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Nitrous Oxide (N₂O) Emissions from a Japanese Lowland Soil Cropped to Onion: III. Relationship with Soil Physical Properties

Nsalambi V. Nkongolo, Kanta Kuramochi and Hatano Ryusuke

We studied the spatial variability of soil physical properties and related these properties to N₂O emissions. The study was conducted in a Japanese lowland soil cropped to onion in Mikassa, Hokkaido (Japan). N₂O emissions measurements and soil sampling were conducted along a 100×100 m (1999) and 60×60 m (2000) grids with samples taken at 10 m spacing. Air samples for N₂O determination were collected using the closed-chamber technique. Air samples were stored in vial bottles for analysis with a gas chromatograph with electron capture detector within 24 h after sampling. Soil samples were collected with a 5 cm diameter and a 5 cm height cylinder. Soil physical properties measured were soil temperature (T), bulk density (ρ_b), volumetric water content (θ_v), gravimetric water content (θ_g), air-filled porosity (fa), total pore space (TPS), relative gas diffusivity coefficient (D_g/D_o) and the pore tortuosity factor (τ). Results showed that N₂O emissions were highest in 1999 as compared to 2000. They were fitted to a linear variogram in 1999 while they responded to a spherical variogram model in 2000. Positive first degree surface trends were also found in N₂O emissions data in both years and the removal of these trends did not change variogram models, but significantly improved them by increasing the R² and Q values. Soil physical properties responded to a range of variograms, from linear to spherical models. Detrending soil physical properties either increased (T) or decreased (θ_v) the range and R² values. Soil T, τ , D_g/D_o , WFPS were significantly correlated with N₂O emissions. N₂O emissions and soil properties varied considerably in space and time. More studies are needed to identify other soil physical properties which might better correlate with N₂O emissions, besides the traditional T and WFPS. (*International Journal of Agricultural Research 4 (1): 1-16, 2009; doi: 10.3923/ijar.2009.1.16*)

Nitrous Oxide (N₂O) Emissions from a Japanese Lowland Soil Cropped to Onion: I. Spatial and Temporal Variability of Fluxes

Nsalambi V. Nkongolo, Kanta Kuramochi and Hatano Ryusuke

Field studies were conducted to assess the spatial and temporal variability of nitrous oxide (N₂O) emissions in an agricultural field cropped to onion in Mikassa, northern Hokkaido (Japan). N₂O emissions measurements were conducted in 100

by 100 m and 60 by 60 m grids in 1999 and 2000, respectively with samples taken at 10 m spacing. Air samples for N₂O determinations were collected using the closed-chamber technique. The chambers were circular with steel frames. The top of each chamber had a gas sampling tube and a bag to control air pressure inside. The height and diameter of the chamber were 0.35 and 0.30 m, respectively. Air samples were stored in vial bottles for analysis with a gas chromatograph with electron capture detector within 24 h after sampling. GS+ 7.0 geostatistical software and statistix 8.0 were used for data analysis. Results showed that N₂O emissions were highest in 1999 as compared to 2000. N₂O emissions were fitted to a linear variogram in 1999 and responded to a spherical variogram model in 2000. Positive first degree surface trends were also found for N₂O emissions data in both years. However, the removal of these trends did not change variogram models, but significantly improved them by increasing the R² and Q values. N₂O emissions systematically varied with small zones of uptake (negative flux) across the field, suggesting the presence of hot spots. (*International Journal of Agricultural Research 4 (1): 17-28, 2009; doi: 10.3923/ijar.2009.17.28*)

Adoption of Integrated Soil Fertility and Nutrient Management Approach: Farmers' Preferences for Extension Teaching Methods in Bangladesh

M.G. Farouque and H. Takeya

The major purpose of the study was to determine the extent of preferences of different categories of farmers for effective extension teaching methods aimed at encouraging adoption of the Integrated Soil Fertility (ISF) and Nutrient Management (NM) approach. Data were collected from 120 farmers from eight villages in four districts in Bangladesh between December 2007 and January 2008. Of these farmers, 39 landless, 34 marginal, 19 small, 20 medium and 8 were large farmers. A four-point rating scale was used to analyze the preferences: strongly resist, mildly resist, mildly prefer and strongly prefer corresponded to scores of 0, 1, 2 and 3, respectively. The majority of the landless, marginal and small farmers preferred individual extension teaching methods; on the other hand, the largest segment of medium and large farmers preferred group and mass extension teaching methods. Inadequate education, poor training and low income were the major reasons for the landless, marginal and small farmers' relatively higher preferences for individual teaching methods. The channel of transfer of crop production technology showed that extension service providers had very little involvement in pre-extension activities. Conversely, farmers and farmers' representatives played very little role in planning, implementing, evaluating and

verification of trials undertaken by the extension department. Present different farmers' groups require different types of extension teaching methods in order to adopt the ISF and NM approach. (*International Journal of Agricultural Research 4 (1): 29-37, 2009; doi: 10.3923/ijar.2009.29.37*)

Isolation and Characterization of A Novel *Glu-Bx* HMW-GS Allele from Tibet Bread Wheat Landrace

Zehong Yan, Shoufen Dai, Dengcai Liu, Yuming Wei, Jirui Wang and Youliang Zheng

A novel HMW-GS of Bx6** , with slightly slower migration rate than that of Bx7 presented in wheat cultivar Chinese Spring, was found in a Tibet bread wheat landrace using SDS-PAGE. The gene for this subunit was isolated and its sequence was obtained. This gene was very similar to Bx7 both in nucleotide and deduced amino acid sequence. At the nucleotide sequence level, Bx6** different from Bx7 by the deletion of an 18 bp fragment and three nucleotides replacement at position 455 A/G, 2046 G/A and 2208C/G, respectively. At the deduced amino acid sequence level, the only difference is that Bx6** shorter than Bx7 by the deletion of a hexaploid peptide unit (PGQGKQ). These results suggested that Bx6** was a derivation of Bx7 and was formed by replication slippage. (*International Journal of Agricultural Research 4 (1): 38-45, 2009; doi: 10.3923/ijar.2009.38.45*)

Effects of Partial Rootzone and Controlled Deficit Irrigation on Growth, Yield and Peroxidase Activities of Tomatoes (*Lycopersicon esculentum* Mill.)

Mohd Razi Ismail and S. Phizackerley

The aim of the experiment was to examine the application of partial rootzone drying and deficit irrigation on growth and plant development of tomatoes. Potted fresh market tomatoes (*Lycopersicon esculentum* Mill.) in pots were subjected to partial root zone drying (PRD) and controlled deficit irrigation (CDI) under glasshouse conditions. Roots of plants were remained attached to plants and half the volume divided in one plant and the other half planted in the other adjacent pot. The treatments were: well-watered continually maintained close to field capacity in both pots (control), CDI₅₀ (half the amount of water in control divided equally to both pots with each watering), PRD₅₀ (half the amount of water in control applied to one pot while water was withheld from the other pot until soil water declined to 50-70% the field capacity and then water was applied to the other

pot), PRD₂₅ (half the amount of water in control was applied to one pot while water was withheld from the other pots until soil moisture declined to 25-50% field capacity and then water was applied to the other pot) and CDI₂₅ (quarter amount of water in control divided equally to both pots with each watering). Imposing water deficit reduced fruit yield up to 18% in PRD₅₀ and 33% in CDI₅₀ which coincided with an impairment of fruit expansion. The percentage of fruit dry matter and osmotic potential increased in both PRD and CDI compared with the control. The incidence of blossom end rot increased in both CDI and PRD₂₅ compared with the control and PRD₅₀ treatments. Cell wall peroxidase in the epidermal layer of fruit may have a role in cessation of fruit expansion towards fruit maturity under reduced water availability. (*International Journal of Agricultural Research* 4 (1): 46-52, 2009; doi: 10.3923/ijar.2009.46.52)

Effects of Calcium and Chitosan Treatments on Controlling Anthracnose and Postharvest Quality of Papaya (*Carica papaya* L.)

A.Al Eryani-Raqeeb, T.M.M. Mahmud, S.R. Syed Omar, A.R. Mohamed Zaki and A.R. Al Eryani

This study was conducted to evaluate the *in vitro* fungicidal effects of calcium and chitosan on *Colletotrichum gloeosporioides* and to as well determine their effects on storage life and quality of papaya. Potato Dextrose Agar (PDA) incorporated with calcium at different concentrations (1.5, 2.5 or 3.5%) or in combination with chitosan at 0.75% or chitosan alone were used as treatments for *in vitro* tests. Uncorporated treatments with PDA and untreated fruits as control used on papaya fruits for storage life and quality evolutions. Chitosan had the greatest effect against *Colletotrichum gloeosporioides* in both *in vitro* and in disease incidence (%) on papaya fruits compared to calcium treatment and as well as control. Calcium reduced spores germination significantly as calcium concentrations increased from 2.5 to 3.5%, compared to the 1.5% and control treatments. However, it did not show any fungicidal effects on mycelial growth. The combination of 2.5% calcium with chitosan 0.75% completely inhibited spore germinations and significantly inhibited mycelia growth compared to calcium individual treatments and as well as control. Anthracnose disease incidence (%) was significantly controlled (5.6%) using calcium at 2.5% combined with chitosan compared with the other treatments. This demonstrated the best effect on controlling anthracnose disease incidence for papaya fruits. Moreover, this treatment proved able to extend the storage life of papaya fruits up to 33 days of storage life while maintaining valuable attributes of quality. (*International Journal of Agricultural Research* 4 (2): 53-68, 2009; doi: 10.3923/ijar.2009.53.68)

Co-Composting of Empty Fruit Bunches and Partially Treated Palm Oil Mill Effluents in Pilot Scale

A.S. Baharuddin, M. Wakisaka, Y. Shirai, S. Abd-Aziz, N.A. Abdul Rahman and M.A. Hassan

The main objective of this study is to investigate the physicochemical changes of the co-composting Empty Fruit Bunch (EFB) with partially treated palm oil mill effluent (POME) in pilot scale. The partially treated POME from anaerobic pond was sprayed onto the shredded EFB throughout the treatment. The composting materials were turned over one to three times per week for aeration. Temperature and oxygen were monitored at different depths of the composting piles. Parameters such as C, N, pH, nutrients, heavy metals and total bacteria count were also determined. The temperature was increased up to 58.5°C at day three of treatment, after that fluctuated between 50 to 62°C and then decreased in the latter stage of the process. The pH of the system (7.75-8.10) did not vary significantly during the treatment period while moisture content was reduced from 65-75% to about 60% at the end of the treatment. The initial C/N ratio of 45 was significantly reduced to 12 after 60 days of composting. The final cured compost contained a considerable amount of nutrients (carbon, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur and iron) and trace amounts of manganese, zinc, copper. In addition, very low levels of heavy metals were detected in the compost. The number of bacteria involved in the composting process was decreased at the end of the composting period. The results obtained indicated that pilot scale of co-composting EFB with partially treated POME gave acceptable quality of compost and ease in operation. The compost product may be useful in palm oil plantation as fertilizer and soil amendment. (*International Journal of Agricultural Research* 4 (2): 69-78, 2009; doi: 10.3923/ijar.2009.69.78)

Phosphate Solubilizing *Gluconacetobacter* sp., *Burkholderia* sp. and their Potential Interaction with Cowpea (*Vigna unguiculata* (L.) Walp.)

