

ABSTRACTS OF POSTERS

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IN-HOUSE ELISA TEST FOR CYMBIDIUM MOSAIC VIRUS IN DENDROBIUM SPP.

Ratchanee Hongprayoon¹, Siriwan Burikam², Suwanna Kladpun³ and Wipavee Thongsri⁴

¹Department of Plant Pathology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Nakhon Pathom. ^{2,3}Scientific Equipment Center, Kasetsart University Research and Development Institute, Kasetsart University, Bangkok ⁴Center for Agricultural Biotechnology, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom.
E-mail Address: agrat@ku.ac.th

In-house Enzyme-linked immunosorbent assay for the detection of *Cymbidium mosaic virus* (CymMV) was developed. First, monoclonal antibodies (MAbs) against CymMV were raised by the fusions of P3-X63-Ag8.653 myeloma cell line and the spleen cells from CymMV-immunized BALB/c mice. After characterization of the obtained hybridomas for their ability to produce specific MAbs, clone Cy1 and Cy2 were chosen for further development of ELISA protocol. Comparison of direct, indirect and sandwich enzyme-linked immunosorbent assay (ELISA) for the detection of CymMV demonstrated that indirect ELISA gave highest sensitivity which as low as 5 ng/ml CymMV concentration could be detected. The efficiency of the developed ELISA test was then compared with the commercially available GLIFT kit using *Dendrobium spp.* plant and tissue culture samples. The results showed the same positive and negative samples obtained from two methods. In addition, by comparing between leaf and root tissues, we found that approximately half of the numbers of positive root samples gave stronger signals than the leaf samples. These results provide the in-house ELISA protocol for routine investigation of CymMV contamination which is needed for the production virus-free propagating materials especially beneficial for orchid tissue culture.

**DEVELOPMENT OF A SCREENING METHOD FOR ISOLATION OF
ENDOPHYTIC BACTERIA FROM SUGARCANE**

Chainarong Rattanakreetakul¹, Ronnapop Bunjoedchoedchu¹ and Rewat Lersrutaiyotin^{2,3}

¹Department of Plant Pathology, Faculty of Agriculture, Kamphaeng Saen, Nakhon Pathom 73140 THAILAND. ²Department of Agronomy, Faculty of Agriculture, Kamphaeng Saen, Nakhon Pathom 73140 THAILAND. ³Cane and Sugar Research and Development Center, Research and Development Institute at Kamphaeng Saen, Kasetsart University, Nakhonpathom 73140 THAILAND. E-mail address: crattan99@yahoo.com

Endophytic bacteria are a group of bacteria living in plant tissues without harm for the host plant. Bacteria were found from surface-disinfected plant tissue or internal plant tissue extraction. In several crops, endophytic bacteria have been found on their beneficial effects such as; plant growth and health production, nitrogen fixation, phytohormones production, antifungal compounds production which tended to induce systemic resistance of plant. In sugarcane, endophytic bacteria was become a major concern on enhanced plant on growth and yield. Our study was focused on isolation and screening method of endophytic bacteria from sugarcane tissue. Two extraction methods were studied as 1) sugarcane tissue grinding and 2) sugarcane tissue centrifuge. Different media were used to isolate bacteria; nutrient agar and modified Czapek solution agar (Czapek solution agar with 20% sucrose plus 250 ppm bromthymol blue). Extraction of bacteria through centrifuge and isolation with modified czapek agar was showed a potential for screening of endophytic bacteria from sugarcane tissue. There was minimized extraction time used in each sample with similar result of colony type

and acid production. After the selection, bacteria were determined on their ethylene production from acetylene using gas chromatography. Bacteria were divided to group by acid production data, growth ability on high sucrose content and acetylene transformation to ethylene activity. One of selected endophytic bacteria was identified as *Bacillus megatherium* using Biolog Microlog® Bacterial Identification System.

INTRODUCTION OF HOT WATER TREATMENT AS ORGANIC SEED DISINFECTION METHOD IN JAPAN

Mayuko OKABE^{1,2}, Tadashi BABA¹ and Kazuo SUYAMA¹

¹Tokyo University of Agriculture ²National Food Research Institute

E-mail address: mayuco@affrc.go.jp

The simplest method for organic seed disinfection of rice is Hot Water Treatment (HWT) which only involves the soaking of seeds in hot water prior to sowing. In Japan, HWT at 60°C for 10 min is used to control pathogens of rice¹), but it may adversely affect germination. If cultivars differ in sensitivity to HWT used, thermosensitivity of different cultivars need to be understood in relation to the adoption of HWT. The authors investigated the effect of HWT at 60°C for 10 min on germination of 19 cultivars contained 10 Japonica type and 9 non-Japonica type of rice. One of the variable used in the germination test is temperature conditions in the range of 15 to 30. The thermosensitivity was different among cultivars and seed performance was divided into three types i.e.-accelerate type, no effect type and decelerate type. Our results showed that under Japonica cultivars, 40% of the cultivars were accelerate type, 30% were no effect type, and 30% were decelerate type. Under non-Japonica type, 44% of the cultivars were no effect type, 56% were decelerate type, and there was no accelerate type. Especially under the low temperature, germination rates of some cultivars were increased by HWT. Therefore, such stimulatory effects of HWT offer great hope for enhancing seed performance under the broader range of cultivation temperatures. On the other hand, seed had also been damaged for germination ability of another group of cultivars including Indica rice by HWT. And so it is necessary to note the selection cultivar because germination decelerated on some cultivars. The authors suggested that it is necessary to set appropriate processing conditions in not only Japonica cultivars but also the Indica cultivars.

EFFICACY OF PLANT EXTRACT AND SILICON AMENDMENT ON THE CONTROL OF BACTERIAL WILT OF TOMATO UNDER GREENHOUSE CONDITION.

Jittraya Jarujit¹, Wichai Kositratana², Srunya Vajrodaya³ and Niphone Thaveechai^{1*}

¹Department of Plant Pathology, Faculty of Agriculture, Kasetsart University, Bangkok 10900

, ²Department of Plant Pathology, ² Faculty of Agriculture at Kamphaeng Saen, Kasetsart University,

Nakhon Pathom 73140 and ³Department of Botany, Faculty of Science, Kasetsart University,

Bangkok 10900, Thailand. E-mail address: agrnpt@ku.ac.th

Bacterial wilt of tomato caused by *Ralstonia solanacearum* is one of the most destructive disease in tropical and subtropical areas. The goal for production of tomato in greenhouse with integrated management by plant extract and silicon amendment is an alternative effective management the wilt disease to obtain product with high quality and safety for either consumer and environment. Inhibition of *R. solanacearum* strains To-Ud3^{amp} by crude extract of Chung Chia (*Zanthoxylum* sp.) and guava (*Psidium guajava*) was carried out in laboratory by paper disc diffusion method. Diameter of inhibition zone of *R. solanacearum* by Chung Chia and guava were 0.52 and 0.43 cm, respectively. Efficacy evaluation of Chung Chia and silicon in the form of salicylic acid (Si1) and sodium silicate (Si2) to control bacterial wilt in tomato cv. Seeda in greenhouse found that treatment Si1 and

Si2 gave the highest of survival rate by 78 % whereas control was the lowest of survival rate by 11 %. Treatment Si1 provided the highest tomato yield at 150 gm/plant whereas control was only 10 gm/plant. Initial rhizosphere population of *R. solanacearum* was 1.48×10^8 cfu/g of soil and gradually decreased every week after treatment. At the eight weeks post inoculation, treatment Si2 had the lowest population of *R. solanacearum* at 4.72×10^2 cfu/g of soil whereas control was the highest *R. solanacearum* population at 5.72×10^2 cfu/g of soil which was significantly different.

2-DIMENSIONAL POLYACRYLAMIDE GEL ELECTROPHORESIS (2D-PAGE) OF KHAK NUAL PAPAYA (*CARICA PAPAYA*)

Chaline Kongsawat¹, Wichai Kositrattana¹, Sirirak Roytrakul², Parichart Burns², Sirinuch Banyen², Tanong Phueaouan³

¹Center for Agricultural Biotechnology, Kasetsart University Kampaengsaen Campus, Nakhon Pathom 73104, ²National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency (NSTDA), Thailand Science Park, Pathumtani 12120 and ³School of Science, Mae Fah Luang University, Chiang Rai 57100. E-Mail address: agrwck@ku.ac.th

Two-dimensional polyacrylamide gel electrophoresis (2D-PAGE) differentially expressed from leaf, flower, mature fruit and root of Khak Nual Papaya (*Carica papaya*) were determined by a 18 centimeters of non linear gradient of pH ranged 3 – 10 strip for isoelectric focusing and 12.5% sodium dodecyl sulfate polyacrylamide gel electrophoresis. The 2D-PAGE patterns were visualized using silver stain. Approximately 1,042 – 1,329 protein spots were resolved from different parts of papaya. Comparison the amount of total proteome in some parts, we found the most number of protein spots in flower. There were 1,118, 1,329, 1,190 and 1,042 protein spots in flower, mature fruit, leaf and root, respectively. Protein patterns are in the area pI 4 – 8/MW 10 - 100 and pI 9.5 – 10/MW 15 – 50. This preliminary study of 2D-PAGE papaya may be able to be used for analysis in order to the understanding on proteomic and protein database of papaya.

EFFICIENCY OF GENE TRANSFORMATION BY AGROBACTERIUM TUMEFACIENS IN NODE TISSUE OF NILEGRASS (*ACROCERAS MACRUM*)

Sarun Sukhawat¹ and Anurug Poeaim¹

¹Department of Applied Biology, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang Bangkok. 10520. E-mail address: sarun_007@hotmail.com

Forage grasses are critical to livestock industries throughout the world. Nilegrass (*Acroceras macrum*) is one of the most important tropical forage grass species. It is commonly used for pastures, hay production and silage. Soon after its release Nilegrass has become one of the major forage crops grown in Taiwan. Dry yield and crude protein content in Nilegrass are found greater than Pangolagrass (Jeng et al., 2004). Improvement of forage by conventional breeding is slow due to the genetic complexity of these species (Ha et al., 1992). Genetic transformation is an alternative that permits direct introduction of useful genes into a plant's genome. Agrobacterium-mediated transformation allows stable integration of transgene into the plant genome (Hiei et al., 2000). Agrobacterium-mediated transformation has been successfully used to transfer genes into a wide range of forage grasses plant species. The object of this study, The efficient genetic transformation system for Nilegrass, using Agrobacterium-mediated TDNA delivery, is described herein. Sterilized nodes were infected and co-cultivated with 2 strains of Agrobacterium tumefaciens, EHA 105 and LBA 4404, which harbor the plasmids, pCAMBIA(1301) and pTOK(233), respectively and contain genes for hygromycin phosphotransferase (HPT) and β -D-glucuronidase (GUS). Agrobacterium solution concentration of 0.8 O.D at 600 nm were co-cultivation on solid LS medium,

supplemented with 1 mg/l BA, 30 g/l sucrose and 2.6 g/l phytigel, 50 and 100 μ M acetosyringone, 3, 5 and 7 days of co-cultivation period. The efficiency of gene transformation was evaluated by determination of GUS expression. In this study, the highest percentage of transformation was 82.22 % after transformation with EHA 105 at 50 μ M acetosyringone for 7 days. Putative transgenic plants and control plants were chosen analyzed by PCR analysis. Bands corresponding to the HPT gene and GUS gene were clearly shown in transgenic plants. Preliminary study of Agrobacterium-mediated gene transformation in Nilegrass is a useful technique for generate of transgenic Nilegrass containing genes of agronomic importance and can be applied as a promising system to enhance transformation efficiency in Poaceae family.

