0.05) in pasta containing an increased level of pumpkin than control. Moisture and protein content in pasta containing these vegetables, however, were not significantly different (p>0.05) with control. The pasta incorporated with pumpkin and sweet corn showed relative lower carbohydrate content (p<0.05) than control. Colour analysis indicated uncooked pasta had high $L^*$, $a^*$ and $b^*$ compared to cooked pasta. Both cooked and uncooked pasta had a similar trend with decreased of $L^*$ while increased of $a^*$ and $b^*$ compared with control. The texture properties of uncooked pasta did not show a much significant difference compared to control. On the contrary, the cooked pasta revealed cooked pasta was a significant difference in hardness, springiness, chewiness and cohesiveness. High level of pumpkin had significant lower hardness, followed by higher springiness, chewiness and cohesiveness by 3337, 0.23, 29.20 and 3.81. The sensory evaluation indicated 25% incorporation of pumpkin powder obtained highest rated in colour, aroma, firmness, stickiness, taste, flavour and overall acceptability. In conclusion, 25% incorporation of pumpkin powder was the most acceptable scored with lower carbohydrate, deep yellow orange colour and good texture properties. Hence, pumpkin powder is suggested to be used as a flour replacement in conventional pasta manufacturing.

**Keywords:** pasta, pumpkin, corn, nutritional, physicochemical and sensory
Consumer acceptance on the effect of temperature and aroma on Kaffir lime leaves (*Citrus hystrix*) as food ingredients

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*Citrus hystrix* or the Kaffir lime primarily used for its leaves. Usually, the leaves are widely used as herbs that added into Asian dishes. It provides the aroma and also flavour. For the fruit, it almost has no juice, but the zest and rind might be useful. The fruit also uses as one of the traditional medicinal purposes. Usually, mold is susceptible to growth when the food contains any kind of water or fluid. In order to preserve the food or to keep the food in a good condition, the moisture content must always be in a low state so that the spoilage organisms cannot grow. Kaffir lime leaves undergo the drying method which is one of the oldest methods to identify the change in aroma by increasing the temperature and also the acceptance by the consumer. The drying method that is used is oven-drying which gives effect on the aroma of the kaffir lime leaves depending on the temperature applied, the percentage of moisture loss and aroma also will change. Even though most of the people more prefer fresh sample over the processed sample, 71.25% of the respondents are willing to purchase the dried sample if available in the market (Figure 4.23). Not to mention that more than half of the respondents look forward to the dried sample that has a similar aroma to the fresh sample. Thus, for consumer preferences temperature selection is vital on the aroma change and also for a future project in involving dried food ingredient as a product.

**Keywords:** Kaffir lime leaves (*Citrus hystrix*), Temperature, Aroma, Moisture loss, Consumer Acceptance
Preliminary magnetic biocarbon synthesis comparison and its characterization

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Water treatment is important for solving water pollution problem which brings an impact to the ecosystem. Current activated carbon (AC) is widely used in the water treatment process while there is a problem in removing the AC from the treated water. In this experiment, the iron fine powder is used to prepare magnetic biocarbon which is magnetized the AC and found that the sonicated bath treatment can improve the adsorption of the sample. This magnetic biocarbon can be removed from water easily by using the magnetic force. The methylene blue test and iodine number test were carried out to test on the adsorption capability of the sample. The sample was tested by SEM, FTIR, TGA and XRD and showed the existed of magnetite (Fe3O4). This proved the sample can be used to magnetize the AC.

Keywords: Magnetic biocarbon, Activated carbon (AC), Iron fine powder (IFP)
Preparation and screening of cross-linked magnetic biocarbon for methylene blue removal

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A cross-linked iron oxide particle with activated biocarbon (MAC) by Cetyltrimethylammonium Bromide (CTAB) and Cyclopentasiloxane (CPS) was designed for the uptake of Methylene Blue (MB) in water solution. The cross-linked MAC was successfully prepared with strong magnetization property. The effect of contact time of MB onto newly prepared MAC samples was screened and studied. The removal effectiveness also compared with MAC (T1), AC (positive control), and provided MAC (pMAC) (negative control). The physical and chemical properties of studied samples were obtained through iodine test, Fourier transforms infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscope equipped with energy-dispersive spectroscopy (SEM-EDS), and thermogravimetric analysis (TGA). MAC cross-linked with CPS (MAC-CPS) showed the highest efficiency in MB removal of 99.84 % in 60 min relative to CTAB cross-linking agent (MAC-CTAB). However, low iodine number obtained in MAC-CPS as 90.18 mg/g decreased compared to AC and MAC as 1007.01 mg/g and 240.48 mg/g respectively. The FTIR spectrum of MAC-CPS indicated intense of Si-O stretching and Fe-O stretching at 1254 cm\(^{-1}\) and 525 cm\(^{-1}\) respectively. This can be assigned to the interaction between iron oxide and CPS in cross-linked reaction. The analysis of XRD suggested that the main magnetic phase present is magnetite (Fe3O4) with small amounts of maghemite (γ-Fe2O3). The TGA demonstrates MAC-CPS possessed higher thermal stability property. The excellent characteristics presented by CPS potential as a cross-linking agent for further practical applications.

**Keywords:** Magnetic Activated Biocarbon, Cross-linked, CTAB, CPS, Methylene Blue Removal.
Study of sodium dodecyl sulphate treated magnetic biocarbon synthesis

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Magnetic activated carbon (MAC), the activated carbon (AC) that contain magnetism, which found to be useful for the methylene blue adsorption due to its physico-chemical properties such as strong adsorption causes by magnetism. The use of AC for methylene blue adsorption was ineffective compared to MAC. Additionally, the MAC in the market still facing a problem which was the magnetism was not stable. MAC was prepared by incorporating a different type of iron powder and chemical to strengthen the magnetism. The adsorbent sample was carried out methylene blue adsorption test and iodine test. The adsorbent sample was characterized by physical and chemical properties which are scanning electron microscopy (SEM), energy-dispersive X-ray (EDX), Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA) and X-ray diffraction (XRD). The performance study of the adsorbent sample shows that MAC_A3II presented better qualities in methylene blue adsorption which the removal percentage was high and low magnetic contact time that shows strong magnetism. MAC_A3II are prepared by incorporating iron powder and cured by using sodium dodecyl sulphate (SDS). Among the adsorbent sample, MAC_B2III was considered as the weakest qualities because the removal percentage was low and the preparation process was complicated compared with others. The EDX analysis shows that MAC_B2III contain more silicone compared to MAC_A3II. Due to the TGA test, both adsorbent samples achieved almost the same residue after heat up to 1000 °C which show that both samples have high thermal stability properties.

Keywords: magnetic activated carbon, sodium dodecyl sulphate, iron powder, methylene blue adsorption.
Preparation of raw oyster shell for adsorption of methyl red dye in aqueous solution

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The raw oyster shell was successfully prepared as an adsorbent for removal of Methyl Red (MR) dye. Adsorption studies were carried out for removal of MR dye from aqueous solution by varying the adsorption parameters such as adsorbent size, adsorbent dosage, initial dye concentration, contact time, pH, agitation speed and agitation time. Optimum conditions for adsorption of MR dye were obtained at 75 μm of adsorbent size with 0.3 g of adsorbent dosage at 2 hours as contact time. Initial dye concentration at its optimum level was found to be 100 mg/L working efficiently at pH 3 and agitation rate of 110 rpm. Orbital shaker was used to reduce the time consumption during the adsorption process, and it gives the positive result when the contact time can be reduced from 2 hours to 45 min after the process of agitation. The removal efficiency was found out to be 99.2%, and this result shows that raw oyster shell has great potential in removing of MR dye from aqueous solution. The experimental data obtained were best fitted by the Langmuir isotherm model than the Freundlich isotherm model, and this defines the monolayer adsorption mechanism of adsorbent.

**Keywords:** Raw oyster shell, adsorption, methyl red dye, isotherm model
Preparation of raw oyster shell for removal of congo red dye in aqueous solution

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The raw oyster shell obtained from food waste was successfully prepared as an adsorbent for the removal of Congo Red (CR) dye in aqueous solution by using adsorption technique. The various parameters that influence in this adsorption process such as adsorbent size, adsorbent dosage, initial dye concentration, contact time, pH, agitation speed and agitation time were studied. From the results, a maximum adsorption capacity of 96.3% was obtained at the optimized conditions of 75 μm of adsorbent size, 1.0 g of adsorbent dosage, 30 mg/L of initial dye concentration, 2 hours of contact time, pH3, 110 rpm of agitation speed and 75 min of agitation time, respectively. The experimental data were analysed by using two adsorption models, Langmuir isotherm model and Freundlich isotherm model. The adsorption data obtained well fitted for the Langmuir isotherm model, indicate monolayer adsorption reaction involved during the adsorption process. The result shows that raw oyster shell could be employed as a suitable alternative adsorbent to remove Congo red dye in aqueous solution.

**Keywords:** Raw oyster shell, adsorption, congo red dye, isotherm model
Preparation of raw oyster shell for adsorption of methyl orange dye in aqueous solution

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The development of oyster culture in Peninsular Malaysia nowadays is increasing well due to high demands of oyster from restaurants and hotels, especially in the tourist spot. However, there is bad consequence through this development which is irresponsible disposal of waste oyster shell to certain areas that create new problems such as delivering an intense scent and pollute surrounding environment. In addition, another problem is to remove dye that has been discharged by industries into water through adsorption technique. This problem needs to be resolved using a creative solution by turning the shell waste into something beneficial and useful. The raw oyster shell was successfully prepared as an adsorbent for adsorption of methyl orange dye in aqueous solution. Study on adsorption was carried out by varying adsorption parameters such as adsorbent size, adsorbent dosage, initial dye concentration, contact time, pH, agitation speed and agitation time. Based on results, the optimum parameters for the removal of MO dye is using 1.0 g of 75µm of adsorbent particle size with the initial dye concentration of 150 mg/L in the acidic condition of pH 3 in 130 rpm agitation speed for 1 hour. Raw oyster shell has great potential in removing MO dye from aqueous solution because it recorded 98.39% of percentage removal. The experimental data obtained were best fitted by Langmuir isotherm model than the Freundlich isotherm model, and this proves that monolayer adsorption happens at the specific homogenous site of adsorbent in which all adsorption sites are equally probable in this adsorption process.

Keywords: Raw oyster shell, methyl orange dye, adsorption, isotherm model
Effect of ginger, banana, and sugarcane agro waste in the quality of paper

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This final year project will be focusing on making paper from the waste of banana, sugar cane and ginger. Transforming the unwanted waste into a beneficial paper is one of the best methods in utilising the plant 100%. There are three treatments to be studied which are banana, ginger, and sugarcane while the parameters to be evaluated are the strength, dryness, and flammability of papers. However, this study only applies the traditional method in papermaking, where the pulp will be created by using the kitchen blender (Elvidge, 2018). The quality of papers is highly affected by the presence of cellulose fibres, which is the main component in order to allow the paper to hold together. Thus, this study will determine the difference of the strength of papers from the different plant (banana, sugar cane and ginger).

**Keywords:** Paper, strength of paper, paper plant, agricultural waste, pulp
Effect of cooking methods of chicken meat mixed with macaroni on physicochemical properties and sensory acceptability during frozen storage

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The different cooking process leads to change in the chemical composition and physical structure of food. The frozen food industry has increased in the market and is important in human’s diet. Frozen food has also been cooked by a cooking method based on the preference of the household. In this study, the different cooking method had been applied to chicken meat and macaroni. The colour, textural properties and sensory acceptability on different cooking method have been studied while the nutritional composition of chicken and macaroni was accessed according to AOAC. The results showed that air fry method for chicken was the highest for $L^*$ and $b^*$ value $(62.82 \pm 1.71a)$, $(25.75 \pm 0.77b)$ respectively while for macaroni the oven method was highest in $L^*$ and $a^*$ value of $61.24 \pm 2.18a$ and $4.26 \pm 1.95a$ respectively. For texture properties, of chicken and macaroni, there was a slight difference among cooking method in hardness with the range $5074.33 – 5253.33$, springiness and chewiness of chicken and macaroni have the highest value in air fry at $9.37 \pm 0.81a$ and $10.38 \pm 0.17b$, $349.33 \pm 63.64$ and $460.80 \pm 58.23a$ respectively. For nutritional composition of chicken and macaroni showed been cooked by air fry is the highest in moisture $(72.93 \pm 0.01a$, $58.43 \pm 0.06a)$, protein $(35.69 \pm 0.04a$, $7.20 \pm 0.04a)$ and ash $(5.70 \pm 0.01a$, $0.51 \pm 0.01a)$ while lowest in fat $(1.97 \pm 0.014c$, $0.02 \pm 0.01c)$. For sensory acceptability, air fry method showed the highest for all the attributes With such a good and beneficial properties; air fry method may be used as the main cooking method in order for the food to be healthier and more nutrition after being cooked.

**Keywords:** Frozen, Cooking Method, colour, texture, nutritional composition, sensory acceptability.
D. Aquaculture/ feed technology/Phytoremediation
The study on growth performance of African Catfish (*Clarias gariepinus*) reared in earthen pond farming system

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Aquaculture industry involves culture of many fish species of either fresh or brackish water origin such as tilapia and catfish. The African catfish (*Clarias gariepinus*) is one of the most popular freshwater fish and have a high demand in Malaysia. This research study was carried out to monitoring the growth performance of African catfish (*C. gariepinus*) reared in earthen pond farming system. 30,000 African catfish (*C. gariepinus*) fingerlings were stocked in the earthen pond farming system with the size of 30.48 m × 12.19 m. The growth performance of African catfish (*C. gariepinus*) was evaluated for 8 weeks. Water quality, percentage weight gain (PWG), specific growth rate (SGR) and feed conversion ratio (FCR) were determined. Initial body weight of African catfish (*C. gariepinus*) was 8.05 g ± 0.08 and final body weight of African catfish on week 8 was 19.74 g ± 0.27. The highest growth rate of African catfish (*C. gariepinus*) was shown on week 2 which was 0.45 g ± 0.06. The least value of feed conversion ratio resulted in week 2 which was 0.14 ± 0.03 which was the best value for feed conversion ratio. All the water quality parameters were within the acceptable range for African catfish (*C. gariepinus*). In conclusion, the earthen pond culture system was applicable for African catfish (*C. gariepinus*) farming.