M.S. Linu, J. Stephen and M.S. Jisha

Eighty-one potential phosphate solubilizing bacteria isolated from rhizosphere soil were screened for their Mineral Phosphate Solubilizing (MPS) ability on Pikovskaya and National Botanical Research Institute's Phosphate (NBRIP) medium. The majority of the isolates exhibited a strong ability to solubilize hydroxyapatite in both liquid and solid media. The solubilization in liquid medium

corresponded with a decrease in the pH of the medium. Two bacterial strains exhibiting high solubilization of Tricalcium Phosphate (TCP) in Pikovskaya liquid cultures were identified as *Gluconacetobacter* sp. and *Burkholderia* sp. on the basis of phenotypic features, whole cell Fatty Acid Methyl Ester (FAME) profiles, 16S rDNA typing and carbon Substrate Utilization (SU) using Biolog GN2 plates. Seed inoculation of cowpea by these novel phosphate solubilizers improved nodulation, root and shoot biomass, straw and grain yield and phosphorus and nitrogen uptake of the crop. The dehydrogenase, phosphatase and the available P contents of the soil were stimulated by the inoculation with the phosphate solubilizing bacteria. Among the bacterial strains best effect on yield was obtained with *Burkholderia* sp. (*International Journal of Agricultural Research* 4 (2): 79-87, 2009; doi: 10.3923/ijar.2009.79.87)

Studying of Genetic Diversity in Satsuma (*Citrus unshiu*) Mandarin Utilizing Microsatellite Markers

A. Ghanbari, N.B. Jelodar and H. Rahimian

Genetic diversity of forty-four genotypes of Satsuma cultivars from Mazandaran was assessed using Simple Sequence Repeat (SSR) markers. SSR markers in different genotypes determined 2-5 alleles. The average of Polymorphic Information Content (PIC) in SSR markers were 0.88. Also, Principal Component Analysis (PCA) showed that SSR with four primary factors explained 80% of variations. Dendrograms showed that SSR markers could completely separate the Unshiu population. All the genotypes were grouped in 3 distinct clusters in cluster analysis. The control population, owari Genotypes were located in a separated cluster, while local Unshiu genotypes, unknown Unshiu, Wase and Wase derived genotypes were put together in another cluster. These results confirm the close relationship between local unshiu genotypes and Wase group or one of its similar varieties. (*International Journal of Agricultural Research* 4 (2): 88-96, 2009; doi: 10.3923/ijar.2009.88.96)

Influence of NPK Fertilization on Productivity and Oil Yield of Goundnut (*Arachis hypogaea*) and Sunflower (*Helianthus annuus*) in Intercropping System under Irrigated Condition

R. Sathya Priya, M. Mohammed Yassin, J. Maheswari and S.P. Sangeetha

A field experiment has been conducted at garden lands (*Vertic ustochrept*) of Agricultural College and Research Institute, Tamil Nadu Agricultural University,

Coimbatore during Kharif (June to October) season of 2004 to ascertain the optimum nutrient requirement for groundnut+sunflower intercropping system under irrigated conditions with replacement series to enhance the productivity of groundnut+sunflower inter cropping system. Groundnut was raised as main crop and sunflower was planted as intercrop with 3:1 ratio. There were ten treatments viz., control (T₁), 100% Recommended Dose of Fertilizers (RDF) to main and inter crops (T₂), 100% RDF to main crop+no fertilizer to intercrop (T₃), 100% RDF to main crop+100% RDF to intercrop (T₄), 100% RDF to main crop+50% RDF of intercrop (T₅), T₃+50% RDF to intercrop as basal+50% N to intercrop as top dress (T₆), T₃+50% N to intercrop as basal (T₇), T₃+100% PK of intercrop as basal+50% N as basal+50% N as top dress (T₈), pure crop of sunflower with RDF (T₉) and pure crop of groundnut with RDF (T₁₀) were tested in randomized block design with three replications. All the above fertilizer treatments were imposed based on the area. 100% RDF to groundnut (main crop)+100% RDF P and K to sunflower (intercrop)+50% of N basal and 50% of N as top dressing to sunflower increased yield attributes, yield and oil contents of groundnut and sunflower. So, 100% recommended doses of NPK fertilizer to groundnut+100 RDF PK to sunflower with 50% N as basal and 50% (T₈) as top dressing will be optimum to realize maximum yield under groundnut+sunflower intercropping system in irrigated conditions. (*International Journal of Agricultural Research* 4 (2): 97-106, 2009; **doi:** 10.3923/ijar.2009.97.106)

Gas Chromatography-Mass Spectroscopy Analysis and Evaluate Cumin Seeds and Their Essential Oil as Growth Promoters of New Zealand White Rabbits

M.A. EL-Manyawi and Hanaa F.M. Ali

Present study was aimed to investigate the chemical composition of cumin seeds essential oil by using Gas Chromatography-Mass Spectroscopy (GC-MS), also evaluate the effect of cumin seeds at two levels (0.25 and 0.50%) and its essential oil at four levels (25, 50, 100 and 200 mg kg⁻¹ b.wt.) on growing New Zealand White (NZW) rabbits performance. Furthermore, a change in blood constituents was measured as indicators of metabolic enzymes. GC-MS data indicated that 28 constituents were identified, representing (91.37%) of the total amount of essential oil. Significant effects of cumin seeds and its essential oil on growing performance, digestibility and some metabolic enzymes functions were observed at some levels either from cumin seed or its essential oil. (*International Journal of Agricultural Research* 4 (3): 107-115, 2009; **doi:** 10.3923/ijar.2009.107.115)

Impacts of Rate and Split Application of N Fertilizer on Sugarcane Quality

A. Koochekzadeh, G. Fathi, M.H. Gharineh, S.A. Siadat, S. Jafari and Kh. Alami-Saeid

Effect of nitrogen (N) rate and its split application (AP) on qualitative and quantitative characteristics of sugarcane (*Saccharum officinarum* L.) cultivar CP48-103 was investigated on a loamy soil texture from 2006 to 2008 in the Sugarcane Research Center of the Khuzestan Province, Iran. The experiment was arranged in split plot randomized complete block design with three replications consisted of three different rates of N ($N_1 = 92$, $N_2 = 138$, $N_3 = 184$ kg N ha⁻¹) as main plots and three different AP ($AP_1 = 20-40-40\%$, $AP_2 = 30-35-35\%$, $AP_3 = 30-30-40\%$) as subplots. Twenty canes were randomly harvested from each plot and their quantitative and qualitative characteristics were determined. The results showed that both rate and split application of N fertilizer had no significant effect on sugarcane characteristics. The interactive effects of N application rate and AP on juice purity depicted applying 92 kg N ha⁻¹ and AP of 30-30-40% gave the purest juice with 90%. The Nitrogen Use Efficiency (NUE) was significantly greater for N_1 with values of 1.39 and 0.13 t kg⁻¹ N in Cane Yield (CY) and Sugar Yield (SY), respectively. The results showed that the highest cane and sugar yield was obtained with 92 kg N ha⁻¹ and AP of 30-35-35%. (*International Journal of Agricultural Research 4 (3): 116-123, 2009; doi: 10.3923/ijar.2009.116.123*)

The Influence of Temperature on Growth and Yield of Green Beans for Processing

F. Yoldas and D. Esiyok

This research was carried out between in 2004 and 2005 at Odemis Technical Training College of Ege University in Odemis, Izmir to investigate the effects of sowing dates and windbreak treatments on growth and yield of 4 varieties of processing bean (*Phaseolus vulgaris* vars. Amboto, Gina, Nassau and Volare). Also, the heat summations (thermal time) were determined for all cultivars. The heat summations were calculated for different periods as (a) from emergence to harvest, (b) from emergence to beginning of flowering and (c) from beginning of flowering to harvest. The highest yield (12783.7 kg ha⁻¹) was obtained by early sowing in July. It was observed that delaying the sowing date decreased the yield (10926.7 kg) in 2005. Yields showed a decreasing tendency as sowing dates get

closer to autumn. Amboto variety with windbreak gave the highest yields in both years as 12501.0 and 12413.8 kg ha⁻¹, respectively. 1552.6°C day in Gina and Nassau, 795.3°C day in Gina and 958.7°C day in Volare were calculated as the highest thermal times for a, b and c, respectively. (*International Journal of Agricultural Research* 4 (3): 124-130, 2009; doi: 10.3923/ijar.2009.124.130)

Karyotype Studies on *Pseudoroegneria gracillima* and *P. kosaninii* (Poaceae: Triticeae)

Haiqing Yu, Chunbang Ding, Chun Zhang and Yonghong Zhou

In order to obtain more cytological data, the karyotypes of *Pseudoroegneria gracillima* and *P. kosaninii* were investigated. Root tips of *P. gracillima* and *P. kosaninii* were pretreated in an ice bath, fixed in a mixture of 95% ethanol: glacial acetic acid and treated in 1 M HCl at 60°C in a water bath. Somatic cells were stained in Schiff at room temperature and the meristematic portions of the root tips were squashed in 45% acetic acid. The results show that: (1) *P. gracillima* is diploid with two pairs of satellites and *P. kosaninii* is octoploid with three pairs of satellites. The karyotypes of diploid *P. gracillima* and octoploid *P. kosaninii* are first reported, (2) the karyotype formulas of *P. gracillima* and *P. kosaninii* are $2n = 2x = 14 = 12m(2sat)+2sm(2sat)$ and $2n = 8x = 56 = 42m(6sat)+12sm+2st$, respectively and (3) the karyotype of *P. gracillima* is 1A type, while *P. kosaninii* is 2B type. This demonstrated that there are great variations between the karyotypes of *P. gracillima* and *P. kosaninii*. (*International Journal of Agricultural Research* 4 (3): 131-136, 2009; doi: 10.3923/ijar.2009.131.136)

Sex Pheromones of the Green Mirid, *Creontiades dilutus* (Stål) (Hemiptera: Miridae)

S.T. Lowor, A.P. Del Socorro and P.C. Gregg

Whole body extracts and air collections from *Creontiades dilutus* males and females were analyzed to identify the sex pheromone components. The major component, hexyl hexanoate was found in whole body extracts and air collections from both sexes, while the minor component, (*E*)-2-hexenyl hexanoate, was only present in the female air collections. Field trapping experiments were conducted to determine the attractiveness of either of the single components and various binary blends to males. The optimum blend that consistently caught males in pheromone traps was a 5:1 ratio of hexyl hexanoate and (*E*)-2-hexenyl hexanoate.

