POSTER PAPER ABSTRACTS

P1 EVALUATION ON THE USAGE OF A PLANT ACTIVATOR (ACIBENZOLAR-S-METHYL) FOR THE CONTROL OF BASAL STEM ROT (BSR) OF OIL PALM (ELAEIS GUINEENSIS)

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This study was conducted to determine the effectiveness of acibenzolar-S-methyl (ASM), a plant activator, in protecting oil palm seedlings against Basal Stem Rot (BSR) and to detect biomarkers associated with host resistance induced by ASM. Four months old oil palm seedlings of variety DxP maintained in pots were inoculated with *Ganoderma boninense* followed by ASM as a foliar spray (T2), a drench (T3) or a combination of both (T4) applied at four intervals. Plants inoculated with *G. boninense* but without ASM were used as control (T1). Disease assessment was based on foliar symptom and sporophore formation, and recorded as percentage of disease incidence (DI). Plants of T4 displayed the highest DI (31.3%) followed by plants of T1 (25.0%), T2 (15.6%) and T3 (12.5%). White rhizomorph was observed at the base of plants displaying foliar symptoms but no sporophore was observed. Biomarkers for induced resistance, i.e., glucanase and chitinase were detected in basal stem tissues using polymerase chain reaction (PCR) method. Chitinase was detected in plants of all treatments throughout the experiment whereas glucanase was intensely detected four and six months after inoculation except for T3 where both genes were detected earlier which may contribute to the low DI. Spraying ASM was effective in reducing 50% DI of BSR as compared to control. Protocol for detecting both chitinase and glucanase in oil palm was established for the first time and could be used as biomarkers for induced resistance in oil palm.

P2 AGRICULTURAL USE OF WASTE WATER FROM BIOMASS STEAM REFORMING PROCESS

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In recent years, many countries have promoted production and utilization of biofuel in order to reduce global warming and respond to the inflating crude oil prices. New energy innovation is needed to promote the efforts of local-production for local-consumption through biomass energy and wind-powered electricity and solar-powered electricity to improve the self-sufficiency ratio of the energy supply in the region. Biomass is a substantial renewable resource that can be used as a fuel to generate electric power and useful thermal output. But energy systems of the liquid fuel or the gasification of biomass normally need special machines, and are expensive. Many countries try to develop a low cost and efficient wood biomass energy system. One of the favorable systems is biomass steam reforming system. Waste water from steam reforming process included a lot of ingredients eluted from trees. Therefore, there is a potential as a growth promoter. It is essential to utilize the wastewater from steam reforming process. So this study aimed to find the effective agricultural use of the waste water for promoting biomass utilization.

Cedar (*Crypotomeria japonica*) and Konara oak (*Quercus serrata*) were steam reformed. The wastewater samples were diluted 10, 50, 100, 200, 500times, and applied for germination test. The result shows that cedar steam reformed wastewater was effective in plant growth in all concentration, and Konara oak was effective in the plant growth in low concentration.

P3 WATER USE EFFICIENCY RESPONSES IN RELATION TO SPECIFIC IONIC SOURCES (Cl^- and SO_4^{2-})

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A glasshouse study was conducted at Agriculture Faculty Glasshouse Complex, University Putra Malaysia to determine the effects of specific potassium ionic from different sources of potassium (K) on young oil palm seedlings. Experimental design carried out Randomized Complete Block Design (RCBD) with factorial combination of treatments where the factors were oil palm progeny (Deli Yangambi and Deli Avros), sources of potassium (Potassium Chloride and Potassium Sulfate) and rates of potassium (0, 50, 100 and 150). Results show that there are significantly different between K sources on WUE($p \leq 0.05$). Rates of K also significantly different ($p \leq 0.05$) where WUE for rate of K at 150 is 120.69% higher than control while for rate 0 and 50 are 78.41% and 98.08%. Interactions were observed between sources and rates of K also between progenies, sources and rates of K at week 16. For potassium chloride, increasing rates of K from 0 to 100 will increase WUE. WUE decreased at rate 150 for potassium chloride. For potassium sulfate, WUE increase when rate increase from 0 to 50 and start decreasing with increasing rate to 100 and 150. Significantly different for sources and rates of K at week 8 after treatments, interaction also occurs between sources and rate at week 4 after treatments. Regression analysis was carried out to study the relationship between water use efficiency (WUE) and stomata conductance. There are significant relationship between water use efficiency and stomata conductance with $R^2=0.78$.

P4 EFFECTIVENESS OF ANTAGONISTIC FORMULATION TO CONTROL BACTERIAL WILT OF TOMATO IN GREENHOUSE

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An effectiveness of antagonistic formulation made from *Bacillus subtilis* strain CH4 (BS) amending with different substrates and carriers was evaluated for the control of *Ralstonia solanacearum* strain To-Ud3 (RS), the causal agent of bacterial wilt of tomato (BWT), under laboratory and greenhouse conditions. Five antagonistic formulations were developed by mixing BS at $1.8x10^8$ cfu/ml with rice bran and talcum powder (F1), steamed sorghum seeds (F2), F2+rice bran (F3), sako pellets (F4) and F4+rice bran (F5). After storage for 3 months at room temperature, F1 formulation had the highest inhibition of RS and increment of BS population ($1.6x10^{10}$ cfu/ml) when tested on NA plate in laboratory. The F1 formulation was further investigated on the control of BWT under greenhouse at the Asian Institute of Technology, Pathum Thani province. Populations of BS and RS, % tomato survival and tomato yield were determined at 8 weeks after inoculation of RS. The F1 formulation provided tomato survival by 66% and tomato yield by 200 gm/plant whereas non-treated control showed tomato survival by 11% and yield by 10 gm/plant which were significantly different. At the end of 8 weeks post inoculation, the BS population was significantly increased from the initial of $7.3x10^6$ cfu/ml to $5.1x10^8$ cfu/ml while the RS population was significantly reduced from the initial of $3.4x10^8$ cfu/ml to $1.2x10^3$ cfu/ml. This study indicated that F1 formulation containing BS: rice bran: talcum powder at 1:2:2 (v/w/w) is effective for controlling BWT until harvesting in greenhouse which is promising for further evaluation in farmer's field.

P5 THE EFFICACY OF *PSEUDOMONAS FLOURESCENS* AND *BACILLUS SP.* IN REDUCING SCAB DISEASES CAUSED *STREPTOMYCES SCABIES* ON POTATO

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Common scab caused by *Streptomyces scabies* is world wide and responsible for potatoes tuber damage in most potato producing countries where 80% of tuber damage has been reported. Experiments were conducted to asses the potential of *Pseudomonas fluorescens* and *Bacillus sp*. as biocontrol agents to control this diseases. The study was conducted on Dieng Mountain, Central Java with four treatments and four replications both on Granola and Klon 17 cultivars. Plot A (control) were fertilized at the same amount of fertilizer applied by local farmer, while plot B, C and D were treated as the same as plot A, but tubers were treated with *Pseudomonas flourescens, Bacillus sp* and *P. fluorescen + Bacillus sp* just before planting. The treatment of biocontrol agents, especially *Bacillus sp* significantly reduced diseases intensity, increased the population and the diversity of microbes (bacteria) both on Granola and Klon varieties. On Granola varieties, the disease intensity in plot A, B, C, and D were 83.36; 75.55; 72.58; and 73.43%, respectively, showing significant suppression of the scab diseases, the similar phenomenon also shown on Klon 17 varieties. Microbe diversities and population analysis showed that plots C has the highest microbe diversity and the highest total microbe population for both Granola and Klon varieties. This could assume that high microbe diversities and population has strong effect in lowering disease severity. Overall, tuber weight analysis showed no difference among the treatments. This showed that antagonist bacteria has no effect on potato production.

P6 EFFECTS OF IRRADIANCE ON ACCUMULATION AND PARTITIONING OF TOTAL PHENOLIC CONTENTS OF *LABISIA PUMILA* BENTH

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Manipulation of micro-environment, particularly irradiance, is known to influence the production of secondary metabolites in some herbal plants. Knowing what impact the irradiance has on the changes in the metabolite content of the herbal plant may ensure continuous production of quality herb for commercial cultivation. A two-way greenhouse experiment was carried out to determine the effects of irradiance on the accumulation and partitioning of total phenolic contents of two varieties of *Labisia pumila* (var. *pumila:* green; var. *alata*: red). A total of eight treatments combination was arranged in a split-plot – Randomized Complete Block Design, replicated four times. Total phenolic content was determined by Folin-ciocalteau method. Prior to start of the experiment, total leaf phenolic content for both *L. pumila* varieties were almost similar. In the 9th week, total phenolic contents either increased or decreased dramatically according to variety growing at different irradiance level. Exposing both varieties to higher irradiance level with low shading percentage of 0 and 30% decreased leaf total phenolic contents. Variety *alata* seemed to be more affected by high irradiance condition in accumulation of the phenolic compound. However, a significant increase in leaf phenolic content to 44.6% for var. *pumila,* and 55.6% for var. *alata* occurred at 50% and 70% shading, respectively, indicating that red variety is more sensitive to irradiance level. The accumulation of phenolic contents in *L. pumila* plants, and the partitioning to root, stem and leaf were affected by the type growing under specific light condition. Higher phenolic contents were partitioned to the leaves>stem>root, with red and green varieties thriving better when grown under 70% and 50% shading, respectively. Total phenolic content of the red variety that partitioned to the stem increased consistently before declining under 70% shading. Green variety

accumulated higher stem phenolic contents under 70% shade. Similar trend of total phenolic contents partitioning to the root was also observed.