**Keywords:** *Clarias gariepinus*, earthen pond, growth performance, water quality parameter
A study of growth performance of African Catfish, *Clarias gariepinus*
In Hapa System

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African catfish (*Clarias gariepinus*) fingerling with an average body weight of 8.91g and the size was 5cm were used to monitor the growth performance of African catfish using hapa system. In the present study is determined the viability of using hapa in African catfish farming. Hapa is a rectangular or square shape like a cage where placed in an earthen pond for keeping fish for various reasons. It is rarely practice in fish farming compare to other culture system. Hapa system usually uses for nursery the fingerlings or hatchery phase of the fish before transfer it into pond or other systems for the grow out until achieving marketable size. In the present study, 2 000 fingerlings of African catfish were stocked in the hapa system. The growth performance of the experimental fish was evaluated for eight weeks where the feed conversion ratio (FCR) was -2.73, 2.64, -1.76, -9.46, -4.5, -3.71, 14.38 and 36.54 from week 1 until week 8 respectively. For specific growth rate (SGR) the value was -0.13, 0.26, -0.04, -0.41, 0.01, -0.06, 0.06 and -0.03 from week 1 until week 8 respectively. The water quality including dissolved oxygen (3.44 mg/L to 5.64 mg/L), temperature (28.1°C to 33.57°C) and pH (6.85 to 7.9) in hapa was measured using multi-parameter for four times a week. The finding of the present study was useful for the farmer who wants to apply the hapa system in African catfish farming.

*Keywords: African Catfish, Farming, Hapa System*
Asian clam or locally known as ‘etak’ is consumed as a snack by East coast community in Peninsular Malaysia especially Kelantan and Terengganu. There are arising cases of food poisoning associated with Asian clam consumption, and *Escherichia coli* is one of the culprits to this issue. Furthermore, there is also insufficient information about the *E. coli* level in Asian clam and the suitable antibiotic use to inhibit bacteria growth. Therefore, a study on the antibiogram of *E. coli* isolated from semi-closed system farmed Asian clam was carried out. A total of 100 single colonies was successfully isolated was identify as *E. coli* by using biochemical test and commercial kits. The *E. coli* was subjected to antibiotic sensitivity test using disk diffusion method with 18 types of antibiotics namely novobiocin (30 µg), fosfomycin (50 µg), tetracycline (30 µg), linomycin (15 µg), flumequine (30 µg), sulphamethoxazole (25 µg), amoxycillin (25 µg), chloramphenicol (30 µg), oleandomycin (15 µg), spiramycin (100µg), ampicillin (10 µg), oxytetracycline (30 µg), doxycycline (30 µg), nalidixic acid (30 µg), florfenicol (30 µg), erythromycin (15 µg), kanamycin (30 µg) and oxolinic acid (2 µg). The result showed Asian clam was safe to be consumed and water was suitable to use in Asian clam farm as MPN test showed lower than standard levels. Next, the total plate count of *E. coli* from Asian clam samples GO bio-filter system was 5.7x105 CFU/mL while the control system was 2.45x104 CFU/mL. Then, a water sample from Asian clam farm control system was reported to have 6.45 x 103 CFU/mL, meanwhile, GO system was too numerous to count (TFTC). Besides, *E. coli* isolated from all sample was sensitive (≥70 %) to florfenicol however bacteria isolated were resistance (100 %) to linomycin. Hence, the findings might be useful as guidance for the farmers to control the *E. coli* infection.

**Keywords:** Most Probable Number Test, antibiogram, *Corbicula fluminea*, *Escherichia coli*
Antibiogram of *Salmonella* spp. isolated from semi-closed system farmed asian clam, *Corbicula fluminea*

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In the present study, most probably number (MPN) analysis of farmed Asian clam, *Corbicula fluminea* tissue samples from graphene oxide (GO) and without GO bio-filter farm were carried out. Water samples of respective farms were also subjected to MPN analysis. Both tissue and water samples showed no significance difference in the effectiveness of GO in affecting the number of coliform bacteria. Overall, MPN index of all four samples were not too high, between 33/100g to 1600/100g. Despite low MPN index, *Salmonella* spp. were isolated using Xylose Lysine Deoxycholate (XLD) agar. The isolated *Salmonella* spp. were tested with the commercial kit for confirmation. *Salmonella* spp. is pathogenic to human as it causes food borne illness, Salmonellosis through food contamination. Thus, antibiotic susceptibility test of *Salmonella* spp. extracted from C. fluminea tissue and water samples from both GO and without GO bio-filter farm were conducted. A total of 10 colonies from each sample were isolated and subjected to antibiotic susceptibility test using disc diffusion method. The findings of the present study showed total antibiotic sensitive case for *Salmonella* spp. isolated from C. fluminea tissue sample from GO bio-filter farm was 52.22%, intermediary sensitive case 3.33% and resistance case 44.44%. For *Salmonella* spp. from without GO bio-filter farm, 59.44% was sensitive, 5% was intermediary sensitive and 35.56% was resistance. Meanwhile, antibiotic susceptibility test for Salmonella spp. isolated from water sample of GO bio-filter farm was 50% sensitive, 6.11% intermediary sensitive and 43.89% resistant whereas *Salmonella* spp. isolated from water sample without GO bio-filter farm was 56.67% sensitive, 6.11% intermediary sensitive and 37.22% resistant to antibiotics tested. GO was found to be ineffective towards all *Salmonella* spp. from four samples. This present study found tetracycline, oxytetracycline and flumequine are the best antibiotics in inhibiting *Salmonella* spp. with 100% sensitivity. Furthermore, multiple antibiotic resistance (MAR) index for *C. fluminea* tissue sample from GO and without GO bio-filter farm were 0.44 and 0.36 respectively whereas water sample from GO and without GO bio-filter farm were 0.44 and 0.37. Findings show that all four samples were highly exposed to antibiotics.

**Keywords:** Asian Clam, Corbicula fluminea, Most Probable Number (MPN) Analysis, Salmonella Spp., Antibiotic Susceptibility Test
Antibiogram of *Vibrio* sp. isolated from semi-closed system farm asian clam, *Corbicula fluminea*

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*Vibrio* sp. is gram-negative bacterium with facultative properties. They not only play as a causative agent of vibriosis in clam farming but also lead to several diseases harming human health. Despite all the advances in the research, the study of *Vibrio* sp. is still in research and lacking information on scientific study. In Kelantan, Asian clam is known as ‘etok’ are popular among citizen and use to serve as snack or meal. This research provides an experimental study on *Vibrio* sp. isolated from Asian clam or also known as *Corbicula fluminea*. The objectives of the study are monitored the safety level of *Vibrio* contaminated via most probably number (MPN) analysis and antibiogram characterise of live Asian clam, *Corbicula fluminea* in the semi-closed farm. Throughout the study, MPN test suggested it is not safe to be consumed raw Asian clam. *Vibrio* colonies were successfully isolated in Thiosulfate-citrate-bile salts-sucrose (TCBS) agar and were subjected to 18 antibiotic discs for antibiogram test. Among all the antibiotics, nalidixic acid, oxolinic acid, oxytetracycline and tetracycline were found most sensitive followed by florfenicol (90%) and flumequine (70%) in controlling *Vibrio* sp. cultivated from water and tissue sample of Asian clam. Furthermore, the isolated bacteria identified by using BBL crystal enteric/nonfermenter kit confirmed the presence of *V. Cholerae* from the samples. Hence, mentioned antibiotics were advised to be used as prophylactic and treatment for clam farming while suitable treatment must conduct for safe consuming.

**Keywords:** *Corbicula fluminea, Vibrio sp., Most Probably Number (MPN), Antiobiogram, BBL crystal enteric/nonfermenter kit*
The effect of pineapples (*Ananas comosus*) waste (peel and crown) extract to the growth performance of Nile tilapia (*Oreochromis niloticus*) fingerlings

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In Malaysia, tilapia is the common and important aquaculture species that are produced for the daily consumptions. The main purpose of this experiment is to determine the effect of pineapples (*Ananas comosus*) waste (peel and crown) extract on the growth performance of Nile tilapia (*Oreochromis niloticus*). In this experiment, have four different types of treatments. The first treatment is control (Diet 1) which is only giving the commercial pallet to Nile tilapia. For the second treatment (Diet 2), the Nile tilapia fed with commercial pallet + 10% pineapples waste extract (PWE). Then, for third treatment (Diet 3) the Nile tilapia were fed with commercial pallet + 20% pineapples waste extract. Lastly, for the fourth treatment (Diet 4) Nile tilapia were fed with commercial pallet + 30% Pineapples waste extract. From the result, Diet 4 showed the growth performance 16.90 g, specific growth rate (SGR) is 2.67%, feed conversion ratio (FCR) is 4.69 and survival rate is 95.55%. Then, followed by Diet 3 with growth performance 15.15 g, specific growth rate (SGR) is 2.50%, feed conversion ratio (FCR) is 3.87 and survival rate is 75.66%. Diet 2 showed the growth performance 14.68 g, specific growth rate (SGR) is 2.46%, feed conversion ratio (FCR) is 4.88, survival rate is 81.11% and followed by Diet 1 with growth performance 13.91 g, specific growth rate (SGR) is 2.42%, feed conversion ratio (FCR) is 3.35 and survival rate is 67.78%. In conclusion, the tilapia fed the feed supplemented with 30% PWE resulted in the optimum growth performance, optimum specific growth rate, and better survival rate but the feed conversion ratio, not in the optimum range.

**Keywords:** Oreochromis niloticus, Pineapples (*Ananas comosus*) Waste, Growth Performance, Feed Additive.
Antibacterial activity of Ulam Raja (*Cosmos caudatus*)

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*Cosmos caudatus* is one of good for knowing the bacteria and wants to against the disease resistance expected for aquaculture culture and also in human body as well. The aim of the study is to investigate the potential of *C. caudatus* extract with different solvent extraction ethanol, hexane, methanol and distilled water of *C. caudatus* with the present if antibacterial potential that against the bacteria, Gram-positive which is *Streptococcus sp.* by using agar well diffusion method. The result of maximum inhibition zone was 1.1\pm0.33d mm against ethanol extract of *C. caudatus* compare to methanol and hexane. There is no inhibition zone detected in distilled water and control treatment. The herb plant species showed they are rich in antimicrobial properties to reduce any pathogen attack the animal surrounding and human disease. Besides that, *C. caudatus* also has the high anti-oxidant capacity and has various medical properties such as anti-diabetic activity, anti-hypertensive properties, anti-inflammatory response, bone-protective effect and anti-microbial activity. Further study needs to be continued to know more component beside antibacterial activity in *C. caudatus* or in other herbs plant that also can be an advantage to others.

**Keywords:** Cosmos caudatus, Antibacterial Activity, Bacteria, Disease Resistance
Antibacterial activity of pineapple (*Ananas comosus*) waste (peel and crown)

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The aim of this research study is to determine the antibacterial activity of pineapple (*Ananas comosus*) waste (peel and crown) against *Streptococcus sp*. There are four different extraction solvents that been used which are ethanol, methanol, hexane and distilled water and antibacterial activity was carried out using agar well diffusion method. The result showed that the highest inhibition zone was observed for ethanol crude extract which was 1.20±0.10 mm compared to the inhibition zone of methanol extract, 1.00±0.10 mm. For the hexane and distilled water, no detected inhibition was observed in the agar. This finding showed that the A. *comosus* waste (peel and crown) contain a high level of antibacterial properties that can be used to prevent any bacteria which can attack the aquaculture species and human health. Further study needs to be conducted to find the full structural component of the antibacterial compound derived from the A. *comosus*. The result obtained can be used as a guideline for further research on this field in the future.

**Keywords:** *Ananas comosus* waste, Antibacterial activity, Extraction, Agar well diffusion, Bacteria.
Investigation of proximate composition of Asian clams (*Corbicula fluminea*) in two different treatment at selected district in Kelantan

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This research investigated the proximate composition of Asian clams (*Corbicula fluminea*) in two different treatments which are fresh and smoked at selected districts in Kelantan which are Pasir Mas and Tumpat. Five components in proximate composition (moisture, ash, crude fat, crude protein and carbohydrate) were evaluated. The moisture contents of the fresh samples were higher compared to the moisture of the smoked samples. The results showed that the crude protein, crude fat and ash contents of the smoked samples from both harvested location were higher compared to the fresh samples. However, there are some errors occur, and the value of carbohydrate from both treatment and both harvested location might not be accurate. The value of moisture content, ash content, crude fat content, crude protein content and carbohydrate content between both treatment are not significantly different (p>0.05). Thus, the result shows that, smoking process help in increasing the value of proximate composition.

**Keywords:** *Corbicula fluminea, ash, crude fat, crude protein, smoking*
In terms of providing a low cost feeds for animal consumption, the nutrient component for different species of aquatic plants was evaluated. This study emphasizes on the nutrition comparative between 5 different species of aquatic plants such as *Hydrilla verticillata* (Order: Hydrocharitales), *Pistia stratiotes* (Order: Arales), *Chara corallina* (Order: Charales), *Myriophyllum spicatum* (Order: Haloragidales) and *Azolla pinnata* (Order: Salviniales) were collected around Kelantan (6.1254° N, 102.2381°E). The objectives of this study are to differentiate the nutrient component for five different species of aquatic plants. The study shows that the crude fiber values for *H. verticillata*, *P. stratiotes*, *C. corallina*, *M. spicatum*, and *A. pinnata* were 15.35±0.35%, 14.10±0.10%, 20.05±0.55%, 25.60±5.10% and 42.95±2.25% respectively. While the percentage of ash content recorded for *H. verticillata*, *P. stratiotes*, *C. corallina*, *M. spicatum*, and *A. pinnata* were 18.8%, 31.8%, 20.6%, 28.9% and 12.0% respectively. The organic matter content for *H. verticillata*, *P. stratiotes*, *C. corallina*, *M. spicatum*, and *A. pinnata* were 81.20±0.10%, 68.20±0.10%, 79.40±0.20%, 80.80±0.10% and 88.05±1.45% respectively. The crude protein value for *H. verticillata*, *P. stratiotes*, *C. corallina*, *M. spicatum*, and *A. pinnata* were 23.18±0.13%, 16.89±0.08%, 22.30±0.13%, 22.78±0.76% and 21.70±0.09% respectively. While the microbial analysis based on the total bacterial count for *H. verticillata*, *P. stratiotes*, *C. corallina*, *M. spicatum*, and *A. pinnata* were 2.71CFU/mL, 2.88CFU/mL, 2.16CFU/mL, 0.49CFU/mL and 1.68CFU/mL respectively. In conclusion, the nutrient component for five different species of aquatic plants differs from each other. So, the nutrient for five different species of aquatic plants is suitable for animal feed.