Trapping studies also showed that green mirids came to pheromone traps only between 18:00 and 06:00 h, suggesting that they might be nocturnal rather than diurnal insects as previously thought. (*International Journal of Agricultural Research 4 (4): 137-145, 2009; doi: 10.3923/ijar.2009.137.145*)

Soil Degradation under Culture of Palm Oil Tree in the South of Ivory Cost

K. Ballo, A. Yao-Kouamé, K.A. Alui, A. Kouassi, D. Boa and Krogba Yves Nangah

In order to measure the impact of planting on the ground, the present study was undertaken to evaluate the evolution of particle size, chemical and physicochemical properties of soil during two consecutive cycles of cultivation of palm oil trees. The condition of soil under palm grove was compared to a control taken under natural forest. After 25 years of growing in the second generation, soil samples were collected in two areas. Samples were taken: one in the 0-20 cm layer and the other in the in the 40-60 cm layer. All samples were analyzed in a soil science laboratory. The results revealed a degradation of the physical, chemical and physicochemical characteristics of the soil. Planting palm oil trees resulted in the impoverishment of the soil in fine elements and a decline of the content in easily absorbed phosphorous. The cation exchange capacity and the content in organic matter was reduced while the content of exchangeable aluminum quadrupled. (*International Journal of Agricultural Research 4 (4): 146-152, 2009; doi: 10.3923/ijar.2009.146.152*)

Potential for Pheromone Based Attract-and-Kill and Mating Disruption of the Green Mirid, *Creontiades dilutus* (Stål) (Hemiptera: Miridae)

S.T. Lowor, P.C. Gregg and A.P. Del Socorro

Attempts were made at applying green mirid pheromones in a sprayable formulation for mating disruption and attract-and-kill in *Creontiades dilutus* (Stål), an emerging significant pest of cotton and other crops in Australia. In the mating disruption trials, a total trap shutdown for 2 days was observed. The short trap shutdown period is thought to have arisen from the formulation used. In the attract-and-kill work, efforts made to locate and count dead mirids for quantification did not work. Either the insecticide did not kill the mirids fast enough, resulting in their moving away from the treated row before dying, or the low numbers of mirids

present made the sampling method ineffective. However, the trap results suggest that attract-and-kill for male green mirids remains a promising option. As with mating disruption, however, further work needs to be done on a long lasting formulation to overcome potential problems with reinvasion of treated fields. (*International Journal of Agricultural Research 4 (4): 153-162, 2009; doi: 10.3923/ijar.2009.153.162*)

Start-Up of Biohydrogen Production from Palm Oil Mill Effluent under Non-Sterile Condition in 50 L Continuous Stirred Tank Reactor

M.Z.M. Yusoff, M.A. Hassan, S. Abd-Aziz and N.A.A. Rahman

Feasibility study of biohydrogen production from Palm Oil Mill Effluent (POME) using POME sludge as a mixed culture of natural inoculum was conducted. The experiment was done using a 150 mL serum bottle and 50 L Continuous Stirred Tank Reactor (CSTR) in batch and continuous modes, respectively. The biogas produced from both fermentations was free from methane due to heat treatment of the sludge prior to inoculation. The results obtained showed that the biohydrogen content in 150 mL serum bottle was higher (70%) than that of 50 L CSTR (25%). The biohydrogen rates for serum bottle and 50 L bioreactor were 74 and 33 NmL/h/L, respectively. Butyrate, propionate and acetate were the main soluble metabolites produced during the fermentation and reduced the pH of broth. (*International Journal of Agricultural Research 4 (4): 163-168, 2009; doi: 10.3923/ijar.2009.163.168*)

Physiological and Biochemical Evaluation of Rice Seed Storability with Different Seed Coating Techniques

P. Thobunluepop, W. Chitbanchong, E. Pawelzik and S. Vearasilp

The effect of pre-sowing seed treatments in direct-seeding rice production system on the germination, seedling vigor of rice cv. KDML 105 was evaluated through investigating the biochemical changes during storage following seed coating techniques. The seeds were coated by traditional fungicide (captan; CA), biological fungicide polymers [chitosan-lignosulphonate polymer (CL) and eugenol incorporated into chitosan-lignosulphonate polymer (E+CL)] and un-coated seeds as control (CO). CA significantly affected the rice seed storability and the associated biochemical deterioration. After 12 months storage, seed moisture content and seed water activity increased that affected the germination rate and

spread, seedling vigor; seedling dry weight, shoot and root length, seedling growth rate and susceptible to stress conditions. The loss of viability is associated with disturbances of the cell membranes, the loss of enzymes; α -amylase, ascorbate peroxidase APX and superoxide dismutase SOD activity, sugars and lipid content accompanied by increased free fatty acid FFA and activated lipoxygenase enzyme LOX. CL and E+CL performed the best of seed vigor, because they could maintain the antioxidative scavenging enzymes are APX and SOD and a high antioxidant activity. In addition, α -amylase activity and sugar content increased which was positive correlated with seed germination and vigor. These improvements were attributed to maintain the nutritive reserve and dehydrogenase activity in seeds. Moreover, the biological seed treatments stimulated the embryo growth and so speeding up the seedling emergence. (*International Journal of Agricultural Research* 4 (5): 169-184, 2009; doi: 10.3923/ijar.2009.169.184)

Effect of Palm Oil Mill Effluent Supplementation on Cellulase Production from Rice Straw by Local Fungal Isolates

A.M. Roslan, M.A. Hassan, S. Abd-Aziz and P.L. Yee

In this study, Palm Oil Mill Effluent (POME) was selected as supplement in rice straw fermentation to replace commercial inducer due to its high concentration of simple carbohydrate and nitrogenous compounds. The cellulase activity of the enzyme produced were then determined individually and combined (enzyme cocktail) to observe increment in cellulase activity. Individually, filter paperase (FPase), carboxymethyl cellulase (CMCase) and β -glucosidase activities increase for all 3 fungi used except FPase for *Aspergillus* sp. (NEW). Highest FPase and CMCase activities increment observed was from *Phanerochaete chrysosporium* which were 72 and 236% increment, respectively, while highest β -glucosidase activity was from *Aspergillus terreus* (AT) which was 298% increment. Meanwhile in cocktail cellulase, synergistic effect was observed especially for FPase activity whereby highest FPase activity observed was by cocktail of all the three species of fungi which show 393% increment. Though CMCase increment was observed in this mode, it was not as high as FPase where the highest CMCase activity observed was cocktail by the three fungal species which increased by 41%. However, in β -glucosidase activity, only cocktail of NEW and AT showed increment from their average activity which was by 6%. It seems that β -glucosidase activity plays major role in determining the total cellulase activity. In the nutshell, supplementation of POME can improve cellulase activity. (*International Journal of Agricultural Research* 4 (5): 185-192, 2009; doi: 10.3923/ijar.2009.185.192)

Effect of Different Levels of Nitrogen and Phosphorus Fertilizers on the Growth and Yield of Maize (*Zea mays* L.) in Southwest Nigeria

R.O. Onasanya, O.P. Aiyelari, A. Onasanya, F.E. Nwilene and O.O. Oyelakin

An experiment to determine the effects of different levels of nitrogen and phosphorus fertilizers on the growth and yield of maize was conducted between June and October, 2007 at the Teaching and Research Farm of the Federal University of Technology, Akure. The experiment was laid out in a Randomized Complete Block Design (RCBD) consisting of twelve treatments with three replicates. The treatments were, 0 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₁), 60 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₂), 120 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₃), 0 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₄), 0 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₅), 0 kg N ha⁻¹ + 60 kg P ha⁻¹ (T₆), 60 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₇), 60 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₈), 60 kg N ha⁻¹ + 60 kg P ha⁻¹ (T₉), 120 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₁₀), 120 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₁₁) and 120 kg N ha⁻¹ + 60 kg P ha⁻¹ (T₁₂). The result of the study showed that application of 120 kg N ha⁻¹ + 0 kg P ha⁻¹ and 60 kg N ha⁻¹ + 40 kg P ha⁻¹ significantly increased the growth of maize than other treatments. The application rate of 120 kg N ha⁻¹ + 40 kg P ha⁻¹ significantly ($p = 0.05$) enhanced grain yield. The study therefore suggests that, for optimum grain yield, 120 kg N ha⁻¹ + 40 kg P ha⁻¹ should be applied particularly in the study area and its environment. (*International Journal of Agricultural Research* 4 (6): 193-203, 2009; **doi**: 10.3923/ijar.2009.193.203)

Rye Green Manure along with Nitrogen Fertilizer Application Increases Wheat (*Triticum aestivum* L.) Production under Dryland Condition

S.B. Mosavi, A.A. Jafarzadeh, M.R. Neishabouri, S. Ostan and V. Feiziasl

The effects of rye green manure application along with different levels of nitrogen fertilizer on wheat production was investigated under rainfed dryland condition. This study was carried out with or without rye green manure along with 4 nitrogen fertilization treatments (0, 26, 103 and 337 kg N ha⁻¹) in 3 rotation system (green manure-wheat) between 1999-2007 years. Results showed that the effects of green manure application with different amount of N fertilizers on wheat production tended to be significant. A maximum grain yield (2484 kg ha⁻¹) was obtained by application of rye green manure along with 26 kg N ha⁻¹ and minimum yield (1757 kg ha⁻¹) from rye green manure without nitrogen application.

