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Nitrous Oxide (N_2O) 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 N_2O emissions. The study was conducted in a Japanese lowland soil cropped to onion in Mikassa, Hokkaido (Japan). N_2O 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 N_2O 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 (ρb), volumetric water content (θ_v), gravimetric water content (θ_g), air-filled porosity (fa), total pore space (TPS), relative gas diffusivity coefficient (D_s/D_o) and the pore tortuosity factor (τ). Results showed that N_2O 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 N_2O emissions data in both years and the removal of these trends did not change variogram models, but significantly improved them by increasing the R^2 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 R^2 values. Soil T, τ, D_s/D_o, WFPS were significantly correlated with N_2O emissions. N_2O 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 N_2O 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 (N_2O) 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 (N_2O) emissions in an agricultural field cropped to onion in Mikassa, northern Hokkaido (Japan). N_2O 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 N_2O 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 N_2O emissions were highest in 1999 as compared to 2000. N_2O 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 N_2O emissions data in both years. However, the removal of these trends did not change variogram models, but significantly improved them by increasing the R^2 and Q values. N_2O 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), CDI_{50} (half the amount of water in control divided equally to both pots with each watering), PRD_{50} (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), PRD_{25} (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 CDI_{25} (quarter amount of water in control divided equally to both pots with each watering). Imposing water deficit reduced fruit yield up to 18% in PRD_{50} and 33% in CDI_{50} 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 PRD_{25} compared with the control and PRD_{50} 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 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 (T_1), 100% Recommended Dose of Fertilizers (RDF) to main and inter crops (T_2), 100% RDF to main crop+no fertilizer to intercrop (T_3), 100% RDF to main crop+100% RDF to intercrop (T_4), 100% RDF to main crop+50% RDF of intercrop (T_5), T_3+50% RDF to intercrop as basal+50% N to intercrop as top dress (T_6), T_3+50% N to intercrop as basal (T_7), T_3+100% PK of intercrop as basal+50% N as basal+50% N as top dress (T_8), pure crop of sunflower with RDF (T_9) and pure crop of groundnut with RDF (T_{10}) 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% (T_8) 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 Zeland White Rabbits

M.A. EL-Manylawi 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 = 12 m (2sat)+2sm (2sat) and 2n = 8x = 56 = 42 m (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 incoporated 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} (T_1), 60 kg N ha^{-1} + 0 kg P ha^{-1} (T_2), 120 kg N ha^{-1} + 0 kg P ha^{-1} (T_3), 0 kg N ha^{-1} + 20 kg P ha^{-1} (T_4), 0 kg N ha^{-1} + 40 kg P ha^{-1} (T_5), 0 kg N ha^{-1} + 60 kg P ha^{-1} (T_6), 60 kg N ha^{-1} + 20 kg P ha^{-1} (T_7), 60 kg N ha^{-1} + 40 kg P ha^{-1} (T_8), 60 kg N ha^{-1} + 60 kg P ha^{-1} (T_9), 120 kg N ha^{-1} + 20 kg P ha^{-1} (T_{10}), 120 kg N ha^{-1} + 40 kg P ha^{-1} (T_{11}) and 120 kg N ha^{-1} + 60 kg P ha^{-1} (T_{12}). 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

S. Shokri, S.A. Siadat, Gh. Fathi, B. Maadi, A. Gilani and A.R. Abdali Mashhadi

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 (1*Ax-dp*), 1Bx gene (1*Bx-dp*) and a silent 1Ay (1*Ay-dp*) gene. The complete ORF of x-type HMW glutenin genes, 1*Ax-dp* and 1*Bx-dp*, were 2508 and 2385 bp in size, encoding 836 and 795 amino acids, respectively. The silent 1*Ay-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 1*Ax-dp* from dwarfing polish wheat was most closely related to 1Ax1 and 1Ax2* from *Triticum aestivum*, while 1*Bx-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 1*Ax-dp* and 1*Bx-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 ($B_4O.2Na.10H_2O$) 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 then 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 SO_2 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 SO_2 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 SO_2 treatment, while no SO_2 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 SO_2 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 unsaponoted 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

M.C. Law, S.K. Balasundram, M.H.A. Husni, O.H. Ahmed and Mohd. Haniff Harun

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 (Fo) 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)*

A Revised Check-List of the Bryophytes of A4 Square of Turkey

Turan Özdemır

The checklist includes a list of genera, species, subspecies and varieties of A4 square (including Trabzon, Giresun, Rize, Gümüşhane, Bayburt and Artvin regions of Turkey) adopted by Henderson. It consist of 469 taxa of Bryophyta, 2 of them belong to Anthocerotopsida, 95 to the Hepaticopsida and 382 to Bryopsida. The result of the studies done in the study areas 112 taxa (10 Hepaticopsida and 102 Bryopsida) have been added as new record to A4 square from 2000 up to now (September 2008). Of these, 12 taxa (6 Hepaticopsida and 6 Bryopsida) are new to Turkey for A4 square in last ten years. *(International Journal of Botany 5 (1): 1-35, 2009;* ***doi:*** *10.3923/ijb.2009.1.35)*

Distribution of Flowering Plants and Cyanobacteria in Relation to Soil Characters in Bahariya Oasis, Egypt

I.B.M. Ibraheem and E.A. Al-Sherif

Baharia Oasis in one of the famous Oasses in western desert of Egypt. This study dealt with the distribution of flowering plants and cyanobacteria in the Oasis in relation to each other and to physicochemical characters of soil. Fifty six species of flowering plants and 29 cyanobacterial species were identified in seven different habitats. The data revealed that the flowering plants and algal taxa were controlled by the edaphic factors and physico-chemical characters of the soil. In the present study, both positive and negative correlations between flowering plants and cyanobacterial taxa were obtained confirming the controversial effect of cyanobacterial crust on vascular plants. *(International Journal of Botany 5 (1): 36-46, 2009; **doi**: 10.3923/ijb.2009.36-46)*

The Distribution of C_3 and C_4 Photosynthetic Species of the Centrospermeae Along an Altitudinal Gradient in Western Kenya

S. Sikolia, J.C. Onyango, E. Beck and J.I. Kinyamario

Two hundred and seventy eight species of the Centrospermeae were collected at different sites in Western Kenya representing gradients of altitude and aridity. Climate data were obtained from meteorological research stations. Species were examined for C_3 or C_4 photosynthesis using the anatomical Kranz syndrome, $\delta^{13}C$ values and carbon dioxide compensation points. C_4 photosynthesis is a feature of modern members of dicotyledoneae is of multiple evolutionary origins. It evolved independently in members of the same family and was found in one to several genera and then often only with two to three species. C_4 species are concentrated in lowland habitats subjected to high temperature, low precipitation and high evaporation. High $\delta^{13}C$ values is associated with low water availability which is a physiological syndrome and also a feature of saline habitats. The C_3 representatives of the Centrospermeae dominate in more moist and colder habitats, especially at higher altitudes. Only a few C_4 species occur at high altitudes (3000-4000 m) namely *Sagina gallica*, *Silene abyssinica* and *Melandrium nordiflorum*. The transition zone between C_3 and C_4-dicot is rather narrow between 1500 to 1700 m and thus much lower than that recorded for the monocots (2000-2200 m). The general pattern of $\delta^{13}C$ values distribution along the altitudinal gradient show that the values of -10.60 to -16.55, -17.75 to -18.87

and -18.89 to -32.42‰ that corresponds to altitudinal ranges, 0-1500, 1550-1700 and 1800-4200 m, respectively. The low altitudes are associated with drought and high temperatures. C_4 and C_3 dicot species can be intercropped to increase bioproductivity for the betterment of the flora and fauna in the semi-arid and arid ecosystem. C_4-species are potential candidates for exploitation in the agroforestry systems especially for long-term management programmes. The present study may also be relevant for better understanding of global change with respect to the diversity of photosynthetic pathways, herbivory and vegetation dynamics. *(International Journal of Botany 5 (1): 47-57, 2009;* ***doi:*** *10.3923/ijb.2009.47-57)*