**Keywords:** Aquatic plant, nutrition, animal feed.
Mixture of *Hydrilla verticillata* (Order: Hydrocharitales) and *Blaptica dubia* (Order: Blattodea) as fish feed

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In Malaysia, there is an issue of increasing demand and unstable production of the fish meal which led to an increased cost of aquaculture production. Despite the nutritive value of the fish meal, the escalated cost of fish meal has urged the industry to seek alternatives protein source to replace the costly fish meal. In this research, different proportion of *Hydrilla verticillata* and *Blaptica dubia* were used to produce fish meal. The proportions were named as T1 (60% *Hydrilla verticillata* and 40% *Blaptica dubia*), T2 (70% *Hydrilla verticillata* and 30% *Blaptica dubia*), T3 (80% *Hydrilla verticillata* and 20% *Blaptica dubia*), T4 (90% *Hydrilla verticillata* and 10% *Blaptica dubia*) and T5 (100% *Hydrilla verticillata*). T5 had the highest floatation compared to other diets. Thus, T5 can be indicated as a pellet that has good water stability. From the result obtained, T3 is the most suitable diet to be used as a commercial pellet in the future. However, others diet can be suggested to be consumed according to life stages of fish and based on their species as differ species require a different amount of protein content. The result showed that these treatments could be locally developed to substitute commercial pellet in the future as both raw materials contain high protein content and easily available.

**Keywords:** fish meal, *Hydrilla verticillata*, *Blaptica dubia*, floatation, crude protein
E. Animal reproduction/Animal Nutrition
Comparison between Holstein – Friesian (HF), Jersey – Friesian (JF) And Jersey (J) with regard body weight, milk quantity and milk quality under intensive system

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Many constraints in the dairy industry such as lack of skills and training, low breed performance and inadaptability to the local environmental condition as well as poor dairy farm management caused the inability of Malaysia to meet the dairy demand of its population. Therefore, this study was proposed to compare different breeds in terms of body weight, milk quantity and milk quality under the intensive system. It is worthy to highlight that body weight condition is an essential part of modern dairy management while milk production is the main product in the dairy industry. This study also presents that the different breeds of dairy cattle affected the body weight, milk quantity and milk quality under the intensive system which allows the farmers to choose wisely among the breeds in order to maximize the profit in the dairy industry. The data taken related to Holstein – Friesian (HF), Jersey – Friesian (JF) and Jersey (J) dairy cow from Desa Selatan Beef Sdn Bhd which started from the year of 2016 until the year of 2018. All the data that been analysed had a significant difference with the p-value less than 0.05. The highest body weight in this study was Holstein Friesian (HF) with the value 395.000 ± 23.15. For the milk production, breed of Holstein Friesian (HF) had the highest quantity of milk with the value 38.588 ± 1.06. It was several milk qualities showed significance difference were fat, protein, and lactose with the highest value for fat 7.044 ± 0.83 with Jersey (J) breed of dairy cow. For the protein percentage Jersey (J) was the highest with value 4.033 ± 0.34. Milk quality for lactose percentage with the highest value was Jersey (J), 5.978 ± 0.44. The different breeds affect the body weight, and milk production and Holstein – Friesian (HF) showed the best result whereas the best result for milk quality including fat, protein and lactose Jersey (J) compare to another breeds.

Keywords: Holstein – Friesian (HF), Jersey (J), body weight, milk quantity, milk quality
Effect on bovine semen qualities with supplemented date palm pollen grain in extender using electrical stimulation

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This study was to evaluate (1) The effect of extender supplementation with different concentration of date palm pollen grain (DPPG) on sperm quality parameter in Brahman bull and (2) To observe the quality of sperm with different temperatures between chilled and frozen semen after seven days of storage. The semen was collected through electrical stimulation and assigned to four treatment groups. The semen was diluted in Tris fructose citric (TFCG) based extender (control group; CG) and Tris extender supplemented with different concentration of DPPG (G1=2% DPPG; G2=4% DPPG and G3=6% DPPG). In the first experiment, the semen samples (n=12) were preserved in the refrigerator (4°C) while in the second experiment, the semen samples (n=12) were cryopreserved in liquid nitrogen and the experiment has three replications. The samples were thawed in the water bath (37°C) and analysed for motility, membrane integrity and viability. The addition of 6% DPPG resulted in improved maintenance of sperm in a chilling and frozen process. No significant difference was observed among treatments groups for all the parameter (p>0.05) in the first experiment. However, in the second experiment, the addition 6% DPPG resulted significantly higher (p<0.05) in viability (71.25±1.04) during freezing compare to control groups (56.47±4.69). However, the supplementation with 2% of DPPG did not affect all post-thawing semen parameters in semen chilled and frozen, and the results were nearly similar to the control group. In conclusion, 6% DPPG had better ability to protect the bovine sperm viability and seemed useful in the chilling and freezing process of Brahman bull sperm.

Keywords: Cryopreserve, Date Palm pollen grain, Chilling, Frozen, Brahman bull
Effect of extender supplemented with olive oil on bovine semen qualities

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Malaysia’s development of artificial insemination (AI) programme in the assisted reproduction technologies during the past decades has been significant. Meanwhile supplementing olive oil in humans seems applicable since olive oil contains several potent bioactive compounds of antioxidant that aids in protected the spermatozoa. The aim of this study was to evaluate the effects of using olive oil as an antioxidant supplement into Tris based extender in comparison with the different concentration on bull semen cryopreservation quality of progressive motility, membrane integrity and viability. A total of three ejaculation semen samples from a fertile bull of Brahman breed was collected using an electro-ejaculation method. Collected samples were freshly evaluated physically and microscopically before divided and diluted using four Tris based extender containing 0% (control), 0.25%, 0.50% and 0.75% olive oil. The processed semen was equilibrated at 5°C for 3 h (chilling), packed into straws (0.25 ml), frozen and stored in a liquid nitrogen tank for 7 d before thawing and assessment of quality parameter. Semen quality parameters used for evaluation and comparison after chilling and freezing included progressive motility, membrane integrity (hypo-osmotic swelling test) and viability (eosin-nigrosin staining). The experiment revealed that among all Tris based extender on chilling, improved post-cryopreservation semen quality was obtained from Tris+0.75% olive oil. Contrast to Tris extender on freezing, Tris+0.25% olive oil gave the highest value. The use of olive oil at the different concentration on different temperature, however, influenced the semen quality parameters following cryopreservation. In conclusion, Tris based extender with olive oil can be considered as a cheaper alternative to commercial extender as it is cost effective to the farmers.

Keywords: Artificial Insemination, Tris Based Extender, Semen Cryopreservation, Olive Oil, Antioxidant.
Optimization of Response Surface Methodology (RSM) for estimation of feed requirement broiler chicken

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In this study, the feed requirement will be estimated to know the most preferred value that is needed by broiler chicken. The broiler chicken will be observed to evaluate their growth by the different mix of the parameter in feed formulation. There are three parameters, which are Moringa Oleifera (24.5% to 74%), black soldier fly larvae (5% to 25%) and turmeric (0.5% to 1.0%). Meanwhile, the responses in this study are the average daily weight gain (g/d), survival rate (%) and feed conversion ratio (g). The Moringa Oleifera leaf, black soldier fly larvae and turmeric rhizome were being prepared by the drying technique before being crushed in the powder form and formulated. The broiler chick is given with crumb form of feed. This optimization studied were conducted by using the Response Surface Methodology (RSM) technique with Central Composite Design (CCD) method to design the value for the three parameters that needed in the feed formulation. The models are linear, quadratic and FCR does not have model were being chosen by CCD. The effect of the parameter has been studied by using the 3D response surface graph and 2D contour plot. The optimum level for average daily weight gain that predicted by RSM was 6.05 g/d which percentages of Moringa Oleifera is 7.63 %, turmeric is 0.75 % and black soldier fly larvae is 15 %. For optimum level survival rate was 58.97 % which percentages of Moringa Oleifera are 49.25 %, turmeric is 0.75% and black soldier fly larvae is 31.82 %. And for optimum level feed conversion ratio was 0.5 g which percentages of Moringa Oleifera is 49.25 %, turmeric is 0.75 % and black soldier fly larvae is 31.82 %.

Keywords: Broiler Chicken, Response Surface Methodology (RSM), Central Composite Design (CCD), Moringa Oleifera, Black Soldier Fly Larvae, Turmeric.
Optimization of Response Surface Methodology (RSM) for estimation of broiler quail's basal diet

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The aim of this research was to optimise the utilisation of Response Surface Methodology (RSM) for estimation of basal feed requirement of broiler quail using three sources of ingredients. The sources are Tapioca starch as the carbohydrate source, Black Soldier Fly Larvae (BSFL) as the protein source and turmeric rhizome as an immunity booster. The ration of feed formulation was studied by using a standard RSM design called a central composite design (CCD). It is well suited for fitting a quadratic surface, which usually works well for process optimisation. The Design-Expert Software Version 7.0 was used to estimate the feed requirement for broiler quail by inserting the three factor. The broiler quail was used in this research is Japanese quail. A total of 120 quail age 1 day were allocated in 20 cages replicates each with six quails. The quails were given different treatment in each 20 cages. The treatment consists of 20 different feed formulation which follows the predicted experimental data by Design-Expert Software Version 7.0. The feeding trial was done for 2 weeks which only for the brooding period. In this study, three responses that were measured during the experiment were Average Daily Gain (ADG), Feed Conversion Ratio (FCR) and Survival Rate (SR). Experimental levels of tapioca starch, BSFL and turmeric significantly affected quail performance. Tapioca was the most influential factor in ADG based on the statistical analysis of ANOVA that show a significant difference in this factor. Tapioca was also the most influential factor in FCR based on the statistical analysis of ANOVA that show a significant difference in this factor and give the biggest positive influence based on the coded equation. BSFL was the most influential factor in SR based on the coded equation in RSM. The desirability of the three responses also high as the desirability is 0.912 which is close to d=1.

*Keywords: Tapioca starch, Japanese quail, turmeric rhizome, Black Soldier Fly Larvae, average daily gain*
Determination of oxalic acid by HPLC and silica contents by conventional method in different varieties of Napier grass (*Pennisetum purpureum*)

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Napier grass (*Pennisetum purpureum*) is used as a common feed source for livestock especially ruminant. Although it uses as a fodder because of its nutritive values, it also contains the anti-nutritive values. Oxalic acid and silica contents are examples of anti-nutritive factors that present in Napier grass. The soluble form of oxalic acid is the anti-nutrients as it can be combined with blood calcium or magnesium to form an insoluble oxalate crystal that excreted in faeces. The silica is the hairy part on the leaves that will reduce palatability and caused some physical damages. Therefore, the aim of this study was to determine the concentration of oxalic acid and silica in the Napier grass. Seven varieties of Napier grass included Taiwan, Zanzibar, Australian Dwarf, Pakchong, Red, Kobe and Indian were planted in Agro Techno Park, Universiti Malaysia Kelantan Jeli campus under standard level (300 kg NPK/ha/year) of fertiliser application. Plants were harvested at 2 months of plant maturity, and the regrowth of plants were harvested at 45 days interval after first cutting. The oxalic acid content in plant samples was determined by high-performance liquid chromatography (HPLC), while silica content was measured by the conventional method which included the ashing method. The results showed that the total oxalate content in Dwarf variety was the highest (3.23%), followed by Kobe (2.61%), Zanzibar (2.60%), Purple (2.44%), Taiwan (2.43%), Indian (2.15%) and Pakchong variety (1.95%). Pakchong also had the lowest content of insoluble oxalate (1.80%) while Dwarf had the highest content (3.00%). Insoluble oxalate has no significant difference at (P>0.05). For the silica content, Dwarf varieties numerically showed the highest content (4.19%) while Pakchong showed the lowest content (3.14%). Thus, Dwarf variety contained high oxalate and silica content while Pakchong variety contained the lowest amount of oxalate and silica.

**Keywords:** Pennisetum Purpureum, Anti-Nutritive, Oxalate, Silica.
Evaluation of Napier Grass (*Pennisetum Purpureum*) varieties on mineral composition by Atomic Absorption Spectrometer

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Napier Grass (*Pennisetum purpureum*) is a popular forage used as ruminant feed such as cattle and goat. Farmers who run the livestock farming with feedlot system usually feed their livestock by cut and carry methods. There are various types of Napier grass that can be found in Malaysia. Each variety of Napier grass has different morphology, potential yield, and nutritive value. Pakchong Napier (hybrid type), Taiwan Napier and Indian Napier are famous among farmers as they were believed it has the best features of Napier grass, especially in nutritive value. However, there are limited information on mineral composition in various types of Napier grass. Therefore, the objective of this study was to investigate the mineral composition of various types of Napier grass. Seven types of Napier grass were planted in Agro Techno Park, Universiti Malaysia Kelantan and harvested after two months of maturity for mineral analysis by using Atomic Absorption Spectrometer (AAS). The composition of minerals found in seven types of Napier grass was assessed and recorded. The important of this study is to suggest the best type of Napier grass with the optimum minerals concentration as the main forage that effects on animal production positively. Macro and micro minerals concentration were significantly affected by the different varieties of Napier grass. The results suggest Zanzibar Napier could provide an adequate amount of macro minerals which were calcium (6.50 g/kg of DM), potassium (40.35 g/kg of DM) and sodium (2.20 g/kg of DM). While for micro minerals, Dwarf Napier obtained a sufficient amount of zinc (28.81 mg/kg of DM), manganese (157.35 mg/kg of DM) and iron (240.75 mg/kg of DM) required in the ruminant diet.