P7 PERFORMANCE, HETEROSIS AND CORRELATION STUDIES ON TROPICAL MAIZE HYBRIDS FOR ACID SOIL TOLERANCE

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Highly weathered soils occupy about 72% of arable soils in Malaysia. These soils have low pH, high Al concentration, low cation exchange capacities and Ca and/or Mg deficiencies which limit maize production on acid soils. Planting maize hybrids tolerant to soil acidity would increase yields on acid soils. Thirty-six single cross hybrids were evaluated at two locations to determine their general performance, level of heterosis revealed and correlation for important traits measured on acid soils. Split plots in randomized complete block design with 3 replications were used. Main plots were soil acidity statues, while subplots were genotypes. H28, H34, H11, H27 and H5 were the top five acid soil tolerant hybrids, consistently giving high grain yields. Average grain yield from the top five hybrids in Puchong was lower than that in Serdang. In addition, H28 showed the highest soil acidity tolerance indices for grain yield at both locations. High mid-parent heterosis (MPH) and better-parent heterosis (BPH) were revealed by crosses between parents of diverse population sources. Generally, the expression of MPH and BPH was higher on acidic soil than non acidic, suggesting that soil acidity influences the manifestation of this genetic phenomenon. Grain yield of the hybrids was correlated with all yield components measured. Highest correlation was shown between grain yield and ear weight/ear, with r value of 0.99 at both locations. Flowering and maturity traits were negatively correlated with other traits, indicating that early flowering and maturing hybrids gave more favourable grain yield and other traits measured. Promising hybrids identified in the study have the potential to be grown in acid soils in Malaysia.

P8 EFFECTS OF PLANT DENSITY AND IRRIGATION TECHNIQUES ON YIELD AND YIELD COMPONENTS IN SWEET CORN

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A field study was conducted to determine the effects of plant density and alternative irrigation techniques on performance of yield and its components in sweet corn, in Iran. The study was executed in strip plots in a randomized complete block design with four replications. Three irrigation techniques were applied i.e. A1= conventional furrow irrigation (every row) throughout the growth period, A2= alternate furrow irrigation (every other row) until flowering, subsequently followed by conventional furrow irrigation, A3= alternate furrow irrigation throughout the growth period. The plant density factors were 7, 8, and 9 plants/square meter. When the irrigation techniques were solely considered, there was no significant effect on yield and its components, whereas when plant density factors were solely considered, effects were significant on ear diameter, seed depth and ear fresh yield. Interaction effects of irrigation technique and plant density were found to be significant for ear diameter, seed depth, number of row on ear, number of seed on ear, cob dry weight, seed dry yield, ear dry yield and ear fresh yield. A2 and A3, at each respective planting density gave similar yields compared to A1, while significantly reducing the water utilization. Mean dehusked fresh ear yields obtained from the fields for A1, A2 and A3 were 3460 kg/ha, 3794 kg/ha and 3484

kg/ha, respectively. It is therefore suggested that A3 irrigation technique is practiced in sweet corn growing areas with similar rainfall pattern.

P9 GROWTH PERFORMANCE OF HEMPEDU BUMI (*ANDROGRAPHIS PANICULATA)* AS AFFECTED BY ORGANIC FERTILIZER RATES

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Andrographis paniculata which contains a bitter compound called andrographolide, is commonly used for medicinal purposes. For herbs, where leaf is the major plant part used for medicinal purpose, promoting vegetative growth is the priority. Attempts to improve foliar production through proper management of fertilizer application should become the main concern for commercial production. There is limited information regarding fertilization of *Andrographis paniculata* under local environment. Hence, the effects of bio-organic fertilizer (JITU 3:3:3) rate were studied on growth of 'hempedu bumi' under netted structure. Seedlings in polyethylene bags were fertilized after transplanting and at week four, at the rates: 0, 90, 180 and 270kgh^{-1}. A field experiment consisting of 100 plants were laid out in a completely randomized design with five replications. Plant height and biomass, root to shoot ratio, number of branches, total and specific leaf area, ascorbic acid and nutrient content in leaf were determined at harvest. For relative growth rate, plants were harvested at two week intervals. Leaf relative chlorophyll content was recorded at weeks four and eight.

Relative growth rate, total leaf area and leaf dry mass were significantly increased upon higher application of fertilizer. Fertilizer supplied at 180 kgh-1 nitrogen produced higher dry weight of roots. Leaf dry mass of plants receiving 270 kgh^{-1} nitrogen was 54% higher than control while the number of branches also increased by two fold. However, there was no significant difference between the rates 90, 180 and 270 kgh^{-1} nitrogen. Another outcome also confirmed that there were no significant effects on dry weight of stem, root to shoot ratio, specific leaf area, ascorbic acid and nutrient content in leaf. Total leaf area was maximum in plants supplied with 270 kgh^{-1} nitrogen. Increment also took place when applied with 90 and 180 kgh^{-1} nitrogen. The relative chlorophyll content increased with fertilizer at 180 kgh^{-1} nitrogen. Since leaf biomass is most valued in the herb industry, fertilizer rate of 270 kgh^{-1} nitrogen can be potentially used for optimum leaf production of *Andrographis paniculata*.

P10 YIELD AND NITROGEN UPTAKE BY RICE FROM CONTROLLED RELEASED UREA

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Nitrogen (N) is the most important nutrient for rice and is needed throughout the growth stages of the rice plant, from seedling up to maturity, for vegetative growth as well as for yield production. Nitrogen Use Efficiency in rice is often low due to high N loss through volatilization, leaching and denitrification. One of the approaches to improve N efficiency is by using Controlled released urea (CRU). The CRU released nutrients during the entire growing-season, reduced nutrient loss, reduces capital and labour outlay and increased yield. A field study was undertaken to identify suitable CRU varying in release duration from 150 – 270 days, to determine yield and N uptake by rice from CRU. Six treatments of CRU used; CDU Uber-10, Meister-20, Meister-27, Humate Coated Urea, Duration Type-V, Sulfur Coated Urea (Gold N) and Urea fertilizer as control. Rice variety of MR220 was grown as test crop on Bakau Series soil. There was significant effect on grain yield and N

uptake by grain. The highest grain yield was recorded from CDU Uber-10 (5.9 t ha^{-1}) while the highest N uptake was from Meister-20 with 78 kg ha^{-1}. CRU increased grain yield and N uptake by rice. Therefore, the effectiveness of these CRU is given in the following order; Meister-20 > CDU Uber-10 > Meister-27 > Duration Type-V > Gold-N > Humate Coated Urea > Uncoated Urea

P11 MORPHOLOGICAL CHARACTERISTIC OF *LABISIA PUMILA* BENTH

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Labisia pumila (Myrsinaceae), popularly known as 'Kacip Fatimah', has been used by many generations of Malay woman to induce and facilitate childbirth as well as post-partum medicine (Burkill, 1935). Today, this species is one of the important species in the herbal and pharmaceutical industries. There are three varieties of this species, var. *alata*, var. *pumila* and var. *lanceolata*. Species identification is made difficult by the lack of differences in the leaves and petiole particularly between var. *alata* and var. *pumila.* Identification can be done by studying their morphological characteristics focusing on their vegetative and flower structures. Materials for this study were collected from 4 different places namely Ulu Langat, Rawang, Kota Tinggi and Sungai Pelepah. Three variety of *Labisia pumila* has been examined. The species is *Labisia pumila* var. *pumila, Labisia pumila* var. *alata* and *Labisia pumila* var. *lanceolata.* Vegetative structures include leaf length and width, stem, root, and fruit, and floral characters observed were petal, sepal, lip, anther and ovary. The *Labisia pumila* is a small herbaceous under shrub that roots from the stem. The whole leaf is about 10-35cm long and 4-8cm wide finely toothed with numerous veins. Flowers are very small, generally white or pink, in spike like panicle or small clusters. The fruit are about 5mm in diameter and red in colour when ripe.