The Effects of Aluminum on Fiber and Protein Bound Condensed Tannin, Polyphenols and Some Growth Index in Two *Sorghum* Cultivars

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The effect of Al on fiber and protein bound condensed tannin, polyphenols, tannin and some growth index in two cultivars of *Sorghum* (cult. 132 and 552) has been investigated. The medium culture was river sand and peat in 3:1 ratio, respectively. All pots received Hoagland's nutrient solution with and without $AlCl_3$. The first plant samples were obtained 30 day after sowing and the others were obtained each two weeks interval (days, 30, 44, 58, 72, 86, 90, 114 and 128) up to the end of plant's vegetative growth. Plant dry weight, growth rate and leaf area were measured and then total tannin, fiber and protein bound condensed tannin, total polyphenols in eight successive harvests were compared. The results indicated that the mean growth rate for cultivars 132 and 552 in control plants were 255 and 196 mg/plant/day, respectively and when Al contributed in the growth medium, the mean growth rates were reduced to 224 and 170 mg/plant/day in cultivars 132 and 552, respectively (almost 36% reduction). In average, leaf expansions were 6.4 and 4.5 cm^2 day^{-1} in cultivar 132 and 552, respectively and Al significantly decreased ($p<0.001$) the leaf area by 11.3 and 7.1% in cultivar 552 and 132, respectively ($p<0.001$). Al causes to increase the concentration of Protein Bound Condensed Tannin (PBCT) in leaves of two cultivars with different patterns. In cultivar 132, PBCT was accumulated almost in a rate of 0.075 mg g^{-1} DW day^{-1} in plant during growing season. In contrast, in cultivar 552 the amount of PBCT was the same at early stage of growth in plants treated with Al and then increased slightly afterward. Although the root's PBCT were lower in cultivar 552, their amounts were decreased up to the end of growing season. This behavior was

completely different in cultivar 132. Adding Al into nutrient media would change the pattern of PBCT in root. The amounts of PBCT in control plants were higher than fiber bound condensed tannin. However the trend was different in different cultivars respect to Al toxicity. Amount of total polyphenols in control plants were higher in cultivar 132 (90.9 mg g^{-1} DW) than cultivar 552 (52.6 mg g^{-1} DW) during growing season however Al has no significant effect on the amount of total polyphenols except at late stage of growth in which Al increased total polyphenols in both cultivars. Total tannin in cultivar 132 was peaked at middle stage of growth and was lower at younger and elder leaves. Al causes to increase the total tannin at elder leaves. *(International Journal of Botany 5 (1): 58-66, 2009;* ***doi:*** *10.3923/ijb.2009.58-66)*

Carbon Dioxide Compensation Points of Some Dicots of the Centrospermeae Species and Their Ecological Implications for Agroforestry

S. Sikolia, E. Beck and J.C. Onyango

The present studies on carbon dioxide compensation point (Γ) considered species from tropical semi-arid, snowline and saline ecosystems. The aim of the study was to establish the ecological range of the CO_2 compensation point of species in the semi-arid/arid, snowline/or saline conditions. Secondly, to determine the effect of biomass on the rate of carbon dioxide assimilation in relation to the ecological efficiency of the C_3 and C_4 photosynthetic pathways. Four and six-seven week old plants were used to assimilate carbon dioxide in the gas chamber until a constant reading was attained by Infra Red Gas Analyzer (IRGA). The carbon dioxide uptake concentrations (assimilations) were continuously measured by pumping a stream of the air through a closed gas tight, circuit with IRGA while temperature and light intensity and previous growth conditions were maintained constant. The dry weight of the plant was measured using a digital balance after the experiment. The CO_2 compensation points of the C_4 plants vary between 8-20 ppm. The CO_2 compensation points of the C_3 plants vary between 40-60 ppm. The age and biomass of the plant influenced the rate of carbon dioxide assimilation in the C_4 species and C_3 species. The C_4 plant attained the CO_2 compensation point faster than C_3 plant under the same physiological conditions. The C_4 plant photosynthesized below 40 ppm of carbon dioxide concentration. The C_3 plant ceased carbon dioxide assimilation below 40 ppm of carbon dioxide concentration. Thus, an ideal ecological canopy set-up should consist of a C_4 over storey and a C_3 under storey for efficient photosynthetic performance and yield. Potential C_4 overstorey species including *Amaranthus* species and

Kochia scoparia, should be intercropped with potential C_3 understorey species like *Chenopodium album* and *Phytolaca dioica* by farmers and horticulturalists in Agriculture. The intercropping practice is economical, viable and apt in agroforestry systems, especially in the semi-arid and saline conditions socialized by nomadic tribes in Kenya. Perkerra irrigation project can act as satellite agroforestry research station, including Kerio valley and Turkana regions. *(International Journal of Botany 5 (1): 67-75, 2009;* ***doi:*** *10.3923/ijb.2009.67-75)*

Sequence and Expression Analysis of EgSAPK, a Putative Member of the Serine/Threonine Protein Kinases in Oil Palm (*Elaeis guineensis* Jacq.)

Huynh Ky, Le Vinh Thuc, Siew-Eng Ooi, Z. Ishak, P. Namasivayam and S. Napis

In present study, EgSAPK (EU805512), an oil palm transcript coding for a putative SAPK protein kinase, have been molecular characterized. The cDNA for EgSAPK isolated from an oil palm cell suspension culture is 1470 bp in length with a longest Open Reading Frame (ORF) of 963 bp. No translation start codon could be identified so EgSAPK cDNA sequence is lacking the 5'-end. The deduced protein sequence shares 89% identity with the serine/threonine protein kinase SAPK9 from rice (AB125310.1). Real time PCR results showed that the expression levels of EgSAPK varied in different oil palm tissues and the EgSAPK gene shares a similar expression pattern with the SAPK gene of rice. Furthermore, the transcription of the EgSAPK gene in green embryo, white embryo and embryogenic calli tissues were higher than in non-embryogenic calli tissues. Southern blot analysis showed that the EgSAPK gene might be present as a single copy gene in the oil palm genome. These results suggest that EgSAPK may have a similar function as the SAPK gene of rice and thus can be a candidate marker for oil palm somatic embryogenesis. *(International Journal of Botany 5 (1): 76-84, 2009;* ***doi:*** *10.3923/ijb.2009.76-84)*

Bryophyte Diversity Within Urban Areas: Case Study of the City of Belgrade (Serbia)

M. Sabovljević and S. Grdović

The bryophyte diversity and urban bryophyte flora of the city of Belgrade was studied. In total 210 taxa were recorded, with 23 hepatics and 187 mosses.

