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ABSTRACTS – POSTER PRESENTATION

I. Agricultural Biotechnology to Breed Plants and Animals

EFFECT OF CHITOSAN AND ACIDIFIED NITRITE ON CONTROL OF SEED-BORNE ANTHRACNOSE IN CHILI PEPPER

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Anthracnose caused by *Colletotrichum* spp., is one of the most important diseases of chili pepper production in Thailand. Anthracnose infects chili pepper at all growth stages and transmits to seed. Conventionally, fungicides are widely used to control the disease, but have adverse effect on health of farmers and consumers. Acidified nitrite ($NaNO_2$), a food additive, and chitosan have been shown its activity against plant pathogenic fungi. This study sought to determine the efficacy of acidified nitrite and chitosan on control of seed-borne *C. capsici* isolate 158ci in chili pepper (*Capsicum annuum* L.) cv.'Bangchang'. The experiment was carried out in a Completely Randomized Design (CRD). Soaking *C. capsici* isolate 158ci infected seeds in acidified nitrite [$NaNO_2$ in citric acid buffer (pH 2.5) at 0 (control), 100, 200, 250, 300, 350 and 400 mM for 30 min] and chitosan solution (in 0.05% acetic acid at 2.5, 5.0, 10.0 and 50.0 mg ml^{-1} for 60 min), and then transferred the treated seeds on PDA (potato dextrose agar) for 7 days. Chitosan at all concentrations could not control the seed-borne anthracnose but showed a potential for improvement of seed quality. Nitrite solution at 100 and 200 mM reduced disease incidence by 70 and 90%, respectively without phytotoxicity, and the 250-400 mM nitrite solution completely controlled seed-borne anthracnose but proved to be phytotoxic at seed germination.

EFFECT OF CONCENTRATION OF NUTRIENT SOLUTION ON SUNFLOWER GROWTH IN HYDROPONIC SYSTEM

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The effect of nutrient concentration on sunflower grown using hydroponic system under greenhouse conditions was investigated. Plug transplants of three hybrid sunflower varieties, Opera, Pacific77 and Artuel, were grown in 40 L- rectangular plastic tray container supplied with 10 l of "Enshi" nutrient solution. Three concentrations, 0.25X, 0.5X and 1X of the full strength Enshi solution, were evaluated weekly for 4 weeks in term of dry weight of leaf, stem and root, number of leaf, leaf area per plant, plant height, root length, stem diameter, chlorophyll content using SPAD-502 meter and NPK content in plant. The experiment was conducted using split-plot (main plots were concentrations and subplots were varieties) in RCB with 4 replications. The result indicates that the effect of concentration of Enshi solution on dry weight of leaf, stem and root, number of leaf, leaf area per tree, SPAD value and nutrient accumulation of nitrogen and phosphorus in leaf and stem were

greatest at 1X of the full strength solution. In conclusion, the full strength of Enshi solution is the optimal nutrient concentration for culturing sunflower seeding in hydroponic system under greenhouse condition.

ISOLATION AND CHARACTERIZATION OF DIHYDROFLAVONOL 4-REDUCTASE GENE FROM *DENDROBIUM* SONIA 'EARSAKUL'

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This paper meant to isolate and characterize dihydroflavonol 4-reductase gene in anthocyanin biosynthetic pathway during flower development of *Dendrobium* Sonia 'Earsakul'. The gene was isolated from floral tissues of the orchid by reverse transcriptase polymerase chain reaction procedure. Characterization of the gene is considered to its relevancy to dihydroflavonol 4-reductase gene in other plants elucidated by construction of a neighbor-joining phylogenetic tree. Gene expression pattern related to flower development and pigmentation was investigated by relative quantification using real time polymerase chain reaction procedure. A complete coding sequence was obtained and sequence analysis revealed that the gene of *Dendrobium* Sonia 'Earsakul' consisted of 1,059 base pairs. Blast analysis and multiple alignments also showed that the dihydroflavonol 4-reductase gene of *Dendrobium* Sonia 'Earsakul' shares high homology to dihydroflavonol 4-reductase gene of *Dendrobium* genus particularly *Dendrobium hybrid* 'Uniwai prince' and *Dendrobium hybrid* 'Geeting Fragrance'. Phylogenetic tree revealed for the first time that dihydroflavonol 4-reductase of *Dendrobium* genus are highly conserved. The dihydroflavonol 4-reductase gene of *Dendrobium* Sonia 'Earsakul' was highly expressed in young flower bud with no pigmentation and the expression was abundant when young flower bud started accumulation of pigments. The expression was decreased in half open flowers but slightly expressed with fully opened flowers.

RNAi TECHNOLOGY FOR *PAPAYA RINGSPOT VIRUS* (PRSV) RESISTANCE IN PAPAYA

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The increasing average global temperature owing to global warming contributes to the rising number of disease-carrying insects, particularly the fast-growing aphids – a major carrier of papaya ring spot virus disease (PRSV) – and their shorter life cycles. PRSV-infected papaya trees bear growth-inhibited fruits that are tainted by ring spots on the surface, and their trunks are dwarfed. PRSV is difficult to control without felling. The growing number of carriers poses a higher risk of spread of the disease. Conventional breeding is time-consuming and has so far not been successful in producing a truly PRSV-resistant variety. Moreover, the Thai government does not promote cultivation of genetically-modified plants, despite the fact that it is an effective way to contain the spread of the disease. This research work applies the grafting technique in combination with the RNA-interference technology to induce PRSV-resistance in papaya. Papayas of a commercial variety (*carica papaya linn.*) were grafted onto those of another variety that is resistant to the disease. After

three PRSV cultures, each with two 15-day intervals in between, the results were papaya trees that were substantially more PSRV-resistant than the papaya of the same variety but not grafted by the same method and the non-resistant varieties. It is speculated that this technique could be used to produce papaya that is resistant to the disease irrespective of their variety. This would, in turn, provide a solution in relation to anti-GMO sentiment, since the genetically-modified stock signals PSRV resistance exclusively to the scion while the fruits remain of the generic variety.