**Keywords:** Napier grass, nutritive value, minerals composition, calcium, sodium
Effect of different storage conditions on the physical and chemical characteristics of urea molasses multi-nutrient block

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This study was conducted to investigate different conditions of storability in order to overcome fungus and moisture contaminations of Urea Molasses Multi-Nutrient Block (UMMB). The chemical constituents of UMMB were varied during the storage thus, proper storage of UMMB should be an utmost concern to preserve the shelf-life of UMMB. The objective of this study was to determine the optimum time duration for UMMB storability and also evaluate the physical and chemical characteristics. The conditions of storability were compared with three types of packaging which were High Density Polyethylene (Hdpe) plastic and vacuum Polyproplene plastics. The control was UMMB without wrapping with plastic. Then, storability means shelf life of UMMB which was analysed every after 3 weeks, 6 weeks and 9 weeks. For the assessment of chemical and physical characteristics, the proximate analysis and microbial count were carried out. The data were analysed using SPSS Statistics by Two Way Multivariate Analysis of Variance (two-way MANOVA), and the result showed that all types of packaging have significant difference through Multiple Comparative analysis and Tukey which (P < 0.05). Purposes of using MANOVA because have two and more of independent variables and also dependent variable. The results of microbial count showed that Hdpe plastics have less Total Plate Count at optimum duration time of storability than Vacuum packaging which can be stored after 9 weeks.

Keywords: Urea Molasses Multi-nutrient Block, High Density Polyethylene, Polyproplene
Physical, chemical and microbiological characteristics of meat from boer goats fed with napier grass and oil palm frond

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The present study was conducted to investigate the effect of the inclusion of pretreated oil palm frond (OPF) in the diet of Boer goats that may improve the physical, chemical and microbiological characteristics of the goat's meat. The animal feed trial was conducted at Agro Technopark, Universiti Malaysia Kelantan (UMK), Jeli Campus. A total of nine Boer goats were selected and randomly assigned to 3 different dietary groups. The goats were fed with Napier grass, freshly chopped OPF, pressed OPF and commercial goat pellets. The goats were slaughtered, and the longissimus dorsi muscle of the goats was analyzed for determination of the physical, chemical and microbiological characteristics. In conclusion, if the OPF was included in the goat's diet, it resulted in the increased value of the goat meat that can increase the consumer's preference.

**Keywords**: Oil Palm Frond (OPF), Boer Goat, Proximate Composition, Physical, Chemical and Microbiological Characteristics of the Goat’s Meat.
Development of *Moringa Oleifera* based total mixed ration for meat goat

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Adequate nutrition is important for meat type goat to improve growth and health performance. A good quality forages and the balance amount of grains are important sources of nutrients, minerals and vitamins. Total mixed ration (TMR) is a feeding method that involves the mixing of all forages, grains, protein feeds, minerals and vitamins. This feeding method is effective, efficient and profitable to increase animal productivity. *Moringa oleifera* (Moringa) is commonly known as ‘drumstick tree’ with high nutritive values. The current study aims to develop *Moringa oleifera* based TMR (mTMR) for meat goat in order to reduce the cost of the feed and access cost ratio of mTMR. The mTMR was tested in the lab to make sure that the mTMR fulfill the goat requirement. The data was recorded and analysed using IMB SPSS Statistic version 23(2015) software and further analysed using Duncan multiple comparison test if there was any significant value. Crude protein (CP) and metabolise energy (ME) contents in mTMR were 12.30±0.28% and 10.38±0.06% while the goat requirements of CP and ME were 13.17% and 10.5%. There were no significant differences between the chemical composition of mTMR due to insufficient of data. The newly formulated mTMR was beneficial in reducing the feeding cost, and it contained a sufficient amount of nutrient that is needed by the goat.

**Keywords:** *Moringa Oleifera, total mixed ration, meat goat requirement*
Effect of *Moringa Oleifera* based total mixed ration on parasite infestation in meat goats

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Feed cost for meat goats in Malaysia is very high due to the imported concentrates. Hence, the farmers feed their animals with forage solely such as Napier grass. Napier grass has low nutritional value, thus the growth of the animal and production are not good due to the inappropriate and low nutrition feed. Legumes is a very good source of dietary protein for animals. Nutritionally, legumes also tend to have higher levels of energy per unit weight and more calcium than grasses. Therefore, the purpose of this study was to evaluate the effect of *Moringa Oleifera* based total mixed ration (mTMR) on parasite infestation in meat goats. Two different groups of treatments (control and mTMR) were used. Fecal egg count was done to evaluate the egg per gram (EPG) of nematode eggs in gastrointestinal tract of the goats. The data were recorded and analyzed using One-Way ANOVA Test followed by the Duncan multiple comparison test and analyzed with the IMB SPSS Statistics 25 software. Total mixed ration is a method of feeding goats that combines all forages, grains, protein, minerals, vitamins and feed additives formulated to a specified nutrient concentration into a single feed mix. This method is more effective, efficient and profitable to feed the animals. From this research, the result showed that the mean EPG of the parasite infestation between the control group and the mTMR group had no significant difference. However, the *Moringa Oleifera* based total mixed ration was a good diet for a better health condition and reduce the EPG in the gastrointestinal tract of the goats.

*Keywords:* *Moringa Oleifera, Total Mixed Ration, Meat Goat, Parasite Infestation*
Optimization of total protein concentration based on buffer type and ratio in placental protein extraction of bovine Kedah and Kelantan

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Proteomic study related with placental protein has been an interesting topic to the researcher over decades to determine the function and mechanism of a particular protein that perhaps to improve pregnancy related disorder or pregnancy diagnosis in human and livestock industry. Protein extraction is a preliminary step of protein purification which mainly focus on maximisation of total protein yield. The heterogenous properties cause diversification of protein; therefore there is no absolute protocol in protein extraction, the type of buffer and ratio could give different protein concentration in different types of mammalian tissue, hence lead to the study of optimisation of types of buffer and buffer ratio to obtain better total protein yield. The objectives of this study are to compare the total protein yield based on three types of buffer with three different ratios. Three types of buffer included PBS, RIPA buffer and RIPA buffer with the addition of protease inhibitor while sample to buffer ratio, 1:1, 1:3, and 1:5 were used in the series of protein extraction process that involved mechanical disruption, incubation, sonication, and centrifugation. Bradford assay was carried out to determine the total protein yield based on the standard curve of BSA. From this study it is concluded there is a significant interaction between buffer type and the ratio (P<0.05) where the use RIPA buffer with 1:1 ratio gave the best total protein yield (194.880 ± 15.089 mg/g). The protein yield is relatively higher than the previous study, however, the detection of PAG particularly PSPB did not been conducted to prove the effectiveness. This study is perhaps to be a useful reference to the future study in term of protein extraction of mammalian tissue, especially placental tissue.

Keywords: Placenta Protein Extraction, Foetal Cotyledon, Total Protein Yield, PSPB
The optimisation of ammonium sulfate, ((NH₄)₂SO₄) was applied to purify protein based on solubility from Kedah-Kelantan cattle (Bos indicus) placenta. Double precipitation was carried out by using different concentration of (NH₄)₂SO₄. First precipitation used 0% (initial concentration), 20%, 40%, 60% and 80% of (NH₄)₂SO₄ as final concentration. Meanwhile, second precipitation was started with 20%-40%, 40%-60%, 40%-80% and 60%-80% of (NH₄)₂SO₄. In first precipitation, the extracted supernatant was added with a different concentration of (NH₄)₂SO₄. An incubation was applied for 2 hours at 4°C. The sample was centrifuged for 1 hour at 27,000 × g. The supernatant from first precipitation was used in second precipitation. The (NH₄)₂SO₄ was added to achieve the required concentration. The sample was incubated for overnight at 4°C. Centrifugation was applied for 1 hour at 27,000 × g. Dialysis was carried out to remove the salts from the sample. The precipitates from second precipitation were dissolved in 1ml of 0.01 M Tris-HCl buffer (pH 7.5) and extensively dialyzed against the same buffer. The samples were centrifuged for 1 hour at 12,000 rpm. The supernatant was undergone Bradford protein assay. In the first precipitation, the concentration of protein was highest (22.92 mg/ml) at 0%-60% of (NH₄)₂SO₄ with 40% concentration of unknown protein sample. The concentration of protein was significantly highest (25.09 ml/mg) at 40%-60% of (NH₄)₂SO₄ with 20% concentration of unknown protein sample in second precipitation. These data showed that the concentration of (NH₄)₂SO₄ play important role in purification protein based on solubility

**Keywords:** placenta, ammonium sulfate, precipitation, dialysis, Bradford protein assay
F. Soil Science
Assessment of phosphorus adsorption and desorption characteristics of tropical acids soil applied with paddy husk compost

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Phosphorus (P) is an essential component of adenosine triphosphate (ATP), which is involved in most biochemical processes in plants and enables them to extract nutrients from the soil (Fact & Series, n.d.). It plays an important role for root growth, it is often a major element in starter fertilizers, those applied at planting. Applications of organic amendment are highly recommended in reducing P sorption and increasing the P availability in the soil. Besides, the objectives of this study are to: (i) sample and characterize all the soil samples that will be used in the study; (ii) determine the changes in the soil P sorption and desorption upon application of paddy husk compost and (iii) determine the soil maximum P buffering capacity of the soil upon applied of paddy husk compost. The results proved that at initial P concentration of < 20 mg L⁻¹, sorbed P increased with the amendment of paddy husk compost while more P desorbed with increasing P application rates (20 to 30 mg L⁻¹). The decreases in P sorption in this study was due to the exchangeable of Aluminium and extractable iron at the highly negatively charged humic substances functional group surfaces of the organic amendment. The sorption of phosphorus was enhanced by the increase of soil pH due to the application of organic amendments. Amending of paddy husk compost showed high buffering capacity and increased the availability of phosphorus in acid soil used in this study. The finding shows that the application of paddy husk compost can enhance the soil phosphorus availability by changing the soil sorption and desorption capacity and pH buffering capacity.

Keywords: Phosphorus, organic amendment, sorption, desorption, paddy husk
Assessment of soil phosphorus sorption and desorption characteristic of tropical acid soil amended with rice straw compost

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Phosphorus is an essential crop macronutrient because of the relatively large amount of P required by plants. Application of organic amendment is highly recommended to minimize the phosphorus sorption in the acidic soils. The research examined changes in phosphorus sorption and desorption and compost pH buffering capacity. Thus, the objective of this study is to determine the changes in the soil phosphorus sorption and desorption upon application of rice straw compost and to determine the soil phosphorus maximum buffering capacity that is resistant to change in phosphorus concentration of the soil of the labile solid phase. Rice straw compost was used, and the sorption data were fitted to the Langmuir equation. The result showed phosphorus sorbed was decreased as the phosphorus concentration increased whereas phosphorus desorption increase significantly with increasing the phosphorus application rates (10 to 30 mg L⁻¹). The sorption of phosphorus increase due to the increase in soil organic matter which is highly negatively charged thus cause the precipitation of exchangeable aluminium and iron in the soil. Besides, high pH buffering capacity of compost was reported in this study. This was due to increase cation exchangeable capacity thus can help in increasing the pH of acidic soil. Amendment of rice straw compost with soil can repay for phosphorus losses in soil through leaching of tropical acid soil by increase phosphorus availability and reduced phosphorus fixation.

Keywords: Phosphorus, rice straw compost, sorption, desorption, pH buffering capacity
Evaluation of soil carbon storage between secondary forest, cropland, and fallow pond

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Decomposition of organic matter sources such as plant, animal and microbial residues contribute largely to soil organic carbon (C). Land-use changes often disturb the soil organic C stock, and it takes years to sequester the loss soil organic C stock. Therefore, it is important to quantify soil organic C stock to mitigate this problem. Nonetheless, there is inadequate information available on the comparison of soil C storage among secondary forest, cropland, and fallow pond. The objectives of this study were to quantify soil organic C content and selected soil physio-chemical parameters, and the relationship between them. This study will be focusing on the comparison of the soil C storage between secondary forest, cropland, and fallow pond at 0-20 cm and 20-40 cm depth at UMK Agro Techno Park. Random soil sampling was conducted within these three areas with ten soil samples each. The bulk density method was used to quantify SOC content and the selected physio-chemical parameters at the stated sampling depths on per hectare basis. Soil organic C content was analysed by using the loss on ignition method. Among the three lands, cropland (278.1504 Mg/ha and 143.7616 Mg/ha) had the highest soil C storage, followed by secondary forest (196.9450 Mg/ha and 100.1060 Mg/ha), and then fallow pond (168.1532 Mg/ha and 89.7026 Mg/ha). This study showed that cropland has higher potential in C sequestration than secondary forest and fallow pond.

Keywords: Land-use changes, soil organic carbon storage, secondary forest, cropland, fallow pond
Effects of Bokashi and application of Monosodium Glutamate (MSG) as foliar fertilizer on soil characteristics and growth performance of okra

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A field experiment was conducted at the Agro Techno Park (ATP), Universiti Malaysia Kelantan, Jeli Campus. The main objective of this study is the interaction between application of bokashi and msg toward the growth performance, soil characteristics and yield production of okra plant. Thus, there are three experiments were conducted by following the theory of completely randomized design (CRD). Experiments one and two have five different treatments of Bokashi and MSG respectively where each treatment will have three replications. Both experiment one and two were carried out at the same time by using polybag. Furthermore, experiment three was factorial experiment which is a combination between bokashi and msg application. There are six treatments with three replications for each treatment was conducted on experiment three on planting bed. The parameter included the soil characteristics, growth performance and yield production were observed and recorded to analyze. The result showed significant differences in each plant. There were significant differences between single bokashi treatments. This could be due to use of bokashi having significantly increased in growth performance. Availability total phosphorus (P) in soil directly could affect root elongation and growth performance of okra. The interaction between bokashi and application of msg can give positive feedback and improve the growth performance, soil characteristics and yield production of Okra plant.

