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# INDONESIAN AGRICULTURAL RESEARCH ABSTRACTS

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## INDONESIAN AGRICULTURAL RESEARCH ABSTRACTS

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#### **PREFACE**

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Director of Indonesian Center for Agricultural Library and Technology Dissemination

#### E11 LAND ECONOMICS AND POLICIES

#### 151 FIRMANSYAH, M.A.

[Sustainable peatland management: case study of rubber and intercrops in Jabiren Village, Pulang Pisau Regency, South Kalimantan (Indonesia)]. *Pengelolaan lahan gambut berkelanjutan: studi kasus pengembangan karet dan tanaman sela di Desa Jabiren, Kabupaten Pulang Pisau, Kalimantan Tengah* / Firmansyah, M.A.; Nugroho, W.A.; Mokhtar, M.S. (Balai Pengkajian Teknologi Pertanian Kalimantan Tengah, Palangkaraya (Indonesia)). [Proceedings of the national seminar on sustainable peatland management], Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 233-243, 12 ill., 1 table; 7 ref. 631.445.1:631.61/SEM/p

HEVEA BRASILIENSIS; PEATLANDS; INTERCROPPING; AGRONOMIC CHARACTERS; LAND MANAGEMENT; SUSTAINABILITY; KALIMANTAN.

Utilization of peat for the rubber plants have been carried out by people in Central Kalimantan. Upon the occurrence of large-scale forest and peat fires, peat utilization for rubber trees increasing, especially in the former area of the fire. ICCTF Demonstration plots in the Jabiren Village, Jabiren Raya District, Pulang Pisau Regency, Central Kalimantan was the area of the former peat fires region in 2005. Location was a peatland with the criteria in the thickness is very deep, between 5 to 7 meters, and level of maturity varies between hemic and sapric. Rubber derived from the seeds (GT-1) were planted in 2006. The purpose of this study was to determine the effect of material amelioration (pugam A, pugam T, chicken manure, soil mineral and control) of the agronomic characteristics of rubber plants and between plants that have been implemented during the one year of the study, from January 2011 - March 2012. Each treatment plot had a size of 35 m x 180 m consisted of seven rubber aisle with rubber planting distance 3 m x 5 m. Planting carried out in the aisle between the rows of rubber trees (width 5 m), namely for rice, corn was replaced, and the last pineapple. The results showed that the rubber stem circumference increment for a period of one year is about 10 cm is obtained at Pugam T treatment, and control, and Pugam A, while in chicken manure treatment of about 8.45 cm, and mineral land treatment amounted to only 7.17 cm. Utilization aisle between rows of rubber age 5 years showed that the response of the pineapple plant was more able to adapt (grow well) compared to rice and corn. Based on the agronomic parameters of high accretion pineapple plant showed that after 6 months of planting, the treatment pugam A was the highest reached 30.7 cm, while based on the parameter increment width and number of leaf canopy, chicken manure treatment was the highest, reaching respectively 82.8 cm and 10 strands. Plant development of rice or corn crops as the intercropping crops could not produce at the age of 5 year rubber, while the development of the pineapple plant looked quite able to adapt to the shade of the canopy of rubber.

#### 152 MULIJANTI, S.L.

Growing forage of former sand-excavation sites (a case study in Cibeureum Wetan Village, Cimalaka District, Sumedang Regency) [Indonesia]. *Pemanfaatan lahan bekas galian pasir dengan hijauan pakan ternak (studi kasus di Desa Cibeureum Wetan, Kecamatan Cimalaka, Kabupaten Sumedang)* / Mulijanti, S.L.; Nurbæti, B. (Balai Pengkajian Teknologi Pertanian Jawa Barat, Bandung (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform], Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisæstra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 148-158, 2 ill., 1 table; 14 ref. 332.2.021.8/.3/SEM/p

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GOATS; FORAGE; LEGUMINOSAE; WASTE LAND; LAND USE; FEED CROPS; RECLAMATION; LAND PRODUCTIVITY; ANIMAL HUSBANDRY; FARMYARD MANURE; JAVA.

Integrated farming approach between livestock, fodder crops and other agricultural commodities is an alternative land use of former sand mining. In the former sand mining land, planting cover crops such as legumes that have high tolerance for the former mining conditions will serve to accelerate the greening program and have good nutritional value to be used as animal feed for goats after legume grow well to provide fodder for goats. The former sand mining land has the potential for planting legume after addition of manure as a soil recovery, which can be obtained from goats and forage legume used as animal feed. The data processed includes general goats population, variability of feeding, farmers group institution, and marketing. The data obtained was analyzed descriptively. Identification and characterization results indicate that the use of the former sand mining land in the Cibeureum Wetan Village, Cimalaka Subdistrict, Sumedang District is dominated by dry land, which has not been utilized optimally, even most of the land used for sand mining. Currently, the land used for the cultivation of legumes and raising livestock, especially PE goats. Goat raising can transform marginal land into potential source of forage.

#### 153 MURDOLELONO, B.

**Utilization of neglected-land using rain water in the dryland of West Timor's.** *Upaya pengelolaan lahan tidur dengan memanfaatkan sisa air hujan di lahan kering Timor Barat* / Murdolelono, B.; Da Silva, H.; De Rosari, B. (Balai Pengkajian Teknologi Pertanian Nusa Tenggara Timur, Kupang (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform], Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.) Bogor (Indonesia): PSEKP, 2013: p. 190-198, 3 tables; 11 ref. 332.2.021.8/.3/SEM/p

VIGNA RADIATA RADIATA; ARABLE LAND; LAND MANAGEMENT; FARMING SYSTEMS; RAINWATER; USE; ZERO TILLAGE; PROFITABILITY; DRY FARMING; NUSA TENGGARA.

A study of utilizing rainwater in the dry land of West Timor was conducted in the Regencies of Kupang and TTS during the period of February - May 2012 on an area of 66.5 hectares. The study revealed that: (a) the growth of mungbean was considered good, particularly among the stoned areas and relatively free of stillwater, (b) mungbean farming was considered profitable due to its production which reached 0.6/ha with R/C ration 1.55, and (c) farmer's responses on the trial were positive due to the fact that the practice on their land did not interfere their farming routines, and financially profitable. It was concluded that mungbean farming on the abandoned land during the end of rainy season could be adopted for it was easy to practice, economically profitable, and socially accepted.

#### 154 SABIHAM, S.

[Peatland management for oil palm development in Indonesia]. *Pengelolaan lahan gambut untuk pengembangan kelapa sawit di Indonesia* / Sabiham, S.; Sukarman (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.) Bogor (Indonesia): BBSDLP, 2012: p. 1-15, 4 ill., 6 tables; 23 ref. 631.445.1:631.61/SEM/p

OIL PALMS; PEATLANDS; AGRICULTURAL DEVELOPMENT; LAND SUITABILITY; AGRICULTURAL PRODUCTS; LAND USE; COST BENEFIT ANALYSIS; POLLUTION; INDONESIA.

Peatlands with their nature to be fragile should be enhanced their value by using the so-called of sustainability-based land development that proposed as the development concept of "constructive-adaptive". Conversion of peatlands for other purposes based on land capability and land suitability as well as the appropriate use of technology should be the basis for their future development. Thus, the selection of suitable technologies and commodities with the efforts to reduce the land damage as small as possible is very important. Oil palm is one of the agricultural commodities that could be able to adapt at different types of land, including peatlands. With proper water management and the efforts to increase peat stability and  $\rm CO_2$  sequestration in the area of oil palm development, the use of peatlands will provide a great benefit, not only for today but also for the future.

#### 155 SUBARDJA, D.

[Technology of rice field construction on tin mined lands in Bangka Belitung (Indonesia)]. Teknologi pencetakan sawah pada lahan bekas tambang timah di Bangka Belitung / Subardja, D. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Kasno, A.; Sutono [Proceedings of the national seminar on fertilizer and degraded land reclamation technology], Bogor (Indonesia), 29-30 Jun 2012 / Wigena, I G.P.; Nurida, N.L.; Setyorini, D.; Husnain; Husen, E.; Suryani, E. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 111-122, 2 ill., 4 tables; 10 ref. 631.617/.8/SEM/p

BANGKA; RICE FIELDS; WASTE LAND; TECHNOLOGY; SOIL CHEMICOPHYSICAL PROPERTIES; LAND IMPROVEMENT; PROCESSING; AGROPASTORAL SYSTEMS.

The useful of land after tin mining for agriculture has a challenge and significant opportunity to support food security and improve environmental quality. This research aims to study the land characteristics and construct technology for create a rice fields in the tin mining land in Bangka Belitung Province. Study sites located in the former tin mining area of PT. Kobatin in Perlang Village, Central Bangka Regency. Stages of research include: (1) survey of land identification and characterization, (2) to set up the model of rice field design, (3) the technique of rice fields construction, and (4) to prepare the model of integrated agriculture and SITT. Information on slope, soil depth, texture, permeability and water-resistant layer depth, and soil chemical properties resulting from the survey is used as the basis for the identification of land use in the preparation of the design of the rice field construction. Generally, land after tin mining has an irregular surface, the texture varies from coarse to medium, the structure loose to massive, effective soil depth of shallow (<50 cm), very slow permeability at a depth of 40 cm, very acidic soil, very low soil organic and poor nutrient. In the construction of rice fields, the surface soil was dredged soil as deep as 40 cm or to impermeable layers, soil was pushed onto the lower and flattened by heavy equipment (dozer, excavator). Fields plot was made flat or terraced with a size range 20-50 m x 50 m, depending on slope land, the steeper the slope the smaller the size of the rice terraces. Border of plot was made from soil which thrust by dozer until 50 cm - 60 cm width, length followed length of plot size, height 40 cm - 60 cm. On the every plot at rice field was added 1,000 t/ha of top soil materials or as high as 10 cm, organic matter (manure) 10 t/ha, and limestone (dolomite) 1 t/ha. Land were flooded with water which risen 10 cm from channel for overnight, then puddled by handtractor and flooded with 5 cm - 10 cm. At first rice growing season 250 kg urea fertilizer, 100 kg SP-36, and 100 kg KCl and organic matter (manure) 10 t/ha were given. The fertilizer and organic material in Perlang were spreaded evenly. An average of rice yield at first harvest in Perlang was 3.8 t/ha harvesting dried rice, while in Cerucuk, Belitung Regency rice yield is about 5.6 to 6.7 t/ha. Productivity of rice field in Perlang is still low but it shows the development of better land quality.

#### 156 WIDIASTUTI, D.P.

Potencies and constraints of swamp land management for farmers' welfare improvement in Sambas, West Kalimantan [Indonesia]. *Potensi dan kendala dalam pengelolaan lahan sub optimal pasang surut untuk peningkatan kesejahteraan petani di Sambas, Kalimantan Barat* / Widiastuti, D.P. (Balai Pengkajian Teknologi Pertanian Kalimantan Barat, Pontianak (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform] Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 213-224, 2 ill., 1 table; 7 ref. 332.2.021.8/.3/SEM/p

KALIMANTAN; INTERTIDAL ENVIRONMENT; LAND MANAGEMENT; CAPITAL; SEED CERTIFICATION; SOIL PH; IRON; SWAMP SOILS; FARMERS; SOCIAL WELFARE; KALIMANTAN.

Utilization of suboptimal tidal lands is still restrained by numerous technical problems. If these problems could not be resolved, many tidal lands will be abandoned by farmers or the owners. Sambas subregency is an area of rice farming in tidal land agro ecosystem, which is expected to contribute to local revenues and significant economic growth, especially for Sambas Regency, West Kalimantan. The purpose of this assessment is to determine the potential and constraints in managing suboptimal tidal lands in the regency. The assessment was conducted in Semangau Village, Sambas Subregency, Sambas Regency. Data were collected by interview technique during baseline surveys and participatory rural appraisal (PRA) implementation. The analysis reveals that the main obstacle to manage sub optimal tidal lands in rice farming, is capital scarcity, pests and diseases attack, certified seeds unavailability, high soil acidity and Fe toxicity, water scarcity in the dry season and irrigation problem, and lack of thresher. With technological improvements in suboptimal tidal lands management in the area, crop productivity, farm revenues, employment generation, and labor compensation increases in rice farming could materialize.

### E20 ORGANIZATION, ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL ENTERPRISES OR FARMS

#### 157 PRASETIASWATI, N.

Feasibility of sweet potato farming on an acid dryland soil in Lampung [Indonesia] applying improved ridging technology. *Kelayakan usaha tani ubi jalar dengan penerapan teknologi pengguludan di lahan kering masam di Lampung* / Prasetiaswati, N.; Radjit, B.S. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 188-194, 6 tables; 17 ref.

IPOMOEA BATATAS; VARIETIES; CULTIVATION; RIDGING; FARMING SYSTEMS; SOIL CHEMICOPHYSICAL PROPERTIES; GROWTH; YIELDS; COST BENEFIT ANALYSIS; FARM INCOME; DRY FARMING; ACID SOILS.

An experiment was carried out at Natar Experiment Station, South Lampung, from March to June 2010. The objective of the research was to identify technical and economic feasibilities of sweet potato farming system on a dry acid soil using improved ridging technology. The 112

technologies tested were: (1) use of large ridges (60 cm high) with a 125 cm x 20 cm plant spacing without breaking down the ridges, and (2) use of small ridges (30 cm high) with a 100 cm x 25 cm plant spacing and followed by breaking down the ridges, and the common farm practice as control. Sweet potato varieties Sawentar and local Kuning Banyuwangi were used in this experiment. The fertilizers applied in the improved technologies were at rate of 300 kg urea + 200 kg SP-36 + 100 kg KCl + 500 kg dolomite + 4 t manure/ha. Results of the experiment showed that yields of sweet potato varieties grown on large ridges were higher than those grown on the small ridge. Sawentar variety that was grown on large ridges yielded 18.68 t/ha and on small ridges 14.43 t/ha fresh tubers, with benefits of Rp 16,090,000 (B/C ratio 2.22) dan Rp 10,987,500 (B/C ratio 1.56), respectively. The local variety Kuning Banyuwangi produced lower yield than that of Sawentar on both of the improved technology with B/C ratios < 1.0. Sawentar variety that was grown on the small ridge gave MBCR up to 3.09, hence this technology could be recommended to be applied in the dry land acid soil.

#### 158 SEMBIRING, A.

Partial budget analysis of assembled potato integrated crop management technological components in highland areas. *Analisis anggaran parsial rakitan komponen teknologi pengelolaan tanaman kentang secara terpadu di dataran tinggi* / Sembiring, A.; Rosliani, R. (Balai Penelitian Tanaman Sayuran, Lembang (Indonesia)). *Jurnal Hortikultura* (Indonesia) ISSN 0853-7097 (2011) v. 21(4) p. 385-392, 6 tables; 19 ref.

SOLANUM TUBEROSUM; HIGHLANDS; CROP MANAGEMENT; CULTIVATION; FERTILIZERS; PEST CONTROL; DISEASE CONTROL; INTEGRATED PLANT PRODUCTION; BUDGETS; COST ANALYSIS; FARMERS.

The objective of the study was to compare the IVEGRI's potato integrated crop management to farmers' practices. An on-farm trial was carried out in Ciburial Village of Lembang from May to September 2009. Potato integrated crop management components assembled in Indonesian Vegetable Research Institute (IVEGRI) was compared to simulated farmers' practices. Farmers' practices were derived from averaging the result of a prior farm survey to 24 potato farmers in Pangalengan, Garut, and Lembang. Results showed that IVEGRI's technology did not provide a higher yield as compared to farmers' practices. Even though the IVEGRI's technology spended some additional costs for subsoiling, trap crop (Tagetes), sex pheromone, and yellow trap, but its total cost was still slightly lower than of farmers Rp 494,327.58 and Rp 536,735.21 per m², respectively. Partial budget analysis indicated that the IVEGRI's technology provided additional net income as much as Rp 10,447.63 per 100 m² or Rp 1,004,763 per ha. This study indicated a need to conduct similar research in a larger scale to seek for its consistency.

#### F01 CROP HUSBANDRY

#### 159 BAON, J.B.

[Prospect of sustainable liberoid coffee cultivation in peatland]. Prospek budi daya kopi liberoid berkelanjutan di lahan gambut / Baon, J.B.; Hulupi, R.; Abdoellah, S.; Sugiyono, Y.; Wibawa, A.; Suhartono (Pusat Penelitian Kopi dan Kakao, Jember (Indonesia)) [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 345-255, 3 tables; 10 ref. 631.445.1:631.61/SEM/p

COFFEA LIBERICA; COFFEA EXCELSA; CULTIVATION; PEATLANDS; FERTILIZER APPLICATION; BOTANY; PLANT ANATOMY; PRODUCTION; CHEMICOPHYSICAL PROPERTIES.

Coffee (Coffea spp.) is a perennial crop which can be developed in nearly all types of land from lowland until highland, including peatland, on the other hand this commodity may support the public, local and national economic, besides improving environment quality. Management of natural resources in peatland areas must be done in wisdom way without devastating natural resource conservation. Peatland as a land resource which potentially be used for cultivating is not optimally exploited. Several potential species of coffee which can well adapt to peatland condition are classified as liberoid, such Coffea liberica, Coffea excelsa, Coffea dewevrei, Coffea klainii, and Coffea aruwimiensis. The objective of this paper is to discuss the prospects of sustainable farming of liberoid coffee in peatland areas. Many liberoid coffee farmers in Indonesia traditionally have many experiences in cultivating this type of coffee by using simple technology based on local wisdom suited with natural condition, economic needs and local community culture. Some technologies based on local wisdom in managing either peatland or liberoid coffee cultivation have been well-known although with some constraints in field implementation due to limitation in proper production equipment availability. By understanding its environmental condition and learning from their experience, farmers have developed liberoid coffee farms with high productivity, environmental friendly and sustainable. This review concludes that development of liberoid coffee farms with considering local wisdom of coffee farmers can be sustainably practiced.

#### 160 DAVID H., J.

Study on loss of rice on suboptimal land to raise farmers revenues in West Kalimantan [Indonesia]. *Hubungan antara kehilangan hasil padi pada lahan suboptimal dengan pendapatan petani di Kalimantan Barat* / David H., J. (Balai Pengkajian Teknologi Pertanian Kalimantan Barat, Pontianak (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform]] Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 355-365, 5 tables; 13 ref. 332.2.021.8/.3/SEM/p

RICE; HARVESTING LOSSES; HANDLING; DRYING; MILLING; NATURAL DRYING; QUALITY; DRY FARMING; FARM INCOME; KALIMANTAN.

Paradigm and orientation of integrated rice processing is a must, because only high quality and competitive commodity prices is able to capture the market and will improve farmer's income. Therefore, postharvest handling is an important factor in the effort to increase the productivity and value added of rice. The rice value is determined by the quantity (weight, volume) and quality. The production loss consists of two components, namely the decrease in quantity and quality. The decrease in quantity generally occurs due to loss of physical products thoroughly, while the quality loss is a decrease in the intrinsic physical properties of the product (shape, color, flavor, aroma, and the chemical content, and blackened materials intrusion). In tidal swamp of West Kalimantan low quality rice is often encounterred, known as batik rice. The main cause is the improper harvest and postharvest handling, especially delayed drying process due to lack of manpower and facilities owned by the farmers. The assessment was conducted in September 2012 in the Kebong Village, Kelam Permai Subdistrict, Sintang District. The wet grain of dry season of 2012 was used in this study. The two technology package introduced were: (1) Drying grain using bed dryer with rice husks fuel, and (2) Rice milling with various configurations. The observation indicated that the loss of rice under solar drying was 3.39%, while the loss under box dryer was 6.05%. The RMU

1, indicating that the milling rate of the grain dried using a dryer box (61.91%) was lower than that by using sun drying (64.12%). While at RMU 2, the milling rate of rice dried by using box dryer was (62.46) lower than that by sun drying (64.497%). For milling shrinkage in 2 (two) Rice Milling Unit (RMU) showed that the average decrease in grain milled dried using dryer box (4.78%) was lower than that in the sun drying method (5.80).

#### 161 FANINDI, A.

Forage and seed production of puero (*Pueraria javanica*) in a different light intensity level. *Produksi hijauan dan benih puero (Pueraria javanica) pada taraf intensitas cabaya yang berbeda* / Fanindi, A.; Sutedi, E.; Prawiradiputra, B.R. (Balai Penelitian Ternak, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* (Indonesia). ISSN 0853-7380 (2013) v. 18(2) p. 81-87, 6 tables; 17 ref.

PUERARIA PHASEOLOIDES; SEEDS; FORAGE; PRODUCTION; INTEGRATION; DIGESTIBILITY; IN VITRO EXPERIMENTATION;

Puero (Pueraria javanica) is forage that can serve as a cover crop in plantations. The limiting factor for plant growth in the plantation is the light intensity, therefore the influence of light intensity on forage and seed production of Puero needs to be examined. Research was conducted at Kaum Pandak Research Station of Indonesian Research Institute for Animal Production Bogor and Laboratory of Agrostology Faculty of Animal Husbandry, Bogor Agricultural University, for 16 months. Four levels of light intensity i.e. 100, 80, 60 and 40% were applied, leguminosainous species Puero (Pueraria javanica), was used. The treatments were arangged in randomized completely block design with 3 replications. Data collected were analyzed by ANOVA and Duncan's Multiple Range Test. Forage production was evaluated in one year. The forage quality and digestibility (in vitro) were assessed. Seed production was recorded accumulatively from seasonal seed production during one year. Results showed that light intensity affected (P<0.05) forage and seed production, chlorophyll a and total chlorophyll of Puero, but did not affect (P>0.05) quality and digestibility of Puero. The highest forage and seed production of Puero were obtained from full light intensity (100%), and seed production of Puero was affected (P<0.05) by light intensity. The seed quality of Puero was also affected by light intensity. The best seed quality of Puero was achieved by from 80% light intensity.

#### 162 HIDAYAT, Y.

Feasibility of farming system of the new improved rice varieties by applying the integrated crop management in Central Halmahera District [Indonesia]. *Kelayakan usaha tani padi varietas unggul baru melalui PTT di Kabupaten Halmahera Tengah* / Hidayat, Y.; Saleh, Y.; Waraiya, M. (Balai Pengkajian Teknologi Pertanian Maluku Utara, Tidore (Indonesia)). *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 166-172, 4 tables; 18 ref.

ORYZA SATIVA; HIGH YIELDING VARIETIES; INTEGRATED PLANT PRODUCTION; APPROPRIATE TECHNOLOGY; AGRONOMIC CHARACTERS; HARVESTING DATE; YIELDS; FARMING SYSTEMS; COST ANALYSIS; FARM INCOME; MALUKU.

Increasing rice production in isolated areas of the Central Halmahera District, North Maluku Province, is expected to strengthen food security as well as increasing farmers' income. The objective of the study was to identify technology for increasing rice productivity in the lowland rice farming. An experiment was conducted at Sumbersari Village, Central

Halmahera District, North Maluku Province, from July to October 2010. Four treatments consisted of four high yielding rice varieties (Inpari2, Inpari3, Inpari7, and Silugonggo) were cultivated applying the integrated crop management (ICM) and one variety (Cigeulis) was grown applying the local farmer's practice as control. The experiment was arranged in a randomized completely block design with three replications. Results showed that yield of cultivar Inpari2 (7.15 t harvest dry grains (HDG)/ha), Inpari3 (6.29 t HDG/ha), Inpari7 (6.35 t HDG/ha), and Silugonggo (5.23 t HDG/ha) were higher than that of Cigeulis variety (4.69 t HDG/ha). The R/C ratios of the ICM were higher than that of the conventional crop management, namely for Inpari2 1.95, Inpari3 1.72, Inpari7 1.75, and Silugonggo 1.43, whereas the non-ICM (Cigeulis) was 1.49. The seed advantage value for the respective varieties was 2.14, 1.62, 1.65, and 1.02, respectively, each was higher than 1. This study indicated that introduction of new varieties into the ICM system increased rice productivity by 0.54-2.46 t/ha and increased farmers' incomes by Rp 1 to Rp 3 million/ha. This meant that the adoption of new rice variety applying the ICM system in Central Halmahera, North Maluku, could be recommended for increasing rice production and farmers' income.

#### 163 ISKANDAR, D.

[Inoculation test of Fusarium sp. for agarwood production of A. beccariana culture]. Uji inokulasi Fusarium sp. untuk produksi gaharu pada budidaya A. beccariana / Iskandar, D.; Suhendra, A. (Pusat Teknologi Produksi Pertanian, Jakarta (Indonesia)). Jurnal Sains dan Teknologi Indonesia (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 182-188, 5 ill., 2 tables; 12 ref.

GUM PLANTS; INDUSTRIAL CROPS; GONYSTYLUS; CULTIVATION; FUSARIUM; INOCULATION; ISOLATION; NONWOOD FOREST PRODUCTS; PRODUCTION.

Gaharu (agarwood) is one of the most valuable of non-timber forest products (NTFPs) commodities in Indonesia, produced from *Aquilata* sp., *Gyrinops* sp., and *Gonystilus* sp. that has an important role in economic and income for the community surrounding forest. However, the intensive exploitation and uncontrolled harvest capacity has brought three potential species tends to decrease, and therefore gaharu is listed in the list of the CITES' Appendix II as endangered species for trading. One of the solutions to deal with those cases, researchers have been developing gaharu plantation as well technique to produce gaharu products through inoculation. The aim of this study was at finding the effectiveness of four different *Fusarium* sp. from different locations in Indonesia (Parung/F1, Banjarmasin/F2, Jambi/F3 and Gorontalo/F4) in order to produce gaharu. These Fusarium were inoculated to 10 year's old of *A. beccariana* at Penajam, East Kalimantan. The result showed that inoculant from Gorontalo (F4) gave the best result and the highest potential to the production of gaharu compare to other *Fusarium* sp.

#### 164 WAHYUNI, S.

Morphological characteristic, yield potential, and major rhizome constituent of nine accessions of wild ginger. *Karakteristik morfologi, potensi produksi dan komponen utama rimpang sembilan nomor lempuyang wangi* / Wahyuni, S.; Bermawie, N.; Kristina, N.N. (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 99-107, 1 ill., 7 tables; 22 ref.

ZINGIBER; DRUG PLANTS; PLANT ANATOMY; RHIZOMES; YIELDS; GROWTH; QUALITY; PROXIMATE COMPOSITION.

Wild ginger is one of Zingiberaceae family. Plants are used as a medicine for stamina improvement, anticancer and antiinfection. IMACRI had collected wild ginger from several areas and its potential characters should be evaluated. Characterization was conducted at Cicurua Experimental Garden, West Java on 2009-2010. Seed rhizome of nine accession was planted with 60 cm x 40 cm space, twenty numbers of plant each plot and three replication. Observation was carried out for morphological characters, growth, vield, and rhizome quality. Result showed that there were variations in morphology and growth of wild ginger. Plant height, numbers of tillers, numbers of leaves, leaves length, leaves width, and stem diameter among accessions were varied. Rhizome yield was generally more than 15 t/ha, rhizome having plenty of roots. Rhizome quality analysis showed that among accessions have essential oil content range from 1.34-4.61%, extract soluble water 16.22-23.5%, extract soluble ethanol 7.9-13.88%, fiber content 5.47-8.87%, and carbohydrate content 40-50%. GS-MS of wild ginger rhizome extract revealed totally around 50 constituent was detected. The highest constituent detected was zerumbone (36-49%). Moreover, acetic acid was also detected in all accession with value range from 4.64-14.36%. Other major constituents were -humulene, humulene oxide, -eudesmol, -selinene, linalool, 12-oxabicyclo, caryophilene oxide, 3-octadecyne, hexadecanoic acid, and 3-octyne 5-methyl. The composition of major constituent among collection numbers was different and reflected the differences of the flavour of the flesh rhizome. Seven collection numbers were having yield potential more than 15 t/ha, essential oil content more than 1% and zerumbone content 40%.

#### F02 PLANT PROPAGATION

165 HIDAYAT, I.M.

Basic seed (Go) production of several potato varieties from microtuber. *Produksi benih sumber (Go) beberapa varietas kentang dari umbi mikro* / Hidayat, I.M. (Balai Penelitian Tanaman Sayuran, Lembang, Bandung (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(3) p. 197-205, 2 ill., 2 tables; 31 ref.

SOLANUM TUBEROSUM; VARIETIES; TUBERS; SEED; IN VITRO CULTURE; SEED PRODUCTION.

The increasing and developing potato production area as well as potato seed industry which is spread through out the country must be supported by an efficient seed production and distribution system. The use of microtuber is one alternative to overcome seed production and distribution problems in Indonesia. Study on the use of microtuber in potato basic seed (Go) production was conducted in the Tissue Culture Laboratory and aphid-free Screen house, the Indonesian Vegetable Research Institute from June 2010 to April 2011. The study aimed to obtain information on multiplication rate of microtubers var. Amudra, Atlantik M., Cipanas, Granola L, Manohara, Merbabu, and Ping to produce tuber that meets basic seed criteria. Microtubers derived from in vitro culture of virus free plantlet of seven potato varieties viz Amudra, Atlantik M., Cipanas, Granola L., Manohara, Merbabu, and Ping with which their dormancy had broken were planted in the media composed of stable manure and burnt rice husk (1:1 v/v) sterilized by steaming for 4 hours. Planting distance was 10 cm x 10 cm, 1 cm depth. Each replication consisted of 20 tuber seeds. Completely randomized design with three replications was used in the study. NPK 16:16:16 at 5 g/l, 3 l/roller bench was applied at 1 week interval up to 10 weeks after planting (WAP). Growing media was added for hilling up at 4 and 8 WAP, and tuber was harvested at 12 WAP. The results indicated that tuber weight/plant, tuber number/plant, tuber proportion with diameter 0.7-1, 1.1-2, and 2.1-3 cm were highly significant different among tested varieties. Plants derived from microtubers var. Amudra and Merbabu performed the highest tuber weight/plant at each 35

and 34 g/plant, with tuber diameter proportion 0.7-1, 1.1-2, and 2.1-3 cm were 34.80, 50.52, 15.55%, and 50.15, 33.93, and 18.12%, respectively. Varieties that gave number of tuber/plant >10 were Granola L, Manohara, Merbabu, and Ping.

#### 166 KARYANTI

Use of KNO<sub>3</sub>, CaCl<sub>2</sub>, MgSO<sub>4</sub>, KH<sub>2</sub>PO<sub>4</sub> as macro nutrients and Benzyl Adenine on teak (*Tectona grandis* L.) *in vitro* propagation. *Pemanfaatan bahan teknis KNO*<sub>3</sub>, CaCl<sub>2</sub>, MgSO<sub>4</sub>, KH<sub>2</sub>PO<sub>4</sub> sebagai hara makro dan benzil adenin dalam perbanyakan jati (*Tectona grandis* L.) secara in vitro / Karyanti; Royani, J.I. (Balai Pengkajian Bioteknologi, Serpong (Indonesia)). *Jurnal Sains dan Teknologi Indonesia* (Indonesia) ISSN 1410-9409 (2012) v. 14(3) p. 203-208, 3 ill., 3 tables; 19 ref.

TECTONA GRANDIS; IN VITRO CULTURE; BA; KINETIN; NUTRIENTS; PLANT PROPAGATION; GROWTH.

Indonesia is a major producer of teak after India and predicted had gradually decrease if not followed by replanting. In general, teak plants propagated through seeds but have many disadvantages. Teak plant propagation using *in vitro* technique being an alternative to get the mass production of teak clones. *In vitro* technique, to some extent, needs a high cost particularly in using pure chemical substance. As an alternative solution, pure chemical substance can be substituted by using a few specific chemical substances such as KNO<sub>3</sub>, CaCl<sub>2</sub>, MgSO<sub>4</sub>, and KH<sub>2</sub>PO<sub>4</sub>. The research was aimed at evaluating induction of shoot teaks, planted on different media with macro element substituted by different chemical subtances such as KNO<sub>3</sub>, CaCl<sub>2</sub>, MgSO<sub>4</sub>, and KH<sub>2</sub>PO<sub>4</sub>. The result showed that using the same concentration between 2 different chemical substances on teak shoot induction, there was no different shoot growing in teak propagated between 2 media.

#### 167 KRISTINA, N.N.

Effect of coconut water on *in vitro* shoots multiplication, rhizome yield, and xanthorrhizol content of java turmeric in the field. *Pengaruh air kelapa terhadap multiplikasi tunas in vitro, produksi rimpang, dan kandungan xanthorrhizol temulawak di lapangan* / Kristina, N.N.; Syahid, S.F. (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia) ISSN 0853-8212 (2012) v. 18(3) p. 125-134, 10 tables; 31 ref.

CURCUMA XANTHORRHIZA; COCONUT WATER; IN VITRO; PLANT PROPAGATION; YIELDS; GROWTH.

Anticipated step for Java turmeric seed massal fulfillment was conducted by *in vitro* using cheap growth medium enriched with coconut water. The aim of the research was to analyse the chemical content of coconut water and its role on java turmeric micropropagation *in vitro* and their effect on yield and xanthorrhizol content. The experiement was conducted from May 2009 to August 2010 at Indonesian Spices and Medicinal Research Institute and Indonesian Center for Agricultural Postharvest Research and Development. The coconut water used comes from young coconut (7-8 months) and old coconut (10-12 months). The research consisted of four steps. First, analysis of growth regulator, vitamin and sucrose from coconut water using HPLC method. Second, the effect of several concentration od coconut water: 0, 5, 10, 15, 20, and 25% on *in vitro* multiplication. The experiment was arranged in completely block design with three replicates. The parameters observed were growth of culture during *in vitro*. Third, acclimatization and chlorophyll content of plant derived from *in vitro* and fourth, growth, and yield of java turmeric seed on pot containing soil + sand as

growth medium and xanthorrhizol analysis. The experiment was arranged in completely block design with three replicates. The parameters observed were growth characters, yield and xanthorrhizol content. Result showed that coconut water contain kinetin, zeatin, auxins in, vitamin, mineral and carbon source which used for *in vitro* shoots multiplication. The chemical of young coconut water was higher than old coconut. The growth medium enriched with 15% coconut water gave the best result on inducing shoots *in vitro* (average 4.6 shoots/bottle during 8 weeks culture), so its used as multiplication standard. Java turmeric seed from *in vitro* culture grew well (72%) on acclimatization. Although, some of them were greenish. The content of a, b, and total chlorophyll of java ginger from *in vitro* culture was higher than conventional rhizome and have a normal rhizome. The production on Vo (plantlet generation) around 320.2 g/plant, is lower than conventional rhizome (800.5 g). Xanthorhizol and essential oil content of Java turmeric from *in vitro* seed were lower than conventional rhizome. Result research indicated potency of the coconut water as a nature growth regulator *in vitro*.

#### 168 ROOSTIKA, I.

Optimization and evaluation of cryopreservation method of pruatjan. *Optimasi dan evaluasi metode kriopreservasi purwoceng* / Roostika, I. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Darwati, I.; Megia, R. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 147-157, 6 ill., 3 tables; 24 ref.

#### PIMPINELLA; DRUG PLANTS; BIOLOGICAL PRESERVATION; FREEZING.

Optimization and evaluation of cryopreservation methods should be conducted to obtain standard protocol for long term conservation of pruatjan. The objective of this study was to evaluate the effect of combined treatments of pregrowth, preculture, and recovery media to the survival and regeneration rate of in vitro shoots and embryogenic calli and to evaluate the cryopreservation methods by observing the morphological, anatomical, and cytological characters. The techniques of vitrification (for apex) and encapsulation-vitrification (for embryogenic calli) were applied in this study. On vitrification technique, the apical shoots were pregrown on media containing of 3, 4, 5, and 6% sucrose for 1 and 2 weeks, precultured on media containing of 0.3 M sucrose for 1 and 3 days, dehydrated by PVS2 solution for 15 and 30 minutes, and planted on recovery media (MS or DKW basal media supplemented with 20 ppm adenine sulphate). On encapsulation-vitrification technique, embryogenic calli were encapsulated by 3% Na-alginate, dehydrated by PVS2 solution for 0, 30, and 60 minutes. The evaluation of cryopreservation methods was done through visual observation, SEM analysis, viability test, and flowcytometry determination. The result showed that encapsulation-vitrification was better than vitrification technique for cryopreservation of pruatjan. The successful rate of this method was low (10%) but the embryogenic calli could proliferate and regenerate into thousands mature somatic embryos. The evaluation by SEM and FDA can be applied as early detection to estimate the successful of cryopreservation, whereas flowcytometry analysis may determine the genetic stability of cryopreserved materials.