THE UTILIZATION OF NON-LIVING AQUATIC WEEDS, *HYDRILLA VERTICILLATA* AND *PISTIA STRATIOTES*, FOR LEAD IONS REMOVAL

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In this work, the removal potential of lead ions by non-living aquatic weeds, *Hydrilla verticillata* and *Pistia stratiotes* has been studied. The effects of pH, initial metal concentration, and contact time were studied in batch experiments. It was found that the optimum pH for adsorption of *H. verticillata* and *P. stratiotes* were 4.0 and 3.0 respectively. The biosorption kinetic results have shown that lead ions removal rate was at its maximum at the beginning of the process. The equilibrium state was achieved within 60 min for both biomass. The experimental equilibrium data were evaluated by Freundlich and Langmuir isotherm models. In addition, The spectrum of FTIR confirms that the carboxyl groups on the surface of biomass were the main adsorption sites for lead removal. The surface structure of biomass was analyzed by scanning electron microscopy (SEM). Thus, this study demonstrated that both the biomass could be used as an efficient biosorbents for the treatment of lead(II) ions from aqueous solutions.

SELECTIVE PRESSURES TO EGGPLANT (*Solanum melongena* Linn.) GERMPLASM : IMPLICATIONS ON SEED MARKET AND GENE FLOW

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Eggplant is cultivated in Albay Province as monocrop, part of multicrop or intercrop under coconut. As one of the high value crops, it is cultivated across gradients of soil textures and topography. Production varies from backyard to business scale. Farmers' options for high yielding and stress tolerant varieties widen as planting materials of newly developed varieties flourish. This influx brings competition among the genotypes to be dessiminated in time and space. Germplasm which can overcome selective pressures in the area perpetuate and become ecologically adapted. Those that cannot adapt in the environment perish and eggplant germplasm is not an exception. The onslaught of super typhoon Reming (Durian) on November 2006 decimated the arable lands of the province and might have resulted to : (1) fragmented populations of plant pathogens, pathogens and pollinators which aid in successful geneflow; and (2) altered movement of germplasm due to physical barriers. These factors become selective pressures for genotypes (varieties) in synergy with changing climate. There is dearth of literature that assess varietal performance and preference of farmers for eggplant in Albay. This paper seeks to complement this gap as it present findings based on survey and ocular inspection done during the 2008-2009 cropping season.

2-DIMENSIONAL POLYACRYLAMIDE GEL ELECTROPHORESIS (2D-PAGE) OF *PAPAYA RINGSPOT VIRUS* (PRSV) INFECTED PAPAYA LEAF

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The *Papaya ringspot virus* (PRSV) causes severe economic losses in both papaya and cucurbits throughout the tropics and subtropics regions. PRSV belongs to the potyvirus genus with consists of 30% of know plant virus. The symptoms include mosaic and distortion on papaya leaves, ringspots on fruits, and water-soaked streaks on stems and petioes. The virus stunted papaya plants and drastically reduces the size of fruit. Infected papaya leaf was confirmed by RT-PCR assay with specific primer for coat protein of PRSV that yielded about 550 bp. Comparison of protein profiles from infected and healthy papaya leafs by Two-dimensional polyacrylamide gel electrophoresis (2-DE) techniques. Immobilized pH gradient (IPG) strips, pH 4-7 and pH 6-11 were use to analyze the protein extracted from 2 samples of infected and healthy leafs of papaya. In this experiment we detected approximately 180 protein spots from the IPG strip of pH 4-7 and 30 protein spots from the 2 samples of infected and healthy leafs. We also differentiate approximately 110 protein spots in the IPG strip of pH 6-11 and 20 protein spots in the 2 samples of infected and healthy leafs of papaya plant. The proteins were chosen from different protein spots in 2 different samples and analyzed by MALDI-TOF MS/MS and MASCOT program. We were able to analyze 20 proteins by this program. The Lipoxygenase (Lox gene) gene up regulated or elevated contrast healthy plant. An increase in LOX activity in response to infection has been reported for several plant-pathogen systems.

CLONING, EXPRESSION AND CHARACTERIZATION OF RECOMBINANT CRY1AB FOR THE DEVELOPMENT OF IMMUNE-BASED DETECTION METHODS

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The insecticidal crystal proteins encoded by *cry* gene of *Bacillus thuringiensis* have been used for control both as biopesticides and in transgenic plants. In this study, the *cry*1Ab gene was cloned and sequenced from the genome of transgenic maize MON 810 by polymerase chain reaction. The open reading frame of *cry*1Ab gene consisted of 2,459 base pairs, encoding a protein of 806 amino acids. DNA sequencing result confirmed 99% homology with that of the accession number AY326434 in GenBank and it shared 98% identity with homologous pesticidal crystal protein Cry1Ab by BLAST analysis. The *cry*1Ab gene was inserted into *Escherichia coli* expression plasmid pET to produce pTAb. Recombinant Cry1Ab protein was expressed following IPTG induction and verified by Western blot analysis using anti-his tag. Analysis of the fusion proteins by SDS-PAGE showed a molecular weight of 110 kDa. The result of this study opens up the possibility of preparing large-scale production of the recombinant *cry*1Ab protein. Subsequently, the protein will be used in order to produce antibody for immune-based methods employed in the detection of relating GMO materials.

MILD ISOLATES OF *CUCUMBER MOSAIC CUCUMOVIRUS* COLLECTED FROM NATURAL INFECTED CHILI PEPPER IN BALI, INDONESIA

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Cucumber mosaic cucumovirus (CMV), a type virus of the genus *Cucumovirus*, is one of the most serious plant virus pathogens with a broad host range including both monocotyledonous and dicotyledonous plants. As CMV is transmitted by aphids in a non-persistent manner, controls of the virus diseases is difficult. During surveys conducted in chili pepper production areas of Bali, there were some plants showing very mild mosaic symptoms among the plants with severe mosaic appearances. Double stranded (ds) RNA analyses to the samples collected from asymptomatic plants found four CMV isolates having dsRNA corresponding to satellite (sat) RNA of about 300 to 400 bp. SatRNA-containing CMV isolates have very mild pathogenicity on chili pepper plant, and the virus isolates were designed as CMV mild isolates. The researches are being going to know the potencies of the CMV mild isolates used as mosaic disease control bioagents on chili pepper.