P12 PHYSIOLOGICAL CHARACTERISTICS OF TWO *CAPSICUM ANNUUM L.* VARIETIES EXPOSED TO DIFFERENT FREQUENCY OF WATERING APPLICATION

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Water is the most important component for plant growth and photosynthesis for biomass production. This requirement depends on variety, growth stage, watering duration and growing season. When crops are supplied with water steadily throughout the season but at an inadequate rate for normal growth, water stress develops. Plant growth and organ development becomes retarded early in the season, thus affecting total growth performance and yield. Cultivation of *Capsicum annuum* L. under controlled environment system, still faces some effects from instantaneous micro-environment fluctuations, especially water deficit stress. Therefore, a study was conducted under rainshelter to examine the physiological responses of two varieties of *C. annuum* L., Kulai and Hot Chilli, exposed to three water applications frequency i.e. 4 times/day, 6 times/day and 8 times/day. Six treatments combination were subjected to a split-plot- randomized complete block design, replicated three times. Physiological data collected were subjected to analysis of variance and turkey's test. Relative chlorophyll contents, net photosynthesis, light response curve, apparent quantum yield, photochemical efficiency of PS II, photosystem II efficiency and water use efficiency were determined. Relative chlorophyll values were significantly different between varieties recorded at every growth stage. The paper further discusses the physiological characteristics of the two varieties of *C. annuum* L. throughout the developmental stages using different watering management.

P13 IMPROVING ROOT SYSTEM TO ENHANCE THE POTENTIAL YIELD OF NEW HIGH YIELDING RICE LINE MR 257

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One of the major morphological characteristics related to grain yield are the dry matter partition of roots and root length. The root length per unit volume of soil (i.e. root density and root surface area) would determine the efficiency of nutrient uptake. In Malaysia, MR 257 is one of new rice line can achieve high yield of 11-13 ton/ha because it have large grain size and panicle length more than 30 cm compare to other variety, however it had problem with poor grain filling. This study investigated the suitable application of BCA (Bacterial Control Agent) and P (Phosphorus) to improve root system for a new rice line MR 257 to maximize its yield. A total of 6 treatment including NP1 (80 kg/ha P), NP2 (100 kg/ha P), NP3 (120 kg/ha P), BP1 (80 kg/ha P + BCA), BP2 (100 kg/ha P + BCA) and BP3 (120 kg/ha P + BCA) were conducted with 4 replicates each in trough. The design used was split plot design with BCA in the main plot and P in the sub plot. The parameters collected including root surface area, root length and yield. Analysis of variance showed significant interaction between treatments. BP3 showed the highest result and improved all parameter including root surface area (88.2 cm^2), root length (19.6 cm) and yield (11.29 ton/ha) as compared to other treatment. It also showed that yield for BP3 was 18.55 % higher than NP3. Overall, it is suggested that this study should be continued to develop agronomic package for high yielding rice line MR 257.

P14 CHARACTERIZATION OF *ALLIUM* VIRUSES IN VIETNAM AND MYANMAR

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Plants in the genus *Allium* such as shallot (*A. ascalonicum*), garlic (*A. sativum*), onion (*A. cepa*), leek (*A. porrum*), and Welsh onion (*A. fistulosum*) are major crops worldwide. *Allium* plants have been reported to be infected by a complex of viruses including *Garlic common latent virus* (GCLV) and *Shallot latent virus* (SLV) of the genus *Carlavirus* and also by *Leek yellow stripe virus* (LYSV), *Onion yellow dwarf virus* (OYDV), and *Wakegi yellow dwarf virus* (WYDV) of the genus *Potyvirus*. Though viruses infecting *Allium* plants are known to cause yield reduction and quality degradation, the significance of these *Allium* viruses is not well recognized. Moreover, survey of *Allium* viruses is limited in many Asian countries.

Using RT-PCR, we detected five kinds of viruses (GCLV, SLV, LYSV, OYDV, WYDV) from *Allium* plants in 38 and 20 samples collected from Vietnam and Myanmar, respectively. Virus infection in *Allium* plants was detected in 33 samples from Vietnam and from the 16 samples collected in Myanmar. Many of the samples were infected by more than one virus. One isolate of SLV from Vietnam and Myanmar were partially cloned and sequenced for phylogenetic analysis. For simple and simultaneous detection of mix infection, we applied two systems of duplex-PCR to differentiate GCLV and SLV in the genus *Carlavirus*, and LYSV and OYDV in the genus *Potyvirus* to save labor, cost and time. We produced virus-free garlic by meristem tip culture using LS medium from a garlic plant infected with 3 viruses. The production of virus free *Allium* plant was confirmed by PCR. We believe that the production and use of virus-free plants is important especially in vegetative propagation of *Allium* plants.

P15 IMPROVING UREA-N UPTAKE EFFICIENCY IN SWAN (ZEA MAYS) CULTIVATION ON ACID SOILS (BUNGOR SERIES)

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Ammonia loss upon soil surface applications of urea is one of the major sources which affect efficient use of this fertilizer in agriculture. Numerous studies on ammonia volatilization have been focused on laboratory conditions which may not reflect field conditions. This paper reports some of the findings of a field study that investigated the effects of urea mixed with zeolite, humic acids (HA), and triple superphosphate (TSP) on selected soil chemical properties and urea-N uptake efficiency of Swan (Zea mays). Treatments investigated had significant effect on soil exchangeable ammonium and fresh cob yield. However, the treatments had no long term effect on soil nitrate, pH, dry matter production, and N uptake. Treatments with additives i.e. TSP, HA, and zeolite improved urea-N uptake efficiency compared to urea without additives. Urea coated with TSP, HA, and zeolite could improve fresh cob yield of Swan besides contributing to reduction in environmental pollution such as nitrate eutrophication via improving Urea-N uptake efficiency.

P16 KAFFIR LIME, *CITRUS HYSTRIX* AS A POTENTIAL BOTANICAL INSECTICIDE TO CONTROL THE DIAMONDBACK MOTH, *PLUTELLA XYLOSTELLA*.

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Botanical insecticides either derived from natural plants parts or purified insecticidal compounds that are isolated from such plants become a promising agricultural pest control agent at present, and probably in the future. Environmental and health issues have led us to replace synthetic chemical insecticides with natural plants products. It is urgently needed for successful pest management, especially in crucifers which are the most common vegetable in the Asian diet. This study was conducted to examine the effect of *C. hystrix* dried leaves and fruit peels extract with ethanol on *P. xylostella* mortality. Four concentrations of 10%, 20%, 30% and 40% were tested using permethrin and Neemix as comparisons with distilled water as control. Ten third instar diamondback moth larvae were placed on the cabbage leaf treated with 1 ml extract solution in petri dishes. Larval mortality was recorded every 24 hours for 3 days. Analysis of data was carried out by using analysis of variance (ANOVA), the Statistical Analysis System (SAS). Means were separated and compared by used Tukey Studentized Range (HSD).

Kaffir lime leaves extract have slightly higher insecticidal properties as compared to the fruit peels extract. Their toxicity may be as good as compared to Neemix at high concentration (30% and 40%). However, both of the crude extracts had significant lower toxicity when compared with the commercial pyrethroid insecticide, Permethrin. Both of the leaves and peels extract could be used as a potential botanical insecticide because of their repellent and antifeedant properties. Further study on the mode of action, mechanisms reaction, effectiveness timing and stability of the crude extracts may be required.

P17 ABUNDANCE OF *HELOPELTIS ANTONII* POPULATION IN CASHEW PLANTATION

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Helopeltis antonii is an important pest of cashew which causes substantial losses. It is also a major pest on cocoa, tea and neem. Both nymph and adult of the insect feed on young and succulent parts of the plants such as young leaves, shoots, inflorescences and fruits. Population abundance of *H. antonii* was studied in a cashew smallholder plantation in Wonogiri, Indonesia on 60 sample trees in about 2 ha area every two weeks. Other parameters such as numbers of shoots and inflorescences, local rainfall, temperature and relative humidity were also recorded. *H. antonii* population increased just after the rainfall ceased and were high during low and intermittent rainfall. Numbers of shoots and inflorescences of cashew trees has significantly influence on the number of *H. antonii* population. This trend of population abundance is not directly associated with the rainfall, but the rainfall influenced the physiology of the cashew plant to produce flushes/shoots and inflorescences. Results of correlation and regression analysis of those parameters shows that rainfall is not significantly correlated to *H. antonii* population and does not significantly contribute to the number of *H. antonii* population on cashew. However, the availability of foods in the form of shoots and inflorescences positively correlated with the abundance of *H. antonii* population.