#### 169 SUKARMAN

Growth of four promissing vanila clones (*Vanilla planifolia*) at different physiological stages and internodes positions. *Pertumbuhan empat klon harapan vanili (Vanilla planifolia) pada umur fisiologis dan posisi ruas yang berbeda* / Sukarman (Balai Penelitian Tanaman Obat dan Aromatik, Bogor (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 1-5, 3 tables; 17 ref.

VANILLA PLANIFOLIA; PLANT PROPAGATION; SCIONS; PLANT PHYSIOLOGY; INTERNODES; GERMINABILITY; GERMINATION; GROWTH.

The experiment was conducted at the Indonesian Medicinal and Aromatic Crops Research Institute (IMACRI) and Indonesian Spice and Industrial Crops Research Institute (ISICRI). This experiment aimed at evaluating the effect of physiological stages and internodes positions on the cutting germination percentage and growth of four vanilla clones, in terms of establishing standard operational procedure (SOP) of vegetative propagation of vanilla. The research consisted of 2 experiments, i.e. (1) effect of physiological stages and internodes positions on the cutting germination and growth of vanilla clon 1 and 2, and (2) effect of internodes positions on the germination and growth of vanilla clone 3 and 4. The first experiment tested 3 treatment factors and was arranged in 2 x 2 x 3 factorial pattern in splitsplit plot design with 3 replicates. Twenty cuttings were planted in each experimental unit. The main plot was two vanilla clones (clone 1 and 2), and subplot was two different physiological stages of internodes, i.e. (1) 6 and (2) 12 months old after cutting their main stem. While the sub-subplot was cuttings from five internodes positions: (1) first, (2) second, (3) third, (4) fourth, and (5) fifth internodes. The second experiment was arranged in factorial split plot design with 3 replicates. The main plot was 2 different vanilla clones, i.e. (1) clone 3 and 4, and subplot was cuttings from 10 different internodes positions, i.e. 1) first, (2) second, (3) third, (4) fourth, (5) fifth, 6) sixth, 7) seventh, 8) eighth, 9) ninth, and 10) tenth internodes. Variables observed were germination of cuttings and plant growth (plant height, number and length of internodes, number and size of leaves). The results indicated that growth of vanilla was not affected by clones and physiological stage of cuttings, but it was significantly influenced by internodes positions. Cuttings originated from second until seventh internodes positions resulted in the best growth of vanilla plant, with germination rates of 84.58; 81.25; 85.00; 81.67; and 83.83%, respectively. It could be concluded that cuttings from second until seventh internodes positions were recommended for planting materials of vanilla.

#### 170 WINARTO, B.

Effect of glutamine and serine on anther culture of *Anthurium andraeanum* cv. Tropical. *Pengaruh glutamin dan serin terhadap kultur anter Anthurium andraeanum cv. Tropical* / Winarto, B. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(4) p. 295-305, 2 ill., 5 tables; Bibliography: p. 303-305.

ANTHURIUM ANDRAEANUM; ANTHER CULTURE; GLUTAMINE; SERINE; STIMULI; CALLUS; REGENERATION; GROWTH.

Anther culture is one of important haploid technologies in producing double haploid lines and successfully applied in many plants, while the application in Anthurium is not reported yet. Research and development in anther culture of Anthurium focusing on studying the effect of glutamine and serine on callus induction, growth, and its regeneration was conducted at Tissue Culture Laboratory of Indonesian Ornamental Crops Research Institute. Objective of this study was to find out the effect of glutamine and serine on callus induction, growth, and its regeneration in anther culture of Anthurium. Spadix of *Anthurium andraeanum* cv. Tropical, callus derived from anther and Winarto and Teixeira medium were utilized in the study. Glutamine and serine of 0, 250, 500, and 750 mg/l were tested in the experiments. Factorial experiment was arranged by completely randomized design with four replications. Results of the study indicated that addition of glutamine and serine in selected culture medium gave moderate significant effect on induction, growth, and regeneration of callus. Glutamine in 250 mg/l induced potential growth of anther up to 48% 120

with 21% regenerated anthers and 1.3 anthers per treatment producing calli, while 500 mg/l of serine was better concentration in callus formation with 55% potential growth of callus, 24% regenerated anthers and 1.4 anthers per treatment producing calli. Supplementation of serine reduced callus capacity to grow and produce shoots and stimulated callus senescence causing browning and death of it, while 250 mg/l glutamine exhibited positive effect on callus growth and regeneration. The treatment without serine was able to induce potential growth of callus up to 77% with 237 mm³ per callus and four shoots produced per explants. Results of the study suggested application of glutamine improved anther culture of *Anthurium* compared to serine application.

#### F03 SEED PRODUCTION AND PROCESSING

171 AZMI. C.

Influence of variety and bulb size on the shallots productivity. *Pengaruh varietas dan ukuran umbi terhadap produktivitas bawang merah* / Azmi, C.; Hidayat, I.M.; Wiguna, G.; (Balai Penelitian Tanaman Sayuran, Lembang, Bandung (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(3) p. 206-213, 1 ill., 5 tables; 22 ref.

ALLIUM ASCALONICUM; VARIETIES; SEED SIZE; SETS; SEED PRODUCTION; PRODUCTIVITY.

Increasing of shallots cultivation area stimulates improving superior varieties use and availability of high quality bulb as seed source. Study was aimed to determine the effect of variety and bulb size on the shallots productivity was conducted at Margahayu Experimental Garden of Indonesian Vegetable Research Institute from August till November 2009. Factorial experiment was arranged in a randomized completely block design with six replications. Three shallots varieties, i.e. Bima, Maja, and Sumenep and bulb sizes of small (1.04 cm - 1.29 cm), medium (1.47 cm - 1.67 cm), and large (1.93 cm - 2.05 cm) were used. Parameters observed were number of bulb, bulb diameter, fresh and dry bulb weight per bulb, plant, and plot. The research results indicated that shallots productivity derived from medium bulbs was not significantly different compared to the large bulbs. Medium bulb size was appropriate applied in shallots cultivation due to reduction of production cost down to 33-40%.

#### F04 FERTILIZING

#### 172 DARIAH, A.

Roles of soil conditioner to improve land quality, food crop productioin, and fertilizer efficiency, on the dryland of Panjalu, Ciamis, West Java [Indonesia]. *Peranan pembenah tanah untuk perbaikan kualitas tanah, peningkatan produksi tanaman pangan dan efisiensi penggunaan pupuk pada lahan kering di Panjalu, Ciamis, Jawa Barat /* Dariah, A.; Nurida, N.L.; Sutono (Balai Penelitian Tanah, Bogor (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform]. Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 104-114, 2 ill., 6 tables; 10 ref. 332.2.021.8/.3/SEM/p

FOOD CROPS; SOIL CONDITIONERS; SOIL IMPROVEMENT; SOIL CHEMICOPHYSICAL PROPERTIES; FARMYARD MANURE; DOSAGE EFFECTS; FERTILIZER APPLICATION; GROWTH; YIELDS; DRY FARMING; JAVA.

A study on the role of soil conditioner was conducted in the Subdistrict of Panjalu, the Regency of Ciamis, West Java, using completely block design with 3 replications and 8 treatments. The research revealed that the addition of manure and soil conditioner improved the soil's ability to hold water. Soil conditioner significantly affected the plants' growth with the exception on corn. There was an average on the highest trend achieved by biomass production, husk and corn grain, through the addition of manure and organic soil conditioner. The effect of 2.5 t/ha soil conditioner on plant growth production and the physical quality of soil was equal to the effect of 7.5 t/ha manure. Adding 2.5 t/ha soil conditioner and reducing NPK as low as 3/4 persen of recommended dosage, did not affect on the lowering of growth and production on corn.

#### 173 DJAMHARI, S.

[Liquid biocompost and chemical fertilizer NPK as an alternative nutrition on hydroponic caisim]. *Biokompos cair dan pupuk kimia NPK sebagai alternatif nutrisi pada budidaya tanaman caisim teknik hidroponik* / Djamhari, S. (Pusat Teknologi Produksi Pertanian, Tangerang (Indonesia)). *Jurnal Sains dan Teknologi Indonesia* (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 234-238, 3 tables; 9 ref.

BRASSICA RAPA; VEGETABLE CROPS; HYDROPONICS; CULTIVATION; COMPOSTS; LIQUID FERTILIZERS; ORGANIC FERTILIZERS; NPK FERTILIZERS; PLANT NUTRITION; FERTILIZER APPLICATION; APPLICATION METHODS.

Hydroponic system with Nutrient Film Technique (NFT), is one way of vegetable crops that can be done in a narrow and without the use of soil media. Nutrition is done by pouring so that it can carry oxygen (O2) from the air. Generally fertilizer nutrient used in hydroponic technique is AB-mix, this study sought to examine alternative combinations of NPK fertilizer and liquid biocompost on some degree of concentration that can provide optimum production growth in caisim crop varieties Tosakan. This experiment used completely randomized design (CRD) with 4 treatments. Data analysis was performed using different test for each plant and resumed by using Duncan Multiple Test Distance otherwise known Duncan's Multiple Range Test (DMRT) at 5% level (F count > F table or P>0.05) was conducted to determine the extent of the effect is real or not experiment treatment. Research results indicated that administration of a mixture of NPK fertilizer and liquid fertilizer biocompost An1O1 for the treatment can be used as a substitution for AB-mix in the provision of nutrition to the cultivation of caisim varieties Tosakan with hydroponic techniques. An1O1 treatment was the best dose when compared to the control treatment ABmix, An2O2, and An3O3 with the highest production yield component (gross production amounted to 97.67 g/plant and 85.75 g CP/tan).

#### 174 JUFRI. A.

[Effect of zeolite in fertilizer on the growth and production of lowland irrigated rice in Badung Regency, Bali Province (Indonesia)]. Pengaruh zeolit dalam pupuk terhadap pertumbuhan dan produksi padi sawah di Kabupaten Badung Provinsi Bali / Jufri, A.; Rosjidi, M. (Pusat Teknologi Produksi Pertanian, Jakarta (Indonesia)). Jurnal Sains dan Teknologi Indonesia (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 161-166, 3 tables; 9 ref.

ORYZA SATIVA; ZEOLITES; NITROGEN FERTILIZERS; NPK FERTILIZERS; GROWTH; PRODUCTION.

Many efforts are conducted to increase the fertilizing efficiency, especially nitrogen in rice cultivation practices. This field experiment was conducted to evaluate the effect of zeolite on growth and production of lowland rice during rainy season in Badung, Bali. The experiment showed that fertilizer mixed with zeolite resulted in the same growth and productivity, although the fertilizing doses was reduced. This meant that zeolite increased fertilizing efficiency in rice cultivation.

#### 175 LIFERDI, L.

Statistical model in determining nitrogen nutrient status as a guide of fertilizer recommendations on mangosteen. *Model statistik dalam menentukan status hara nitrogen sebagai pedoman rekomendasi pupuk pada tanaman manggis* / Liferdi, L. (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)); Susila, A.D. *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 24-32, 3 ill., 4 tables; 17 ref.

GARCINIA MANGOSTANA; NITROGEN; TISSUES ANALYSIS; NUTRITIONAL STATUS; NITROGEN FERTILIZERS; APPLICATION RATES; YIELDS; STATISTICAL METHODS.

The objectives of this study was to determine an ideal regression model for estimating nitrogen status on mangosteen plants, so that the nitogen status in mangosteen leaf tissue can be interpreted. The research was conducted at a mangosteen orchard at Cengal Kampong, Karacak Village, Leuwiliang Subdistrict, Bogor District, West Java. A completely randomized block design was used with five treatments levels of N fertilizer dosages and six replications. The dosages levels of N tested were 0,300,600,900, and 1,200 g/plant/year. The results showed that the best regression model for describing the relation between concentration of N on mangosteen leaf of 5 months age and plant production was the quadratic model. According to this model, the nitrogen status in leaf tissues was very low (0.99%), low (0.99 to 0.35%), medium (0.35 to 0.35%), and high (0.35%). To increase the concentration of N on mangosteen leaf from low status to medium ones, it needed N fertilizer approximately 0.300 to 0.300 g/plant/year in the first year. For the second year, it required about 0.300 to 0.300 to 0.300 g/plant/year. This results can be used as a guide to estimate fertilizer recommendations for mangosteen.

#### 176 MARTIAS

Response of growth and production of papaya to nitrogen and potassium fertilizer in tidal swamp land. Respons pertumbuhan dan produksi pepaya terhadap pemupukan nitrogen dan kalium di lahan rawa pasang surut / Martias; Nasution, F.; Noftindawati; Budiyanti, T. (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)); Hilman, Y. Jurnal Hortikultura. (Indonesia) ISSN 0853-7097 (2011) v. 21(4) p. 324-330, 4 tables; 19 ref.

CARICA PAPAYA; NITROGEN FERTILIZERS; POTASH FERTILIZERS; APPLICATION RATES; GROWTH; PRODUCTION; SWAMPS.

Papaya has opportunity to be cultivated in tidal swamp land but the availability of nutrient in the soil is low. Nitrogen and potassium are the major nutrients needed by papaya, so that the nutrient should be added through fertilization. The research was conducted in tidal swamp land in Mantangai, Kapuas, Central Kalimantan Province. The objective of this research was to investigate the effect of nutrient and K on growth and production of papaya in tidal swamp land. Merah Delima variety was used as a seed in this research. The factorial experiment was arranged in a randomized block design with three replications. The first

factor was dosage of nitrogen of 0, 125, 250, and 375 g/plant and the second factor was amount of potassium ( $K_2O$ ) from 0, 150, 300, and 450 g/plant. Each unit of treatment consisted of 10 plants. The parameters observed include the chemical properties of soil, vegetative growth, and crop production. The results showed that the availability of N, P, and P0 Fe at the research location was classified as very high, whereas P1 K was low, P2 and P3 Mg were very low. Nitrogen fertilization up to level P3 g/plant did not significantly increase the vegetative growth of papaya plants because of its high availability of the nutrition on the soil. However, in the productive phase (P0 months after planting), fruit length was significantly increased with application of P30 Mg/plant. Application of P40 fertilizer on P40 g/plant significantly increased vegetative growth and yield (number of fruit, fruit weight, fruit length, and P41 TSS), whereas application of more than P40 g/plant decreased their growth, yield, and fruit quality. The results could be used as the basis to arrange and to formulate fertilizer recommendation on papaya which was mainly grown on tidal swamp land.

#### 177 NURHAYATI

[Nutrient status and fertilizer recommendation of lowland rice in Siak Regency (Indonesia)]. Status hara dan rekomendasi pupuk padi sawah di Kabupaten Siak / Nurhayati; Zona, R.F. (Balai Pengkajian Teknologi Pertanian Riau, Pekanbaru (Indonesia)). [Proceedings of the national seminar on fertilizer and degraded land reclamation technology] Bogor (Indonesia), 29-30 Jun 2012 / Wigena, I G.P.; Nurida, N.L.; Setyorini, D.; Husnain; Husen, E.; Suryani, E. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 187-194, 2 ill., 5 tables; 9 ref. 631.617/.8/SEM/p

ORYZA SATIVA; IRRIGATED RICE; SOIL FERTILITY; FERTILIZER APPLICATION; APPLICATION RATES; UREA; PHOSPHATES.

Fertilizing at farmer level is increasing along with increase of harvested area, dose and type of fertilizer to increase rice production. Until now fertilizers are not used rationally according to crop needs and the ability of the soil providing nutrients. Fertilizer in addition to a waste of funds, also discrupt the balance of nutrients in the soil and environmental pollution, while giving too little fertilizer cannot provide the optimal level of production. The purpose of this activity was to determine the nutrient status of soil and nutrient management of rice in Siak. Results of the activities showed that fertilizer recommendations of rice on IP 100-200 land both in the Village of Dayang Suri, Bunga Raya, and Kemuning Muda, using urea, SP-36 and KCl of 200, 100 and 50 kg/ha, respectively. In RST in Sabak Auh Village, urea, SP-36 and KCl were 200, 75 and 50 kg/ha, respectively. In the sub-region CSB of Sabak Auh dose recommendation for urea was 200 kg/ha, SP-36 100 kg/ha and KCl 50 kg/ha. For Perincit District, urea given was 200 kg/ha, SP-36 75 kg/ha and KCl 50 kg/ha.

#### 178 NURZAKIAH, S.

[Methane emissions from rice planting on several dosages of NPK fertilizing in peatland]. *Emisi metan dari pertanaman padi pada beberapa dosis pemupukan NPK di lahan gambut* / Nurzakiyah, S.; Hairani, A.; Noor, M. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 245-252, 3 ill., 1 table; 13 ref. 631.445.1:631.61/SEM/p

ORYZA SATIVA; PEAT SOILS; NPK FERTILIZERS; CULTIVATION; METHANE; EMISSION.

Peatlands is one of the many wetlands agroecosystem that utilized for agricultural development. Peat soil has a potential to release greenhouse gases such as methane produced through anaerobic decomposition of organic material and the presence of gas can cause global warming. One of the factors that influence the amount of methane gas emissions is a nutrient management systems such as application of ameliorant materials and fertilizers. Research was conducted on peat soil at Pangkoh Village, Pulang Pisau District, Central Kalimantan during dry season of 2010. The objective of experiment was to determine the amount of methane emissions from rice cultivation and rice yield on several dosage fertilization. Treatment dosage of NPK fertilization was: (1) 75 kg/ha urea + 75 kg/ha SP-36 + 100 kg/ha KCl (N1P1K1), (2) 75 kg/ha urea + 112.5 kg/ha SP-36 + 150 kg/ha KCl (N1P1SK1.5), dan (3) 75 kg/ha urea + 150 kg/ha SP-36 + 200 kg/ha KCl (N1P2K2). The result showed that fertilization based on soil nutrient status (N1P1K1) produced the lowest emissions of methane and higher rice yield compared to other treatments.

#### 179 SILALAHI, F.H.

Response of loquat plant growth treated with N, P, and K fertilizing ratio. *Tanggap pertumbuhan tanaman biwa terhadap berbagai perbandingan dosis pupuk N, P, dan K /* Silalahi, F.H.; Marpaung, A.E.; Tarigan, R. (Kebun Percobaan Tanaman Buah Berastagi, Medan-Berastagi (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 1-13, 6 tables; 26 ref. Appendices.

ERIOBOTRYA JAPONICA; NPK FERTILIZERS; APPLICATION RATES; GROWTH; LEAVES; TISSUE ANALYSIS.

Loquat fruits is very good for human health. Furthermore, it can be used as the raw material for some medicines. Until now the loquat cultivation is still traditionally practiced by farmers, so its production is still very low and can not meet consumers demand. One of the reasons is that the information of effective and efficient fertilization is not available. The objective of the research was to determine the effect of N, P, and K fertilizers on the growth of loquat. The research was conducted at Berastagi Experimental Fruit Farm, at altitude of 1,340 m asl, with Andisol soil type. A randomized block design was used with two replications. The research consisted of 18 treatments combination with three factors i.e. N (0, 180, and 360 kg/ha), P (0 and 36 kg/ha), and K (0, 180, and 360 kg/ha). The results showed that there were significant interaction effects of NxP and NxK to plant height on 6 and 8 months after the first fertilizer application. The significant interaction effect of NxK was also stem diameter on 4, 6, and 8 months after the first fertilizer application. The dosage of N:P:K (360:36:180 kg/ha) exhibited better vegetative growth of loquat (plants height, stem diameter, and number of shoots) compared to other treatments. The analysis of loquat leaves indicated that the content of N, P, and K nutrients on leaves was higher on the fertilizer dosage of N:P:K = 360:36:180 kg/ha compared to the other fertilizer treatments. Implication of the research is to guide fertilizing on loquat cultivation.

#### 180 SUKARMAN

Effect of spacing and fertilizer dosages on production and viability of patchouli cutting seeds. *Pengaruh jarak tanam dan dosis pupuk terhadap produksi dan viabilitas benih setek nilam (Pogostemon cablin Benth)* / Sukarman (Balai Penelitian Tanaman Obat dan Aromatik, Bogor (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 81-87, 5 tables; 21 ref.

POGOSTEMON CABLIN; SEED; SPACING; FERTILIZERS; APPLICATION RATES; PRODUCTION; VIABILITY; QUALITY.

Information on the effect of plant density and fertilizer dosage on the production and viability of patchouli seeds is still limited. This experiment was aimed at finding out optimum plant spacing and fertilizer dosage for improving production and quality of patchouli cutting seeds. The experiment was conducted at Sukamulya Experimental Station of Indonesian Spice and Industrial Crops Research Institute (ISICRI), Pakuwon, Sukabumi from January through November 2010. This experiment was consisted of three factors and three replicates and was arranged in a split-split-plot design. The main plot was two varieties of patchouli, i.e.  $V_1 = Sidikalang$  and  $V_2 = Lhokseumawe$ . The subplot was three plant spacing dimensions, i.e. S1 (1 m x 0.5 m), S2 (1 m x 0.7 m), and S3 (1 m x 1 m). The subsubplot was two levels of fertilizer dosage, i.e. F1 (manure; urea, SP-36, and KCl of 30 t; 450, 225, and 450 kg/ha, respectively) and F2 (manure; urea, SP-36, and KCl of 45 t; 300, 150, and 450 kg/year, respectively). Variables observed were plant growth (plant height; number of primary, secondary, and tertiary branches), seed productivity and viability, diameter of bottom, medium, and upper of cutting seeds. The results of experiment indicated that Sidikalang variety, treated with 45 tons of manure, 450 kg urea, 225 kg SP-36, and 450 kg KCl per hectare produced the highest number of primary branches compared to other treatments. Plant spacing of 1 m x 0.5 m produced the highest number of cutting seeds (73,555 stumps/1,000 m<sup>2</sup>). The averaged diameters of cutting seeds from basal were 5 mm while those from top were 4 mm. Viability of the cutting seeds at 0 and 4 days after storage was 80%. Plant spacing 1 m x 0.5 m with dosage of fertilizer 30 ton dung manure, 300 kg urea, 150 kg SP-36, and 300 kg KCl per year is the dosage optimum for producing seed/cutting of patchouli. Combination of fertilizer dosages of 30 tons manure, 300 kg urea. 150 kg SP-36, and 300 kg KCl per year and plant spacing of 1 m x 0.5 m produced the highest profit as much as Rp 6,668,500 with B/C value of 2.05.

#### 181 SUMARNO

Farmer's preparedness for using organic fertilizers on lowland rice. Kesiapan petani menggunakan pupuk organik pada padi sawah / Sumarno; Kartasasmita, U.G. (Pusat Penelitian dan Pengembangan Tanaman Pangan, Bogor (Indonesia)). Jurnal Penelitian Pertanian Tanaman Pangan (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 137-144, 5 tables; 24 ref.

ORYZA SATIVA; ORGANIC FERTILIZERS; COMPOSTING; USES; FARMERS ASSOCIATIONS; JAVA.

Organic fertilizers are presently being recommended for use on wetland rice, as a supplement to inorganic fertilizers. A survey on the availability of materials and preparedness of farmers to utilize organic fertilizers was carried out in 2010 in 10 regencies within three provinces in Java, namely four regencies in West Java, three in Central Java, and four in East Java. The survey was carried out using a structured questionaries involving 63 farmer-groups as respondents. Correlation analysis were done among 15 variables, and ttest was applied for paired data obtained from the dry-wet seasons. Majority of the farmers were empirically familiar on the advantage of using organic fertilizer. However, their knowledges on its benefit were limited to the immediate results, such as on increase of grain yield, better grain quality, and more vigorous crop growth. The number of farmers familiar with the composting technique was in lower proportion than those of the unfamiliar ones. Not all farmers familiar with the composting technique; however, were actually practicing their knowledge, only about 25% in West Java, 15% in Central Java, and 35% in East Java. The amount of organic fertilizer applied by farmers was generally far less than that of the recommended only 0.41 t/ha in West Java, 0.39 t/ha in Central Java, and 1.2 t/ha in East Java. Rice straw from the wet season harvest was either burned (30% in West Java, 38% in Central Java, and 15% in East Java), used for feed (10% in West Java, 22% in Central Java, and 46% in East Java), or returned to the soil (60% in West Java, 40% in Central Java, and 39% in East Java). Those figures were somewhat similar with those on the dry season. The use of organic fertilizer was hampered partly by the lack of knowledge on long-term benefit, and due to the unavailability of manure. The number of livestock owned by farmer, the farmer's practice of making compost, and the availability of manure in each household, each was significantly correlated to the amount of organic matter applied by farmers. Presently, farmers seem to be not yet ready to use organic fertilizer as a supplement for inorganic fertilizer. Integration of rice crop-livestock farming is suggested to be campaigned and facilitated by the Government. In order that the farmers are able to apply the organic fertilizer. This requires that farmers to be assisted for processing livestock, through a credit-scheme program.

#### 182 SYAKIR, M.

Effect of potassium sources on application yield and quality of patchouli. *Pengaruh penggunaan sumber pupuk kalium terhadap produksi dan mutu minyak tanaman nilam /* Syakir, M. (Pusat Penelitian dan Pengembangan Tanaman Perkebunan, Bogor (Indonesia)); Gusmaini. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 60-65, 1 ill., 6 tables; 22 ref.

POTASH FERTILIZERS; POGOSTEMON CABLIN; PRODUCTION; QUALITY; ESSENTIAL OILS.

Patchouli ( $Pogostemon\ cablin\$ Benth) is an aromatic plant that has long been cultivated in Indonesia, however its productivity and quality are still low due to simple cultivation technology, and the development of diseases, such as bacterial wilt disease, budog, and pests caused by nematodes. This study aimed at obtaining sources and dosage of potassium fertilizers to increase plant growth and oil yield of patchouli. The research was conducted in Kuningan, West Java, from May to December 2009 and was arranged using randomized block design, with 9 treatments and 3 replicates. There were 9 treatments consisting of: 1) control, 2) 60 kg KCl/ha, 3) 120 kg KCl/ha, 4) 180 kg KCl/ha, 5) 240 kg KCl/ha, 6) 60 kg K $_2$ SO $_4$ /ha, 7) 120 kg K $_2$ SO $_4$ /ha, 8) 180 kg K $_2$ SO $_4$ /ha, and 9) 240 kg K $_2$ SO $_4$ /ha. The research results showed that the sources and dosage of potassium fertilizers significantly affected growth, fresh herbal yield and patchouli oil. The best plant growth, dry herbage yield, content and yield of patchouli oil were obtained from the treatment of 60 kg/ha of KCl or K $_2$ SO $_4$ . The highest N and P uptakes were shown by 60 kg K $_2$ SO $_4$ /ha treatment and the highest K nutrient uptake was shown by 120 kg KCl/ha.

#### 183 YUSRON, M.

Response of five accessions of small white ginger to fertilizers. Respon lima aksesi jahe putih kecil (Zingiber officinale var. Amarum) terhadap pemupukan / Yusron, M. (Pusat Penelitian dan Pengembangan Perkebunan, Bogor (Indonesia)); Syukur, C.; Trisilawati, O. Jurnal Penelitian Tanaman Industri (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 66-73, 6 ill., 2 tables; 24 ref.

ZINGIBER OFFICINALE; FERTILIZERS; APPLICATION RATES; PLANT RESPONSE; GROWTH; YIELDS; NUTRIENT UPTAKE.

The use of ginger varieties responsive to low fertilization dosages, is expected to increase fertilizer use efficiency and reduce environmental pollution. Research aimed at observing response of five small white ginger accessions of low-dosage fertilization has been conducted in the Cimanggu Experimental Station, from August 2009 through May 2010.

Five small white ginger accessions from marginal areas were planted in polybags. The experiment was and arranged using a randomized block design was repeated with 3 times replications. Each treatment consisted of 20 plants. Two treatments were tested factorially, where factor I: 5 small white ginger accessions, namely (1) Ziof0004, (2) Ziof0007, (3) Ziof0008, (4) Ziof0013, and (5) Ziof0014, and factor II: 3 fertilization dosages, namely (a) 50% recommendation dosage (200 kg urea + 150 kg SP-36 + 150 kg KCl/hectare), (b) 75% recommendation dosage (300 kg urea + 225 kg SP-36 + 225 kg KCl/hectare), and (c) recommendation dosage (400 kg Urea + 300 kg SP-36 + 300 kg KCl/hectare). Each treatment was given 20 t/ha of manure as basal fertilizer. The parameters observed were growth parameters (plant height, number of tillers, stem diameter, and number of leaves), yield and nutrient uptake of N, P, and K at 4 and 9 months after planting (MAP). The results showed that each of the accessions responded differently to the reduction of fertilizer dosages, either in vegetative or generative growth phase of ginger plants. Reduction of fertilizer dosages to 25% did not significantly reduce the yield of ginger, however, fertilizer dosages reduction up to 50% of the recommended dosages led to significant decrease of ginger yield. Compositions of N, P, and K nutrients absorbed by plants were different in every phase of plant growth.

#### F07 SOIL CULTIVATION

184 HARTOYO, B.

Arbuscular mycorrhizae fungi (AMF) diversity on asiatic pennywort *Centella asiatica* (L.) Urban) rhizosphere *Keanekaragaman fungi mikoriza arbuskula (FMA) pada rizosfer tanaman pegagan (Centella asiatica (L.) Urban)* / Hartoyo, B.; Ghulamahdi, M.; Darusman, L.K.; Aziz, S.A.; Mansur, I. (Balai Pengkajian Teknologi Pertanian Jawa Tengah, Ungaran (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 32-40, 2 ill., 2 tables; 25 ref.

CENTELLA ASIATICA; MYCORRHIZAE; DIVERSIFICATION; SOIL DEFICIENCIES; GLOMUS; SCUTELLASPORA; FERTILIZERS; NUTRIENT AVAILABILITY.

Deficiency of phosphorus (P) is one of the limiting factors of agricultural production system in Indonesia which is generally managed on acid soils. Utilizing arbuscular mycorrhizae fungi (AMF) is one of the alternative solutions on acid soils problem, because of its ability to take up P and other nutrients from soils. The first concern which must be studied is diversity of the organism. Data on AMF diversity obtained is useful to select potential and effective AMF by increasing plant growth and production of asiatic pennywort. The aim of this research was to isolate and identity types of AMF in asiatic pennywort rhizosphere. Soil samples were taken from three locations of asiatic pennywort plantations i.e. Gunung Putri, Sukamulya, and Cicurug Experimental Stations, Isolation, identification, and trapping of spore were conducted at the Eco-physiology laboratory and glasshouse of Indonesian Medicinal and Aromatic Crops Research Institute (IMACRI), Bogor. The laboratory results of soil samples before trapping showed that there were two genus of AMF spores (Glomus and Acaulospora) in the samples from Gunung Putri, three genus (Glomus, Acaulospora, and Scutellospora) from Sukamulya, and two genus (Glomus and Acaulospora) from Cicurug. After trapping, it was identified that the soil samples from Gunung Putri, Sukamulya, and Cicurug contained five AMF species (four types of Glomus and one type of Acaulospora) five AMF species (three types of Glomus, one type of Acaulospora and Scutellosporas, and four AMF species (three types of Glomus and one type of Acaulospora) from Cicurug. Diversity of AMF variety can be utilized to get potential to increase the efficiency of fertilizer, specifically availability and uptake of nutrient P.

#### F08 CROPPING PATTERNS AND SYSTEMS

#### 185 ARIANI, M.

[Reducing CO<sub>2</sub> emissions throught amelioration on rubber and pineapple intercropping on peatland of Jabiren, Central Kalimantan (Indonesia)]. *Pengurangan emisi CO<sub>2</sub> melalui ameliorasi pada intercropping karet dan nanas di lahan gambut Jabiren, Kalimantan Tengah* / Ariani, M. (Balai Penelitian Lingkungan Pertanian, Pati (Indonesia)); Nugroho, W.A.; Firmansyah, A.; Nursyamsi, D.; Setyanto, P. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 275-283, 2 ill., 4 tables; 9 ref. 631.445.1:631.61/SEM/p

RUBBER; PINEAPPLES; CARBON DIOXIDE; PEATLANDS; CROPPING SYSTEMS.

Over peat land, in particular functions to crop cultivation will reduce the stability and speed up the process of decomposition. Therefore it needs to be done various attempts in order to make greenhouse gases emissions mainly CO2 on peatland can be controlled. This research aims at geting sustainable management of peat land in particular on intercropping system combined with the use of ameliorant in demonstration plot totalling 5 ha in the Jabiren Village, District Pulang Pisau, Central Kalimantan. Intercropping systems observed is rubber and pineapple, with ameliorant material treatment are Pugam A, Pugam T, manure and mineral soil. Measurement of CO<sub>2</sub> gas emissions carried out every week for 4 months (May-August 2011) by using Micro GC CP 4900 Varian. Gas sample was taken from the edge of rubber canopy, on the interstate of rubber plantations and between pineapple plant, each replicated three times. The result showed that the lowest CO<sub>2</sub> flux from the edge of rubber canopy was on treatment granting ameliorant manure, namely 350.2 mg CO<sub>2</sub>/m<sup>2</sup>/h, then in a row was treatment pugam A < pugam T < Control < mineral soil, worth 409.4; 411.5; 495.1; and 497.1 mg CO<sub>2</sub>/m<sup>2</sup>/h. The lowest CO<sub>2</sub> flux on pineapple plants was on treatment granting pugam T namely 315.1 mg CO<sub>2</sub>/m<sup>2</sup>/h, then in a row is treatment manure < pugam A < mineral soil < control, worth 344.3; 370.9; 380.4; 423.5 mg CO<sub>2</sub>/m<sup>2</sup>/h. The percentage of the highest CO<sub>2</sub> emission reduced (36%) was found in pineapple planting with Pugam T as ameliorant.

#### 186 KOMALAWATI

**Dryland potential of inside and outside forest areas for food production enhancement.** *Potensi lahan kering dalam dan luar kawasan hutan untuk peningkatan produksi pangan* / Komalawati; Hermawan, A. (Balai Pengkajian Teknologi Pertanian Jawa Tengah, Ungaran (Indonesia)) [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform]. Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 159-168, 1 table; 12 ref. 332.2.021.8/.3/SEM/p

AGRICULTURE; ARID ZONE; WATERSHEDS; DRY FARMING; FOREST LAND; PRODUCTION POSSIBILITIES; LAND USE; PRODUCTION INCREASE; HIGHLANDS; FOOD PRODUCTION.

Land is a strategic resource for the development of agriculture. In Indonesia, the role of land, as the decisive factor of production, is increasingly important due to the leveling off in the growth of agricultural productivity. Demands for agricultural products as a result of population growth and rising incomes are significantly increasing. This increasing production was attributed to increase in planting area. The problem arises with the increasing conversion of agricultural land for non-agriculture, land degradation, and global climate

change that disrupt food production system. Therefore, it is necessary to find alternative land to increase food production. Dry land in the watershed upstream and upland in forest areas are extensive available and has not yet optimally cultivated. Potential upland in forest areas as indicated by the planting of cash crops and intercropping patterns of 150,000 hectares which is expected to produce 13.5 million tons of food worth Rp 9,1 trillion per year. Meanwhile, planting crops on reforestation land and rehabilitation of forests covering an area of 601.13 million hectares, has produced 2.48 billion tons of food commodities valued at Rp 2.77 trillion. Food production in dry land is still not optimal, because the dissemination of technology (eg. ICM) have not been touched by farmers in a forest area. Dryland farmers do not have sufficient access to capital and fertilizer subsidies. Limitations of cultivation technology of non-forest by the forest officials and the limited access to agricultural extension in agricultural activities on forest lands become an inhibiting factor. Therefore, cooperation among ministries, like the Ministry of Forestry and the Ministry of Agriculture, as well as the involvement of the private sector is indispensable.

#### 187 PUSTIKA, A.B.

Goats-cassava integration for optimizing abandoned land use around the lime excavation sites in Gunungkidul [Indonesia]. *Optimalisasi lahan terlantar sekitar perbukitan tambang kapur Gunungkidul melalui integrasi tanaman ubi kayu-kambing* / Pustika, A.B. (Balai Pengkajian Teknologi Pertanian, Yogyakarta (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform]. Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 225-236, 12 tables; 12 ref. 332.2.021.8/.3/SEM/p

MANIHOT ESCULENTA; GOATS; INTEGRATED PLANT PRODUCTION; AGROPASTORAL SYSTEMS; ABANDONED LAND; LAND USE; LIMESTONE; FERTILIZER APPLICATION; DOSAGE EFFECTS; PRODUCTIVITY; JAVA.