ASSOCIATION OF A TOSPOVIRUS WITH PINEAPPLE RED-TIP DISEASE

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Malaysia, once ranked as one of the top 3 pineapple producers in the world in the 60's and early 70's, has only a relatively modest industry today but shown steady growth over the last several years. Despite this, and the government's recognition as a priority sector of growth, the pineapple industry in Malaysia still faces numerous challenges, one of which is the management of disease and pest. There are several disease that have been reported in Malaysian pineapples, among them is the Mealybug wilt of pineapple (MWP), which is present in all major pineapple growing-areas of the world and red-tip disease, which is a relatively new problem in Malaysian pineapples. It was first recognized in the early 1990's at Simpang Renggam, Johore where it has been found that 10% or more of its leaves starting from the tip had turned red, do not produce fruits or produce small fruits. It was previously associated with MWP which is caused by a pineapple mealybug wilt-associated closterovirus based on the symptoms. However, absence of the mealybug wilt-associated closterovirus virus particle and the lack of mealybug infestation in the affected plants have ruled the possibility of this virus as the causal agent of this disease. Moreover, the leaf would remain healthy and show no sign of wilting. In addition, there were no evidence linking this disease to fungus, bacteria and nutrient deficiency. Nevertheless, the symptoms and the spread of this disease in the field still seemed to point to a viral etiology for this disease. Bioaasay test on nucleic acid extracted from the red-tip affected pineapple plants was done on *Nicotiana tabacum* cv. coker by rubbing the extracted sap. Localised lesions were observed 3 weeks after inoculation. Negative staining of the fresh diseased sample and inoculated *Nicotiana tabacum* cv. coker showed the presence of membrane bound spherical particles with average diameters of 94.25nm under transmission electron microscope. The shape and size of the particles were similar to tospovirus. RT PCR amplification of nucleic acid extracted from the re-tip affected pineapple using tospovirus universal primer, BR60 and BR 65 targeting on the N gene of tospovirus showed a band at approximately 400bp, which is close to the expected band of 453bp. Nucleic acid sequencing is currently being done to identify the species of the tospovirus, but with the evidence obtained in this study, pineapple red-tip disease could be associated with a tospovirus from the family *Bunyaviridae*.

MOLECULAR AND MORPHOLOGICAL COMPARISONS BETWEEN FAR EAST AND MEDITERRANEAN *Anisakis pegreffii* CAMPANA-ROUGET ET BIOCCA, 1955

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Anisakis pegreffii Campana-Rouget et Biocca, 1955 has been widely reported, not only in the Mediterranean and Atlantic but also in the Far East region. Recently, two base differences was detected in the sequence of 5.8S rDNA between *A. pegreffii* from the Mediterranean and that from the Far East region, and the latter was tentatively designated as *Anisakis pegreffii* JP based on this difference. In this study, *A. pegreffii* from the Mediterranean and from the Far East were morphologically and molecularly compared. Morphologically, little difference was detected, including the ventriculus length, among the specimens. In PCR-RFLP and DNA sequences of ITS rDNA, identical results were obtained from all the present and previously reported specimens of *A. pegreffii* except that the two base differences was detected in only one sequence reported from the Mediterranean (GenBank Acc. No. AY826720), in which an unclear base was sandwiched between the different base positions, suggesting possible error in sequencing. In *mt*DNA *cox*2, no geographical difference was also detected. These results indicate that *A. pegreffii* JP is identical morphologically and molecularly with other *A. pegreffii*.

PROLIFERATION AND REGENERATION PROTOCOL FOR PROTOCORM-LIKE BODIES OF *Phalaenopsis gigantea* ORCHID

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Phalaenopsis is one of the popular orchids which has long arching sprays, beautiful flower and have a long flower shelf-life. One of the important *Phalaenopsis* species is *Phalaenopsis gigantea* which is highly sought after by the orchid collector. Mass production of *phalaenopsis* is *via* micropropagation through the protocorm-like bodies which is a rapid method of proliferation within a short period of time. Each PLBs can be regenerated into individual plantlets when cultured into media (Park et al., 2000). This study was done to determine the suitable type of culture media for the PLBs proliferation. The type of media tested was liquid and solid New Dogashima media supplemented with 1 mgL^{-1} NAA and 0.1 mgL^{-1} TDZ. Four PLBs were inoculated into 100 ml conical flasks. Besides, different size of PLBs namely 1, 2 and 3 mm were cultured onto the hormone free NDM media to see the effect of the size on the regeneration process. PLBs cultured in both liquid media as well as solid media did not differ much in their response to proliferation. However, *Phalaenopsis gigantea* appears to exudates a high amount of phenolic compounds which was deleterious in the liquid culture as the spread was quick. At the end of the sixth week the number of PLBs in solid media exceeded the number of PLBs on the liquid media which were 13 and 8, respectively. In both cases, the proliferation was relatively slow as compared to many other orchid species. So, it is suggested that solid media is more appropriate for the proliferation process. In the second part of the study, it was found that although the 3mm PLBs were able to convert into shoot very early but plantlet

development was low. PLBs with the size of 1mm had a high rate of conversion into complete plantlet.