**Keywords:** Bokashi, MSG, Okra, CRD, factorial design, growth performance, soil characteristics, yield production
Effects of bokashi and application of Monosodium Glutamate (MSG) as foliar fertilizer on soil characteristics and growth performance of mustard (Brassica chinensis)

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Pak Choy has high many advantages to human health such as anti cancer and can rose the vitamin consumption for human. The purpose of this study was to determine the optimum rate of organic fertilizer in the production of Brassica chinensis (Pak Choy). These studies have two experiments which in the greenhouse and open field. As for the greenhouse, the experimental designed used is complete randomized design experiment (CRD) consisting of 5 Bokashi readings, and each treatment is replicated three replications. Monosodium Glutamate (MSG) also uses 5 readings which by foliar application. NPK (15-15-15) is used as a control and was applied alternately. As for the open field, Complete Randomized Block Design (CRBD) was used as the experimental design to study the interaction between MSG and Bokashi. The combination of 2 factors of MSG and 3 factors of Bokashi was used in the open field. Every treatment was replicated three times. The parameters that evaluated were growth performance (height of the plants, diameter of branches, number of leaves and chlorophyll content), soil characteristics (soil organic matter, soil pH) and biomass production. The results showed significant effects of organic fertilizer. Bokashi with a rate of 2 tons / hectare on the heights (F = 16.9, P = <0.05), number of leaf (9.83cm), diameter of branch (1.58cm), chlorophyll content (F= 38.7, P=< 0.05). The treatment of MSG with the rate of 2g/1L effect on the heights (12.3cm), number of leaves (8.41cm), the diameter of branch (0.78cm), chlorophyll content (37.7). The soil organic matter was decreased. The fresh weight and dry weight biomass production of the roots are highest in 4tan/hectare of Bokashi which is 12.33a and 7.08. The fresh and dry weight biomass production of Brassica chinensis plant was highest in Bokashi with the reading of 430g and 128g.

Keywords: Bokashi, Monosodium Glutamate (MSG), Brassica Chinensis, foliar application, and NPK
G. Plant protection/ Plant physiology/ Plant Biotechnology/ Plant Genetics/ Plant tissue culture/ Post harvest
Establishment of callus culture of Purple Amaranth (*Amaranthus cruentus*)

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Food colourant is widely used in the food industry in order to enhance product aesthetics. Natural food colourant is safer and healthy to be consumed compared to a synthetic colourant that is used extensively nowadays. Natural food colourant can be obtained from the plant source. Therefore, purple amaranth or *Amaranthus Cruentus* can be used for anthocyanin extraction for producing natural food colourant. Studies should be conducted to establish aseptic seedlings of purple amaranth and callus should be induced from the different part of the explant. Aseptic seedlings were cultured on MS basal media. After the plant grows bigger, explant from stem and shoot has been taken to be subculture on different plant growth regulator at three different concentration. The explant was subculture on 1 mg, 2 mg and 3 mg of NAA, 2,4-D and picloram. The seed that has been subculture on MS basal media has germinated. Explant subculture on NAA media does not produce any callus same to explant subculture on picloram. Explant subculture on 2,4-D media produces callus at the concentration of 1 mg. Among the 3 PGR used, 2,4-D shows better growth performance. This study of inducing callus from *Amaranthus Cruentus* is hopefully will be able to produce more callus, which can be used for anthocyanin production to produce more natural food colourant.

**Keywords:** *Amaranthus Cruentus, purple amaranth, callus induction, anthocyanin*
Antagonistic activity of *Trichoderma harzianum* and *Trichoderma koningii* against *Colletotrichum spp.*

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This study is about the antagonistic activity of *Trichoderma harzianum* and *Trichoderma koningii* against *Colletotrichum spp.* which anthracnose disease has been the cause of the decline in chili yield production and concern by the farmer. The aim of this study is to observe whether the both *Trichoderma spp.* fungi can inhibit the growth of fungus, *Colletotrichum spp.* within period of time. The experiment carried out by bought chili fruits from Jeli market which has been infected with anthracnose disease. Then the infected part will be cultured and growth on Potato Dextrose Agar (PDA). After that, the pure culture of *Colletotrichum spp.* need to be subcultured into new PDA for multiplying the fungus population. Same goes to the *Trichoderma harzianum* and *Trichoderma koningii* need to be subcultured from pure culture into new PDA which provided from laboratory stock. After the three fungus growth, the antagonistic activity of *Trichoderma hazianum* and *Trichoderma koningii* against *Colletotrichum spp.* can be proceed by culture *Colletotrichum spp.* and *Trichoderma koningii*, *Colletotrichum spp.* and *Trichoderma harzianum* and only *Colletotrichum spp.* as control in new PDA plate. The data need to be collected everyday by taking the length of the *Colletotrichum spp.* growth from backside of plates. The resulting outcome is as expected where the *Trichoderma spp.* fungi can inhibit the growth of *Colletotrichum spp.* with PGI percentage of *Trichoderma harzianum* and *Trichoderma koningii* against *Colletotrichum spp.* are 76-80% and 77-89%.

**Keywords:** *Colletotrichum spp.*, *Trichoderma harzianum*, *Trichoderma koningii*, Antrachnose, Chili
Insect association with *Parthenium hysterophorus* weed at different habitats of Sungai Petani, Kedah

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Biocontrol of Parthenium weed is a national agenda in Malaysia. A study (field survey) was conducted at Sungai Petani, Kedah to know insect association with the Parthenium weed and to ensure the mechanism of damage caused by the insects. The impact of three different habitats such as residential area, riverside and roadside of Sungai Petani on the diversity of insects on Parthenium weed was also studied. Significantly different insect diversity and population were noted in different habitats. Both the harmful and beneficial insects of Parthenium weed were found to associate with the weed. The leaf-footed bug, *Acanthocephala femorata* was found to lay eggs on the leaf of Parthenium weed, which might cause damage to Parthenium weed. Some leaf-eating grasshopper were also noted. Among the three habitats, residential area sheltered more (61%) insects on Parthenium weed than other habitats.

**Keywords:** *Parthenium hysterophorus, biocontrol agents, Parthenium insects, leaf-footed bugs, leaf-eating grasshopper*
Response of Woody Borreria (*Hedyotis verticillata* (L.) Lam.) towards Curry Leaves (*Murraya koenigii*) aqueous extract

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Chemical herbicide is favourably used in the massive field of the agriculture industry in Malaysia, but in contrast it gives few negatives side impact to environment and ecosystem. It has diverse immense consequences on the human being, soil, ground water, disturbing conservation of ecosystem especially impact to nature. Allelopathy approach of potential crops is a suitable alternative that should be explored to have sustainable weed management. The present study is to determine the phytotoxic effect of aqueous curry leaves (*Murraya koenigii*) extract on the emergence and seedling growth of woody borreria (*Hedyotis verticillata*) under laboratory and nursery condition. The seed and seedling of bioassay species were treated with different concentration of aqueous curry leaves extract at 0, 20, 40, 60, 80 and 100g/L (laboratory) and 0, 50, 100, 150, 200 and 250g/L (nursery). The results obtained shows that the aqueous curry leaves extract possesses a significant inhibition on seed emergence, shoot fresh weight and radicle length of *H. verticillata* at 100g/L concentration, where it reduced by almost 100% when applied as pre-emergence under laboratory condition. Meanwhile, the optimal concentration for shoot fresh weight, shoot height and root length is at 250g/L of aqueous curry leaves extract with 21% inhibition level under nursery condition. Conversely, there is only slight reduction in shoot fresh weight, shoot height and root length of *H. verticillata* when treated at soil surface as post emergence under nursery condition. The results obtained might vary between laboratory and nursery as soil media tend to have a flexible chemical reaction in response to aqueous curry leaves extract. The inhibition level increase with incremental of extract concentration as the probable reason for inhibitory activity of aqueous curry leaves extract may be due to the presence of allelochemicals. These results suggest that curry leaves can be a good source to produce natural herbicide for weed management while it is also an eco-friendly compound for the environment and human being.

**Keywords:** Curry leaves, allelopathy, woody borreria, phytotoxic effect, aqueous extract.
Antagonistic activity of *Trichoderma Pararessei* and *Trichoderma Harzianum* against *Colletotrichum* sp., causal pathogen Anthracnose disease in Chilli

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Chilli is an important vegetable crop that been used worldwide for culinary substrate and very important due to its nutritional, medical and economic value, however, anthracnose disease caused by fungal pathogen *Colletotrichum* species that become a major constraint in chilli production. In these days, the disease being control by chemical and cultural practices are still not effective where chemical usage are not eco-friendly. Using a biocontrol agent is an alternative option that eco-friendly and more compatible. Thus, this study was aimed to isolate and identify the fungal pathogen of *Colletotrichum* sp. from infected chilli as well as control the disease using selected two species of *Trichoderma* which were *T. pararessei* and *T. harzianum* as the biocontrol agent. The identification of *Colletotrichum* result showed that at the early stage of fungus growth, colour appears as white to greyish colour and then the colonies were bright orange conidial masses at the late stage while for the microscopic study found cylindrical-like conidia with ovoid, clavate and slightly irregular appressoria which similar with *Colletotrichum gloeosporioides*. Hence, based on morphological and anatomical studies the isolated fungus has been identified as *C. gloeosporioides*. Antagonistic results showed that all selected ten strains of *Trichoderma* sp. were successfully inhibited the growth of *Colletotrichum gloeosporioides* by the basis of Percentage Inhibition Radial Growth (PIRG) analysis. The range values obtained from analysis were between 56.25% to 75%. Among these ten strains of *Trichoderma* sp, *T. harzianum* THC1 obtained the higher value of Percentage Inhibition Radial Growth (PIRG) which was 75% while *T. harzianum* strains THC4 and *T. pararessei* TPC1 obtained the same value which was 68.75%. In conclusion, the antagonistic results determined that both species of *Trichoderma* had an important role to be used as a very potential biocontrol agent against *Colletotrichum gloeosporioides* for anthracnose disease in chilli.

**Keywords**: Chilli, *Trichoderma*, antagonistic, anthracnose, *Colletotrichum gloeosporioides*
Allelopathic activity of Tulsi (*Ocimum sanctum* L.) leaves and Neem (*Azadirachta indica* A. Juss) leaves extract on Goosegrass (*Eleusine indica*)

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Agrochemical plays a significant role in agriculture fields. However, the negative impacts of agrochemical to the environment are inevitable. The effects of agrochemicals on the soil, water and air is polluting the environment, yet the application of agrochemical is not reduced. This is due to its effectiveness in weed management. Recently, the repetition of the agrochemicals or herbicides causes the weeds to form resistance towards the herbicide which eventually the chemicals herbicide lost its function. Hence, the present study is conducted to investigate the effect of various concentrations (2%, 4%, 6%, 8% and 10%) of aqueous Tulsi (*Ocimum sanctum* L) and Neem (*Azadirachta indica* A.Juss) leaves extracts on goose grass (*Eleusine indica*) weed. The seed germination and growth of treated weeds will be determined through conducting this experiment under laboratory and nursery conditions. Tulsi and Neem leaves were dried and ground into powder. Stoke solution of 50gram of powder into 250ml distilled water was prepared separately for both extracts. It is then kept in orbital shaker for 24 hours under 250rpm for continuous agitation. The solution is then filtrated and diluted with distilled water to make the various concentration of 2%, 4%, 6%, 8% and 10%. The results obtained by determining the seed germination percentage, shoot elongation, shoot fresh weight and root length of the goosegrass under both nursery and laboratory conditions.

**Keywords:** Allelopathy, Tulsi, Neem, weed control, seed germination, aqueous extracts
Efficacy of tricompost on maintenance chilli plant growth

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Agriculture nowadays is an important sector of Malaysia especially in the production of chilies for the domestic and international markets. Thus, the application of biological control is necessary to produce a good yield in especially to organic farmers on the eco-friendly method for improvement. Trichoderma sp. is a soil fungus which showed as biocontrol. Thus, the objectives of the study was to determine the efficacy of Tricompost as biofertilizer as maintenance for the chilli plant growth and productivity in the net house at Agropark. The treatment were: T1 = 100 g Tricompost, T2 = 10 g chemical, T3 = control, T4 = 50 g Tricompost + 5 g chemical, T5 = 15 g chemical and T6 = 150 Tricompost. A total of 53 chilli seedlings were planted in polybags contained soils. Plant growth was determined based on plant length, the diameter of the stem, number of leaves, the formation of branch and flower. The result showed that T6 = 150 Tricompost effective for highest growth of chili stem diameter and increase number of leaves while T5 = 15 g chemical result highest length of chili growth among treatments. Using chemical fertilizer can increase the yield nevertheless chemical residues caused environmental pollution, to overcome this problem to use biofertilizer. This project determined either the Tricompost have the efficacy for maintenance chilli plant growth or vice versa.

**Keywords:** Fungus, compost, bio control agent, antagonistic activity, yield
Effect of BAP and NAA concentration on seed germination and growth of *Cymbidium finlaysonianum* orchid

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*Cymbidium finlaysonianum* is an epiphytic orchid native in Malaysia. However, due to deforestation and human exploitation, the distribution of this species in the Malaysian forest has been decreasing. The germination of this orchid in nature is difficult because it depends on specific mycorrhizal fungal symbionts that supply the carbohydrates in order to germinate. It is because orchids lack endosperms. So, due to these difficulties, an in vitro seed germination is required in order to get the propagules. Therefore in this study, different growth media composition was used to enhance the germination of *Cymbidium finlaysonianum* orchid seeds. Sterile orchid seed was cultured on seed germination medium supplemented with 1 mg/l, 2mg/l and 3mg/l of BAP respectively. The maximum seed germination with callus initiation was recorded in Dendrobium Seed Germination medium(DSG) with 3 mg/L of BAP. The protocorm like bodies(PLB) was continuously observed using the MS media medium supplemented with 0 mg/L, 1 mg/l, 2mg/l and 3mg/l of BAP respectively and 0 mg/L and 1 mg/L of NAA respectively. Number of the root, length of root, number of leaves, length of leaf, and height of the plant were collected after 6 weeks to determine the best media for seed germination. The effect of different concentration of BAP was evaluated on PLB shows that 2 mg/L of BAP has been proved as the best concentration on shoot development while MS basal (0 mg/L of BAP) for root development. After 6 weeks of observation, the plantlet of orchids was subcultured using MS media supplemented with 2 different concentration of NAA (0 mg/L and 1 mg/L of NAA). It is for determined the best concentration of NAA for root elongation.

**Keywords:** Seed culture; *Cymbidium finlaysonianum*; BAP, in vitro, Media.
Pollen analysis of airborne samples collected from different locations of Pahang, Malaysia

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The investigation on the pollen analysis of airborne pollen samples collected was carried out by using a remote control helicopter in the atmosphere at six different locations in Pahang, Malaysia. Pollen in airborne is the most percentage causes for allergic reactions. The objective of this research is to evaluate the number of pollen present in the airborne samples collected from different locations of Pahang and to identify the types of pollen based on pollen's morphology in the airborne samples collected from different locations of Pahang. The chosen place are Kuantan, Bera, Jerantut, Temerloh, Raub and Kuala Lipis. Pollen count and pollen acetolysis method have been carried out in order to determine the number of pollen loads in the atmosphere. A total number of 183 pollen grains were recorded in which consisted of 19 species from six locations. Kuantan had the highest abundance of pollen loads (24.5%) while Raub recorded the lowest abundance of pollen loads (8.2%) due to its climatic factors as well as geographical factors. Elaeis guineensis from Arecaceae family recorded as the most common pollen grains found in Pahang, and it was identified as allergic pollen.