Deserted land in Gunungkidul Regency, which is predominated by cars/limestone hilly area and rainfed lands lead to soil infertility, is still large, amounting around 535 hectares, or 0.36% out of total regency area of 14.853,6 hectares. The objective of assessment is to utilize such abandoned lands optimally through ncrease in cassava productivity and goat average daily gain by integrating the two farm activities as one business, which is undertaken from January - September 2012. Optimal cassava productivity achievement attempt is done by fertilizing technology specifically designed for marginal lands with heavy texture, while optimal additional daily gain on goat is conducted by integrating the goat rearing with cassava growing and using material from cassava such as roughage, green materials, stems and root shells as goat feed. The results showed that different dosage of Ponska fertilizer does not affect crop height and leave number at either 4, 6, or 7 months of cassava age. At 7 months old of cassava, the highest stem diameter of cassava is found in crop that is not provided with Ponska fertilizer. At 50 g/crop dosage of Ponska would make dried root shell and food root weight heavier compared to other dosages. Ponska 100 g/crop would give larger amount of feed root relative to other dosages. With Ponska 100 g/crop, the percentage of crop parts that is edible for livestock that is 50.29% fresh and 46.8% in dried form. By integrating cassava with goat farming, the average daily gain achieved was at 10%.

#### F30 PLANT GENETICS AND BREEDING

#### 188 AMBARWATI, A.D.

Efficacy of RB gene in transgenic potato Katahdin SP904 and SP951 to West Java (Indonesia) isolates of Phytophthora infestans. *Efikasi gen RB pada tanaman kentang transgenik Katahdin SP904 dan SP951 terhadap empat isolat Phytophthora infestans dari Jawa Barat* / Ambarwati, A.D. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Sumaraw, S.M.; Purwito, A.; Herman, M.; Suryaningsih, E.; Aswidinnoor, H. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 28-36, 6 ill., 1 table; 29 ref.

SOLANUM TUBEROSUM; POTATOES; PHYTOPHTHORA INFESTANS; TRANSGENIC PLANTS; EVALUATION; PLANT DISEASES; INFESTATION; JAVA.

Potato late blight, caused by Phytophthora infestans is one of the most devastating plant diseases. Potato yield losses due to this disease ranged from 47-100%. A major late blight resistance gene, called RB, previously was identified in the wild potato species Solanum bulbocastanum. RB gene has been integrated into cultivated potato Katahdin using Agrobacterium-mediated transformation, and showed durable and broad spectrum resistance either in laboratory assay or in confined field trial. Evaluation of transgenic Katahdin SP904 and SP951 was conducted to verify whether the RB gene with broad spectrum to all known races of P. infestans in the United States and in Toluca, Mexico was also effective against P. infestans isolates in Indonesia. Efficacy of RB gene was evaluated for foliar and tuber resistance to West Java isolates. Transgenic Katahdin were more resistant in foliar than nontransgenic plants, at 14 days after inoculation. Diseases intensity of transgenic Katahdin SP904 and SP951 were 19.8-43.8%, whereas nontransgenic Katahdin, Granola, and Atlantic were 46.9-100%. In contrast to the foliar resistance phenotype, RB-containing tubers in transgenic Katahdin did not exhibit increase of resistance to Lembang, Pangalengan and Galunggung isolates. Tubers of transgenic Katahdin SP904, SP951, and nontransgenic Katahdin showed lesion volume of 0.93, 0.91, and 0.91 m³, respectively. RB gene in transgenic Katahdin showed efficacy against late blight P. infestans in foliar, but did not show efficacy in tuber. Transgenic Katahdin RB provides a potential source of resistance for breeding programs.

#### 189 APRIANA, A.

Delivering of over-expression construct OsWRKY76 candidate gene in rice cv. Nipponbare through *Agrobacterium tumefaciens*. *Introduksi konstruk over-ekspresi kandidat gen OsWRKY76 melalui Agrobacterium tumefaciens pada tanaman padi Nipponbare* / Apriana, A.; Sisharmini, A.; Enggarini, W. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Sudarsono; Khumaida, N.; Trijatmiko, K.R. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 19-27, 8 ill., 1 table; 20 ref.

ORYZA SATIVA; AGROBACTERIUM TUMEFACIENS; BLIGHTS; VECTORS; MAGNAPORTHE GRISEA.

Plant genetic improvement can be done through classical breeding or genetic engineering. WRKY is a transcription factor involved in regulating plant defense responses. OsWRKY76 gene is located in a narrow segment of chromosome 9 which is identified previously to be related to wide spectrum resistance in rice. A sequence of OsWRKY76 ( $\pm 1,200$  bp) has available in the gene bank and it makes possible to isolate, clone, and construct the gene into over-expression vector. The aim of this research was at assembling an over-expression

construct of OsWRKY76 candidate gene and introduce it into rice through Agrobacterium-mediated transformation. A construct of pCAMBIA-1301::35S::0sWRKY76 has been successfully assembled and transformed into embryogenic calli of rice cv. Nipponbare using A. tumefaciens strain Agl-1 and EHA 105. A number of 126 independent lines has been produced, in which Agl-1 showed 3.8 times more efficient than EHA 105. PCR analysis of randomly selected 25 independent lines showed that all of them positively contained hptII gene, a selectable marker used in the over-expression construct of the OsWRKY76 candidate gene. Based on the result, it could be concluded that the over-expression construct of OsWRKY76 candidate gene have been successfully introduced into the tissue of rice cv. Nipponbare.

#### 190 CHAERANI

Genetic diversity of 50 soybean accessions based on ten microsatellite markers. *Keragaman genetik 50 aksesi plasma nutfah kedelai berdasarkan sepuluh penanda mikrosatelit* / Chaerani; Hidayatun, N.; Utami, D.W. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(2) p. 96-105, 1 ill., 4 tables; 16 ref.

GLYCINE MAX; GERMPLASM; MICROSATELLITES; GENETIC VARIATION; HIGH YIELDING VARIETIES.

Soybean accessions in germplasm collection have increased in number as a result of exploration, introduction as well as development or release of new commercial varieties. This complicates accurate and reliable evaluation of an accession for purposes of utilization in breeding program and discrimination of a new commercial variety for purposes of plant variety protection. The purpose of this study were to identify the genetic diversity of soybean germplasm; to complement the existing phenotypic database as the basis for efficient management and accurate discrimination of commercial varieties, and to identify potential parents for hybridizations. Fifty soybean accessions consisting of 12 released varieties, 32 local varieties, and 6 introduced accessions were analyzed using microsatellite DNA markers based on semi-automatic sizing system. A total of 86 alleles were detected with the number of alleles per locus ranged from 4 to 16. Rare alleles were detected at a rate of 53% which was shown by 68% of the genotypes. Informativeness of the microsatellite markers as measured by the average gene diversity (D) or polymorphism information content (PIC) was 0.60 and 0.58, respectively. A heterozygosity level of 0.09 as detected by seven loci was observed among 64% of the genotypes. The average genetic distance among the genotypes was 0.56, which indicated the relatively low polymorphism among the analyzed soybean germplasm. Four microsatellites that showed a high D or PIC value (over 0.75) were able to discriminate between accession reliably. Each soybean accession had different DNA microsatellite fingerprint which could be used for accurate discrimination to complement the previous conventional characterizations. UPGMA clustering separated the 50 accessions into 10 major clusters, which showed no clear pattern of clustering according to varietal group or geographical origin. Genetic similarity data identified five clusters and 15 genotypes with highest intercluster or inter-genotype genetic distances which were potential candidates to be exploited as parents in hybridizations for development of new commercial varieties.

#### 191 DAMAYANTI, D.

[Genetic diversity analysis of wild ginger (Curcuma xanthorrhiza Roxb.) using Amplified Fragment Length Polymorphism (AFLP) markers]. Analisis keragaman genetik temulawak (Curcuma xanthorrhiza Roxb.) menggunakan penanda Amplified Fragment Length Polymorphism (AFLP) / Damayanti, D. (Institut Pertanian Bogor 132

(Indonesia). Program Studi Bioteknologi); Tajuddin, T.; Purwoko, D.; Cartealy, I.C.; Zulaeha, S.; Suharsono. *Jurnal Sains dan Teknologi Indonesia* (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 174-181, 3 ill., 3 tables; 23 ref.

CURCUMA XANTHORRHIZA; GENETIC VARIATION; GENETIC MARKERS; DNA.

Curcuma xanthorrhiza Roxb. which is well-known as Java turmeric, has been extensively used in pharmaceutical industries in Indonesia. In spite of this commercial value, the identity of this species is commonly mistaken from other similar orange rhizomes Curcuma. Identity originality of these species is vital in pharmaceutical industries. The objective of the study was to determine genetic diversity of 32 accessions Curcuma xanthorrhiza Roxb. Genomic DNA was extracted from leaf using Sodium Dodesyl Sulphate (SDS) modification. Amplified fragment length polymorphism (AFLP) was carried out according to the protocol of AFLP (TM) plant mapping kit and the final polymerase chain reaction (PCR) products were separated using The Agilent 2100 Bioanalyzer. The number of fragment produced by 12 pairs primer combination of AFLP ranged from 42 to 60 with an average of 52. Data obtained was analyzed by the NTSys program. From the AFLP amplification on 32 DNA samples, it was proven that the accession of Curcuma x anthorrhiza Roxb, had a high degree of diversity. Based on analysis of AFLP and unweighted pair group with arithme average (UPHMA) it was shown that the accession of Curcuma Xanthorrhiza Roxb. could be grouped into two clusters at relative ecludian distance of 0.10 (10%). Cluster I for accessions from Palembang, Pacitan and Ciamis 2. Cluster II for accessions from Makale, Pontianak, Kulonprogo, Mataram, Boyolali, Salatiga, Sumberrejo, Bali, P. Seram, Sentolo, Purworejo, Samas Bantul, Ciamis 1, Blora, Semarang, Poso, Kalsel, Tagari, Merapi Farm, Salakaria, NTB, Menoreh, Karang Anyar, Mangunan, Medan, Toraja and Solok.

#### 192 HADIATI, S.

Evaluation of growth and yield on several candidates of pineapple varieties with low oxalate content and sweet taste with spineless leaves. *Evaluasi pertumbuhan dan hasil beberapa kandidat varietas nenas rendah oksalat dan manis tanpa duri* / Hadiati, S.; Yuliati, S.; Jumjunidang (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(4) p. 315-323, 2 ill., 4 tables; 24 ref. Appendices.

ANANAS COMOSUS; PINEAPPLES; VARIETIES; CALCIUM; OXALATES; THORNS; LEAVES; GROWTH; YIELDS; PLANT ANATOMY.

The high Ca-oxalate content in pineapple fruit is not good for health. Meanwhile pineapple plants with spineless leaves make farmers easy in their maintainance. The purpose of this research was to evaluate growth and yield of several pineapple candidates with low oxalate, sweet taste, and spineless leaves. The research was conducted from June 2009 to December 2010 at Subang Research Station. A randomized block design with five treatments (two candidates of pineapple varieties with low oxalate content (Q and EE), one candidate of pineapple variety with spineless leaves (P), and two popular varieties as comparison (Simadu and Ponggok) with four replications was used in this study. Each unit experiment consisted of 52 plants and 10 plants of sampled randomly were observed. Pineapple plants were planted in two rows with plant distance 50 cm x 50 cm. The results showed that at the end of vegetative growth (11 months after planting) the average plant height of accessions tested were significantly different, Ponggok variety had the highest of plant height (88.94 cm) but the number of leaves ranging from 41-51 was not significantly different. Ponggok variety had the highest percentage of fruiting plants (94.86%). Conversely, Simadu variety was the least one (5.6%). Accessions of P, Q, and EE produced lower fruit quality than Simadu, but

accession o EE had better fruit quality in fruit weight 910.00 g, vitamin C 24.53 mg/100 g, and oxalate content 486.25 ppm than Ponggok variety. The EE was a promising accession that can be released as a new superior variety.

#### 193 HAKIM, L.

Yield components and morphological characters determining grain yield of soybean. *Komponen hasil dan karakter morfologi penentu hasil kedelai* / Hakim, L. (Pusat Penelitian dan Pengembangan Tanaman Pangan, Bogor (Indonesia)). *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 173-179, 1 ill., 4 tables; 16 ref.

GLYCINE MAX; HIGH YIELDING VARIETIES; VARIETY TRIALS; GROWTH; PLANT ANATOMY; AGRONOMIC CHARACTERS; YIELD COMPONENTS; YIELDS.

Ten soybean genotypes representing improved varieties and promising lines were grown on wetland after rice at Muara Experimental Farm, Bogor, West Java, during the 2010 dry season. The experiment was arranged in a randomized block design with three replications. Each of the genotypes was grown in a 2 m x 4.5 m plot at a 40 cm x 15 cm plant spacing, two plants per hill. Results of the data analyses showed that among the yield components, plant height, number of pods per plant, and harvest index were positively correlated with grain yield. The direct effects of plant height, number of pods per plant, and harvest index on grain yield as indicated by the path coefficient were the highest, while the effect of other yield components were either small or negative. The yield variation (1-R2) not attributable to the ten yield component variables was high (53.66%). Based on the analyses, soybean genotypes with high grain yield should have sufficient plant height, high number of pods per plant, and high harvest index. Therefore, plant height, number of pods per plant, and harvest index could be used as criteria for selection of high yielding genotypes in the soybean breeding program.

#### 194 HARTATI, R.S.

Genetic variability, heritability, and correlation among characters of 10 selected genotypes of physic nut (*Jatropha curcas* L.). *Keragaman genetik, heritabilitas, dan korelasi antar karakter* / Hartati, R.S. (Pusat Penelitian dan Pengembangan Perkebunan, Bogor (Indonesia)); Setiawan, A.; Heliyanto, B.; Sudarsono. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 74-80, 6 tables; 26 ref.

JATROPHA CURCAS; GENETIC VARIATION; HERITABILITY; GENETIC CORRELATION; SELECTION CRITERIA.

To arrange breeding programme of jatropha high yielding varieties, it is required population base with having high genetic variabilities, especially in yield components. The objectives of this research were to evaluate genetic variability, heritability estimate, and analyze correlation among characters of 10 physic nut genotypes. Ten *Jatropha curcas* genotypes were evaluated at Pakuwon Experimental Station of Indonesian Spice and Industrial Crops Research Institute, Sukabumi, from August 2009 - July 2010. A randomized completely block design with 3 replicates was applied in this experiment. Each experimental unit consisted of five plants grown in a row with 2 m spacing in line and 1 m in row. The observations were made for vegetative characters (plant height, stem girth, canopy width, and number of total branches per plant), generative characters (days to flowering, number of productive branches, inflorescences, fruit bunches per plant, and fruit set percentages), and yield component: number of fruit per plant. Results of the experiments indicated that the

evaluated genotypes had wide genetic variability on several generative characters i.e. days to flowering, number of inflorescences, number of fruit bunches, and number of fruits per plant with genotypic variability coefficient (GVC) values of 21.89; 29.77; 32.08; and 33.75, respectively. Their genetic variabilities were broad and high heritability. The total number of branches as a vegetative character was fairly wide in genetic diversity, high heritability, and positively correlated with number of inflorescences, bunches, and fruits per plant. These characters can be considered as selection criteria.

#### 195 HARTATI, R.S.

Inheritance of hermaphrodite character and its contribution to the yield of physic nut (Jatropha curcas L.). Pewarisan sifat hermaprodit dan kontribusinya terhadap daya hasil jarak pagar (Jatropha curcas L.) / Hartati, R.S. (Pusat Penelitian dan Pengembangan Perkebunan, Bogor (Indonesia)); Sudarsono. Jurnal Penelitian Tanaman Industri (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 117-129, 5 ill., 5 tables; 26 ref.

JATROPHA CURCAS; GENETIC INHERITANCE; HERMAPHRODITISM; GENOTYPES; YIELDS.

Hermaphrodite character had been reported in physic nut, but its role and contribution to production process especially to the yield has not been investigated. The objectives of this research were to evaluate hermaphrodite flowers contribution on yield and their mechanism inheritance. The evaluation was conducted at the Experimental Station of Balittri Sukabumi from May 2007 to July 2010. The spacing was 2 m x 2 m with 2.5 kg manure + 20 g urea + 20 g SP 36 + 10 g KCl/plant. The experiment consisted of (1) evaluation of flower type of physic nut and (2) hermaphrodite inheritance and their contribution on yield. Results of the experiment indicated eight from 60 physic nut genotypes were tri-monoecious which were capable on producing male, female, and hermaphrodite flowers while as the rest (52 genotypes) were monoecious which produced only male and female flowers. The trimonoecious were generally late flowering (120-274 days after planting) and low to medium yield (producing 23-228 fruits per plant in the first year). Hermaphrodite flowers generally occurred six months after planting at the amount ranged from 6.25-53% of total flowers. Fruit set of inflorescences having hermaphrodite flowers was higher, average of 80% (ranged from 56-100%) than those with female and male flowers, average of 50% (ranged from 11-100%). Yield of physic nut was affected by the genetic potential of their parents rather than hermaphrodite character. Hermaphrodite flower character was inherited by both female and male parents and might be controlled by simple-dominant gene.

#### 196 HENDRATI, R.L.

Clone and seedling performances of two *Eucalyptus occidentalis* families with high and low salt tolerance under waterlogging and high salinity. *Penampilan klon dan semai dua famili Eucalyptus occidentalis bertoleransi garam tinggi dan rendah pada kondisi tergenang dan salinitas tinggi* / Hendrati, R.L. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2010) v. 4(1) p. 9-24, 4 ill., 41 ref.

EUCALYPTUS; CLONES; SEEDLINGS; SALT TOLERANCE; WATER TOLERANCE; GROWTH.

Clonal materials are often collected for testing under extreme condition. Clonal production through mass vegetative propagation is also common for deployment of improved genotypes. Root development of clones compared to that of seedlings will further determine

the subsequent growth. *Eucalyptus occidentalis* ability to grow under extreme conditions (waterlogging and/or salinity) drives the importance of provenance and family selection from materials collected throughout its natural distribution. Performance of clones and seedlings under waterlogging and salt waterlogging conditions of two *E. occidentalis* families, high and low salt tolerant, were investigated. Seedlings (4.5 months) and cuttings/clones (5.5 months) were exposed to control, waterlogged and salt waterlogged conditions reaching to sea salt level (500 mM NaCl). Seedlings and cuttings performances were determined by ability of plant type and family to produce roots and consequently initial leaves to support their growth. Seedlings and cuttings of high tolerant family 153-Red Lake perform better than that of low tolerant family 96-Lake Magenta under high level of salinity. Under high salt concentration, seedlings are better than cuttings for family 153-Red Lake, but both plant types perform similarly for family 96-Lake Magenta. Salinity hinders shoot and root development. Under inundation, *E. occidentalis* tends to decrease shoots rather than roots. For clonal growth improvement, propagation method to produce root abundance is necessary.

#### 197 HIDAYATUN, N.

DNA fingerprinting of Indonesian 88 sweet potato germplasm based on eight SSR markers. Sidik jari DNA 88 plasma nutfah ubi jalar di Indonesia berdasarkan delapan penanda SSR / Hidayatun, N.; Chaerani; Utami, D.W. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). Jurnal Agro Biogen (Indonesia) ISSN 1907-1094 (2011) v. 7(2) p. 119-127, 2 ill., 3 tables; 22 ref.

IPOMOEA BATATAS; GERMPLASM; DNA; DNA FINGERPRINTING; PCR; NUCLEOTIDASE; GENES; MOLECULAR CLONING; INDONESIA.

Indonesia possesses a great number of sweet potato varieties. Understanding the diversity and distribution of this genetic resource is essential for its management and future use. The objective of this study was to elaborate the molecular character as DNA finger print of Indonesian sweet potato germplasm. Eight fluorescent labeled SSR primers were used to amplify DNA of 88 sweet potato accessions consisting of improved varieties and landraces collected from 7 islands in Indonesia. The amplified products were detected using capillary electrophoresis method in CEQ Genetic Analysis System machine. A total of 135 alleles ranging from 8 to 36 alleles per locus with an average of 17 alleles were generated. Each accession had a unique microsatellite finger print marked by specific combination of 11 to 22 alleles in 8 SSR loci. Dendrogram generated by UPGMA based on simple matching coefficients produced 4 nonspecific groups at 80% similarity. The groups revealed the possibilities that the accessions were distributed from similar genetic resources.

#### 198 KARTIKANINGRUM, S.

Carnation haploid technology: a study on development phase of microspore and selection of carnation donor plant. *Teknologi haploid anyelir: studi tahap perkembangan mikrospora dan seleksi tanaman donor anyelir* / Kartikaningrum, S. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)); Purwito, A.; Wattimena, G.A.; Marwoto, B.; Sukma, D. *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(2) p. 101-112, 4 ill., 6 tables; 45 ref.

DIANTHUS; ANTHER CULTURE; HAPLOIDY; MICROSPORA; SELECTION.

The development of haploid technology is one of the breakthrough innovation to fasten the revival of floriculture industry in Indonesia. Homozygous double haploid plants can be 136

produced through this technology. The aims of this research were to determine (1) flower development stage, microspores, and survival, (2) isolation techniques and medium having the potential for initiation of anther or microspores culture of carnation. The study was conducted at the Tissue Culture Laboratory, Indonesian Ornamental Crops Research Institute, Segunung, and the Microtechnique Laboratory, Department of Agronomy, Bogor Agricultural University, from September 2009 to October 2010. Five genotypes of Dianthus chinensis were used in this study. Periodically observations of anther morphology, DAPI and FDA staining, selection of medium, and donor plants were done in this research. The results showed that D. chinensis genotypes tested had relatively the same growth speed of anther ranged from 14 to 16 days, specific characteristics in color change of anther of the flower bud stage development of the same genotype and variation of microspore size among the genotypes V11, V13, and V15. The highest number of microspores per anther was presented in genotype V11 (30,400). The ratio of microspore developmental stage changed in line with flower bud development stage with the highest percentage of late-uninucleate (44.64%) at flower bud size between 1.31 to 1.51 cm, and there was no change in color of anther. Microspore viability ranged between 40 and 60%, and the highest percentage shown by genotype V11. Microspore development phase of T3 (bud size 1.31 cm - 1.50 cm, white anther color) had potential for further testing. The selected initiation media were M2 and M5, which will be examined further. Genotype V11 designated as a major donor plant, while the other potential genotypes were V13 and V15. The results of this study are useful as a first step to develop anther culture protocol on carnation.

#### 199 NURTJAHJANINGSIH, I.L.G.

Development of microsatellite markers for *Pinus merkusii* using a dual suppression and primer screening methods. *Pengembangan penanda mikrosatelit pada Pinus merkusii menggunakan metode dual suppression dan screening penanda* / Nurtjahjaningsih, I.L.G. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2010) v. 4(1) p. 25-35, 1 ill., 1 table; 21 ref.

PINUS MERKUSII; MICROSATELLITES; SCREENING; ALLELES; POLYMORPHISM.

This study aimed at developing and characterizing microsatellite markers for *Pinus merkusii*. Twelve markers have been developed by dual suppression method and 12 markers from three species of Pinus, i.e. *P. densiflora*, *P. pinaster* and *P. taeda* were screened to amplify microsatellite in *P. merkusii*. The results showed that 5 out of the 12 developed microsatellite markers by dual suppression amplified at a single polymorphic locus; otherwise there was no polymorphic locus of the 12 screened microsatellite markers. However, it is difficult to compare the efficiency of these two methods due to the limited number of the screened primers used in this study.

#### 200 SATYAWAN, D.

Genetic diversity analysis of *Jatropha curcas* provenances using Randomly Amplified Polymorphic DNA markers. *Analisis keragaman genetik jarak pagar (Jatropha curcas) menggunakan marka RAPD* / Satyawan, D.; Tasma, I M. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 47-55, 2 ill., 2 tables; 19 ref.

JATROPHA CURCAS; RAPD; GENETIC VARIATION; BIODIVERSITY; PCR.

Jatropha curcas nuts are rich in oil that is highly suitable for the production of biodiesel or to be used directly in modified diesel engines. The objective of this study was to assess the extent of genetic diversity among 50 J. curcas provenances and one accession of J. integerrima using RAPD markers. The fifty J. curcas provenances were collected from ecologically diverse regions of Indonesia, and planted in the Pakuwon Experimental Station (Sukabumi, West Java). Fourteen RAPD primers with 60-80% G+C content were used in this genetic diversity analysis and produced 64 bands with 95.7% polymorphism level. The Polymerase Chain Reactions used to generate the RAPD bands sometimes produced inconsistent and non-reproducible results, necessitating the duplication of each reaction to prevent scoring errors. Sixty one validated bands were subsequently used for genetic diversity analysis using Unweighted Pair Group Method Arithmetic (UPGMA) method and Dice coefficients. It was shown that the similarity coefficients among the provenances ranged from 0.2 to 0.98 with an average similarity of 0.75. Dendrogram analysis produced two major groups of provenances, with one outlier from South Lampung. There was no tendency for provenances originated from nearby regions to cluster together in each group, and several provenances showed more similarities with provenances originated from distant regions. This pattern indicated that Jatropha was introduced to Indonesia around four centuries ago and was mainly spread by humans. Based on the mean similarities among the accessions and their clustering pattern, the genetic diversity of the Jatropha collection appeared to be fairly low. Future additions of genetic materials from more diverse genetic background will be necessary to maintain the current progress of Jatropha improvement program.

#### 201 SETIADI, D.

Genetic variation of provenances and progeny tests of *Araucaria cunninghamii* at 18 months old in Bondowoso, East Java [Indonesia]. *Keragaman genetik uji provenans dan uji keturunan Araucaria cunninghamii pada umur 18 bulan di Bondowoso, Jawa Timur /* Setiadi, D. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2010) v. 4(1) p. 1-8, 4 tables; 12 ref.

ARAUCARIA CUNNIINGHAMII; GENETIC VARIATION; PROVENANCE TRIALS; PROGENY TESTING; ADAPTABILITY; HERITABILITY; GROWTH.

A progeny test of *Araucaria cunninghamii* seedling was established comprising of eighty open-pollinated families collected from six seed sources (Fak-fak, Sorong, Serui, Wamena, Manokwari and Queensland). The trial was designed as a randomized completely block design (RCBD) which comprised 80 seedlots, 4 tree-line plots with 4 replications. At 18 months of age there were significant differences among seed sources for tree height and stem diameter. The survival rate of all seed sources was high (96.7 - 100%). Differences between families within seed source were significant both for height and diameter growth. Heritability estimates for height were moderate ( $h^{2f} = 0.42$ ,  $h^{2i} = 0.19$ ) and also for diameter ( $h^{2f} = 0.57$ ,  $h^{2i} = 0.30$ ). Genetic correlation between height and diameter was strong (rg = 0.80).

#### 202 SUKMADJAJA, D.

Regeneration and growth of some varieties of sugarcane (Saccharum officinarum L.) through in vitro culture. Regenerasi dan pertumbuhan beberapa varietas tebu (Saccharum officinarum L.) secara in vitro / Sukmadjaja, D. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia));

Mulyana, A. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(2) p. 106-118, 9 ill., 5 tables; 22 ref.

SACCHARUM OFFICINARUM; VARIETIES; GROWTH; IN VITRO; REGENERATION.

The research was conducted at the Laboratory of Tissue Culture, The Biology of Cell and Tissue Researcher Group of ICABIOGRAD, Bogor from June to November 2009 to study growth and regenerations response of some varieties of sugarcane through in vitro culture. The research activities have been carried out in three steps, i.e., callus formation, regeneration of shoots and roots regeneration. The type of explants used in the study was in vitro plantlet explants of both sugarcane varieties. Seven media formulations were used for the callus induction and regeneration of shoots, while five media formulations were used for the roots regeneration. The results showed that the highest response for callus induction was Bulu Lawang variety at media formulation MS + 2.4-D 2 mg/l + BAP 0.4 mg/l + CH 2000 mg/l and PS 951 variety at media formulation MS + 2.4-D 1 mg/l + BAP 0.4 mg/l. While the highest response for regeneration of shoots was Bulu Lawang variety at media formulation MS 0 (control MS) dan PS 951 varieties at media formulation MS + BAP 1 mg/l + kinetiy at media formulation MS + IBA 1 mg/l. Acclimatization of plantlets produced that were grew successfully was about 90-100% in greenhouse.

#### 203 SUMARTINI, S.

Screening of cotton lines (*Gossypium hirsutum* L.) tolerance to drought at germination stage with PEG-6000. Skrining galur kapas (*Gossypium hirsutum* L.) toleran terhadap kekeringan dengan PEG-6000 pada fase kecambah / Sumartini, S.; Sulistyowati, E.; Mulyani, S.; Abdurrakhman (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)). Jurnal Penelitian Tanaman Industri (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 139-146, 4 ill., 3 tables; 28 ref.

GOSSYPIUM HIRSUTUM; SELECTION; DROUGHT RESISTANCE; GERMINATION; GERMINABILITY.

Cotton production areas in Indonesia are arable land with lack of water availability. The aim of this study was at obtaining cotton lines tolerant to drought using PEG-6000 at germination stage. The experiment was conducted at the Seed Testing Laboratory in Indonesian Sweetener and Fiber Crops Research Institute, from April to June 2012. Treatments were arranged in a split plots design with two replications. The main plot was PEG-6000 (-3 bar) and without PEG-6000 (water), while the subplot was 13 cotton lines and Kanesia 14 variety. Seed cotton was treated with 80% Mancozeb fungicide dose of 2 g/kg seed before sowing. Parameters observed were germination percentage, shoot and root length, shoot and root weight, ratio of root/shoot length, and drought susceptibility index. Seedling was counted as normal if its length more than 0.5 cm. PEG-6000 treatment gave very significant effect on the decline on seed germination, shoot and root length, shoot and root weight. Otherwise, ratio of root/shoot length was higher in the PEG-6000 than without PEG-6000 treatment. Response of cotton lines to drought which calculated with a drought susceptibility index were different among parameter observed. Mean drought susceptibility index of all parameters showed that none of cotton line tolerant to drought (S < 0.50) was achieved from the study. There were eight moderately drought-resistant lines (0.50 < S < 1.0) achieved namely 03002112, 03006/1, 03008/7, 03008/24, 03012/17, 03014/12, 03017/13, and 03017/15 which more resistant than Kanesia 14.

## 204 SUSANTO, M.

Genetic parameter analysis of wood properties in combination of provenance and progeny trial of *Acacia mangium* in South Kalimantan [Indonesia]. *Analisa parameter genetik sifat kayu kombinasi uji provenans dan uji keturunan Acacia mangium di Kalimantan Selatan* / Susanto, M. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)); Naiem, M.; Hardiyanto, E.B.; Prayitno, T.A. *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2012) v. 6(3) p. 131-142, 3 ill., 4 tables; 12 ref.

ACACIA MANGIUM; PROVENANCE TRIALS; PROGENY TESTING; F1 HYBRIDS; HERITABILITY; WOOD PROPERTIES; KALIMANTAN.

Combination of provenance progeny trial of Acacia mangium from Claudie River-Queensland-Australia was established in Pelaihari, South Kalimantan. The objective of this research was to find variation on diameter, wood specific gravity and fiber length between provenance seedlot and family within provenance seedlot in provenance progeny trial of A. mangium on 22 months old. The results showed that the mean of wood specific gravity was 0.40 and mean of fiber length was 0.89 mm. Variation of diameter, wood specific gravity, and fiber length were significant difference among provenance seedlot or between family within provenance seed lot in the trial. Individual heritability of diameter, wood specific gravity, and fiber length were medium ( $hi^2 = 0.49$  for diameter;  $hi^2 = 0.33$  for specific gravity and  $hi^2 = 0.39$  for fiber length). The results indicated that diameter, wood specific gravity, and fiber length are necessary to be used for tree selection to improve growth wood quality in the combination of provenance progeny trial of A. mangium.

## 205 TASMA, I M.

Genetic mapping of SSR markers in eight soybean chromosomes based on F2 population B3462 x B3293. Peta genetik marka SSR pada delapan kromosom kedelai berdasarkan populasi F2 B3462 x B3293 / Tasma, I M.; Warsun, A.; Satyawan, D.; Pardal, S.J.; Slamet (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). Jurnal Agro Biogen (Indonesia). ISSN 1907-1094 (2011) v. 7(2) p. 69-75, 2 ill., 1 table; 31 ref.

GLYCINE MAX; SOYBEANS; CHROMOSOMES; GENETIC MAPS; DNA; PCR; SEGREGATION; ALUMINIUM; TOXICITY.

Aluminum toxicity is one of the main contraints for cultivating soybean in acid soils. Genetic mapping of SSR markers is one step for detecting aluminum-toxicity tolerant QTLs in soybean. Another step is to phenotype the same population at various aluminum-toxicity environments. The objectives of this study were to analyze the segregation of SSR markers in progenies of an F2 population and to ap the markers in 8 soybean chromosomes. The F2 population was previously developed by crossing the Al-tolerant parent B3462 and the Alsensitive parent B3293. Polymorphic SSR markers in the parents were used to PCR amplify DNA of the 100 F2 progenies. PCR products were separated using agarose or polyacrylamide gels. A Chi-Square test was done with a null hypothesis that progenies segregated in a 1:2:1 ratio. Results showed that 125 SSR markers were polymorphics in the parents. Out of 125 polymorphic markers, 122 were segregated in the progenies of the F2 population. Among the segregating markers, 119 were segregated in a 1:2:1 ratio. Only 8 markers (5.6%) did not follow the 1:2:1 ratio. One hundred and nineteen SSR markers were mapped in 8 soybean chromosomes. These include 18 markers in chromosome A2, 10 in B1, 16 (C1), 16 (F), 10 (G), 23 (J), 16 (L), and 10 (N). Total genetic maps covered was 1,194.8 cM with average map distances between two adjacent markers of 10.7 cM. Further SSR 140

marker enrichment is required to fill in the gaps of several chromosomal regions. Genetic maps presented in this study should be useful for detection of Al-toxicity tolerant QTLs in soybean.

# 206 UTAMI, D.W.

Genetic diversity of 96 accessions of rice germplasm using 30 SSR markers linked to heading date genes (HD Genes). *Keragaman genetik 96 aksesi plasma nutfah padi berdasarkan 30 marka SSR terpaut gen pengatur waktu pembungaan (HD Genes) /* Utami, D.W.; Sutoro; Hidayatun, N.; Risliawati, A.; Hanarida, I. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(2) p. 76-84, 3 ill., 2 tables; 14 ref.

ORYZA SATIVA; GERMPLASM; GENES; MATURATION; DNA FINGERPRINTING; HIGH YIELDING VARIETIES; GENETIC VARIATION.

Rice with early maturity is one of important genetic resources in rice germplasm collection. Characterization and identification of genetic diversity is an important issue for plant variety protection. Molecular identification by microsatellite markers using Genetic Analyzer enables resolve of this issue. The objective of this research is to identify the genetic diversity of 96 rice accessions based on their specific DNA fingerprint using microsatellite markers. A total of 96 accessions consisting of a diverse-variety of maturity classification were genotyped with 30 SSR markers linked to HD genes which spread out in 12 chromosomes of rice genome. The total 297 alleles that were detected indicated the level of marker informativeness. RM5607 generated 7 alleles with the size ranged 103 - 197 and the highest PIC at 0.90. RM3571 (linked to HD12 gene) has a significant value associated with varieties which have early maturity trait. Clustering analysis showed the cluster is based on subspecies genome background and on early maturity trait.

## 207 WAHDAH, R.

Variability among local rice varieties of tidal swamp area in South Kalimantan [Indonesia]. *Keragaman karakter varietas lokal padi pasang surut Kalimantan Selatan* / Wahdah, R.; Langai, B.F. (Universitas Lambung Mangkurat, Banjarbaru (Indonesia). Fakultas Pertanian); Sitaresmi, T. *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 158-165, 1 ill., 5 tables; 29 ref.

ORYZA SATIVA; VARIETIES; MUTATION BREEDING; GENETIC VARIATION; INTERTIDAL ENVIRONMENT; KALIMANTAN.

Artificial mutation could be used in the formation of base population for plant selection. Local varieties which have a wide distance of relationship are expected to have a greater opportunity for obtaining more diverse offspring. The purpose of this study was to select five distinct local tidal swamp rice varieties of South Kalimantan that could be used for parental mutation. The study was conducted from March to December 2009. The distance of varietal relationship was estimated by cluster analysis using the SPSS Programme Version 11.5. Selection of the five best varieties was carried out by the Experimental Rank Method (ERM) applying 7 criteria, namely plant height, number of panicles, panicle length, grain weight/panicle, number of grains/panicle, weight of 1000 grains, and grain yield. Results of the cluster analysis based on a 82.5% similarity level showed that diversities of the 40 accessions of local tidal swamp rice in South Kalimantan were spread in four clusters, namely Cluster I (13 varieties), Cluster II (1 variety), Cluster III (6 varieties), and Cluster IV (20 varieties). Five varieties that were selected based on the cluster analysis and the ERM

were Siam Harli, Siam Unus (Bumi Makmur), Siam Kuatek, Datu, and Siam Unus (Barambai).