PRODUCTION AND DISEASES OF *Angelica keiskei*, "ASHITABA", IN JAPAN

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Angelica keiskei, a perennial herbal plant in the *Umbelliferae* family, is called as "Ashitaba" in Japanese. Because of its vigorous nature and high concentration of chalcone derivatives, *A.keiskei* plants are popular for medicinal and nutrition supplemental purposes. Not only used as fresh vegetables, the leaf is reduced to green powder and mixed with noodles, tea, Japanese cakes and others. The plant is indigenous to Izu Islands located south of Tokyo and Shizuoka prefecture and cultivated widely in the islands as the local specialty. In 2009, mosaic symptoms were noticed in some *A.keiskei* plants in Oshima islands. By electron microscopy, flexuous and filamentous particles of about 830 nm in length were observed. It showed chlorotic local lesions on *Chenopodium quinoa* but not yet infectious to the original species by artificial inoculation. The isolate reacted positive to *Potyvirus* group test kit (Agdia, USA) while negative to CMV antibody. The RT-PCR was conducted using M4/S primers which are designed from consensus sequences of the genus *Potyvirus* (Chen et al., 2003) and the amplified products showed low but the highest homology with *Carrot thin leaf virus* followed by *Konjak mosaic virus*. Alhough the identity of this virus has not been concluded, to protect *A.keiskei* from the impact of this virus infection, the use of healthy seedlings for propagation and aphid control are recommended.

CONTENT AND ANTIOXIDANT PROPERTIES OF PEANUT (*Arachis hypogaea L.*) FLOUR

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Roasted peanut flour is commonly used as a food ingredient to add flavor and protein for food industry. It has been recognized as a functional food due to its heart-healthy nutrient compositions and antioxidant compounds. The antioxidant factors responsible for the stability of roasted peanut flour are highly affected by the roasting conditions. Survey of the roasting times effect on total phenolic content and antioxidant activity in roasted peanut flour was the aim of this investigation. Two forms of peanut kernels flour, with and without skins, were roasted at 160°C for 10, 20, 30, 40 and 50 min. Total phenolic content (TPC) by Foiln-Ciocalteau method and antioxidant activity by Ferric Reducing Antioxidant Power assay (FRAP) and TBA assay (thiobarbituric acid) were evaluated and compared with those of unroasted kernels flour. The results indicated that total phenolic content and antioxidant activity of both peanut kernel flour with and without skins were increased significantly ($p < 0.05$) as increasing roasting times. However, there was no significant different between the antioxidant activities measured by TBA method for both samples indicating that roasted peanut flour may inhibit the formation of lipid oxidation products. The present study indicated that peanut flour can be considered as a good source of natural antioxidant specially after roasting.

II. Rural Development and Agribusiness

FEASIBILITY STUDY: INTEGRATED ANIMALCULTURE AND SOILLESS TECHNOLOGIES FOR ORGANIC ANIMAL AND PLANT PRODUCTION

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Integrated animal culture and soilless techniques are the technological combination between of organic animal and plant production. This model consists of native breed chicken raising on high density walking catfish pond, plant production such as lettuce, hydroponic system, using waste water from animal rearing by means of organic nutrient film technique (ONFT), and plant production in organic substrate culture – chili and tomato production using chopped coconut pericarp. Waste water from animal rearing is the source of water and nutrient supply. For the effectiveness of resources using, the rest of water from many system was supplied to surrounding plants. At 4 weeks, the results showed that the lettuce production in ONFT can be grown although its growth rate was less than that of lettuce production in nutrient solution using Macbils and Torrey (1965) method, at EC 1.2 dS/m. The application of *Trichoderma hazianum* in walking catfish pond, can promote lettuce growth. There was no disease on lettuce and it was found negative for bacteria, pathogenic bacteria of plant pathology. Lettuce from ONFT is safe for human consumption because there are less pathogenic bacteria than normal standard and had low nitrate (153.3 mg/kg). Chili and tomato grown in chopped coconut pericarp were not significantly different to chili and tomato in mixed soil with chemical fertilizer. At 4 weeks, the average daily gain and feed conversion ratio of native breed chickens were 15 gram/bird/day and 3.93, respectively. In terms of walking catfish growth, the average weight gain was 102 gram/fish. From the above results, it was found that integrating the technologies of organic agriculture for both plant and animal production, can be effective. It is a suitable alternative of sustainable organic agriculture for the farmer.

INTEGRATING GENDER ANALYSIS INTO DAIRY CATTLE FARMING IN CENTRAL JAVA PROVINCE

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The study focused on the social and gendered nature of dairy cattle farming and disease management. The study aimed to explore the role of women in dairy cattle farming by analyzing the social and gender dynamics in relation to disease management. A survey was conducted in Getasan Village in Getasan District, Semarang Regency, Central Java Province. The respondents are generally wives of beef cattle farmers with ages ranging from 15 to 60 years. We chose 96 wives of farmers who work in farming activities by *simple random sampling*. The result of the study shows that in all the communities the roles of women and men at the various stages of dairy cattle farming management are almost similar. Women's work remains undervalued compared with men's. Women not only work in the fields as much as or more than men, but they also have the major role in housework and caretaking. Women have almost equal access to all inputs required for dairy cattle farming (breeds, land, labour, feeding practices). Both male and female have equal opportunities to work in the fields. In general women have a minor role in decision making. However, the differences exist depending on the family, position of the women in the household and individual people

involved. The study provided some recommendations and proposed gender analysis as indicators in the design and implementation of dairy cattle development projects.

MARKET RESEARCH THAT UTILIZED THE TASTE SENSOR TECHNOLOGY FOR JAPANESE STRAWBERRIES

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Japanese strawberry attracts the attention of the world consumers worldwide because of their from superior tasty and high quality. Therefore, strawberries are a strategic export farm product of Japan. The market evaluation of “Amaou,” a is high in the kind of large and good taste superior tasting variety of strawberries, such as "Amaou",is high, and a market is spreading in particular led by the Southeastern Asian well off. In Japan, many new varieties of strawberries are developed from research centers, For example, “"Okimi"," and “"Tochiotome,"" and “Benihoppe"." Therefore, this study sought to fully understand consumer's’ wants, and create an export strategy for exports to Asian countries. For foreign students (China, Taiwan, and Thailand) who studied in Japan, we carried out the sensory rating of 8 kinds of strawberries developed in Japan. Furthermore, using a taste sensor, we collected the smart data for each kind. We integrated smart analysis with sensuality findings and examined exports of every variety.