Furthermore, crop morphophysiological characteristics including harvest index, spike length, number of spikes per square meter, number of tillers and thousand kernel weight (TKW) in plant tended to increase compared with check (green manure without N). It can be concluded that, application of green manure with nitrogen could indirectly increase Sardari yield by increasing yield components such as TKW and number of spikes per square meter. (*International Journal of Agricultural Research* 4 (6): 204-212, 2009; **doi**: 10.3923/ijar.2009.204.212)

Effect of Nitrogen Rates on Dry Matter Remobilization of Three Rice Cultivars

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The aim of this study was to evaluate the effects of nitrogen fertilizer rates on dry matter remobilization among three rice cultivars. A field study was carried out at Ramin Agricultural and Natural Resources University. In 2007, a split plot experiment in the basis of randomized complete block design with three replications was used. Four nitrogen fertilizer rates (0, 100, 135 and 170 kg ha⁻¹ from urea source) as the main plots and three rice cultivars (Champa, Anburi and LD183) as the sub plots were used. Results showed that nitrogen fertilizer rates had significant effect on dry matter remobilization amount in total shoot, stem and leaves in which among cultivars, LD183 had the highest amounts in terms of stem and total shoot dry matter remobilization. This amount was obtained at 0 kg ha⁻¹ nitrogen fertilizer treatment. The highest rate of dry matter remobilization in leaves (except flag leaf) related to LD183 that obtained in 170 kg ha⁻¹ nitrogen fertilizer level. Also, flag leaf of LD183 had the highest dry matter remobilization amount, although was not affected by nitrogen fertilizer rate. Thus, it seems that this part has important role in current photosynthesis at post anthesis stage compared with dry matter remobilization. According to our findings, flag leaf in Champa not only has no significant role in dry matter remobilization, but also act as a powerful sink for photosynthetic assimilates. (*International Journal of Agricultural Research* 4 (6): 213-217, 2009; **doi**: 10.3923/ijar.2009.213.217)

Optimisation of Cryopreservation Technique in *Mokara* Golden Nugget Orchid Using PVS2 Vitrification

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The study was conducted to evaluate the effects of various sucrose concentrations on *Mokara* orchid shoots (0.5-1.0 and 1.0-1.5 cm) after precultured at 24 and

48 h. The 1.0-1.5 cm of *Mokara* shoots preculture at 0.25 M sucrose for 48 h was the best condition based on TTC assay and subsequently used for the following PVS2 vitrification treatment. The selected *Mokara* orchid shoots were subjected to PVS2 treatment at different time of exposure (min) and temperatures (0 and 24°C). The results showed that viability of shoots reached the highest absorbance value at 10 min and 24°C. However, for the overall treatment with the results shown that 0°C temperature treatment gave the higher absorbance value which could reduce the injurious effects of PVS2. For chlorophyll determination, cryopreservation of shoots at 0°C without LN (LN-) for 5 min exposure to PVS2 recorded as highest chlorophyll content. The result also shows that total chlorophyll a for shoot in all treatment were higher than chlorophyll b. (*International Journal of Agricultural Research 4 (7): 218-227, 2009; doi: 10.3923/ijar.2009.218.227*)

Role of Biologically Active Amino Acid Formulations on Quality and Crop Productivity of Tea (*Camellia* sp.)

J. Thomas, A.K.A. Mandal, R. Raj Kumar and A. Chordia

Present study deals with foliar application of active amino acids based commercial formulations with particular reference to physiological attributes and their synergism with crop productivity. Application of Aminolforte resulted in momentous improvement in stomatal conductance and SPAD values while it reduced the diffusion resistance. Identical results were obtained in Humiforte 20, Fosnutren 20R and Kadostim 20 with varying degree of responses. Biochemical analysis revealed a significant increase in the content of total polyphenols and amino acids due to application of increasing concentrations of Aminolforte 20. Even though catechins increased marginally with application of Fosnutren 20R, positive improvement in the amino acid content was also noticed. Quality attributes like theaflavins, thearubigins, total liquor colour, colour index, briskness index and caffeine of made tea samples had a significant improvement in response to the foliar application. Significant improvement in productivity, physiological attributes, biochemical constituents, quality parameters of the tea was evident with reference to the foliar application of bioformulations. Responses of the individual active amino acid formulations are presented and discussed in detail. (*International Journal of Agricultural Research 4 (7): 228-236, 2009; doi: 10.3923/ijar.2009.228.236*)

Identification and Characterization of HMW Glutenin Subunits and their Coding Sequences in Dwarfing Polish Wheat

Xing Fan, Zi-Jian Song, Hou-Yang Kang, Rui-Wu Yang and Yong-Hong Zhou

To evaluate High Molecular Weight (HMW) glutenin subunit comparison in *Triticum turgidum* sp. *polonicum*, HMW glutenin subunits of 22 accessions were analyzed using SDS-PAGE. The result showed that the variation in the number of HMW glutenin subunits in this taxon ranged from 1-3. A dwarfing accession of *T. turgidum* sp. *polonicum* (dwarfing polish wheat) from Xingjiang in China has two putative expressed HMW glutenin subunits. Three complete coding region sequences of HMW glutenin subunit genes were amplified from dwarfing polish wheat using PCR method. The PCR products were derived from 1Ax (*1Ax-dp*), 1Bx gene (*1Bx-dp*) and a silent 1Ay (*1Ay-dp*) gene. The complete ORF of x-type HMW glutenin genes, *1Ax-dp* and *1Bx-dp*, were 2508 and 2385 bp in size, encoding 836 and 795 amino acids, respectively. The silent *1Ay-dp* gene contained an in-frame internal stop codon and was 1806 bp in size. Sequence comparison indicated that they had primary structure identical to the published HMW glutenin subunits. Phylogenetic analysis suggested that *1Ax-dp* from dwarfing polish wheat was most closely related to 1Ax1 and 1Ax2* from *Triticum aestivum*, while *1Bx-dp* from dwarfing polish wheat was most closely related to 1Bx7 from *Triticum aestivum*. Based on sequence comparison, SDS-PAGE and phylogenetic analysis, it can be deduced that *1Ax-dp* and *1Bx-dp* are additional alleles at the *Glu-A1* and *Glu-B1* loci, respectively. (*International Journal of Agricultural Research* 4 (8): 237-249, 2009; doi: 10.3923/ijar.2009.237.249)

Delignification of Oil Palm Empty Fruit Bunch using Chemical and Microbial Pretreatment Methods

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In this study, Oil Palm Empty Fruit Bunch (OPEFB) were subjected to chemical and microbial pretreatment for bioconversion of lignocellulosic biomass to fermentable sugars. For chemical pretreatment, 2% (w/v) sodium hydroxide (NaOH) was been used for delignification while for microbial pretreatment, *Phanerochaete chrysosporium* ATCC 32629 was used as model microorganism

by liquid and solid state culture techniques. Microbial pretreatment showed significant lignin removal with longer delignification time as compared to chemical pretreatment. For the same value of Klason lignin, delignification by chemical pretreatment need only 3 h as compared to 7 days for microbial pretreatment. The optimum value of Klason lignin for microbial pretreatment and chemical pretreatment were 5.89 and 5.93, respectively. In conclusion, delignification of OPEFB can be achieved via chemical and microbial pretreatment. (*International Journal of Agricultural Research* 4 (8): 250-256, 2009; *doi: 10.3923/ijar.2009.250.256*)

Efficacy of Boron Spraying on Growth and Some External Qualities of Lettuce

B. Chutichudet and P. Chutichudet

A study to evaluate boron, in terms of borax ($B_4O_5 \cdot 2Na_2O \cdot 10H_2O$) or boric (H_3BO_3) by foliar spraying, on growth and external qualities was conducted on lettuce var. Grand Rapids under field conditions. A Factorial in Completely Randomized Design was arranged with four replications and composed of two factors; two types of boron (borax or boric) with four concentration rates (0, 0.0625, 0.125 or 0.1875%). The results showed that plants-treated with 0.0625% boric had the maximal plant height and bush size. While two types of boron at any concentration had no effect to biomass, chlorophyll content and the leaf colour. Furthermore, plants treated with 0.0625% boric experienced the lowest browning appearance at harvesting stage. (*International Journal of Agricultural Research* 4 (9): 257-269, 2009; *doi: 10.3923/ijar.2009.257.269*)

Differences in Salt Tolerance Between *Phaseolus vulgaris* and *Phaseolus coccineus* Cultivars

M. Gutierrez, J.A. Escalante-Estrada and M.T. Rodriguez-Gonzalez

Diverse cultivars of *Phaseolus vulgaris* L. and *Phaseolus coccineus* L. were tested under saline conditions to evaluate yield performance and to estimate physiological differences (chlorophyll, stomatal conductance and transpiration rate). The study was carried out in Central Mexico in a low saline soil (pH 6.8-7.5 and EC of 2-5 dS m^{-1}) and high saline soil (pH 8-8.7 and EC of 5-8 dS m^{-1}). Three *P. vulgaris* cultivars and one *P. coccineus* cultivar were

planted in a high saline soil during 2003, while thirteen *P. vulgaris* cultivars and three *P. coccineus* cultivars were planted in a low saline soil during 2004. The experimental design for both saline fields was a randomized complete block with four replicates. The *P. vulgaris* cv. Bayomex showed the highest seed yield, biomass and pod number under high saline conditions, while the *P. coccineus* cv. Ayocote Negro showed a lower seed yield and biomass, but higher seed weight. Canario-107 and Criollo were the *P. vulgaris* cultivars with the lowest yield during 2003. For the season 2004 under low saline conditions, four *P. vulgaris* cultivars (Zacatecas, Ojo de Cabra, Morito and Bayo-18) showed higher seed yield, biomass and seed weight, but the three *P. coccineus* cultivars showed major yield in all parameters. Generally, the cultivars of both crop species with high yield presented high chlorophyll levels than the sensitive cultivars under low and high saline conditions. In low salinity, the *P. coccineus* and *P. vulgaris* cultivars showed diversity in leaf stomatal conductance, transpiration rate and leaf temperature. Stomatal conductance explained yield differences among cultivars of both crop species showing two well defined groups (one for each crop species). (*International Journal of Agricultural Research* 4 (9): 270-278, 2009; doi: 10.3923/ijar.2009.270.278)

Flue Gas Desulphurization Gypsum as a Soil Amendment in the Growth of Wild Rye and Poplar (Hybrid 275 and Weser 6) Clones in Lusatia, Germany

S. Narra

The aim of this study is to investigate effects of FGD gypsum on virgin clay (>43%) soils in Lusatia, Germany carried out from year 2005 till year 2008. A thorough understanding of various processes controlling persistence, retention and leaching of contaminants is required for proper long-term management and disposal of industrial wastes such as Fly Ash (FA), Flue Gas Desulphurization (FGD) gypsum etc., which are major coal combustion by-products resulting from electric power generation. The FGD gypsum is selected as a substitute for calcium carbonate in amelioration of virgin clay soils in Lusatia. Pot experiments have been evaluated with the wild rye species where as the investigations at open cast mining pit Nochten were evaluated with two different kinds of Poplar clones (Hybrid 275 and Weser 6). Slight reduction in pH with strong increase in electrical conductivity has been observed with increasing the FGD gypsum concentrations. Electrical conductivity obtained was more than 2 mS cm^{-1} with 16 times the FGD gypsum concentration. Even though the pH and the electrical conductivity did not

give positive results, germination success achieved was good, with which the average biomass produced was also good. Nutritional elements lied in between optimum ranges. Accumulation of heavy metals reduced with the 100% FGD gypsum substitution compared to that of 100% lime. The Poplar clones showed good growth at open mining field Nochten. Proportional growth was observed. Significant differences in diameters and heights with respect to different variants were not observed. However, a difference with respect to biomass has been observed. Acceptance of the FGD-gypsum has been clearly observed with biomass produced under both the Poplar clones. Acceptance of FGD gypsum observed was comparatively higher with the Hybrid 275 compared to the Weser 6, which could be correlated to the genotype of the Hybrid 275. (*International Journal of Agricultural Research* 4 (10): 297-309, 2009; *doi: 10.3923/ijar.2009.297.309*)

Concentration of Heavy Metals in Guava Plant Parts and Soil in the Sungai Wangi Plantation, Perak, Malaysia