## 208 WINARTO, B.

Chromosome staining and its application on determination of the ploidy level of explants derived from anther culture of Anthurium. *Pewarnaan kromosom dan pemanfaatannya dalam penentuan tingkat ploidi eksplan hasil kultur anter Anthurium /* Winarto, B. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(2) p. 113-123, 4 ill., 6 tables; 32 ref.

ANTHURIUM; ANTHER CULTURE; CHROMOSOMES; COLOUR; EXPLANTS.

Optimal chromosome staining method is an important pre-requisite in determination of plant ploidy level derived from anther culture, involving varied explants regenerated from Anthurium anther culture. Application and modification of chromosome staining methods on different explants were conducted at the Tissue Culture Laboratory of Indonesian Ornamental Crops Research Institute from February to August 2009 for determination of the ploidy level of regenerants derived from anther culture of Anthurium. The aim of this research was to determine the chromosome staining method and its modifications, type of explant and root suitable to study the ploidy level of explants derived from anther culture of Anthurium. Callus, shoot tips, and root tips were utilized in the experiment. The research was consisted of three experiments, i.e. (1) modification of chromosome staining methods (2) selection of explants suitable for chromosome staining, and (3) improvement of the selected chromosome staining method. Results of the study indicated that root tips and roots cultured on medium containing 1% active carchoal were the most appropriate explants and the root type in obtaining better chromosome staining results. The modification method with root tip boiled in 1N HCl: 45% of acetic acid glacial (3:1, v/v) for 10 minutes in 60°C and aceto-orcein treatment for 15 minutes gave appropriate chromosome staining results exhibited clearer chromosome pictures and was easy to be counted. The application of chromosome staining on anther culture of Anthurium was able to distinguish the ploidy level of regenerants. Ploidy ratio of regenerants derived from anther culture was 33.5% of haploid, 62.7% of diploid, and 5.7% of triploid. Chromosome staining method resulted from the study give high benefit in developing haploid technologies on other Araceae plants.

## 209 WOELAN, S.

Performance of IRR 300 and 400 series clone in promotion plot trial. *Keragaan klon IRR seri 300 dan 400 di pengujian plot promosi* / Woelan, S.; Sayurandi; Pasaribu, S.A. (Balai Penelitian Karet, Sungei Putih, Medan (Indonesia)). *Warta Perkaretan* (Indonesia). ISSN 0216-6062 (2012) v. 31(1) p. 1-9, 6 tables; 5 ref.

HEVEA BRASILIENSIS; HIGH YIELDING VARIETIES; VARIETY TRIALS; FIELD SIZE; GROWTH; DISEASE RESISTANCE; YIELDS.

Rubber clones of IRR 300 and 400 series were obtained from selection of pollination program in 1991 and 1992. Clone of IRR 300 series was obtained from 397 progenies out of 25,388 pollinations, and clone of IRR 400 series was obtained from 828 progenies out of 31,120 pollinations. All pollinations and promotion plot trials were conducted at Sungai Putih Research Centre of Indonesian Rubber Research Institute. Promotion plot trial is an alternative method to shorten the duration of rubber plant selection. It can reduce the duration of plant selection from nearly of 25-30 years to become 10-15 years. In promotion plot trial, the material used is from 1% of the best progeny of F1 plants in the nursery and the

experimental design used is simple latice design. Clone of IRR 300 series was established in 1999, whilst clone of IRR 400 series was established in 2004. There were 21 clones of IRR 300 series and 26 clones of IRR series which were evaluated in this trial. Rubber clones of PB 260, RRIC 100, and BPM 24 were used for comparison. The evaluation of IRR 300 series clone revealed that rubber clones of IRR 302, IRR 309, IRR 313, IRR 317, IRR 318 and IRR 319 showed fast tree growth, latex yield potency of > 45 g/t/t, and fairly good tolerance of leaf fall diseases of *Colletotrichum*, *Corynespora*, and *Oidium*. Hence, these clones could be developed as high latex and/or latex-timber yielding promising clones. Moreover, clones of IRR 400 series, i.e. IRR 417 and IRR 420, showed vigorous tree growth, good tolerance of *Colletotrichum*, *Corynespora*, and *Oidium* leaf fall diseases, and yielded latex of > 40 g/t/t during 2 years of tapping.

## 210 YUDOHARTONO, T.P.

Growth characteristic of binuang seedlings from Pasaman Provenance West Sumatra [Indonesia]. *Karakteristik pertumbuhan semai binuang asal provenans Pasaman Sumatera Barat* / Yudohartono, T.P.; Fambayun, R.A. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2012) v. 6(3) p. 143-156, 7 tables; 11 ref.

FOREST TREES; SEEDLINGS; GENETIC VARIATION; GROWTH; AGRONOMIC CHARACTERS; SUMATRA.

Binuang is a fast growing species which is native in Indonesia. This research was purposed to study the role of genetic variation to characteristic of binuang seedling at the age of 6 and 10 months from several mother trees from Pasaman, West Sumatra Provenances in nursery. This research was arranged in completely randomized design (CRD) with 22 mother trees and 5 replications. Each replication comprised 9 seedlings. Totally, there were 990 seedlings. The results showed that high genetic variation have affected observed traits of binuang seedlings. It showed by the high genetic variation of height, diameter and sturdiness quotient among binuang mother trees. Seedlings having high value of diameter and height value of seedlings at all observation ages were from the same mother namely mother tree 17. Seedlings having the lowest average diameter at all observation ages were from the same mother namely mother tree 6. Whereas, seedlings having the lowest average height at 6 and 10 months were from mother tree 9, 7 and 6. Value of sturdiness quotient of seedlings from all mother trees at 6 and 10 months was above or classified high. Mother tree had the lowest sturdiness quotient at all observation ages was mother tree 19. The value of sturdiness quotient decreased along with increasing the age of binuang seedlings.

## F40 PLANT ECOLOGY

# 211 PUTRI, D.M.S.

Phenology of *Rhododendron* spp. (*Subgenus Vireya*) Bali Botanical Garden collections. *Fenologi Rhododendron spp.* (*Subgenus Vireya*) koleksi Kebun Raya Eka Karya Bali / Putri, D.M.S. (Balai Konservasi Tumbuhan, Kebun Raya Eka Karya Bali-LIPI Candikuning, Tabanan (Indonesia)). *Jurnal Hortikultura* (Indonesia) ISSN 0853-7097 (2011) v. 21(3) p. 232-244, 9 ill., 3 tables; 23 ref.

RHODODENDRON; PHENOLOGY; FLOWERING; FRUITING; BOTANICAL GARDENS; COLLECTIONS; BALI.

Until now data resulted from *Rhododendron* spp. phenology are limited. Phenology research of *Rhododendron* spp. is needed to develop utility of their collection. The phenology study of *Rhododendron* spp. (*subgenus vireya*) was conducted at Bali Botanical Garden from January 2008 to Desember 2010. This study was aimed to determine the phenology of *Rhododendron* spp. (*subgenus vireya*). The method used was class/grading model. Observation results showed that was known period of flowering and fruiting of 14 species of Rhododendron were grouped into three categories, namely: (1) Rhododendron which blooming in certain month only, (2) Rhododendron which blooming throughout the year, and (3) Rhododendron which not or not yet flowering. Environmental factors such as temperature and humidity also affected the amount of Rhododendron species that can flower and bear fruit. May was the appropriate month for flowering of the Rhododendron where most species flowered, while for the fruit ready for harvest varied. The results could be used as the basis for intercross research (breeding) and collecting of seeds (seed banks).

## F60 PLANT PHYSIOLOGY AND BIOCHEMISTRY

## 212 TRUSTINAH

Characterization of fatty acid composition in grains of groundnut genotypes. *Karakterisasi kandungan asam lemak beberapa genotipe kacang tanah* / Trustinah; Kasno, A. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 145-151, 5 ill., 4 tables; 25 ref.

ARACHIS HYPOGAEA; GENOTYPES; GROUNDNUTS; FATTY ACIDS; LINOLEIC ACID; PALMITIC ACID; ARACHIDONIC ACID; OLEIC ACID.

Groundnut is an economically important oil crop. Main fatty acid components of the groundnut oil are oleic and linoleic acid, which are useful to human health. Forty five groundnut genotypes were grown at the Jambegede Experimental Farm, Malang, East Java during the dry season of 2009. Samples of the harvested grains were analyzed for their fatty acid contents at the Food and Technology Laboratory Gajah Mada University, Yogyakarta in 2009 using gas chromatography. Groundnut cultivar Singa produced the highest pod yield (3.59 t/ha), followed by cultivars Talam 1 and Gajah (3.10 t/ha). Fatty acid composition among genotypes varied, ranging from 37.7 to 45.7%. Oleic and linoleic acids were the major fatty acid components, accounting for 70.8 - 85.4% of the total fatty acid contents. The average of oleic, linoleic, palmitic, behenic, and arachidic acid contents was each 37.7%, 41.2%, 12.5%, 3.6%, and 3,0%, respectively. Genotype MLGA 0261 contained the highest oleic acid (49.3%), while MLGA 0077 contained the highest linoleic acid (48.9%). Significant negatif correlation between oleic acid content with linoleic acid (-0.59\*\*), palmitic acid (-0.49\*\*), and behenic acid (-0.45\*\*) was detected. These correlations indicated that high content of oleic acid would be followed by low linoleic, palmitic, and behenic acids. Based on the fatty acid content, the groundnut genotypes were divided into three groups. Group I contained palmitic, linoleic, and behenic acids above the average. Group II contained oleic and arachidic acids below the average, and Group III contained high oleic acid and low other fatty acids. Cultivars Gajah, Tapir, Turangga, Sima, Singa, Zebra, Panter, Tuban, and Talam 1 were belong to Group I, where as cultivars Badak, Landak, Jerapah, and Kancil were in the Group II, and MLGA 0261 in Group III.

## F62 PLANT PHYSIOLOGY - GROWTH AND DEVELOPMENT

## 213 DEVY, N.F.

Growth of Citrus cv. Calamondin derived from somatic embryogenesis propagation on JC rootstock. *Daya tumbuh tanaman jeruk Kalamondin hasil perbanyakan via somatik embriogenesis in vitro pada batang bawah JC* / Devy, N.F.; Sugiyatno, A.; Yulianti, F. (Balai Penelitian Tanaman Jeruk dan Buah Subtropika, Batu (Indonesia). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(3) p. 214-224, 7 ill., 8 tables; 13 ref.

CALAMONDINS; CITRUS MITIS; SOMATIC EMBRYOGENESIS; IN VITRO; GRAFTING; ROOTSTOCKS; PLANT TISSUES; GROWTH.

The propagation fruit plants by grafting method of in vitro product has been documented already. The use of a rootstock is very important in citrus propagation industry. Besides of its better root system, it has an important role on preventing root diseases attack where scion part relatively more susceptible. The research of Calamondin derived from somatic embryogenesis (SE) propagation that grafted in vitro and ex vitro on JC rootstock grafting was conducted in Somatic Embryogenesis Laboratory and Nursery House of Indonesian Citrus and Subtropical Fruit Research Institute (ICISFRI) from January to December 2010. This research used both embryos and plantlets of citrus cv. Calamondin derived from SE propagation in vitro as stocks and JC as rootstock, respectively. The grafting was done on the two conditions, (1) in vitro, i.e. the stock was grafted on the JC plantlet and (2) field condition i.e. the stock plant was grafted to three treatments rootstock (4 and 8 months acclimated SE plant and 8 months age-seedling of JC). The activities were arranged in randomized block design and factorial randomized complete design respectively, with three replications and four plants for each experimental unit. The results showed that the growth of citrus cv. Calamondin (Citrus mitis Blanco) derived from SE propagation on JC rootstock at ex vitro activity was better than that at in vitro activity. At in vitro activity, up to 10 months after grafting, percentage of death grafting was influenced by type of stock, where the use of plantlets as stock causing more death grafting than embryo. At another activity, there was no interaction between rootstock and stock treatment for all parameters, with average plants height reached 53.7 cm. It concluded that the product of propagation via somatic embryogenesis technique, both cotyledonary embryos and plantlets, could be used as a stock that would growth satisfactory if grafted on the citrus rootstock ex vitro.

# 214 LESTARI, P.

Purification and characterization of thermostable alpha-amylase from *Bacillus stearothermophilus* TII-12. *Purifikasi dan karakterisasi alpha-amilase termostabil dari Bacillus stearothermophilus TII-12* / Lestari, P. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Richana, N.; Darwis, A.A.; Syamsu, K.; Murdiyatmo, U. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 56-62, 5 ill., 3 tables; 25 ref.

BACILLUS STEAROTHERMOPHILUS; AMYLASES; PH; ENZYMES; GLUCOSE; MALTOSE; TAPIOCA.

Thermostable -amylase is a potential enzyme employed in the starch processing and widely used in food industries, but this enzyme is still imported. The local enzyme production would be more economic and useful for its broad applications. This study describes -amylase from indigenous bacteria TII-12 which was purified and characterized, as well as analyzed its hydrolysis product on cassava starch. The enzyme of <code>Bacillus stearothermophilus TII-12</code> partially purified by ultrafiltration, acetone precipitation and gel

filtration (Sephadex G-100) showed the reduced total activity, total protein and yield, but increased the specific activity. The enzyme had a Km of 1.06 mg/ml and V max of 1.21 mol/min, with optimal activity at pH 7 and 90°C. An apparent molecular mass was of 192.932,8 Dalton, as estimated by Native-Polyacrylamide Agarose Gel Electrophoresis. Its activity was inhibited by the divalent cation chelator such as EDTA and  $CuSO_4$  but activated by calcium ion. Hydrolysis products of this enzyme on cassava starch were glucose, dextrin, maltose and oligosaccharides. After 24 hours of hydrolysis, the concentration of glucose and maltose reached 51.970 and 10.090 ppm, respectively. The thermostable -amylase of TII-12 is an endo--amylase and prospective to be applied on starch liquefaction with high temperature process.

# 215 LIFERDI, L.

Correlation test of leaf nitrogen nutrient with soil chemical characteristics and mangosteen production. *Korelasi konsentrasi hara nitrogen daun dengan sifat kimia tanah dan produksi manggis* / Liferdi, L. (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)); Poerwanto, R. *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 14-23, 4 ill., 3 tables; 25 ref.

GARCINIA MANGOSTANA; NITROGEN; LEAVES; TISSUE ANALYSIS; SOIL CHEMICOPHYSICAL PROPERTIES; NUTRITIONAL STATUS; YIELDS.

Leaf analysis can be used as a guide to diagnose nutritional status and as a fertilizer recommendation tool for mangosteen tree. Therefore, the sampling technique of standard leaf has to be established. Leave age was the main important factor to estimate fruits plant nutrient status. The best leaf sampling was the one which has the best correlation between leaf nutrients concentration with growth and yield as well. This leaf will be used in the calibration test. Leaf nutrient concentration was investigated in three mangosteen production areas i.e. Bogor, Tasikmalaya, and Purwakarta. To analyze N concentration of twenty uniform and representative mangosteen trees, leaves were taken monthly. The results showed that concentration of N on the leaves decreased following the increase of leaf age. Mangosteen leaves from Purwakarta contained more N than those from Tasikmalaya and Bogor. Fifth months leaf age was the best one to be used as a leaf sample to diagnose N nutritional status which coefficient correlation more than 0.7, because it had the best correlation among concentration of N in leaf with soil nitrogen nutrient and production. This research results were used as a guide to estimate fertilizer recommendations for mangosteen.

## 216 MULYONO, D.

[Combined effect of shade intensity with plant growth regulator indole butyric acid (IBA), naphthalene acetic acid (NAA), vitamin B1 and growth in acclimatization of gaharu seedlings (Aquilaria beccariana)]. Pengaruh kombinasi intensitas naungan dengan zat pengatur tumbuh indole butyric acid (IBA), naphthalene acetic acid (NAA), dan vitamin B1 dalam aklimatisasi pertumbuhan bibit gaharu (Aquilaria beccariana) / Mulyono, D. (Pusat Teknologi Produksi Pertanian, Jakarta (Indonesia)). Jurnal Sains dan Teknologi Indonesia (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 167-173, 12 tables; 10 ref.

GUM PLANTS; INDUSTRIAL CROPS; ROOTS; STUMPS; SHADING; ADAPTATION; GROWTH; IBA; NAA; VITAMINS B; PLANT GROWTH SUBSTANCES; CULTIVATION.

The objective of this research is to know the optimal formula of Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA), Vitamin B1 and the combinations with shading intensities to the acclimatization of Gaharu stump (*Aquilaria beccariana*). This research used factorial design with basic analysis of completely randomized design in order to know the effect of treatment. The research was carried out in Agroindustry and Biotechnology Laboratory, Ciampea, Bogor. The results of the research showed that after 8 weeks of treatment: (a) The combination of 55% shading intensity with IBA 15 mg/l + NAA 10 mg/l + Vitamin B1 1 mg/l was the best formula for increasing height of Gaharu stump 4.660 cm. (b) The combination of 55% shading intensity with IBA 15 mg/l + NAA 30 mg/l + Vitamin B1 1 mg/l was the best formula for increasing number of Gaharu leaf stump 12.337 leafs, (c) The combination of 55% shading intensity with IBA 15 mg/l + NAA 40 mg/l + Vitamin B1 1 mg/l was the best formula for increasing number of Gaharu root stump 3.783 roots, and (d) The combination of 55% shading intensity with IBA 15 mg/l + NAA 40 mg/l + Vitamin B1 1 mg/l was the best formula for increasing length of Gaharu root stump 3.686 cm.

## 217 OKTAVIDIATI, E.

Plant growth and total phyllanthin and hypophyllanthin contents of *Phyllanthus* sp. L accession on various shading levels. *Pertumbuhan tanaman dan kandungan total filantindan hipofilantin aksesi meniran (Phyllanthus sp. L.) pada berbagai tingkat naungan* / Oktavidiati, E. (Universitas Muhammadiyah Bengkulu (Indonesia). Fakultas Pertanian); Chozin, M.A.; Wijayanto, N.; Ghulamahdi, M.; Darusman, L.K. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 25-31, 1 ill., 6 tables; 36 ref.

EUPHORBIACEAE; PHYLANTHUS; GROWTH; SHADING; BIOMASS; PRODUCTION.

Meniran (*Phyllanthus* sp. L.) is family member of Euphorbiaceae. The lignan, consisting of phyllanthin and hypophyllanthin in the plant, was reported as therapeutically active constituent and serve as hepatoprotective agent. The objective of this research was to investigate the effect of shading intensities on plant growth and phyllanthin and hypophyllanthin contents of *Phyllanthus* sp. accessions. The experiment was arranged in split plot design with three replicates. The main plot was shading intensity consisting of 0% (N0), 25% (N1), and 50% (N2) shades. The subplot was of *Phyllanthus* sp. accessions (A) consisting of A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, All, A12, and A13 taken from Bangkalan and Gresik. The results showed that 50% shade increased plant height but decreased number of leaves. Interaction between shading intensity and accession gave significant effect on number of branches. Referring to their responses on shades, all accessions were divided into 3 groups by DMRT. Biomass productions of accessions number 6 and 7 were greater than the other accessions. Accession number 7 was the highest in phyllanthin and hypophyllanthin contents where the shading reduced the phyllanthin but increased the hypophyllanthin contents.

## 218 ROCHMAN, F.

Growth, resistance to pathogen, and nicotine content characters of several Temanggung tobacco hybrids lines. *Karakter pertumbuhan, ketahanan terhadap penyakit, dan kadar nikotin beberapa galur tembakau Temanggung* / Rochman, F. (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia) ISSN 0853-8212 (2012) v. 18(3) p. 102-106, 4 tables; 13 ref.

NICOTIANA TABACUM; NICOTINE; DISEASE RESISTANCE; PLANT DISEASES; MELOIDOGYNE; PSEUDOMONAS SOLANACEARUM; GROWTH; PATHOGENESIS.

A shift in consumer tastes toward lighter cigarette has led to finding of low nicotine content of temanggung tobacco with the quality suitable to consumer preferences. The nicotine content of temanggung tobacco is very high, which can reach 7.8%. One of the main problem of temanggung tobacco cultivation is soil born diseases caused by complexity of nematodes Meloidogyne spp, Ralstonia solanacearum, and the fungi Phytophthora nicotianae which is known as "lincat". The research aimed at obtaining hybrid lines of temanggung tobacco with nicotine levels lower than the existing varieties (Kemloko 1 and Kemloko 2), quality suitable to consumers preferences, and tolerant to the main diseases. The experiment was conducted from February to October 2009 in Gandurejo Village, Bulu Subdistrict, Temanggung District, on the dry land endemic pathogens with altitude about 800 m asl. Research material consisted of 7 genotypes F6 from hybridization between temanggung and orient tobacco, and 5 parental varieties. As many as 520 crops of each genotype were planted. First selection was done based on the criteria: free from disease, having > 18 leaves, medium to big leaf size, and farmers' favorite. The results showed that from 2,436 healthy plants (derived from 7 genotypes) were visually selected for 302 plants. From the second selection based on leaf size from the 302 plants obtained 40 genotypes. The forty genotypes were evaluated/screened at later stage. Nicotine content ranged from 1.07 to 5.22% and the lowest nicotine content was derived from crosses between Kemloko 1 and Xanthi Yacca.

## 219 TASMA, I M.

Phylogenetic and maturity analyses of sixty soybean genotypes used for DNA marker development of early maturity quantitative trait loci in soybean. *Analisis filogenetik dan kegenjahan 60 genotipe kedelai untuk pengembangan marka DNA terkait karakter umur genjah pada kedelai* / Tasma, I M.; Satyawan, D.; Warsun, A.; Yunus, M.; Santosa, B. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 37-46, 3 ill., 6 tables; 25 ref.

GLYCINE MAX; SOYBEANS; GENOTYPES; DNA; GENETIC DISTANCE; GENETIC MARKERS; PCR; GERMINABILITY MATURITY; QUANTITATIVE ANALYSIS.

The Indonesian soybean productivity is still very low with the national average of 1.3 t/ha. One means to improve national soybean productivity is by manipulating harvest index by cultivating very early maturing soybean cultivars. Development of early maturing soybean cultivars can be carried out by using marker-aided selection. The objective of this study was to select parental lines having contrasted maturity traits and selected parents must be genetically distance. The parents then were used to develop F2 populations for detecting early maturity QTL in soybean. Maturity tests of 60 soybean genotypes were conducted at two locations, Cikeumeuh (Bogor) and Pacet (Cianjur) using a randomized block design with three replications. Genomic DNA of the 60 genotypes were analyzed using 18 SSR markers and genetic relationship was constructed using the Unweighted Pair-Group Method Arithmatic through Numerical Taxonomy and Multivariate System program version 2.1-pc. Results showed that the 60 genotypes demonstrated normal distribution in both locations for days to R1 (32-48d), days to R3 (35-55d), days to R7 (75-92d), and days to R8 (78-99d). Four early maturing genotypes and three late genotypes were obtained. Total SSR alleles observed were 237 with average allele per locus of 12.6 (3-29), and average PIC value of 0.78 (0.55-0.89). Genetic similarity among genotypes ranges from 74.8-95%. At similarity level of 77% the genotypes were divided into six clusters (the four selected early maturing genotypes located in clusters III and IV, while the three late genotypes located in cluster II). Based on maturity data, pubescent color, and phylogenetic analysis seven parents were selected (four early maturing genotypes B1430, B2973, B3611, B4433 and three late genotypes B1635, B1658, and B3570). Twelve F2 populations were developed with the aid of SSR markers Satt300 and Satt516. Two of the populations will be used to develop DNA markers for earliness in soybean.

## H10 PESTS OF PLANTS

## 220 HARNI, R.

Effectiveness of endophytic bacteria to control *Pratylenchus brachyurus* nematode on patchouli. *Keefektifan bakteri endofit untuk mengendalikan nematoda Pratylenchus brachyurus pada tanaman nilam* / Harni, R. (Balai Penelitian Tanaman Rempah dan Aneka Tanaman Industri, Sukabumi (Indonesia)); Supramana; Sinaga, M.S.; Giyanto; Supriadi. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 6-10, 2 ill., 2 tables; 15 ref.

POGOSTEMON CABLIN; PRATYLENCHUS BRACHYURUS; BIOLOGICAL CONTROL AGENTS; ENDOPHYTES; MELOIDOGYNE INCOGNITA; GLOBADERA; RADOPHOLUS SIMILIS.

The use of endophytic bacteria as biocontrol agents for nematodes, such as *Meloidogyne incognito* on cotton and tomatoes, *Globodera* sp. on potatoes and *Radopholus similis* on bananas has been widely studied in several crops. The aim of the study was to investigate the effectiveness of some endophytic bacteria to control *P. branchyurus*, penetration, reproduction, and plant fresh weight production. Five isolates, namely *A. xylosoxidans* TT2, *A. faecalis* NJ16, *P. putida* EH11, *B. cereus* MSK, and *B. subtilis* NJ57 were applied to the patchouli cutting roots by soaking method before planting. A week after planting, the plants were inoculated with 500 juveniles and adults of *P. brachyurus*. Observations were done on penetration and reproduction rates of the nematode, and growth of patchouli plant. Under greenhouse condition, *A. xylosoxidans* TT2, *A. faecalis* NJ16, *P. putida* EH11. *B. cereus* MSK, and *B. subtilis* NJ57 reduced penetration rate of *P. brachyurus* into the patchouli roots by 54.8 to 70.6% and suppressed nematode population with pf/pi value 0.61 to 0.94. Growth of inoculated plants increased by 37.86 to 84.71% compared with uninoculated (control) ones.

## 221 INDIATI, S.W.

Effect of biological and synthetic insecticides on thrips and mungbean yield. *Pengaruh insektisida nabati dan kimia terhadap hama thrips dan hasil kacang hijau* / Indiati, S.W. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 152-157, 4 tables; 21 ref.

VIGNA RADIATA RADIATA; THRIPS; POPULATION DYNAMICS; BOTANICAL INSECTICIDES; BIOLOGICAL PEST CONTROL; GROWTH; YIELD COMPONENTS; YIELDS; YIELD LOSSES.

Thrips, Megalurothrips usitatus, is an important pest of mungbean at its vegetative phase. Severe attacks of the pest can cause yield losses of mungbean from 13 to 64%. An experiment was conducted at Muneng Research Station, Probolinggo, East Java, in dry season of to 2010, to identify effectiveness of biological and chemical insecticides to control

thrips. The trial was arranged in a randomized block design with 10 treatments and three replications. The treatments were: control, spraying with water suspensions of fipronil 2 ml/l, imidaklorprit 200 SL 2 ml/l, imidaklorprit 100 EC 2 ml/l, emamektin benzoate 2 g/10 l, neem seed powder (SBM) 100 g/l, garlic bulb extract 85 g/100 ml, ginger rhizome extract 50 g/3 l, papaya leaves extract 50 g/l, and a mixture of extracts from 25 g green chilies, 25 g ginger, and garlic 50 g/3 l. The results showed that the use of SBM, garlic, ginger, papaya, and extracts a mixture of LBJ has an equal effectiveness in suppressing population and intensity of thrips attacked on mungbean. The biological insecticides were less effective than the synthetic ones in controlling population and intensity of thrips attacked, but they were safe for the environment. The pesticide treatments reduced yield losses of mungbean up to 63%, depending on the pesticide used.

# 222 INDRAYANI, I G.A.A.

Effect of leaf hair and gossypol gland densities on infestation of sucking insect pest Amrasca biguttula Ishida and bollworm Helicoverpa armigera Hubner on cotton. Pengaruh kerapatan bulu daun dan kelenjar gosipol terhadap infestasi hama pengisap daun Amrasca biguttula Ishida dan penggerek buah Helicoverpa armigera Hubner pada kapas / Indrayani, I G.A.A.; Sumartini, S. (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)). Jurnal Penelitian Tanaman Industri (Indonesia). ISSN 0853-8212 (2012) v. 18(3) p. 95-101, 3 ill., 2 tables; 41 ref.

GOSSYPIUM HIRSUTUM; PESTS OF PLANTS; AMRASCA BIGUTTULA; HELICOVERPA ARMIGERA; GOSSYPOL; SUCKING INSECTS; PLANT HAIRS.

As major insect pests, A. biguttula and H. armigera have been limiting factors of cotton productivity. These insect pests could be effectively controlled by using resistant varieties based on plant morphological characters (antixenosis), especially leaf hair density, and antibiosis resistance mechanism. Leaf hair density prevented the nymph of A. biguttula to suck the leaf sap freely while gossypol gland toxics to H. armigera larvae. This study was conducted at Asembagus Experimental Garden and Insect Pathology Laboratory of Indonesian Sweeteners and Fiber Crops Research Institute in Malang from March to July 2011. The objective of study was to find out the effect of leaf hairs and gossypol glands density of fifteen cotton accessions to infestation of sucking pest, A. biguttula and bollworm H. armigera. Fifteen cotton accessions: (1) HSCY 52, (2) DPL 55, (3) Deltapine (DP) 340, (4) PTY 800, (5) Chinese x 229, (6) GLK 320 x 359 x 339 x 448/8, (7) GLK 135 x 182 x 351 x 268/9, (8) GLK 351 x 268/4, (9) GLK 135 x 182/8, (10) GLK 135 x 182110, (11) Kanesia 15, (12) CEA N 886 (hirsute), (13) Stoneville 825 (black seed), (14) DPL 55 B, and (15) HSC 5 were used as treatments and planted in 10 m x 3 m of plot size with 100 m x 25 cm of row spacing with one plant per hole. Each treatment (accession) was arranged in randomized completely design (RCD) with four replications. Parameter observed were leaf hair density and population of A. biguttula nymph on three sample leaves from different plant, gossypol gland density was observed on stem, leaves and boll of sample plant, and population of H. armigera larvae was recorded from plant canopy. Data observed were analized with analysis of variance. Results showed that cotton accessions with lower leaf hair density (200-268 pieces/cm²) and less than 2 nymphs/plant were GLK 320 x 359 x 339 x 448/8, GLK 135 x 182 x 351 x 268/9, GLK 351 x 268/4, GLK 135 x 182/8, GLK 135 x 182110, Kanesia 15 and CEA N 886 (hirsute) and DPL 55 B. Negative correlation (r = -0.711 and y = -0.012x + 3.836) between leaf hair density and population of A. biguttula nymph reduced the nymph population when leaf hair density increased. Gossypol gland density, mainly on bollwall, effectively reduced the larval population due to negative correlation between the two parameters (r = -0.579 and y = -3.796x + 51.886). Lower population of H. armigera larvae was counted on HSCY 52, DP 340, PTY 800, Kanesia 15, 150

and CEA N 886 (hirsute) due to higher gossypol density (43-57 glands/cm²) compared to other accessions with lower gossypol density (34-44 glands/cm²). Kanesia 15 and CEA N 886 (hirsute) were seemed to be the potential genetic materials for developing resistant varieties against *A. biguttula* and *H. armigera*.

## 223 INDRAYANI, I G.A.A.

Effectiveness and efficiency of different control techniques of cotton jassid, *Amrasca biguttula*. Efektivitas dan efisiensi beberapa teknik pengendalian hama pengisap daun pada kapas / Indrayani, I G.A.A.; Prabowo, H.; Sumartini, S. (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 47-53, 5 ill., 1 table; 36 ref.

GOSSYPIUM HIRSUTUM; VARIETIES; PESTS OF PLANTS; PEST RESISTANCE; AMRASCA BIGUTTULA; IMIDACLOPRID; ECONOMIC THRESHOLDS; PREDATORS.

Recommendation for controlling jassid (A. biguttula) of cotton still relies on the use of combination of resistant variety and seed treatment (imidachloprid). Farmers, however, often spray chemical insecticides over plant canopy that also kill beneficial insects, including natural enemies. This study was conducted at Asembagus Experimental Station from January to November 2010. The objective of the study was to find out the effectiveness and efficiency of control techniques against cotton jassid, A. biguttula. This field study consisted of two factors. First factor was consisted of four different control techniques i.e. (1) seed treatment (PB), (2) without seed treatment and foliar application or control (TPB), (3) combination between seed treatment and foliar application (PBS), and (4) foliar application alone (S). Second factor consisted of three cotton varieties, e.g. 98050/9/2/4, KI 645, and Kanesia 10. Treatments were arranged in a split plot design with three replicates. Cotton intercropped with mung bean planted in between cotton rows. Population of A. biguttula and its predator, economic threshold achievement, score of plant injury, yields of cotton and mung bean were observed. Economic analysis of the treatments was evaluated at the end of the experiment. Results showed that each control techniques caused different effect on jassid and its predator development. The average of economic threshold achievement in seed treatment application (PB) and control (TPB) were lower (0.5-2.0 times) compared to combination between seed treatment and foliar sprayed (PBS), also only foliar sprayed (3-4 times). Averaged of economic threshold achievement on 9805019/2/4 line was the lowest, followed by Kanesia 10 and KI 645. Application of seed treatment (PB) not only reduced jassid population but also less effective on predator population. It was more efficient than other treatments with marginal rate 1.38 and increased net income by 14.3%. It meant that foliar sprays to control A. biguttula on cotton should be ignored, preferred on applying seed treatment and resistant/tolerant varieties.

# 224 PRIYATNO, T.P.

Identification of entomopathogenic red bacterial from brown planthopper (*Nilaparvata lugens* Stal.). *Identifikasi entomopatogen bakteri merah pada wereng batang coklat (Nilaparvata lugens Stal.)* / Priyatno, T.P. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Dahlian, Y.A.; Suryadi, Y.; Samudra, I M.; Susilowati, D.N.; Rusmana, I.; Wibowo, B.S.; Irwan, C. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(2) p. 85-95, 4 ill., 3 tables; 21 ref.

NILAPARVATA LUGENS; ENTOMOGENOUS BACTERIA; SERRATIA; ENTEROBACTERIACEAE; IDENTIFICATION; XANTHOMONAS ORYZAE; NUCLEOTIDASE.

Red bacteria isolated from brown planthopper (BPH) has been proven pathogenic against BPH and others insects. Application of  $10^6$  to  $10^7$  cells/ml of red bacteria caused 65.6-78.2% mortality of BPH. The 50% effective concentration (EC50) and lethal time of red bacteria against BPH is  $2.8 \times 10^5$  cells/ml and 6.8 days, respectively. Based on phenotypic characters tested on GN MicroPlate (TM) Biolog kit and 16S rRNA sequences analysis, red bacteria was identified as Serratia marcescens with 99% similarity. Red pigment produced by S. marcescens strain BPH is secondary metabolite determined as prodigiosin showing bactericidal activities against Xanthomonas oryzae pv. oryzae. It is concluded that S. marcescens did not only potent as biocontrol agent to BPH, but also it could be used to control plant pathogenic bacteria.

## 225 SETIAWATI. W.

Compatibility of citronella oils with *Menochilus sexmaculatus* for controlling vector of yellow virus disease. *Kompatibilitas minyak serai dengan predator Menochilus sexmaculatus untuk pengendalian vektor penyakit virus kuning* / Setiawati, W.; Murtiningsih, R. (Balai Penelitian Tanaman Sayuran, Lembang, Bandung (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(4) p. 344-352, 2 ill., 5 tables; 31 ref.

CYMBOPOGON; BEMISIA TABACI; MENOCHILUS SEXMACULATUS; PREDATORS; VECTORS; NYMPHS; LARVAE; MORTALITY; BIOLOGICAL CONTROL AGENTS; BIOPESTICIDES; DISEASE CONTROL.