Through this study, the following conclusions became clear:

1) Through the marketing research of foreign students (China, Taiwan, and Thailand), we found that “"Amaou” (a kind of strawberry)" was highly evaluated in the taste investigation and color test.
2) We collected taste data by taste sensor technology, and we are building the database, that contains data on 8 kinds of strawberries variety.
3) Southeastern Asian foreign students desired taste was strong sweetness and sour taste, so we find a good variety of strawberries variety.
4) We were able to understand precisely the desired taste of each favorite variety for consumers from different countries precisely by combining sensory evaluation with smart analysis technology.

COMPLEX NETWORKS OF NEW FOOD PRODUCT DEVELOPMENTS IN AGRICULTURAL COOPERATIVES AND LOCAL ENTERPRISES

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This study aimed to visualize the network of new food product development in agricultural cooperatives and local enterprises, and to clarify the network structure. The flaw of the network becomes clear when the network structure is clarified. Complex networks can be used to describe a wide variety of systems in the nature and society, and is expressed by a graph made using a collection of vertices (or “nodes”) and edges. Complex networks analysis can visualize the relations between subjects, and also enables quantitative analysis. This study examined the complex networks of new food product development in the Ashikita Agricultural Cooperative and its business partners. Between 1988 and 2009, the Ashikita Agricultural Cooperative developed approximately forty new products in collaboration with local enterprises. After obtaining the result of the analysis, we divide this network into three components: (1) innovation, (2) local branding and promotion, and (3) new food product development using existing techniques. Here, the term “component” refers to a cluster of nodes that performs a certain function in the network. In the first component, the involved entities are closely associated and promote innovation. In the second component, multiple agricultural cooperatives and local enterprises create new products that make full use of the characteristics of the region. In the third component, the multiple agricultural cooperatives and local enterprises create many new products, but

have drawbacks of weak ties and low potential for innovation. For the network to develop properly, it is necessary that these three components are associated with each other.

DECISION SUPPORT SYSTEM FOR CABBAGE PEST MANAGEMENT.

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The cabbage pest management system is an agricultural decision-support tool developed using Microsoft Access program which is easily access and easy to use. The software assists farmers and agricultural extension officers with the important decision of selecting correct pest control methods. Information on cabbages pests and control methods were obtained from literature reviews and survey. The survey was conducted at Cameron Highlands; the data from the survey was used to confirm the current pest status and control methods used by the farmer. The entity-relationship model was used to link the many options in the database. The program allows the user to find the pest according to the photo of symptoms; search for controls options, biological, mechanical or chemical. For chemical controls, the farmers were given several choices which include its trade name, active ingredients, application rate and pre-harvest interval.

III. Food Security and Development of Bioenergy

CLEANING METHODS OF CATTLE TRIPE FOR CONSUMER SAFETY

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At present, Thai people like to consume animal visceral organs (tripe) because tripe is able to bring a variety of cooking, complete nutrition and contains certain minerals than meat. However, tripe from fresh market may be contaminated with chemical residues, non food grade chemical including pathogenic microbes. So, for utilization of by-products from cattle slaughtering process, research aims was to develop a safe process for the utilization of by-product that will benefit consumer and entrepreneurs. Six stomach samples from native cattle were taken for three months (one time per month), washed using different methods and the dirt removed. The different methods are as follows: Method 1. (Control group) dipping in hot water (around 70 ^{o}C) approximately one min. Method 2. dipping in cement clear water for 15 min. Method 3. dipping in lime water for 15 mins. Method 4. dipping in hot water for about one min. After the sodium hydroxide soak solution provided about 20 minutes then rinse with water (to assist in the tenderness and bounce or springiness). Method 5. dipping in cement clear water for 15 minutes, and dipping in hot water for approximately one min . After the sodium hydroxide soak solution provided about 20 mins then rinse with water. Method 6. dipping in lime water for 15 mins and the stomach was dipped in hot water for approximately one min . After the sodium hydroxide soak solution provided about 20 mins then rinse with water. Method 7. stomach samples from cattle trade market. The samples were analyzed for total microorganisms, including bacteria *E. coli, Coliform, Staphylococcus aureus, Salmonella spp.* and *Clostridium perfringen* and analyzed for chemical residues including sodium hydroxide and sulfur dioxide (bleach). The results showed that stomach samples from cattle trade market had the highest chemical residues and *E. coli, Coliform, Staphylococcus aureus* and *Clostridium perfringen*. There were no *Salmonella spp*. Method 1 was a safe process for consumer and tripe was still natural in color (clear yellow).

THE INFLUENCE OF HIGH PLACES ON PERFORMANCE AND FAALI STATUS OF BROILER CHICKENS

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Research on the influence of high elevation on performance and faali staatus of broiler strain Hubbard was been carried out for 5 weeks. The research was conducted in two different places: one in high places area with 900 m above sea levels (SoE district) the other one in 50 m above sea levels (Kupang district). The aim of the research was determine the influence of different high places above sea levels which have different temperature on performance , feed consumption, feed conversion, carcass percentage, respiration rate, body temperature, erythrocyte content and hemoglobin of broiler chicken. Unsexed 3 day old broiler chicks of Hubbard strain were used in two different experimental location of 40 each. The birds were given commercial broiler diet (BR 1) and kept in deep litter of a small poultry house (4 x 1 m). Diet and water adlibitum was provided through out the experiment. Data analysis was T - student by Nasir (1983). The average temperature and relative humidity were 20.75 ^{o} C and 71.96% in high place SoE area and 29.29 ^{o}C and 76.93% in high place Kupang area, respectively. The result showed that the influence of high places SoE area gave highest performance, frequency respiration rate and carcass percentage is significantly affected, but there is no significant different in faali status :body temperature erythrocyte content, hemoglobin of broiler chickens compare with Kupang district about 50 m above sea level.