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The aim of this study was to determine the level of heavy metals in the soil and in the plant parts (fruits, leaves and roots) of two cultivars of guava. The study was carried out at the Sungai Wangi Plantation in Sitiawan, Perak, Malaysia. Heavy metals in the soil were extracted using the sequential extraction method. Heavy metals in the soil and plants were determined using atomic absorption spectrometry. In general, it was found that the concentration of heavy metals in the soil was low and no Cu was detected in any fraction of the soil. Ni was detected in the RR fraction of all the four blocks studied and ranged from 2.71 to 4.52 mg kg⁻¹. Cd was detected in all fractions of the four blocks except in the AR fraction of block 3. The concentration of Pb was considerably low in the soil of this plantation. Pb was not detected in the AR fraction of the four blocks. Mn was detected in all fractions. In the guava plants, Pb and Cu were not detected in all parts of the plants except that Cu (0.01 mg kg⁻¹) was detected in the seeds from block 1. Of the heavy metals, only Fe was found in all plant parts from the four blocks. Similarly Zn was also found in all plant parts except those plants sampled from block 2. In conclusion, it can be stated that the concentration of heavy metals in both soil and guava plants from the Sungai Wangi Plantation at Sitiawan, Perak was considerably low. (*International Journal of Agricultural Research* 4 (10): 310-316, 2009; *doi: 10.3923/ijar.2009.310.316*)

Minimally of Polyphenol Oxidase Activity and Controlling of Rotting and Browning of Longan Fruits cv. DAW by SO₂ Treatment under Cold Storage Conditions

Wilasinee Chitbanchong, Vicha Sardsud, Kanda Whangchai, Rumphan Koslanund and Pitipong Thobunluepop

The effects of sulphur dioxide, in combination with, storage temperatures on postharvest decay, pericarp browning and physiological ultrastructure changed of the Longan fruit cv. daw were studied. The treatment of fresh the Longan fruit with SO₂ fumigation combined with the suitable storage condition improved the overall the Longan fruit quality, especially on inner and outer peel tissue and aril color than no SO₂ treatment, while no SO₂ treatment showed the dark color of inner and outer peel of the Longan fruit was appeared, this was correlated with the increasing of polyphenol oxidase (PPO) activity. Moreover, the main factor affected Longan fruits quality was storage duration, the increasing of weight loss, pH value of both peel and aril, PPO activity, especially on the changing of dark-red color of peel was observed after long term of storage. However, the sulphite residues could detect immediately after SO₂ treatment in all part of the Longan fruit, especially on peel tissue, but the residues was significantly decreased along the storage durations. On the other hand, Scanning Electron Microscope (SEM) evaluation found that the surface cracking was also impair the physiological function of the cuticle and increasing water permeability, which may cause water soaking at the inner side of the peel. The injured cell would accelerate the oxidation of phenolic substances and the oxidative products resulted in dark color of inner and outer peel. Therefore, the combination sulphur dioxide fumigation with controlling the optimum of storage temperature could control of postharvest decay and browning. (*International Journal of Agricultural Research* 4 (11): 349-361, 2009; doi: 10.3923/ijar.2009.349.361)

The Role of Grafting Tomato and Watermelon on Different Rootstocks on Their Chemical Contents

S.M.T. Mohammed, M. Humidan, M. Boras and O.A. Abdalla

The objective of this study was to determine the impact of interaction between rootstocks and scions of watermelon and tomato on the chemical contents of their leaves and roots. The rootstock of local Syrian tomato produced the highest amount of total lipids, total fatty acids percentage and total unsaponated percentage of total lipids in root (0.69, 92.39, 3.34%) and leaf (0.73, 91.54,

4.02%) compared to Beaufort rootstock and He-man rootstock when grafted with Cecilia scion. With regard to watermelon grafts Samara on *C. pepo* excelled the two other watermelon grafts namely, Samara on Tetsukauto and Samara on *Lagenaria siceria* in its overall root contents of total fatty acids percentage of total lipids and total unsaponated percentage of total lipids. Samara on *C. pepo* excelled the other two watermelon grafts with regards to its significant leaves (0.1326, 18.73%) and root contents (0.1214, 15.33%) of phospholipids percentage and total unsaponated phospholipids, respectively. Grafting increased indole-3-acetic acid (IAA) in seedlings of both tomato and watermelon. Cecilia on Beaufort (32.43 nm g⁻¹) and Cecilia on Syria (36.71 nm g⁻¹) had significantly greater contents of Indole-3-acetic acid in their roots whereas, only Samara on *C. pepo* watermelon grafts (98.27 nm g⁻¹) had significant greater contents of IAA in its roots. Clear effects of grafting watermelon and tomato on their lipids and IAA contents were concluded in this study. (*International Journal of Agricultural Research* 4 (11): 362-369, 2009; doi: 10.3923/ijar.2009.362.369)

Spatial Variability of Soil Organic Carbon in Oil Palm: A Comparison Between Young and Mature Stands

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This study aimed at quantifying the spatial variability of Soil Organic Carbon (SOC), estimating SOC at unsampled locations and comparing the spatial variability of SOC between young and mature oil palm stands. Two study sites were chosen to represent two different palm age groups, i.e., 5 Years after Planting (YAP) and 17 YAP. A systematic sampling design was employed for soil sampling at the 0-20 cm depth based on a cluster of four palms that comprised three operational zones: Weeded Circle (WC), Frond Heap (FH) and Harvesting Path (HP). A total of 60 sampling clusters were obtained for each site. Soil samples were analyzed for SOC by dry combustion method. All measurement points were geo-referenced by differential Global Positioning System (dGPS). The SOC data were first explored using descriptive statistics, normality check, outlier detection and data transformation, followed by variography and interpolation. Spatial variability of SOC was mapped based on measured and kriged values. Results showed that all operational zones exhibited a definable spatial structure, which were described by either spherical or exponential models. All operational zones exhibited strong spatial dependence. Operational zones of 5-year old palms exhibited a shorter effective range than those of 17 year old palms. Additionally,

SOC heterogeneity was evident among operational zones at both sites, where FH registered the highest SOC, followed by WC and HP. SOC concentration at 17 year old palms was found to be more stable than that from 5 year old palms. This study suggests spatial variability assessment appears to be a feasible technique to quantify the variability of SOC in oil palm cultivation. (*International Journal of Agricultural Research* 4 (12): 402-417, 2009; *doi: 10.3923/ijar.2009.402.417*)

Effects of Wheat Straw and Farmyard Manure Mulches on Overcoming Crust Effect, Improving Emergence, Growth and Yield of Soybean and Reducing Dry Matter of Weeds

Guriqbal Singh

Poor plant stand is one of the important factors responsible for low yields of soybean (*Glycine max* (L.) Merrill). Poor plant stand, apart from other reasons, could also be due to rainfall soon after sowing but before emergence of the crop, which results in crust formation. The aim of the present study was to improve the emergence of soybean under crusted field conditions. Two field experiments were conducted on a loamy sand soil during kharif (rainy) season of 1999 and 2001 to study the effects of various mulching treatments on the emergence of soybean under simulated and natural rainfall. Under simulated rainfall the emergence of soybean was not only quicker but was also improved by covering rows with the use of 3 t wheat straw ha⁻¹ and 5 t farmyard manure (FYM) ha⁻¹ over no use of mulch (28.5, 26.5 and 18.5 plants m⁻¹ row length after 6 days of sowing, respectively). Under natural rainfall the emergence improved substantially with the use of wheat straw mulch when only the rows of soybean were covered with it using 3 t straw mulch ha⁻¹ (row mulch) or the whole plot was covered using 6 t straw mulch ha⁻¹ (plot mulch). Row mulch, plot mulch and non-mulched plots had 23.0, 25.3 and 8.6-9.8 plants m⁻¹ row length, respectively after 12 days of sowing. Row mulch as well as plot mulch treatments were very effective in reducing dry matter of weeds. (*International Journal of Agricultural Research* 4 (12): 418-424, 2009; *doi: 10.3923/ijar.2009.418.424*)

Effects of Low Nitrogen and Drought on Genetic Parameters of Grain Yield and Endosperm Hardness of Quality Protein Maize

Claver Ngaboyisonga, Kiarie Njoroge, Duncan Kirubi and Sam M. Githiri

The aim of this study was to assess how low nitrogen and drought stresses affect genetic parameters of grain yield and endosperm hardness of QPM. Twelve

inbred lines were acquired from CIMMYT and used to generate 36 single cross hybrids with North Carolina Design II procedures. The single crosses were evaluated at Kiboko in Kenya and Rubona in Rwanda in 2005 and 2006 cropping seasons under optimum, low nitrogen and drought conditions. Observations were performed on grain yield and endosperm hardness. The results showed that gene action on the grain yield was predominantly non-additive and maternal, whereas that of the endosperm hardness was predominantly additive and maternal. Low nitrogen and drought changed the proportions of different genetic effects. They changed as well the magnitudes and direction of General Combining Abilities (GCAs) of lines and Specific Combining Abilities (SCAs) of crosses. It was possible to have together, significant and positive SCAs for grain yield and significant and negative SCAs for endosperm hardness. Crosses with significant and positive SCAs for grain yield and significant and negative SCAs for endosperm hardness are candidates to use in QPM production, especially in drought and low nitrogen prone areas. (*Asian Journal of Agricultural Research* 3 (1): 1-10, 2009; doi: 10.3923/ajar.2009.1.10)

Investigation of Ecological Relationship and Density Acceptance of Canola in Canola-field Bean Intercropping

M.H. Gharineh and M.R. Moradi Telavat

In order to evaluate biologic effects of mixed culture of canola-field bean on farming system, in comparison with sole cropping, an experiment was carried out in 2004 at Ramin Agriculture and Natural Resources University, Iran. Experimental design was randomized complete blocks with three replicates. Different compositions of two crop, canola and field bean are treatments of the experiment, that including 20, 40 shrub m^{-2} for canola and 0, 20, 40 and 60 shrubs m^{-2} for field bean. Grain yield and components of crops, weed biomass and diversity, Land Equivalent Ratio (LER) and dominance index were evaluated. Results showed a significant difference between sole cropping and mixed culture in grain yield and components. In canola mixed field bean, yield of both crops was lower than monoculture. Highest yield of canola in monoculture was gained with 40 canola shrubs m^{-2} (2788 kg ha^{-1}) and lowest grain yield was gained with intercrop of 40 and 40 canola and field bean shrub m^{-2} , respectively. This trend, also be observed in field bean yield with increase of intercrop composition. It seems that cause of yields loss is competition between two crops and decrease of branches. Highest LER was found in mixed 20 and 60 canola and field bean shrub m^{-2} , respectively. And lowest LER was observed in mixed 40 and 20 canola and field bean shrub m^{-2} , respectively. Lowest dry matter (DM) of weeds within mixed stands was gained with 20 canola and 40 field bean shrub m^{-2} . Highest DM

of weeds was related to monoculture of 20 canola shrub m^{-2} . Also, with increase density of field bean mixed stands, DM of weeds decreased, significantly. Also, diversity of weeds was decreased in mixed stands, in comparison with monoculture. (*Asian Journal of Agricultural Research* 3 (1): 11-17, 2009; doi: 10.3923/ajar.2009.11.17)

General Status and Long Term Trend Analysis of Sheep and Goat Husbandry in the Eastern Anatolian Region of Turkey

Beşir Koç and Melike Ceylan

This study presents a study of the current status and 15 year trend of sheep and goat husbandry in the Eastern Anatolian Region of Turkey. In this study, a simple index, chain index and least squares annual growth rate of the trend line method is used. The region is known as the livestock center of Turkey. In 2005, there were more than 10 million sheep and more than 1 million goats in the region. Accordingly, the share of the region in sheep and goat number is quite high with 36%. Forty percent of the total sheep in Turkey is kept in this region. However, the long term trend analysis found that number of animals has gradually fallen, resulting in a negative effect on the livestock sector. The reasons for this decline in all factor levels within the study may be that the region has security problems, pasture and meadows are not used or only have a limited use. (*Asian Journal of Agricultural Research*, 3 (1): 18-27, 2009; doi: 10.3923/ajar.2009.18.27)

Effect of Salt Stress on Chlorophyll Content, Fluorescence, Na^+ and K^+ Ions Content in Rape Plants (*Brassica napus* L.)