P18 UTILIZATION OF OIL PALM WASTES COMPOST AS AN AMENDMENT IN THE POLYBAG MEDIUM FOR GROWTH OF OIL PALM SEEDLINGS IN THE SECOND STAGE NURSERY

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The oil palm industry in Malaysia produces a lot of organic wastes which contribute to the current environmental problems, especially with the ban on traditional burning of agrowastes. Currently, one of the popular alternatives is to transform the wastes into organic fertilizers through composting. With the positive effects of oil palm wastes compost on oil palm seedling growth in the first stage nursery (Zikri 2005), this study was conducted to continue similar investigation of the use of oil palm wastes compost in polybag medium in the 2nd stage nursery. The experimental treatments consist of mixture of Serdang series topsoil and oil palm wastes, 0%, 20%, 40%, 60% compost with full recommended rate of fertilizer and 60% compost with half recommended rate of fertilizer. Three months old seedlings were transplanted into polybags, harvested after 3 months and analysed for dry matter weight and nutrient uptake. Seedlings in a media with 60% compost (with full and half recommended rate of compound fertilizer) had good growth performance compared to other treatments. Plant nutrient uptake of N, P, K and Mg were also higher in the 60% compost media which had the lowest bulk density, highest water retention and pH value 6.7 – 7.4. The use of 60% compost with only half the recommended rate of fertilizer was found to be sufficient to produce good plant growth. By adding oil palm wastes compost, fertilizer application rate in the oil palm nursery may be reduced.

P19 GROWTH PERFORMANCE OF LIME *(CITRUS AURANTIFOLIA)* ON SEVERAL *CITRUS* ROOTSTOCKS

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Lime *(Citrus aurantifolia)* originated from the southeast Asia-India region. Today, lime is produced between the North and South 40º latitudes and other tropical areas. *C. aurantifolia* has two major types, the Key lime, and Persian or Tahiti lime. Originally, *Citrus* was propagated by using seeds to produce seedlings. In modern commercial production seedlings are grafted onto rootstocks. However, rootstock are susceptible to more than 20 horticultural characteristics such as pests and diseases, soil conditions and micro environment. This research was carried out under Minab (a part of Hormozgan province in South of Iran) conditions to evaluate lime vegetative growth on several citrus rootstocks. This area is warm and humid, with annual rainfall ranging from 203 to 381 mm, but in this few years, Hormozgan has experienced some dry season. The rootstocks include Volkameriana *(C. vilkameriana*), Rough lemon *(C. Jambhiri)*, Rangpur lime *(C.limonia)* and Mexican lime. This study was carried out following the randomized complete block designs (RCBD) with four replicates. The results showed percentage grafting success in nursery, was highest on Mexican lime and on Rangpur lime. The lowest was on Volkameriana and Rough lemon. Stem diameter, trees height and trees canopy were evaluated in the field every year for three year. In term of diameter of stem, height and canopy, there was no significant difference between Rough Lemon and Rangpur Lime, however, there is significant difference between Volkameriana, Rough Lemon and Mexican Lime. From this study, it can be concluded that Mexican Lime has the fastest growth in the field after 3 years and Volkameriana has the slowest growth.

P20 EXOGENOUS PLANT GROWTH REGULATORS FOR TOMATOES UNDER HIGH TEMPERATURES AND HUMID CONDITIONS

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The effect of environmental stress on growing tomato under high technology system under protective environmental structures at lowland areas as proposed by Malaysia Agriculture Policy need to be studied so that the implementation would sustain. Under lowland conditions, high humidity and high temperatures easily prevail when protective environmental structures are used. Thus alternative measures to improve productivity of tomato grown under such conditions are needed. Hormones had been identified as important regulatory agents involved in fruit formation. Thus, a study was carried out to determine flowering and fruit set of hybrid tomato cultivars grown in netted rain shelter under lowland conditions as affected by exogenous hormone application.

Imported and local hybrid tomato cultivars namely Batu King and Alboran (imported) and Ehsan 2 (local) were planted and placed under netted rain shelter. Three plant growth regulators (PGR), chlorophenoxyacetic acid (CPA), gibberellin (GA_3) and paclobutrazol were applied as recommended. Treatments were arranged in completely randomized design. Flowering and fruit set including days to first flower, number of flowers, number of undeveloped and marketable fruits were determined up to 5 clusters. The imported hybrids, Alboran and Batu King cultivars exhibited better heat-tolerance than local hybrid, Ehsan 2. Hence, these cultivars are more suitable under netted rain

shelter. Exogenous plant growth regulator CPA was the most effective to improve fruit set and fruit weight under high temperature and humid conditions.

P21 LIGHT AND NITROGEN SUPPLY ON BIOMASS AND GROWTH OF *ANDROGRAPHIS PANICULATA*

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In nature, *Andrographis paniculata* is a medicinal herb found in the wild. Thus, to be grown commercially understanding of the crop responses to different ecosystem is important. Light and nutrient particularly are the two factors known to have great influence on plant productivity. Under wild environment, light intensity level is considerably reduced. Hence, the adaptability of the plant to different light intensity must be determined. Thus this research studied the effect of light and nitrogen levels on vegetative growth of *Andrographis paniculata* (king of bitter).

A factorial experiment was conducted in split plot design with 3 replications, with shade levels (0, 40 and 80%) as the main plot and nitrogen rates (0, 74, 150 and 225 kgh^{-1}) as the subplot.

In general, plants under shade performed significantly better than without shade. Grown under 40% shade, plants significantly produced more branches resulting in larger total leaf area and leaf mass. The better shoot growth attributed to lower root to shoot ratio. Root to shoot ratio was also affected by N levels. Without shade, the ratio was relatively higher at higher N levels as compared to shaded plants. The higher N levels led to better vegetative growth. Shoot mass of plants receiving $150kgh^{-1}N$ was 62% higher than without N supplement. However, at the highest N level the shoot mass was only 14% higher than150 $kgh^{-1}N$. Considering the cost of fertilizer and the negative impact on environmental quality, the results suggested that N at $150kgh^{-1}$ has the potential to be used for optimum shoot mass. The king of bitter also requires shade or lower light intensity for shoot production.

P22 SPATIAL VARIABILITY OF SELECTED SOIL CHEMICAL PROPERTIES IN PADDY PLOTS IN SABAK BERNAM, SELANGOR, MALAYSIA

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A study was conducted to evaluate the spatial variability of soil chemical properties in a 50.9 ha paddy field comprising 43 plots in Sabak Bernam, Selangor. A digital area map was first constructed using a DGPS Trimble Pro XR and GIS software. Geo-referenced soil samples (132) were collected after harvest to investigate the spatial variability of selected soil chemical properties: pH, organic carbon, total N, available P and exchangeable K. Geostatistical analysis was carried out to examine within-field spatial variability using semivariograms and kriged maps as well as descriptive statistics. Descriptive statistics showed that the coefficient of variation for the total N content, contents of available P and exchangeable K ranges from 30-46% while pH and organic carbon content show 5.4% and 2.7%, respectively. Based on the results of spatial dependence, kriged maps were prepared for the properties using Gamma GS+ software to analyze their spatial distribution in the field. The effective ranges were about 2000 meters for pH, 900 meters for organic carbon, 5700 meters for total N content, 6300 meters for available P and 6100 meters for exchangeable K. The kriged maps showed that a large portion of the area (>97%) have moderate values of N (3-6%), while more than 95% of the area contained very high values of soil P (>45mg/kg). The kriged maps also

showed that all of the studied area have very low content of exchangeable K (<0.14cmol$_c$ kg^{-1}), almost 90% of the area have 4.0 to 4.5 % organic carbon and more than 95% of the area have pH values ranging from 4.5-5.0. This integrated technique of using GPS, GIS and geostatistics is useful for the site-specific management in this paddy area.

P23 LEMBA: ALTERNATIVE SOURCE FOR ARTIFICIAL SWEETENER

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Lemba is a perennial shrub and distributed widely in Malaysia. Easily mistaken as ground orchids or young palms, the leaf of this plant was traditional used for wrapping rice cake and fruit are eaten fresh. The latin name for lemba is *Curculigo latifolia* L. and belongs to the Family Hypoxidaceae. Ironically, the taste of the fruit is not sweet but rather sour. However, after eating the fruits, foods consumed after will taste sweet. The chemical responsible for the sweetness is a protein called curculin. In Malaysia, the number of species is uncertain and there are various sizes of fruits hence the sweetness varies according to size of fruits. Ultimately, the desired traits for fruits are bigger size and sweeter fruits. This goal can be achieved through plant breeding. However, before hybridization is being carried out, the characteristic for each species available in Malaysia has to be determined. This is in order to identify species with desired traits. In this study, the morphological characteristics of Lemba from various locations in Malaysia were described. Introductory morphology studies of Lemba will be able to assist in better understanding specifically of the reproductive biology and fruit set which finally is crucial for plant breeding program in Lemba. Also from this study, the variation of species will be identified. The objective of this study was to describe the morphology characteristic of *C. latifolia* L. Plant morphology were recorded and samples were collected from three states in Malaysia. Reproductive organs were fixed in 70% FAA prior to process for histology and Scanning Electron Microscope. The morphological characteristics obtained include pollen, anther, stigma, ovule, ovary, seed and fruit morphology.

P24 HOUSEHOLD EXPENDITURE ON FOOD IN MALAYSIA

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"Engel's law" explains that share of household expenditure on food typically falls as income and expenditure increase. The objectives of this study are to investigate the food expenditure patterns of different income groups and the relationships between household characteristics and expenditure patterns. The study employed the Ordinary Least Squares (OLS) model on analyzing Household Expenditure Survey 2004/2005 data. The estimated results are clearly a reflection of "Engel's law", resulting in higher expenditure elasticity for lower income groups than higher income groups. The share of food will increase with income enhancement due mainly to economic growth in Malaysia. It was found that household size, races, age of household head, income, and gender are the main variables related to household food expenditure pattern.

