



International Journal of
**Agricultural
Research**

ISSN 1816-4897



Academic
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Effect of Silicon and Boron Foliar Applications on Wheat Plants Grown under Saline Soil Conditions

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Two pot experiments were carried out under different soil salinity levels (0, 2000, 4000 and 6000 ppm), as well as field experiment under saline soil condition, to investigate the effect of spraying silicon (0, 250 and 1000 ppm SiO₂) and/or boron (0 and 25 ppm B) sprayed twice (40 and 70 days after sowing) under pots experiment, as well as spraying silicon (0, 250, 500 and 1000 ppm SiO₂) and/or boron (0, 25 and 50 ppm B) sprayed three successive times (at 35, 60 and 85 days after sowing) under field experiment on growth, yield and chemical composition of wheat (*Triticum aestivum* L.) var. Seets 1. Generally, under pots experiment, both silicon levels either alone or combined with boron significantly increased shoots height and leaf area as well as grains yield/plant and weight of 1000. However, under field experiment only the lowest level of silicon significantly increased all the studied growth characters, while all levels of silicon significantly increased number of spikes and grains as well as grains yield when compared with control non-sprayed plants, however, the lowest level of silicon had the superiority effect. Both silicon and boron applications correct to some extent the negative effects of salinity either on growth, yield, nutrients uptake, free polyamines and endogenous plant hormones (gibberellic acid and cytokinins) while decreased abscisic acid. However, no constant trend was obtained for indole-3-acetic acid concentration. (*International Journal of Agricultural Research* 3 (1): 1-26, 2008; doi: 10.3923/ijar.2008.1.26)

Yielding Ability and Nitrogen Use Efficiency in Maize Inbred Lines and Their Crosses

Manal M. Hefny and A.A. Aly

A field experiment was carried out to study the grain yield and Nitrogen Use Efficiency (NUE) components of 16 inbred lines of exotic yellow maize and their crosses. The experiment was cropped at two nitrogen fertilizers; low (70 kg f⁻¹) and high (140 kg f⁻¹), split-plot design was used. The results indicated that, all measured traits were affected significantly by N levels, genotypes and the interaction, except days to 50% tasseling and silking of inbred lines which were not affected by N levels and the N x genotype interaction. N deficiency caused delay in flowering time for male and female inflorescence, accelerated leaf senescence, reduced total dry matter production, N-uptake by plants, grain yield components and grain protein percentage. On the other hand, nitrogen use efficiency for dry

matter and grain production and nitrogen harvest index were increased under limited soil N. Inbred lines showed severe reduction for the above variables as compared to crosses. The inbred lines 4, 9, 13 and 15 were distinguished for their superiority in grain yield, nitrogen harvest index, harvest index, nitrogen use efficiency for grain, N-uptake and protein percentage. Three lines, 13, 15 and 16 were the earliest in flowering and represented the highest stay green percentage. While, the inbred lines 1, 8 and 14 were the most N-inefficient for grain production and the lowest for grain yield. In relation to crosses, high nitrogen harvest index, harvest index and nitrogen use efficiency for grain were shown by the crosses (4×1), (8×7), (9×10), (9×12) and (13×15). The crosses (4×1), (9×10), (13×15) and (13×16) surpassed the check and recorded the highest grain yield. The highest stay green percentage was revealed by the single cross Pioneer 3062 followed by the crosses (4×1), (13×15) and (13×16). It is recommended to use the inbred lines; 4, 9, 13 and 15, as a N-efficient source for further studies, whereas using the crosses; (4×1), (8×7), (9×10), (9×12) and (13×15) as N-efficient hybrids for under N limited cultivation. Phenotypic correlation coefficients were higher at low N compared with high application rate. High grain yield was significantly associated with delayed leaf senescence, nitrogen harvest index, harvest index, nitrogen use efficiency for grain and yield plant⁻¹. High nitrogen use efficiency for grain production correlated positively with high yield, yield plant⁻¹, NHI and HI. N-uptake was found to be a function of growth rate at both levels of N fertilizer. (*International Journal of Agricultural Research* 3 (1): 27-39, 2008; *doi: 10.3923/ijar.2008.27.39*)

The Effect of Moisture of Organic Chickpea (*Cicer arietinum* L.) Grain on the Physical and Mechanical Properties