V. Atlassi Pak, M. Nabipour and M. Meskarbashee

In order to investigate the effect of salt stress on chlorophyll content and fluorescence, sodium (Na^+) and potassium (K^+) ions content of rape (*Brassica napus* L.) plants, ten genotypes were subjected to salinity levels (control [2.5], 6, 10, 14 and 18 dS m^{-1}) for 30 days in hydroponics. Salt treatments were imposed to genotypes in root establishment stage (4 leaves). Results showed that quantum yield of photosystem II from light adapted (ΦPSII) and dark-adapted leaf (Fv/Fm), photochemical quenching (qP) and minimal fluorescence from dark-adapted leaf (F_0) were affected by salinity. Genotypes MHA4921 and Hyola 401 had highest shoot dry weight at the two higher salt treatments (14 and 18 dS m^{-1}) and resulted the most tolerant to salinity among the tested genotypes. Chlorophyll (chl) fluorescence attributes was generally affected by salinity stress, except in the two salt tolerant genotypes and thus could be used as a tool for screening for

salinity tolerance. Chlorophyll content (SPAD units) changed significantly in all genotypes, except in salt tolerant ones. Shoots Na^+ content increased, by increasing salinity levels, but in MHA4921 this increase was higher than the other genotypes and may be relation to decline in the osmotic potential of cellular contents. Rape ability to accumulate sodium in response to salinity is one of the major criteria of salt tolerance. K^+ content in shoots, at the different levels of salinity in MHA4921 and Hyola 401 were higher than the other genotypes. (*Asian Journal of Agricultural Research* 3 (2): 28-37, 2009; doi: 10.3923/ajar.2009.28.37)

Assessment of Nitrogen Accumulation and Movement in Soil Profile under Different Irrigation and Fertilization Regime

O. Bahmani, S.B. Nasab, M. Behzad and Abd Ali Naseri

Nitrate and ammonium leaching from agricultural soil can represent a substantial loss of fertilizer nitrogen (N), but a large variation in losses has been reported. The objectives of this study were to assess the accumulation of NO_3^- -N and NH_4^+ -N in the soil profile over a 1-year period under different irrigation and fertilization conditions in sugarcane area of the Khuzestan, Iran. Three irrigation and fertilizer treatments were applied. The first treatment I1 is consisted of full irrigation and others I2 and I3 were 80 and 75% of I1, respectively. N application consist of (N1) 150, (N2) 250 and (N3) 350 kg ha^{-1} . Soil samples were collected from field plots in 0.3 m depth increments to 1.2 m on a periodic basis. NO_3^- -N values increased with rise of fertilizer consuming and decreasing of water application. It depended to NH_4^+ -N transformation and irrigation regimes. In all treatments, NH_4^+ -N decreased from the surface to 120 cm depth. Maximum concentration of NO_3^- -N and NH_4^+ -N accrued in I3N3 and I2N3 treatments respectively. This study showed that the moisture was the important parameter because nitrification and denitrification dependent on it and had a direct relationship to nitrate and ammonium accumulation in soil profile. (*Asian Journal of Agricultural Research* 3 (2): 38-46, 2009; doi: 10.3923/ajar.2009.38.46)

Effect of Grafting Tomato on Different Rootstocks on Growth and Productivity under Glasshouse Conditions

S.M.T. Mohammed, M. Humidan, M. Boras and O.A. Abdalla

The aim of this study was to determine the effect of growing tomato on different root stocks on its growth and yield. In this study, tube grafting method was

adopted since it has been widely used with high percentage of success. Tomato (*Lycopersicon esculentum* Mill.) cultivar Cecilia F1 was grafted using tube grafting method on three rootstocks, Beaufort, He-man and local Syrian tomato which were grown under glasshouse and fertilized according to the routine fertilization program with macro and micronutrients in ASTRA farms, Tabuk, north-west of Saudi Arabia. Plants produced from grafting Cecilia F1 scion on Beaufort rootstock were the tallest (37.56 cm) and had the greatest number of leaves (7.22) and stem diameter (4.92 cm). Six weeks after of grafting seedling leaves contents of Ca, Na, Mg, Fe and K increased and while the roots contents were not affected. Chlorophyll a and carotenoids significantly increased. The productivity of grafted tomato planted in glasshouse increased significantly and had reached up to 21%. Grafting also increased Total Dissolved Solids (TDS) and decreased the amount of lycopene in all grafts but β -carotene increased in Cecilia on Beaufort (5.46 mg kg⁻¹) and decreased in both Cecilia on He-man and Cecilia on local Syrian tomato fruits. It is concluded from this study that grafting significantly affected tomato growth and yield depending on the different rootstocks utilized. (*Asian Journal of Agricultural Research* 3 (2): 47-54, 2009; doi: 10.3923/ajar.2009.47.54)

Effects of Agronomic Practices on the Soil Carbon Storage Potential in Northern Tunisia

N. Brahim, T. Gallali and M. Bernoux

Sub-humid and semi-arid zones comprise a land area of about approximately 1/3 of Tunisia, good agricultural soils and major organic carbon storage are situated in this region. The objective of this study is to investigate the organic carbon distribution and stocks in soils of this region under different land uses by using different investigations: (1) The conversion from natural forest to agricultural land caused significant loss of Soil Organic Carbon (SOC) stock, it induces a decrease of SOC stock with 19.33 t C ha⁻¹, (2) however, restoring forestry after conversion from agricultural ecosystems to forest, we found an increase of SOC stock with 0.42 t C/ha/year, (3) soil carbon sinks increase most rapidly under practice of no-tillage compared with conventional tillage, no-tillage treatment was found to increase the storage of OC in the surface layer 0-20 cm compared to conventional tillage and (4) irrigation with saline water stock higher than irrigation with freshwater only at superficial layer. Although, under this depth, irrigation with freshwater and at total profile stock higher than saline water. SOC stock is 148.5 t ha⁻¹ in the freshwaters irrigated soils against 139.6 t ha⁻¹ in saline water irrigated soil. (*Asian Journal of Agricultural Research* 3 (3): 55-66, 2009; doi: 10.3923/ajar.2009.55.66)

Adsorption, Desorption and Mobility of 2,4-D in Two Malaysian Agricultural Soils

B.S. Ismail, M. Sameni and M. Halimah

Pesticide adsorption and desorption are important processes that influence the amount of pesticide retained in the soil matrix and its subsequent movement in the soil profile. A study was made on the adsorption-desorption and mobility of the herbicide 2,4-D (2,4-dichlorophenoxyacetic acid) in two ricefield soils in the Kerian district, located in the state of Perak, North West Malaysia. Adsorption studies were conducted using the batch equilibrium technique and mobility was studied using a soil column under laboratory conditions. The adsorption and desorption studies fit the Freundlich equation, the adsorption coefficient (K_d) of the clay loam and clay soils were 33.83 and 18.12 L kg⁻¹ and the $1/n_{ads}$ values were found to be lower than unity. The total percentage desorption from the clay loam and clay soils after the fourth desorption process was 18.31 and 28.33%, respectively. Complete leaching of the chemical through the soil column was not observed under the conditions of the present study, as the chemical was not detected in the leachate. The total amount of 2,4-D found in the clay loam and clay soil columns were 66.96 and 72.28% with 5 mm of simulated rainfall per day. The results obtained indicate the importance of organic matter in adsorption-desorption and mobility of 2,4-D in the Malaysian soils studied. (*Asian Journal of Agricultural Research* 3 (3): 67-77, 2009; **doi:** 10.3923/ajar.2009.67.77)

Quality Evaluation of Gliadins from Zhengmai 9023×99E18 in Wheat

Wu Xiao-lan, Lan Xiu-jin, Wei Yu-ming, Pu zhi-en and Zheng You-liang

Although it is known that the compositions of gliadins have effects on bread-making quality of wheat, it is still not clear which gliadins confer improved bread-making quality and whether those gliadins interact with glutenins and other gliadins. Using a hard red winter wheat line 99E18 and zhengmai9023 with good bread-making quality as well as their progeny we identified gliadins associated with the bread-making quality. SDS-PAGE and APAGE method were used to analyze the gliadin composition and HMW-glutenin subunits of 45 wheat inbred lines and their relationships to bread-making quality were conducted. The significance of difference was calculated between the omega gliadins and bread-making quality. The positive and negative effects have been detected between the particular gliadin bands and baking quality. Thus, gliadin could be used as parameters when breeding for bread-making quality. (*Journal of Plant Sciences* 4 (1): 1-9, 2009; **doi:** 10.3923/jps.2009.1.9)

The Rooting Performance of Shea (*Vitellaria paradoxa* C.F. Gaertn) Cuttings Leached in Water and Application of Rooting Hormone in Different Media

J. Yeboah, S.T. Lowor and F.M. Amoah

In order to improve the rooting performance of shea stem cuttings to enhance the establishment of shea plantation, an investigation was carried out in 2003/2004 at the Cocoa Research Institute of Ghana Substation, Bole in a polythene propagator. The propagating structures for the experiment were kept under a shade net (50% shade) to create a microclimate for the cuttings. The treatments employed were leaching, different growth media and hormone application. Rejuvenated (coppiced cuttings) shoots that were not leached (not dipped in water) gave significantly higher rooting than the leached cuttings while Seradix 3 powder applied cuttings produced significantly higher ($p < 0.05$) rooting than the control. Significantly high in number, more developed and longer roots per cutting were recorded for the rice husk medium than the sand and sand+top soil (1:1) media. The biochemical analysis significantly recorded high levels of sugar and phenol for cuttings that were not leached in water. The results of this study demonstrated that rice husk medium was the best for rooting shea cuttings. (*Journal of Plant Sciences* 4 (1): 10-14, 2009; doi: 10.3923/jps.2009.10.14)