**Keywords:** Airborne pollen, pollen count, pollen acetolysis, allergic reaction, Elaeis guineensis
Pollination analysis of honey samples collected from several regions of Pahang, Malaysia

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Melissopalynological studies were carried out on 18 honey samples collected from several regions of Pahang, Malaysia. These regions are Kuala Lipis, Maran, Raub, Bera, Temerloh and Jerantut. The objective of this study was to identify the different types of pollen in honey samples besides determining their floral sources, geographical and botanical origin of local Malaysian honey. Acetolysis method by using acetic anhydride solution was done on the honey samples, and the pollen were viewed under the microscope for identification in terms of morphology and classify them according to their species and families. The percentage abundance of pollen was calculated in each honey samples by counted the pollen in each slide besides identify the dominant pollen. 70 types of pollen were discovered from 36 families. From the analysis, 8 honey samples were multifloral, and the rest were unifloral. The important marker pollen which distinguished Malaysian honey from imported foreign honey was Cocos nucifera and Elaeis guineensis which occurred in most of the local honey samples analysed. Pollen analysis is an essential tool in identifying the floral types of honey besides determining their botanical and geographical.

Keywords: Melissopalynological studies, Pollen analysis, Pollen morphology, Acetolysis, Acetic anhydride solution, Predominant pollen, Botanical and geographical origin, Unifloral
Snake bean (Vigna unguiculata ssp sesquipedalis L.) was one of the important vegetables in this world, especially in the tropical and subtropical region. In Malaysia, it was popular vegetables with the common name, “kacang panjang”. In addition, the demanded of snake bean in Malaysia was high because of the increase of human population growth that wants to use it as food for the human diet. Snake bean well known with the nutrients which contained high protein, minerals and vitamins. Besides that, snake bean used as nutrient fodder for livestock. This research was discussed about the method used to increase the yield of the snake bean. Therefore, the objective of this research was to improve the yield by improving pod length through mass selection. Two hundred and forty seeds of snake bean selection from the fourth generation was grown in nine plots. The technique used was the mass selection method. Finally, the long pods greater than 75 cm was selected for the next generation. From this research, the mean of pod length of the population increased compared to the fourth generation.

**Keywords:** Snake bean, mass selection, pod length, yield, generation.
Mass selection of snake bean (*Vigna unguiculata* ssp. *sesquipedalis* (L.) Verdc.) cv MKP5 for pod length and yield in fourth generation

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Snake bean (*Vigna unguiculata* ssp *sesquipedalis* L.) is one of the important vegetables in the tropical and subtropical region. In Malaysia, it is commonly known as “*kacang panjang*”. Snake bean is specifically long, draping pod which is famous in Southeast Asia. It contains many nutrients as a food legume. Thus, the consumption of snake bean is high by increasing the human population growth in Malaysia. People used it as food for the human diet which contains high protein, minerals and vitamins. Pod length is one of the main components of the yield of snake bean. Therefore, this research is conducted to improve the yield by upgrade pod length through mass selection. Two hundred and forty seeds of snake bean seeds are obtained from previous research were grown in eight plots. The growth of the plant will be measured and recorded until week eight. The data including the number of flowers, number of pods, weight of pod, and pod length were recorded until the last harvest. Then, the long pods >75cm of snake bean were selected and dried for next generation (fifth generation). From this research, the mean pod length was 54.31 cm which is lower than the third generation (56.17cm). Meanwhile, the yield for the fourth generation was 169.9 kg higher than the third generation (161.0 kg). The heritability was -0.06. In conclusion, mass selection methods can be used to improve the yield of snake bean and for pod length of snake bean is had less heritability.

**Keywords**: Snake bean, mass selection, pod length, yield, generation
G13

RAPD analysis of somaclonal variation on different abnormal morphological characteristics at post planting stage in *Musa Accuminata* cv. Berangan

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*Musa Accuminata* cv. Berangan has a high demand for local consumption and exportation. However, somaclonal variation has become a serious problem in micropropagation where it has known to cause mutation, phenotypic variation or genetic variation. Somaclonal variation resulted during tissue culture stages, and the explant was treated with different concentration of 6-Benzylaminopurine (BAP) treatments to induced somaclonal variation. From the treatments, the morphological changes of the explant are in parallel with the increased BAP concentration used during growth in tissue culture stages. Besides, genetic polymorphism of bananas with varied morphologies during tissue culture stages could also be detected by using the molecular marker RAPD. However, the plantlet can revert to normal when the BAP treatment was removed, and at post-planting the individuals further showed significant phenotypic changes especially their plant height. RAPD analysis was used in this study to assess the genetic diversity of somaclonal variation and sensitivity to detect genetic polymorphisms in banana clones. Six arbitrary RAPD primers were used to analyse the genetic polymorphisms within the treatments and the morphologies of the banana clones at post-planting stages. A total of 44 bands were amplified using RAPD primers, OPJ-13, OPB-10, OPU-06, OPA-19, OPA-15 and OPA-06. Primer, OPU-06 produced the highest number of bands (12) while primer OPJ-13 produced the lowest which is 3 total bands. The primer OPA-06 produces the highest number of polymorphic bands which is 5 total bands followed by OPJ-13 and OPA-19. From all the primers used, three RAPD primers were identified (OPJ-13, OPA-19, OPA-06) as good primers to detect the polymorphisms between the individuals of the banana clones. The results showed that all the selected primers were useful to amplify a higher number of bands within the individual but could not differentiate the genetics polymorphisms through the treatments and the morphologies of *Musa accuminata* cv. Berangan at post-planting stages.

**Keywords:** Musa Accuminata cv. Berangan, somaclonal variation, molecular marker, RAPD
Assessment of gene variation in terpene synthase gene among varieties of local pineapple

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Pineapple or *Ananas comosus* is an important horticultural industry throughout the area of the tropical and subtropical. Studies on pineapple compounds aged over 60 years old and more than 280 aroma compounds found the nature of pineapple flavours. Pineapple is widely consumed as fresh and canned fruit as processed juices and also use as an ingredient in food due to its unique sweet flavour. In pineapple, the most abundant aroma volatile contributes to the flavour of pineapple are mainly from ester and terpene. Terpene synthase gene is an enzyme responsible for the synthesis of sesquiterpenoid in the aromatic plant. Identification of numerous variation in genes and analysis of their effect may lead to a better understanding of their impact on gene function. Identification of numerous variation in genes and analysis of their effect may lead to a better understanding of their impact on gene function. In this study, optimization of extraction method using two different extraction method produced different yielded of DNA amount. Using SDS method produced a higher amount of DNA yielded compared to the CTAB method. A five band were amplified using primer Exon 2 was produced only two band while other three were missing band for CTAB extraction method. Then, for SDS extraction method, a total of 15 bands were amplified using primer Exon 2, Exon 3 and Exon 6 produced thick intense band which indicates its integrity of the extraction method. However, for DNA sequencing all 15 PCR product of 5 pineapple varieties was sent for sequencing showed there was two sequence overlapping. The Data showed that the sequence produced consists of mainly runs of adenine (A) and Thymine (T) repeat. The presence of the polymorphism of the terpene gene among the different varieties of pineapples cannot be identified and characterized due to the unsuccessful of DNA sequencing.

**Keywords:** *Ananas comosus*, terpene, CTAB method, SDS method, DNA
SCAR marker analysis of somaclonal variation on different abnormal morphological characteristics at post-planting stage in *Musa accuminata* cv. Berangan

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The regeneration of various horticultural species in vitro as tissue culture protocols make it potential for commercial scale multiplication which are available for any crops due to the improvements made in tissue culture techniques. Clonal propagation and preservation of elite genotypes which are being selected for their superior characteristics require a high degree of genetic uniformity amongst the regenerated plants. However, plant tissue culture can generate genetic variability which leads to somaclonal variations. Morphological changes to the explant were observed in parallel with the increased BAP concentration used during growth in tissue culture stages of banana (*Musa accuminata* cv. Berangan) seedling. Previously, samples of banana tissue culture were treated with different BAP concentration (0 mg/l, 5 mg/l, 10 mg/l and 15 mg/l) to study the effect of somaclonal variation by plant growth regulator. Polymorphisms were observed among the plantlet by using RAPD analysis which was later developed to SCAR marker. In this study, the SCAR markers were used to analyse the genome of somaclonal variation on different abnormal morphological characteristics at post planting stage in banana. Fifty-one samples of somaclonal variation clone of bananas were collected at the field for each treatment with the knowledge of their plant height. The plantlets were screened using SCAR marker which were UMK-01,02; OPU06-01,02; OPU06-03,04 and OPJ13-03,04. After optimization of PCR, annealing temperature of 55 °C and template DNA volume of 4 µl were selected for all primers as the condition provide the most specific amplification. All of the SCAR markers showed monomorphic banding pattern except for OPJ13-03,04 where sample 35 showed a missing band. The variation, however, was unique only to this sample and not consistent thorough the samples of the same treatment nor the same plant height average. This indicated that the genetic variant that occurs to the sample is random and that any genetic change induced by the BAP was not uniform for all sample within the same treatment. Most importantly, the markers used could not differentiate the sample based on their group plant height, which was significantly different among the treated samples. Further analysis of the somaclonal variants of banana needs to be done using other types of DNA marker that were able to explain the variance among the treatment, notably its plant height. This information is crucial for early identification of stunted clones which are usually uneconomic for commercial planting.

**Keywords:** RAPD, SCAR, PCR, polymorphism, somaclonal variation
In vitro regeneration of *Phalaenopsis* orchid sp.

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The breeding of *Phalaenopsis* orchid sp. is needed to be maintained as to reach high demand of world population and to overcome extinction due to limited distribution and over collection. In vitro technique allows the increment of the production faster than the conventional method. Surface sterilization method with 0.5% (v/v) fungicide (Benomyl) had the best effectiveness in reducing contamination especially from fungi that shows the least percentage of contamination level 21.30 ± 5.75 after 3 days compared to sterilization method with sonication, without sonication as well as addition of 0.2% (v/v) Plant Preservative Mixture (PPM) solution. Longitude thin cell layer (lTCL) showed the highest percentage of 78.70%, and mean level of 21.25 ± 0.96 of survive rate within 30 days compared to transverse thin cell layer (tTCL) and square measurement of 1 cm x 1 cm. Among combination hormone of 0, 0.5 and 2.0 mg/L naphthaleneacetic acid (NAA) and 0, 0.5 and 2.0 mg/L 6-Benzylaminopurine (BAP), 0.5 mg/L NAA and 2.0 mg/L BAP showed the highest percentage of 63.89% survive rate with mean level of 5.75 ± 0.50 within 30 days. Only one responded shoot from the treatment of 0.5 mg/L NAA, and 2.0 mg/L BAP regenerate buds into leaves of *Phalaenopsis* orchid sp. within a week after inoculated. The development of explant’s height, number of shoots and number of leaf were found increased every week and subculture had done to enhance the development and to prevent the contamination break out.

**Keywords:** *Phalaenopsis* orchid sp., sterilization method, TCLs, 6-Benzylaminopurine (BAP), naphthaleneacetic acid (NAA).
Development of \textit{in-vitro} culture of Phalaenopsis Blackjack orchid

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Phalaenopsis Blackjack orchid, originates from Taiwan has a high demand due to its popularity as cut flowers and potted plants. However due to its low seed formation and low conventional breeding, the demand for Phalaenopsis Blackjack could not be fulfilled, hence this study was done. An aseptic technique to develop an \textit{in-vitro} culture of Phalaenopsis Blackjack was carried out by using leaves as explant. There were three surface sterilization used to investigate the effect of different surface sterilization technique towards the \textit{in-vitro} culture of Phalaenopsis Blackjack orchid, method A (sonication), method B (Shaker) and method C (shaker + activated charcoal in media). Apart from that, to investigate the effect of hormone combinations toward Phalaenopsis Blackjack orchid multiplication, different hormone combinations with different concentrations Naphthaleneacetic acid (NAA; 0, 0.1, 1 mg/l) and Thidiazuron (TDZ; 0, 1, 3 mg/l) were used. In this experiment, survival rate, contamination rate and appearance were analysed and observed. Sonication method was found to be the most effective surface sterilization method compared to using shaker while $\frac{1}{2}$ MS media supplemented with 0.1 mg/l NAA and 1 mg/l TDZ was the best treatment in multiplication.

\textbf{Keywords:} Phalaenopsis Blackjack, Sonication, Shaker, NAA, TDZ
Effect of purified culture filtrate of *Rhizoctonia solani* isolate on detached fresh leaf of Parthenium

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Parthenium control by using bioherbicide is highly demanded in Malaysia and elsewhere. A study was conducted to observe the effect of purified culture filtrate of *Rhizoctonia solani* (UMKRSPL1) isolate on the fresh detached leaf of parthenium at the laboratory of University Malaysia Kelantan, Jeli Campus. The isolate was cultured in Potato Dextrose Broth for 10 days. Filtrate was collected and was extracted with methanol and without methanol. The filtrate was purified by treating with activated charcoal. The purified filtrate was centrifuged for 15 minutes, and the pallets were collected from the bottom of the centrifuged extracts. The purified and centrifuged extracts were applied to the detached leaf of parthenium at different concentrations of 0%, 2.2%, 5.0% and 10.0%. It was observed that 10.0% extract without methanol caused more 90% killing effect on day 8. The extract without methanol at 10.0% concentration caused only 55% killing effect in comparison to control.