P25 SYMBIOTIC EFFECTIVENESS OF *MUCUNA BRACTEATA* BRADYRHIZOBIAL ISOLATES IN ACID CONDITIONS

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Bradyrhizobia are symbiotic bacterial partners that form N_2 fixing nodules with tropical legumes. Biological N_2 fixation is a renewable source of nitrogen and forms an integral part of a sustainable agro-ecosystem. *Mucuna bracteata* originates from North-Eastern States of India and is rapidly recognised as a new and superior legume cover crop in oil palm plantations in Malaysia with favourable growth characteristics. However, there is a lack of information on the indigenous bradyrhizobial strain that could further enhance N_2 fixation and growth of *M.bracteata* in tropical soils. Two experiments were conducted to isolate bradyrhizobia from root nodules of *M.bracteata* and to evaluate their symbiotic effectiveness on the host legume. In Expt. 1, root nodule bacteria isolated from *M.bracteata* grown on five different soil series [Briah (Typic Endoaquepts; pH-H_2O 4.6), Jawa (Sulfic Endoaquepts; pH 3.5), Penor (Terric Sulfisaprists; pH 4.9), Sabrang (Sulfic Endoaquepts; pH 3.6) and Selangor (Fluvaquentic Endoaquepts; pH 4.0)] from Jendarata Estate, Teluk Intan, Perak were identified (UPMR58, UPMR59, UPMR60, UPMR61 and UPMR62). The laboratory studies conclusively showed that all isolates were rod-shaped, Gram-negative slow-growers taking approximately a week to form very fine colonies on Yeast Extract Mannitol Agar and tolerant to lower pH (pH 4.5). Expt. 2 was conducted using modified Leonard jar assembly with N-free solution in four replicates and harvested after 49 days of growth. The observations involved leaf chlorophyll content, fresh weight of plant tops, roots and nodules and leaf nitrogen concentrations. Results showed that all isolates were able to nodulate *M.bracteata* and produced higher chlorophyll content of young leaves. Howevers, plants inoculated with UPMR61 gave the highest nodule fresh weight, leaf N concentration and total plant N content while UPMR62 gave the lowest effect. The study indicated that bradyrhizobial isolates UPMR58, UPMR59, UPMR60 and UPMR61 could be used as effective inoculants for *M.bracteata* in acidic tropical soils.

P26 COLOUR MATCHING FOR RECOGNITION OF *SPODOPTERA LITURA* LARVAE INFECTED WITH BACULOVIRUS

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Biopesticide is one of the most promising biological insecticides for insect pest control to date. *Spodoptera litura* Nucleopolyhedrovirus (SpltNPV), a member of the family Baculoviridae, has been used for the control of armyworm, *Spodoptera litura*. To commercialize NPV as a biopesticide product, the harvesting of SpltNPV-infected *Spodoptera litura* is done manually by screening the external symptom. This process is currently done by human expert and time-consuming. Therefore, an image processing system based on color matching technology to identify SpltNPV-infected *Spodoptera litura* larva is proposed. The present study was conducted to construct a colour matching system for recognition of SpltNPV-infected *Spodoptera litura* larvae. Third instar larvae were inoculated with NPV at a dosage of 10^6 occlusion bodies using leaf disc method. The leaf disc treated with distilled water was served as control. Both categories of larvae were fed with leaf diet. Three parts of the larval body were identified showing significant colour changes at the initial stage. The three parts were at the side beside the yellow lines at dorsal, the middle of the dark patch on the

mesothorax at ventral and the middle of last proleg at ventral. R (red), G (green) and B (blue) colour coordinate data was collected from all parts and the levels of infection were developed based on the colour range of each part. The levels of infection consisted of post infection level, intermediate infection level and serious infection level. Among the three parts, only RGB colour coordinate at the side beside the yellow lines at dorsal showed a significant difference among control and diseased larvae at respective level of infection. The validation of samples using colour matching recognition method based on the side beside the yellow lines at dorsal gave the best matching percentage up to 100%. Therefore, the colour matching for recognition of SpltNPV-infected *Spodoptera litura* larva can be done based on the side beside the yellow lines at dorsal.

P27 *SPODOPTERA LITURA* NUCLEOPOLYHEDROVIRUS (SPLTNPV) INDUCED INHIBITION OF APOPTOSIS IN *SPODOPTERA EXIGUA* LARVAE

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Spodoptera litura nucleopolyhedrovirus (SpltNPV), a member of the Baculoviridae found in Malaysia, is a successful biological control agent for controlling *Spodoptera litura* (Fabricius). *Spodoptera exigua* (Hubner), an extremely polyphagous insect pest, has similar genera and plant preferences as *S. litura* larvae. A study has been carried out to determine the susceptibility of *S. exigua* larvae to the local isolate of SpltNPV. The SpltNPV was propagated in *S. exigua* larvae for ten passages and the degree of viral infectivity towards *S. exigua* was determined by apoptotic test at 12, 24, 48, 72, 96 and 120 h post inoculation. The results showed that neither DNA fragmentation nor dead larva was detected when the *S. exigua* larvae were infected with SpltNPV passage one at a dose of 2.84×10^6 occlusion bodies. When the viral dose was increased to 2.84×10^8 occlusion bodies, the total DNA extracted from the virus-infected haemocytes showed DNA ladder. Similar results were detected when larvae were exposed to SpltNPV passage tenth at a dose of 1.56×10^6occlusion bodies. These results suggest that SpltNPV have the potential to inhibit the apoptosis in *S. exigua* larvae, and the larvae became more susceptible to SpltNPV infection after a few passages. Infected larvae did not undergo melt nor liquefaction but showed darken cadavers.

P28 PRODUCTION OF TOBACCO MOSAIC VIRUS (TMV)-FREE CHILI PEPPER SEEDS THROUGH DRY HEAT TREATMENT

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A study entitled "production of tobacco mosaic virus-free chili pepper seeds through dry heat treatment" was done in Denpasar, Bali under greenhouse conditions as well as in the field. The objective of the research is to know the effectiveness of dry heat treatment to inactivate TMV which contaminated chili pepper seeds, and to improve the seeds quality.

The seeds which were dry heated under 40ºC for 24 hours and hereinafter 70ºC for 72 hours did not have different viability with those of non treated seeds. These indicated that dry heat treatment does not affect germination of chili pepper seeds. The dry heat treated chili pepper seeds

(DHS), non treated ones (NT), and manually TMV-contaminated DHS (DHS+TMV) were planted under field conditions. Verification of TMV infection in the 90 days old chili pepper plants by enzyme-linked immunoassay revealed that the rate of TMV infection were 57.89%, 12.5% and 100% for NT, DHS and DHS+TMV. These results indicated that the TMV source was abundant in the field. Infection of TMV in the chili pepper plants gave much effect on the plant height, branch number and production. These research results suggest a possibility of using dry heat.

P29 EFFECTIVENESS AND ECONOMICS OF ROTENONE FOR THE CONTROL OF INSECT PEST OF VEGETABLE

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Conventional insect pest control mostly relies on the use of insecticide of synthetic origin. The synthetic insecticide is well documented for its adverse effect on the environment, spray operator and consumer. Interest on the use of biological insecticide as the alternative to the conventional insecticide has generated number of products of microbes and plant origin. The microbes are the most popular and fungi such as *Paecilomyces fumosoroseus, Metarhizium anisopliae, Beauveria bassiana* have been used as mycoinsecticides. On the other hand, botanical insecticide azadiracthin extracted from the seeds of *Azadirachta indica* is available locally for insect control. Apart from azadirachtin, the other candidate of botanical insecticide is rotenone.

Rotenone in South East Asia is commonly found in the root of *Derris* species. It has been used by the farmers as an insecticide and piscicide. The farmers use crude extract of rotenone obtained by soaking the roots in water. Nevertheless the extraction efficiency is generally poor leading to inconsistent or poor result of insect control. Extraction technique using methanol or acetone improved the yield of rotenone with extraction efficiency of up to 3.5%. Formulating the rotenone organic extract as emulsifiable concentrate and laboratory evaluation of its toxicity against *Plutella xylostella* shows the LC_{50} of 6.13µg/mL. This value is lower compare with the LC_{50} of azadirachtin and chlorfenapyr being 12.11 and 10.37µg/mL, respectively. This indicates better or comparable toxicity of rotenone as azadirachtin and chlorfenapyr. Field application of rotenone at 30 g a.i./ha gave similar level of control of *Spodoptera litura* compared with the standard spinosad.