There is a tendency of diminishing the number of natural enemies caused by utilization of non-selective insecticides that lead to serious consequences for pest population dynamics. Bemisia tabaci is an extremely polyphagous pest that causes direct damage and can act as a viral vector on hot peppers causing yellow virus disease. The activity of natural enemies can be exploited by employing proper conservation and augmentation techniques. Natural enemies might play roles to control of B. tabaci on hot peppers. The study was conducted in the Laboratory and Screenhouse of IVEGRI from June to December 2009. The objective of this study was to determine compatibility of citronella oil with M. sexmaculatus to control B. tabaci. Dipping methods, dry film, and odor effect were used in this study. Randomized completely block design with six treatments and four replications was used in this study. The treatments were citronella oils at different concentration 5,000, 4,000, 3,000, 2,000, 1,000, and 0 ppm as a control and stages of B. tabaci (1st, 2nd, 3rd, and 4th instars) and M. sexmaculatus. Probit analysis was used to determine LC50 and LT50 value. The results indicated that citronella oils at concentration of 2,000-5,000 ppm was effective to control nymphs of B. tabaci at 1st and 2nd instar, while 3,000-5,000 ppm for 3rd and 4th instar. The first two nymphal stages were more susceptible to citronella oil compared to the third and fourth nymphal stage. LC<sub>50</sub> value for first to fourth nymphal stage was 1,266.48; 1,755.81; 2,305.46, and 2,343.59 ppm, respectively. The LT<sub>50</sub> occurred at 2.95 days in all instar stages. Menochilus sexmaculatus predators were highly susceptible to the essential oil vapours and the selective toxicity ratio varied depending on the methods and stages. Citronella oil at 1,000-2,000 ppm was compatible with M. sexmaculatus larvae on odor effect and 1.000 ppm on dry film method. Menochilus sexmaculatus adult more tolerant to citronella oil compared to larvae stage at concentration 1,000-5,000 ppm. Concentration 2,000 ppm of citronella oil was the appropriate concentration applied as bioinsecticide for B. tabaci, safety and compatibility for *M. sexmaculatus*. Based on the study known citronella oil and *M. sexmaculatus* had potential to be incorporated in controlling *B. tabaci* on hot peppers.

## 226 SUNARTO, T.

Biological control of *Meloidogyne* spp. using *Paecilomyces fumosoroseus* and *Pasteuria* penetrans and their effect on bean (*Phaseolus vulgaris* L.) growth. *Pengendalian biologi* nematoda *Meloidogyne* spp. dengan jamur Paecilomyces fumosoroseus dan bakteri Pasteuria penetrans serta pengaruhnya terhadap tanaman buncis (*Phaseolus vulgaris* L.) / Sunarto, T.; Djaja, L.; Meliansyah, R. (Universitas Padjadjaran, Sumedang (Indonesia). Fakultas Pertanian). *Bionatura* (Indonesia). ISSN 1411-0903 (2009) v. 11(1) p. 37-46, 3 tables; 16 ref.

PHASEOLUS VULGARIS; MELOIDOGYNE; NATURAL ENEMIES; PAECILOMYCES; PASTEURIA; BIOLOGICAL CONTROL.

Bean yield in Indonesia is lower compared to other countries, because is due to the infection of root knot nematode (Meloidogyne spp.) which caused 41% reduction. One of Meloidogyne controlling method is using the natural enemies, Paecilomyces fumosoroseus and Pasteuria penetrans. The objective of this research was to find out the effect of P. fumosoroseus, P. penetrans, and the mixture of both against the root gall index, the number of egg, the fresh weight of upper part of plant, the number of second larva of Meloidogyne spp. in 100 ml of soil, and the yield of bean. The experiment was carried out using randomized block design with 8 treatments and 4 replications. The result demonstrated that the number of the root gall index, the number of egg, and the number second larva Meloidogyne were decreased when the plant treated with Meloidogyne spp. + P. fumosoroseus, Meloidogyne Spp. + P. penetrans, and Meloidogyne Spp. + P. fumosoroseus + P. penetrans. The bean yield and the fresh weight of the upper part of the plant were also increased when the plant treated with the same treatments. However, the best result was showed when bean treated with the mixture of P. fumosoroseus and P. penetrans. They were able to reduce the number of egg, reduce the number of second larva Meloidogyne in 100 ml soil and increase the bean yield.

## 227 TUKIMIN, S.W.

Effect of jatropha cake oil on mortality and fertility of *Helicoverpa armigera* Hubner. *Pengaruh minyak bungkil biji jarak pagar terhadap mortalitas dan peneluran Helicoverpa armigera Hubner* / Tukimin, S.W. (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)); Karmawati, E. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(2) p. 54-59, 6 tables; 23 ref.

JATROPHA CURCAS; SEEDS; BY PRODUCTS; INDUSTRIAL WASTES; HELICOVERPA ARMIGERA; MORTALITY; PESTICIDES; FERTILITY.

Physic nut (*Jatropha curcas* L.) produces waste from its seeds during seed processing into JCO. This waste (cake) can be further processed into organic fertilizer and botanical pesticide. The toxic chemicals for insect inside the seeds are phorbol ester and curcin. Both are included in JCO during the process and those are effective to control estate crops insect pests after being formulated. In fact same of those chemicals still remain in the seeds cake, therefore, the objective of the research is to find out the effectiveness of its formulation on *Helicoverpa armigera* Hubner, the main pest of cotton. The research was carried out at the Indonesian Sweetener and Fiber Crops Research Institute, Malang from April to December 2010, and the experiment was arranged using randomized block design with 6 treatments and

4 replicates. The materials used were three (3) accessions of jatropha from South Sulawesi, Lampung, and East Java origins. Methanol was used for extracting the chemicals, and then detergent was used for formulating 4 concentration levels of: 5, 10, 20, and 40 ml/l + 1 g detergent each. The methods used were contact and oral applications. The parameters observed were mortality, pupae weight and fertility. It was revealed that the effectiveness was positively correlated with phorbol ester contents i.e. 9.39, 6.64, and 4.39  $\mu$ g/ml for South Sulawesi, Lampung, and East Java accessions, respectively. There was no egg laid by female of H. armigera fed with shoots and squares contaminated with bio-pesticides (10 and 20 ml/l of South Sulawesi and East Java accessions).

#### H20 PLANT DISEASES

# 228 EMILDA, D.

Effect of clove oil on the growth and antagonism activity of *Gliocladium* sp. against *Fusarium oxysporum* f. sp. cubense. *Pengaruh minyak cengkeh terhadap pertumbuhan koloni dan sifat antagonis cendawan Gliocladium sp. terhadap Fusarium oxysporum f. sp. cubense* / Emilda, D.; Istianto, M. (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 33-39, 4 ill., 3 tables; 19 ref.

CLOVES; ESSENTIAL OILS; GLIOCLADIUM; GROWTH; INHIBITION; FUSARIUM OXYSPORUM; ANTAGONISM.

Clove essential oil and Gliocladium sp. are known to have the potency for controlling Fusarium oxysporum f. sp cubense (Foc) the causal agent of wilt banana disease. The compatibility of clove oil and Gliocladium sp. has to be evaluated to establish an integrated pest management against Fusarium disease. The objective of this experiment was to evaluate the effect of clove oil on the growth of Gliocladium sp. colony and the inhibition value of this fungus to Foc race 4. The experiment was conducted in the Plant Protection Laboratory of Indonesian Tropical Fruit Research Institute. The treatments were application of clove oil i.e. 3, 9, and 18 µl that were arranged in a completely randomized design with five replications. The results showed that Gliocladium sp. mycelia treated with clove oil could still grow throughout the available space within petri dish. However, Gliocladium sp. treated with this oil had lower number of conidia than that it was untreated. Gliocladium sp. treated with clove oil had still effective antagonism trait to Foc. This effectiveness was not significantly different from Gliocladium sp. that was untreated with clove oil. This result indicated that clove oil had good potency as a component in integrated control program against wilt disease on banana, because it did not have negative effect to Gliocladium sp. However, further research is still needed to evaluate the effect of clove oil to plant growth.

## 229 HANUDIN

Comparison of inoculation techniques and selection of antagonist bacteria to control white rust disease on chrysanthemum. *Perbandingan teknik inokulasi Puccinia horiana dan seleksi bakteri antagonis untuk mengendalikan penyakit karat putih pada krisan* / Hanudin; Nuryani, W.; Silvia Yusuf, E.; Djatnika, I.; Soedarjo, M. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(2) p. 173-184, 1 ill., 6 tables; 40 ref.

DENDRANTHEMA MORIFOLIUM; UREDINALES; DISEASE CONTROL; BACTERIAL PESTICIDES; SELECTION; PUCCINIA HORIANA; INOCULATION.

White rust disease caused by P. horiana is one of the serious problems on chrysanthemum cultivation. The pathogen causes yield losses up to 100%. The research was aimed (1) to determine the effective inoculation technique and (2) to select antagonistic bacteria for effectively controlling the pathogen. The research was carried out in the Laboratory and Glasshouse of Indonesian Ornamental Crops Research Institute (IOCRJ), from June to December 2009. The research consisted of two experiments. Each experiments was arranged in a randomized completely block design with 11 treatments, i.e. rust pustuls dipped in water, mature rust pustuls dipped in water, rust pustuls dipped in water and stored at 10°C during 12 hours, mature rust pustuls dipped in water and stored at 10°C during 12 hours, pustuls adhered on the leaf, mature pustuls adhered on the leaf, pustuls adhered beneath the leaf, mature rust pustuls adhered beneath the leaf, the plant + pustuls stored beside tested plants covered by transparent plastic, mature pustuls plants stored beside tested plants covered by transparent plastic, and control with three replications. The results indicated that the most effective inoculation technique for the pathogen was locating and infected plant with immature or mature pustuls surrounding a healthy plant. The effective antagonistic bacteria against the pathogen was Corynebacterium-Z. The effectiveness of the antagonistic bacteria in suppressing P. horiana was equivalent to synthetic fungicide azoksistrobin 0.1%. The Corynebacterium-2 isolate will be potentially used as an active ingredient of biopesticide for controlling white rust disease on chrysanthemum. The development of the biopesticide is expected to decrease utilization of synthetic pesticides.

## 230 HANUDIN

Study of organic biopesticide containing *Bacillus subtilis* and *Pseudomonas fluorescens* for controlling fusarium wilt on carnation. *Biopestisida organik berbahan aktif Bacillus subtilis dan Pseudomonas fluorescens untuk mengendalikan penyakit layu fusarium pada anyelir* / Hanudin; Nuryani, W.; Silvia-Yusuf E.; Marwoto, B. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(2) p. 152-163, 1 ill., 6 tables; 39 ref.

DIANTHUS CARYOPHYLLUS; WILTS; PSEUDOMONAS FLUORESCENS; DISEASE CONTROL; FUSARIUM; BIOPESTICIDES; BACILLUS SUBTILIS.

Carnation (Dianthus caryophyllus L.) is one of the most economically important cut flowers in Indonesia. The crops is commonly cultivated in the highland areas of the country. Cultivation of the crops in the production center areas have faced various problems, especially wilt disease caused by Fusarium oxysporum f. sp. dianthi as the most important one. Based on the field observation, the disease could reduce plant production and its yield quality up to 20-60%. To control the disease, farmers usually use a synthetic chemical pesticides. However the control measures are not sufficiently effective to overcome the diseases problems. Therefore, an alternative control measures which are more environmentally friendly is necessary. The use of biocontrol agents is nowadays being popular to be recommended to control the disease. A study on the control of fusarial wilt disease on carnation was carried out in the Laboratory and Glasshouse of Indonesian Ornamental Crops Research Institute (1,100 m as1.) from May to December 2009, using Bacillus subtilis and Pseudomonas fluorescens formulated in the liquid organic pesticide. The study was arranged in a randomized block design, with 10 treatments, i.e. 10% vermicompost + 10% molasse + BP and 10% horse manure + 10% molasse + BP concentration 0.1, 0.3, 0.5, 0.7% respectively, dazomet 0.2% and control with four replications. The results showed that population of antagonistic bacterial increased from 107-109 to 1010 - 1012 cfu/ml after 3 weeks fermentation in the organic carrier. The population of two antagonistic bacteria was likely stable on  $10^{10}$  -  $10^{11}$  cfu/ml after storing 2 months. The treatments of B. subtilis and P. fluorescens suspended in the vermicompost extract and molasses on the concentration level of 0.5% and formulated in the biofermentor for 3 weeks were consistently effective in reducing Fusarium wilt on carnation. The implication of research results that it could be increase commodity competitive ability of ornamental plants by using national nature resource on a continuity for support the ornamental plants industry with high competitiveness.

#### 231 JUMJUNIDANG

Virulence of Fusarium oxysporum f. sp. cubense VCG 01213/16 on banana cv Barangan from different banana varieties and locations. Virulensi isolat Fusarium oxysporum f. sp. cubense VCG 01213/16 pada pisang barangan dari varietas pisang dan lokasi yang berbeda / Jumjunidang; Hermanto, C.; Riska (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)). Jurnal Hortikultura (Indonesia). ISSN 0853-7097 (2011) v. 21(2) p. 145-151, 3 tables; 29 ref.

MUSA; VARIETIES; FUSARIUM OXYSPORUM; ISOLATES; PATHOGENICITY.

Genetic analysis of isolates of the Fusarium oxysporum f. sp. cubense (Foc) that are grouped in VCG 01213/16, as the causal agent of wilt disease in banana plants showed a considerable variation. This research aimed to study the variation in virulence of isolates that are grouped in VCG 01213116 from different varieties of banana and regions. The study was conducted in the Protection Laboratory and the Screenhouse of Indonesian Tropical Fruit Research Institute (ITFRJ) Solok, from March to June 2009. A randomized block design was used in this research with 10 treatments and three replications. Each treatments consisted of 10 banana plants. The treatment was 10 Foc isolates belonging to VCG 01213/16 originating from different varieties of banana and locations. Barangan plantlets produced from tissue culture propagation were used as the planting material. The results showed that there were high variations in virulence among 10 Foc isolates in VCG 01213116 based on variables of the incubation period, percentage of wilt, and disease severity index on corm and leaves of Barangan variety. Nine of the 10 Foc isolates tested were highly virulent isolates. The incubation period ranged from 13.98 to 16.80 days, the percentage of wilt from 93.33 to 100%, and the disease severity index of corm and leaves ranged from 3.46 to 5.35 and from 4.68 to 5.41, respectively. The Foc VCG 01213/16 isolates originated from Jabung, East Lampung and from Ambon Kuning variety (isolate F) shown relatively low virulence than others isolates that the incubation period was 30.27 days and the disease severity index on the corm and leaves was 2.14 and 3.76, respectively. This result provides useful information on biology of *F. oxysprum* f. sp. cubense to find out the best control method of the pathogen.

# 232 MIFTAKHUROHMAH

Serological and PCR detection of virus(es) associated with mosaic symptoms on patchouli plant (*Pogostemon cablin Benth*). *Deteksi secara serologi dan molekuler beberapa jenis virus yang berasosiasi dengan penyakit mosaik tanaman nilam (Pogostemon cablin Benth*) / Miftakhurohmah (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)); Suastika, G.; Damayanti, T. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 130-138, 3 ill., 5 tables; 28 ref.

POGOSTEMON CABLIN; PLANT VIRUSES; IMMUNODIAGNOSIS; SYMPTOMS.

Mosaic symptoms on patchouli plant are associated with several viruses, i.e. Potyvirus, Potexvirus, CMV, and BBWV2. The objective of the study was to detect virus(es) associated with mosaic symptoms on patchouli at the patchouli seed nurseries, in Manoko, Cicurug, and Cijeruk. Thirty leaf samples either showing typical symptomatic mosaic or asymptomatic 156

were taken from each location. Serological testing by Direct-ELISA and Indirect-ELISA using four antisera namely CMV, Cymbidium mosaic virus (CymMV), Potyvirus, and BBWV2 was carried out to test the incidence of each virus. Molecular detection by RT-PCR was performed to confirm the new virus(es). The results showed that symptoms of virus infection were found vary, i.e. weak mosaic, green yellow mosaic, mosaic with thickening, mosaic with leaf malformations, and yellow spot. Based on the serological detection, virus(es) incidence varied at each seed nurseries. In Manoko, Potyvirus, and BBWV2 were more dominant (100%) compared with CymMV. In Cicurug, Potyvirus and CMV were more dominat (83.3 and 80%) compared with BBWV2 and CymMV while in Cijeruk, BBWV2 was the most dominant (90%) than Potyvirus (50%) and CMV (13.3%). Result of RT-PCR with degenerate primers pair of BBWV was successfully identified BBWV2 from Manoko, Cicurug, and Cijeruk samples, whereas by using Potexvirus general primary, CymMV was identified only from Manoko samples. BBWV2 and CymMV were first reported to infect patchouli in West Java. The result indicated that virus(es) were the major constraint on patchouli seed that should be managed immediately.

# 233 NOVERIZA, R.

Elimination of Potyvirus causing mosaic diseases in patchouli plant using apical meristem culture and hot water treatment on stem cutting. *Eliminasi Potyvirus penyebab penyakit mosaik pada tanaman nilam dengan kultur meristem apikal dan perlakuan air panas pada setek batang* / Noveriza, R. (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)); Suastika, G.; Hidayat, S.H.; Kartosuwondo, U. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(3) p. 107-114, 2 ill., 2 tables; 33 ref.

POGOSTEMON CABLIN; PLANT DISEASES; PLANT VIRUSES; APICAL MERISTEMS; POTYVIRUSES; HEAT TREATMENT.

Patchouli oil produced by patchouli plant is one of multi functioning perfume's raw materials and has high economic value. One important constraint during its cultivation is infection by Potyvirus causing serious mosaic disease. This study was conducted to develop a technique to produce virus-free cutting seeds using apical meristem culture and hot water treatment on stem cutting. The study was carried out from January to December 2010 in Plant Virology Laboratory of Bogor Agricultural University and Pest and Diseases screenhouse of Indonesian Medicinal and Aromatic Crops Research Institute (Balittro) in Bogor. Three varieties of patchouli plant, i.e. Sidikalang, Lhokseumawe, and Tapak Tuan, were used in this study. The study consisted of (1) Elimination Potyvirus in cuttings of patchouli through apical meristem culture and (2) Elimination Potyvirus in stem cuttings of patchouli with hot water treatment. The first experiment was arranged using completely randomized design with treatments of three patchouli varieties and two explant types (apical meristem and stem terminal), and it was replicated 10 times. Parameters observed were bud growth percentage, initiation time, height, and color, and also percentage of plant infected by Potyvirus. The second experiment applied hot water at three temperature levels (50, 55, and 60°C) and submersion periods (10, 20, and 30 minutes). It was arranged using randomized completely design, consisting of 10 treatments with 10 plants for each treatment. The patchouli plants were maintained for 8 weeks and observations were made for height of growing cuttings and leaves with mosaic symptoms. The results showed that the patchouli plants propagated from apical meristem culture of 0.5-1 mm in sizes yielded 33.3-99.9% virus-free plants. Submersion of patchouli stem cutting seeds in hot water of 50-60°C and soaking period of 10-30 minutes could not eliminated the infecting Potyvirus on patchouli the three tested varieties. Cutting seeds of Lhokseumawe and Tapak Tuan varieties were more tolerant to hot water than Sidikalang one. However, their ability to grow decreased in line with longer

submersion time period. Apical meristem culture technique is potential to produce virus-free cutting seeds of patchouli.

## 234 NURYANI, W.

Control of fusarium by using antagonist and pathogenic microbes and plant resistant on lilium. *Pengendalian layu fusarium menggunakan mikrobe antagonis dan tanaman resisten pada lili* / Nuryani, W.; Silvia-Yusuf, E.; Hanudin; Djatnika, I.; Marwoto, B. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(4) p. 338-343, 4 tables; 26 ref.

LILIUM LONGIFLORUM; FUSARIUM OXYSPORUM; GLIOCLADIUM; TRICHODERMA; PATHOGENS; MICROORGANISMS; MICROBIAL PESTICIDES; DISEASE CONTROL.

Lilium is one of the most important and the heighest economic value of cut flower in Indonesia. Cultivation of Lilium faces major constrain, that is wilt disease caused by Fusarium. Application of synthetic chemicals to control the diseases is not recommended, because its dangerous impact for environment and human life. Therefore other control measures which more environmentally friendly and more effective/efficient have to applied. The use of antagonistic microbes and resistance varieties are the most promising control measures to be recommended in the field. The study was aimed at finding out of antagonist and nonpathogenic microbes and plant resistant that were effective to control Fusarium bulb rot on Lilium. The experiment was conducted at Laboratory and Glasshouse of Indonesian Ornamental Crops Research Institute (1,100 m asl). Factorial experiment was arranged in a randomized block design with three replications. The first factor was Lilium clones i.e. No. I. No. 2, No. 3 (resistant), and No. 4 (susceptible clone as control). The second factor was antagonism microbes, i.e. (1) Gliocladium sp. 10<sup>7</sup> spora/ml, (2) Trichoderma sp. 10<sup>7</sup> cel/ml, (3) Nonpathogenic Fusarium 10<sup>7</sup> spora/ml, and (4) control (tap water without antagonist microbe). The results indicated that the use of Gliocladium sp. and resistant clone of Lilium i.e. clone No. 3 was effective to control Fusarium bulb rot of Lilium. This proven from lower percentage of disease occurance on the treatment of antagonistics microbes and resistance varieties compared both to those of without treatment (control). The use of resistance plant followed by application of Gliocladium was known to be most effective to control fusarial wilt disease compared to the other treatment combinations.

#### 235 NURYANI, W.

Control of Fusarium Wilt on gladiolus by using fumigation and biopesticide. *Pengendalian penyakit layu fusarium pada subang gladiol dengan pengasapan dan biopestisida* / Nuryani, W.; Silvia-Yusuf,E.; Djatnika, I.; Hanudin; Marwoto, B. (Balai Penelitian Tanaman Hias, Pacet, Cianjur (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 40-50, 4 ill., 5 tables; 36 ref.

GLADIOLUS; FUSARIUM OXYSPORUM; DISEASE CONTROL; GROWTH; FUMIGATION; BIOPESTICIDES.

Gladiolus (*Gladiolus hybridus* L.) is one of the most economically important cut flowers in Indonesia. The crops is commonly cultivated in the highland. Cultivation of the crops in the production centers have faced various problems especially wilt disease caused by *Fusarium oxysporum* f. sp. gladioli as the most important one. Based on the field observations, the disease can reduce plant production and its yield quality up to 100%. The experiment was aimed to determine the effect of fumigation by using smoke produced by burned up coconut 158

shell and biopesticide on gladioulus bud growth and fusarial wilt incidence. The experiment was carried out at the laboratory, glasshouse and the field of Indonesian Ornamental Crops Research Institute (1,100 m asl.) since January to December 2009. A randomized block design with nine treatments and three replications was used. The results indicated that fumigation by using smoke of burned up coconut shell combined with biopesticide Prima BAPF stimulated gladiolus bud growth, but did not suppress infection of the bulb and fusarial disease intensity at the storage. Based on the field trial, fumigation by smoke of burned up coconut shell combined with sulphur and Prima BAPF was proven to be the best treatment. Application of the treatment significantly reduced disease intensity, AUDPC value, and increased flower production. This research result is expected to be adopted by farmers in order to widely control the *F. oxysporum* f. sp. gladioli.

#### 236 PUSPITASARI. D.

Somatic incompatibility test to reveal disease spread of *Ganoderma philippii* in *Acacia mangium* plantation. *Uji somatik inkompatibilitas Ganoderma philippii untuk mengetahui pola sebaran penyakit busuk akar pada tanaman Acacia mangium* / Puspitasari, D.; Rimbawanto, A. (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2010) v. 4(1) p. 49-61, 7 ill., 5 tables; 18 ref.

ACACIA MANGIUM; PLANT DISEASES; GANODERMA; DISEASE TRANSMISSION; GENETIC VARIATION.

Ganoderma philippii is a fungi causing root rot disease that have spread widely in Acacia mangium plantation. Study on mode of disease spreading is necessary to develop method of controlling the spread of the disease. Somatic incompatibility test was carried out using fungal cultures that has been identified as G. philippii from two sites of different rotation. Each location shows different type of incompatibility. Compatible reaction was observed at Logas of first rotation indicating that the isolates are not genotypically distinct and may come from closely related clones. At this site the spread of root rot occurred by root to root contact. Incompatible reaction was observed at Deras of second rotation indicating that G. philippii isolate are genotypically distinct individuals and of different clones, eventhough they share same morphological characters. Genetic diversity found in G. philippii suggested that sexual reproduction of basidiocarps is an important factor and is strongly implicated as one of the main modes of dispersal as well as root to root contact.

## 237 RISKA

Effectiveness of some plant producing essential oils to control fusarium wilt on banana. *Pemanfaatan tumbuhan penghasil minyak atsiri untuk pengendalian Fusarium oxysporum f. sp. cubense penyebab penyakit layu fusarium pada tanaman pisang* / Riska; Jumjunidang; Hermanto, C. (Balai Penelitian Tanaman Buah Tropika, Solok (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(4) p. 331-337, 3 tables; 37 ref.

MUSA; BANANAS; FUSARIUM OXYSPORUM; BOTANICAL PESTICIDES; ESSENTIAL OIL CROPS; POGOSTEMON CABLIN; CLOVES; CASSIA; CYMBOPOGON CITRATUS; DISEASE CONTROL.

Fusarium wilt caused by *Fusarium oxysporum* f. sp. cubense (Foc) is the most important disease on banana. Effective and environmental friendly techniques in controlling the disease need to be effort continually, among of them are with application of biopesticide to suppress

Foc. The objectives of the research were to study the effect of some plant producing essential oils on initial number of propagule of Foc in soil and disease development of Fusarium wilt of banana. The research was conducted at Indonesian Tropical Fruits Research Institute Solok from February to June 2009. A randomized block design with five treatments and four replications was used, whereas each treatment consisted of five plants. Four types of plant producing essential oils as treatments, namely (A) crude of patchouly leaves, (B) crude of lemon grass, (C) crude of cassia leaves, (D) crude of clove leaves, and (E) water as control treatment were used. Ambon Hijau cultivar derived from tissue culture propagation of 2 months after acclimatization was used as experiemental material. The result showed that application of leaves of plant producing essential oils decreased initial number of Foc propagules in the banana cultivation media. Percentage of reducing the number of initial propagule of Foc in medium after infestation of plant producing essential oils ranged between 50.1-70.6%. All application of plant producing essential oils, except crude of patchouly leaves, was effective to reduce the incidence of wilting or incubation period of the disease. The longest disease incubation period was determined on treatment with clove leaves, followed by cassia and lemon grass leaf with extending incubation period up to 22 and 15 days, respectively compared to control. Application of the plant producing essential oils was not successfully applied in suppressing the percentage of wilt and disease intensity on banana under screenhouse condition. Therefore combination treatments with other techniques in conjunction to improve the effectivity of the plants in controlling Fusarium wilt disease are suggested.

## 238 SANTOSO, T.J.

Construction of Begomovirus AV1 gene candidate into PB1121 and its introduction into tobacco by using *Agrobacterium tumefaciens* vector. *Konstruksi kandidat gen AV1 Begomovirus pada pB1121 dan introduksinya ke dalam tembakau menggunakan vektor Agrobacterium tumefaciens* / Santoso, T.J.; Herman, M. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Hidayat, S.H.; Aswidinnoor, H.; Sudarsono. *Jurnal Agro Biogen* (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 9-18, 7 ill., 1 table; 24 ref.

LYCOPERSICON ESCULENTUM; PLANT DISEASES; NICOTIANA TABACUM; VECTORS; AVIAN PARAMYXOVIRUS; TOMATO YELLOW LEAF CURL GEMINIVIRUS; PCR.

Infection of Begomovirus has caused leaf curl disease in tomato. This infection has significantly impact on yield losses of tomato production. Recently, there was no effectively way to control this disease in Indonesia. The use of resistant tomato variety is one of strategies to control this virus. Genetic engineering technology gives an opportunity to develop the transgenic tomato resistant to Begomovirus through pathogen derived resistance (PDR) approach. The objectives of this study were to construct the Begomovirus AV1 candidate gene in the PB1121 and to introduce the construct into tobacco plant genome through Agrobacterium tumefaciens vector. Activity series in gene construct have been conducted including PCR amplification of AV1 gene using a pair of specific primer, cloning the gene into pGEM-T easy, transformation of the clone into Escherichia coli DH5a competent cell, construct the gene into PBI121, and transform the construct into A. tumefaciens. Leaf segments of in vitro tobacco plant were transformed by co-cultivation with A. tumefaciens containing ToLCV-AV1 construct. In the research activity, Indonesian Begomovirus AV1 gene was successfully amplified and inserted in expression vector plasmid PB1121. Tobacco transformants carrying kanamycin-resistant gene (nptII gene) were regenerated and established in the glasshouse. Those transformant plants are expected containing the AV1 gene.

## 239 UTAMI, D.W.

AvrBs3/PthA virulence factor of bacterial leaf blight Race III, Race IV, Race VIII, and IX093-068. Faktor virulensi AvrBs3/PthA pada ras III, ras IV, ras VIII, dan IX093-068 patogen hawar daun bakteri (Xanthomonas oryzae pv. oryzae) / Utami, D.W. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)); Kadir, T.S.; Yuriyah, S. Jurnal Agro Biogen (Indonesia). ISSN 1907-1094 (2011) v. 7(1) p. 1-8, 5 ill., 4 tables; 21 ref.

XANTHOMONAS ORYZAE; PLANT DISEASES; BACTERIAL PESTICIDES; NUCLEOTIDASE.

Bacterial leaf blight (BLB) is an important disease of rice and occurs throughout many ricegrowing regions in the world, also in Indonesia. Xanthomonas oryzae pv. oryzae (Xoo) is the causal agent and a member of the Protebacteria and like many other bacteria of this phyllum have a type III secretion system for protein virulence effector (PYE) released on their pathogenicity system. Commonly, PYE in Xanthomonas sp. is coded by AvrBs3/PthA family gene. This research was conducted to identify the virulence factor of AvrBs3/PthA on dominant Indonesian BLB isolates (race III, race IV, ras VIII, and IX093-068). The objective of the research was obtained by using sequence analysis through designed markers for members of the virulence factor AvrBs3/PthA gene family (PthXo4, AvrXa7#38, PthXoS and avrXa7sacB50). Results gave information that race III was a dependent elicitor race due to no PYE transcript formed and intracellular protein target with RLL type on NLS (nuclear localization signal). Race IV and race VIII are the virulent race which PYE active formed with intracellular protein target and have the RLL and RLLP type for the NLS signal. While isolate IX093-068 is a virulent isolate that active by formed a PYE but the extracellular protein target is due to-no type of NLS. Based on cluster analysis, race VIII has a genetic distance closely to PthXoS and avrXa7sacB50.

# 240 YULIANTI, T.

Resistance of eight bondowoso tobacco cultivars to three major pathogens (*Ralstonia solanacearum*, *Pectobacterium carotovorum*, *and Phytophthora nicotianae*). *Ketahanan delapan kultivar tembakau lokal Bondowoso terhadap tiga patogen penting (Ralstonia solanacearum*, *Pectobacterium carotovorum*, *dan Phytophthora nicotianae*) / Yulianti, T.; Hidayah, N.; Yulaikah, S. (Balai Penelitian Tanaman Pemanis dan Serat, Malang (Indonesia)). *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(3) p. 89-94, 3 ill., 3 tables; 22 ref.

## NICOTIANA TABACUM; CROPS; PATHOGENS; DISEASE RESISTANCE.

Bondowoso tobacco is a local type of sliced tobacco which is restrictedly cultivated in Bondowoso Regency, East Java. There are eight cultivars known, i.e. Samporis, Serumpung. Marakot, Samporis Lokal, Samporis AH, Samporis CH, Samporis B. Disbun, and Deli with their own distinctive characters on their production, quality, and resistance to diseases. Bacterial wilt (*Ralstonia solanacearum*), hollow stalk rot (*Pectobacterium carotovorum*), and blackshank (Phytophthora nicotianae) are the main cause of bondowoso tobacco production loss. Evaluation on the resistance level of the cultivars to the three pathogens above has been conducted at a laboratory and screenhouse scale in Indonesian Sweetener and Fibre Crops Research Institute from April to October 2011. The evaluation of each pathogen was conducted separately. Each evaluation of the pathogen per cultivar used 10 plants planted individually in a polybag. The experiment was arranged in a randomized block design with 3 replicates. *R. solanacearum and P. carotovorum* were separately inoculated on the test plants 24 h before transplanting. The inoculation of *P. nicotianae* was done twice via

the root and stem. Disease intensity was observed weekly for 11 weeks. The results showed that Samporis CH, Samporis, and Deli cultivars were resistant to *P. carotovorum*, *R. solanacearum* and *P. nicotianae*, whereas Samporis and Deli cultivars were more resistant to the pathogens (disease intensity ranged 3.3%-6.7%). Marakot cultivar was very susceptible to all of the three pathogens (disease intensity more than or same with 50%). Similarly, Samporis AH cultivar was also susceptible to the pathogens with disease intensity ranged 23.3%-53.3%. The study indicated that Samporis CH, Samporis, and Deli cultivars are suitable to be cultivated in the endemic soil borre pathogen areas of Bondowoso Regency.

#### H50 MISCELLANEOUS PLANT DISORDERS

## 241 DEVY, L.

[Growth, quantity and quality of ginger (Zingiber officinale Roscoe) under the shade drought stress]. Pertumbuhan, kuantitas dan kualitas rimpang jahe (Zingiber officinale Roscoe) pada cekaman kekeringan di bawah naungan / Devy, L.; Nawfetrias, W. (Pusat Teknologi Produksi Pertanian, Jakarta (Indonesia)). Jurnal Sains dan Teknologi Indonesia (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 216-220, 1 ill., 4 tables; 18 ref.

ZINGIBER OFFICINALE; GINGER; DROUGHT STRESS; SHADING; QUALITY; QUANTITATIVE ANALYSIS; CHEMICOPHYSICAL PROPERTIES; GROWTH.

This research studied the growth, quantity and quality of ginger rhizome under drought stress condition. The drought stress condition was 60% of soil field capacity. This experiment was arranged in randomized completely block design. The treatments were drought stress periods (6, 4, 2 and 0 week before harvesting) with six replications. The result showed that drought stress period affected the quantity (rhizome dry weight) and quality (gingerol content) of ginger. Rhizome dry weight was decreased with the increase of drought stress period, while gingerol content showed opposite trend.

## 242 SETIAWAN

Effect of water deficit on physiological characteristics of patchouli (*Pogostemon cablin* Benth). *Pengaruh cekaman kurang air terhadap beberapa karakter fisiologis tanaman nilam (Pogostemon cablin Benth)* / Setiawan (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)); Tohari; Shiddieq, D. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2013) v. 19(3) p. 108-116, 3 ill., 8 tables; 26 ref.

POGOSTEMON CABLIN; DROUGHT STRESS; SOIL MOISTURE CONTENT; PLANT PHYSIOLOGY; WATERING.

Patchouli (*Pogosternon cablin* Benth) is one of plants that produce essential oils called patchouli oil. However, patchouli is susceptible to drought. The effect of global warming which changes rainfall pattern causes droughts in several regions including Indonesia. Therefore, it is important to find out patchouli variety which is relatively tolerant to drought. Tapaktuan, Sidikalang, and Lhokseumawe are three varieties of patchouli which produce high essential oil (290-375 kg/ha) with high patchouli alcohol content (32-33%). The objective of this research was to evaluate the physiological responses of four varieties/clone of patchouli to drought. The experiment was conducted at greenhouse at Cimanggu, Bogor from February to July 2012. The research was designed in randomized factorial block design (RBD) with three replications. The first factor was four varieties/clones of patchouli (V), i.e. Sidikalang, Lhokseumawe, Tapaktuan, and Bio-4. The second factor was four watering intervals (W) every 1, 3, 6 and 9 days of watering. Parameters evaluated were physiological

characteristics, soil moisture content, stomatal conductance, and transpiration leaf. The results showed that soil moisture content, stomatal conductivity, transpiration rate and relative water content decreased, while leaf water potential and proline levels increased along with the increase of watering intervals. The highest proline level was at interval of nine days watering treatment on Sidikalang varieties. However, all varieties/clones had no different responses to water deficit.

# J11 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF PLANT PRODUCTS

## 243 ROSMEIKA

Assessment for drying process of paddy using exergy analysis. *Kajian proses pengeringan gabah dengan perangkat analisis eksergi* / Rosmeika; Widodo, T.W.; Nurhasanah, A.; Harmanto (Balai Besar Pengembangan Mekanisasi Pertanian, Tangerang (Indonesia)). *Jurnal Enjiniring Pertanian* (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 103-110, 5 ill., 5 tables; 10 ref.

RICE; DRYING; TEMPERATURE; HUMIDITY.

Exergy analysis is utilized to achieve more effective energy source utilization because of its ability to determine energy loss at every steps of process. Exergy analysis on drying process is an important tool for design, analysis and optimation of thermal system. Energy utilization on drying process is used to evaporate water moisture from inside kernel moves to the surface of paddy kernel and is absorbed by airflow at a certain temperature and relative humidity. The study was proposed to analyze the exergy of drying process for paddy. The method that was utilized for analyzing was theoretical approach of drying system by formulating input and output of the product that was dried and drying air into equations of exergy balances. Exergy inflow and outflow tended to increase by the time of drying process, whereas exergy flow rates for water inside paddy kernel tended to be decrease because the water molecule bonds inside paddy kernel was tighter. Moreover, exergy destruction also went down since of the beginning of drying process, whereas exergy efficiency tended to be increase as increasing of time of drying process, average of exergy efficiency was 30.9%. The result of exergy efficiency was able to be improved by recirculation of exhaust air from drying chamber because relative humidity (RH) was remain low, as well as by improving thermal efficiency of rice husk burner.