Antioxidant Activity of Isolated Phytoconstituents from *Casuarina equisetifolia* Frost (Casuarinaceae)

A.N. Aher, S.C. Pal, S.K. Yadav, U.K. Patil and S. Bhattacharya

The aim of the present study was to isolate the active constituents responsible for antioxidant activity. Radical scavenging activities of chromatographically isolated compounds from methanolic extracts of wood, bark, fruit and leaf were measured by the 1, 1-Diphenyl-2- Picrylhydrazyl (DPPH) method. The structures of isolated compounds were confirmed by spectroscopic techniques comprising of UV, IR, ^{13}C NMR, P-NMR, Mass spectral and Co-TLC studies. The compound ANA 01, ANA 02 and ANA 04 were isolated from bark and confirmed as catechin, ellagic acid and gallic acid, respectively. The leaf extract resulted in separation of compounds ANA 03 (quercetin). The free radical scavenging activity of the different isolated compounds from methanolic extracts of *Casuarina equisetifolia* increased in a concentration dependent manner. ANA 04 (gallic acid) exhibited very strong antioxidant activity and when compared to ANA 01 (catechin), ANA02 (ellagic acid), ANA 03 (quercetin) and ANA05 (lupeol). This study

suggests that the *Casuarina equisetifolia* could be pharmaceutically exploited for antioxidant properties. (*Journal of Plant Sciences* 4 (1): 15-20, 2009; doi: 10.3923/jps.2009.15.20)

Development of a Low Cost Micropropagation Technology for an Endangered Medicinal Herb (*Picrorhiza kurroa*) of North-Western Himalayas

H. Sood and R.S. Chauhan

The current study was undertaken with the objective that tissue culture conditions need to be optimized for obtaining vigorous shoot growth coupled with modifications in the nutrient medium so as to reduce the cost of nutrient medium. Axillary shoot tips cultured on MS +IBA (2 mg L⁻¹) + KN (3 mg L⁻¹) + sucrose 3% (w/v) + agar-agar 0.8% (w/v) was the best medium for multiple shoot formation with 86.3% shoot apices forming multiple shoots. The sucrose was replaced with table sugar and agar-agar was omitted completely. Out of 6 low-cost media combinations tested, MS liquid medium supplemented with Indole-3-Butyric Acid (IBA) (2 mg L⁻¹) + kinetin (KN) (3 mg L⁻¹) + table sugar 3% (w/v) was found to be the best with 27 shoots/explant. Seventy percent shoots formed roots on half strength MS salts supplemented with IBA (3 mg L⁻¹) + table sugar 3% (w/v) + agar-agar with an average of 5.6 roots per shoot. The study has resulted in the identification of a low-cost medium combination for rapid multiplication of *P. kurroa* with a potential that the technology can be up-scaled to a large-scale production. (*Journal of Plant Sciences* 4 (2): 21-31, 2009; doi: 10.3923/jps.2009.21.31)

Effect of Signal Molecules and Hormones on the Expression of Protein Kinase Gene *OrMKK1* in Rice

K. Nadarajah and N.M. Kassim

A putative protein kinase gene was isolated from *Oryza rufipogon* using the *OsMKK1* as template for primer synthesis. This gene was used to analyse the involvement of signal molecules and hormones in signal transduction of mitogen-activated protein kinase. The 352 amino acids long MAPK has a molecular weight of 37 kDa and a pI value of 6.1. The gene sequence contained a dual-phosphorylation activation motif TDY (Thr-Asp-Tyr) and four activity domains (catalytic loop, activation loop, ATP binding site and substrate binding site). The 5'UTR of the gene was also analysed and was shown to contain the

MYBCORE, ERE, GT-1 and GATA box, all of which have a role to play in MAPK function. Here we have treated the *OrMKK1* lines with Jasmonic Acid (JA), salicylic acid (SA), ethylene (ET), benzothiadiazole (BTH) and abscisic acid (ABA) to determine the involvement of these molecules and hormones in MAPK signal transduction. *OrMKK1* gene was induced by JA, SA, BTH and ET but was delayed and weak in ABA. The highest level of expression is seen in JA treated plants. The transcript level of this gene was also studied in various tissues and organs of rice and the results show that the gene is developmentally regulated as clearly seen from the Northern analysis conducted on rice tissues. The results from this study suggest that *OrMKK1* may be activated by signal molecules and hormones and this gene may play a role in the plant defense mechanism. (*Journal of Plant Sciences* 4 (2): 32-42, 2009; doi: 10.3923/jps.2009.32.42)

The Effects of Steviol Glycosides Blending Liquid on Seeding Growth and Development in Upland Rice

Ren Guangxi, Liu Xiangyang and Shi Yan

Using the method of liquid culture and selecting the variety of Handao502, the effect of Steviol glycosides Blending Liquid (SBL) on seeding growth and development in upland rice had been studied in phytotron. Many indexes were studied including the germination rate of seed, the fresh weight and dry weight, the indexes of physiology and biochemistry in seeding stage. The results indicate that the appropriate treatment of SBL increases the seed germination rate, promotes the growth of shoot and the roots in the seeding stage, increases the fresh weight, dry weight and the ratio of root to shoot, increases the peroxidase (POD) activity, the free proline content and the root vigor, decreases the malondialdehyde (MDA) content. So, proper SBL increases the unsuitable resistance ability in the growth and development of seeding stage in upland rice. This study provides a certain foundation for the high yield cultivation of upland rice. (*Journal of Plant Sciences* 4 (2): 43-48, 2009; doi: 10.3923/jps.2009.43.48)

Pre-Planting (Cold) Treatment of *Allium sativum* Cloves Improves its Growth and Yield Under Open Field and Open Shade Conditions

O.E. Ade-Ademilua, T.O. Iwaotan and T.C. Osaji

The effects of open field and open shade environmental conditions on the growth and yield of untreated and cold treated cloves of *A. sativum* were investigated.

Plants from untreated cloves grew higher under open shade, while those from treated cloves grew higher in the open field. Leaf production was influenced under open field condition and not by pre-planting cold treatment of cloves. There was no significant difference in the total leaf area and fresh weight of plants from untreated cloves grown in the open field and those of treated cloves grown in the open shade until day 56 and 70, respectively. Pre-planting cold treatment of garlic cloves enhanced total leaf area, fresh and dry weight of plants under open shade. Plants from treated cloves had better yield (clove/bulb, clove size, clove dry weight and allicin content/clove) than plants from untreated cloves irrespective of the light condition. Results show that pre-planting treatment of garlic cloves did not only enhance dry matter production but also the allicin content of harvested cloves even under open shade conditions. Plants from treated cloves grown in the open field had the best growth while plants of untreated cloves grown under open shade had the worst (50% less than the former). However, plants from treated cloves grown under open shade had very close growth characteristics with plants from untreated cloves grown in the open field. Results show that the cold pretreatment of garlic cloves help to improve its yield and ability to utilize light. (*Journal of Plant Sciences* 4 (3): 49-58, 2009; doi: 10.3923/jps.2009.49.58)

Molecular Characterization of the *Waxy* Gene in Einkorn Wheat

Ya-Xi Liu, Wei Li, Yu-Ming Wei, Guo-Yue Chen and You-Liang Zheng

This study characterizes 15 *waxy* genes from 15 accessions of the einkorn wheats *Triticum urartu*, *T. boeoticum* and *T. monococcum*. The mature protein coding sequences of *waxy* genes were analyzed. Nucleotide sequence variations in these regions resulted from base substitution and/or indel mutations. This work identified 8 distinct haplotypes from the diploid wheat *waxy* gene sequences. A main haplotype was found in 7 gene samples from the A^u genome and A^m genome. The *waxy* gene sequences from the A^u and A^m genomes could be obviously clustered into two clades, but the sequences from the A^m genome of *T. boeoticum* and *T. monococcum* could not be clearly distinguished. The phylogenetic analysis revealed that the *waxy* gene sequences from the A^m genome had accumulated fewer variations and evolved at a slower rate than the sequences from the A^u genome. These results would contribute to the understanding of functional aspects and efficient utilization of *waxy* genes. (*Journal of Plant Sciences* 4 (4): 114-121, 2009; doi: 10.3923/jps.2009.114.121)

Study of Air Pollution Effects on Some Physiology and Morphology Factors of *Albizia lebbek* in High Temperature Condition in *Khuzestan*

S.M. Seyyednejad, M. Niknejad and M. Yusefi

The main purpose of this study is to determine some physiological and morphological characters of *Albizia lebbek* grown in high temperature condition of Khuzestan in Iran. The location was selected because of high rate of industrial pollution that is caused by petrochemical companies. *Albizia lebbek* Benth. is a deciduous tree with compound leaves, flat oblong fruits, round cream colored seeds, grows wild and planted in almost south of Iran. The plant is found throughout tropical and subtropical Asia and Africa. The concentrations of chlorophyll A, B total chlorophyll, carotenoid, soluble sugar, proline and morphological effects were examined in the leaves of tree species (*Albizia lebeck*), growing in polluted area in comparison with natural condition. In the polluted regions higher concentrations of soluble carbohydrate, proline, chlorophyll A, B, carotenoid were observed in comparison with trees in the unpolluted regions. The morphological characters such as leaf area showed decrease. (*Journal of Plant Sciences* 4 (4): 122-126, 2009; doi: 10.3923/jps.2009.122.126)

Influence of Zeolite Application on Germination and Seed Quality of Soybean Grown on Allophanic Soil

Hamayoon Khan, Amir Zaman Khan, Rozina Khan, Naoto Matsue and Teruo Henmi

The objective of the present study was to evaluate the effect of zeolite application levels and allophanic soil on seed germination and vigor of soybean cultivars grown under natural green house environment. Seeds of two soybean cultivars (Enrei, [MG] 1V) and Harosoy [MG] 11) were produced in the greenhouse from three zeolite application levels (0, 1 and 2%) and three soil (two allophanic and one paddy) at the Faculty of Agriculture, Ehime University, Japan during summer, 2007. Brown (mature) pods were harvested, threshed and all shriveled and abnormal seeds were removed before determining germination and other vigor tests. Zeolite applied at the rate of 1 and 2% improved germination and vigor of the seed increased linearly ($R^2 = 0.72$) as compared to control treated plots (0%). Seeds obtained from two allophanic soils (KyP and KnP) gave similar trend of increase in germination and vigor as compared to a Paddy Soil. Among the vigor tests, accelerated aging, electrical conductivity and seedling dry weight provided

the best estimate of seed vigor for the two soybean cultivars, both for ranking seed lots quality and predicting field emergence. Seeds of Harosoy were more sensitive to high temperature stress than seeds of Enrei and accelerated aging test was more responsive in categorizing seed lots as compared to standard germination. Among cultivars, Enrei gave maximum germination and showed more vigor than Harosoy. Present findings support the results of experiment by demonstrating that zeolite application to soybean crop improves germination and vigor of soybean seeds. KyP and KnP allophanic soils showed its potential for fertility and availability of nutrients for plant growth and development as compared to paddy soil. (*Research Journal of Seed Science* 2 (1): 1-8, 2009; **doi:** 10.3923/rjss.2008.1.8)

Effect of Exogenous Hormones and Chilling on Dormancy Breaking of Seeds of Asafoetida (*Ferula assafoetida* L.)