**Keywords:** Parthenium, *Rhizoctonia solani*, methanol, filtrate, concentration
Micropropagation of purple yam (*Dioscorea alata* L.) from nodal and petiole explants using different types of plant growth regulators

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Yam is one of the tuber root-types that contain malfunctions and nutrients. Previous research saying that purple yam is commercially used as a food colourant, but there is not much to extract that purple colour since we are lack of the purple yam production. Hence, tissue culture technology is manipulated to produce more purple yam in the shortest time through multiple inductions of shoots and roots. This is expected to be as the alternative source in gaining natural food colourant. Nodal and petiole were used as the source of explants to establish plant cell culture. Those explants were cultured on medium contained single cytokinin (BAP, TDZ, Kinetin) and combination of both Plant Growth Regulators (PGR) auxin and cytokinin (NAA+ BAP, NAA+ Kinetin, NAA+ TDZ, Kinetin+ IAA, NAA+IP, IAA+ IP). In this study, sterilization of purple yam explants using a combination of Tween 20, 95% of ethanol and 10% chlorox are the most suitable surfactants. Moreover, the use of Thidiazuron(TDZ) and BAP hormones function more in inducing shoots while auxin hormone such as NAA actively promotes roots rather than shoots. According to this research, the most suitable combination of auxin and cytokinin for inducing multiple shoots are MS + 0.5 mg/l KIN + 1.5 mg/l IAA while in vitro rooting most suitable cultured on medium MS + 1.0 mg/l NAA + 0.5 mg/l TDZ. Therefore, these results proved that larger production of purple yam plantlet could be achieved by tissue culture technology.

*Keywords:* Medium, auxin, cytokinin, purple yam, nodal
Effects of plant growth regulators on callus induction of *Clitorea ternatea*

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*Clitorea ternatea* is a herb plant that has valuable medicinal value. The properties of the plant that able to cure diseases shows the potential of this plant being over exploit due to the changing trend in life style and health. *C. ternatea* commonly used in traditional medicine and had also been used in modern treatment. In this project, the used of the two different Plant Growth Regulator (PGR) 6-benzylaminopurine (BAP) and Indole-3-acetic acid (IAA) at several different combination concentration also the application thin cell layer (TCL) method transverse TCL (tTCL), longitudinal TCL (lTCL) and Square 1cm² were applied as the variable to bring out the callus. The best callus induction treatment in this experiment was 2 mg/L BAP + 0.1 mg/L IAA and the best TCL method used is tTCL.

**Keywords:** Callus, Clitoria ternatea, Thin Cell Layer, Plant Growth Regulator
Phytoremediation of *Hydrilla verticillata* (*Order: Alismatales*) on heavy metal

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Water pollution was one of the problems which can challenge human survival rate as clear water is essential to all living organisms on the earth. With the dramatically rising of the world human population, the demand for clean fresh water is also increased, but the cost of water treatment is increasing. The objectives of the experiment are identifying the phytoremediation using *Hydrilla verticillata* on two different rivers which is River Peng Chepa and River Kelantan and also the different concentration of heavy metal of the river water. A negative control with tape water and a positive control with nutrient solution containing the heavy metal is prepared. The cadmium, chromium, manganese, lead and zinc in content in the water samples and *Hydrilla verticillata* will be measured using Atomic Absorption Spectrometry (AAS) analysis before and after the phytoremediation of *Hydrilla verticillata*. There are significant different of heavy metal Cd, Cr and Zn in the river water before treatment. There are also significant grow of *Hydrilla verticillata* after the treatment as the p-value of 0.005. There are significantly different on the concentration of Cd, Cr and Zn after phytoremediation using *Hydrilla verticillata*.

**Keywords:** Water pollution, Phytoremediation, *Hydrilla verticillata*
Botrytis cinerea disease progress on tomato fruits in different packaging

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This research is focusing on observing the growth progress of Botrytis cinerea on tomato fruits. Different packaging will be used to find any differences that might occur during storage. Tomato fruits are one of the commercial fruits that often infected by B. cinerea whether in the field or in the storage. It is shown that in the pre-harvest stage, the disease could decrease the yield and production of tomatoes. So, many wastes were produced from the rotten and spoil tomato production. Pollution occurs due to the waste that was thrown away and might attract new disease by pest and insects. The objectives of this research are to study the spore spreading progress of B. cinerea on tomato fruits, and to analyse the differences of disease progression in different packaging. Each tomato will be stored in different packaging. The packaging that will be used in this research is in the plastic zip lock bag, plastic fruit container, and cardboard box. B. cinerea fungus will be inoculated directly to the fresh tomatoes. After that, each tomato will be stored in the controlled environment, and the progress will be observed within a fixed time. Every three days, the data of the spore spreading will be recorded. Through this study, the progress of B. cinerea spore spread could be observed and analyzed.

Keywords: Botrytis cinerea, spore spreading, disease progress, different packaging, tomato
The effectiveness of chitosan coating with different concentrations at different temperature storage of brinjal (*Solanum melongena*)

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The study focuses on determining the effectiveness of chitosan coating with different concentrations at different storage temperatures on brinjal (*Solanum melongena*). A primary concern of brinjals is that the shelf life of the brinjal is very short. An edible coating is an eco-friendly technology that used in many industries including the food industry. There are many edible coatings available in the industry. Chitosan coating is one of the edible coatings used in order to prolong the shelf-life of the brinjals. An edible coating is increasingly important in the post-harvest technology to reduce the losses. This study investigates the factors that determine the effectiveness of the chitosan which is the concentration and temperatures of the storage. Different concentrations of chitosan are 1.0%, 1.5%, 2.0%. Different temperatures are ambient temperature (30±2) and 7°C. Four parameters were examined which are colour, weight loss, firmness/texture, and Total soluble solids (TSS). Results show that 2.0% is better at ambient temperature and 1.0% better at 7°C.

*Keywords: Brinjals, chitosan, concentration, shelf-life, temperature*
H. Agronomy
The effect of different concentration of BAP on growth performance and yield in *Musa acuminata* cv. Berangan after six months post planting stage

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*Musa acuminata* cv Berangan is a Cavendish type of banana that is popularly grown in Malaysia but still cannot fulfil the market and customer demand. This experiment was carried out to evaluate the growth and yield performance of *Musa acuminata* cv Berangan at post planting after 6 months being treated with different concentration of BAP 0 mg/L, 5 mg/L, 10 mg/L and 15 mg/L during *in vitro* stage. The aim of this study is to identify which concentration of BAP lead to the highest performance in the field. Parameters that have been measured to evaluate the growth performance were leaf length, leaf width, number of functional leaves, plant height and the girth size while the parameter to evaluate the yield performance were bunch weight, weight without bunch, bunch length, number of hands, number of finger per hand, finger length and finger girth. The results showed that the plants treated with 5 mg/L BAP showed higher performance in growth and yield compared to the other treatments. Somaclonal variation had been recorded in treatment 5 mg/L BAP that showed good agronomical characteristics at the plant and yield which suitable to apply this in agriculture industries.

**Keywords:** *Musa acuminata* cv. Berangan, growth performance, yield performance, after 6 months in field, different concentration of BAP.
Effect of different commercial fertilizer on growth performance and yield of *Zingiber officinale* Roscoe

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Maximum growth performance and production yield of ginger are incredibly desired by farmers due to its higher value. Selection of fertilizer is crucial in developing a high growth performance and production yield of ginger. In this research, different commercial fertilizers were used in determining the growth performance of the ginger. The growth performance parameters for this study are the average plant height, average number of leaf, and the average relative growth weight of rhizome. The aim of this research is to find the best fertilizer that can increase the growth performance and yield on ginger. Treatments for this study were categorized into T0 (Negative control; No fertilizer), T1 (Positive control; NPK fertilizer), T2 (Chicken manure), T3 (Goat dung), T4 (NPK+Chicken manure), T5 (NPK+Goat dung), T6 (NPK+Chicken Manure+Goat dung). As for the experimental design, Randomized Block Design (RBD) and the significant difference on growth performance and yield development has been calculated and recorded by using Statistical Package for Social Science (SPSS) and Analysis of Variance (ANOVA). The highest average plant height is T6 followed by T2, T4, T1, T5, T3 and T0. The highest average number of leaves is T4 followed by T5, T2, T6, T1, T3, and T0. For relative weight, the highest increment is treatment T6 and followed by T5, T4, T2, T1, T3, and finally T0. Additional research could be done in future to determine the better growth performance and yield for ginger cultivation.

**Keyword:** *Zingiber officinale* Roscoe, mixed organic and inorganic fertilizer, young ginger, intercropping, growth performance and yield.
Efficacy of coco peat mulch treated with aqueous curry leaves extract on control woody Borreria (*Hedyotis verticillata* (L.) Lam.) at the vegetative stage

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The present study was undertaken to investigate the efficacy of coco peat mulch treated with aqueous curry leaves extract on control woody borreria (*Hedyotis verticillata*) under nursery condition. The bioassay weed species were treated with different application rates of coco peat mulch (4 t ha⁻¹ and 8 t ha⁻¹) and aqueous curry leaves extract (20% and 40%). Coco peat mulch treated with aqueous curry leaves extract exhibited markedly variable herbicidal activities against the target weed species. The mean value (% of control) of the weed growth (except the root length) significantly inhibited with an increase of coco peat mulch rate and aqueous curry leaves extract from 4 t ha⁻¹ to 8 t ha⁻¹ to 20% and 40%, respectively. The weed emergence was strongly inhibited by 90% when the bioassay species were treated at 8 t ha⁻¹ coco peat mulch + 40% aqueous curry leaves extract (T₆). Similar trend of inhibition on shoot fresh weight and root length also was observed at this application rate. The shoot fresh weight and the root length of *H. verticillata* were reduced by 80-90% respectively. There was no significant inhibition on the weed emergence, shoot fresh weight and root length at application rate of 8 t ha⁻¹ coco peat mulch + 20% aqueous curry leaves extract (T₅). This result suggested that coco peat mulch and aqueous curry leaves extract have a synergistic effect in suppressed the target weed species.

**Keywords:** Curry leaves, inhibition, coco peat mulch, *Hedyotis verticillata*, bioassay
Influence of organic compost on the growth of two types of mustard greens, Choy Sum (*Brassica rapa var parachinensis*) and Pak Choi (*Brassica rapa var chinensis*)

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Soil fertility is important for sustainable crop production. Chemical fertilizers are expensive and can bring a negative impact to the soil in the long term. Organic compost can act as an alternative way to overcome this problem. Therefore, a study was carried out to investigate the influence of organic compost on the growth of two types of mustard greens, choy sum (*Brassica rapa var parachinensis*) and pak choi (*Brassica rapa var chinensis*) under nursery condition in University Malaysia Kelantan, Jeli campus. The bioassay species were treated with commercial NPK fertilizer and organic compost at an application rate of 250 kg ha⁻¹ and 15000 kg ha⁻¹, respectively while control at 0 kg ha⁻¹. The result from this study showed the stimulating effect from the treatment of organic compost to two types of that mustard greens. The parameters of height plant, plant weight and chlorophyll content for both types of mustard greens are significantly increase (P≤0.05) while the root length shows insignificant results (P≤0.05) compared to control. Thus, this study proved that the maximum growth of two types of mustard greens, choy sum (*Brassica rapa var parachinensis*) and pak choi (*Brassica rapa var chinensis*) were successfully achieved when the plants were supplemented with organic compost which is vegetables waste mixed with goat dung. Even though commercial NPK fertilizer shows a similar effect to organic compost, the organic compost exhibit more higher value in increasing the growth of both vegetables. To conclude, the overall results of the study indicate that the compost of vegetables waste mixed with goat dung can be applied and used to ensure the more healthy and vigorous growth of mustard green plants.

**Keywords:** Organic compost, choy sum, pak choi, commercial NPK fertilizer, growth performance
Vermiwash as a soil supplement to improve the growth of Pak Choi
*(Brassica rapa var chinensis)*

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An experiment was carried out at the nursery of University Malaysia Kelantan (UMK) Jeli Campus to investigate the effect of vermiwash as a soil supplement on the growth of pak choi *(Brassica rapa var chinensis)* along with commercial NPK fertilizer. The treatments: T1 (0 g/ha control), T2 (0.4 g/ha of NPK) and T3 (0.0003 g/ha of vermiwash) were applied on the soil surface when the tested plant at ages of 2 weeks and 4 weeks. After 1 month of treatment application, vermiwash application showed significance increased on the growth of *B. rapa* in term of plant height, plant weight and root length with 527 cm, 57 g and 277 cm, respectively compared to commercial NPK fertilizer and control. However, there were no significant increased on the chlorophyll content. It can be concluded that the growth of *B. rapa* showed stimulation when applied using vermiwash. Hence, vermiwash proves to be an effective fertilizer, which encourages the growth of plants and may be a potential source of plant nutrient for sustainable crop production.

**Keywords:** Vermiwash, organic fertilizer, earthworm, *Brassica rapa var chinensis*.
Evaluation performance of drip irrigation system and water use efficiency of Rock melon (*Cucumis melo* L) at netted rain shelter house

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Drip irrigation system distributes water to the plant root zone by drippers. This study emphasizes to evaluate water application uniformity during the rock melon cultivation and without crop cultivation of drip irrigation system by determining the discharge and pressure of the drip irrigation system. The discharge of the dripper between 0.14 Lmin⁻¹ and 0.25 Lmin⁻¹ under pressure between 0.8 psi and 3.0 psi. The application of water application uniformity was found to be above 81% that describe the drip irrigation was designed on a proper scale. Water use efficiency of rock melon was 7.93294 kg/m³. Statistical analysis of all study parameters such as discharge, pressure and application uniformity showed that water application uniformity is classified as a fair performance of the system. The study shows that mean of discharge value for the head, middle and tail were 0.364 ± 0.027 L, 0.317 ± 0.051 L and 0.257 ± 0.036 L, respectively.

**Keywords:** Discharge, pressure, drip irrigation, water application uniformity and rock melon
Evaluation of performance of installation of sprinkler irrigation system and water use efficiency of cultivation Fan Pak Choy (*Brassica campestris sp chinensis var juliennius*) at netted house

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Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. This study emphasizes to evaluate the coefficient uniformity of the water discharge and measurement of pressure during cultivation fan pak choy from sowing to its maturity stage. The discharge of the water at bench number four, seven and eight were found approximately near 84% distribution of uniformity which each of them is 81.66%, 83.19%, 83.26% and that three benches considered as high sprinkler distribution uniformity. Water Use Efficiency (WUE) for the cultivation of Fan Pak Choy is 3.460 kg/m³. Statistical analysis of all study parameter such discharge of water, pressure, and coefficient of uniformity shows that fair performance of this sprinkler system. Statistical analysis using ANOVA test between different of valve control and pressure shows the significant value which is 0.065 sig in which the mean of the pressure obtained for head, middle, and tail control valve is 14 psi, 17 psi and 16 psi, respectively.