## K10 FORESTRY PRODUCTION

## 244 HARDIWINOTO, S.

Effect of media physical properties on the rooting ability and early root development of *Shorea platyclados* shoot cutting in PT Sari Bumi Kusuma, Central Kalimantan [Indonesia]. *Pengaruh sifat fisika media terhadap kemampuan berakar dan pembentukan akar setek pucuk Shorea platyclados di PT. Sari Bumi Kusuma Kalimantan Tengah /* Hardiwinoto, S.; Adriana; Nurjanto, H.H.; Widiyatno; Dhina, F.; Priyo, E. (Universitas Gadjah Mada, Yogyakarta (Indonesia). Fakultas Kehutanan). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia ISSN 1693-7147 (2010) v. 4(1) p. 37-47, 1 ill., 5 tables; 28 ref.

SHOREA; PROPAGATION BY CUTTINGS; SHOOTS; GROWING MEDIA; CHEMICOPHYSICAL PROPERTIES; ROOTING.

Seedlings production of S. platyclados through vegetative propagations offers various advantages particularly mass production of good quality seedlings in a certain time that can be attained. Shoot cutting is affected by various factors including the physical properties of the media. The objectives of this research were to clarify the effect of physical properties of several media on rooting ability and early root development of S. platyclados shoot cuttings. Completely randomized design (CRD) was used with 6 replications. Three medium used were Dipterocarp wood sawdust, wood sawdust + rice husk (2/1), and rice husk charcoal. Results showed that wood sawdust bulk density was highest (0.36 kg/l) in compare to that of wood sawdust + rice husk (0.29 kg/l) and rice husk charcoal (0.17 kg/l). The bulk density has positively correlated (r = 0.97) with water holding capacity (WHC) and negatively correlated with porosity (r= -0.99). Rooting ability of the shoot cutting in sawdust + rice husk (2/1) was highest (63%) in compare to that in wood sawdust (43%) and rice husk charcoal (33%). The rooting ability has negatively correlated with bulk density (r = -0.75) and positively corelated with porosity (r = 0.59). Early root development in the media did not show significant difference; however, the media of wood sawdust and wood sawdust + rice husk(2/1) tended to have a better early root development compare to rice husk charcoal.

## 245 MUHDI

Structure and species composition of seedling and poles in tropical forest caused by timber harvesting of Indonesian selective cutting sylviculture system. *Struktur dan komposisi jenis permudaan hutan alam tropika akibat pemanenan kayu dengan sistem silvikultur tebang pilih tanam Indonesia* / Muhdi (Universitas Sumatera Utara, Medan (Indonesia). Fakultas Pertanian). *Bionatura* (Indonesia). ISSN 1411-0903 (2009) v. 11(1) p. 68-79, 2 ill., 2 tables; 21 ref.

SHOREA; EUGENIA; TROPICAL FORESTS; SEEDLINGS; SILVICULTURAL SYSTEMS; CUTTING; HARVESTING; INDONESIA.

A study was conducted in tropical forest concession of PT Suka Jaya Makmur, West Kalimantan. There were three plots of size 100 m x 100 m placed based on random at landing, middle skiddtrail and tips of skiddtrail, respectively. The objective of the study is to eliminate the structure and species composition of seedling and poles in tropical forest before and after forest harvesting. The most dominant species found, based on important value index (IVI) before forest harvesting was teratung (Compnospera sp.) and red meranti (Shorea leprosula Miq.) seedling and poles ubar (Eugenia sp. Lour) pole, respectively. The most dominant species found, based on important value index (IVI) after forest harvesting was teratung (Compnospera sp.) seedling and ubar (Eugenia sp. Lour), respectively. The research indicated that the species composition in natural tropical forest changed between before and after harvesting.

## 246 PUTRI, A.I.

Axillary buds and callus initiation from stem cutting of *Toona sinensis* and *Toona sureni*. *Inisiasi tunas aksiler serta kalus Toona sinensis dan Toona sureni dengan sumber bahan setek cabang* / Putri, I.A.; Jayusman (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2012) v. 6(3) p. 167-180, 5 ill., 5 tables; 29 ref.

TOONA; PROPAGATION BY CUTTINGS; BUD INITIATION; CALLUS; PLANT GROWTH SUBSTANCES; IBA; GIBBERELLIC ACID; SEEDLINGS.

The availability of material source of multifunctional tree Toona sp. becomes constraints for macro and micro propagation. In this regard, this study aimed to: 1) observe the formation of buds on T. sinensis and T. sureni stem cuttings in an effort to sustain the availability of explants and 2) analyze the effect of GA4, IBA and BAP growth hormone on regeneration and propagation of the axillary bud initiation and callogenesis through tissue culture. Isolation of stem cuttings was conducted in a greenhouse with number of shoots per nodule and nodule distance as observed. Tissue culture techniques were used to study the effect of exogenous GA4 hormones application on the initiation of axillary buds. The application of IBA hormone on plantlet rooting and callogenesis. The results showed that T. sinensis had 2-7 buds per nodule and nodule distance of 2-5 mm, while T. sureni had one bud per nodule and nodule distance of 5-10 cm. The average length of T. sinensis shoots was 15.8 cm and 17.4 for T. sureni. Enrichment with 1 mg/l GA4 gave the highest axillary shoot length on T. sinensis (8.5 cm  $\pm$  0.7228) and (9.8 cm  $\pm$  0.1022) for T. sureni. IBA enrichment 2 mg/l gave the highest root length of T. sinensis (10.9 cm  $\pm$  1.8392) and for T. sureni (7.9 cm  $\pm$  0.7633). BAP application 3 mg/l gave the best effect in term of callus weight of T. sinensis (1.4 g  $\pm$ 0.3833). Scoring of callus weight showed moderate response categories to both T. sinensis and T. sureni.

#### 247 YELNITITIS

Friable callus induction from leaf explant of ramin (*Gonystylus bancanus* (Miq) Kurz.). *Pembentukan kalus remah dari eksplan daun ramin (Gonystylus bancanus (Miq) Kurz.*) / Yelnititis (Balai Besar Penelitian Bioteknologi dan Pemuliaan Tanaman Hutan, Yogyakarta (Indonesia)). *Jurnal Pemuliaan Tanaman Hutan* (Indonesia). ISSN 1693-7147 (2012) v. 6(3) p. 181-193, 4 ill., 3 tables; 28 ref.

GONYSTYLUS BANCANUS; EMBRYONIC DEVELOPMENT; PLANT GROWTH SUBSTANCES; SOMATIC EMBRYOS; CALLUS; EXPLANTS; GROWTH.

Ramin (Gonystylus bancanus (Miq.) Kurz) is the highly demanded and the most overexploited woody species. This species has been listed in CITES APPENDIX 11 from 2004. The purpose of this experiment was to obtain the best treatment for friable and embryogenic callus formation that can develop to somatic embryo. Basal Murashige and Skoog (MS) media was used as growth medium. The experiment was conducted in three stages: callus induction and propagation stage, friable callus induction stage and embryogenic callus induction stage. The treatment of 3.0; 5.0 mg/l 2,4-D was used for callus induction. The best of callus was propagated in 5.0 mg/l 2,4-D + 1.0 - 2.0 mg/l thidiazuron. The best of callus was subcultured for callus friable induction used 6.0 mg/1 2,4-D + 1.0 -2.0 mg/l thidiazuron + 1.0; 2.0 mg/l biotin. The best friable callus was subcultured for embryogenic callus induction used 7.0; 8.0 mg/l 2,4-D + 1.0 - 2.0 mg/l biotin. The observation was made on texture, percentages, performance and color of friable callus. The results showed that call us can be induced on 5.0 mg/l 2,4-D. The treatment of 6.0 mg/l 2,4-D + thidiazuron produced friable callus with yellowish color. 2,4-D + biotin treatment produced highly friable callus with yellowish color and with no embryogenic callus development.

## L01 ANIMAL HUSBANDRY

# 248 BUGIWATI, S.R A.

Relationships between ultrasonic estimates of carcass traits and body measurements of japanese black bull. Hubungan antara dugaan sifat karkas menggunakan alat ultrasonografi dengan dimensi tubuh sapi jepang hitam jantan / Bugiwati, S.R A.

(Universitas Hasanuddin, Makassar (Indonesia). Fakultas Peternakan). *Bionatura* (Indonesia) ISSN 1411-0903 (2009) v. 11(1) p. 59-67, 2 ill., 2 tables; 17 ref.

CATTLE; CARCASSES; BODY MEASUREMENTS; ULTRASONICS; ECHOGRAPHY; PERFORMANCE TESTING.

This experiment was done at 292 head of Japanese black bull at Kagoshima and Miyazaki Prefectural Experimental Station Japan to find out the relationship between ultrasonic estimates of carcass traits and body measurements as one of criteria to select Japanese black bull. The carcass traits of 20 months of age were predicted using the ultrasonic machine. The body dimensions were measured at the end of performance test (12 months of age) and 16 months of age. The ultrasonic evaluation techniques were used to estimate Musculus Longissimus thoracis area between 6-7th and 12-13th ribs (MLTA6-7 and MLTA12-13), Subcutaneous Fat Thickness (SFT), Intermuscular Fat Thickness (IMFT), Rib Thickness (RT) and Marbling Score (MS). Body measurements were taken on body weight (BW), withers height (WH), hip height (HH), body length (BL), chest girth (CG), chest depth (CD), chest width (CW), rump length (RL), hip width (HW), thurl width (TW) and pin bone width (PBW). Chest girth, chest width and chest depth at 12 and 16 months of age were showed the highest significant and positive correlations among the other body dimensions with ultrasonic estimated of carcass traits at 20 months of age. The ratio of contribution to predict MLTA6-7, MLTA12-13 and SFT at 20 months of age using the body dimensions at 12 months of age were higher than those of 16 months of age.

## L10 ANIMAL GENETICS AND BREEDING

## 249 CHOTIAH, S.

Exploration and conservation of bacterial genetic resources as bacteriocin producing inhibitory microorganisms to pathogen bacteria in livestock. *Eksplorasi dan konservasi sumber daya genetik mikroba penghasil bakteriosin penghambat pertumbuhan bakteri patogen pada ternak* / Chotiah, S. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* (Indonesia). ISSN 0853-7380 (2013) v. 18(2) p. 114-122, 3 ill., 3 tables; 29 ref.

LIVESTOCK; GENETIC RESOURCES; CONSERVATION; BACTERIOCINS; BACTERIA; MICROORGANISMS; PATHOGENIC BACTERIA; EXPLORATION; STREPTOCOCCUS FAECALIS; LACTOBACILLUS CASEI; ENTEROBACTER CLOACEA; BIFIDOBACTERIUM DENTIUM; SALMONELLA TYPHIMURIUM; ESCHERICHIA COLI; LISTERIA MONOCYTOGENES; FOODBORNE DISEASES.

Exploration and conservation of microorganisms producing bacteriocin was done as the primary study towards the collection of potential bacteria and its application in improving livestock health condition and inhibit food borne pathogens. Different kinds of samples such as beef cattle rectal swab, rumen fluids, cow's milk, chicken gut content, goat's milk were collected at Bogor cattle slaughter houses, poultry slaughter houses, dairy cattle and goat farms. A total of 452 bacterial isolates consisted of 73 Gram negative bacteria and 379 Gram positive bacteria were isolated from samples collected and screened for bacteriocin activity. Determination of bacteriocin activity with bioassay using agar spot tests were carried out on liquid and semisolid medium assessing 8 kinds of indicators of pathogenic bacteria and food borne pathogens. A total of 51 bacteriocin producing strains were collected and some of the strains had high inhibitory zone such as *Lactobacillus casei* SSI4C (26 mm), *Enterobacter cloacae* SRUT (24 mm), *Enterococcus faecalis* SK39 (21 mm) and *Bifidobacterium dentium* SSI4T (20 mm) respectively, to *Salmonella typhimurium* BCC B0046/ATCC 13311, *E. coli* 166

0157 hemolytic BCC B2717, Listeria monocytogenes BCC B2767/ATCC 7764 and Escherichia coli VTEC 0157 BCC B2687. Evaluation after conservation ex situ to all bacterocin producing strain at 5°C for 1 year in freeze drying ampoules in vacuum and dry condition revealed the decreasing viability starting from log 0.8 cfu/ml for Lactococcus and Leuconostoc to log 2.2 cfu/ml for Streptococcus. Result of the study showed that the bacteriocin producing strains obtained were offered a potential resource for preventing disease of livestock and food borne diseases.

## 250 HERDIS

[Effect of extracellular cryoprotectants maltose on improving the quality of frozen cement to support the acceleration of artificial insemination technology. *Pengaruh maltosa sebagai krioprotektan ekstraseluler dalam meningkatkan kualitas semen beku guna mendukung keberhasilan teknologi inseminasi buatan* / Herdis; Darmawan, I W.A. (Pusat Teknologi Produksi Pertanian, Jakarta (Indonesia)). *Jurnal Sains dan Teknologi Indonesia* (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 197-202, 2 tables; 15 ref.

SHEEP; SEMEN; ARTIFICIAL INSEMINATION; QUALITY; MALTOSE; SPERMATOZOA; CRYOPROTECTANTS; ANIMAL REPRODUCTION.

The research carried out to observe the effect of maltose addition on the quality of frozen semen of garut rams. Semen was collected once a week using artificial vagina from six mature garut rams. Semen was equilibrated at  $5^{\circ}$ C for 4h, frozen and stored in liquid nitrogen. The thawing was carried out at the temperature  $30^{\circ}$ C for 30 seconds. The result showed that percentages of viable sperm for addition of maltose 1.2 g/100 ml extender  $(68.50 \pm 0.84\%)$  was significantly different (P<0.05) than control  $(54.83 \pm 1.94\%)$  and addition of maltose 0.6 g/100 ml extender  $(65.67 \pm 1.03\%)$ . The percentages of progressive motile sperm and percentages of plasma membrane for addition of maltose 1.2 g/100 ml extender (53%) and 64.67% were significantly different (P<0.05) than control (43%) and (53.83%) but were not significantly different (P>0.05) from addition of maltose (50.83%) and (50.83%) are specially an extender was optimal dose to improve the quality of frozen semen of garut rams.

# L53 ANIMAL PHYSIOLOGY - REPRODUCTION

# 251 KUNTANA, Y.P.

Effect of phytoestrogen on sperma quality, spermatogenesis, and wide of interstitial tissue of rabbit. Pengaruh pemberian phytoestrogen terhadap kualitas spermatozoa, spermatogenesis dan luas jaringan interstitial pada kelinci (Oryctolagus cuniculus) / Kuntana, Y.P. (Universitas Padjadjaran, Sumedang (Indonesia). Fakultas Matematika dan Ilmu Pengetahuan Alam). Bionatura (Indonesia). ISSN 1411-0903 (2009) v. 11(1) p. 48-58, 1 ill., 4 tables; 27 ref.

RABBITS; RATIONS; PHYTOOESTROGENS; SOYBEAN FLOUR; SPERMATOGENESIS; ANIMAL TISSUES; REPRODUCTION; LABORATORY ANIMALS.

Soybean, as one as substance of ransum livestock have been known contain compound phytoestrogen. This compound phytoestrogen accumulation in male livestock have influenced reproductive system, which covered macro and micro anatomy change, and the organ function of reproductive organ, exhibit cell gamet growth fertility, and ability sexual behaviour. On the other side, soybean contain all acid amino essential which seldom be

found at substance consentrate of other dissimilar and also contained high calcium, protein content and lower fat. This research was done to know influence of phytoestrogen and concentration of phytoestrogen which do not decrease the quality sperma, spermatogenesis sperma and wide of interstitial tissue especially at male rabbit and livestock generally; so that, it could become in its exploiting as component of ransum. The research was carried out experimentally in laboratory by using completely random design (RAL). The treatment consisted of 4 types of soybean meal dose namely control (K1), soybean meal dose 123 mg/kg rabbit bw (K2), soybean meal dose 246 mg/kg rabbit bw (K3) and soybean meal dose 490 mg/kg rabbit bw (K4). Each treatment is repeated 4 times. The 16 male rabbits of 2 month old were used as model animal. The variables testing were involved measurement of living spermatozoa percentage, spermatozoa abnormality, spermatogenesis observation and wide of interstitial tissue. The data of variable testing result was analyzed using Analysis of Variance (ANAVA) and Duncan test. The result showed that the application of soybean meal as the source of phytoestrogen on rabbit proved the decreased of reproduction aspect, especially spermatogenesis and spermatozoa quality which inolved living spermatozoa, spermatozoa abnormality and wide of interstitial tissue. The soybean meal dose 123 mg/kg rabbit bw was a relatively safe concentration and yield a similar output by controling the formation of living spermatozoa, spermatozoa abnormality and wide of interstitial tissue.

## 252 UTOMO, B.N.

Puberty of Katingan cow in relation to Cu mineral and the environment. *Pubertas api katingan betina dikaitkan dengan konsentrasi mineral Cu dan lingkungan* / Utomo B.N. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)); Noor, R.R.; Sumantri, C.; Supriatna; Gurnardi, E.D. *Jurnal Ilmu Ternak dan Veteriner* (Indonesia). ISSN 0853-7380 (2013) v. 18(2) p. 123-130, 3 ill., 1 table; 45 ref.

CATTLE; REPRODUCTION; SEXUAL MATURITY; CONCENTRATING; PROGESTERONE; ENVIRONMENT.

The onset of puberty is an important role in order to optimize performance of Katingan cattle reproduction. The onset of puberty can be estimated from blood progesterone concentration. In this study the onset of puberty was estimated through analysze of progesterone hormone in various age of individual cattle. Thirty blood samples were obtained from 30 Katingan heifers of 13 months and 15 days to 23 months and 18 days old from Tumbang Lahang (10 samples) and Buntut Bali (20 sampels) to be analyzed for progesterone concentrations using RIA method. The same samples were also analyzed to find out information about Copper (Cu) concentration. The results showed that progesterone concentration varied narrowly from 0.008 to 0.184 ng/ml. The result indicated that the Katingan cattle in 23 months old was still in prepuberty category. Environment factor such as land pH was acid (pH<6), grass quality and climate in term of temperature and humidity relatively high, predicted as an important role on delaying the onset of their puberty. One of the environment problem was proved by the most of the same samples than had under adequate value of level of Copper.

## L73 ANIMAL DISEASES

## 253 DHARMAYANTI, N.L.P.I.

Molecular characteristic and pathogenicity of Indonesian H5N1 clade 2.3.2 viruses. *Karakteristik molekuler dan patogenesitas virus H5N1 clade 2.3.2 asal Indonesia* / Dharmayanti, N.L.P.I.; Hartawan, R.I.; Hewajuli, D.A.; Hardiman (Balai Besar Penelitian Veteriner, Bogor (Indonesia)); Wibawa H.; Pudjiatmoko. *Jurnal Ilmu Ternak dan Veteriner* (Indonesia). ISSN 0853-7380 (2013) v. 18(2) p. 99-113, 13 ill., 2 tables; 24 ref.

DUCKS; ANIMAL DISEASES; VIRUSES; PATHOGENICITY; DNA; MORTALITY; GENES.

The outbreak of disease in late 2012 in Indonesia caused high duck mortality. The agent of the disease was identified as H5N1 clade 2.3.2. The disease caused economic loss to the Indonesian duck farmer. The clade 2.3.2 of H5N1 virus has not previously been identified, so this study was conducted to characterize 4 of H5NI clade 2.3.2 viruses by DNA sequencing in eight genes segment virus namely HA, NA, NS, M, PB1, PB2, PA and NP. The pathogenicity test of clade 2.3.2 viruses in ducks was compared to clade 2.1.3 viruses which predominat circulating in Indonesia. Results of phylogenetic tree analysis showed that the four of clade 2.3.2 viruses isolated in 2012 was the new introduced virus from abroad. Further analysis showed eight genes were in one group with the clade 2.3.2 viruses, especially those from Vietnam and did not belong to Indonesian viruses group. The pathogenicity test in ducks showed that virus H5NI clade 2.3.2 and clade 2.1.3 have similar clinical symptoms and pathogenicity and cause death in 75% of ducks on days 3-6 after infection.

## 254 FATIMAH, F.

Effect of virgin coconut oil (VCO) emulsion diet on lipid profile of white rats (*Rattus norvegicus*). *Pengaruh diet emulsi virgin coconut oil (VCO) terhadap rofil lipid tikus putih (Rattus norvegicus)* / Fatimah, F. (Universitas Sam Ratulangi, Manado (Indonesia). Fakultas Matematika dan Ilmu Pengetahuan Alam); Rindengan, B. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 18-24, 2 ill., 1 table; 21 ref.

COCONUT OIL; RATS; LABORATORY ANIMALS; EMULSIONS; DIET; LIPIDS; CHOLESTEROL.

Virgin Coconut Oil (VCO) is a functional food product that is popular in the society. VCOemulsion is a VCO emulsified with pineapple juice. This study was conducted to find out the effect of VCO-emulsion diet on lipid profile of mouse (Rattus norvegicus strain Wistar which was already treated by inducting hyperlipidemia using lard (180 g/l00 g) and yolk (4 ml/days). This research was conducted from January to December 2009 at the Laboratory of Coconut and Other Palm Trees Research Institute (BALITKA), the Laboratory of FMIPA Sam Ratulangi University Manado, the Laboratory of Experiment Animal Research Unit Gadjah Mada University Yoqyakarta, and the Laboratory of PAU IPB Bogor. Eighteen mice were randomly divided into 3 groups. Group I was the control group treated with aquadest only. Group II was treated with VCO-emulsion diet, and group III was treated with pure VCO diet. The content of total cholesterol, HDL, LDL, and triacylglicerol were measured at the end of the treatment using enzymatic method. In this study, there were some methods used for measurements: CHOD-PAP method for level of total cholesterol, PVS method for level of LDL cholesterol, CHOD-PAP method for level of HDL cholesterol, and GPO-PAP method for measuring level of triacylglicerol. The study results showed that diet of 0.945 ml/days of VCO and 3.78 ml/days of VCO emulsion for 7 days significantly decreased the level of total cholesterol and the level of LDL cholesterol, and increased the level of HDL cholesterol in the blood of Wistar mouse (=0.05). Whereas it was shown that only by diet of VCO emulsion (=0.05) decreased the level of triacylglicerol. Thus, VCO emulsion significantly lowered cholesterol in the experimental mouse better than pure VCO diet only.

#### 255 KARIMY M.F.

Effectivity of water soluble granule from kenikir leaves extract (*Cosmos caudatus*), noni leaves extract (*Morinda citrifolia*), and earthworm meal extract (*Lumbricus rubellus*) as a natural coccidiostat for broiler chickens against infection caused by *Eimeria tenella*. *Efektifitas ekstrak daun kenikir* (*Cosmos caudatus*), *daun mengkudu* (*Morinda citrifolia*), *dan tepung cacing tanah* (*Lumbricus rubellus*) *dalam sediaan granul larut air sebagai koksidiostat alami terhadap infeksi eimeria tenella pada ayam broiler* / Karimy M.F.; Julendra H.; Hayati S.N.; Sofyan A.; Damayanti E. (Balai Pengembangan Proses dan Teknologi Kimia, Yogyakarta (Indonesia). Bagian Pakan dan Nutrisi Ternak); Priyowidodo D. *Jurnal Ilmu Ternak dan Veteriner* (Indonesia). ISSN 0853-7380 (2013) v. 18(2) p. 88-98, 3 ill., 4 tables; 47 ref.

BROILER CHICKENS; COSMOS; LUMBRICUS RUBELLUS; EXTRACTS; ANTICOCCIDIATS; OLIGOCHAETA; INFECTION.

The aim of this research was to study effectivity of water soluble granule from kenikir leaves extract (Cosmos caudatus), noni leaves extract (Morinda citrifolia), and earthworm meal extract (Lumbricus rubellus) as a natural coccidiostat for broiler chickens against infection caused by Eimeria tenella. One hundred day old chick (DOC) of the Cobb strain broiler were randomly devided into 10 groups and each group consisted of 10 chickens. All groups were orally infected by 5000 sporulated oocyst of E. tenella on the 25th days old as a challenge infection. The chickens was treated by granule of kenikir leaves extract, noni leaves extract and granule of earthworm meal extract which level dosage was 100, 200 and 300 mg/kg bw, respectively on each treatment (K1, K2, K3; MI, M2, M3 and T1, T2, T3). Control (K0) did not treated by feed additive. Treatment was administered on drinking water. On the 5th days after challenge infection 5 chickens of each groups were slaughtered and necropted to evaluate lession score and histopatology of caeca. Oocyst per gram excreta was count on 7th days until 10th days after challenge infection of the others 5 chickens of each groups. The results showed that the lowest score of lession was obtained on M2 and M3 whereas the lowest total oocyst per gram excreta was obtained on M3. Histopathological observation revealed that there was no stadia development of E. tenella in M2 treatment. It was concluded that granule of noni leaves extract at 200 mg/kg bw (M2) was the most effective natural coccidiostat.

## N10 AGRICULTURAL STRUCTURES

#### 256 NURYAWATI, T.

Simulation of temperature distribution and airflow pattern on a modified arch greenhouse using computational fluid dynamics. Simulasi distribusi suhu dan pola aliran udara rumah tanaman Tipe busur termodifikasi menggunakan computational fluid dynamics / Nuryawati, T. (Balai Besar Pengembangan Mekanisasi Pertanian, Tangerang (Indonesia)); Suhardiyanto, H.; Harmanto; Suharnoto, Y. Jurnal Enjiniring Pertanian (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 93-102, 11 ill., 3 tables; 16 ref.

GREENHOUSES; FARM BUILDINGS; AIR TEMPERATURE; AIR FLOW; PROTOTYPES; EQUIPMENT CHARACTERISTICS.

Greenhouse technology application by replicating the greenhouse construction in the subtropical region was not suitable for the tropics. This is indicated by a high temperature and airflow patterns are not evenly well distributed in the greenhouse. The objectives of this research were to observe the natural ventilation on the greenhouse and to develop a simulation of temperature distribution and the airflow pattern on the modified arch 170

greenhouse using Computational Fluid Dynamics (CFD). The experiment was carried out in an empty modified arch greenhouse equipped with both top and side ventilations. Climate data and greenhouse characteristics were used as inputs and boundary condition to develop a simulation model. Two-dimensional simulation in a steady state with the condition of no wind speed (0.0 m/s), moderate wind speed (0.5 and 0.6 m/s) and high wind speed (1.8 m/s) were carried out. The wind speed through the insect-proof screen was simulated as a flow through porous media. The CFD model has succeeded in predicting the temperature distribution and airflow pattern of the greenhouse. The result of the model showed that the greenhouse had a gradient temperature vertically and the natural ventilation works effectively. It was proved that a small error percentage of difference temperatures between the simulation result and the observed data (<8%) were obtained. The coefficient variation was also small (0.12), with the coefficient of uniformity of 89.76%.

# N20 AGRICULTURAL MACHINERY AND EQUIPMENT

## 257 BUDIMAN, D.A.

Modification of two rows type manual transplanter of Chinese model. *Modifikasi alat tanam bibit padi manual tipe dua baris model China* / Budiman, D.A.; Sulistiadji, K. (Balai Besar Pengembangan Mekanisasi Pertanian, Tangerang, Banten (Indonesia)). *Jurnal Enjiniring Pertanian* (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 57-67, 6 ill., 7 tables; 12 ref. Appendices.

ORYZA SATIVA; SEEDLINGS; TRANSPLANTERS; PLANTING EQUIPMENT; PROTOTYPES; EQUIPMENT PERFORMANCE; EQUIPMENT TESTING; COST ANALYSIS.

Rice cropping systems in Indonesia is generally done by rice transplanting (96%). Although this plant needs a large amount of labor (up to 25-30% of the total power production), rather than direct seeding and spread seeding. Since the shortage of labor have occurred in the centers rice production, it needs an alternative use of mechanization technology for transplanting activity with simple, easy and cheaper ways. This study was aimed at modifying of two rows manual transplanter Chinese model related to the land conditions and the habit of rice farmers in Indonesia. The methodology used starting from the identification of the character of rice seeds, rice lowland and planting rice seeding manner. The methods consisted of pre-design, technical drawings and manufacture of prototype equipment of two rows type rice transplanter. Laboratory tests, field testing and modifications of rice transplanter to determine and refine the performance of planting equipment. Based on field test results, they were obtained: number of rice seeds implanted ranged 2-8 plants/hole (it should be 2-4 plants/hole), 41.27% missing hills (it should be < 5%), floating-hill 9.92% (it should be < 3-4%), damage hill 7.5 % (it should be < 3-4%) and planting depth was 9.8 cm (it should be 4.5 to 6 cm). The results indicated that the performance of rice transplanter was still not perfect. However, work capacity and the cost reduction of planting has been reached, each amounting to 20.29 hours/ha and Rp 351.000/ha (it reduced the cost of planting by 46.87%). The next step is still done by fixing some equipment components, such as: feeding units and rotary picker. Laboratory and field tests would be conducted continuously until stable results.

# 258 FATAH, G.S.A.

Modification and the performance test of soybean dehuller Orbapas. *Modifikasi dan uji kinerja alat pengupas kulit ari kedelai (Orbapas)* / Fatah, G.S.A. (Balai Penelitian Tanaman

Tembakau dan Serat, Malang (Indonesia)); Fanani, A.; Lutfi, M.; Nugroho, W.A. *Jurnal Enjiniring Pertanian* (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 73-80, 8 ill., 11 ref.

SOYBEANS; HUSKING; POSTHARVEST EQUIPMENT; EQUIPMENT PERFORMANCE; EQUIPMENT TESTING; PROCESSING LOSSES; COST BENEFIT ANALYSIS.

Soybean is an important food crop to support the national food security program. To produce soybeans products for consumption it is necessary to use the machine, however the operation is still causing weariness of work. The objective of this research was to modify the driving engine of soybean dehuller by using an electric motor, to reduce fatigue and to increase dehulling capacity. Research was conducted at Mechanization and Engineering Laboratory, Indonesian Legumes and Tuber Crops Research Institute, Malang. The research was accomplished by modify dehuller with additional electric motor, gearbox, their's holder and then carried out the tests of performance. The improved dehuller Orbapas showed increasing of dehulling capacity from 14.12 kg/hour to 21.90 kg/hour. More over, the economic analysis showed that the modified version was more profitable than before, the benefits and costs ratio were 1.49 and 1.23, respectively. In conclusion, modified Orbapas increased the capacity and financial benefit.

## 259 HARSONO

**Testing of GHE-Hybrid dryer for paddy capacity 5 ton/bath.** *Pengujian unit pengering ERK-Hybrid untuk padi kapasitas 5 ton* / Harsono; Widodo, P.; Budiharti, U.; Mulyantara, F.X.T. (Balai Besar Pengembangan Mekanisasi Pertanian, Tangerang (Indonesia)). *Jurnal Enjiniring Pertanian* (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 81-92, 8 ill., 10 ref.

RICE; POSTHARVEST EQUIPMENT; DRYERS; PROTOTYPES; EQUIPMENT PERFORMANCE; GREENHOUSE EFFECT; TEMPERATURE; EQUIPMENT TESTING.

The crucial issue in the of postharvest rice is rice activity drying process especially during the harvest at rainy season hence that drying rice can not take place perfectly. The use of mechanical dryers with fuel constrained in the use of expensive petroleum fuels, solar and biomass energy while still abundant. Therefore, the use of hybrid dryer is expected to increase rice production. The purpose of this study was to obtain a hybrid dryer unit with a capacity of 5 tons of biomass fuel to increase rice productivity. This research method was using engineering methods which included: design and fabrication of a prototype, functional testing, and the performance testing of the hybrid dryer unit. The results showed that the hybrid dryer unit had been able to drain the capacity of 3 tons of rice for 10 hours, the specific energy consumption of grain evaporation of 9,146 MJ/kg, 2,153,25 MJ biomass energy derived from coconut shell 22.5 kg and 120 kg of corn cobs, and solar energy 280.14 MJ in cloudy and rainy weather conditions, moisture decreased 0.9%/h, grain moisture content 12% and heat efficiency drying of 31.74%.

## 260 WIYONO, J.

Trash chopping machine: design and performance testing laboratory of sugarcane trash gathering-conveying unit. *Desain dan uji kinerja laboratorium unit pengangkat serasah tebu pada mesin pencacah serasah tebu /* Wiyono, J. (Balai Besar Pengembangan Mekanisasi Pertanian, Tangerang (Indonesia)); Hermawan, W.; Setiawan, R.P.A. *Jurnal Enjiniring Pertanian* (Indonesia). ISSN 1693-2900 (2011) v. 9(2) p. 111-120, 9 ill., 10 ref.

SACCHARUM OFFICINARUM; SUGARCANES; AGRICULTURAL WASTES; FARM EQUIPMENT; CHOPPERS; PROTOTYPES; EQUIPMENT PERFORMANCE.

Sugarcane trash burning is very common handling, but this practice tends to decrease fertility of the soil. In order to collect the trash, therefore, gathering-conveying machine are needed. The objective of this research was to design a machine for gathering-conveying of sugarcane trash. A machine for gathering and chopping the piles of sugarcane trash on the field after harvesting is being designed. As a part of the machine, a gathering-conveying unit was designed. Important data including condition and characteristics of leaves piles were collected as a basic requirement designing the unit. The average bulk density of trash on the field was 7.71 kg/m<sup>3</sup>, the average pressure to compress the piles thickness from 40 cm to 30 cm was 50.65 N/m<sup>2</sup>, and the pressure to compress thickness the trash from 27 cm to 8 cm was 1,166.60 N/m<sup>2</sup>. The unit component was consisted of a gathering reel, a pair of conveyors, cover-frame and power transmission components. The prototype was tested to measure its working performance and its power requirement of each component. Raking level was varied into 6 levels (ranking index: 1, 2, 3, 4, 5 and 6), and conveying level was varied into 3 levels (conveying index: 1, 1.14 and 1.20) for the experiment. Sugarcane trash having 8 kg/m<sup>3</sup> in bulk density and 40 cm in height were used and feed to the unit at feeding velocity of 0.3 m/s, for the experiments. The experimental result showed that the gathering real and the conveyors could work properly. The working capacity of the unit was 1,964.76-2,101.25 kg/hour. Average rotating power of the reel was 18 Watt, and average rotating power of the conveyor was 98 Watt. After processing 8 kg trash, there was around 1.5-3.7% of trash trapped on the reel, and around 3.13-9.20% of trash trapped on the conveyor.

## 261 YUNUS, M.R.

Development of the MT vertical hydraulic presser to extract the butter of cocoa beans. Pengembangan mesin kempa hidrolik vertikal MT untuk memisahkan lemak biji kakao / Yunus, M.R. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 22-31, 7 ill., 15 ref.

## COCOA BEANS; POSTHARVEST EQUIPMENT; COCOA BUTTER; LIPID CONTENT.

A Development of the MT vertical hydraulic presser to extract the butter of cocoa beans has been carried out through supplementation of a set of pressing components of cocoa with single press pot. Working with lubricant oil as the working fluid, the hydraulic pump of the machine is driven by a 1.0 kW electric motor. The pressing components of cocoa consists of a press pot with 80 mm in diameter and 140 mm in height, a butter plate with 260 mm in diameter, a pressing ram with 50 mm in middle diameter, and a pot base with 79 mm in diameter, all made from stainless steel. Pressure for extracting the butter of cocoa beans is designed at 6,000 psi (4 x 10<sup>7</sup> N/m²). In the performance test of the machine using 300 gram cocoa liquor per batch at 70°C pre-pressing temperature, the butter yield was found to be 34.9% of the liquor mass on average. At the same liquor mass per batch at 3L pre-pressing temperature (without liquor heating treatment), the butter yield was 33.3%. The butter contents remained in the cakes after pressing were 16.2 and 17.8%, respectively. Power required to press the cocoa when the pressing force reached 30 ton (in this case equivalent to 6,000 psi in pressure) was 200 watts on average.

## P30 SOIL SCIENCE AND MANAGEMENT

## 262 ANWAR, K.

[Peatland management for sustainable farming system]. Pengelolaan lahan gambut untuk usaha tani berkelanjutan / Anwar, K. (Balai Penelitian Pertanian Lahan Rawa, Banjarbaru (Indonesia)). [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 435-443, 3 tables; 6 ref. 631.445.1:631.61/SEM/p

PEATLANDS; LAND MANAGEMENT; SUSTAINABILITY; FARMING SYSTEMS; CROPPING SYSTEMS; RECLAMATION.