Comparing to some other urban areas of Europe, bryophyte diversity of the Belgrade metropolitan belongs among the richest in Europe, however bryophyte are not abundant. Among bryophytes of Belgrade city, there are 14 nationally red-listed species and two internationally threatened. According to the frequency of records, the Belgrade bryophytes are classified to rare, common and spread. Rare species within the urban area are 94, 69 are common to find and only 24 are spread and easy to record in Belgrade wide area. Urban metropolitan areas are different from native but gives various condition in small shelters for rich diversity of small organisms like bryophytes. *(International Journal of Botany 5 (1): 85-92, 2009;* ***doi:*** *10.3923/ijb.2009.85-92)*

Hybridization and Polyploidy: Cytogenetic Indications for *Hoffmannseggella* (Orchidaceae) Species Evolution

Júlia Yamagishi-Costa and Eliana Regina Forni-Martins

In the present research through chromosome counts utilizing root meristems and immature ovaries and/or observation of meiotic behavior from floral buds, we analysed seven *Hoffmannseggella* species and confirmed the basic number of x = 20. From the seven species analyzed, one presented polyploidy (*H. briegeri*) (Blumensch. ex Pabst) V.P.Castro and Chiron, 2n = 80), one presented both diploid (2n = 40) and polyploid (2n = 80) cytotypes (*H. rupestris* (Lindley) V.P. Castro and Chiron) and the five remaining species presented n = 20/2n = 40 chromosomes. Polyploid species/cytotypes presented aneusomatic root tissues. Meiotic abnormalities, like monovalents, early disjunction of bivalents and putative tetravalents were observed in several species. We suggest that hybridization and polyploidy are, if not the major, at least very important mechanisms for the evolution of species and that these events are probably occurring in the present, possibly being responsible for many taxonomic divergences within the group. *(International Journal of Botany 5 (1): 93-99, 2009;* ***doi:*** *10.3923/ijb.2009.93-99)*

Compatibility, Growth and Production Potentials of Mustard/Lentil Intercrops

M.M. Rahman, M.A. Awal, A. Amin and M.R. Parvej

An experiment was conducted to analyse the interspecies compatibility and production potentials of mustard and lentil in intercrop association. The experiment comprised four planting systems viz., sole mustard, sole lentil, single row (1:1 i.e., one row of mustard followed by one row of lentil) and double row

(1:2 i.e., one row of mustard followed by two rows of lentil) intercropping. The stands height and number of branches (primary and secondary) per plant were maximum and minimum in sole and single row intercropped plants, respectively. Higher leaf area index and total dry matter production was observed in sole cropped mustard or lentil while those were lower in 1:2 intercropped mustard or 1:1 intercropped lentil plants. Maximum seed yield, 1.26 t ha^{-1} (or 1.30 t ha^{-1}) was harvested from sole crop of mustard (or lentil) which was about 40 and 48% (or 34 and 12%) higher than that of the mustard (or lentil) yield obtained from single and double row intercrop mixtures, respectively. Combined seed yield from double row mixture was the maximum (1.8 t ha^{-1}) and was respectively 11, 30 or 28% higher than that obtained from single row intercropped stands, sole mustard or lentil. Single and double row intercropping systems respectively resulted 25 or 41% increase in land equivalent ratios. Area time equivalency ratio was also increased by about 14 and 31%, respectively for single and double row intercropping systems. The competitive ratio of each population is approached to be unity in both intercropping systems reflecting the proper balance of the natural resources between associated species resulted better yield. The results suggest that mustard and lentil populations are well compatible in intercrop association and 1:2 row ratio mixture would be better for their profitable production. *(International Journal of Botany 5 (1): 100-106, 2009;* ***doi:*** *10.3923/ijb.2009.100-106)*

Post-Fire Regeneration of a *Pinus brutia* (Pinaceae) Forest in Marmaris National Park, Turkey

Ç. Tavşanoğlu and B. Gürkan

Post-fire recovery of a *Pinus brutia* Ten. forest on ophiolithic rocks was studied in Marmaris National Park, southwestern Turkey. Three study sites burned in different years (1999, 1995 and 1979) and a study site not burned for at least 45 years were studied from September 2000-2001. Although some opportunistic species had established in one-year-old site, species composition had been recovered again in older sites. Change in the plant species cover during early post-fire succession was basically different between seeders and resprouters; cover of the seeders increased, but that of resprouters did not change. Post-fire growing line of *P. brutia* individuals during 22 year period was fitted to a linear regression model ($r^2 = 0.9995$, $p<0.001$). In conclusion, post-fire regeneration of *P. brutia* forests on ophiolithic rocks in Marmaris National Park fits to the general autosuccessional model in Mediterranean Basin and fire is a complementary element for these forest ecosystems. *(International Journal of Botany 5 (1): 107-111, 2009;* ***doi:*** *10.3923/ijb.2009.107-111)*

Ratooning Potential of Interspecific NERICA Rice Varieties (*Oryza glaberrima*×*Oryza sativa*)

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Field experiment was conducted in Deve (6°48 N, 1°47'E, 72 masl) in the Savannah zone of Benin Republic, to examine the increase in grain yield due to ratooning. Eighteen upland interspecific varieties (NERICA1-18) and their *Oryza glaberrima* (CG 14) and one of the *O. sativa* (WAB 56-104) parents were used in a Randomized complete block design with three replications. The first (main) crop was harvested at mass maturity, after which the tillers were hand mowed to stubbles of about 10 cm tall. These were then left without any further input, until the ratooned plants were ready for harvest. The result showed a large variation in the ratoon performance among NERICA, with ratoon ability ranging from 13% (NERICA 2) to 39% (NERICA 14 and 17). Total grain yield (main plus ratoon) was significantly different ($p<0.001$) from that of the main harvest. The maximum total grain yield was 6.14 t ha^{-1} for NERICA 2 followed by NERICA 15 and 11 (6.02 and 6.01 t ha^{-1}, respectively). The yield increase of more than 1.5 t ha^{-1}(the average yield of upland rice in Sub-saharan Africa) recorded in NERICA, with no additional input was very encouraging. This will presumably increase with additional input during ratoon. Therefore, NERICA rice is able to fructify twice, hence farmers can harvest more rice and make more profit. *(International Journal of Botany 5 (1): 112-115, 2009;* ***doi:*** *10.3923/ijb.2009.112-115)*

Floristic Composition of Lake Al-Asfar, Alahsa, Saudi Arabia

Ashraf M. Youssef, Mohamed A. Al-Fredan and Adel A. Fathi

The vegetation communities of the shores of Lake Al-Asfar; a large salt lake in Al-Hofouf, Al-Hassa, Saudi Arabia; were studied. The aim of the research was to study the relationship between the distribution of vegetation along salt lake shores in relation to soil and climatic conditions. Four distinct lake shore habitats were examined. A total of 72 stands along the study area of the lake were investigated. It was concluded that soil texture, pH, soil moisture content, mineralization as well as the climatic factors were likely to be key factor in determining the distribution of vegetation communities along the shores and habitats of the lake. The study included: list of species and their families, growth forms, frequencies, densities, abundances, recurrence, diversity richness, heterogeneity and evenness in each of the four habitats along the lake. A total of