**Keyword**: Sprinkler Irrigation, discharge of water, uniformity.
Enhancing plant growth performance and fertiliser uptake in maize (Zea mays L.) cultivated on a tropical acid soil using rice straw compost

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Nutrient deficiencies and environmental problem are common problems in tropical acid soil due to nitrogen volatilisation, phosphorus fixation and potassium leaching. The application of rice straw compost can be used to mitigate N, P, and K losses in acid by increasing nutrient availability in these soils. The aims of the study are to (i) characterize the selected physiochemical properties of the soil samples, and rice straw compost, (ii) assess the selected plant growth parameters of Zea mays upon amending chemical fertiliser with rice straw compost, and (iii) determine the soil nutrients availability, total nutrient uptake, and dry matter production of Zea mays L. by amending chemical fertiliser with rice straw compost. A pot trial was conducted for 80 days, and a F1 hybrid sweet corn 801 variety was used as a test crop. The soil samples were then collected and analysed at the end of pot trial. The maize was harvested and partitioned into leaves, stems, and roots at 80 during end of the pot trial. The rice straw compost increased nitrogen, phosphorus, potassium, magnesium and calcium availability and increased the soil pH to near neutral due to the H⁺ consumption capacity of organic materials. Nutrient availability in the soil was significantly increased due to microbial mediated mineralization causing an increased in available nutrients for plant uptake. The results also showed that the rice straw compost could increase the maize nutrient uptake and dry weight due to the high cation exchange capacity contributed by the rice straw amendments which increased the affinity of cations like ammonium, potassium ion, calcium ion and magnesium ion in the soil. Treatment with 20 t ha⁻¹ of compost had the highest nutrient uptake and cation exchange capacity due to higher rate of compost application which imposed larger surface area, and had the most abundant nutrient concentration in the leaves.

Keywords: Nutrient deficiencies, rice straw compost, nutrient uptake, volatilization, leaching, and P fixation.
Enhancing plant growth performance and phosphorus use efficiency in maize (*Zea mays* L.) cultivated on a tropical acid soil paddy husk compost

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In tropical acid soils, P is often being limited because the soluble form of inorganic P in the soil is fixed by Al and Fe, thus reduces the P availability in the soil. Application of organic amendment is highly recommended to mitigate P losses in acid soil by increasing P availability in these soils. This process will enable long term bonding of Al and Fe by compost instead of P. Therefore, this study is aimed to (i) characterize the selected physio-chemical properties of the soil samples and chemical properties of paddy husk compost, (ii) assess the selected plant growth parameters of *Zea mays* L. upon amending chemical fertiliser with paddy husk compost and (iii) determine the soil P availability, P uptake, and dry matter production of *Zea mays* L. by amending chemical fertiliser with paddy husk compost. A pot test experiment was conducted in a net house at Universiti Malaysia Kelantan Jeli Campus for 60 days, and a F1 hybrid sweet corn 801 variety was used as a test crop. The soil samples from each pot test trials were then collected and analysed. The maize was harvested and partitioned into leaves, stems, and roots at 60 DAS. The result showed, treatments with paddy husk compost showed significant increase in the soil pH, and significant reduction of exchangeable aluminium and iron in the soil compared to treatments with soil only and soil with chemical fertilizer only. There was also a significant increase in growth performance, phosphorus uptake and dry matter production (leaves, stems and roots) of *Zea mays* L. in treatments amended with paddy husk compost. This was due to the reduction of exchangeable toxicity in the root zone and increase in the phosphorus availability in the soil. In conclusion, compost derived from paddy husk compost can be used to improve the growth performance, phosphorus uptake, phosphorus availability and dry matter production of *Zea mays* L. cultivated in tropical acid soil by reducing the soil phosphorus fixation.

**Keywords:** Soil phosphorus fixation, paddy husk compost, *Zea mays* L., phosphorus uptake, dry matter production.
Study on the effect of organic matter in the performance growth of
*Lactuca sativa* L. in MARDI, Cameron Highland

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This research was conducted due to the current demanding towards the production of organic agricultural product, especially in vegetable crops. The aim of this research is to prove that the organic fertilizer which contains in organic matter may give the same quality with the conventional method that using inorganic fertilizer. This study was done to study the effect of organic matter on the performance growth of *Lactuca sativa* L. This study also investigated the most preferred and suitable rate of organic matter in fertilizer, using in the fertilizing system of *Lactuca sativa* L. This experimental study was conducted at MARDI Cameron Highland where this place was known as the low temperature land that may grow well the crops whereby Lettuce are also known as the hardy annual and suitable with the condition that are preferred. As for the control method which is using the fertigation system that are also known as the conventional method because almost 70% of Lettuce or vegetable crops nowadays are using the fertigation method especially in Cameron Highland. This shows that the technology have been reach upon the time by introducing a lot of methods in agricultural industries. As for the data analysis the means, standard deviation and post hoc has been tabulated in a figure which shows the differences of the result. In addition the ANOVA two-way-test are also being used for this study as well to conclude the collected data. At the end of the study, it can be concluded that the organic fertilizer is also giving the same result with the conventional method. Where the lettuce for both investigation giving almost the same rate in performance growth but still it shows that the organic matter that contains in the fertilizer for organic fertilizer uses are more qualified where the freshness of Lettuce are clearly stated in the result. All the findings and significant for this study were proved in a positive relationship with the objective of the study. As a conclusion, it can be conclude that all the objectives of the study were achieved.

*Keywords: Organic fertilizer, Mardi Cameron Highland, Lactuca sativa L., conventional method, performance growth, vegetables crops.*
To investigate plant growth performance of *Chrysanthemum morifolium* for different rates of organic fertilizer applications

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Chrysanthemum is one type of popular ornamental plants flowers and have a relatively high economic value in Malaysia and have good marketing prospects. Requests cut flowers, and potted chrysanthemum plants are increasing from year to year, in line with improving standards of living. This study aims to investigate which rates inorganic fertilizer applications contribute the most higher and excellent plant growth performance. The research was conducted in Mardi, Cameron Highland, Pahang. The study is based on RCBD of four treatment with four replications. The four treatments including control treatment, NPK Blue fertilizer (Control) (T1), (600g, 12:12:17:2), (T2) Organic Harvester (600g, 5:5:5), (T3) Organic Harvester (900g, 5:5:5), (T4) Organic Harvester (1000g, 5:5:5). The data result indicated on the parameter is needed. Among all the treatment, the performance growth between organic harvester fertilizer with rates 1000g application and control treatment which is 600 gm NPK Blue give excellent growth plant performance. This is means organic fertilizer also one of the fertilizers that can be used to fertilize the chrysanthemum and give the best result of plant performance same as chemical fertilizer. Organic fertilizer also has good characteristics in plant propagation of media such as soils are dark in colour, lightweight, and have extremely high water holding capacities. The nutrient in organic soil is greater than 60% contain organic matter which also accumulates from temperature and moisture. Besides, the organic fertilizer cheaper and easy to get. These organic fertilizer are also commonly used in the Agriculture sector. In conclusion, organic fertilizer can be used for plant fertilize and propagation in order to get the excellent plant growth the same as chemical fertilizer.

**Keywords:** Chrysanthemum, Growth Performance, Rates, Organic Fertilizer, Chemical Fertilizer.
The effect of different frequency and timing of fertilizer application on growth performance and yield observation of Capsicum plant

(Capsicum annuum)

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The research conducted is to know the current worldwide practices and knowledge about nutrient application through the different frequency of application of fertilizer towards the crops. Capsicum (Capsicum annuum) plant is the perennial crops that can be promoted as an economical crop for some countries. The yield for fresh fruits of crops can be increased through correct fertilization frequency and timing. This research was done with the objectives to observe the effect of different frequency of fertilizer on the growth performance and the yield production of Capsicum. Besides, to determine the economics of different frequency of fertilizer application towards farmers. A practical experiment and study will be conducted using three treatments of different frequency of fertilizer application towards the Capsicum plants in order to obtain the expected results.

The three different treatments used in this experiment are the 4 days interval application as a control treatment, 7 days interval application and 14 days interval application. The parameters that evaluated were growth performance, yield production (number of fruits, length of fruits and weight of fruits). Results indicate that the highest mean average in the height of the plants (49.650 cm) under treatment of 4 days interval frequency of application of fertilizer. Results of the number of fruits yielding from Capsicum plants showed that the application of fertilizer with 4 days interval gives the highest mean average (16 fruits) of production compared to treatment of fertilizer within 7 days interval (12 fruits) and (9 fruits) for the average mean production of fruits from treatment of fertilizer with 14 days interval. The fresh weight of fruits from treatment 1 gave a smallest mean average at (9.778 g) followed by treatment 2 (10.2746) which does not give a significant difference between both treatments. However, fresh weight mean average of treatment 3 with 11.179 g gives the largest among the treatments. For the length of fruits, all of the treatment gives an individual significance difference with the highest mean average from the third treatment (11.612 cm) and lowest mean average from the first treatment with 9.576 cm.

Keywords: Frequency of fertilizer, growth performance, yield observation, capsicum
The effects of micronutrients on the growth development of papaya (*Carica papaya*)

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Trace elements or also known as micronutrients are nutrients that are needed by a plant in order to grow and develop better even though in a minute amount. This research is conducted to determine the effects of micronutrients on the growth development of papaya (*Carica papaya*). This study only focused on several parameters such as the height, basal girth, chlorophyll content and leaf count within 13 weeks by using complete randomise design and one-way ANOVA for the statistical tests. All 4 kind of different treatments were in the form of foliar applied fertilisers, and every treatment have 3 replications. From the research that has been done, it is proven that micronutrients have positive effects on the growth development of the papaya plants. Papaya plants that were treated with all kind of essential nutrients grow better than others while papaya plants that are only treated with primary macronutrients such as N, P, and K performed the lowest value in that parameter. Therefore, there are significant difference in the parameter between all 4 kinds of treatments applied to the papaya plants.

**Keywords:** *Carica papaya, micronutrients, growth development, complete randomise design, chlorophyll content.*
Micro fertigation system using arduino mega in outdoor vertical garden

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The Micro fertigation using Arduino mega based on soil moisture sensor in the outdoor vertical garden is an automatic plant fertigation system in a vertically stacked structure. The system can automatically sense dry soil condition and answered correctly by fertigating the soil with the sufficient water fertilizer mixed solution. This study aim was to compare the growth of three types of vegetables which are pak choy (Brassica rapa l. var. chinensis), kale (Brassica oleracea cv. group chinese kale) and kangkong (Ipomea reptans l. pior) in micro fertigation system using Arduino Mega in the outdoor vertical garden. The experiment was conducted with three treatments and one control. Kangkong irrigated using automatic fertigation as the first treatment, Kale irrigated using automatic fertigation as second treatment, Pak Choy irrigated using automatic fertigation as third treatment, and one of each of the vegetables irrigated manually act as the control. There are three replications for each treatment. The result showed, micro fertigation system using Arduino mega using soil moisture sensor in outdoor vertical garden can be compared on the height of plants (cm), number of leaves(units), leaf chlorophyll content (µmol per m2 of leaf) and light intensity received by plant(lx) of three types vegetables. From the result obtained, optimum height of plants is from Kangkong plant with a value of 29.17 cm. Next, the highest number of leaves produced is by Kangkong (7.15 units). Plus, the highest chlorophyll content recorded from Kangkong (36.86 µmol per m2 of leaf). Lastly, the highest light intensity received is by Kale Sensor 3(532 lx).

Keywords: Micro fertigation, Arduino mega, vertical garden, vegetables, automatic
Effect on Bokashi of growth yield of Yardlong bean (Vigna unguiculata var. Sesquapedalis)

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Bokashi is one of the organic fertilizers, which is made by fermenting organic matter. This can be relate identifying weather applying Bokashi fertilizer can encourage a healthy crop and foundation of sustainable agriculture. The objective of this study is to determine the effect on the different quantity of Bokashi on growth and yield of Yardlong bean (Vigna unguiculata var. Sesquapedalis). This study is using Randomized Block Design (RBD). It is suitable for experiments where the number of treatments is not large, and the experimental site has a predictable productivity gradient. There are six treatments which for treatment 1 there is no application of Bokashi, treatment 2 is 2000kg/ha of Bokashi, treatment 3 is 4000kg/ha of Bokashi, treatment 4 is 6000kg/ha of Bokashi, treatment 5 is 8000kg/ha of Bokashi and lastly for treatment 6 is 10000kg/ha of compost. The reason between last treatment function as a positive control whereas for no application of Bokashi known as negative control. The parameters that will be collected are the height of plants, the total number of leaves, and the total number of leaves, total biomass, and total yield per plot. The experimental result showed that Treatment 5 was the best doses of Bokashi application for growth and yield of Yardlong bean.

Keywords: Bokashi, compost, Yardlong bean, growth, yield
Impacts of Bokashi on growth and yield of Common Bean (*Phaseolus vulgaris* L.)

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The main purpose of this research was to investigate the impacts of bokashi on common bean (*Phaseolus vulgaris*) for its enhancement in growth and yield. This study was done at Agropark UMK Jeli Campus. The objectives of this study were to assess the growth performance and yield of common bean when different amounts of bokashi were applied at Agropark University Malaysia Kelantan Jeli Campus. Randomized Block Design (RBD) with three replications for each treatment were used in this research. There were six treatments of different amounts of bokashi. The different amounts of bokashi that were applied to the experimental units. For treatment 1 there was no application of bokashi which is 0kg/ha, 2000kg/ha of bokashi for treatment 2, 4000kg/ha of bokashi for treatment 3, 6000kg/ha of bokashi for treatment 4, 8000kg/ha of bokashi for treatment 5 and lastly 10000kg/ha of compost for treatment 6. Treatment 6 was used as positive control while for no application of bokashi known as the negative control. Data were taken after common bean seedlings are transplanted to the field. There are 9 parameters were taken for analysis such as plant height, number of leaves, number of branches, number of flowers per plant, numbers of flowers per plot, number of pod per plant, number of pod per plot, yield per plant and yield per plot. The experimental results for this research showed that the treatment that has high growth production and produced a high number of yield was the treatment that contained 8000kg/ha bokashi.

*Keywords:* Bokashi, common bean, morphology, growth, yield