In the reclamation of peatlands, the subsidence is a major problem in the development of sustainable farming, as it also would disrupt the balance of the existing environment. Exploitation of peat need to the suitability of land and the application of technology on the concept of conservation is to reduce/prevents the occurrence of subsidence. Among the existing cropping system, rice farming is a way to reduce the speed of subsidence. Cropping systems in dry conditions (aerobic) will accelerate land degradation. The selected land for rice plants is peat which has a thickness of less than 1 meter, the rate of decomposition sapric/hemic, subtratum clay, potential hydrologic support to the rice, and endeavored to get a tidal influence. Component technology is applied to prevent or reduce the occurrence of an accelerated land degradation, among others: implementation of water management, soil, and plants appropriate to the characteristics of peat. Water management should be matched with potential hydrological, preferably to a reduction in conditions such as planting rice, while if the potential hydrology requires planting in oxidizing conditions, the necessary arrangements according to the depth of water table groundwater optimum crop. Soil amelioration are directed to improve or maintain soil fertility and fertilization amelioration through the efforts of macro and micro nutrients, in addition to the cultivation of land is necessary to apply minimum tillage or no tillage. Crop management emphasis on the use of tolerant varieties of crops and economic value and potential application of appropriate cropping patterns hydrology. The conduct of the above efforts, at least aiming for slow down the degradation of land. To the success of conservation efforts, the support of various agencies in an integrated way are needed, in order to overcome barriers to technical aspects, social, economic, cultural and political field.

## 263 BARUS, B.

[Actual distribution of oil palm plantations and potential development in peatland in Sumatra Island]. Sebaran kebun kelapa sawit aktual dan potensi pengembangannya di lahan bergambut di Pulau Sumatera / Barus, B.; Shiddiq, D.; Iman, L.S.; Trisasongko, B.H.; Komarsa G.; Kusumo, R. (Institut Pertanian Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 223-232, 3 ill., 5 tables; 5 ref. 631.445.1:631.61/ SEM/p

OIL PALMS; PEATLANDS; PLANTATIONS; LAND POLICIES; GEOGRAPHICAL INFORMATION SYSTEMS; REMOTE SENSING; SUMATRA.

Sumatra Island is the largest oil palm development in Indonesia, its about 4,819,494 ha, and partially located in peat areas. There was also a tendency for investors to develop oil palm in peat areas. The Ministry of Environment of Indonesia suggests that palm oil development is 174

directed out of peat dome, because it has function for protection areas. This paper examines the actual condition of oil palm nowadays and the potential future development of oil palm based on the existing consession, and possible environmental damage by using remote sensing and GIS. The result shows that the actual distribution of oil palm in the peat dome is less number, but the tendency of oil palm plantations are outside the peat dome, and based on provided consession for oil palm development, the future development of oil palm may reach all of peat dome. This will endanger for environment and development.

## 264 NURHAYATI

[Sustainable peatland management: development of oil palm and intercrops in Riau Province (Indonesia)]. *Pengelolaan lahan gambut berkelanjutan: pengembangan kelapa sawit dan tanaman sela di Provinsi Riau* / Nurhayati; Jamil, A.; Istina, I.N.; Widyanto, H. (Balai Pengkajian Teknologi Pertanian Riau, Pekanbaru (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 389-398, 2 ill., 6 tables; 5 ref. 631.445.1:631.61/SEM/p

ELAEIS GUINEENSIS; ZEA MAYS; PEATLANDS; LAND MANAGEMENT; INTERCROPPING; BIOFERTILIZERS; FERTILIZER APPLICATION; GROWTH.

The use of peat lands for oil palm plantation is more profitable than annual crops. Oil palm is a perennial plant with deep rooted and does not require intensive plowing, so that the bearing capacity of peat is more adequate soil fertility and can reduce the accelerated rate of depreciation of the thickness of the peat. Problems occur when the palm trees has not produced yet. Plant canopy which has not covered peat surface can accelerate the shrinkage of peatland thickness, increase emissions of greenhouse gases (GHGs). These problems can be minimized with intercrops. Basic approach of the applied technology is a profitable production system and reduce the rate of GHG emissions using ameliorant. Ameliorant materials used are  $Pugam\ A$ ,  $Pugam\ T$ , compost of palm empty fruit bunches, manure and mineral soil. The results of fertilizer and ameliorant applications shows changes appearance of oil palm trees marked with a greenleaf color and glossy as well as the increase in average leaf midrib 3/tree/month, for the appearance of maize "Sukmaraga" seen that compost of palm empty fruit bunches ameliorant showed the best growth compared to other treatments.

# P31 SOIL SURVEY AND MAPPING

## 265 HIKMATULLAH

[Detailed peat soil mapping in experimental plot of Landasan Ulin, South Kalimantan (Indonesia) supporting carbon emission study]. *Pemetaan detail tanah gambut di demplot Landasan Ulin Kalimantan Selatan mendukung penelitian emisi karbon |* Hikmatullah (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Soleh; Prasodjo, N. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 129-142, 7 ill., 4 tables; 19 ref. 631.445.1:631.61/SEM/p

PEAT SOILS; POLLUTION; CARBON; CARTOGRAPHY; ASH CONTENT; SOIL CHEMICOPHYSICAL PROPERTIES; CRUDE FIBRE; KALIMANTAN.

Detailed peat soil mapping at scale of 1:500 at an Experimental Plot of Landasan Ulin, South Kalimantan has been conducted in an area of 6.7 ha. The objective of the study was to

characterize the physical and chemical properties of peat soils as basic for carbon emission study. Soil observation used grid system at distance of 25 m x 50 m for each observation. Soil boring and sampling used a peat auger of Eijkelkamp type. The results showed that the study area could be divided into nine soil mapping units. The degree of peat decomposition was hemic in the top layer and hemicin in the subsurface layer. The peat thickness varied between 0.6-

## 266 HIKMATULLAH

[Detailed peat soil mapping Jabiran demonstration plot, Central Kalimantan (Indonesia) supporting carbon emission study]. *Pemetaan detail tanah gambut di demplot Jabiren Kalimantan Tengah mendukung penelitian emisi karbon* / Hikmatullah (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Hidayat, H.; Suryana, U. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 113-127, 4 ill., 5 tables; 19 ref. 631.445.1:631.61/SEM/p

KALIMANTAN; PEAT SOILS; CARBON; CARTOGRAPHY; ASH CONTENT; SOIL CHEMICOPHYSICAL PROPERTIES; CRUDE FIBRE; KALIMANTAN.

Detailed peat soil mapping at scale of 1:500 at an Experimental Plot of Jabiren, Central Kalimantan, has been conducted in an area of 5.01 ha. The objective of the study is to characterize the physical and chemical properties of peat soils as basic for carbon emission study. Soil observation used grid system at distance of 25 m x 50 m for each observation. Soil boring and sampling used peat auger of Eijkelkamp type. The results showed that the study area could be divided into four soil mapping units. The degree of peat decomposition was Sapric in the upper layer and Hemic in the lower layer. The peat thickness varied between 5 m - 7 m overlaying clavey texture of mineral soils. The fiber content varied between 13-43% and increased with soil depth. The ash content was 0.1-8.5% and increased to the transition of mineral soils. There was significant correlation between ash content and organic carbon ( $R^2 = 0.68$ ). Bulk density (BD) varied between 0.21-0.23 g/cm<sup>3</sup>. The soils showed very acid reaction (pH 3.4-4.0) and very high organic carbon content (31.28-57.59%) which increased with depth. Soil CEC was very high (66-126 cmol(+)/kg) and showed significant correlation to organic carbon content ( $R^2 = 0.80$ ). Soil base saturation was very low (<10%) which reflected low exchangable bases. These soils were grouped as ombrogenous peat, and classified according to Soil Taxonomy (2010) into subgroup as Typic Haplohemists and Sapric Haplohemists.

# 267 SULAEMAN, Y.

[Digital soil mapping application for mapping soil properties to support fertilizer recommendation]. Aplikasi pemetaan tanah digital untuk pemetaan sifat tanah menunjang rekomendasi pemupukan / Sulæman, Y.; Hikmatullah; Sarwani, M. (Balai 176

Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Ardi S., D.; Sutandi, A.; Barus, B. [Proceedings of the national seminar on fertilizer and degraded land reclamation technology]. Bogor (Indonesia), 29-30 Jun 2012 / Wigena, I G.P.; Nurida, N.L.; Setyorini, D.; Husnain; Husen, E.; Suryani, E. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 73-82, 3 ill., 2 tables; 7 ref. 631.617/.8/SEM/p

CARTOGRAPHY; SOIL CHEMICOPHYSICAL PROPERTIES; MODELS; FERTILIZER APPLICATION.

Better recommendation of fertilizer application can be formulated if it is supported by voluminous, well distributed soil data. Yet, this effort requires much money and consume much time. In the other hand, there is available legacy soil data that can be used to derive soil-landcape model. This model can be used to predict and map soil properties. This paper discusses digital soil mapping approach to provide quantitative soil properties as base for formulating fertilizer recommendation. For a given region, digital soil mapping is applied following 3 main steps, i.e. (i) dataset preparation by collecting previous soil data and auxiliary information, (ii) soil-landscape model development, and (iii) model application to derive digital soil properties map. The framework was applied in Java where 301 soil profiles were re-documented and used to develop soil-landscape model for predicting sand fraction, clay fraction, soil organic matter, soil organic carbon, nitrogen total, pH, base saturation, and cation exchange capacity. This model is used to create soil property map in Subang Regency. The application of digital soil mapping technique can complement current technique in providing soil property map to support fertilizer recommendation. Based on data and these baseline map, soil sampling can be done efficiently, and better fertilizer recommendation can be formulated.

## P32 SOIL CLASSIFICATION AND GENESIS

# 268 SUKARMAN

[Peat soil characteristics and its relationship with greenhouse gas emission at oil palm plantation in Riau and Jambi (Indonesia)]. *Karakteristik tanah gambut dan hubungannya dengan emisi gas rumah kaca pada perkebunan kelapa sawit di Riau dan Jambi* / Sukarman; Suparto; Mamat H.S. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012; p. 95-111, 7 ill., 3 tables; 14 ref. 631.445.1:631.61/SEM/p

OIL PALMS; PLANTATIONS; SOIL CHEMICOPHYSICAL PROPERTIES; PEAT SOILS; POLLUTANTS; SUMATRA.

Peat soil is one of land resources with high potential for development of oil palm plantations. The peatlands for oil palm development is mostly done in Riau and Jambi Province. Utilization of peatland for oil palm development is highlighted because a lot of clearing of peat generate GHG emissions that can lead to higher global warming. High and low potential for peat soil in greenhouse gas emissions is determined by the characteristics of peat soil itself and changes in environmental factors due to its management. This study aims at determining the relationship between characteristics of peat soils in oil palm plantations in greenhouse gas emissions. The study was conducted in oil palm plantations in Riau and Jambi Province. Observations of soil characteristics at each site performed on five soil map units that have different characteristics. At each soil map unit is taken each at three sites observations. So that for each location in Riau and Jambi each comprising 15-16 observation

locations. Along with the observation of soil characteristics, at each observation site was taken using the example of greenhouse gas chambers with two replications. Soil characteristics observed were depth of groundwater, soil water content, and the rate of decomposition up to a depth of 50 cm. Other soil properties were analyzed in laboratorium which included ash content, fiber content, total acidity, and CEC. The study found that soil properties that intimately associated with greenhouse gas emissions (CO<sub>2</sub> flux) were the soil water content, total acidity, and cation exchange capacity. This result showed that the amount of greenhouse gas emissions was not only determined by one factor but determined by several factors and the interaction between these factors.

## P33 SOIL CHEMISTRY AND PHYSICS

## 269 DARIAH, A.

[Probe factors (proxy) of carbon stock in peatland]. Faktor penduga simpanan karbon pada tanah gambut / Dariah, A. (Balai Penelitian Tanah, Bogor (Indonesia)); Susanti, E.; Mulyani, A.; Agus, F. [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 213-221, 4 ill., 2 tables; 14 ref. 631.445.1:631.61/SEM/p

PEAT SOILS; PEATLANDS; CARBON; STORAGE; LAND MANAGEMENT; FORECASTING; METHODS.

Measurement of carbon stock in peatlands is required in addition to inventory the amount of carbon stock, as well as for monitoring changes in carbon stocks as a result of changes in land management system. Carbon stock in peatlands are usually measured based on data obtained from direct observations and measurements in the field (especially for depth or thickness of peat layer) and the results of laboratory analysis (for bulk density, moisture and carbon content). To obtain these data takes a relatively long time and high costs (for observations, sampling, and laboratory analysis). The relationship between some specific variables such as thickness and maturity of the peat with the magnitude of carbon stock opportunities in order to predict of carbon stock amount in peatlands. This study aims at determining the factors probe (proxy) of carbon stock in peatland. Determination of carbon storage estimators performed using the data of observations of peat in Sumatra and Kalimantan. Based on the observations and analysis of peat at 248 observation points Sumatra Island (Aceh, Jambi and Riau) and Kalimantan Island (Central Kalimantan, West Kalimantan and South Kalimantan) shows the relationship between the depth of peat and peat deposits in the form of the equation as follows: Y = 5.534 X, where Y = savings C (t/ha),  $X = \frac{depth}{thickness}$  of the peat (cm), with a value of  $R^2 = 0.68$ . Another factor which determines the C deposit in peat deposits is the maturity of the peat. The average content carbon content in peat soils with a maturity fibric, hemic, and sapric, 0.049, 0.061, and 0.084 t/m<sup>3</sup> respectively. C density is higher in more mature peat. C density of peat predominantly influenced by BD. In addition to its maturation process of peat, change of BD can also be caused by the consolidation of the peat material as a result of the drainage process or change in the load/pressure at the surface of the peat. Therefore, the monitoring of emissions by reducing the thickness of the peat (subsidence), then change the level of maturity and BD is an important factor to be observed.

## 270 KURNAIN, A.

[Estimation of subsidence with proximate approach and its relationship with GHG emission on peatland]. *Perhitungan ablesan (subsidense) dengan pendekatan proksimat* 178

dan hubungannya dengan emisi gas rumah kaca pada lahan gambut / Kurnain, A. (Universitas Lambung Mangkurat, Banjarbaru (Indonesia). Fakultas Pertanian). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.) Bogor (Indonesia): BBSDLP, 2012: p. 369-378, 4 ill., 9 ref. 631.445.1:631.61/SEM/p

GREENHOUSES; MOISTURE CONTENT; PEATLANDS; PROXIMATE COMPOSITION; SOIL CHEMICOPHYSICAL PROPERTIES.

Losses of peat mass as a result of peat oxidation is often related to peat subsidence that subsequently used in practices to estimate greenhouse gas emission. These logics will result in an overestimate of GHG emission as the peat subsidence is not only due to the loss of peat, but also due to compaction and dewatering of peat. The study emphasized on analysis of peat hydro-physics data collected on various types of peatland uses to estimate proportion of peat subsidence due to compaction and dewatering. The peat subsidence could be described proximately through indicators of compaction and moisture content. At spesific moisture content of >2 dm³/kg, the subsidence due to peat compaction dan dewatering proportionally could be described with a modified equation of Groenevelt and Grant (2004). A critical moisture content at which the subsidence is only due to peat losses (peat oxidation) could be extrapolated from the curve resulted from the quation, however this proximate approach has to be validated with other data before it is applied to calculate losses of carbon on peatlands.

# 271 MULYANI, A.

[Characteristics and distribution of degraded rice field in 8 provinces of rice production centers]. *Karakteristik dan sebaran lahan sawah terdegradasi di 8 provinsi sentra produksi padi* / Mulyani, A. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Setyorini, D.; Rochayati, S.; Las, I. [Proceedings of the national seminar on fertilizer and degraded land reclamation technology]. Bogor (Indonesia), 29-30 Jun 2012 / Wigena, I G.P.; Nurida, N.L.; Setyorini, D.; Husnain; Husen, E.; Suryani, E. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 99-110, 1 ill., 6 tables; 11 ref. 631.617/.8/ SEM/p

RICE FIELDS; LAND DISTRIBUTION; LAND DEGRADATION; RECLAMATION; SOIL FERTILITY; FERTILIZER APPLICATION; ORGANIC MATTER; EFFICIENCY.

Lowland rice fields are the main food production areas of Indonesia, especially for the strategic commodities such as rice, maize and soybean. Lowland rice field have been used intensively by generations and some of the areas have been degraded as indicated by decreases of yield, soil organic carbon content, macronutrient content including P and K and the reduction of plough layer thickness. The distribution of degraded paddy areas was evaluated in eight provinces of main rice production centre (Banten, West Java, Central Java, Yogyakarta, East Java, South Sulawesi, South Sumatra and West Sumatra). The soil P and K status were obtained from P and K Status Map, while soil organic-C content was based on secondary soil C content data. The spatial distribution was delineated using the GIS technique by over-laying paddy field map, soil P and K status and soil C content data. Paddy fields were categorized into four classes, including highly degraded (TB), moderately degraded (TS), slightly degraded (TS) and not degraded (TT). From the total of 4.7 million ha (Mha) of paddy field in the eight provinces, about 2.3 Mha (50%) was classified as TS which are distributed in East Java, Central Java and South Sulawesi. The TB class covers around 1.8 Mha (38%) and distributed mainly in East Java, Central Java and West Java. The TR and TT cover 8% and 4% of the total area, respectively. Several techniques are required

to overcome the degradation and to maintain the rice field fertility, including improvement of fertilizer application to meet the balanced fertilization principle, organic matter and organic fertilizer management, and improved soil physical and biological management. The map of degraded paddy field distribution can be used as a basis for prioritizing the soil quality recovery based on the degradation severity to improve land productivity and fertilizer use efficiency.

# 272 MULYANI, A.

[Peat soil characteristic database in Indonesia]. Basisdata karakteristik tanah gambut di Indonesia / Mulyani, A. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Susanti, E.; Dariah, A.; Maswar; Wahyunto; Agus, F. [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 143-154, 2 ill., 6 tables; 14 ref. 631.445.1:631.61/SEM/p

INDONESIA; DATABASES; PEAT SOILS; CARBON; SOIL DENSITY.

Peatland area of Indonesia is estimated around 14.9 million ha, distributed mainly in Sumatra, Kalimantan, and Papua Islands. The characteristics of peat soil vary and thus database is needed to facilitate grouping and modelling. We initiated peat soil database from various research projects under the Indonesian Center for Agricultural Land Resources Research and Development including the data of administration, geographical position, land use, peat thickness and maturity, sampling position distance from the drainage canal, water table, bulk density (BD), organic matter content, ash content, carbon density, and carbon stock for sampling points in Sumatra (Naggroe Aceh Darussalam, Jambi, and Riau) and Kalimantan (Central Kalimantan, West Kalimantan, and South Kalimantan). The database was generated from 281 observation points, 201 points from Sumatra and 80 points from Kalimantan. The total number of peat layer (samples) were 2.230 consisted of 415 (18.6%) sapric, 1,025 (46%) hemic, and 790 (34.4%) fibric maturities. The number of sapric and hemic samples was dominant (71%) in Sumatra, while in Kalimantan it was 50%. The ash content and bulk density of peat in Sumatra were higher than those in Kalimantan, indicating a higher mineral soil enrichment in Sumatra. Carbon contents of the sapric, hemic, and fibric peats were  $0.083\pm0.032$ ;  $0.060\pm0.028$ ; and  $0.049\pm0.026$  t/m<sup>3</sup>, while the BD were 0.179±0.104; 0.124±0.008; 0.097±0.059 t/m³, respectively. Peat thickness varied from 50 to 1,100 cm, leading to a very wide range of carbon stock of 162 to 6,390 t/ha. The high variation of carbon stock was observed not only between sites, but also within the same site. The current data is not yet well distributed; it is limited to certain localities. There is a need to further develop for this database to cover a wider area to support the management planning, modelling and further research.

## P34 SOIL BIOLOGY

## 273 HADI, A.

[Greenhouse gas microbiology on tropical peatland]. *Mikrobiologi gas rumah kaca pada lahan gambut tropika* / Hadi, A. (Universitas Lambung Mangkurat, Banjarbaru (Indonesia)); Inubushi, K. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 253-260, 2 ill., 2 tables; 19 ref. 631.445.1:631.61/SEM/p

# PEATLANDS; GREENHOUSES; TROPICAL SOILS; MICROBIOLOGY.

Peat soils from Obihiro, Ozegahara, and Amuntai were used to elucidate the diversity of microbes as affected by climatic zones. The microbial diversities were presented by ATP contents, population of viable bacteria and fungi and population of nitrifying and denitrifying bacteria. Concurrently, three kg of peat soils from Chiba were filled in to pots and given rice straw compost which parts were put in four nylon mesh bags and inserted vertically around the middle of the pots. Crane water was filled into the pots up to more than or same with 5 cm above the soil surface. Three hills of rice seedling were then transplanted and maintained until harvest. A set of pots was also prepared in similar way but without rice plant. The rice straw bags were taken out at corresponding to the tillering, panicle initiation, heading and harvest stages of rice. The all bags were free from soil and used for determination of methane potential production, which two of them were used to determine population of methanogenic bacteria. To determine the critical pH for N<sub>2</sub>O formation through nitrification, peat soils cultivated to rice and oil palm were taken from two depths and their pH were then measured. After knowing the significant correlation with pH, the changes in nitrification rate were calculated. The results showed that the number of bacteria in tropical peat was similar to that in temperate peat, while the number of fungi was about ten times lower. The number of nitrifying and denitrifying bacteria was the highest in tropical peat, followed by temperate peat. Methanogens were found in peat parent material, buried rice straw, and rice root with the population in 10 time higher in buried rice straw than that in peat parent material. The research also showed that the critical pH for  $N_2O$  formation through nitrification was 5.6.

# 274 KARTIKAWATI, R.

[Role of ameliorant in mitigation of greenhouse gas (CH<sub>4</sub> and CO<sub>2</sub>) emission on rice field land use in peat soil of Landasan Ulin Village, Banjarbaru District, South Kalimantan (Indonesia)]. *Peranan amelioran dalam mitigasi emisi GRK (CH<sub>4</sub> dan CO<sub>2</sub>) pada penggunaan lahan sawah di tanah gambut Desa Landasan Ulin, Kecamatan Banjarbaru, Kalimantan Selatan /* Kartikawati, R.; Nursyamsi, D. (Balai Penelitian Lingkungan Pertanian, Pati (Indonesia)); Setyanto, P.; Nurzakiyah, S. [Proceedings of the national seminar on sustainable peatland management] Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulæman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 295-303, 6 ill., 1 table; 11 ref. 631.445.1:631.61/SEM/p

KALIMANTAN; CARBON DIOXIDE; RICE FIELDS; PEATLANDS; LAND USE; SOIL FERTILITY; POLLUTANTS; CLIMATIC CHANGE.

Peat soils are marginal land, but the productivity of peat lands could be improved by using ameliorant material. The ameliorant can increase rice yield and reduce GHG emission by maintaining stability of peat lands through soil carbon loss in the form  $CH_4$  and  $CO_2$ . The objective of research was determine effect of the ameliorant to reduce  $CH_4$  and  $CO_2$  emission from peat lands. The study was conducted in August-October 2011 in Landasan Ulin Village, District of Banjarbaru, South Kalimantan. Research was arranged in randomized block design with three replications. The treatments were 1). Control, 2). Pugam A, 3). Pugam T, 4). Manure fertilizer, 5). Mineral soil and 6). Husk ash. The result showed that the ameliorant could reduce  $CH_4$  emission by 40-50% and  $CO_2$  by 5-30%. The ameliorant which produced the lowest of global warming potential and reduced the highest of  $CH_4$  and  $CO_2$  emission was animal manure.

## 275 SANTI, L.P.

[Utilization of exopolysaccharide-producing endophytic microbe as bio-ameliorant in peatland]. *Pemanfaatan mikroba endofitik penghasil eksopolisakarida sebagai pembenah hayati pada lahan gambut* / Santi, L.P.; Goenadi, D.H. (Balai Penelitian Bioteknologi Perkebunan Indonesia, Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 285-294, 3 ill., 3 tables; 18 ref. 631.445.1:631.61/SEM/p

ELAEIS GUINEENSIS; MICROORGANISMS; ENDOPHYTES; PEATLANDS; NPK FERTILIZERS; SOIL BIOLOGY.

Many oil palm plantations had been developed in the areas with peat soils. The irreversible character of peat promoting pseudo-sands formation is a limiting factor for available water and nutrients for root growth and productivity of the plant. The domination of organic matter in peat leading to water saturated condition is not appropriate for organic complex bond formation. On the other hand, the dry peat areas have also low capability in water holding and nutrient retention. Many methods have been developed chemically to overcome the problem but still have limited success. Therefore, soil microbiological aspect could be then considered to study interaction within microbe, peat organic matter, and plant. The exopolysaccharide excreted by microbes could promote the formation of peat molecular structure and their configurations that related to water and nutrient supply for plant. This research was carried to use the exopolysaccharide-producing endophytic microbe as bioameliorant in peat areas for optimizing oil palm productivity. Field experiment was conducted at a private plantation, PT Persada Bina Nusantara Abadi, Afdeling D Block 9, Central Kalimantan. The monitoring of oil palm productivity was carried out during four semesters of application (2010-2011) with bio-ameliorant. The data indicated that application dosage 50% of NPK 16-4-25 combined with 1500 g bio-ameliorant plant/year resulted higher productions (15.4 ton/ha/year) than at obtained from 100% standard dosage of NPK 16-4-25 (10.8 ton/ha/year). Furthermore, cost savings reached 8.9-39.9%/ha/year (specific location) by using bio-ameliorant combined with reducing dosage 25-50% of NPK 16-4-25.

# 276 SUKMADI, R.B.

[Activities of phytohormones indole-3-acetic acid (IAA) isolated from some bacteria and endophytic rhizosphere]. Aktivitas fitohormon indole-3-acetic acid (IAA) dari beberapa isolat bakteri rizosfer dan endofit / Sukmadi, R.B. (Balai Pengkajian Bioteknologi, Tangerang (Indonesia)). Jurnal Sains dan Teknologi Indonesia (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 221-227, 1 ill., 1 table; 14 ref.

FRUIT CROPS; VEGETABLE CROPS; BACTERIA; RHIZOSPHERE; ENDOPHYTES; ISOLATION; HPLC; IAA; PLANT GROWTH SUBSTANCES.

A total of 34 isolates of rhizosphere bacteria and endophytic bacteria have been isolated from several fruit and vegetable plants. Bacterial isolates were then screened to produce phytohormone indole-3-acetic acid (IAA) in a minimal medium (MM) with the addition of 1 g/l tryptophan as a precursor. Phytohormone production was carried out in an incubator shaker for 5 days at 28°C in a dark condition. IAA in the culture supernatant was extracted with ethyl acetate. The presence of IAA in the bacterial extract was detected using Thin Layer Chromatography (TLC). The concentration of IAA was determined quantitatively using High Performance Liquid Chromatography (HPLC). The result showed that among 34 bacterial isolates, 20 isolates were able to produce IAA with different concentrations. The

highest concentration of IAA (16.71 ppm) was produced by the endophytic bacteria isolated from twigs of starfruit plant. In addition, within the group of rhizosphere bacterial isolates, bacteria from kangkong plant was found to be the best one with IAA concentration of 10.99 ppm.

# 277 SUSILAWATI, H.L.

[Effect of ameliorant application on CO<sub>2</sub> flux at peat soil oil palm plantation at smallholder plantation of Muara Jambi Regency, Jambi Province (Indonesia)]. *Pengaruh pemberian bahan amelioran terhadap fluks CO<sub>2</sub> pada pertanaman kelapa sawit tanah gambut di perkebunan rakyat Kabupaten Muara Jambi Propinsi Jambi /* Susilawati, H.L. (Balai Penelitian Lingkungan Pertanian, Pati (Indonesia)); Hendri; Nursyamsi, D.; Setyanto, P. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 321-331, 6 ill., 23 ref. 631.445.1:631.61/SEM/p

ELAEIS GUINEENSIS; PLANTATIONS; CARBON DIOXIDE; INTERCROPPING; FERTILIZER APPLICATION; PEATLANDS; SOIL FERTILITY; SUMATRA.

In Indonesia, peatlands generally has been cultivated by local residents as the area of crops plantations, horticulture plantations. Extensification of peatland as agricultural land is still cast and doubt. Peat soil is fragile and as a source of greenhouse gas (GHG) emissions. The objectives of this study were to obtain the emission data and information of technology to mitigate GHG emissions from peatlands that have been planted with oil palm plantation in Muara Jambi, Jambi Province. Activities were conducted during in January to October 2011 at Arang-Arang, Kumpeh Hulu District, Muara Jambi, Jambi Province. The sites had been planted with 3 years old of oil palm plantation with a spacing of 9 m x 7 m. The treatments were pugam A, pugam T, compost tankos, animal manure, soil minerals and control. CO2 sampling was done using of close chamber technique. GHG samples were taken in the morning (6.00 am to 8.00 am) and afternoon (12.00 am to 14.00 pm). Chambers size was 50 cm x 50 cm x 30 cm. The chamber was placed near oil palm crops. The result of this study were CO<sub>2</sub> emissions of oil palm plantation at Arang-Arang, Kumpeh Hulu, Muara Jambi, Jambi was about 3.27 tons CO<sub>2</sub>/ha/year. The addition of a pugam T, tankos, compost, animal manure and mineral soil could reduce CO<sub>2</sub> emissions by 5.7 to 26.6% and CO<sub>2</sub> emissions become 2.40 to 3.09 tons CO<sub>2</sub>/ha/year. A pugam increase GHG emissions by 1.2% to 3.31 tons CO<sub>2</sub>/ha/year. Generally, flux of CO<sub>2</sub> at the afternoon was lower between 10-37.7% than flux of CO<sub>2</sub> which was emitted in the morning.

## 278 SUSILAWATI, H.L.

[Role of organic matter and dolomite application on GHG (CO<sub>2</sub> and CH<sub>4</sub>) emission and carbon balance in rice lowland on peat soil of South Kalimantan (Indonesia)]. Peranan pemberian bahan organik dan dolomit terhadap emisi GRK (CO<sub>2</sub> dan CH<sub>4</sub>) dan neraca karbon pada lahan padi sawah di tanah gambut Kalimantan Selatan / Susilawati, H.L. (Balai Penelitian Tanah, Bogor (Indonesia)); Noor, M.; Sopiawati, T.; Pramono, A.; Setyanto, P. [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 357-368, 1 ill., 6 tables; 20 ref. 631.445.1:631.61/SEM/p

ORYZA SATIVA; RICE; PEATLANDS; GREENHOUSES; CARBON DIOXIDE; PRODUCTIVITY; ORGANIC MATTER; FERTILIZER APPLICATION; CLIMATIC CHANGE; LOWLAND; KALIMANTAN.

Peatland is land which is having marginal productivity, properties and behaviors are very specific and fragile. However, productivity of peatlands still can be enhanced. One of ways to improve peat soil productivity is using ameliorant. Amelioration increases yield and reduce GHG emissions because it maintains the stability of peat soils through suppression rate of carbon loss in the form of CH<sub>4</sub> and CO<sub>2</sub>. The objective of this study was to get data of GHG emissions (CO<sub>2</sub> and CH<sub>4</sub>) and carbon balance of amelioration in paddy crops on peat soils. The study was conducted at Landasan Ulin, Banjarbaru, South Kalimantan in 2010. Experiment used a randomized block design and replicated three times. The treatments were without ameliorant/control, dolomite, animal manure, compost and combination of animal manure + dolomite. Punggur was used as indicator plants. Gas sample was taken by using a manually chambers and analyzed using a GC equipped with FID for analysis of CH4 and TCD for analysis of CO<sub>2</sub>. Rice straw and weed biomass were analyzed using CN analyzer to measure total carbon content. The result showed that CH<sub>4</sub> emissions of without ameliorant, compost, combination of manure + dolomite, animal manure and dolomite were 766, 762, 438, 350 and 339 kg/ha/season. CO<sub>2</sub> emissions of without ameliorant was 2101 kg/ha/season, dolomite was 2665 kg/ha/season, compost was 4692 kg/ha/season, animal manure was 7899 kg/ha/season, and the combination of animal manure + dolomite was 8890 kg/ha/season. The highest total carbon content was dolomite and the value was 2629 kg C/ha and followed by compost, animal manure, combination of animal manure + dolomite, without ameliorant and the value was 2409, 2289, 2166 and 1915 kg C/ha, respectively. Lowest carbon budget was dolomite and followed by animal manure, combination of animal manure + dolomite, without ameliorant and compost with value of 3941, 5908, 7806, 11871 and 12022 kg C/ha respectively.

# P35 SOIL FERTILITY

## 279 SUBIKSA, I G.M.

[Role of pugam [ameliorant] in overcoming land physical constants and greenhouse gas mitigation in peatland farming systems]. *Peran pugam dalam penanggulangan kendala fisik lahan dan mitigasi gas rumah kaca dalam sistem usaha tani lahan gambut* / Subiksa, I G.M. (Balai Penelitian Tanah, Bogor (Indonesia)). [Proceedings of the national seminar on sustainable peatland management]. Bogor (Indonesia), 4 May 2012 / Husen, E.; Anda, M.; Noor, M.; Mamat H.S.; Mawar; Fahmi, A.; Sulaeman, Y. (eds.). Bogor (Indonesia): BBSDLP, 2012: p. 333-344, 3 ill., 6 tables; 17 ref. 631.445.1:631.61/SEM/p

FERTILIZERS; POLLUTANTS; GREENHOUSES; PEATLANDS; FARMING SYSTEMS: FERTILIZER APPLICATION.

Peat land in Indonesia has been used for profitable farming, both for food crops, horticulture as well as estate crops. On the other hand, the utilization of peat land also has a negative impact to the environment because it produces substantial carbon emissions. Mitigation of carbon emissions from peat lands is very important, however, adaptation efforts through environmental friendly farming technology seems to be a wise effort. Pugam, a fertilizer specially formulated for peatland, have been tried in demonstration plots of ICCTF in four provinces, i.e. Jambi, Riau, Central Kalimantan and South Kalimantan. Pugam-A and Pugam-T were applied to oil palm and rubber estate crop as well as inter row food crops such as corn and peanut. The results revealed that oil palm showed better growth performance. Leaf frond establishment occurred more rapidly with the application of Pugam-

A. Fruit bunches are also likely avoided from the sterile pollens, then oil palm fruit formed normally, meanwhile the control treatment the fruit is not established. Corn also grows well and it has better yield. Pugam contain polyvalent cations as active ingredient and it's seems to contribute reducing the solubility of phenolic acids, a substance that can inhibit the root establishment. Pugam application on peat soil within the crop circle and inter row crops, resulting in lower GHG emissions until 20-30%. This is because of Pugam contain active ingredients that could promote the formation process of complex compounds that are more resistant to decomposition. The lower carbon emissions indicating that peat will more stable then the peat land could be utilized as sustainable farming.

#### P40 METEOROLGY AND CLIMATOLOGY

#### 280 SIMANJUNTAK. B.

Determining agroecology zones and planning land use through autozae system version 1 application for regional food security model in Boyolali Regency (Indonesia). Penentuan zona agroekologi dan perencanaan penggunaan lahan di Kabupaten Boyolali menggunakan sistem autozae version 1 dalam rangka untuk menyusun model ketahanan pangan wilayah / Simanjuntak, B.; Yulianto JP., S. (Universitas Kristen Satya Wacana, Salatiga (Indonesia)). [Proceedings of the national seminar on abandoned land empowerment and utilization toward the implementation of agrarian reform]. Bogor (Indonesia), 2012 / Swastika, D.K.S.Suradisastra, K.; Hutabarat, B. (eds.). Bogor (Indonesia): PSEKP, 2013: p. 75-94, 11 ill., 1 table; 18 ref. 332.2.021.8/.3/SEM/p

JAVA; AGROCLIMATIC ZONES; PHYSIOGRAPHY; SOIL TYPES; LAND SUITABILITY; LAND USE; APPROPRIATE TECHNOLOGY; SOIL CHEMICOPHYSICAL PROPERTIES; FOOD SECURITY; RURAL DEVELOPMENT; PLANNING.