EFFECTS OF DRY WATER HYACINTH SUPPLEMENTATION IN TOTAL MIXED RATION ON PRODUCTION PERFORMANCE AND COSTS OF GROWING-FINISHING RABBITS

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An experiment was conducted to determine the effects of dry water hyacinth supplementation in total mixed ration (TMR) on growth performance, carcass trait and production cost of growing-finishing rabbits. Fourty-eight New Zealand White rabbits (84 day of age) were used in Completely Randomized Design experiment. The animals were divided into four groups of six replications with two rabbits per replication each. Each group of the animal was randomly assigned to a dietary treatment as follows: Diet1- Concentrate and roughage *ad libitum*, Diet2- TMR contains dry cassava leaves 15%, Diet3- TMR contains dry water hyacinth 15%, and Diet4- TMR contains dry water hyacinth 25%. At day 56 of experiment, 4 rabbits per group were randomly slaughtered for the carcass trait. The results showed that the group receiving Diet3 had significant higher feed intake and average daily feed intake than those fed with other diets ($P<0.05$) but no significant differences with the group receiving Diet4. There were no significant differences in final body weight, weight gain, average daily gain and feed conversion ratio among groups. Furthermore, the percentage of carcass, leather, meat and bone were not significantly different among groups. In addition, the group receiving Diet3 and 4 had the significantly lower production cost than those fed with other diets ($P<0.01$). It is indicated that dry water hyacinth could be applied at 15-25% of TMR diet without adverse effect on growth performances and carcass trait and could reduce the production cost.

DEVELOPMENT OF CHICKPEA (*Garbanzos*) NUTRI-FOOD PRODUCTS

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Chickpea (*Cicer arietanum* L.) locally known as *garbansos* is a newly introduced leguminous crop that was found to be adaptable in Benguet. Seeds were sourced from International Crop Research Institute for Semi-Arid Tropics (ICRISAT), India and were evaluated for its' milling recovery. With the varieties evaluated, a desi-type chickpea variety, ICCV 93954 had the highest milling recovery of 80%. This variety was therefore analyzed for its physico-chemical properties and nutrient content and was compared to wheat flour. Different levels of substitution of chickpea flour for cookies and puto was explored. Results showed that water and oil holding capacity of chickpea flour was comparable to wheat flour. Nutrient analysis of chickpea flour was higher for dietary fiber, protein, iron and fat as compared to wheat flour. Among the four formulations for chickpea based-cookie and puto, 2 cups wheat flour and 1 cup chickpea flour gave the highest acceptability rating for cookies (6.84) and for puto (6.66). Increasing of nutrient content of chickpea flour resulted in increased on content for energy, protein, fat, carbohydrate and dietary fiber. The production cost varied depending in the different formulations.

IV. Bioresource Management and Revitalization of Local Wisdom

BUTTERFLY DIVERSITY IN MOUNT MASARAGA, ALBAY, PHILIPPINES

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An inventory of butterflies in Mount Masaraga, Oas, Albay was conducted during a seven-month data collection period in 2009. Non-destructive sampling techniques such as sweep net method, visual encounter and ocular inspection were employed. A total of 301 butterflies were collected. These were consisted of seven (7) species in five (5) genera of Papilionidae, four (4) species in three (3) genera of Pieridae, 3 species in 3 genera of Nymphalidae, 2 species in 2 genera of Danaidae and one (1) species in 1 genera of Satyridae. The species in Papilionidae were; *Pachliopta kotzebuena kotzebuena* (Esch.), *Papilio rumanzovia* (Esch), *Papilio alphenorladebouria (Esch.)*, *Graphium agamemnon agamemnon* (L.), *Graphium sarpedon sarpedon* (L.), *Troides rhadamantus* (Lucas),*Troides* sp..The species under Pieridae were *Leptosia nina georgi* (F.), *Eurema hecabe* (L.),*Catopsilia pyranthe* (L.),*Leptosia* sp.. The species in Nymphalidae were *Parthenos sylvia philippensis* (F.),*Junonia almana* (L.), *Athyma maenas semperi*. On the other hand, family Danaidae were represented by *Parantica vitrina vitrina* (C.&R.Felder),*Danatus chrysippus*(Linn.) while Satyridae were represented by *Acropthalmia artemis artemis* (C. &R. Felder). Among the 17 identified species, *Pachliopta kotzebuena kotzebuena* (Esch.) under the family Papilionidae was the most abundant with 82 individuals throughout the period while *Leptosia nina georgi* (F.) (Pieridae) with only 2 individuals was the least. In terms of species richness, family Papilionidae ranked first followed by Pieridae, Nymphalidae, Danaidae and Satyridae. The abundance of the former was attributed largely to the availability of host plants in the area and favorable climatic conditions. Likewise, the species that have wide range of host plants have a better chance of increasing their kind and ensuring their survival. So far, this is the first report on butterfly diversity in Mount Masaraga located in Albay, Philippines.

EFFECT OF AIR VELOCITY UNDER OPTIMAL TEMPERATURE CONDITIONS FOR DRYING DUCKWEED

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Duckweed is a small-aquatic plant, which float on the surface of fresh water and widely distributed in nature. This plant is highly nutritious that is suitable for animal nutrition. Its dry matter consists of 20-40% of protein, 4-6% of fiber. Effect of air velocity under optimal temperature conditions for drying duckweed was found out. Air velocities, time, and difficulty of grinding were the important parameters. Twenty five percent increment of fan speed was adjusted into three air flow speeds including 50%, 75% and 100%. Each of thousand grams of fresh duckweed was dried in hot air oven at $60^{\circ}C$ incorporation with those fan speeds. The properties and ability of grinding of dried products were compared. The results showed that at 50%, 75% and 100% of fan speeds consumed 6.00, 5.30 and 4.45 hrs of drying duckweed, respectively. The samples were reversed twice during drying process and decreased 600 grams in weight. The dried product also showed easily grinding with no difference in color. It is interesting that increase in air flow speed decreased time to drying.