39 plant species belonging to 20 families were identified from the four studied habitats. More than 61% of the species recorded were perennial shrubs (PSH). Diversity richness indices were 2.02, 2.22, 3.05 and 4.91 in the inundated wet zone (Site I), moist zone (Site II), semi-dry zone (Site III) and arid zone (Site IV), respectively. Heterogeneity was from 2.01-3.10 (Shannon-H') and evenness was 0.89 to 0.98. The heterogeneity in species composition among the sites was moderate indicating that each site has its own unique flora. Those dominant communities occurring on highly and moderate saline soils of the four habitats (I, II, III and IV) along the lake included *Phragmites australis*, *Halocnemum strobilaceum*, *Zygophyllum mandavillei* and *Haloxylon salicornicum*, respectively. *(International Journal of Botany 5 (2): 116-125, 2009; **doi:** 10.3923/ijb.2009.116-125)*

A Checklist of Lekki Lagoon Diatoms

T.A. Adesalu and D.I. Nwankwo

The diatoms of Lekki lagoon for the first time were studied at monthly intervals for two years (June 2003-May 2005). Two hundred and thirty seven (203 pennate and 34 centric forms) diatom species belonging to 50 genera were recorded. Among the pennate diatoms, the most frequent species were *Achnanthes conspicua*, *Bachysira follis*, *Bacillaria paradoxa*, *Craticula cuspidata*, *Cymbella ventricosa*, *Decussata placentula*, *Eunotia incisa*, *Frustulia rhomboides*, *Gyrosigma balticum*, *Luticola mutica*, *Nitzschia radiosa*, *Pinnularia biceps*, *P. gibba*, *Placoneis exigua*, *Plagiotropis* sp., *Sellophora pupila* and *Synedra ulna* var. *longissima*. The holoplanktonic forms included *Synedra ulna* (Nitz.) Ehr., *Synedra acus* Kutzing and *Tabellaria fenestrata* (Lyng.) Kutzing. The centrals were ably represented by *Aulacoseira* and its varieties, *Cyclotella* and *Terpsinoe musica*. In this study, fifty new diatoms species were recorded for Lagos lagoon complex while *Aulacoseira herzogii* is new record for Nigeria. Community structure analysis shows a highly diverse environment. *(International Journal of Botany 5 (2): 126-134, 2009; **doi:** 10.3923/ijb.2009.126-134)*

Effects of Salinity Stress on Growth, Ions Partitioning and Yield of Some Cowpea (*Vigna unguiculata* L. Walp.) Cultivars

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In this study, twenty one cowpea cultivars (*Vigna unguiculata* L. Walp.) were tested for their salt tolerance at different degrees of salinity; 0, 50, 100 and

200 mM of NaCl, in both the laboratory and field conditions. In the laboratory, Na^+, K^+, K/Na ratio, plant height, roots dry weights, stems and leaves were investigated. In the field conditions, yield components (weight of 1000 seeds, number of pods per plant, total chlorophyll and grains yield) were determined in harvesting phase. Results showed that K^+ concentration, K/Na ratio, seedlings height and total chlorophyll were significantly decreased by salt solutions, especially by 200 mM and the magnitude of reduction varied according to cultivars. Na^+ was significantly increased with increasing NaCl concentrations in all plant organs. Roots dry weights as well as stems and leaves decreased significantly in all cultivars with increasing salinity except in organs of Bambey 21 (V11), IT97K-556-4 (V3) and IT04K-332-1 (V10) cultivars. Under field conditions, the weight of 1000 seeds, the number of pods per plant and grains yield were affected by soil salinity at 50 mM of all cultivars except in Bambey 21, IT97K-556-4 and IT04K-332-1. The results obtained during vegetative growth and harvesting phase suggested that Bambey 21, IT97K-556-4 and IT04K-332-1 cultivars were relatively tolerant to salinity than others. Bambey 21, IT97K-556-4 and IT04K-332-1 cultivars could be grown in environments with varying salinity. *(International Journal of Botany 5 (2): 135-143, 2009; **doi:** 10.3923/ijb.2009.135-143)*

A Multifunctional Acetyl-CoA Carboxylase Gene Confers Freezing Tolerance in *Arabidopsis thaliana*

Azura Amid and Gareth J. Warren

The *sfr3-1* mutation causes freezing-sensitivity in *Arabidopsis thaliana.* Through mapping, sequencing and transgenic complementation, *sfr3-1* was revealed as a missense mutation in ACC1, which is an essential gene encoding multifunctional acetyl-CoA carboxylase. Suppression of ACC1 expression by RNA interference produced a freezing-sensitive phenotype with some similarity to that of *sfr3-1*. The dCAPS primers and PCR confirmed that *sfr3* gene encodes multifunctional acetyl-CoA carboxylase. Microarray and real-time PCR experiments demonstrated that the expression of ACC1 increase only 1.48 fold in wild-type and 1.35 fold in mutant in response to cold treatment. Studies also suggested that the *sfr3-1* mutation is more likely to be a temperature-sensitive mutation as the *sfr3* mutant cuticle becomes leaky only at low temperature and this was confirmed by cuticular defects analysis. *(International Journal of Botany 5 (2): 144-152, 2009; **doi:** 10.3923/ijb.2009.144-152)*

Variation of Some Nutritional Constituents and Fatty Acid Profiles of *Chlorella vulgaris* Beijerinck Grown under Auto and Heterotrophic Conditions

Mostafa M. El-Sheekh and Alaa A. Fathy

This study is an attempt to evaluate the nutritional value of *Chlorella vulgaris* Beijerinck grown under autotrophic and heterotrophic conditions concerning their content of carotenoids, protein, proline, total free amino acids and fatty acids. Chlorophyll a (Chl.a) content of autotrophic cells of *C. vulgaris* was double that estimated in heterotrophic cells, while chlorophyll b (Chl.b) content of autotrophic cells was nearly half the value recorded for heterotrophic cells. Carotenoids (Car.) content of heterotrophic cultures decreased by 30.82% compared to that value of autotrophic cells. There was a slight decrease in the protein content of *C. vulgaris* under heterotrophic conditions. When the composition of total free amino acids and proline of *C. vulgaris* grown under autotrophic conditions is compared to that grown heterotrophically, it was observed that a significant increase in total free amino acids and proline in heterotrophic cultures. The percentage of most fatty acids of heterotrophic cells was relatively higher than autotrophic ones. There was no qualitative difference between autotrophic and heterotrophic cultures, except for the fatty acid 16:02 which was absent under autotrophic conditions. Present results showed that *C. vulgaris* has quite a simple qualitative fatty acids composition compared to other chlorophycean species, considering production of natural food supplements and/or natural pharmaceutical products, it is strongly recommended using autotrophic cells of *Chlorella* rather than using those of heterotrophic cells for such purpose. *(International Journal of Botany 5 (2): 153-159, 2009; **doi:** 10.3923/ijb.2009.153-159)*

Identification of Peach Genotypes (*Prunus persica* (L.) Batsch) in the North-Central Region, Mexico