RISK ASSESSMENT OF RHIZOSPHERE BACTERIA COMMUNITIES ON TRANSGENIC AND NON-TRANSGENIC PAPAYA UNDER CONTAINMENT CONDITION

Kasama Chusang¹, Parichart Burns^{1,2} and Wichai Kositratana¹

¹Center for Agricultural Biotechnology, Kasetsart University, Kamphaeng Saen, Nakhon Pathom 73140, Plant Research Group, National Center for Genetic Engineering and Biotechnology (BIOTEC), Kamphaeng Saen, Nakhon Pathom 73140, Department of Plant Pathology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Nakhon Pathom 73140, Thailand.
E-mail address: agrwck@ku.ac.th

Khak Nual line 116/5 is transgenic papaya resistant to Papaya ringspot virus (PRSV), which was investigated for the effect on the rhizosphere bacterial community under containment conditions. Investigation on the attraction or repellence of rhizosphere bacteria to transgenic papaya was tested by growing papaya in the native soil containing pot with a diameter of 12 inches. The pot was connected to six surrounded-pots filled with sterilized soils equally distributed, with PVC tubes diameter of 2 inches, to transgenic and non-transgenic papaya plants were grown in each pot. Rhizosphere soil samples were taken every 30 day begins 60 days (papaya seeding state) of interval until 210 days (papaya premature fruit stage). The analysis of soil bacterial population structure was determined by using the community-level physiological profiles (CLPP) which based on the utilization of 95 carbon sources. Characterization of bacterial species, diversity and population were also investigated of attract or repel between rhizosphere bacterial of transgenic papaya and non-transgenic papaya. The results revealed that the population profiles of rhizosphere bacteria and bacterial species and population obtained from both treatments were not difference from each other and then not found of rhizosphere bacteria were attract and repel from non transgenic to transgenic papaya. These results indicated that transgenic papaya did not affect on rhizosphere bacteria ecology under the containment conditions.

MATURATION OF MICRO-PROPAGATED PLANTLET INFLUENCES VEGETATIVE AND YIELD PERFORMANCES IN BANANA 'KLUAI KHAI' (AA)

Kunlayanee Suvittawat, Benchamas Silayoi, Pinit Karintanyakit and Parson Saradhulhat*
Kasetsart University, Thailand. Contact: parson.s@ku.ac.th

Banana 'Kluai Khai' (AA) is commercially grown in Thailand with suckers as conventional plant materials. A new clone 'KB2' was recently released by Kasetsart University in Thailand. Subsequently, micro-propagated plantlets were required for mass propagation. The appropriate maturation of plantlets and plant performance of micro-propagated plants compared with conventional suckers were questioned. This research aimed to investigate how maturation of micro-propagated plantlets affected the field and fruit performances. A randomized complete block experiment was set up at Pakchong Research Station in Thailand (15°N, 101°E at 340 m MSL). The 'KB2' micro-

propagated plantlets, acclimatized in a nursery for 4-6 months, and suckers were planted and compared for vegetative morphology and yield components during the first crop. All the micro-propagated plants exhibited apparently more vigorous vegetative developments than the plants from the suckers. The micro-propagated plants produced 5-6 more leaves, as well as significantly larger leaf and pseudostem sizes, than sucker plants. Moreover, the micro-propagated plants gave higher fruit yield and quality than the sucker plants. The four-month-acclimatized micro-propagated plantlets tended to provide proper vegetative and yield performances over the others. The results revealed that four-month acclimatization was an appropriate maturation for micro-propagated 'KB2' plantlets. All of the micro-propagated plants exhibited more vigorous vegetative developments with slightly higher fruit yield compared to the sucker plants.

FLOWER BIOLOGY AND YIELD OF PITAYA (HYLOCEREUS POLYRHIZUS) AS AFFECTED BY BIO M AND ADDITIONAL POTASSIUM FERTILIZER APPLICATION

Thohirah, L.A.¹, Brian, R.R.¹, Rosenani, A.B.², Mohd. Ridzwan, A.H.¹

Department of Crop Science; Department of Soil Science, Faculty of Agriculture
Universiti Putra Malaysia, 43400 Serdang
E-mail address: thohirah@agri.upm.edu.my

The study aimed to determine the flower development pattern of Pitaya using scanning electron microscopy (SEM) and through plant observation using digital camera. Effect of Bio M fertilizer and additional potassium application at different levels on the yield of Pitaya was also studied. Flower shoot meristem and floral buds at various stages of development were tagged, examined and prepared for scanning electron microscopy (SEM) and digital photograph. For SEM the samples were fixed in 70% FAA, dehydrated, mounted and coated prior to the observations. Micrographs and photographs of the different stages of development from the vegetative to the flowering stage were obtained. It shows the different floral organ of the pitaya. The information obtained from the micrographs and photograph can be used to develop a timeline for flowering and to explain how flowering and pollination affect fruit set in pitaya. Apart from that this study is beneficial towards the future breeding and hybridization of pitaya in order to create higher number of fruits and seedless fruit. The recommended rate of K in field 10, UPM was 286 kg/ha/yr (71.4 g/plant/yr). Bio M (NPK 8:8:8) was applied on the experimental plot at the rate of 360 grams/plant (1.44 tons/ha/yr) applied 6 times per year (once every two months). There were four treatments, 0, 25%, 50%, and 100 % (0, 17.85g, 35.7g, and 71.4g, respectively) of potassium. The results showed that at 50 % level of K fertilizer application rate, the yield of pitaya was significantly higher compared to yield obtained at 100 % level of K fertilizer application rate.

GROWTH AND NUTRITIONAL VALUES OF CHINESE KALE GROWN IN THE NUTRIENT SOLUTION WITH DIFFERENT NITROGEN AND POTASSIUM CONCENTRATIONS

Worapannee Eamla-or and Thammasak Thongket¹

Department of Horticulture, Faculty of Agriculture at Kamphaeng Saen Kasetsart University, Nakhon Pathom 73140 THAILAND. agrtst@ku.ac.th¹

Vegetables is the major source of minerals and vitamins which are essential human nutrients. Growing vegetables in the nutrient solution of the hydroponic technique allows the easy way to control nutrient uptake by plant roots. As a result of this technique, the better yield and quality in term of increasing of nutritional values and antioxidant compounds can be achieved. At the present, hydroponically grown leafy-vegetables are popular among Thai consumers. However, the

understanding of the effect of essential plant minerals on the nutritional values of Thai leafy-vegetables still limited. Therefore, two experiments in completely randomized design were conducted at the Kasetsart University, Nakhon Pathom to investigate the effects of N and K concentrations on growth and nutritional values of Chinese kale grown hydroponically using the Dynamic Root Floating Technique (DRFT) during June and July 2008. In the experiment I, Chinese kale was grown in the modified Enshi's nutrient solution with 150, 225 and 300 mg N/l and in the experiment II, was grown in the solutions with 150, 250 and 350 mg K/l. The results showed that the plant fresh-weight (g/plant), leaf number, leaf area (cm²), chlorophyll a and b contents (mg/ 100 g FW), and nitrate (NO₃⁻) content (mg/ 100 g FW) were increased but the vitamin C content (mg/100 g FW) was decreased as N concentrations in the solution increased. This is because of vegetative growth was stimulated when plant received higher nitrogen concentration and less glucose molecules remained for vitamin c synthesis. (3). It was found that the K concentration of 250 mg/l gave the highest plant fresh and dry weight. However, K concentrations had no effect on leaf number, leaf area, vitamin C, carotenoid, chlorophyll a and b contents and nitrate content. Therefore, if concerning the safety and quality for consumption, Chinese kale should be hydroponically grown in the nutrient solution with 150 mg N/l and 250 mg K/l.

SEASONAL CHANGES IN NONSTRUCTURAL CARBOHYDRATES IN JASMINE (*JASMINUMS SAMBAC AIT*) FLOWERS AND ROLES OF PHOTOPERIODS AND TEMPERATURES ON ITS QUALITY.

Kanapol Jutamane¹ and Krisana Krisanapook²

¹ Department of Botany, Faculty of Science, Kasetsart University, Bangkok 10900 Thailand. ² Department of Horticulture, Faculty of Agricultural, Kasetsart University, Nakhon Pathom 73140 Thailand . E-mail: faaskpj@ku.ac.th

The problem of commercial jasmine flowers production is there are low yield and small size in cool season. This experiment studied the relationship between total nonstructural carbohydrate (TNC) content in flowers and flowers quality such as weight, size and number of flowers. Since daylength and temperature were reduced under cool season, the role of photoperiod and temperature on flowers size and TNC content were also examined. After treatments, flower numbers were recorded and flower's weight, diameter, length and petal length were measured after sepal had been discarded. Then TNC of flowers were analyzed. The results showed that TNC content decreased during cool season from October to January. Flowers size and weight were decreased with decreasing flower's TNC. Jasmine plants that exposed to artificial lights extend to 12, 13, 14, 15, and 16 hour photoperiods during cool season of December for 15 days had more flower numbers than under natural condition with approximate 11 hour photoperiod. However, 12-16 hour photoperiods had no effects on increasing flower's weight, size and TNC. Jasmine plants that cultivated under 25°C and 35 °C in growth chambers at the same time with photoperiods treatment gave better results in flower quality and TNC content than average 19.2 °C natural condition. The higher temperature, the better flower quality and higher TNC were found. The results indicated that during cool season with limiting in daylength and low temperature, temperature had more effects on improvement jasmine flower quality than photoperiod. Low temperature also caused low carbohydrate content in flower which impacted poor jasmine flower quality.

INDUCED OFF-SEASON FLOWERING BY SUPPLEMENTED FLUORESCENT LIGHT IN DRAGON FRUIT (*HYLOCEREUS UNDATUS*)

Parson Saradhulhat*, Kannikar Kaewsongsang and Kunlayanee Suvittawat
Kasetsart University, Thailand. Contact: parson.s@ku.ac.th

Dragon fruit or pitaya naturally flower only between March and October in the Northern tropical region due to long day period. Extension of production over off-season fruiting associates with premium price. Simulated shortening night by extended light after sunset or night-break possibly accounts for off-season flowering. This research aimed to investigate how supplemented fluorescent light could induce flowering during short day season. The experiment was established at a dragon fruit orchard in Chanthaburi, Thailand (13°N 102°E). Each selected post of mature plants was installed with a daylight fluorescent tube above the canopies. The lighting programs (nightly operated in January – February, 2008) were composed of two- and four-hours after sunset, (18-20 and 18-22 h), and two-hour night-break (22-24 h). The developmental stages (from flower bud emergence to fruit harvest) and fruit qualities were investigated. The plants in natural conditions (control) did not flower during the experiment, whereas all supplemented light treatments exhibited induced flower buds within 43-48 days. The duration from the bud emergence to fruit harvest was about 112 days in all light treatments. The night-break treatment yielded 67% fruit set, maximum fruit number and fruit weight. The fruit development and quality at harvest (titratable acidity, pH and total soluble solid) were not significantly different among the lighting treatments. The results indicated that lighting supplementation from fluorescent tube in short day season potentially replaces long day condition, resulting in the flower induction. The night-break lighting was apparently most effective for flower bud induction and development.