DROUGHT TOLERANCE INDICES TO EVALUATE SPRING TYPE CANOLA (*Brassica napus*)

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Breeding for drought tolerant cultivars is important for successful canola cultivation under drought stress. The objective of this study was to evaluate the suitability of the use of some selection indices in identifying drought resistance cultivars at different environments in Iran. Twenty three spring type canola *(Brassica napus* L.) cultivars were sown under both stress and non-stress conditions, in Gonbad-e Kavoos and Gorgan, Golestan, Iran. The mean annual rainfalls of the locations were 300mm and 450mm, respectively. The randomized complete block design with four replications was used. Sensitivity to stress index (SSI), tolerance (TOL), and stress tolerance index (STI) were used to evaluate tolerance to drought stress conditions. Correlation analysis among the indices and characters showed positive and significant correlations except for yield under drought stress condition (Ys) and SSI which showed no significant correlation. Based on SSI, varieties Rafaela and Balero were found to be the most tolerant and susceptible cultivars, respectively. Based on TOL however, Rafaela and Hyola 401 were found to be the most tolerant and susceptible varieties, respectively. Moreover, evaluation based on STI revealed that Hyola 401 and Dakini were the most tolerant and susceptible varieties, respectively. STI seems to be better than TOL and SSI to indicate drought tolerant cultivars; because high yield has more influence on STI rather than yield differences in the normal and stress conditions. The combined analysis of variance revealed Hyola 401 being the highest yielder, with 4739 kg ha-1 and 3223 kg ha^{-1} in Gorgan and Gonbad-e Kavoos, respectively. Cluster and principle component analyses were done using non-stress yield (Yp), yield in stress (Ys),

TOL, SSI, STI and average yield of non-stress and stress conditions (MP).Varieties Norseman and P.f.7045/91 were found to be most related while Syn-2 and Legacy were the least related to each other based on cluster analysis with square Euclidean distance and ward's method. Principle component analysis (PCA) revealed that the first and second components could account for 99.56% of the total variance. Efficiency of PCA is dependent on correlations among initial variables. The highly correlated variables promised the high efficiency of PCA.

INSECTICIDAL ACTIVITY OF BACTERIAL ANTAGONIST STRAIN *Pseudomonas fluorescent* KU52 WITH BIOPESTICIDE (*Tacca chantrieri*) ON CHINESE KALE

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In this study, the previous reports of plants treated with bacterial antagonist strain *Pseudomonas fluorescent* KU52 exhibited severity reduction of multiple diseases, led to the question if KU52 elicited the result of protection against other insect pests. Greenhouse studies were conducted to answer the question with reduced feeding of common cutworm (*Spordoptera litura*) identified as an important pes t of Chinese kale. Cut leaves of 30-day old kale plants grown from seed treatment and 2-foliar sprays (14 and 21-day old plants) with KU52 and biopesticide (*Tacca chantrieri*), compared to plants treated with synthetic insecticide (cypermetrin), were again soaked in either KU52 suspension or cypermethrin insecticide in their separated treatments belonged for offered common cutworm feeding trials. Ten larvae per leaf per plastic box arranged in CRD design were investigated under control conditions. The average number of common cutworm per plant or per leaf was significantly lower on plants treated with KU52 mixed bioproduct than on non-bacterial plants with 30% reduction (P=0.05). After feeding for 1 day, insect damage remained lower on leaves treated with KU52 mixed bioproduct than nontreated control with interesting to note that they were died before the pupa stage development. The hypothesis of plant metabolites induced by bacterial antagonists or elicitation of physiological changes in plants that were toxic to most insects for support our study was discussed. In addition, bioproduct might be supported efficacy of bacterial antagonist.

POTENTIAL OF CHLOROPHYLL FLUORESCENCE AS AN INDICATOR FOR ASSESSMENT OF WATER STRESS IN SUNFLOWER GROWTH IN HYDROPONIC CULTURE

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The objective of this study was to identify indicators related to water stress through chlorophyll fluorescence in sunflower which grown in nutrient solution using hydroponic system under greenhouse condition. Plug transplants of two commercial sunflower cultivars, Pacific 55 and Opera, were grown in 25 L- rectangular plastic tray container supplied with 10 l of 0.5X of the full strength "Enshi" nutrient solution. Water stress was investigated using polyethylene glycol, PEG-6000, with 6 concentrations, 0, 5, 10, 15, 20 and 30 %. The split plot experimentation in RCBD with three replication design was conducted. Result showed that PEG concentration at 15 % was critical for water stress tolerance in sunflower. Drought stress of sunflower can be identified by chlorophyll fluorescence parameters (Fv/Fm, qNp), chlorophyll content (SPAD value) and cell integrity (% electrical conductivity).

LEAF CURLING OF PILI NUT (*Canarium ovatum* Engl.) SEEDLINGS IN THE NURSERY CAUSED BY *Helopeltis* sp.

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Pili nut is considered a flagship commodity of the Bicol Region in the Southern Luzon part of Philippines. Most pili nut growers in the area maintain seedling banks in the nursery. Leaf curling of the pili nut seedlings in Albay had been occasionally observed. *Helopeltis* sp., a Hemipteran insect was identified as the cause based on controlled experiments and seasonal abundance in the field. It was observed feeding on the immature leaves which produces dark spots on leaf surface after one week of inoculation and begins to curl as feeding continuous and eventually dries up. Populations of *Helopeltis sp*. collected consisted of two kinds namely, the orange and the black bugs. Both types were similar in size. The adults range from 6-8 mm long from the tip of the head of the folded wings. A dark pin-like structure protrudes from the center of the thorax in the adult stage. The nymphs range from 3-4 mm long with five (5) nymphal stages. Among the 327 insects belonging to seven (7) orders and arachnids collected within the four-month monitoring period, Hemipteran insects (123) were the most abundant. Other insect orders identified were Coleoptera (77), Homoptera (37), Hymenoptera (35), Orthoptera (24), Acarina (19) and Diptera (12). This paper reports on pili nut seedlings as a new host of this insect pest.