M. Otroshy, A. Zamani, M. Khodambashi, M. Ebrahimi and P.C. Struik

Asafoetida (*Ferula assafoetida* L.) is a medicinal plant with a problematic seed germination. Seeds of this plant have a long dormancy. The present research was carried out to investigate whether exogenous application of the hormones Gibberellic Acid (GA_3), N6-furfurylaminopurine (kinetin) and 6-benzylaminopurine (BAP), alone or in combinations and chilling (for 0 or 28 days) could be used to alleviate the problem of dormancy. Germination was increased from 53.3% in a medium free of any hormones to 74.4% in a medium supplemented with 0.25 mg L^{-1} BAP. This was the only single hormone treatment giving a statistically significant increase in germination. Chilling increased germination from 37.5% (0 days of chilling) to 82.9% (28 days of chilling). Combining exogenous application of 0.25 mg L^{-1} BAP with 28 day chilling even gave more than 90% seed germination. Present findings suggest that seeds germination of *Asafoetida* can be greatly improved by combining chilling with BAP application. (*Research Journal of Seed Science*, 2009 2 (1): 9-15, 2009; **doi:** 10.3923/rjss.2009.9.15)

Hydropriming, Ascorbic and Salicylic Acid Influence on Germination of *Agropyron elongatum* Host. Seeds Under Salt Stress

A. Tavili, S. Zare and A. Enayati

The objective of this study was to evaluate the effects of ascorbic acid and salicylic acid pretreatment in addition to hydropriming on enhancement of seed germination

of *Agropyron elongatum* under salt stress. The experimental design was two factors factorial based on a completely randomized design. Treatments were the combination of four levels of salt stress (0, -0.3, -0.6 and -0.9 MPa) in three concentrations of ascorbic acid and salicylic acid separately (100, 200 and 300 mg L⁻¹) and three levels of hydropriming (0 as a control, 12 and 18 h) with four replications. Results indicated that an increase in salt stress decreased germination components such as germination percentage and rate, coleoptile, radicle and seedling length and vigor index. Salicylic acid pretreatment and hydropriming did not significantly affect germination, but ascorbic acid spatially it's 300 mg L⁻¹ concentration alleviated the adverse effects of salinity in all germination characteristics. Totally, it is concluded that ascorbic acid pretreatment results in improvement germination properties of *A. elongatum* under salt stress condition which in turn increases the resistance of *A. elongatum* against salt stress in germination phase. (*Research Journal of Seed Science* 2 (1): 16-22, 2009; doi: 10.3923/rjss.2009.16.22)

Hydro-Priming in Dry Bean (*Phaseolus vulgaris* L.)

Abush Tesfaye Abebe and A.T. Modi

Hydro-priming is a very important seed treatment technique for rapid germination and uniform stand establishment in various grain crops. The objectives of the study were to evaluate the effect of hydro-priming and hydration media on the germination of dry bean cultivars. Seed performance was evaluated based on germination test, seed moisture content, electrical conductivity and water uptake. The study constituted two set of experiments. The result of the first experiment revealed that seed priming, cultivars, and their interaction were significant (at p = 0.01) for percent germination at the 2nd, 4th and 8th day and normal seedlings percentage at the 8th day. Seeds failed to produce normal seedlings for both 4 and 8 h seed priming treatments, while the control (no priming treatment) produced large percentage of normal seedlings. The second experiment was designed to examine the cause for the failure of germination in the primed seed in the first experiment. There was significant difference between cultivars for germination percent at the 2nd day, while only the media of hydration was significant at the 8th day count. None of the factors were significant at the 4th day. There was significant difference among hydration media and cultivars for normal seedlings at the 8th day, while the interaction was non-significant. Completely immersing the seed in water-filled flask did not cause the failure of germination in the first experiment; rather hydration followed by dehydration treatment was the possible cause. The better performance of the control in both experiments indicated that hydro-priming seems unnecessary in dry bean. (*Research Journal of Seed Science* 2 (2): 23-31, 2009; doi: 10.3923/rjss.2009.23.31)

Enhancing Seed Germination of *Chlorophytum borivilianum* Sant. Et Fernand. with PGRs, Steroidal Hormones and Zinc

R. Kaur, S. Arora and A.K. Thukral

The objective of the present study was to improve the seed germination of *Chlorophytum borivilianum* Sant. et Fernand. It is a small perennial and rare herb having aphrodisiac, antiaging, health restorative and health promotional properties. There is a great demand for this herb all over the world. In the field, the plant is grown from the tubers, making the cultivation of this plant costly and labour intensive. The plant sets a large number of seeds, which have a poor germination (8-13%) thus not being preferred by the farmers for cultivation. It, therefore, makes it imperative to understand seed germination studies to improve germination of the seeds of *C. borivilianum* through seed treatment with hormones or chemicals which would also otherwise add to its properties. In the present study seed treatments were given with indole butyric acid, kinetin and 24-epibrassinolide (plant growth regulators) testosterone and cholesterol (steroidal hormones) and zinc (known for vital reproductive functions in man). Characteristics of the fruits, seeds and seed viability were also evaluated. Seed germination and seedling growth of *C. borivilianum* were studied when given various treatments of plant growth regulators, steroids and Zinc (II). The highest germination percentage occurred with 10^{-6} M concentrations of testosterone (36.45%) followed by cholesterol (35.17%) with respect to control (8.5%). The maximum shoot length of seedlings was observed when seeds were treated with 10^{-6} M concentration of testosterone (4.43 cm), cholesterol (4.27 cm) and 24-epiBL (4.25 cm) with respect to control (2.80 cm). The maximum root length of seedling was observed in 10^{-6} M of cholesterol (3.83 cm) and 24-epiBL (3.65 cm) as compared to control (0.87 cm). Maximum fresh weights of seedlings were seen in seeds treated with 10^{-6} M concentrations of cholesterol (28.03 mg), 24-epiBL (26.21 mg) and testosterone (26.16 mg) as compared to control (10.87 mg). (*Research Journal of Seed Science* 2 (2): 32-39, 2009; *doi*: 10.3923/rjss.2009.32.39)

Fingerprinting of Rice Hybrids and their Parental Lines using Microsatellite Markers and their Utilization in Genetic Purity Assessment of Hybrid Rice

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Varietal identification has attained critical importance worldwide especially in the context of plant variety protection. The present investigation was undertaken with

an objective to identify distinguishable microsatellite markers to establish fingerprinting of rice (*Oryza sativa* L.) hybrids, assessing variation within parental lines and testing the genetic purity of hybrid seed lot CORH3. About 11 most informative microsatellite markers were employed for fingerprinting five rice hybrids and their parental lines. A total of 32 alleles were obtained using 11 microsatellite primer pairs with an average of 2.90 alleles per primer pair. The number of alleles amplified for each primer pair ranged from 2 to 4. Nevertheless, five microsatellite markers together differentiated all the 5 hybrids and the parental lines. The microsatellite marker, RM234 amplified alleles specific to differentiate parental lines of CORH3 likewise RM 276 for KRH2, RM258 for PRH10, RM202 for AJAY and RM204 for RAJALAXMI used to differentiate parental lines of respective hybrids. The unique microsatellite marker, RM234 was used for testing the genetic purity of CORH3 seeds. (*Research Journal of Seed Science* 2 (3): 40-47, 2009; doi: 10.3923/rjss.2009.40.47)

Storage of *Pinus gerardiana* Seeds: Biochemical Changes and its Applicability as Vigour Test

A.R. Malik and G.S. Shamet

Standardization of storage condition is prerequisite for management of Endangered *Pinus gerardiana* species. Therefore, the present study was undertaken to deal with the effect of storage temperature and type of containers on viability, moisture content and biochemical parameters and changes in them during different time periods (3, 6, 9 and 12 months) of seed storage. For standardization of storage device, the seeds were stored at four temperatures viz., room temperature (19-22°C), 0±1, -4±1 and 4±1°C in five different containers viz., polythene bags, plastic jars, canvas bags, earthen pots and tin boxes. The study revealed that there was a slight decrease in viability of seeds from fresh to nine month period when stored at 0±1°C in earthen pots. The S₂C₄ storage condition performed significantly (p≤0.05) better by achieving maximum viability of 94.30, 92.33, 84.83, 65% and other biochemical parameters after 3, 6, 9 and 12 months of storage period. The storage devices S₁C₅, S₂C₃, S₃C₃ and S₃C₄ for 3 months, S₂C₃ and S₃C₄ for 6 and 9 months also shown significantly (p≤0.05) good seed vigour during the period of storage. This is associated with decrease of moisture and oil per cent but increase of acid value and refractive index of oil content. The total sugar and soluble proteins were however found to increase up to three months after which there was a progressive decline as the storage period was extended up to 12 months. The results indicated that combination of 0±1°C x earthen pot is better storage device for *Pinus gerardiana* seeds storage. The

implementation of standardized storage condition, conserve the viability of seeds for conservation of species through plantation. (*Research Journal of Seed Science* 2 (3): 48-55, 2009; *doi*: 10.3923/rjss.2009.48.55)

Enhanced Emergence and Vigor Seedling Production of Rice through Growth Promoting Bacterial Inoculation

M.A. Baset Mia and Z.H. Shamsuddin

An experiment was conducted at the Soil Microbiology Laboratory, Department of Land Management, University Putra Malaysia, Malaysia to observe the effect of plant growth promoting bacterial inoculation on the enhancement of germination and vigor seedling production of rice. The design of the experiment was completely randomized with five replicates. Seeds were either inoculated by *Bradyrhizobium* strains UPMR48, UPMR29, *Burkholderia* sp. strain SB13, *Corynebacterium* sp. strains SB35 and SB41 or un-inoculated control or cultural media only. The results pointed out that inoculation significantly influenced the seedling emergence and vigor and seeds inoculated with strain UPMR29 and UPMR48 showed better performance in respect of vigor index. Inoculation of seeds with UPMR29 showed the longest plumule (shoot length). Bacterial inoculation also influenced on the root hair formation where UPMR 48 showed earlier root hair initiation than others. The overall root growth and development were positively influenced by the bacterial inoculation. The results concluded that plant growth promoting bacteria UPMR29 and UPMR48 could be used for vigor seedling production of rice. (*Research Journal of Seed Science* 2 (4): 96-104, 2009; *doi*: 10.3923/rjss.2009.96.104)