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Twenty four peach genotypes from the Central North Region of Mexico, were characterized based on morpho-physiological traits. Fruit weights from the

genotypes Roxana (135 g), San Gabriel C-167 (141.9 g) and Zacatecas landrace (162.3 g) were the higher, each in its group, since all genotypes were grouped according to their readiness to harvest as early-, middle- and late-harvest, respectively. RAPDs analysis yielded 52 monomorphic and 93 polymorphic fragments that were related to desirable characteristics from the *Prunus* genotypes. This information provide us tools for early individual identification of high-performance trees when still growing in the nursery. Therefore, growers may use this technique for assisted breeding program on their *Prunus* genotypes. *(International Journal of Botany 5 (2): 160-165, 2009; **doi:** 10.3923/ijb.2009.160-165)*

Development of Elephant Apple Fruit Quality as Affected by Postharvest Ethanol Application and Temperature

A.B.M. Sharif Hossain, A. Nasrulhaq Boyce and Haji Mohamed

Experiments were conducted to study the effects of temperature and ethanol application on the development and quality of the elephant apple fruit. Various treatments were carried out, viz., at room temperature (RT, 28°C), in exposed sunlight (ES, 35°C), in 70% ethanol (ET, 28°C), under plastic covering (PC, 28°C), under plastic covering plus 70% ethanol (PCET, 28°C), at low temperatures (LT, 12°C) and at freezing temperature (FT, -1°C). The longest preservation time was observed in fruits preserved in FT (-1°C) and shortest in fruits preserved in ES (35°C) whilst the maturity index was highest in ES (35°C) treatments and lowest in FT (-1°C) compared to the other treatments at the end of the experiments. However, fruits kept at FT (-1°C) exhibited chilling injury symptoms. Total Soluble Solids (TSS) was highest in ES (35°C) and PCET (28°C) from the 1st to the 7th harvest compared to other treatments. A similar increasing trend in TSS was observed in all the treatments. On the contrary, Titratable Acidity (TA) was highest in FT (-1°C) and LT (12°C) from the 1st till the 7th harvest. Similarly a declining trend of TA was found in all the other treatments. TSS was found to be higher in pulp than in peel in the ethanol treatment at 6, 12, 24, 48 and 72 h. However, TA was higher in peel than pulp. The results showed that low temperatures (LT and FT) and plastic covering with 70% ethanol (PCET) delayed ripening in elephant apple fruits and were the best preservation techniques. *(International Journal of Botany 5 (2): 166-170, 2009; **doi:** 10.3923/ijb.2009.166-170)*

Pharmacognostical Comparison of Three Species of *Himatanthus*

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The species *Himatanthus sucuuba* (Spruce ex Müll. Arg.) Woodson shows a wide range of use in folk medicine and other Amazonian species of this genus: *H. bracteatus* (A.DC.) Woodson and *H. stenophyllus* Plumel are also used by the great similarity between them. This study describes the macroscopic and microscopic morphological variation of leaves and stem bark of these species collected in the Amazonas state (Brazil). The contour of the leaf lamina, apex and the petiole aspects and the venation pattern were important features. The barks of *H. bracteatus*, differently from the other two species, did not present prismatic calcium oxalate crystals. Additionally, the extracts of the leaves, barks and latex of these species and the iridoids, plumieride (major in aqueous extracts of the leaves and latex from *H. bracteatus* and *H. sucuuba*) and isoplumieride (minor in all samples), were analyzed by HPTLC. The chromatographic profiles and the morphological analyses provided data for differentiation among the species. *(International Journal of Botany 5 (2): 171-175, 2009;* ***doi:*** *10.3923/ijb.2009.171-175)*

A Preliminary Study on the Antibacterial Activity of *Quercus brantii* Against Bacterial Pathogens, Particularly Enteric Pathogens

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The antibacterial activity of *Q. brantii* fruits ethanolic and methanolic extracts were examined using agar disc diffusion method against eight bacteria (*Salmonella typhi*, *Proteus mirabilis*, *Shigella dysenteriae*, *Escherichia coli*, *Klebsiella pneumoniae*, *Brucella melitensis*, *Bordetella bronchiseptica*, *Pseudomonas aeruginosa*). These extracts had inhibitory effect at various concentrations (0.5, 0.1, 0.2, 0.3 and 0.4 g mL^{-1}) against tested bacteria. The ethanolic extract had the highest activity (30 mm) against *Br. melitensis* and

B. bronchiseptica while the lowest activity (7 mm) was demonstrated by the methanolic extract on *E. coli*. Studies on the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of the methanolic extract on tested microorganisms showed that the highest MIC (20 mg mL^{-1}) and MBC (32 mg mL^{-1}) were demonstrated against *Sh. dysenteriae*, *B. bronchiseptica* and *P. mirabilis* had the highest MIC and MBC values (32 mg mL^{-1}) for the ethanolic extract. *(International Journal of Botany 5 (2): 176-180, 2009; **doi:** 10.3923/ijb.2009.176-180)*

The Effect of Stratification on Seed Germination of *Jasminus fruticans* L. (Oleaceae): A Contribution to a Better Insight on the Species Germination Ecology

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A germination experiment was carried out in the laboratory to evaluate the effect of stratification on seed germination of *Jasminus fruticans*. Nine different treatments were used to break the embryo imposed dormancy. Seeds were subjected to warm stratification (20/25°C) for 1 or 2 months, cold stratification (2-4°C) for 1, 2 or 3 months and to the following warm plus cold stratification combinations: 1 month warm plus 1 month cold stratification (1W+1C), 1 month warm plus 2 months cold stratification (1W+2C), 2 months warm plus 1 month cold stratification (2W+1C) or 2 months warm plus 2 months cold stratification (2W+2C). Maximum germination (86.00%) and minimum mean germination time (11.26 days) were attained after 3 months of cold stratification without warm stratification. Seeds that were subjected to 2 months cold stratification exhibited 70.50% germination, whereas those stratified for 1W+2C or 2W+2C exhibited 69.00 or 67.50%, respectively. One month of cold stratification resulted in a germination percentage equal to 21%, whereas seeds that were subjected to warm stratification for 1 or 2 months prior to 1 month cold stratification gave germination percentages equal to 18.50 and 20.00%, respectively. None of the control seeds or those that were warm stratified for 1 or 2 months germinated. Results revealed that several months of cold stratification (3 months) were required to overcome physiological dormancy and to enhance *Jasminus fruticans* seed germination. *(International Journal of Botany 5 (2): 181-185, 2009; **doi:** 10.3923/ijb.2009.181-185)*

Management of Iron Deficiency Stress in Citrus through Soil Application of Vivianite to a Calcareous Soil

Tarek G. Ammari, Alaeddin B. Tahboub and Taleb R. Abu-Zahra

Iron deficiency is a common abiotic stress in citrus trees grown on calcareous soils, where considerable reduction in yield is expected if not treated. In this study the effectiveness of synthetic vivianite [$(Fe_3(PO_4)_2.8H_2O)$] to prevent Fe chlorosis in citrumelo Swingle (*Citrus paradisi* Macf. x *Poncirus trifoliata*) a susceptible rootstock to Fe deficiency stress, was investigated. One-year old citrumelo plants were grown on calcareous soil-sand mixture under greenhouse conditions and treated with: (1) no Fe (as control); (2) 1.6 g FeEDDHA plant^{-1} (3) 5.4 g vivianite plant^{-1}. Chlorophyll measurements were performed on the youngest fully expanded leaves in terms of SPAD index and at the end of the experiment leaf chlorophyll and Fe concentrations and growth vigor (young shoot dry weight) were determined. Vivianite was as effective as the FeEDDHA. Vivianite significantly prevented the development of Fe chlorosis. Chlorophyll concentration of plants treated with vivianite was significantly higher than those of control plants although vivianite-treated plants had almost equal leaf Fe concentration as control plants, vivianite significantly improved the vigor of citrus plants similar to the FeEDDHA compared to the control treatment. These results suggest that vivianite is an effective alternative to the environmental-unfriendly and expensive Fe-chelates for preventing Fe deficiency in citrus orchards. *(International Journal of Botany 5 (2): 186-189, 2009;* ***doi:*** *10.3923/ijb.2009.186-189)*