GENETIC AND PHENOTYPIC CORRELATION ANALYSES ON NINE SWEET CORN ADVANCED INBRED LINES USING SAS PROC MIXED MODEL

Pedram Kashiani and Ghizan Saleh

Department of Crop Science, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM,
Serdang, Selangor, Malaysia
E-mail: pedram_kashiani@yahoo.com

The mixed-model analysis of variance has been used in many recent studies in evolutionary quantitative genetics. In this two-way statistical model in *SAS*, the variance component corresponding to the random statement is the covariance associated with a level of the random factor across levels of the fix factor. Therefore, the *SAS* model has a natural application for estimating the genetic correlation among traits measured. Correlation studies were undertaken for ten yield related traits on a series of nine near-homozygous sweet corn inbred lines obtained from various tropical source populations. The *SAS* program used estimated the genetic correlation coefficients among traits observed where blocks were considered as fix effects and inbred lines as random. The "ASYCOV" was added to the "PROC MIXED" statement in order to produce the variance-covariance matrix of variance components. The "TYPE = UN" option requested in "RANDOM" statement resulted in an unstructured covariance matrix for each inbred line being estimated, while the "G" and "GCORR" options produced genetic covariance-variance matrix and genetic correlation matrix between traits, respectively. In general, genetic correlation coefficients were greater than the corresponding phenotypic correlations. Husked fresh yield showed a positive significant genetic correlation with number of ears per hectare (0.99), plant height (0.97), dehusked ear yield (0.96), number of kernel rows per ear (0.91), ear diameter (0.74) and number of kernels per row (0.58). Total soluble solid concentration (-0.52) and days to silking (-0.51) were found to be negatively correlated with husked fresh yield. The interrelationship between these traits showed that they are under the influence of certain common genes, which can be exploited as selection criteria in breeding programs. Selection for one trait would also improve the other positively correlated traits. Husked fresh yield also revealed positive and significant phenotypic correlations with all traits mentioned for genetic correlation. The interrelationship among these traits, therefore, revealed that husked fresh yield could be efficiently increased by obtaining maximum expression of number of ears per hectare, plant height, number of kernel rows per ear and ear diameter, and obtaining minimum expression of days to silking.

EFFECT OF CONTAINER VOLUMES ON GROWTH OF NURSERY GROWN EUCALYPTUS LINERS AND THEIR INITIAL GROWTH POTENTIAL AFTER TRANSPLANTING

Issara Pangsee, Intira Seedama, Krisana Krisanapook and Lop Phavaphutanon*

Department of Horticulture, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Kamphaeng Saen, Nakhon Pathom 73140, Thailand. E-mail address: agrlpv@ku.ac.th

Growth of eucalyptus propagules from tissue culture (clone CT186) and from shoot cutting (clone CT300) grown in 3 different sizes of opaque plastic tube containers; 40 cm³ (12 cm high), 90 cm³ (15 cm high) and 120 cm³, were compared during a 120 – day nursery production period. Consequently, initial growth potential after transplanting was evaluated after transferring these liners into a 2.7-litre plastic pot for 43 days. The results showed that plant height and dry mass during nursery production increased with an increase in container volumes in both clones and the largest plants were obtained from a 120 cm³ container. On day 120, clone CT186 from tissue culture in all container sizes reached the standard size for out planting while clone CT300 from shoot cutting did not meet the standard height and standard root quality and required two more weeks to reach the standard size. Bulk density of saturated growing medium in different container sizes was slightly different. Water-filled porosity and total porosity of growing medium were greatest in 40 cm³ followed by 120 cm³ and 90 cm³ containers, respectively while air-filled porosity tended to increase with increased container height. However, the changed physical properties of growing medium due to container sizes had no clear relationship with growth of eucalyptus liners during nursery production. After transplanting for 43 days, plants from 120 cm³ containers had greater height and dry mass than those from 90 cm³ and 40 cm³ in both clones but dry weight of new roots regenerated from the original root balls after transplanting was not different. In each clone, relative growth rate of plants from different container sizes was comparable after transplanting despite of the different plant sizes at transplanting.

APPLICATION OF GAMMA IRRADIATION FOR STORAGE POTATO

M. Rezaee¹ and M. Almasi²

¹Scientific member of Department of Agronomy .Faculty of Agriculture, Islamic Azad University, Karaj Branch .Iran , mail2rezaee@yahoo.com

²Department of Agricultural Mechanization, science and Research Branch, Islamic Azad University, Tehran, Iran

Since deficiency of controlled store in Iran and environmental problems of chemical material the use of gamma irradiation to control sprouting and increase the length of storage time of potatoes has been proposed as an alternative to cold storage or the use of chemical sprout suppressants. In this study potatoes of Agria Variety were irradiated at a dose of 0.10 KGY and stored along with the unirradiated controls at 12±3°C for a period of more than 6 month from October to April .After 4 month of storage the sprouting ranged from 5 to 12% in irradiated potatoes and 45 to 74% in unirradiated samples and after 6 month the unirradiated potatoes were discarded because of heavy sprouting and rotting. The rot attack was approximately double in unirradiated samples. It was found that losses through dehydration were 10.3 to 15.1 % in the irradiated potatoes. Also a comparative study of reducing and non-reducing sugars, vitamin-C content, total sugar, starch and protein was carried out between unirradiated and irradiated samples. The results suggested the efficacy of Gamma irradiation for ensuring availability of the storing quality of potato during lean periods from October to April.

ON-FARM TRIAL ON BAGGING OF MANGO FRUITS USING RECYCLED MATERIALS

Cornelia S. Tubaña

Abra State Institute of Sciences & Technology

This study was conducted to verify the potential effect of fruit bagging technology by using different recycled materials on the production and quality of mango fruits. This was conducted in a farm from a top mango-grower municipality in Abra. Recycled bagging materials such as *cement paper*, *newspaper*, *foil paper*, *transparent plastic*, *glossy magazine paper*, and *mimeo paper* were effective in controlling wind bruises and insect pests of mango fruits. However, *plastics* and *foil papers* were not effective to control diseases. Fruit bagging did not affect the weight and sugar content of the fruits. In terms of profitability, newspaper, glossy paper, cement bag, and mimeo paper showed the highest net profit and ROI. In bringing the technology directly in the farm, farmers had more chances to witness directly the effects and practicality of such, like the use of recycled materials to produce better fruits with higher price. Conducting a harvest festival wherein farmers and stakeholders were invited and they were convinced that mango fruit bagging is effective to improve mango fruits, hence, had increased production. The study likewise emphasized the advocacy for food security by using a practical technology that is environment-friendly, not hazardous to man's health, and inexpensive but effective to protect mango fruits from pests, diseases, and wind bruises, thus better fruits was produced. The utilization of 'waste' resources that could minimize input cost is also a part of resource management for future generation. Such sustainable agricultural production was shown to farmers and stakeholders, particularly in the commercially-produced fruits, like mango. This also brought the attention of the LGUs in the province in nominating the farmer-cooperator in the search for the Outstanding Farmer of the Year, for which he got the award.

A COMPARISON OF GROWTH, PERFORMANCE AND FEED COST OF PIGS RAISED ON DEEP LITTER IN A SEMI-BIO SYSTEM AND IN A CONVENTIONAL CONFINEMENT SYSTEM

**Wandee Tartrakoon^{*1/}, Adsadawut Sanannam^{1/}, Wipa Homhaul^{1/}, Kunlayaphat Wuthijaree^{1/},
Tinnagon Tartrakoon^{2/}**

^{1/}Faculty of Agriculture, Natural Resource and Environment, Naresuan University,
Phitsanulok, 65000.THAILAND.

^{2/}Rajamangala University of Technology Lanna, Phitsanulok Campus,
Phitsanulok, 65000.THAILAND. E-mail address: wandeeta@nu.ac.th

When pigs are raised on deep litter in Thailand problems with infections and dirty pigs are often observed due to the hot and humid climate. Feeding of fermented feed can improve gut health and balance the microorganism in the litter. For the experiment fermented vegetable waste was chosen as feed due to its low cost. The objective of the study was to compare growth performance and feed cost of pigs fed fermented vegetable and rose on deep litter in a semi-bio system with the results obtained for pigs raised in a conventional confinement system. Eighty castrated Duroc X (Large White X Landrace) males and females of 20 kg BW were randomly divided into groups of 10 pigs and kept in 1) conventional pens with concrete floor or 2) on a 90 cm deep litter consisting of a mixture of rice husk and wood saw dust. In both systems there were 1.8 m² per pig. In the conventional confinement system, concentrate feed was provided *ad libitum* until the pigs reached 100 kg BW. The pigs housed on deep litter were fed *ad libitum* with a mixed diet comprising concentrate feed and fermented vegetables at the ratios 2:1, 1:1 and 1:2 during the growth periods from 20 to 50, 50 to 80 and 80 to 100 kg BW. There were four replications per treatment. T-test was used to compare the two treatments. The performance of the pigs in the semi-bio system compared with the results obtained in the conventional confinement system showed no significant differences

for average daily weight gain, feed intake, feed conversion ratio and running days. However, feed cost per kilogram of weight gain was significantly lower ($P<0.05$) in the pigs housed on the deep litter in the semi-bio system than in the pigs housed in the conventional confinement system (21.21 vs 34.79 Baht /kg of weight gain). It was concluded that a semi-bio system with deep litter had no negative effect the growth performances of the pigs and economic return of the pigs raised in that system was better than in a conventional confinement system.

COMPARATIVE STUDY OF DRYING ROSEMARY LEAVE, LAVENDER FLOWER AND ROSE PETAL WITH SOLAR, TRAY AND VACUUM MICROWAVE DRYERS

Pichaya B. Poonlarp¹ and Autcharaphorn Apiwongngam²

¹ Department of Food Engineering, Faculty of Agro-Industry, Chiang Mai University, Chiang Mai, 50100, ² Department of Food Science and Technology, Faculty of Agro-Industry, Chiang Mai University, Chiang Mai, 50100 THAILAND

Field level experiments on solar drying of rosemary leave, lavender flower and rose petal using indirect solar dryer developed by the Department of Food Engineering, Agro-Industry Faculty, Chiang-Mai University were studied. Air velocity of 0.5 m/s was forced passing over the samples. Color assessment, moisture content, water activity (a_w) total ash, tannin and total phenolic compounds were analyzed as the quality parameters. Subsequently, quality parameters from solar dryer, tray dryer, and microwave vacuum rotary drum dryer were compared. Dried product qualities of rosemary leave, lavender flower and rose petal using solar dryer with moisture content of less than 7% were comparable to those dried in tray dryer and microwave vacuum rotary drum dryer. Electrical energy used by solar dryer, tray dryer and microwave vacuum rotary drum dryer for drying process of rosemary leave were 6.92, 292.83 and 14.88 Baht/ 1 kg (fresh), respectively. For lavender, the electrical energy costed 7.53, 262.80 and 16.61 Baht/ 1 kg (fresh), respectively. Finally, electrical energy used for rose petal drying process were 6.93, 292.83 and, 9.09 Baht/ 1 kg (fresh), respectively.

DRY MATTER PARTITIONING IN POTATO GENOTYPES UNDER ORGANIC PRODUCTION IN THE PHILIPPINE HIGHLANDS

Donita K. Simongo and Belinda A. Tad-Awan

Benguet State University, La Trinidad, Benguet
E-mail address: dsimongo@yahoo.com.ph

Genotypes CIP 380251.17, CIP 13.1.1 and PHIL 5.19.2.2 were the best performers in terms of leaf area index, net assimilation rate and crop growth rate. Assimilates partitioned into leaves, stems, roots, stolons and tubers at 45, 60, 75 and 90 DAP differed among genotypes and at different stages of development. Among the plant organs, the roots and stolons had the highest dry matter contents in genotype PHIL 5.19.2.2 at 45, 60 and 75 DAP. Assimilates partitioned in tubers increased in most of the genotypes at 75 DAP and decreased at 90 DAP except in genotypes 380251.17 and PHIL 5.19.2.2. Genotypes PHIL 5.19.2.2, CIP 13.1.1 and CIP 96-06 had the highest total yield of 4.57, 4.21 kg and 4.13 kg, respectively and computed marketable yields of 6.33, 5.46 and 5.92 tons/ha. Correlation analysis revealed positive significant correlations in: dry matter content of leaves with sunshine duration in Granola; dry matter content of stems with rainfall in genotype CIP 380251.17 and with maximum temperature in genotype CIP 573275. Significant negative correlations were observed in: crop growth rate with rainfall in genotypes CIP 13.1.1 and PHIL 5.19.2.2; and leaf area index with minimum temperature. Among the characters, positive correlations in net assimilation rate with extra large tubers were observed. Highly significant positive correlations were observed between net assimilation rate and crop growth rate.

YIELD LOSS STUDY OF BROWN SPOT DISEASE IN ORGANIC CLAY MUCK (OCM)

Muhammad Naim, F.A.R. ¹, Muhamad, H. ¹, Saad, A. ² and Han, T.S. ²

¹MARDI Research Station, Jln. Parit 1, Sg. Sireh, 45500 Tg. Karang, Selangor.