GERMINATION OF SELECTED PALM SPECIES IN RESPONSE TO DESICCATION

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Palms are especially popular in tropical and subtropical areas for cultivation in streets, parks and gardens due to their beautiful architecture. Palms generally flower regularly each year and reproduce by seeds. Seeds, being small in size are arguably the most convenient and practical part of the plant to store *ex situ*. In a study on seed storage characteristic of almost a hundred palms has shown that only a quarter of them can be stored under the conventional method namely dry and cold. This study looks into the effect of desiccation on viability and germination of two popular ornamental palms, *Livistonia chinensis* and *Ptychosperma macarthurri* seeds. Seeds were dehydrated to various moisture contents and subjected to germination. The two types of seeds used differed in their ability to germinate even in the fresh state. Seeds of *Livistonia chinensis* had more than 90% germination while seed of *Ptychosperma macarthurri* only had circa 50% germination. Seeds of *Livistonia chinensis* could be desiccated to a moisture content of 10% but were not viable. Those desiccated to 20% moisture content had 74% germination indicating that the seeds are relatively tolerant to desiccation. In contrast, seeds of *Ptychosperma macarthurri* could not be desiccated to lower than 25% moisture content. Seeds desiccated to 30% moisture content resulted in drastic loss in viability to 25%. Therefore, seeds of *Ptychosperma macarthurri* are sensitive to desiccation and cannot be stored even to short period of time. The study shows variation in seed storage behavior of two selected ornamental palm and suggest that for different palm species the level of tolerance has to be determined before a method to store can be established.

DIVERSITY OF INSECT FAUNA IN KELIMUTU NATIONAL PARK AREA, FLORES – INDONESIA

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Insects are very abundant in nature and play an important role as pollinators, producing products, biological control agents, eating organic matter and weed eater. Besides that many insect-eating predators depend on the presence of insects. This study sought to provide information on the role of insect species diversity in nature and identify the potential insects which can be used for scientific tourism. Research conducted at the Kelimutu National Park Area located in Ende Flores, from August 2009 - August 2010. Sampling was done in two zones i.e. the core and utilization zones using light traps, trap food, yellow sticky traps, nets, air and land traps in each zone. Sampling is also done manually. Data was analyzed using the Shannon index and Simpson. The results showed that there were 10 orders in the utilization zone and core zone that is divided into 76 families and 191 species. Those orders are Lepidoptera (11 Family, 40 species), Odonata (5 families, 12 species), Orthoptera (6 families, 16 species), Isoptera (2 Family, 4 species), Dermaptera (2 families, 8 species), Hemiptera (11 families, 22 species), Homoptera (2 families, 2 species), Hymenoptera (9 families, 35 species), Coleoptera (14 families, 36 species) and Diptera (9 families, 11 species). The most abundant species were Lepidoptera (6%), Coleoptera (5.1%) and Orthoptera (5.2%) in the core zone, while the utilization zone was dominated by Lepidoptera (6.0%), Coleoptera (13.3%) and Hymenoptera (9.87%). Very low counts were found in the core zone, Dermaptera, Isoptera and Homoptera, while in the utilization zone, these were Odonata, Isoptera and Homoptera. There are 14 species of Lepidoptera and 18 species of Coleoptera which have the potential as a scientific tourism attraction in Kelimutu National Park.

TRAY FERMENTATION OF PALM KERNEL MEAL FOR MANNANASE PRODUCTION BY *Aspergillus wentii*

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The demand for mannan hydrolyzing enzymes, in particular the commercial β-mannanases is increasing because it is widely used in many industrial applications like paper bleaching, coffee production, pre-treatment of waste for animal feed and bioethanol fermentation which is an attractive because it can contribute to a cleaner environment. However, the efficient mannanase production processes and cheap raw material substrates are needed. Tray fermentation is the potential method for mannanase production because of it utilizes lower capital cost, low energy expenditure, less expensive downstream processing and produces low waste water output. This work studied the process parameters such as biomass, crude protein content, total reducing sugar content, pH and a_w in order to examine the factors and patterns of the mannanase enzyme producing during tray fermentation of Palm Kernel Meal (PKM) by A*spergillus wentii.* The different amounts of PKM, 1, 2, 3, 4 kg were optimized in tray. The highest amount of mannanase at 85.3 U/g was obtained when 1 kg PKM cultivated on tray. Maximum carbohydrate content, 11.1 % gDW and maximum total reducing sugar, 6.5 % gDW were available during the initial phase of fermentation. The amount of total protein and total soluble proteins increased during cultivation time which was correlated with growth. Values of pHs were continually increased. Water activity was little changed during tray cultivation.

POPULATION ABUNDANCE OF FLEA BEETLE *Phyllotreta* sp. IN ORGANIC FARM

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An experiment was conducted to study the species occurrence of flea beetle *Phyllotreta* sp., population abundance and its relationship with climatic factors in organic farming. Two plots of 12m X 10m with five rows each planted with *Brassica* sp. were chosen as study plots. Sampling was done for two cultivation periods from 20th February 2009 until 27th March 2009 (Plot 1) followed by 26th April 2009 until 30th May 2009 (Plot 2), using yellow sticky traps and sweep net as sampling methods. The traps were arranged randomly while sweeping net was done weekly. Data regarding temperature and rainfall distribution from Department of Meteorology Malaysia have been used. All collected samples were counted individually and recorded. Correlation and multiple regression (stepwise selection) analysis were done using Statistical Analysis System (SAS) program to determine the relationship of weather parameters (temperature and rainfall), and numbers of *Phyllotreta* sp. Results showed three species of flee beetles occurred in the farm which includes *P. cruciferae*, *P. albionica* and *P. striolata*; with *P. cruciferae* giving the highest number for both plots. In Plot 1, there was no correlation for all three species with any parameter, while for Plot 2, only *P. cruciferae* showed correlation with days and rainfall. The regression analysis (stepwise selection) had detected rainfall as the independent variable that influenced the number performance of *P. cruciferae* by 83% (R^2=0.8362).