The cost of using rotenone is calculated to be about RM 240.00/hectare. The value is about similar to that of azadirachtin and spinosad. *Derris* species are abundant locally and relatively easy to cultivate. They can be grown as intercrop with oil palm and rubber. This will be a plus factor from economic point of view in the utilization of rotenone as biopesticide.

P30 STUDY ON THE CHANGES OF SOIL PROPERTIES, PLANT PESTS AND DISEASES POPULATION IN CONVENTIONAL FARMING CONVERTED INTO ORGANIC FARMING

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In order to develop organic farming in Bali, a series of organic vegetable cultivation experiments consisting of 9 (nine) plantings was conducted in Bangli Village, Baturiti District, Tabanan, Bali, a main vegetable cultivating area in Bali for three years, from 2005 to 2007. The land used in this study had been used for conventional vegetable cultivation, in which synthetic fertilizers and pesticides had been intensively applied.

In each planting, the experiment was designed in Randomized Block Design (RBD) consisting of nine treatments of a combination between cow manure at 20; 30 and 40 tons/ha, and application of botanical pesticides such as Frontir (containing the extracts of *Piper betle, Eugenia aromatica* and *Sphaeranthus indicus*), Egary (containing extracts of *Eugenia aromatica* and *Pometia pinnata*) , Bali spices (a mixture of several spices such as *Alpinia galanga, Curcuma* sp., salt, prawn paste, oil, *Piper retrofractum*, *Eugenia aromatica* etc.) and neem extract. Cabbage is generally planted as monoculture or in mix cropping with leek and carrot, and potato as monoculture farming. The change of soil properties and the main pests and diseases, beneficial microorganisms and the crop yield were evaluated and determined to know the effect of the treatments.

The treatment with cow manure at 40 tons/ha resulted in the increase of the concentration of soil nutrients such as N, P, K, Ca, Mg, Fe and Mn. The C/N ratio in the soil of this treatment obviously decreased, indicated that the concentration of Nitrogen in the soil increased. Population of beneficial microorganisms (antagonists) namely *Bacillus* sp. and *Pseudomonas fluorescens* on this treatment was found to be the highest among other treatments. Treatment with cow manure at 40 tons/ha in combination with application of Bali spices obviously reduced leaf rot disease on cabbage caused by *Xanthomonas* sp. Population of diamondback moth (*Plutella xylostella*) on the treatment with 40 tons/ha cow manure in combination with neem extract was found to be the lowest among other treatments. In general, the yield of cabbage in the second and fourth planting with cow manure treatment was consistently higher in comparison with the conventional farming system. Results of present study suggested that continual organic farming system application after a certain period improves soil properties, increases the population of beneficial microorganisms, reduces the pest and diseases and increases the yield of crop.

P31 BIOLOGICAL ASPECTS OF THE ECTOPARASITOID *HEMIPTARSENUS VARICORNIS* (GIRAULT) (HYMENOPTERA: EULOPIDAE) WHICH EMERGED FROM SOME HOST PLANT ON LEAFMINER, *LIRIOMYZA SATIVAE* BLANCHARD (DIPTERA: AGROMYZIDAE)

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A plastic house experiment was conducted in Denpasar, Bali, Indonesia from June to December 2007 in order to know the effect of host plant on biological aspect of the ectoparasitoid *Hemiptarsenus varicornis.* The longevity of female *H. varicornis* on tomato and caisim was 23.1 days (n=10) and 27.8 days (n=10), respectively while that of the male on tomato was 2.9 days and on caisim 3 days. During its whole lifetime, the female on tomato averagely produced 109.2 progeny and on caisim 173.7 progeny**.** The female on tomato averagely produced 4.7 progeny per day and on caisim 6.3 progeny per day. Sex ratio of the offspring (% females /total) on tomato was 53.3 % and on caisim 51.8%.

P32 CONSERVATION METHOD OF EGG PARASITOIDS OF RICE YELLOW STEMBORER (*TRYPORIZA INCERTULAS* WLK.) IN THE FIELD

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Rice yellow stemborrer (*Tryporiza incertulas* Wlk.) have been known as one of the key pest in rice cultivation in Bali. It is rather difficult to control this insect pest. Three species of egg parasitoids namely, *Tetrastichus schoenobii* Ferriere (Hymenoptera : Eulophidae) , *Telenomus rowani* Gahan (Hymenoptera: Scelionidae) and *Trichogramma japonicum* Ashmed (Hymenoptera :

Trichogrammatidae) was found in the field, associated in the eggs cluster of rice yellow stemborer. By using a bamboo pole about 2m long and with a hole in between the internodes and placing the eggs cluster which was collected from the field, give the good results to conserve the parasitoids in the field. The damage intensity was found less significant between the treatment and control during vegetative and generative stage.

P33 EVALUATION OF THE ANTAGONISTIC MICROBE ACTIVITIES AGAINST CLUB ROOT DISEASE IN CANDIKUNING, BALI

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Clubroot disease caused by a soil borne fungus *Plasmodiophora brassicae* was recognized is the most serious disease of crucifer crops in Candikuning, Bali. Currently, controls of plant disease mainly depend on the use of chemical pesticides. However, using excessive pesticides have been suggested to evoke many problems. A biological control (biocontrol) using living organisms, as agent is one of alternatives approaches for managing plant diseases. A study to evaluate several microbes as biocontrol agents against *P. brassicae*, the causal agent of club root disease was carried out in order to find the effective way to minimize disease in the field. Three species of biocontrol agents namely *Saccharomyces* sp, *Baccillus* sp. and *Pseudomonas fluorescens* were evaluated against *P. brassicae* in the rainy and dry seasons.

The incidence of club root disease caused by *P. brassicae* in the field could not reduce by the activity of antagonistic microbes in rainy and dry seasons. However, when the applications of antagonistic microbes combined with the polyethylene mulch and application of lime in dry and rainy seasons, their activities to suppress the incidence of disease were improved. In the dry season, the incidence of club root disease was reduced to 60% by the application of *Saccharomyces* sp. combined with polyethylene mulch. In the rainy season, the incidence of disease was reduced to 50% by the application of *Saccharomyces* sp. combined with lime. However, the application of *Saccharomyces* and their combination treatments were not success as control by the resistant varieties, which could reduce the incidence of disease to 100% in both rainy and dry seasons. In contrast, the application of *Baccillus* sp. and *Pseudomonas fluorescens* with or without combination with polyethylene mulch could not reduce the incidence of club root disease. The result suggests that the use of *Saccharomyces* against *P. brassicae* in the field must be combined with several treatments for keeping the rhizosphere condition useful for the growth of microorganism.

P34 FORMULATION DEVELOPMENT OF *PSEUDOMONAS FLUORESCENS* SP007S TO CONTROL CHINESE KALE DISEASES IN FARMING PRODUCTION

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P. fluorescens SP007s isolated from cauliflower rhizosphere that showed antagonistic activities against brassicaceae diseases caused by fungi and bacteria was developed for formulation research. Production of SP007s bacterial cells was investigated in 1- liquid and 5- solid formulations with its 2.8 x 10^{12} cfu/ml initial population. Different substrates of nutrient sources and carriers including glucose, soybean meals, fish meals, molasses, chitosan, calcium carbonate, $FeSO_4.7H_2O$, talcum, soil particles and CMC (carboxymetyl cellulose) were tested for appropriate component of

biocontrol agent. Liquid and solid formulations were inoculated with 10 ml cell suspension of SP007s, sealed and incubated at room temperature (27-30 ^{o}C) for 30 days. The efficacy of these 6 formulations in sustaining SP007s population and enhancing biocontrol activity was assessed in RCBD experiment of Chinese kale field production at Suphanburi during June to September, 2007 using each formulation for both seed and foliar (sprayed at 14, 28, and 35 –day old plants) application methods totaled 9 treatments compared with SP007s fresh cells produced in NB, a standard fungicide (copper hydroxide) and nontreated control. Seed treatment with most of solid formulations as well as with copper hydroxide significantly ($P \leq 0.05$) increased seedling stand, plant height and fresh weight compared with nontreated seeds in nonpathogen-infested soil of 28-day old plants. The talcum-based product in the proportions of 1:1:1:1%:1%, wt/ wt/ wt/ vol/ vol with substrate component of talcum/ glucose/ soil particles/ calcium carbonate/ CMC/ $FeSO_4.7H_2O$ was significantly most effective formulation ($P \leq 0.05$) in enhancing seedling vigor and resulting 86.4 and 85.4% reduction of black rot (caused by *Xanthomons campestris* pv. *Campestris*) and downy mildew (*Peronospora parasitica*), the most serious diseases of Chinese kale, with highest yields procured of 16 .07 t/ha. The reduction of these 2 diseases, and yields obtained from SP007s fresh culture cells ; and conventional grower plots however, were 61.9 and 33.5%, and 15.8 t/ha ; and 15.5 and 16.8 %, and 12.7 t/ha respectively. This study demonstrates that carriers and nutrient sources significantly affected SP007s biocontrol efficacy.