² MARDI Research Station, Locked Bag 203, 13200 Kepala Batas, Penang.

E-mail address: naim@mardi.gov.my

Brown spot (formerly called *Helminthosporium oryzae*) is the most serious disease affecting rice growing area in organic clay muck (OCM) soil especially in Block F, Sawah Sempadan, Projek Barat Laut Selangor (PBLs), Malaysia. It was found that brown spot disease can cause reduction in the quality and yield of rice and its seed where it can reach up to 50 % damage to the plant. It also can damage the quality and the weight of rice seed up from 50 % to 90 %. This disease is caused by *Bipolaris oryzae*. The disease is now known to be associated with unbalanced or poor soil. This study was therefore conducted to investigate the yield loss of brown leaf spot disease infestation on rice. Five scales of brown leaf spot infestation score (0 %, 25 %, 50 %, 75 % and 100 %) were used with five replications for each scale of score. Five panicles of rice variety MR 220 were selected and averaged for each replication and samples were separated into empty and full grain and weight separately. The analysis of variance showed that effect of brown leaf spot on yield loss was significant among five scales of score. 100 % brown leaf spot infestation score showed the lowest yield about 2662.4 kg/ha or 66.4 % losses compared to 0 % brown leaf spot infestation score which can get 7924 kg/ha. The findings showed that the brown leaf spot disease can cause the reduction in yield as high as 66.4 % in severe infection.

EFFECT OF TREE ONION EXTRACTS AS PREBIOTICS ON NEWCASTLE DISEASE VACCINE TITER IN BROILER

Vichai korpraditskul, Charunee Kasornpikul, Surawat Chalorsantisakul

E-mail address: Vichai@su.ac.th

Newcastle disease (ND) is an acute paramyxoviral infection to the poultry birds. Immune responses play a pivotal role in protection against diseases. Prebiotics are a non-digestible food ingredient that beneficially affects the host is naturally occurring found in some plants and Tree onion was one of the sources of prebiotics. The purpose of this study was to determine the humoral immune response against ND virus in broiler chicks fed with tree onion extracts using hemagglutination inhibition (HI) test. Ninety Arbor Acres male broilers were assigned to 3 dietary treatment groups with 3 replications 1) basal diet 2) 2% Colistin and 3) 2% Tree onion extracts. Vaccinated with Newcastle diseases vaccine was given to each chicken on day 21 and day 31 then collected serums from 3 chickens each group in day 38. The results found no significantly difference but broiler fed 2% Tree onion extract v/v mixed into water had highest HI Titer. That was show Tree Onion – fed – group can stimulated immune system especially humoral immune system.

PROBIOTICS PROPERTIES OF BACTERIA ISOLATED FROM POULTRY IN THAILAND

Charunee Kasornpikul, Chaiyavat Chaiyasut, Bussabun Sirithanyalug, Worapol Aeagwanich and Thanit Pewnim

E-mail address: makemerry@gmail.com

Probiotics can be defined as single or mixed cultures of living microorganisms, which beneficially affect the host (human or animal) by improving the properties of indigenous microflora. For animal production, they are the biological products which have a capacity to improve growth

performance and increase the immune system in the animals. The aims of this study were to isolate probiotics lactic acid bacteria from chicken faeces and to examine their probiotics properties for use in chickens. The samples were collected by fecal swap from 120 healthy antibiotic-free poultry on between November, 2006 and November, 2007 in Thailand. The bacterial strains were selected based upon bio-safety, viability during storage, *in vitro* tolerance to different pH/ gastric juice and bile, and antimicrobial activity. Subsequently, the effective strains in the laboratory were evaluated *in vivo* to determine their effect in promoting growth. The results revealed that CMU-FP02 and CMU-FP003 were the best in growth promotion ($p < 0.05$). We hypothesized that this growth promotion occurred as a result of the bacteria to thrive under bile and acidic conditions. They also were capable of antagonizing the notorious microbes and excluded them from causing disease to the chickens.

EFFECT OF LOCAL PLANT EXTRACTS AS PREBIOTICS ON BROILER PERFORMANCE

Surawat Chalorsuntisakul, Jakkapan Sirithunyalug, Chaiyavat Chaiyasut, Worapol Aeagwanich and Thanit Pewnim
E-mail address: surawatch@gmail.com

The prolonged use of antibiotic has the potential to increase bacterial resistance and the level of drug residues in edible animal products. Alternatives to them, such as prebiotics, probiotics and other feed additives, have been studied. Thailand has many plants that analyzed the possibility as prebiotics and may be substitute antibiotic use to improve broiler performance. This study was performing to determine the effects of local plants extract on broiler growth performance for use substitute antibiotic in the future. 2% of each Shallot and Tree onion extract was used in this experiment. The results found Average daily gain (ADG), Feed intake (FI) and Feed Conversion Ration (FCR) of all trial were not significantly difference ($p > 0.05$) but Shallot and Tree onion had higher ADG, FI and greater FCR with no significantly difference when compared to antibiotic - fed group. It might conclude that both Shallot and Tree onion extract might substitute for the antibiotic use in broiler production as we hypothesized.

GERMINATION OF JATROPHA CURCAS IN RESPONSE TO DESICCATION AND STORAGE TEMPERATURE

Uma Rani Sinniah, Afifah Abdullah and Ghizan Saleh
Department of Crop Science, Universiti Putra Malaysia, 43400
Serdang, Selangor, Malaysia.
E-mail address: umarani@agri.upm.edu.my

Jatropha is an emerging crop which is being promoted as an alternative feedstock for biofuels. It belongs to the family Euphorbiaceae and the genus *Jatropha* has approximately 175 succulents, shrubs and trees. The crop has been described as a wonder crop as the seeds contain around 37% oil which can be combusted as fuel without refining. It is claimed that *Jatropha* can be grown on marginal land and therefore it will not compete with crop-land unlike other edible oil such as oil palm. The above-mentioned positive characteristics have resulted in new areas for growing *Jatropha* and thus the need for planting materials. *Jatropha* can be grown both *via* cutting as well as seeds, however, seeds are preferred as it is easy to handle and transport. A number of reports have shown that *Jatropha* seeds deteriorate rapidly in storage and therefore cannot be stored for prolonged period of time. This study was initiated in order to determine the effect of desiccation on germination and storage of *Jatropha* seeds under three conditions namely in the deep freezer, in the fridge and under room temperature. The local Malaysian variety was used in this study. Mature seeds were

desiccated to 35, 25, 15, 10 or 7% and subjected to germination test. Seeds from each of this treatment was also extracted and placed in storage under the three conditions mentioned earlier for one, two or three months. The results of this study indicated that *Jatropha* seeds tolerated desiccation to low moisture content of below 10% and are not sensitive to temperature below freezing. This indicates that *Jatropha* seeds can be classified as orthodox. However, if seed moisture content is more than 10%, they undergo freezing injury if kept under freezing conditions. No significant decline in germination was observed for seeds with moisture content below 10% irrespective of condition or time of storage. Further studies have to be carried out in order to understand the long-term storage of *Jatropha curcas*.

TRANSLOCATION OF HEAVY METALS IN JATROPHA CURCAS (PHYSIC NUT) GROWN IN ABANDONED MINE AREAS

Nina M. Cadiz

Institute of Biological Sciences, College of Arts and Sciences,
UPLB, College, Laguna 4031. E-mail: nmcadiz@uplb.edu.ph

Jatropha curcas (physique nut) is a small tree that adapts well in a wide range of conditions like dry and poor soil, thus, the study assessed its adaptability in an abandoned mine area of Mogpog, Marinduque, Philippines by looking into the growth performance, and profile of heavy metal (HM) uptake and translocation of the plant. Because abandoned mine areas are generally devoid of top soil, some mitigating measures (e.g. use of mycorrhiza, compost, lime) to improve the soil condition and regulate the transport were also examined. Initial results showed that *Jatropha* seedlings with no compost and with or without lime exhibited the poorest growth. The tallest and biggest stem diameter were observed in seedlings treated with mycorrhiza plus compost and lime. Without compost or lime, mycorrhizal inoculation was ineffective. Addition of lime, however, significantly increased stem diameter, root, leaf, stem and total dry weights by 40%, 97%, 42%, 262% and 50%, respectively, as compared with the unlimed treatment. Heavy metal (HM) analysis of tissues showed that lead was readily translocated in the leaves, irrespective of treatments. Mycorrhizal treatment, in general, decreased lead and zinc translocation to the shoot, except copper. The study also showed that soil amendment is required for plants like *jatropha* to survive in an abandoned mine area.

ENRICHMENT OF ACETOGENIC BACTERIA AND ACETOCLASTIC METHANOGENS FOR ENHANCING METHANE PRODUCTION IN ANAEROBIC TREATMENT

Sukadeetad, K.¹, Suraraksa, B.^{2*} and Nakbanpote, W.¹

¹ Department of Biology, Faculty of Science, Maharakham university, and ² Excellent Center of Waste Utilization and Management, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency
E-mail address: benjaphon@biotec.or.th

Because of natural crude oil crisis and global warming issues, biomass-derived fuels (biofuels/bioenergy) are likely to have a future as a replacement for fossil fuel-based energy. Biogas, which is one of the most bioenergy produced by anaerobic digestion of organic polluted wastes, is accomplished by four major microbial groups: hydrolytic bacteria, acidogenic bacteria, acetogenic bacteria and methanogens. The efficiency is depended on the kinds of substrate and the balance of species and quantities of the microbes. Therefore, this study aims to enrich acetogenic bacteria and acetoclastic methanogens, which govern limiting step of biogas production, for used as a starter in further study. To enrich the acetogenic bacteria such as enrich butyric utilizing bacteria (BAUB) and propionic utilizing bacteria (PAUB), and acetoclastic methanogens (ACM), mixed culture obtained

from anaerobic pond were fed by butyric acid, propionic acid, and acetic acid, respectively. After that for 2 months, each enriched microbial group was investigated the activity of substrate utilization and was enumerated the number of microbial cell. For microbial activity, 10% v/v of each enriched bacteria was incubated in a closed vial containing 75 ml of 20 mM of acetic acid, butyric acid, propionic acid, lactic acid and ethanol, which are intermediates in anaerobic digestion. Gas and liquid samples were taken and analyzed once a day. Results indicated that lactate was less utilized by all enriched microbial group. Enriched BAUB and enriched PAUB, which are acetogenic bacteria, preferred to utilize ethanol (0.1 and 0.334 g COD/g VSS/d, respectively) and produced methane as 1.96 ml/d and 0.35 ml/d, respectively, whereas enriched ACM preferred to utilize acetic acid (0.48 g COD/g VSS/d) and produced methane as 1.95 ml/d. Enumerating by most probable number (MPN), microbial cells of enriched BAUB, enriched PAUB and enriched ACM are 9.3×10^6 , 7.4×10^7 and 7.5×10^5 , respectively. These results showed the microbial activities and the microbial cells of the enriched microorganisms higher than that of mixed culture. Consequently, these enriched microorganisms will be studied further as a triculture to increase methane production and to reduce start-up period of anaerobic reactor.