Effect of Waste Water on Heavy Metal Accumulation in Hamedan Province Vegetables

M. Cheraghi, B. Lorestani and N. Yousefi

The objective of this research was to elucidate the effect of waste water on heavy metal concentration in vegetables. To this purpose a region fertilized with waste water (Najafi Boolvar, Hamedan, Iran) was chosen as a polluted area and a region without any waste water pollution (Heydareh, Hamedan, Iran) as a control area. Eight kinds of vegetables were collected from both areas, separately and after preparing, Pb, Zn, Cu and Mn concentrations of them, were measured by using the atomic absorption spectrophotometer. Present results showed that concentration of some heavy metals in vegetables grown in Najafi Boolvar was several times as high as that in Heydareh. According to the results of present

study, waste water have special problems for vegetables and thus for human health, because of ability of accumulating heavy metals in soil and biological accumulation of these elements in food chain. *(International Journal of Botany 5 (2): 190-193, 2009; **doi:** 10.3923/ijb.2009.190-193)*

A Floristic List and Phenology of Plant Species of Lawat Area District Neelum, Azad Jammu and Kashmir, Pakistan

M.E.U.I. Dar and Z.H. Malik

The objective of this study was to collect the detailed information of plant biodiversity and phenological pattern of plant species in the area. For this purpose, detailed surveys were done during the months of March to November in 2005 and 2006. One hundred and eighty plant species were recorded from Lawat hills belonging to 66 families and 144 genera. The families Asteraceae, Balsaminaceae, Gentianaceae, Lamiaceae, Poaceae, Polygonaceae, Primulaceae, Ranunculaceae, Rosaceae, Scrophulariaceae and Umbellifereae were recorded with major contribution to the flora of the investigated area. Fifty one plant species (29%) flowered from March to May, 83 plant species (45%) flowered from the month of June and July, while 46 plant species (26%) flowered from August to September. Eleven plant species in the investigated area were reported as evergreen. *(International Journal of Botany 5 (2): 194-199, 2009; **doi:** 10.3923/ijb.2009.194-199)*

Epigeal Cryptocotyly in *Madhuca indica* J. F. Gmel. (Sapotaceae)

A. Mundhra and N.D. Paria

An unusual case of epigeal cryptocotyly found in *Madhuca indica* J. F. Gmel. (Syn. *Bassia latifolia* Roxb.) of Sapotaceae is described and discussed in this study. The morphological characters shown by *M. indica* seedlings such as thickened hypocotyl, thick woody seed coat and non photosynthetic haustorial cotyledons are closely related to its epigeal cryptocotyly. The incidence of epigeal cryptocotylar germination in angiosperms seems to be scarce in available literatures. Such knowledge of germination and seedling morphology can throw some light in the silvicultural practices of this tree. *(International Journal of Botany 5 (2): 200-202, 2009; **doi:** 10.3923/ijb.2009.200-202)*

A Late Tertiary Pollen Record from Niger Delta, Nigeria

O.E. Ige

This study presents the results of palynological investigations carried out on Atala-1 well, Niger Delta, Nigeria. The samples yielded pollen and spores and the identification of the pollen and spores, their relative diversity and abundance provide data on which the palaeoenvironmental interpretations were based. Nine informal lithological units were delineated for the well, characterized by silty clay and very fine to very coarse sand grains which are typical of Benin and Agbada formations of the Niger Delta. Four pollen zones (PZ I-IV) were recognized from the pollen diagram and attempt was made at the reconstruction of the vegetation for the zones. The early part of the zone (I) was characterized by unstable wet and dry climatic conditions characterized by contrasting fluctuations between the percentage occurrence of *Rhizophora* sp. and Poaceae. The vegetation was gradually dominated by mangrove swamp vegetation towards the later part of the zones (II-IV), indicating a wet and moist climates for the period and a rise in sea level. *(International Journal of Botany 5 (3): 203-215, 2009;* ***doi:*** *10.3923/ijb.2009.203-215)*

The Bryophyte Flora in the Urban Area of Aydin (Turkey)

M. Kirmaci and E. Ağcagil

In this study, the bryophyte diversity and urban bryophyte flora of the city of Aydin was investigated. Research area was divided into three zones and nearly 500 bryophyte specimens were collected in 13 representative stands. One hundred and twenty three moss species belong to 22 families and 78 genera, 22 liverwort species belong to 14 families and 19 genera and one hornwort species were found in the area. *Fossombronia echinata* and *Crossidium crassinerve* which were recently recorded from Turkey were collected from the area as a second distributional locality. *Tortula muralis*, *Didymodon vinealis*, *Grimmia pulvinata*, *Bryum argenteum* and *Orthotrichum diaphanum* are the most common species found in the city center where high pollution exists. The protected areas in the city centre such as gardens, cemeteries, school yards etc. are necessary in order to protect of bryophytes. These areas are important to provide various habitats to small organism like bryophytes. *(International Journal of Botany 5 (3): 216-225, 2009;* ***doi:*** *10.3923/ijb.2009.216-225)*

The Bryophyte Flora of Honaz Mountain (Denizli/Turkey)

Mesut Kirmaci and Adnan Erdağ

The bryophyte flora of Honaz Mountain of Aegean Region (Western Turkey) has been investigated. One hundred and seventy five moss species belonging to 24 families and 64 genera, 20 liverwort species belonging to 14 families and 16 genera and one hornwort species were found on the area. *Orthotrichum rivulare* Turner and *Weissia breutelii* Müll. Hal. which was recently recorded from Turkey are collected from the area as a second distributional locality. And also some interesting taxa which are *Didymodon validus*, *Orthotrichum cupulatum* var. *bistratosum* and *Phascum cuspidatum* var. *schreberianum* collected from study area and discussed in the text. *(International Journal of Botany 5 (3): 226-235, 2009;* ***doi:*** *10.3923/ijb.2009.226-235)*

Evaluation of Mychorrhizae Symbiosis Efficiency with Barley (*Hordeum vulgare* L.) through ^{32}P Uptake under Soils Contaminated with Heavy Metals

M.R. Ardakani, S. Teimuri, M. Rezvani, H. Fathollahi, A. Khorasani, F. Rejali, A. Raza and F. Zafarian