P35 SURVIVAL OF *CITRUS GRANDIS* AND *CITRUS MADURENSIS* SEEDS IN LIQUID NITROGEN AFTER DESICCATION USING DIFFERENT METHODS

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In Malaysia, citrus fruits are widely cultivated throughout the country mainly for local consumption where it is used as food flavouring, as a drink and a source of medicine. At present, conservation of citrus germplasm is mainly through field genebanks. However, the trees rarely survive more than 15-20 years and are subjected to problems such as exposure to attacks by pests and diseases, natural hazards, as well as high labour costs for maintenance. Although most citruses produce seeds, however, seed conservation is not practical because it does not remain viable when stored for extended period of time. Cryopreservation is the only safe and cost-effective option for long-term conservation of germplasm of such seeds. However, the success of cryopreservation is highly dependent on the availability of freezable water in order to avoid recrystallization of ice. Desiccation can be achieved through various means and these have been reported to influence viability. Therefore, the present study was undertaken to study the effects of desiccation on viability of *C. grandis* and *C. madurensis* seeds with and without exposure to liquid nitrogen. Two desiccation methods were employed, namely desiccation using the laminar air flow and silica gel whereby seeds were desiccated for 12, 24, 36, 48, 60, 72, 96 and 120 hours. Fresh seeds for both species had high survival of 100%. Upon desiccation the moisture content declined with a faster rate for desiccation using silica gel. Desiccation resulted in reduction in survival especially when desiccated to below 20% moisture content. Seeds with moisture content higher than 30% did not survive liquid nitrogen exposure. Desiccation using silica gel resulted in more damage compared to desiccation. Upon exposure to liquid nitrogen *C. grandis* has more than 50% survival while the results for *C. madurensis* were slightly less. It is shown that both *C. grandis* and *C. madurensis* have the potential to be cryopreserved. From this study it can be concluded that desiccation is necessary for cryopreservation and that desiccation using LAF is better than using silica gel.

P36 BIOLOGICAL CONTROL OF BACTERIAL WILT AND GROWTH PROMOTION IN EGGPLANT (*SOLANUM MELONGENA* L.) USING ANTAGONISTIC PLANT GROWTH PROMOTING MICROORGANISMS

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Bacterial wilt is a serious disease in many solanaceous crops (eggplant, bell pepper, tomatoes and potatoes) caused by *Ralstonia solanacearum*. Economic losses in many of these vegetables are substantial and currently the pathogen is difficult to control. No effective chemical method of controlling the disease has been established. The severity of infection and incidence can be reduced by chemical treatment but it carries the risks associated with using chemicals which consumers will avoid. Consumers will always prefer product that are produced using less chemical fertilizers and pesticides. In this study several promising microorganisms were screened for their antagonistic ability towards *R. solanacearum* and their potential as a growth promoter was also investigated. From the screening exercise, an isolate of *Pseudomonas aeruginosa*, *P. fluorescens* and *Aspergillus* sp. showed the potential as a plant growth promoter and antagonist and revealed some growth promoting characteristics such as production of IAA and phosphate solubilization. An experiment was carried out using the three isolates and the results were evaluated based on plant height, weight and antagonistic activity. *P. fluorescens* increased plant height by 34%, leaves fresh weight by 42% and root fresh weight by 72%. *Aspergillus* sp. showed a 45% increased in plant height, 11% increased in leaves fresh weight and 38% increase in root weight. *P. aeruginosa* also significantly increased plant height by 25%, leaves fresh weight by 3% and root weight by 8.5%. All three microbes were successful in retarding infection of *R. solanacearum*. All eggplants treated with the three microbes survived when challenged with the pathogen compared to control which dies after two weeks of treatment.

P37 TIME OF APPLICATION OF GROWTH RETARDANT ON GROWTH AND LODGING RESISTANCE OF TWO WET SEEDED RICE *(ORYZA SATIVA* L.*)* CULTIVARS

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Rice is the most important staple food in Malaysia. Area under rice cultivation is estimated to be 452,000 ha with a production of 2.4 million metric tons per year. One of the problems that affect the local rice industry is lodging. A study was carried out to determine the effects of time of application of growth retardant namely, paclobutrazol on growth, lodging resistance and yield of two rice (*Oryza sativa* L.) cultivars. The varieties used were MR219 and MR220. Paclobutrazol was applied as foliar spray with a concentration of 0ppm (control) or 200ppm. These treatments were applied at three different stages; seven days before panicle initiation, at panicle initiation and seven days after panicle initiation. The experimental design was a three factorial Randomized Complete Block Design with four replications. The parameters evaluated are plant height, internode length, lodging resistance and yield. The overall results of this experiment showed that the application of paclobutrazol at different times successfully inhibited growth with shorter plant height and internode. The treated plants had higher stem breaking resistance. Plants treated with paclobutrazol before panicle initiation showed the most significant effect on growth inhibition and stem strength. Application before panicle initiation also resulted in the highest value for bending resistance. There was no significant difference in grain yield compared to control.

P38 EFFECTS OF VARIOUS STOCKING DENSITY OF SILVER BARB (*BARBODES GONIONOTUS)* ON PERFORMANCE OF RICE IN INTEGRATED RICE-FISH SYSTEM, IN TELUK INTAN, PERAK, MALAYSIA

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A field experiment was carried out to determine the performance of rice as a result of integrating silver barb at various stocking density. The experiment was conducted at rice field in Labu-Kubong-Sungai Manik, Teluk Intan, Perak. The aim of this study was to reduce overuse of pesticides by using fingerlings act as a biocontrol agent in ricefield. Fingerlings of about 5-8 cm long were introduced into plots of 20 x 15 m at the rate of 0, 4000, 8000 and 12,000/ha at 25 days after direct seeding and the treatments were replicated eight times. Paddy cultivar MR 219 was broadcasted at a sowing rate of 80 kg/ha. A small furrow of 100 cm with width and 60 cm deep was dug along edge for the fishes to seek refuge during harsh condition. Fish were not given additional feed till the end of the trial. Plant height, number of tillers/m^2, panicle/m^2, number of grains/panicle, weight of 1000 grains and yield were determined at harvest. The results showed that plant height was not affected by the treatment. Number of tillers decreased significantly ($p< 0.05$) between control and the treated plots. However, the decline in panicle/m^2 was not significant. There was no significant difference between the treatments for Number of grains per panicle and weight of 1000 grains. It is important to note that integrating fish with rice did not result in significant difference in yield. Based on the results of this study, integration on fish with rice can be advantageous as it does not affect the yield but can provide additional income to farmers. It is however, important to ensure that the cost of fingerlings does not exceed the cost of pesticides, as the idea is to use the fingerlings as biocontrol agents and at the same time generate extra income for the farmer.

P39 DETECTION OF THE *COCONUT CADANG-CADANG VIROID* SEQUENCE IN OIL PALM BY RIBONUCLEASE PROTECTION ASSAY

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A ribonuclease protection assay (RPA) has been developed for detecting the 246 nt sequence of *Coconut cadang-cadang viroid* (CCCVd). Nucleic acid extracts from CCCVd- infected coconut palms protected three major fragments of the complementary RNA viroid probe, ca. 250, 125 and 50 nt in length, as well as a variable number of minor fragments. While smaller than full length components alone cannot be considered as specific markers of infection, the protection of full length ca. 250 nt probe was shown to be diagnostic for the presence of the minimal infectious 246 nt unit of CCCVd in inoculated oil (*Elaies guineensis*) palms. Coconut and oil palms growing outside the known geographical range of CCCVd have previously been reported to contain CCCVd-related RNA. We have used RPA to show that the sequence of CCCVd (to an estimated accuracy of >99%) was present in twelve out of eighteen commercial oil palms sampled in Malaysia. Signal intensity varied between the positive oil palms, was generally lower than in CCCVd affected coconut palms, and a comparison of fronds of one oil palm showed it was strongest in the oldest frond assayed. Detection of the sequence was not exclusively associated with the orange leaf spotting syndrome of oil palm. Apart from allowing us to conclude that the CCCVd sequence occurs outside the known cadang-cadang area, RPA has potential as a sensitive, simple, robust and specific diagnostic method for studying the pathology, epidemiology and control of CCCVd.

P40 *AGROBACTERIUM RHIZOGENES*-MEDIATED TRANSFORMATION OF KACIP FATIMAH (*LABISIA PUMILA*) WITH GREEN FLUORESCENT PROTEIN (*GFP*) AS AN EFFICIENT GENE SELECTION MARKER.