ACADEME AND COMMUNITY INITIATIVES: AN APPROACH IN THE PRESERVATION AND MANAGEMENT OF UPLAND AND LOWLAND AREAS IN OCCIDENTAL MINDORO

Arnold N. Venturina, Emelita V. Macadaeg

Occidental Mindoro National College E-mail address: anv_omnc@yahoo.com

This research was undertaken by the College in response to the global challenges for Sustainable Management of Bio-Resources and Community Empowerment, aligned with the agreement of the College with the National Economic development Authority (NEDA) through the Provincial Development Council to address the prevailing environmental, economic, social and technical problems in the province. Further, the initiatives were anchored on the Research Agenda of the College, the Regional and National priorities in research focusing on natural resources management such as: protection of the environment and sustainability promotion with the following objectives: To consolidate efforts in the establishment of multi-dimensional approaches in rehabilitating, protecting and sustaining the ecosystem; Showcase upland technologies; and Provide alternative mechanisms in the livelihood activities of the stakeholders. The different programs and projects were documented to determine its long term impact to the preservation of the upland, lowland and coastal resources of the province. The involvements of the GOs, NGOs and the affected communities were tapped. Findings revealed that the Initiatives focus on Experimental Forestry Center, On Site Entrepreneurial Projects as Performance Thesis (OSEPPT), Initiating Sustainable Upland Development Projects and Mangrove Gene Bank Development. The Mangrove Gene Bank Development serves as the ready source of propagules for the coastal communities and NGO's conducting mangrove areas rehabilitation activities. The establishment of Experimental Forestry Center showcased the preservation of different endemic species of flora and upland technologies particularly SALT. The On Site Entrepreneurial Projects as Performance Thesis (OSEPPT) harnesses the skills of the students and provide a source of livelihood after graduation. And showcase the one hundred five (105) successful Projects in the whole province. The Upland Development Projects harnesses the capabilities of the indigenous people in the production, management and sustenance of upland resources through demonstrations of agroforestry projects. Rate of participation and access to the program, economic return/benefit, availability of the technology, and consideration to the cultural values of the respondents during advocacy and adoption of the program were found significant success indicators.

STRATEGY OF LEADERSHIP IN LOW-COST RICE PRODUCTION¹

Yosphatrachai Phuangpee²,

Technology Administration Uttaradit Rajabhat University THAILAND

²Graduate student, School of Administrative Studies, Maejo University,
Chiang Mai 50290 THAILAND. E-mail address: chokun9@gmail.com

At present, the cost of energy use of agricultural machinery, which replaces a mankind labor of rice production in Phichit province, is as high as 46% of the total expenses. An assessment from this study had estimated that the cost of machinery used could be reduced to as low as 28.50 % of the present cost. The purpose of this study was to present strategies of leadership in low-cost rice production. In-depth interview was a tool for data collection from administrators in 5 farmer institutions. The interview covered 4 aspects of the management; a group management, a capital management, an agricultural machinery management, and an encourage management. Result of the study revealed that the encouraged management was the most important aspect of the management. A synthesis of managerial agricultural machinery managements, and related environmental factors from this study had recommended 3 strategies that could help the groups in planning their managerial administration. There were; 1) a strategy for an adjusting basic structure of managerial administration, and forming a positive attitude toward a group formation. This strategy would be launched with a transprence administration as an obligation, 2) a strategy for the development of potentiality and quality of the management. This strategy would be launched with a knowledge enrichment, and group supporters as an obligation, 3) a strategy for creating a good atmosphere and moral in a group administration. This strategy would be launched with a sufficient welfare pattern as an obligation. These allocated three strategies would enhance a confidence of members in a group' activities, organized a systematic work pattern, create a group's unity and cooperation, and empower related partners to join the group.

MUSHROOM FOR PROFIT: A LIVELIHOOD ASSISTANCE PROJECT FOR THE YOUTH IN PANGASINAN

Cesar G. Della, Elisa S. Della & Oliver C. Caasi, Honelly mae S. Cascolan

Pangasinan State University, Sta. Maria, Pangasinan, Philippines,

E-mail address: cesar_della@yahoo.com

The R&D project generally aimed to create/open innovative alternative livelihood assistance for the agriculture graduates of Pangasinan. Specifically, the project aims to: develop and strengthen manpower capabilities of 300 unemployed graduates on mushroom low cost technology, efficient and economically productive industry utilizing indigenous or agro-industrial/forest wastes; develop strong partnership among 10 local government units (LGU), 5 people's organizations, non-governmental organizations and 2 state colleges and universities and private higher education institutions in promoting mushroom production technology and assist 300 beneficiaries. The choice of the LGUs and other offices was based on the premise that majority of PSU graduates originated from these municipalities, identified as impoverished municipalities (KALAH I sites) and the manifestation of political support from the local executives. Consultation and planning with the potential partners and stakeholders as well as formulation of implementing rules and regulations was undertaken to identify perceived problems and solutions on the issues related to mushroom production. Training of screened beneficiaries on mushroom package of technologies and management were conducted in the Mushroom Research and Development Center, Sta. Maria, Pangasinan and the rest were in the stakeholders' places. IECM were distributed to the beneficiaries. Equipments, supplies and materials were purchased to enhance the capability of the proponents and beneficiaries to sustain the production of mushroom and delivery of services. Design of ideal mushroom fruiting house was given to the

potential mushroom growers. The need for a directory of the identified beneficiaries were documented which was necessary for planning and decision-making purposes of the management. M&E thru on-site/field monitoring and evaluation of the beneficiaries' project were conducted to validate the accomplishments written on the report.

DEVELOPMENT OF BACILLUS AMYLOLIQUEFACIENS KPS46 FORMULATION FOR CONTROL OF SOYBEAN DISEASE

Chaisit Preecha¹ Sutruedee Prathuangwong²

¹ Department of Plant Science, Faculty of Agriculture, Rajamangala University of Technology Srivijaya, Thung Song Nakhonsrithammarat, 80110

² Department of Plant Pathology, Faculty of Agriculture, Kasetsart University Chatuchack Bangkok, 10900. E-mail address: skpreecha@yahoo.co.uk

Bacillus amyloliquefaciens strain KPS46 had been reported to secrete antimicrobial metabolites and induce systemic resistance to the host plant. The additional based formulation advantages to withstand environmental stress and increase the survival rate and control efficacy stability of biological control bacteria was developed. The ratio of soybean meal: molasses and fish meal: molasses tested for enhancing multiplication for mass production was investigated. The optimal ratio was 10:5 g/l which costs calculated from all ingredient material was 0.10 and 0.12 US \$ per 10-liter. It was lower cost than nutrient glucose broth of 13.58 US \$ per 10-liter. The dry formulation should be maintained or increased its efficacy that was developed by using several local materials as carrier to reduce cost and enhance valuable of production. Viability investigated after 360-day shelf life of KPS46 maintained in wettable formula used rice husk ash dust, dry cow dung, decomposed cow dung, and talcum as carrier storage at room temperature were 8.8, 8.7, 8.5, and 8.4 log CFU respectively. Greenhouse and Field experiment of KPS46 developed as wettable formula could reduce *Sclerotium damping-off*, bacterial pustule caused by *Xanthomonas axonopodis* pv. *glycines* and anthracnose caused by *Colletotrichum truncatum*. It promoted plant growth of green soybean under field experiment to increasing quality and quantity of marketable yield with 24.1 and 29.5 % compared with non-treated control for the first crop and the second crop respectively. The return of investment (ROI) was 43.30% higher than conventional of 33.59%.

POTENTIAL FOR APPLICATION TIME OF PSEUDOMONAS FLUORESCENS SP007S AND BIOFERTILIZER FOR ALTERNARIA LEAF SPOT MANAGEMENT OF CHINESE KALE

Sutruedee Prathuangwong, Wilawan Chuaboon, Supot Kasem and Dusit Athinuwat

Department of Plant Pathology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, THAILAND.

Application timing of *Pseudomonas fluorescens* SP007s based on plant growth stage of planting date, seedling development, and leaf stage with seed treatment, and two (at 17 and 31-day-old plants), and three-foliar spray intervals (at 14, 28 and 42-day-old plants) were evaluated in natural endemicity of commercial Chinese kale field at Suphanburi with a history of *Alternaria* leaf spot caused by *A. brassicae*. The effect of 1×10^6 cfu/ml *P. fluorescens* SP007s in either formulations of 6-month shelf life powder or its pure culture suspension; and with or without algae biofertilizer (Goemar BM86^(R)) combined foliar spray intervals compared with conventional grower and all alone synthetic chemical plots, were also determined. *Alternaria* leaf spot incidence and severity were assessed everyweek, and plant growth promotion and total yield were recorded at seedling development and harvesting time respectively. The experiment was laid out during March-May, 2008 as RCBD design of total 13 treatments in 3x7 m plot size with 3 replications. All treatments applied

with SP007s provided significant disease reduction and yield increase better than conventional grower and alone synthetic chemical plots under 19-21% trace level of natural disease endemic (P=0.05). Over all, the application timing of SP007s with two-or three-foliar spray intervals, a combination of SP007s and algae biofertilizer foliar spray or SP007s alone, and SP007s powder formulation or its pure culture suspension had no significant effect on total yield obtained, although there were treatment differences in the promoting of plant growth at seedling development and incidence of *Alternaria* leaf spot of Chinese kale. These findings suggest the importance of disease trace level and timing for application that naturally occurring product like SP007s could be used successfully to reduce synthetic chemical use on Chinese kale.

DETECTION AND IDENTIFICATION OF *ACIDOVORAX AVEANAE* SUBSP. CITRULLI, CAUSAL AGENT OF BACTERIAL FRUIT BLOTCH IN THAILAND

**Rachadapron Keawhwan¹ Sujin Patatrapuwadol¹ Wichai Kosiratana²
and Natima Kositcharoenkul³**

¹ Department of Plant Pathology, Faculty of Agriculture, Kamphaeng Sean, Kasetsart University Nakhon Pathom 73140, ² Center for Agricultural Biotechnology, Kasetsart University, Kamphaeng Sean Campus, Nakhon Pathom 73140, ³ Department of Agriculture, Ministry of Agriculture and Cooperatives, THAILAND

Bacteria were isolated from a range of naturally infected cucurbitaceous hosts in Ratchaburi Nakhonpathom Kanchanaburi Lopburi and Suphanburi province. Physiological, biochemical, pathogenicity, ELISA, PCR and Biologtm tests were carried out. Two type strains of *Acidovorax aveane* subsp. citrulli isolated from cantaloupe and watermelon were used as positive control throughout these test. The bacterial isolate RB-WS, BL-CA, and SK 2-4 showed positive result on PCR, ELISA, BiologTM and other tests. The pathogenicity of 3 bacterial isolates was confirmed on young seedling of cucurbitaceous hosts. Based on the presence of symptoms recorded for 7 days after inoculation, we observed some slight variations in aggressiveness. This may due to the method of inoculation. In conclusion, the bacterium that cause fruit blotch of cantaloupe and watermelon was *Acidovorax aveane* subsp. citrulli and detected in Nakhonpathom Ratchaburi and Suphanburi province.

SEED COATING WITH MIXED BACTERIAL ANTAGONIST AND STICKER AGENT FOR CONTROL OF *ASPERGILLUS FLAVUS* INFECTION OF SWEET CORN

**Supot Kasem¹, Sutruedee Prathuangwong¹, Prochoom Juthawantana²
and Supraneer Ngamprasitthi³**

¹Dept. of Plant Pathology, Fac. of Agriculture, Kasetsart University, Bangkok THAILAND 10900

²National Corn and Sorghum Research Center, Nakhonrachasima THAILAND

³Suwanwajokasikij Field Crop Research Station, Insechandrastitya Institute for Crop Research and Development, Kasetsart University, Bangkok THAILAND 10900

The experiment was conducted in laboratory and greenhouse conditions to determine the effect of sweet corn seed coating technique using various sticker agents combined with 3-antagonistic bacterial strains, *Bacillus amyloliquefaciens* KPS46, *Pseudomonas fluorescens* SP007s and *Serratia marcescens* Spt360 under different storage conditions. The percentage of seed germination and seedling vigor of sweet corn cv. insee2 was evaluated at 15-day interval for 3 months using blotting and pot bioassay. Coated seed treatment with different sticker agents including carboxy methylcellulose, Tween80 and TensionT7 exhibited lower percentage of seed germination and seedling vigor (shoot and root length) than antagonistic bacteria coated seeds, except polyacrylate

(PLA) and chitosan extract that showed highest percentage seed germination but not seedling vigor. To improve the efficacy of seed coating against *Aspergillus flavus* infection, seeds coated with each antagonistic bacteria, PLA and chitosan combinations were assessed. PLA and chitosan combined with antagonist were better effective than antagonist alone. Seed coated with combined PLA+SP007s or chitosan + SP007s were significantly highest ($P<0.05$) in enhanced seed germination and seedling vigor, where seed coated with PLA + KPS46 significantly reduced *Aspergillus flavus* incidence. None of these sticker agents showed negative effect on seed health and survival of benefit bacteria on seeds that indicated the advantage of improved efficacy of antagonism and PGPR. However, the storage temperature was important factor affecting survival and efficacy of antagonistic bacteria coated onto the seeds. Coated seed stored at room temperature showed a 2-4 fold decrease in bacterial density compared to coated seed stored at 10°C.