This study designed to investigate more precise of mycorrhizal symbiosis in order to increasing mineral absorption by plant root system. Three pot experiments, radioactive with ^{32}P, non-radioactive and a trial with selected strain (from first and second trials) with heavy metals (Cd, Co and Pb) contaminated soil were set up for evaluation the efficacy of four mycorrhizae strains including *Glomus mosseae*, *G. etanicatum, G. intraradices*, mixed strains (combination of *G. mosseae, Gigarpora hartiga* and *G. fasciculatum*) in order to investigate the uptake, translocation and distribution of ^{32}P, P and also dry matter in barely in a glass house. Radioactive phosphorus (^{32}P) was used in this study. Results revealed that *G. mosseae* had the highest amount of P uptake in comparison with other strains. It indicates that differences exist among mycorrhizae strains towards ^{32}P uptake and its transportation to shoot. Increased strain count of *G. mosseae* was found in contaminated pots in trial with contaminated soil along with higher P concentration in root and shoot than non-inoculated plant roots. *(International Journal of Botany 5 (3): 236-243, 2009;* ***doi:*** *10.3923/ijb.2009.236-243)*

In vitro Growth of Wheat (*Triticum aestivum* L.) Seedlings, Inoculated with *Azospirillum* sp., Under Drought Stress

M.H. Arzanesh, H.A. Alikhani, K. Khavazi, H.A. Rahimian and M. Miransari

This research was conducted to determine: (1) the effects of drought on wheat seedlings growth under *in vitro* and dark conditions and (2) if inoculation of wheat seedlings with *Azospirillum* sp. can alleviate the unfavorable effects of drought on the growth of wheat seedlings. *In vitro* planted seedlings were subjected to different drought intensities using poly ethylene glycol and were inoculated with 25 *Azospirillum* strains including the isolated ones and the standard strains of *A. halopreaferanse*, *A. brasilense*, *A. irakense* and *A. lipoferum*. Different strains of *Azospirillum* sp. enhanced seedlings growth and adjusted their water behavior under drought. Such results in combination with the previously related results indicate that *Azospirillum* sp. are able to enhance plant growth and production under different physiological and ecological conditions. *(International Journal of Botany 5 (3): 244-249, 2009;* ***doi:*** *10.3923/ijb.2009.244.249)*

Rapid Isolation of Genome DNA Suitable for PCR from Tropical Almond (*T. catappa)* Plant Populations

B.O. Oboh, L.A. Ogunkanmi and N. Agwu

This study was conducted to develop a rapid and efficient method for the isolation of genomic DNA from the tropical woody tree, *Terminalia catappa* L. Fresh young leaves from 35 trees were sampled for the extraction of genomic DNA. The methodology employed excluded the use of liquid nitrogen and an ultracentrifuge with various modifications in the quantities and reagents used. The result of the extraction showed that genomic DNA of good quality and quantity with a spectrophotometric ratio of between 1.7-2.0 for the trees sampled. Result further showed that the extracted DNA on 1% agarose gel had high molecular weight bands following electrophoresis. Thus, we concluded that the modified protocol used for the extraction of genomic DNA in *T. catappa* which can be easily adapted to other crops produced DNA of good quality and quantity which can be used for PCR based studies. *(International Journal of Botany 5 (3): 250-254, 2009;* ***doi:*** *10.3923/ijb.2009.250.254)*

Evolutionary History of the Genus *Pistacia* (Anacardiaceae)

M.G. Al-Saghir

Pistacia L. belongs to the family Anacardiaceae (cashew family), order Sapindales. *Pistacia vera* L. (cultivated pistachio) is by far the most economically important species in the genus. It has edible seeds and considerable commercial importance. The evolutionary history and the phylogenetic relationships between species within the genus are not well understood. A better understanding of these relationships is needed to make the species more useful for plant improvement or genetic studies. The objective of this perpestective is to provide additional insight into understanding the evolutionary history of *Pistacia*. In conclusion, *Pistacia* is a monophyletic genus and it contains two sections (*Lentiscella* and *Pistacia*) and it is originated in the Paleocene epoch. This is based on Anacardiaceae being pantropical in distribution with North and South America representing major diversification centers of the family including the geographical distribution of Pistacia. This perspective provides additional insight into understanding the evolutionary history of the genus *Pistacia* to make the species more useful for plant improvement or genetic studies. *(International Journal of Botany 5 (3): 255-257, 2009; **doi:** 10.3923/ijb.2009.255.257)*

First Record of *Cheimonophyllum* Singer from Turkey

A. Kaya

This study deals with the first record of pleurotoid fungus *Cheimonophyllum candidissimum* (Berk. and M.A. Curtis) Singer (*Cyphellaceae*) growing on *Alnus* sp. wood from Kahramanmaraş, Turkey. *(International Journal of Botany 5 (3): 258-260, 2009; **doi:** 10.3923/ijb.2009.258.260)*

Phytosociological Attributes of Wadi Gaza Area, Gaza Strip, Palestine

M.M. Abou Auda, K.F. El-Sahhar and N.Y. Deeb

Wadi Gaza area, Gaza Strip, Palestine was subjected to a phytosociological study through 24 trips in the period from March to September 2007. This area has a characteristic semi-arid climate and locates in a transitional zone between Mediterranean, Negev and Sinai regions. Nine quadrats (10×10 m) at buttom,

bank and open field wadi in six locations; namely, Al-Brikat, Al-Nabaheen, Al-Saoud, Al-Bahr, Al-Rabowa and Abu-Malaa representing the entire area of Wadi Gaza, Gaza Strip were chosen to study the vegetation, including species cover-abundance, species frequency, relative frequency, community similarity, in addition to soil analysis. Some quadrats were pure stand of one species; e.g., *Tamarix nilotica* in Al-Rabowa and *Arundo donax* in Abu-Malaa. Some species like *Cynodon dactylon* were restricted only to one place (wadi bank) of the location (Al-Brikat) due to the lower degree of animal grazing and the moisture availability. *Alhagi graecorum* and *Silybum marianum* recorded the highest species frequency in the studied area. Unique occurrence of some salinity tolerant species were observed in Al-Bahr (a coastal location). The highest similarity was found between Al-Brikat wadi bank and Al-Nabaheen wadi open field. In contrast to the dissimilarity between both of Abu-Malaa and Al-Rabowa wadi buttom and other locations as they were pure stands and more or less unique locations. Physical and chemical structure of soil varied according to soil texture, pH values, salinity, moisture, sewage water, urban effect and bordering agricultural fields. *(International Journal of Botany 5 (4): 261-269, 2009;* ***doi:*** *10.3923/ijb.2009.261.269)*

Pollen Grains of Lagos Lagoon Swamp and Hinterland Vegetation-I

O.H. Adekanmbi and O.T. Ogundipe

In order to aid pollen identification, which is the bedrock of palynological studies, 14 plant species belonging to 4 families were subjected to standard palynological sample preparation. Taxa in the collection belong to the families Acanthaceae, Amaranthaceae, Apocynaceae and Aracaceae. Pollen grains belonging to the family Acanthaceae are mostly prolate in equatorial view and trigonal to circular in polar view. Family Amaranthaceae pollens are eurypalynous comprising of different morphological types of pollen, ranging from inaperturate to polyporate. Genera in the family Apocynaceae exhibit palynological extremes indicated by variety in the shape of the pollen grains, aperture, size and ornamentation of the studied species. Pollen grains in Aracaceae also exhibit variations ranging from monocolpate to trichotomosulcate nature of aperture. Light micrographs, detailed descriptions of the species and where possible Scanning Electron Micrographs are provided. It is established from this study that identification of palynomorphs should not pose a problem to the application of palynology even in fields other than biostratigraphy such as forensic studies, mellisopalynology, and medicine (e.g., alleviation of pollinosis). *(International Journal of Botany 5 (4): 270-278, 2009;* ***doi:*** *10.3923/ijb.2009.270.278)*