Based on the Schmidt - Ferguson type of climate, Boyolali is dominated by climate type C which is a rather wet, with humidity of around 80%. Boyolali do not have a document of agroecological zone (AEZ). Agroecological zone is a grouping of a region based on the physical condition of a similar environment, where variability of plants and animals are not expected to be significantly different. The main components of agro-ecological zone is the climate, physiographic regions and soil type. With AEZ analysis, integrated and adequate information can be obtained concerning: (1) the state of the environment in the region, (2) the suitability of crops and technologies in the region, (3) a variety of site-specific agricultural commodities and technology needs, and (4) an input for regional development planning and the development of specific commodities. AEZ maps can be used to direct the operational planning of agricultural development, because the map of AEZ contains comprehensive information about the biophysical potential of the region. The ideal farming systems based AEZ approach can be developed based on a combination of physical and local economy approaches. The system will have an effect on the increase in the aspect of food security. Food Security and Vulnerability Map of Indonesia is based on three pillars of food security, namely: (a) food availability, (b) access to food, and (c) utilization of food. Through AEZ, characteristics and potential of the land for the development of a variety of food commodities will be known, so people do not depend on just one source of food. Based on the above issues, research on AEZ using AUTOZAE system Version 1 in Boyolali is conducted to arrange alternative agricultural development, so that it will be able to prepare the ideal model of food security carrying capacity. The analysis for the determination of the Composite Food Security Index created by using Principal Component Analysis (PCA). The results of the analysis of the system AUTOZAE Version 1 showed that the composite index of food security at the sub-district level in Boyolali varies from low to moderate.

# Q02 FOOD PROCESSING AND PRESERVATION

# 281 DUMA, N.

Effects of candlenut powder supplement in palm snap on characteristics of palm sugar product during storage. *Pengaruh penambahan tepung kemiri pada nira aren selama penyimpanan terhadap karakteristik gula merah* / Duma, N. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 14-21, 9 ill., 2 tables; 12 ref.

PALM SUGAR; PROCESSING; SUPPLEMENTS; CARBOHYDRATE CONTENT; MOISTURE CONTENT; ASH CONTENT; ORGANOLEPTIC TESTING.

Effects of candlenut powder supplement in the palm snap on characteristics of palm sugar product during storage have been investigated. Processing of the palm snap into palm sugar was conducted in a small-scale palm sugar production centre in Bone Regency, South Sulawesi. Variables studied were candlenut powder supplement at the levels of 0; 8.5; 10.5 and 12,5 gram each in 62 litre of palm snap, and storage periods of the palm sugar product at the levels of 0, 2, 4, 6 and 8 weeks. The characteristics of the palm sugar were measured for moisture, reduction sugar, sugar as sucrose, and ash contents and organoleptic (color, texture, and taste) as well. The results indicated that the candlenut powder and storage periods and their interaction had significant effects on the moisture and reduction sugar. Except for their interaction, the candlenut powder and storage periods had significant effect on the sugar as sucrose. The candlenut powder had significant effect on the ash content, but not for storage periods and their interaction. The highest scores for color (5.93), texture (6.45), and taste (6.40) of the palm sugar were obtained from 10.5 gram candlenut powder supplemented. With this candlenut powder amount, the moisture, reduction sugar, sucrose, and ash contents of the palm sugar after 8 wees storage were 9.72%, 1.53%, 87.64%, and 1.74%, respectively.

## 282 DUMA, N.

Research on the fermentation condition and sugar concentrations in the preparation process of tamarin (*Tamarindus indica* Linn.) cider. *Penelitian kondisi fermentasi dan penambahan gula pada proses pembuatan cider buah asam jawa (Tamarindus indica Linn.*) / Duma, N. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2009) v. 4(2) p. 92-98, 8 ill., 9 ref.

TAMARINDUS INDICA; FRUITS; FERMENTATION; CARBOHYDRATE CONTENT; CIDERS; PREPARED FOODS.

A research on the fermentation condition and sugar concentration in the prepation process of tamarind (*Tamarindus indica* Linn.) cider has been done. The research consisted of two treatment factors, which were sugar concentration, varied at 15, 17.5 and 20%; and fermentation periods, varied at 3, 5 and 7 days. The results showed that at 15% sugar concentration and 3 days fermentation, and 17.5% sugar concentration and 7 days fermentation resulted in alcohol content nearly 2%, i.e. 1.88% and 1.78%, respectively. Based on the organoleptic tests, the panelist on average preferred to choosen both at aroma and flavor of tamarind cider with 20% sugar concentration.

## 283 PRAMONO, Y.B.

Isolation and identification of lactic acid bacteria in the traditional meat fermentation-Petis-]. Isolasi dan identifikasi bakteri asam laktat pada fermentasi petis daging 186 *tradisional* / Pramono, Y.B. (Universitas Diponegoro, Semarang (Indonesia). Fakultas Peternakan); Rahayu, E.S.; Utami, T. *Jurnal Pengembangan Peternakan Tropis* (Indonesia) ISSN 0410-6320 (2008) v. 33(4) p. 319-323, 1 ill., 2 tables; 11 ref.

MEAT; FERMENTATION; ISOLATION; IDENTIFICATION; LACTIC ACID BACTERIA.

Lactic acid bacteria is one of natural meat microbe which is often used as fermentation agent. It is needed to maintain the quality, improvement of hygienic, and sensory characteristic of product. This research was isolation and identification of lactic acid bacteria in the meat tradional fermentation -petis-. The isolates could be used to improve some fermentation process. This research was the exploration experimental method by 4 repetition with 2 subresearch. The identification of lactic acid bacteria was based on morphological, biochemical, and physiological of the characters. The morphological characteristic were shape, measure and formation of cell. The biochemical characteristic included catalase test and acid formation with glucose as carbon source, and the physiological characteristics were studied by growth at various temperature, NaCl, and pH. The result of research was obtained 11 isolates of lactic acid bacteria, namely tetrad bacillus cell, clear zone colony at 1% CaCO<sub>3</sub> in MRS, and Gram positive, which were early characteristic of lactic acid bacteria. The isolates were growth at room temperature and 20% of NaCl, which were apparently as genus of *Pediococcus*.

## 284 PRAMONO, Y.B.

Microbiologycal, physical and chemical changes of petis liquid during dry spontaneous fermentation. *Perubahan mikrobiologis, fisik, dan kimiawi cairan bakal petis daging selama fermentasi kering spontan* / Pramono, Y.B. (Universitas Diponegoro, Semarang (Indonesia). Fakultas Peternakan); Rahayu, E.S.; Suparmo; Utami, T. *Jurnal Pengembangan Peternakan Tropis* (Indonesia). ISSN 0410-6320 (2007) v. 32(4) p. 213-221, 2 ill., 3 tables; 23 ref.

MEAT; FERMENTATION; FOOD TECHNOLOGY; CHEMICOPHYSICAL PROPERTIES; LACTIC ACID BACTERIA; ORGANOLEPTIC PROPERTIES.

Spontaneous fermentation will produce unstable product. It is caused by the variety of microbe, uncontrolled environmental of fermentation, and the variety of substance and process. Therefore, exploration research to understand the microbiologycal, physical, and chemical during fermentation is needed. The experiment was aimed to obtain early information that may be used as standard in using lactic acid bacteria as starter media in improving fermentation process. The research was conducted at the laboratory of Microbiology, PSPG of Gadjah Mada University, Yogyakarta. The dilution and plating method were used to observe microbiological changes such as total microbial changes, coliform, yeast, lactic acid bacteria, and bioamine producer bacteria. Physical changes was perceived from its performance, colour, physical meat and odour. While, chemical changes were observed through dissolved protein, carbohydrate (sugar reduction), fat, salt, bioamine as histamine, total acid, and Aw. It was resulted that pH and titrated-acid during fermentation are constant relatively, reduction sugar and dissolve protein increased due to the degradation of carbohydrate and protein component. Meanwhile, these decreased because of microbial metabolism. Microbiologycal changes indicated that lactic acid bacteria population was constant at 10<sup>5</sup> cfu/g during fermentation. These were suspected significant in inhibiting coliform growth (from  $10^5$  at the start of fermentation to  $10^3$  at the end of fermentation), and bioamine producer from 10<sup>6</sup> to 10<sup>3</sup>.

## 285 SUNARYANTO, R.

[Isolation, identification and characterization of lactic acid bacteria from curd buffalo milk]. *Isolasi, identifikasi, dan karakterisasi bakteri asam laktat dari dadih susu kerbau |* Sunaryanto, R.; Marwoto, B. (Balai Pengkajian Bioteknologi, Tangerang (Indonesia)). *Jurnal Sains dan Teknologi Indonesia* (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 228-233, 5 tables; 20 ref.

BUFFALO MILK; CURD; LACTIC ACID BACTERIA; PROBIOTICS; LACTOBACILLUS PLANTARUM; ISOLATION; IDENTIFICATION.

Dadih is one of the traditional fermented milk products of West Sumatra. Dadih contain a lot of lactic acid bacteria that acts as a coagulant and preservative. Some lactic acid bacteria also act as a probiotic agent because of their resistance to acidic conditions. Each species of the genus Lactobacillus have different characteristics. These characteristics are influenced by the environment in which the bacteria live. Isolation, identification and characterization of lactic acid bacteria derived from buffalo milk were done. The results of lactic acid bacteria isolation was Lactobacillus plantarum. Lactobacillus plantarum was able to survive in a concentration of medium containing 0.5% bile salts, resistant to acidic media until pH 2, have antimicrobial activity (inhibit Escherichia coli, Staphylococcus aureus and Enterococcus faecalis).

# 286 YUNUS, M.R.

Application of HACCP principles in manufacturing process of cocoa butter and cakes: case study at PT. Maju Bersama Cocoa Industry Makassar [Indonesia]. *Penerapan prinsip-prinsip HACCP pada proses produksi lemak dan bungkil kakao: studi kasus pada PT. Maju Bersama Cocoa Industry Makassar* / Yunus, M.R.; Yulismulianti (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 51-62, 2 ill., 2 tables; 28 ref.

COCOA BUTTER; CAKES; PROCESSING; HEALTH HAZARDS; SULAWESI.

This study developed an application of HACCP principles in manufacturing process of cocoa butter and cakes with a case study at PT Maju Bersama Cocoa Industry (MBCI) Makassar. The study used a descriptive method in which data and information required to accomplish the study were obtained through literature study and factory observation. The factory observation was held at the MBCI factory from July to Desember 2008. During the processing, the machines and equipments work in line and most of them with an automatic control system. Neither nib nor cake alkalization treatment involves in the process. The HACCP principle in this study focused in particular on hazard analysis, critical control points, critical limits, monitoring requirements, and corrective measures which needed to be taken when any deviation from the critical limits was detected. The hazard analysis of each step of the process had identified the potential hazards which included biological (i.e, Salmonella E. coli, insects, molds Aspergillus), and physical hazards (i.e. stones, iron, glass, plastic, and cocoa bean fragments). Of the twenty three steps identified in the process, the cocoa nib roasting had been classified as a CCP (Critical Control Point). Although no further steps after the cleaning and sorting step of raw cocoa beans would eliminate or reduced the identified physical contaminants on the beans to acceptable levels, the step actually could be regarded as a GMP/GHP. The step was, therefore, classified as a non-CCP. The other non CCPs or CPs (Control Point), i.e. cocoa storage, been pre-roasting, winnowing, nib grinding, liquor pressing, butter tempering, packaging etc. could be also handled by GMP/GHP principles.

# Q03 FOOD CONTAMINATION AND TOXICOLOGY

## 287 WIDIASTUTI, R.

Detection of nitrofurans residue in broiler chicken meat analysed by HPLC. Deteksi residu nitrofuran pada daging ayam pedaging yang dianalisis secara kromatografi cair kinerja tinggi / Widiastuti, R. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)). Jurnal Ilmu Ternak dan Veteriner (Indonesia). ISSN 2252-69 X (2012) v. 17(4) p. 284-289, 3 ill., 2 tables: 15 ref.

# CHICKEN MEAT; RESIDUES; NITROFURANS; HPCL

Furazolidone (FZD), furaltadone (FTD), nitrofurantoin (NFT) and nitrofurazon (NFZ) are veterinary drugs that belong to the nitrofurans (NFs) group and employed as feed additives for growth promotion and theurapetic treatment of gastrointestinal infections caused by Escherichia coli and Salmonella spp. The occurrence of NFs in animal products will end to cause health problem in human consumed such food. This research was conducted to study the analysis of NF residues in chicken meat by a high performance liquid chromatography (HPLC) and to study the occurrence of NFs residues in samples collected from traditional markets and supermarkets in Bandung, Bogor and Depok. The results of validation method on several parameters for each NF showed that average of the relative standard deviation (RSD) from the precision study were 2.15 - 2.38%, the R2 values of the linearity study were 0.9964 - 0.9995; recoveries were 75.90 - 91.50% and the detection limits were 12.01 - 37.25 ng/g. The residual level of NFs for 42 field samples showed that 2 samples positive for NFZ (9.09 and 10.74 ng/g), 1 positive for NFT (10.46 ng/g), 4 positive for FTD (16.44 up to 27.21 ng/g) and none positive for FZD. Present results showed that analysis of NFs in broiler chicken meat can be done using an HPLC and the analysis results from field samples showed that these types of drugs were being used for broiler production both as single and/or combination drugs, therefore it is necessary to raise public awareness to monitor the use of NF in livestock production in Indonesia.

# Q04 FOOD COMPOSITION

# 288 ASGAR, A.

Quality testing of several potato clones for potato chips. Uji kualitas umbi beberapa klon kentang untuk keripik / Asgar, A.; Rahayu, S.T.; Kusmana, M.; Sofiari, E. (Balai Penelitian Tanaman Sayuran, Lembang, Bandung (Indonesia)). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 51-59, 4 tables; 31 ref.

POTATOES; CLONES; TUBERS; QUALITY; FOODS; ORGANOLEPTIC PROPERTIES.

The objective of the research was to determine the quality of potato clones resulted from selection for potato chips. Quality test of 10 selective clones was determined. The research was conducted from July - September 2010 and arranged in a completely randomized block design with three replications. Treatments consisted of (1) 385524.9 x 392639.34, (2) 393077.54 x 391011.17, (3) 393077.54 x 391011.17, (4) 391011.17 x 391580.30, (5) 391011.17 x 385524.9, (6) 393077.54 x 391011.17, (7) 391011.17 x 385524.9, (8) 391011.17 x 385524.9, (9) 393033.54 x 391580.30, and (10) Granola (control). The results showed that chips which had a score value between 2.00 to 2.36 (yellow uniform) for potato chips were clone 7 (391011.17 x 385524.9) and clone 8 (391011.17 x 385524.9). The reducted sugar content of these clones was lower (0.029 and 0.023% respectively) than of the other potato clones which had dark color. The potato clones had good quality and fulfilled conditions for potato chips processing.

# 289 LOPPIES, J.E.

Analysis of the flavour key parameters instability of cocoa beans from several cocoa processing centres in Eastern Indonesia. *Analisis ketidakseimbangan parameter penentu citarasa biji kakao pada beberapa sentra pengolahan di Kawasan Timur Indonesia /* Loppies, J.E. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2009) v. 4(2) p. 65-72, 8 ill., 16 ref.

COCOA BEANS; PROCESSING; FLAVOUR; ACIDITY; BITTERNESS; INDONESIA.

Instability among the key parameters of cocoa beans flavour may become the cause roots of the off-flavour. The flavor parameters cover several parameters: aroma (quality and intensity), acidity, bitterness, astringency, and off-flavour (harshness, nuttiness, and colour), and key parameters: acidity, bitterness, and astringency. The instability of the flavour key parameter of cocoa beans from several cocoa processing centres in Eastern Indonesia: Papua (JP, SR and MN), Maluku (PB and TR), Sulawesi (PL and GR) and Kalimantan (BL) has been analyzed. Analisis was based on the finger prints regarding of the quality of cocoa beans from the processing centres in Eastern Indonesia studied by Pasullean et al. (2002). The results of the analysis showed that the instability among the flavor key parameters of the cocoa beans occured from almost all of the processing centres. The instability was due to the domination of acid (the JP4-JP6, PL1-PL3, GR4-GR6, PB4-PB6 centres), bitter (the MN1-MN6, PB1 and PB2 centres) and astringent (the SR1-SR6, PL4-PL6, GR1, BL1-BL3, PB4-PB6 centres). The only good stability between the flavor and the aroma quality and intensity was found in the samples from the JP1-JP3, BL4-BL6 centres.

# 290 ROSNIATI

Effects of package types and storage periods on cocoa powder quality. *Pengaruh jenis kemasan dan lama penyimpanan terhadap mutu bubuk kakao* / Rosniati; Duma, N. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 40-50, 8 ill., 10 tables; 21 ref.

COCOA POWDER; QUALITY; PACKAGING MATERIALS; ALUMINIUM; PLASTICS; PH; ORGANOLEPTIC TESTING.

The effects of package types and storage period on cocoa powder quality have been investigated. The cocoa beans from Bulukumba, South Sulawesi Province were placed in the fermentation boxes for 5 days, sun dried for  $\pm$  7 days, and roasted for 45 minutes at temperature of  $140^{\circ}$ C before processed into cocoa powder. The studied treatments consisted of two variables namely; package types aluminium foil and plastic low density polyetilen and storage periods in the levels 0, 2, 4, 6, and 8 weeks. Parameters evaluated were water content, pH, free fatty acid, microbe total and organoleptic parameters test (flavor, appearance and texture) based on hedonic scale. The results showed that the cocoa powder with aluminium foil packages still complied with the SNI 01-3747-1995 up to 8 weeks storage, whereas the cocoa powder with plastic low density polyetilene packages complied with the standard maximum for 6 week storage.

# 291 SETIAWAN, J.

Physico-chemical properties, somatic cell count and microbiological quality of ettawa crossbreed goat milk. Sifat fisik dan kimia, jumlah sel somatik dan kualitas mikrobiologis susu kambing peranakan etawah / Setiawan, J. (Institut Pertanian Bogor (Indonesia). Pascasarjana Ilmu Produksi dan Teknologi Peternakan). Acta Veterinaria Indonesiana (Indonesia). ISSN 2337-3202 (2013) v. 1(1) p. 32-43, 6 ill., 6 tables; 32 ref.

GOAT MILK; CHEMICOPHYSICAL PROPERTIES; QUALITY; MICROBIOLOGY; PROXIMATE COMPOSITION; MASTITIS.

Lactation Ettawa crossbreeds were selected from herd in Cordero Farm to determine variations of milk somatic cell counts (SCC), physical and chemical composition and microbiological quality. Individual milk samples were collected daily from morning and evening milking. Milk samples were analyzed for SCC using a Breed method and for physico-chemical composition using milk analyzer. The conventional bacteriological method for bacterial isolation and the indirect test (IPB-1 Test) for determining udder inflammation status were employed. Milk from the herd had high fat, SNF and protein contents and classified as premium quality. Over all, 36.36% of milk samples contained more than 1.0 x 106 SCC/ml, the legal limit for Grade A goat milk or classified as standard quality. As much as 50.65% milk samples classified as premium quality which contained less than 7.0 x 105 SCC/ml and 12.99% of milk samples classified as good quality which contained 7.0 x 10<sup>5-1.0</sup> X 106 SCC/ml. Milk samples which had score +2 and +3 on mastitis test exceeded the maximum limit of total plate count (TPC) and Staphylococcus aureus. Milk samples which had scores neutral, trace and +1 on mastitis test can be classified as premium quality with TPC < 5.0 x 10<sup>4</sup> cfu/ml. Total number of coliform bacteria for milk samples, except for samples with mastitis which had score +3 on mastitis test did not exceed 103 cfu/ml, maximum limit of coliform contamination.

# 292 SUDIBYO, A.

Study on the chemical and flavor characteristics of dark chocolate formulated from dried bean that origin from many different area of Indonesia cacao production. *Mempelajari karakteristik kimia dan citarasa cokelat formulasi dari biji kakao yang berasal dari berbagai daerah penghasil kakao di Indonesia* / Sudibyo, A. (Balai Besar Industri Agro, Bogor (Indonesia)); Astuti, J. *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 1-13, 3 tables; 31 ref.

COCOA BEANS; CHEMICAL COMPOSITION; FLAVOUR; PH; ACIDITY; ACETIC ACID; LACTIC ACID; INDONESIA.

Chemical and flavor characteristic of the formulated chocolate made from 9 dried fermented cocoa bean samples from four different countries and six different areas in Indonesia of origin and relationship with pH, titratable acidity, acetic and lactic acid concentrations and free fatty acid content were studied. The fermented dried cocoa beans were processed into semi-sweet dark chocolate and were analyzed their chemical and flavor difference by the multiple comparison test using the Ghanaian sample as a reference. The descriptors and the intensities of the formulated chocolate flavor perceived by the taste panel members were also obtained. The results showed there was correlation between the flavor score and the pH, titratable acidity, acetic and lactic acid concentrations and free fatty acid content. The study found that formulated chocolate samples made from the low pH (4.76-4.95) cocoa beans had low response in strong chocolate flavor. On the other hand, formulated chocolate samples made from the Ghanaian and Brazilian beans which have high pH values of 5.28 - 5.42 received a high response in strong chocolate flavor. More of flavor descriptors were perceived from formulated chocolate samples made from low-pH cocoa beans.

# Q60 PROCESSING OF NON-FOOD OR NON-FEED AGRICULTURAL PRODUCTS

293 DAUD, D.

Effect of reaction temperatures and duration on the characteristics of metallic soap magnesium stearate from palm fat derivative. *Pengaruh suhu dan waktu reaksi pada karakteristik metallic soap magnesium stearate dari derivat lemak sawit* / Daud, D. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)); Komalasari, Y. *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2009) v. 4(2) p. 73-78, 5 tables; 10 ref.

PALM OILS; SOAPS; PROCESSING; FATTY ACIDS; GLYCEROL; FATS; MAGNESIUM; TEMPERATURE.

Oleochemical is a chemical derivate of palm oil or fat in various forms of fatty acids and glycerol. One of the derivates of the palm fat is metallic soap magnesium stearate which is used widely in industry and pharmacy as stabilizer and emulsifier. The effects of reaction temperatures and duration on the characteristics of metallic soap magnesium stearate from the palm fat derivate have been investigated at laboratory scale using double decomposition reactions. The first reaction was between acid stearate and sodium carbonate at 90°C temperature in 60 minutes to produce sodium stearate. The second reaction was between sodium stearate and magnesium sulphate at 80°C dan 90°C temperature for 10, 30, 60, 120, 180 and 240 minutes to produce metallic soap magnesium stearate. Analysis was conducted for the metallic soap magnesium stearate product as the raw material of paint and varnish. The results showed that the increase of reaction temperatures and duration would reduce water content, acidity and FFA; and increase melting point and solubility in water of the product. However, if compared with the Novac and Tailand standards for the raw material of paint and varnish, for the best results at 90°C temperature and 240 minutes duration of the reaction, the parameters that complied whith the standards were only ash content (4.56%) and melting point (120°C), near to the standards was water content (4.75%), while FFA (15.14%) was relatively needed to be reduced due to the high acidity, the high value of the FFA was most probably due to the high content of acidity (207.60%) of the stearate acid used.

# 294 PABENDON, M.B.

Prospect of the using of stem juice, bagasse, and grain of sweet sorghum as raw material for bioethanol production. *Pemanfaatan nira batang, bagas, dan biji sorghum manis sebagai bahan baku bioetanol* / Pabendon, M.B. (Balai Penelitian Tanaman Serealia, Maros (Indonesia)); Sarungallo, R.S.; Mas'ud, S. *Jurnal Penelitian Pertanian Tanaman Pangan* (Indonesia). ISSN 0216-9959 (2012) v. 31(3) p. 180-187, 7 tables; 25 ref.

SORGHUM BICOLOR; GENOTYPES; STEMS; BAGASSE; SORGHUM GRAIN; FERMENTATION; ETHANOL; BIOFUELS.

The study was conducted at ICERI (Indonesian Cereal's Research Institute), at the Laboratory of Chemical Engineering, Paulus Christen University (UKIP), and at Laboratory of Bioprocess, Department of Chemical Engeneering, Polytechnic Ujung Pandang, from March to November 2010. The aim of this study was at determining the potential ethanol production derived from juice, bagasse (sellulose), and sorghum grain (starch). Eleven sweet sorghum genotypes were tested, local varieties Selayar Hitam, Sorgum Hitam, and variety Numbu were used as checks. The results showed that yield of stem biomass, high brix sugar content, high yield of bagasse, high grain yield, and high content of glucose derived from grain were characters that could be used as criteria for selection of sorghum genotypes producing high

ethanol per unit area. These characters were correlated with the ethanol production per unit area. Genotypes 15021A. 15011A. and Watar Hammu Putih were prospective sweet sorghum for the ethanol production. These genotypes were supported by high yield of stem biomass per unit area, high brix sugar content, and high grain yield than check varieties, except for Watar Hammu Putih. Although all of the three raw materials had the potential use for bioethanol production, stem juice and bagasse were more suitable to be used than the grain, since it would not compete with the use of grain for food.

# **070 PROCESSING OF AGRICULTURAL WASTES**

295 LOPPIES, J.E.

Shelf-life of skin lotion formulated from cocoa butter and paraben preservative. *Keawetan skin lotion hasil formulasi lemak kakao dan pengawet paraben* / Loppies, J.E.; Ramlah, S. (Balai Besar Industri Hasil Perkebunan, Makassar (Indonesia)). *Jurnal Industri Hasil Perkebunan* (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 63-70, 4 ill., 21 ref.

COCOA BUTTER; SKINS; PRESERVATIVES; FORMULATIONS; KEEPING QUALITY.

Skin lotion is one of the cosmetic products which refers to the human skin sensitivity and, therefore its formulation and preservation is determinant factors on the handbody lotion function. The use of cocoa butter in skin lotion formula is due to its ability to protect skin from ultraviolet effects and to disperse easily on the skin. It also contains stearic acid with low double chain (2-3%). The objective of this research was to know the paraben preservative ability to prolong shelf-life of the skin lotion formulated from cocoa butter using 1% preservative in concentrations. Propyl paraben (nipasol) and methyl paraben (nipagin) were used apart and as a combination of the both in the formula. The results showed that the use of the two preservatives resulted in skin lotion which was still preserved after 8 weeks (56 days) storage, while without preservative the shelf-life was only until the 10 days storage. However, methyl paraben was more effective than propyl paraben or their combination eventhough the differences were not significant.

# 296 RISMANA, E.

[Synthesis and characterization chitosan nanoparticles - extracted from shell fruit of Mangosteen (*Garcinia mangostana*)]. *Sintesis dan karakterisasi nanopartikel kitosanekstrak kulit buah manggis (Garcinia mangostana)* / Rismana, E.; Kusumaningrum, S.; Bunga P., O.; Rosidah, I.; Marhamah (Pusat Teknologi Farmasi dan Medika, Jakarta (Indonesia)). *Jurnal Sains dan Teknologi Indonesia* (Indonesia). ISSN 1410-9409 (2012) v. 14(3) p. 189-196, 7 ill., 1 table; 13 ref.

MANGOSTEEN; FRUITS; PEEL; PLANT EXTRACTS; EXTRACTION; CHITOSAN; ETHANOL; SYNTHETIC PYRETHRINS; DRUGS; CHEMICOPHYSICAL PROPERTIES; PARTICLE SIZE.

The chitosan - *Garcinia mangostana* extract nanoparticles has been prepared by ionic gelation reaction by mixture 0.2% chitosan solution in acetic acid with *Garcinia mangostana* extract and continued by reaction process with 0.1% sodium tripolyphosphate. The particle size of material was determined by particle size analyzer (PSA) that it showed in the range of 200-500 nm. The color, pH, water, -mangostin, mercury, arsenic, cadmium, lead, totally microbe aerobic, totally mold and yeast, and solvent residue contents of nanoparticles were also examined by many methods that these resulted are yellow, 4.50-5.50, 89-90%, 1.05%, <

0.005 ppm, < 0.01 ppm, < 0.01 ppm, < 0.05 ppm, < 10 cfu/g, < 10 cfu/g and not detected, respectively. The other characterization were also observed such as stability and TLC chromatogram. A mixture of nanoparticles with cosmetics bases was showed that stability, homogenecity and easy to formed was increased.

## 297 SYAFARUDDIN

Optimation of DNA isolation and purification techniques on *Reutalis trisperma* (Blanco) Airy Shaw. *Optimasi teknik isolasi dan purifikasi DNA yang efisien dan efektif pada kemiri sunan (Reutalis trisperma (Blanco) Airy Shaw)* / Syafaruddin (Balai Penelitian Tanaman Rempah dan Aneka Tanaman Industri, Sukabumi (Indonesia)); Santoso, T.J. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2011) v. 17(1) p. 11-17, 3 ill., 1 table; 24 ref.

PECANS; CANDLE NUTS; PURIFICATION; DNA; EFFICIENCY; ISOLATION TECHNIQUES; BIOFUELS.

Reutalis trisperma is well known as a potential plant which produces biodiesel and to be used for the conservation as well. The reutalis oil is toxic, therefore it is inedible due to about 50% -eleostearat acid content in the oil. As a potential plant, its information in more detail is needed including the DNA analysis. There are many techniques to conduct DNA isolation depending on kind of plants, plant organ, or plant tissue that will be analyzed. The aim of this experiment was to find the effectiveness and efficiency techniques of DNA isolation and purification, so they can reduce cost and time while working in the laboratory. The experiment was conducted at Molecular Biology Laboratory of Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development (BB BIOGEN), Bogor from July to September 2010. Young leaves of reutalis, used as genetic materials were taken from germplasms collection at Pakuwon Experimental Station of Indonesian Spice and Industrial Crops Research Institute (ISICRI), Sukabumi. While some chemicals were used as the other material. The activities were as follows DNA extraction and purification, measurement of DNA concentration, and amplification of DNA. Deletion of resistor enzyme-polysacharide, especially for perennial plant. DNA isolation can be done by breaking down of cell wall, cell membrane, and nuclear membrane. The results showed that conscientiousness of DNA isolation and purification denoted an important step to obtain clean and contaminant free of DNA, so the banding patterns were clear. In this technique did not use polypinilpolypirolidone (PYPP) and mercapto-ethanol such as antioxidant, liquid nitrogen, neither over night storage of leaf extraction before used for purification which is often used for perennial plant. In addition the results showed that band pattern of DNA was very thick and clear, therefore this technique can be applied for DNA isolation on Reutalis trisperma.

# Q80 PACKAGING

# 298 MISKIYAH

Edible coating application based on sago starch and vitamin C on sweet pepper: consumer's preference and microbiological quality. *Aplikasi edible coating berbasis pati sagu dengan penambahan vitamin C pada paprika: preferensi konsumen dan mutu mikrobiologi* / Miskiyah; Widaningrum; Winarti, C. (Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, Bogor). *Jurnal Hortikultura* (Indonesia). ISSN 0853-7097 (2011) v. 21(1) p. 68-76, 7 ill., 26 ref.

SWEET PEPPERS; EDIBLE FILMS; SAGO; STARCH; ASCORBIC ACID; CONSUMER BEHAVIOUR; ORGANOLEPTIC PROPERTIES; MICROBIOLOGICAL ANALYSIS; QUALITY.

Sweet pepper is one of vegetable crops that has good prospects either for local or export market. Nevertheless, sweet pepper is a perishable commodity, so postharvest technology is needed. Edible coating based on sago starch is one of postharvest technology that is hopefully applicable for sweet pepper. This research was aimed to evaluate consumer's acceptance and microbiological quality of red sweet pepper treated with edible coating based on sago starch and vitamin C. Treatments for organoleptic evaluation were (a) ascorbic acid concentration i.e. 0, 0.5, and 1.0%, and (b) dipping periods, i.e. 3 and 5 minutes. Sweet pepper without edible coating was used as the control. The results showed that the coating treatment did not significantly influence panelist acceptance in term of color attribute, aroma, texture, taste, and entire sweet pepper. Panelists commonly accepted sweet pepper coating either with or without vitamin C. Furthermore, it was indicated that coating and vitamin C treatment had an effect to microbial content, signed by prolong storage life of sweet pepper till 3-7 days.

# 299 SEMBIRING, B.S.

Quality changes of dehydrated green pepper during storage in three packaging types and temperature levels. *Perubahan mutu lada hijau kering selama penyimpanan pada tiga macam kemasan dan tingkatan suhu* / Sembiring, B.S. (Balai Penelitian Tanaman Rempah dan Obat, Bogor (Indonesia)); Hidayat, T. *Jurnal Penelitian Tanaman Industri* (Indonesia). ISSN 0853-8212 (2012) v. 18(3) p. 115-124, 13 ill., 6 tables; 24 ref.

PEPPER; QUALITY; DEHYDRATION; STORED PRODUCTS; PACKAGING.

Dehydrated green pepper is one type of pepper product diversification. Product quality is influenced by the quality of raw materials and processing. One of quality criteria is color, where good color of dried pepper is green. This study aimed at determining changes in the quality of dehydrated green pepper during storage at various temperature levels and packaging materials. The study was conducted at the Laboratory of Center for Agricultural Postharvest Research and Development in 2009. The raw material was dehydrated pepper produced by farmers' group at Sukadana Baru Village, East Lampung. Dehydrated green pepper was sorted and weighed and then packed in three types of packaging material: polyethylene (LDPE), polypropylene (PP), and aluminum foil. Subsequently they were stored in three types of room condition/temperature: air-conditioned room (temperature 20°C), room temperature (30°C), and incubator (40°C). They were stored for 4 months with observation interval of 2 weeks. Observational parameters were the characteristics of raw and packaging materials color (a\* value), moisture content, volatile oil content, pH, and organoleptic tests which included color, flavour, aroma, and 3 general acceptances by scoring method analyses. Organoleptic values were processed through modus and median and non parametric statistical analysis of scores given by panelists. Results showed that the type of packaging material, temperature levels, and storage duration affected the quality of dehydrated green pepper. Characteristics of dehydrated green pepper before storage were green color with a\* value -1203, 7.5% water content, 3.29% volatile oil content and 4.7 pH value. Pepper characteristic changes occured in all three packaging types after 84 days. Aluminum foil retained the green color up to 112 days of storage at room temperature of 20°C with a\* value -1.191, 8.5% water content, 3% oil content, and 5.7 pH value, whereas other packaging types were and able to retain pepper quality until the 77th day. Type of packaging and room temperature storage period of dehydrated green pepper did not significantly affect panelists reception, except those packaged with LDPE 40°C after 84 days storage of dehydrated green pepper is not liked by the panelists because of its musty aroma.

## **T01 POLLUTION**

300 AMOS

Impact of small-scale sago processing waste on the water quality of river in Cibuluh Village the City of Bogor [Indonesia]. Dampak limbah pengolahan sagu skala kecil terhadap mutu air anak sungai di Kelurahan Cibuluh Bogor / Amos (Pusat Teknologi Agroindustri, Jakarta (Indonesia)). Jurnal Industri Hasil Perkebunan (Indonesia). ISSN 1979-0023 (2010) v. 5(1) p. 32-39, 2 ill., 1 table; 12 ref.

SAGO; INDUSTRIAL WASTES; WASTE MANAGEMENT; WATER POLLUTION; RIVER; QUALITY; JAVA.

The objective of this research was to study the influence of small-scale sago processing industry to quality of Ciheuleut River water in Cibuluh Subdistrict, District of North Bogor, the City of Bogor. The method used was water analyzing in laboratory and subsequently the result was compared to standard quality of tapioca industry. Response of community in the area regarding this sago processing industry was gathered by performing interview in the form of questionnaire (number of community response was 35). Water samples used for water analysis were from 4 locations. They were water before flowing into the processing unit (A); water after filtration (B); process disposal water collected 1 m apart from filter (C); and discarded water that flows into river (D). Water analyzing applied by using utilized chemical analysis which included pH, COD, BOD, DO, turbidity, cyanide and TSS (Total Soluble Solid) parameters. Laboratory analysis showed that location B had turbidity level that exceeded the standard quality required. Result of hypothesis test showed that hypothesis zero (H0) acceptable and alternative hypothesis rejected. It meant water disposal waste of sago processing industry did not alter the quality of water disposal. Community felt disturbed on the existence of sago processing industry. The disturbance consisted of liquid waste (20%), unpleasant odour due to solid waste (51.1%), and noise (22.9%). Unpleasant odour due to solid waste occured during dry season (45.7%) and rainy season (31.4%). Sixty percent of respondents said that water disposal of, sago processing industry lead to river turbidity; whereas another 40% said that it did not make any difference. River turbidity brought about itchiness (28.6%) while 68.6% said it did not make any difference. Seventy one point four (71.4%) of respondents said that the existence of sago processing industry is beneficial to the community.

# **AUTHOR INDEX**

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