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Kacip Fatimah (*Labisia pumila*) is a medicinal herb found mainly throughout South East Asia. *Agrobacterium rhizogenes* mediated transformation combined with a visual selection for green fluorescent protein (GFP) has been applied effectively in Kacip Fatimah (*Labisia pumila*) transformation. Kacip Fatimah shoots were inoculated with LBA 9420 and ARquaI strains, all bearing *gfp* gene pGEM.Ubi-*sgfp*S65T. Transformed adventitious roots can be visually selected solely based on GFP fluorescence with a very high accuracy. The method requires no selection agents like antibiotics or herbicides and enables reduction in labor and time necessary for tissue culture. Moreover, individual transformants can be easily excised from the host tissue and cultured separately. All Kacip Fatimah plantlets produced transformed adventitious roots and the frequency of shoots producing GFP expressing adventitious roots varied from 25 to 65%. The highest transformation rate was found for using ARquaI strain. The results showed that visual selection of transformed, fluorescing adventitious roots can be highly effective and applied routinely for the production of Kacip Fatimah transgenic plants and hairy roots.

P41 EVALUATING CONSUMERS' PREFERENCE TOWARDS ATTRIBUTES OF MANUFACTURED FOOD USING CONJOINT ANALYSIS

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It is one of the universal truths of business that one of the most important keys to success is an accurate understanding of the customer. Countless factors, personally to culture, have been considered to explain consumer behaviour. The religion which affects the social and cultural environments, in which customers reside and conduct their individuals' behaviour and manners, is very often ignored. Indeed, almost all religions around the globe have set of laws that affect everyday purchases and habits. Even the degree in which individual members adhere to the religious convention varies; the fact is that the preferences and tastes are considerably shaped by the value giving rules and customs of their surrounding religions.

Marketing of products in Muslim countries presents a very challenging task to manufactured food producers or exporters due to the political, economy and socio-cultural aspects. With almost 20% of the world population, and expected to increase to 30% by 2025, the important aspect to be considered whenever exporting to Muslim countries is fulfilling the "halal" requirements. Halal covers the aspects of slaughtering, storage, display, preparation, hygiene and sanitation as well as the ingredients used in producing products that should originated from the halal sources. Halal represents an emerging market force which exerts a powerful influence on the food market in a manner that has not yet been fully anticipated. In marketing the halal label could give great impact on consumers buying decision.

Hence, in this study, the Conjoint Analysis (CA) is used to investigate which attributes of manufactured food products are important within Muslim consumers in Malaysia. CA used is to understand how individuals evaluate products and form preferences and how CA could assist in predicting consumer behavioural outcomes like choices. The approach was used to establish the relative importance of different attributes, how individuals trade between these attributes, and overall benefit scores for different food products configurations. The value of attributes was estimated in proportionate percentage, and this is to indicate the possibilities of consumer purchases.

P42 THE EFFECT OF PRECULTURE ON SURVIVAL OF CRYOPRESERVED ZYGOTIC EMBRYONIC AXES OF KING PALM (*ARCHONTHOPOENIX ALEXANDREA* L.)

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King Palm (*Archonthopoenix alexandrea* L.) is an ornamental palm that is widely used in the landscape industry. This palm normally propagated by means of seed. However, germination takes a long period due to the dormancy and percentage of survival is low. The long-term storage of King Palm seeds is still a problem, as they remain viable for only short periods. Recently, cryopreservation of embryos has been proposed to be a good alternative for long-term storage of difficult materials such as recalcitrant and intermediate seeds. Therefore, this study was carried out for storing these seeds using embryonic axes both with and without sucrose pretreatment in liquid nitrogen. In the desiccation-based cryopreservation, the excised embryonic axes were subjected to desiccation for 0, 1, 2, 3, 4, 5 and 6 hours respectively prior to plunging into liquid nitrogen. The viability and survival of embryonic axes with and without exposure to liquid nitrogen was evaluated after 3 weeks and 6 weeks of culturing onto enriched Murashige and Skoog's medium. Results showed that there is a significant difference between the desiccation hours on survival of embryos. The survival was high (95%) initially at higher moisture contents but reduced to 37.5% after 6 hours of desiccation (11.9% moisture content). In contrast, no survival was obtained after exposure to liquid nitrogen when moisture content was high (above 24.2%). The highest survival (25%) after exposure to liquid nitrogen was obtained for embryos desiccated to 19%. Thus, desiccation is a must for survival in liquid nitrogen. In the sucrose pretreatment-based cryopreservation, the embryonic axes were precultured for 16 hours onto MS medium with 0.4M sucrose followed by desiccation prior to liquid nitrogen exposure. The trend was similar to that obtained for direct deseccation. However, the highest survival was 45% when preculture was used as compared to 25% when the direct desiccation method was used. In addition the plantlet development of the precultured embryos was much better compared to the non-precultured treatment.

P43 STOMATA ADJUSTMENT OF *ELAEIS GUINEENSIS JACQ* SEEDLINGS WITH CARBON DIOXIDE ENRICHMENT

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Three tenera (D x P) progenies of oil palm seedlings, Deli Urt, Deli Yangambi and Deli AVROS were each exposed to three level of CO_2 viz (1) ambient CO_2 (control); (2) twice ambient CO_2 (800 µmol/mol) or (3) thrice ambient CO_2 (1200 µmol/mol). The objectives of the experiment was to study the effect of different levels of carbon dioxide concentration on stomata density of different progenies of oil palm seedlings. The experiment was carried out for 15 weeks. Stomata were

examined by means of peel surface imprints made using clear nail varnish (cellulose acetate). Thin layer of the nail varnish were dried for 10 minutes. The layers with the impression imprinted were then peeled on 1 mm^2 grated slide. Both leaf surfaces were examined at approximately half-away along the leaflets. The result showed that oil palm seedling leaf are "*Ampistomous*" (stomata occur on upper and lower side of leaves). Upon enrichment, abaxial stomata was reduced by 33% and 57% in the 800 µmol/mol and 1200 µmol/mol treatment respectively compared to control plant. Similarly, elevated carbon dioxide resulted in significant lower adaxial. Seedlings that enhanced with carbon dioxide had 32% less adaxial stomata than control. As stomata density reduced, stomata conductance tend to decreased. It was observed that the interaction effect between carbon dioxide and progenies contribute to the effects. As the levels of carbon dioxide increases, stomata conductance tend to reduce in Deli AVROS and Deli Urt. But for Deli AVROS, stomata conductance constant although enhanced with elevated carbon dioxide. This result implies, the reduction in stomata conductance of plants with high than ambient level of carbon dioxide are contributed by decreasing densities of stomata per mm^2.

P44 ULTRAMICROSTRUCTURES DESCRIPTIONS OF *MUSA* POLLEN

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Phylogenetics of *Musa* has been studied by using AFLP and chloroplast DNA (cpDNA). However, phylogenetic tree or dendrogram will alter when there is addition of new genotype in the analysis. Therefore, phylogenetic analysis combined with morphological characters will strengthen the analysis. In this study, pollen grains of 41 genotypes of *Musa* distributed in Malaysia were examined by light and Scanning Electron Microscopy to study the morphological character. The results from this study will be combined with the phylogenetic study of the same genotypes of Musa. The objective of this study was to study the pollen morphology variation between these genotypes in Malaysia. The pollen samples were obtained mostly from fresh collected specimens from *Musa* collection at Ladang 2, Universiti Putra Malaysia. Fresh *Musa* flowers were fixed in FAA solution prior to microscopy examination. Pollen grains were examined by using light microscopy (LM) to observe the general shape and aperture number. This study was followed the standard method described by Erdtman (1969). Then, Scanning Electron Microscopy (SEM) was used to examine the measurements of polar axis (P) and equatorial diameter (E) from 10 grains per sample to calculate the P/E ratio. P/E ratio will determined the pollen shape. From the SEM, aperture type and surface ornamentation will also be obtained. For scanning electron microscopy (SEM), it was followed the protocol explained by Davies (1999) with some modification. From this study, classification of genotypes will be compared to further phylogenetic studies.

P 45 THE EFFECT OF ORGANIC AND CHEMICAL FERTILIZERS ON GROWTH, QUALITY AND PHYTOCHEMICAL CONTENTS OF KANGKUNG (*Ipomoea aquatica*)

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A study was carried out to evaluate the effects of chemical and organic fertilizers on growth, phytochemical properties and quality characteristics of kangkung. A chemical fertilizer (NPK 15:15:15) was applied at the rate of 140 kg N/ha while two types of organic fertilizers (NPK 9:3:3 and NPK 5:5:5) were each applied at the rate of 280 kg N/ha. The experiment was carried out using the

completely randomized design with 4 replications. Agronomic practices such as fertilizer application, weed control and irrigation were done accordingly. The growth characteristics such as plant height, leaf length, leaf number and yield were measured every seven days. After harvest, physical and chemical characteristics such as stem texture, moisture content, ascorbic acid content, soluble solids concentration, pH, titratable acidity and contents of carotenoid, polyphenol and chlorophyll were determined. The data were analyzed by analysis of variance and the treatment means were compared by LSD test. Plant height, leaf length and leaf number of plants treated with the chemical fertilizer were significantly greater than plants that were fertilized with the organic fertilizers. However, plants treated with organic fertilizers contained higher phytochemical contents such as ascorbic acid, carotenoid and polyphenol compared to the plants treated with chemical fertilizers.