Xylem Conductivity and Anatomical Traits in Diverse Lianas and Small Tree Species from a Tropical Forest of Southwest Mexico

Mario Gutiérrez, Rubén San Miguel-Chávez and Teresa Terrazas

Seven lianas and four small trees collected from a tropical rainforest of Southwest Mexico were studied to relate vessel diameter and vessel frequency to the relative hydraulic conductivity (RC), vulnerability to cavitation and anatomical traits on the secondary xylem. The seven liana species and four small tree species represented ten different families. Two liana species (*Passiflora ligularis* A. Juss. and *Vitis tiliifolia* Humb. and Bonpl.) showed the highest vessel diameters, RC and vulnerability to cavitation. A small tree (*Petrea volubilis* L.) presented the lowest values for vessel diameter, RC and cavitation. Narrow vessels determined the vessel frequency per mm^2 (-0.58) while wider vessels showed low influence (-0.24). Wider and narrow vessels determined RC and vulnerability to cavitation ($r = 0.59$ to 0.76). Generally, wider vessels presented solitary distribution on the secondary xylem in liana and small tree species and narrow vessels were grouped in clusters. Liana species presented parenchyma in diverse forms, while parenchyma was scanty in the small tree species. The eleven species showed a broad range in RC and vulnerability to cavitation and showed diversity in anatomical traits on secondary xylem indicating that they have different anatomical adaptations with similar growth habit. *(International Journal of Botany 5 (4): 279-286, 2009;* ***doi:*** *10.3923/ijb.2009.279.286)*

Effect of Topography and Soil on the Distribution of under Canopy Trees of *Garcinia* (Guttiferae) in Lowland Forest of Peninsular Malaysia

M. Nazre, A. Latiff and M.K. Mohamad-Roslan

The distribution and aggregation of species in tropical forests is known to have certain preferences based on the edaphic factors such as topography types and soil series and this study was carried out to see the distribution of 16 *Garcinia* species in lowland dipterocarp forest in Pasoh Forest Reserve with those edaphic factors. Even though there have been many studies in large scale areas with a larger group of species to see the relationship of edaphic factors with species distribution, very few studies have been carried out on individual species especially for under-canopy or lesser known species. *Garcinia* is an under-canopy tree species in tropical South East Asian forests with no commercial values but mostly

known because of their edible fruits. Based on published topography and soil series maps in 50 ha plot, the preferences of *Garcinia* trees were analysed and calculated. Results showed that *Garcinia* trees could be found on all types of topography and soil but most trees are distributed very well on the flatland and well-drained alluvium soils rather than other areas. The least number of stems found are in the top (highest) topography and poorly-drained (prone to flood) alluvium soil. However, at species level, there are significant preferences of each *Garcinia* species on the different type of topography and soil. This shows that different type of topography and soil play significant effect on the distribution of *Garcinia* trees in tropical lowland forest. *(International Journal of Botany 5 (4): 287-294, 2009; **doi:** 10.3923/ijb.2009.287.294)*

Pollen Grains of Asteraceae and Analogous Echinate Grains

O.H. Adekanmbi

Seven plant species belonging to 3 families were subjected to standard palynological sample preparation in other to provide additional tool in pollen identification. Taxa in this study include the families Asteraceae, Convolvulaceae and Malvaceae. Pollen grains belonging to the family Asteraceae are unique in being characteristically echinate. They can be differentiated from similar pollen in other families by the relatively small size of both the pollen and the spines and the irregular arrangement of the spines. Pollen of *Ipomoea aquatica* belonging to the family Convolvulaceae has spines like found in Asteraceae but can be distinguished in that those of Convolvulaceae are remarkedly bigger in size. *Hibiscus rosasinensis* a species in the family Malvaceae share the same echinate characteristics but peculiar in possessing isolated spines, which stand out conspicuously. The pollen grain is differentiated from Convolvulaceae pollen in being larger. Light micrographs, detailed descriptions of the species and where possible Scanning Electron Micrographs are provided. This study is expected to be useful in palaeoecology research, petroleum exploration, honey industry and in forensic investigations. *(International Journal of Botany 5 (4): 295-300, 2009; **doi:** 10.3923/ijb.2009.295.300)*

Macromycetes of Genç District (Bingöl-Turkey)

Y. Uzun, A. Kaya, A. Keleş, M.E. Akçay and İ. Acar

The study was conducted on the macrofungi specimens collected from Genç district (Bingöl-Turkey) between 2006-2009 to determine the macromycota of the

region. Seventy eight taxa belonging to 23 families in *Ascomycetes* and *Basidiomycetes* classes were identified. Agaricaceae, Tricholomataceae and Strophariaceae are the most crowded families in the region. All of the taxa are new for the district. *Omphalotus olivascens* var. *olivascens* (*Marasmiaceae*) is determined as new record for Turkish macromycota. *(International Journal of Botany 5 (4): 301-306, 2009; **doi:** 10.3923/ijb.2009.301.306)*

Wolffia columbiana Can Switch Between Two Anatomically and Physiologically Separate States: Buoyant for Invasion and Starch Rich for Colonization

Michael Witty

Turion formation is poorly studied in all of the *Wolffi*a species and only narrow studies have been done. In this study details of *Wolffia columbiana* ecology and physiology are related to anatomy and histochemistry. We used a combination of histochemistry and a new method of pressing tissue into one focal plane to reveal anatomical features that are not visible using conventional methods. Previously unknown organs, wax coated substomatal cavities, are described which play a crucial role in *Wolffia* ecology. Tank experiments were used to determine the behavior of *Wolffia columbiana* plants in response to light and dark conditions. A physiological mechanism for transition between an invasive floating population and dormant benthic population using oxygen floatation is described, which involves *Wolffia columbiana* behaving like a small bathyscaphe. This mechanism is combined with accumulation of large stores of starch and is an adaptation to colonization and overwintering. *(International Journal of Botany 5 (4): 307-313, 2009; **doi:** 10.3923/ijb.2009.307.313)*

Characteristics of Cogon Grass Rhizomes and its Perforation of a Maiden Cane Rhizome

J.J. Muchovej, O.U. Onokpise and S.K. Bambo

Cogon grass (*Imperata cylindrica*) is one of the most aggressive grasses world wide and spreads by an extensive rhizome system. This study adds observational detail to growth of cogon grass rhizomes and provides for a mechanism by which cogon grass is able to perforate other species of plants. During a competition study between *I. cylindrica* and native grasses, where the plants were grown in 30 cm pots, under greenhouse conditions, the underground systems were harvested by removing the root ball from the pot, then removing the potting mixture in order to

un-potted for determination of length and weight of rhizomes and roots. In one pot, a unique situation was observed where a rhizome of cogon grass had perforated and traversed a rhizome of maiden cane. Aside from the physical damage, the rhizome of the maiden cane did not appear to be diseased. This study describes the rhizomes of the two plants and documents penetration. While cogon grass can penetrate other below ground parts of other species of plants, it does not appear to provide for major damage. *(International Journal of Botany 5 (4): 314-316, 2009;* ***doi:*** *10.3923/ijb.2009.314.316)*