THE EFFECT OF NITRATE KIND OF FERTILIZER TO POTATO COMMON SCAB IN VIETNAM

Dang Thi Dung¹, Hozumi Yoshida² and Suyama Kazuo²

¹Hanoi Agricultural University, VIETNAM

²Tokyo University of Agriculture, JAPAN

Potato common scab, which caused by *Streptomyces scabies*, was considered as one important disease that attack potato tuber on the world. There were some published papers concerned to potato common scab control showing ammonium sulphate has special effect on potato common scab. In Vietnam, the investigation for potato common scab controlling by ammonium sulphate is rather less. This field examination shown that both kind of nitrate (urea and ammonium sulphate), has no effect to water-soluble aluminum, but has some effect on soil's pH as well as on potassium available and potato yields. Nitrate fertilizer decreased soil's pH from stage of forming tuber to harvesting, increased the quantity of potassium availability from germination to mature tuber. For pH(H₂O), it decreased from before planting to at harvest. It is similar results for pH(KCl). For potassium available quantity, it is lower before planting and higher at the stages of tuber forming, tuber development. Urea fertilizer has less effect to potato common scab than ammonium sulphate. The scab rate and scab index were 36.7 and 12.6% (by urea) compared with 29.7 and 10.6% (by ammonium sulphate). But ammonium sulphate has good effect to potato yield, 20.8tons/ha in compare with 17.1tons/ha by Vietnamese style cultivation, and 17.6tons/ha compared with 15.2tons/ha by Japanese style cultivation.

SCREENING AND FIELD TRIALS OF CHILLI VEINAL MOTTLE VIRUS RESISTANT SOURCES IN CAPSICUM SPP.

Wareerat Sompratoom¹ Sujin Patatrapuwadol¹ Krung Sitanee² and Sirikul Wasee²

¹ Department of Plant Pathology, Faculty of Agriculture, Kamphaeng Sean, Kasetsart University

²Tropical Vegetable Research Center (TVRC) Kamphaeng Saen, Kasetsart University

Nakhon Pathom 73140, THAILAND

Chili is an economical importance crop; however it is susceptible to a large number of diseases, including *Chili veinal mottle virus* (CVMV) for which the best control strategy is genetic resistance. Therefore, the objective of this work was to screen *Capsicum* spp. accessions collected by Tropical Vegetable Research Center (TVRC) and GRIN/SINGER, USA to find possible sources of resistance to CVMV. Out of 400 accessions of *Capsicum* spp. inoculated with CVMV-KPS9, 30 did not express symptoms. In addition, viruses were not found in the leaf tissues as measured by indirect ELISA. Field tests of four CVMV resistant accessions, demonstrated that most of the CA446,

CA1151, CA1195 and CA1258 plants were not infected with CVMV among the virus-infested fields. These accessions seem to be suitable for breeding programs aiming at incorporating resistance for this disease into commercial chili cultivars.

TOMATO YELLOW LEAF CURL DISEASE AND MANAGEMENT IN NORTHERN VIETNAM

**Ngo Bich Hao¹, Keiko Natsuaki³, Nguyen Viet Hai², Ha Viet Cuong¹,
Nguyen Ha Thi Quynh Trang¹, Vu Van Hai¹**

Hanoi Agricultural University Trau Qui Gia Lam Hanoi VIETNAM

Post Entry Plant Quarantine No 1 Chem Tu Liem Hanoi VIETNAM

Tokyo University of Agriculture, Setagaya, Tokyo, JAPAN

Tomato yellow leaf curl disease (TYLCD) is the main limiting factor to production of tomato in the North Vietnam. The causing agents of this disease are a complex of virus species that in nature are transmitted by the whitefly *Bemissia tabaci*. In the field the disease is caused by at least two viruses of the genus Begomovirus (family Geminiviridae) with ss DNA, Tomato leaf curl Vietnam virus (ToLCVV, AF264063) and Tomato yellow leaf curl Vietnam virus (TYLCVNV) and they are found in tomato leaf samples with yellow leaf curl symptom by PCR using specific primers for ToLCVV (ToLCVV-sp-F2 & ToLCVV-sp-R2) and TYLCVNV (TYLCVNV-sp-F1 & TYLCVNV-sp-R1). Management of the disease using tomato resistant varieties Magic and Savior and by vector control using yellow traps, a bio product "Somec 2 SL", Bion and a pesticide Actara 25WG, showed effective to decrease the population of the virus vector *Bemissia tabaci* and the occurrence of the disease in the fields.

ASPARAGUS FARM PRACTICAL AGAINST A HIGH GAP STANDARD: PRACTICE AND TRANSFORMATION COST

**Chainarong Rattanakreetakul¹, Chuanpis Aroonrungsikul² and
Roongnapa Korpraditskul²**

¹ Department of Plant Pathology, Faculty of Agriculture, Kamphaeng Saen,
Nakhon Pathom 73140 THAILAND., ² Research and Development Institute at Kamphaeng Saen,
Kasetsart University, Nakhonpathom 73140 THAILAND.

E-mail address: crattan99@yahoo.com

Agricultural product quality was considered to food safety in deep of sanitary and phyto-sanitary. The quality system of agricultural production was interpreted through the good agricultural practice (GAP) which was diverse. It was depended on level of concern or the requirements from customers / countries. GLOBALGAP is a GAP standard which was required by major EU retailers for agricultural product via suppliers around the world. The Q-GAP system approach was a basic practice for farmer production system which was guaranteed by Thai government. The motivation of farmer to develop their practice to higher GAP standard was concerned by various partners. Farmer group of GLOBALGAP and Q-GAP certified were investigated, particularly in scope of farmer practice and transformation cost by using asparagus produce model in a major asparagus production area of Nakhon Pathom, Kanchana Buri and Ratcha Buri. The study was focused to the supply chain from farmer to supplier whose can be access to oversea market. GLOBALGAP option 2 certified farm (n = 8) and Q-GAP certified farm (n= 6) were interviewed and were determined with farm audit report. Difference of asparagus sale price in both farmer groups was obtained, which was 13.2% of price incentive to GLOBALGAP practice. Price incentive was a significant factor to enhance the additional invests of quality management system (QMS) within the farmer group. Major activities of quality

management system were as 1) Adoption of traceability system, 2) Manage all training cost, 3) Sample analysis, 4) Administration and 5) Organized of third party audit. The pesticides usage was significant difference, particularly for abamecthrin and chlorpyrifos, which were not allowed to use for exporting products to Europe. All transformation cost to GLOBALGAP was analyzed for pay back period. By calculation from additional investment cost per beneficial gain, the pay back period was 1.07 year. However, the GLOBALGAP certified farmer was able to access broader market level and worldwide than Q-GAP certified farmer.

LIFE HISTORY OF *AMBLYSEIUS CINCTUS* CORPUZ AND RIMANDO (ACARI: PHYTOSEIIDAE) ON BROAD MITES LARVAE, *POLYPHAGOTARSONEMUS LATUS* (BANKS) (ACARI: TARSONEMIDAE) AND ITS PREDATION RESPONSE ON BROAD MITES AT DIFFERENT PREDATOR: PREY RATIOS IN LABORATORY AND GREENHOUSE CONDITIONS

Patchanee Vichitbandha^a, Angsumarn Chandrapatya^b

^aFaculty of Liberal Arts and Science, Kasetsart University, Kamphaengsaen Campus, Nakhon Pathom 73140, ^bDepartment of Entomology, Kasetsart University, Bangkok THAILAND
E-mail address: faaspnv@ku.ac.th

Polyphagotarsonemus latus (Banks) is one of important pests of several crop plants worldwide. This study aimed to get more information about possible biological control agent of this pest. Life history of *Amblyseius cinctus* Corpuz and Rimando, a predacious mite that currently was evaluated the potential use as biological control agent on *P. latus*, was studied under laboratory conditions of 27.3± 1.8 °C, 72.6± 10.5 %RH with 12/12 L/D. Eggs and larvae of *P. latus* were provided as prey on excised pieces of mulberry leaf arenas. *A. cinctus* has 4 stages before developed in to adult, which are egg, larvae, protonymph and deutonymph, respectively. They could be able to completed their life cycle on this prey within 4.7± 0.6 days with developing times of these four stages were 1.4±0.4, 0.9±0.2, 1.2±0.4 and 1.2±0.4, respectively. Interestingly, males of *A. cinctus* were developed slower than female, but their stayed alive shorter time than females. Female could give birth for new young within approximately two days with the average of 2.41± 2.73 egg per day, which grew to be female more than male. Unfertilized female were not reproduced. The varieties of predator: prey ratio of *A. cinctus*: *P. latus* were used to determine the predation potential of predators on mulberry leaf arenas and on young basil plants in laboratory and greenhouse condition, respectively. In laboratory condition, *A. cinctus* could feed at about 100 broad mite nymph per day with could produce eggs about 2-3 eggs per day. In greenhouse condition, the 1:120 predator: prey ratio were the suggested ratio for future studies in evaluate the effectiveness of this predator in *P. latus* control. The future study plans to evaluate this predator as a biological control agent of *P. latus* will be discussed.

LOCALISING AND INTEGRATING COASTAL RESOURCES EDUCATION IN THE DEPARTMENT OF EDUCATION-BASIC EDUCATION CURRICULUM: THE SAGIP LINGAYEN GULF PROJECT EXPERIENCE

A. F. R. Basco¹, Ma. S. J. Lucero¹, E. A. Aguilar^{1,2} and Unlimited Professional Development and Technical Enhancement (UPDATE), Inc³.

¹Sagip Lingayen Gulf Project-Marine Environment Resources Foundation (MERF), Inc., Bolinao, Pangasinan, ²Permanent Address: Crop Science Cluster, College of Agriculture University of the Philippines Los Baños, College Laguna, 4031 ³ Bolinao, Pangasinan

Since the 1990s when the Coastal Resource Management (CRM) went on full implementation across the Philippines, strategies meant to ensure sustainability of efforts have continuously evolved. Information, Education and Communication (IEC) strategies is a pillar of CRM intended to raise awareness on, imbibe knowledge about, and change behaviours towards the sustainable use of coastal and marine resources. Generally, IEC campaigns target the most immediate resource users, through a variety but often informal means, placing a premium on reaching out to the younger set of audience expected to carry out the advocated CRM principles well into the next generation. However, because of the fragmented nature of these campaigns, much of the inputs are often lost beyond the campaigns. By working through the more formal system of primary and secondary schools, it is expected that an unbroken chain of future stewards of coastal resources will be more systematically targeted. The Sagip Lingayen Gulf Project (SLGP), an Integrated Conservation and Development/Coastal Resources' Management (ICD/CRM) Project developed models for co-management of the coastal environment leading to sustainable coastal resources, water quality and livelihoods. One of these models was the integration of CRM education into the formal school curriculum. Based on the lessons from past related initiatives and through Conservation Partnership Agreements, the SLGP developed and implemented localised and integrated curricula in 29 public elementary and high schools involving 40 Science teachers and more than 2,000 students, an over achievement from the initial target of pilot testing in 10 schools. Further, this effort was legitimated by the Department of Education, strongly supported by mother LGUs who both committed to expand to other schools and to continuously localise the curricula. Based on a review of past and current related initiatives, it appears that this experience is the farthest any CRE effort has gone to date.

POLICY ANALYSIS OF COASTAL ECOTOURISM DEVELOPMENT ON MANGROVE ECOSYSTEM

Myint Thuzar

Yezin Agricultural University, Myanmar
PhD Candidate in University Putra Malaysia, Malaysia

The mangrove ecosystem is one of the important ecosystems in topics and has great economic and ecotourism potential. The mangrove ecosystems in the area have a very limited diversity. A lot of development activities have negatively affected in this area. The balance between economic gain and environment social loss should be weighted in favor of the longer term objectives so that establishment of sustainable resources development will not be ignored. Attention should also be paid to the impact of coastal ecotourism development. The study sought to examine the environmental suitability of mangrove ecosystem and coastal area for ecotourism development, to obtain the optimum plans for the associated enterprise in relation to variables and parameter which relate the potential use of physical, economic and institutional restraints while considering the objectives of entrepreneur and policy planners. Geographic Information System (GIS) methods were used for evaluating the mangrove ecosystem suitability and Analytical Hierarchy Process approach was used for resolving the spatial land use conflict to evaluate policy. The result show that all along Northern coast was originally mangrove forest ecosystem, complete with all richness of bio-diversity attained in it. However Indonesia should utilize institutional facility, such as forestry agency, tourism agency, and other related institutions, to develop coastal ecotourism better, especially mangrove forest ecosystem, so coastal ecotourism project can be sustainable.

WATER TURBIDITY MEASUREMENTS IN ENDAU ROMPIN NATIONAL PARK AREA USING WATER QUALITY FIBER SENSOR

N. Othman, A. F. Omar, C. K. Sim, M. Z. Mat Jafri and H. S. Lim
School of Physics, Universiti Sains Malaysia, 11800 Penang, Malaysia.
E-mail address: nadzri86@hotmail.com

The objective of this study is to calibrate water quality fiber sensor in the unit of RCTIME for turbidity measurement using commercial turbidity meter in the unit of NTU with sets of data taken from streams and rivers in Endau Rompin National Park. The research utilized the method of transmittance light measurement through plastic optical fiber named as water quality fiber sensor to interpret the capacity of water turbidity in Endau Rompin National Park area. The water quality fiber sensor consists of two systems named as BLUE and RED System operated at two different wavelengths which are at 470nm and 635nm respectively. The signal analysis and displays is controlled by Basic Stamp 2 microcontroller. Regression graph were plotted and value of linear correlation coefficient (R^2) were determined to see on the accuracies of the data collected in term of linear relationship between turbidity meter (NTU) and water quality fiber sensor (RCTIME), where the value of $R^2=1$ represent the theoretically perfect fit. This study proved that turbidity measurements can be determined by using water quality fiber sensor in Endau Rompin National Park area.

QUALITY OF NATURAL RAINFALL AND RAIN-WATER FROM THE ROYAL RAINMAKING TO AGRICULTURAL ACTIVITIES IN CENTRAL RIVER BASIN

Unnop Homchan, Nitaya Lauhachinda and Veerasak Udomchoke
Department of Earth Science, Faculty of Science, Kasetsart University.
E-mail address: fsciunh@ku.ac.th

The central river basin is the cradle for economic agro-agriculture which depends on natural rainfall and the rain-water from the Royal Rainmaking especially in repeated drought areas as Nakorn Sawan and Lopburi. Increasing chemical applications in agriculture and other human activities may contaminate the rainfall naturally and artificially. Therefore, it is very important to examine the quality of rain-water. Study of rain-water quality from the Royal Rainmaking and natural rainfall was performed during 8 August, 2005 to 24 June, 2006. The rain-water samples from natural rainfall and the Royal Rainmaking were collected from 3 stations in the Central River Basin namely; Meteorological station, Amphor Muang, Lopburi; Agricultural Meteorological station, Amphor Takpha, Nakhonsawan and Hydrometeorological station at Pasakchollasit Dam. One hundred and fourteen samples of natural rain-water and 204 samples of the Royal rain-water were analyzed for 19 standard parameters (pH, acidity, alkalinity, sulfate, chloride, hardness, ammonia, nitrite, nitrate, calcium, chromium, copper, iron, lead, cadmium, zinc, manganese, magnesium and mercury) for drinking water (WHO standard). The following parameters were significantly different between natural and Royal rain-water: sulfate, chloride, calcium, iron and magnesium. These chemicals were mainly the composition in rainmaking materials. Besides, it appeared that cadmium was present in both types of rain-water in high quality which should be further monitoring. All parameters except cadmium are in acceptable limit of WHO standard for drinking water. Therefore, both types of rain-water can be generally used. However, the presence of some chemicals in both types of rain-water shows the alternative cycles of chemicals used in agricultural activities and the content in rain-water. It appeared that the more chemicals used in agriculture, the more chemicals presented in the rain-water and may finally accumulated in soil and vegetation.

EFFECT OF INCREASING SOIL PORES BY VETIVER GRASS (*VETIVERIA ZIZANIOIDES* NASH.) IN HIGHLAND FRUITS PLANTATION

**Pongsakorn Jiwapornkupt¹, Poolsiri Chuchip², Worawit Yeesawat², Nuanprang Chaitakhob²,
Krongjit Kesjinda¹ and Veerasak Udomchoke¹**

¹Department of Earth Science, Faculty of Science, Kasetsart University.

²Agro-Ecological System Research and Development Institute,
Kasetsart University, THAILAND. E-mail: fscipsw@yahoo.com

The effects of increasing soil pores due to deep tillage by roots of vetiver grass (*Vetiveria zizanioides* Nash.) in fruits plantation at Saun-Buak-ha, Doi-pui Highland Research Station, Chiangmai Province were studied in order to develop a plantation system on highland watershed. Vetiver grasses were planted on the bench terrace surrounding the scion and root stock of 3 species of persimmon (2 years tree). Two half circular rows of vetiver grass were grew around each persimmon tree with radius 0.5 meter and 1.5 meters respectively. The interval of each vetiver bundles was about 0.2 meters. The stem diameters of scion and root stock of persimmon were measured every two month. The inner rows of vetiver grass surrounding each persimmon were cut after 16 and 25 months of planting period to increase the soil micropores. Soil moisture content and soil tension were measured to calculate pore size distribution. The results revealed significantly increased of soil micropores (0.19-9 micrometer). Most of the dense root zones were located at 0.5 meter depths. However, the amount of soil micropores at 0.9 meter tend to increase after 25 months. After 38 months of vetiver plantation, the Juhong on persimmon root stock showed maximum diameter and growth rate about 6.11 cm and 0.22 cm per month respectively, whereas the scion Hongmei persimmon was 5.21 cm in diameter with a growth rate of 0.2 cm per month.

FACTOR ANALYSIS OF THE IMPLICATION OF ADOPTING SUSTAINABLE APPROACH IN IRAN

M. Vahedi¹, H. Moradnejadi², H. Mehdizadeh³

¹Assistant professor of Islamic Azad university of Ilam

^{2,3}Assistant professors of Ilam university E-mail address: m_homauon@yahoo.com

Based on empirical evidences and research founding, the conventional agricultural extension and research approaches in Iran, have failed in significantly contributing to the formulation and addressing the strategies of sustainable approaches are dynamic interactive process designed to enhance and positively increase the impact of systematic and coordinated agricultural research and extension activities. One of the main characteristics of these approaches is that it is directed toward the problems of poor areas and small farmers. Therefore this approach can be best suited to the condition of Iranian small farmer's. The main purpose of this research was to investigate the implications of introducing sustainable approaches in Iranian context. This study was conducted within the general framework of descriptive survey research. The statistical sample of the research, contained two groups of extension socialists (n = 55) and agricultural researchers (n = 85), employed in the Ministry of Jihad agriculture which were selected and studied using proportionate stratified sampling method. Data were collected using a questionnaire which its validity was confirmed by a jury of extension experts and reliability was determined by calculating Cronbach's Alpha. Data analysis was accomplished using SPSS. Findings of this research indicated application of sustainable approaches in Iranian contexts implies that a set of infrastructure and educational should be taken in to consideration before launching programs in the country.

PRIVATIZATION OF AGRICULTURAL EXTENSION: TOWARD AGRICULTURAL SUSTAINABILITY

Farrokhi, S.

Iran, Islamic azad university, Ilam branch. Email address: safa_far@yahoo.com

Nowadays privatization of agricultural extension as complementary alternative for public extension has important role to gain access to agricultural sustainability whereby some of countries have good experiences about it. The purpose of this study was investigation of extension agents and farmer's perception regarding to privatization and agricultural sustainability. The data collecting instrument was structured questionnaire. The Statistical sample was 32 extension agents and 120 farmers. Results show that %51.5 of extension agents have negative or semi negative perception to privatization and this percentage was %72.5 for farmers. Correlation coefficients in extension agents respondents indicated that the level of education has positive and significant relation with their perception to agricultural sustainability and so was the relation between population, land area, mechanization level and participation variables with farmers perception. Based on multiple regression analysis education level, management system and participation of extension agents variables explained %33 of variation in their perception and participation and land area variables for farmers sample explained %27 of variation in their perception. As a result of this research the following suggestions have been made: performing educational courses. Increasing educational coverage by using further agents specially women, enhancement of linkage between agents and researchers, execution of professional conferences, constitution of privatization committee and further studies about effects of privatization of agricultural extension on sustainability of agriculture.

AN EVALUATION OF AGROFORESTRY PRACTICES FOR SUFFICIENCY ECONOMY AND SUSTAINABILITY OF LAND USE

Nathawat Khlangsap¹ Pramote Saridnirun² and Chongrak Wachrinrat³

¹Trat Agroforestry Research Station Kasetsart University Research and Development Institute,

²Department of Horticulture Faculty of Agriculture at Kampaeng Saen

³Department of Silviculture Faculty of Forestry, Kasetsart University

E-mail address: rdispk@ku.ac.th

This study was conducted at Khlongphu-Khlongpook Watershed in Trat province, eastern of Thailand. Seven types of land use practices including natural forest, pararubber plantation, fruit orchard, pineapple, mixed fruit orchard, mixed tree plantation and homegarden were evaluated. Indicators were used evaluation are: 1) environmental indicators (soil loss, organic matter and plant diversity), 2) economic indicators (profitability, time dispersion of income and input self sufficiency), and 3) Social indicators (risk and uncertainties and food security). Agroforestry index (AFI) for evaluate of sufficiency level of agroforestry land was estimated by using the weighting and scoring techniques. The suitability indicators in each aspect will be obtained by using the primary data and secondary data, and ranking all factors are 1 to 5. The results showed that AFI were classified as follows; AFI 1 is homegarden, AFI 2 is natural forest, AFI 3 are rubber plantation, mixed fruit orchard and mixed plantation, AFI 4 is fruit orchard and AFI 5 is pineapple land, respectively. From AFI value, homegarden was highest sufficiency level more than any other land use systems. Generally, homegarden has a multi-layered configuration, and all species within it are considered useful for several purposes. Moreover, the ecological functions of nutrient and energy balance within this system are similar to natural forest. Even though homegarden gives lower economic benefits compared to other cultivation patterns, its environmental and social aspects are better in the long term in terms of providing sustainable income, food security, and low risk due to its crop diversity. Thus,

homegarden agroforestry is a one of high potential land use to promote sufficiency economy and sustainability.

SUSTAINABILITY OF TROUT AQUACULTURE: CASE OF TITICACA LAKE IN PERU AND ITS IMPLICATIONS TO SOUTHEAST ASIA

Natalia Sifuentes Estrada

Tokyo University of Agriculture, Master Program

E-mail address: 73080005@nodai.ac.jp

When it began in the 1940s, trout aquaculture was conducted by farmers as a supplementary activity, but it has become a specialized business among some farmers and private corporations in recent years. Aquaculture of Trout has grown to a popular industry in Titicaca Lake, in the southern part of Peru. This paper focuses on the economics and technology of the specialized aquaculture farmers to assess its sustainability. In fact, interviews with these farmers revealed their confidence in continuing this activity. Farming problems such as environment conditions and investment are factors that made farmers change from agriculture to aquaculture. There are three objectives in this paper: (1) To show this activity done by farmers, its impacts on the environment, food safety and farm household economy; (2) To demonstrate interactions between agriculture and aquaculture activities; and (3) To analyze Asian cases of aquaculture in order to show differences between agriculture and aquaculture activities.

A series of intensive interviews were conducted with farmers, companies and regional organizations to study economic and environmental issues. Questionnaire survey was also conducted on local people in order to know about their fish consumption. It became clear, strict environment rules are needed to maintain aquaculture of trout as worthy activity. There are also problems of investment and educating farmers with respect to aquaculture and environment conservation

STRATEGIES FOR THE INSTITUTIONALIZATION OF THE SOLID WASTE MANAGEMENT PROGRAM IN AN ACADEMIC COMMUNITY: TOWARDS SUSTAINABLE MANAGEMENT OF RESOURCES

Fe Esperanza T Mateo, Rowena C Sodela,

University of Rizal System Main Campus Tanay, Rizal, Philippines, nfmateo@yahoo.com

University of Rizal System Main Campus Tanay, Rizal, Philippines, rowenacsodela1@yahoo.com

The program of the Philippine government on solid wastes provides for the systematic, comprehensive and ecological management of waste materials from various sources. Its features call for the participation of various sectors including academe. After all, it is not just a seat of learning, it also opens avenue for research and development undertakings. In this research, the strategies that can strengthen the institutionalization of the solid waste identified. Likewise, how such strategies can support proper management of resources were determined. The relation of the program to sustainable resource management was looked into. Simple random sampling method was employed in the selection of respondents composed of the stakeholders such as the faculty, staff, parents, households and students. Based from the data gathered, the respondents are willing to support the program and there are various strategies that could be adopted which include production of information education campaign materials, crafting of policies related to the program coupled with strict enforcement of such whenever necessary, involvement of stakeholders in the composting, recycling, segregation and proper disposal activities, periodic monitoring of the activities, construction and operationalization of the Material Recovery Facility, improvement of the existing dumpsite, inclusion of the solid waste management program in the research priorities of the University and generation of appropriate

technologies in handling solid wastes. The stakeholders find the implementation of the program essential and worthy of support, the strategies are significant to properly manage the resources.

AGRO-TOURISM TOWARDS SUSTAINABLE MANAGEMENT

Sasiya Siriphanich, Am-On Aungsuratana and Teernat Kalpax

Faculty of Agriculture at Kamphaeng Saen, Kasetsart University,
Nakhon Pathom, THAILAND. E-mail address: sasiya.s@ku.ac.th

A study on agro-tourism towards sustainable management in 2006-2008 was performed by gathering and upgrading information from Saraburi and Nakhon Rachasima, Thailand as the model. The 11 ideal concerned stakeholders were interviewed. The findings revealed that standardization of agro-tourism was essential to ensure tourist satisfaction and create sustainable tourism, in which 32 indexes, comprising 7 compulsory standards will help to elevate agro-tourism standard towards sustainable management. According to stakeholders the indexes in order of importance were 13 indexes in management administration systematization, 5 indexes in consumer concerns, 2 indexes in opportunity for community participation, 4 indexes in facility and services accommodation, 3 indexes in tourism resources image, 1 index in farm activities to let tourists participate and recognize folk norms and farm culture, and 4 indexes in opportunity to enhance farm knowledge for tourists.

THE STUDY OF DIVERSITY OF AQUATIC ANIMALS IN KAPUR DISTRICT, RANONG PROVINCE TO DEVELOP INTO EDUCATIONAL ECOTOURISM

Suksileung S.¹, Koto R.², Attasat C.¹ and Praphairaksit N.²

¹ Institute of Ecotourism, Srinakharinwirot University. THAILAND

² Biology Department, Faculty of Science, Srinakharinwirot University. THAILAND

Contact detail: rakchanok@swu.ac.th

The biological diversity plays an important role in tourism industry in Kapur District, Ranong Province. This area holds a wide variety of fertile natural resources, especially mangrove forest as well as coral reef and sea grass. Hence, it can be foreseen that this place should be able to develop into an ecotourism destination and educational coastal ecotourism site. In this study, we aimed to survey the diversity of aquatic animals in the coast of Kapur district. The results of the study will be useful in creating an appropriate tourism activities' pattern, raising local people and tourist awareness on environmental conservation. The specimens were tri monthly collected during the period of March to November 2008 and studied from 7 locations; Laem-son beach, Koh Maprow, Koh Nok-hook, Koh Thoa, Koh Piak-num-yai, Koh Piak-num-noi and Ao Khoei. The results indicated that there was 86 species of aquatic fauna which were mollusc (39 species), echinoderm (18 species), crab (15 species), fish (5 species), shrimp (2 species), polychaete (6 species) and brachiopods (1 species). The numbers of species and species composition change depending on season. Koh Thoa is the site with most abundance of 23 aquatic fauna species, following by Laem-son beach (19 species) and Koh Piak-num-yai (13 species), respectively. In addition, one of rare species, tongue shell (*Lithophaga nasuta*) has been widely found in the area of Koh Thoa and Koh Nok-hook. In brief, this study reveals that the Kapur District is an important living habitat especially acting as nursery areas for conserving marine creatures. It should also be preserved as a significant biological and ecological learning environment with high potentialities for ecotourism.

**THE CAPACITY AND NETWORK DEVELOPMENT OF THE SUB-DISTRICT
ADMINISTRATION ORGANIZATION TOWARDS THE PARTICIPATION OF
ENVIRONMENT AND NATURAL RESOURCES CONSERVATION**

**Dusadee Charoensuk¹, Phayun Arkaraborvon², Pornthida Visetsillapanon³,
and Surinporn Sri-in⁴**

Department of Sociology and Anthropology,
Faculty of Social Sciences, Kasetsart University, Bangkok 10900, Thailand.
dusadee_cha@yahoo.com, fsocddc@ku.ac.th

The capacity and network development of the Sub-district Administration Organization towards the participation of natural resources conservation had been using mixed method of quantitative and participation action research in implementation the research with the 134 samples of the members and community leaders in Tambon Kok-kram, Supanburi Province. The research result revealed the development of capacity and the network of members of sub-district administration, community and children leaders on the environmental and natural resources conservation, also the development of the local wisdom in organic agriculture, and enhanced team working and the good relationship between them. They had better understanding on the environment and natural resources conservation and increased positive attitude to the organic agriculture base on the King Bhumipol's Philosophy of economic sufficiency including induced the public mind for the natural resources conservation for all of them.

SURVEY ON FUNGAL DISEASES OF MEDICINAL PLANTS IN JAPAN

Machiko Sano, Kaoru Susuki, Takao Kobayashi and K. T. Natsuaki

Tokyo University of Agriculture, Japan
(corresponding author Machiko Sano E-mail: 69080005@nodai.ac.jp)

A great potential of medicinal plants as natural and genetic resources has been recognized. In Japan, however, the study on diseases and their causal fungi on medicinal plants has not been conducted sufficiently. Thus we organized a series of surveys on diseases of wild and cultivated medicinal plants including some traditional and/or Chinese medicinal plants for several years. In the surveys since 2004, over 90 diseased plant samples in 69 genera from 43 families were collected from total 12 locations in 8 prefectures in Japan. After observation of symptom development, fungi in over 32 genera were detected and identified mainly by morphological characteristics. Among them, 3 new fungal diseases, diseases by *Alternaria alternate* on *Petasites fragrans* (Sweet coltsfoot), *Septoria tussilaginis* on *Farfugium japonicum*, and *Pseudocercospora evodiicola* on *Evodia rutaecarpa*, were reported for the first time in Japan. Six fungi from *Aralia cordata*, *Arbutus unedo* (cane apple), *Glycyrrhiza glabra* (licorice), *Helleborus niger* (Christmas rose), *Paederia scandens*, and *Zingiber mioga*, respectively, were also partially identified as possible new pathogens and/or new species which have not been previously described. The study on fungal diseases of medicinal plants is significant for conservation and stable production of such useful plants. The evaluation of impact of fungal infection on quantity and quality of pharmaceutical substances should be also focused in the future. The present study showed the diversified fungal flora on medicinal plants in Japan.

**BIODIVERSITY ASSESSMENT OF ICHNEUMONOID PARASITIDS
(HYMENOPTERA: ICHNEUMONOIDEA) IN RICE ECOSYSTEM**

Nur Azura, A. and Tan Shilan, M.S.

¹Dept. of Plant Protection, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, MALAYSIA (nur_azura@putra.upm.edu.my)

The diversity of Ichneumonoid parasitoids (Hymenoptera:Ichneumonoidea) was studied to identify the Ichneumonoid parasitoids associated with the rice ecosystem. Five malaise traps were set up in the rice field situated at Bandar Baharu (northern part of Peninsular Malaysia) Kedah, Malaysia. The specimens were collected weekly for 3 consecutive weeks. A total number of 16 subfamilies were obtained from the sampling comprising of 159 individuals. The number of individuals obtained from each subfamilies was significantly different ($p < 0.001$). The highest individuals abundance sampled were from the subfamily Microgastinae (38) , followed by subfamily Cryptinae (36) and Cardiochilinae (18) and Pimplinae(15). Only a single individual was obtained from the subfamilies of Cremastinae, Ichneumoninae, Mesochorinae and Rogadinae. The Shannon-Weiner Species Diversity Index (H') of ichneumonoids in the second (63 to 73-days of age) and the third sampling period (63 to 72-days of age), with the value of 2.7 and 2.51 respectively, were significantly higher than the first sampling period (56 to 63-days of age) which was only 2.07. This results were supported with the total number of subfamilies and individuals obtained from second and third sampling which were 12 subfamilies, 68 individuals and 14 subfamilies, 75 individuals respectively, as to compare with only 7 subfamilies and 16 individualas in the first sampling. The most abundance species captured were *Amauromorpha accepta metathoracica* Ashmead (Ichneumonidae: Cryptinae) *Cardiochiles* sp (Braconidae:Cardiochilinae) and *Macrocentrus* sp. (Braconidae:Macrocentrinae).

THE CONDITIONS AND SUBJECTS OF SIQUASA PRODUCT DEVELOPMENT

Takayuki Aibara , Kazuhisa Goto, Hiroki Ikoma

National Agriculture and Food Research Organization, Japan;
E-mail:aihara@affrc.go.jp gotok@affrc.go.jp halmens@affrc.go.jp

Regarding acid citrus Siquasa (Siquasa, *Citrus depressa* HAYATA) is produced mainly in the north area of Okinawa. From the health functionality the development of marketable new product of siquasa is desired, that is including not only juice but also use of unused by-product. This paper examined the present conditions and the subjects of product development of Siquasa. The following 4 points analyzed: (a) present conditions of Siquasa production (b) trend of Siquasa production markets (c) unused by-product generation at Siquasa processing factories (d) consumer recognition for Siquasa. As the result, the following points were cleared. (a) Production volume was decreased, but functionality of siquasa was introduced by mass media at 2000, then it turned into increase along with the price increase. Currently, new planting is actively conducted. (b) Since juice is main product, it is considered that there are many items. On the other hand, it is the issue of future product development that seasoning that is supposed to be used on a daily basis is not sold in daily supermarkets so much. (c) In certain processing factory, by-product of juice (juice squeezed for the second time, seed and final by-product, etc) makes up more than half of the material is hardly used. (d) By the first nationwide survey, the high recognition was clarified. Beverage such as juice or alcoholic drinks, or seasoning makes up the majority of the future expected products. In the future, to continually develop Siquasa related industry, the following 3 points become issues. (a) clarification of appropriate material price range, and creation of management model /product development based on it (b) development of integrated utilization technology which enables zero-emission (c) development of business model which supports integrated utilization technology from production/process/distribution aspect.