Eşref Işık and Hülya Işık

The physical and mechanical properties of organic chickpeas (cv. Kocabaş) grains were determined as a function of moisture content in the range of 11.31-25.03% dry basis (d.b.). The average length, width and thickness were 10.30, 8.41 and 8.33 mm, at a moisture content of 11.31% d.b., respectively. In the above moisture range, the arithmetic and geometric mean diameters and sphericity increased from 9.01 to 9.85 mm, from 8.96 to 9.80 mm and from 0.870 to 0.884, respectively. Studies on rewetted organic chickpea grains showed that the thousand seed mass increased from 432.22 to 640.00 g, the projected area from 58.30 to 71.50 mm², the true density from 1000 to 1200 kg m⁻³, the porosity from 29.95 to 54.17% and the terminal velocity from 7.20 to 8.70 m sec⁻¹. The bulk density decreased from 700.50 to 550.00 kg m⁻³ with an increase in the moisture content range of 11.31-25.03% d.b. The static coefficient of friction of

organic chickpea grains increased the linear against surfaces of six structural materials, namely, rubber (0.4452-0.4986), aluminum (0.3939-0.4411), stainless steel (0.3541-0.3899), galvanized iron (0.4040-0.4557), glass (0.3057-0.3541) and Medium Density Fiberboard (MDF) (0.2867-0.3249) as the moisture content increased from 11.31-25.03% d.b. The shelling resistance of organic chickpea grains decreased as the moisture content increased from 101 to 70 N. (*International Journal of Agricultural Research* 3 (1): 40-51, 2008; *doi: 10.3923/ijar.2008.40.51*)

Up-shift Spectrum Analysis of 29 Tractors Available in India

Pinaki Mondal, V.K. Tewari, P.N. Rao and N. Balasubramanian

To know the present status of up-shift pattern of Indian tractors a representative up-shift analysis of different 29 models of tractors selected from 8 different companies has been performed. The analysis has proved most of the models produced in India have irregular up-shift pattern. This irregular up-shift pattern may be one of the main reasons of shift discomfort, unpredictable ground speed change, higher noise and vibration, speed mismatch, higher hand ball impulse, shortening of life of gear-shift associated parts etc. Design of gearbox of some models showed regular up-shift. So the present study reveals that ample scope is there to improve the design of gearbox of Indian tractors in the light of up-shift analysis. (*International Journal of Agricultural Research* 3 (1): 52-60, 2008; *doi: 10.3923/ijar.2008.52.60*)

Effect of Roasting on Texture, Colour and Acceptability of Pearl Millet (*Pennisetum glaucum*) for Making Sattu

D. Mridula, R.K. Goyal and M.R. Manikantan

In order to study the effect of roasting on some important physical properties viz. geometric mean diameter, colour, textural properties (hardness, toughness, average rupture force) and sensory attributes of pearl millet for making *sattu*, it was roasted using three time (45, 60 and 75 sec) and temperature (160°, 180° and 200°C) combinations. In general, geometric mean diameter, hardness, toughness and average rupture force increased with increase in roasting temperature. Roasting brought a significant change in colour of pearl millet grain and its roasted flour samples. h^0 and C^* of flour increased with increase in time at the same roasting temperature except at 180°C for 45 sec time. The lower hardness of pearl millet roasted at 180 °C for 60 sec as compared to higher temperature and highest mean sensory scores for colour and appearance (6.28),

roasted odour (6.58) and overall quality (6.58) for pearl millet flour prepared from the grain roasted at 180 °C for 60 sec, make this temperature and time combination best for roasting of it for making *sattu*. The 10% level of pearl millet flour with bengal gram (90%) was found the most accepted *sattu* formulation with mean sensory score (7.01). Regression equations developed for hardness, toughness, average rupture force, hue and chroma showed that temperature had significant effect on these parameters as compared to roasting time. (*International Journal of Agricultural Research* 3 (1): 67-68, 2008; doi: 10.3923/ijar.2008.61.68)

Heat and Mass Transfer of Greenhouse Fish Drying Under Forced Convection Mode

Tribeni Das and G.N. Tiwari

In this communication, a study of convective heat transfer coefficient during greenhouse fish drying for prawn (*Macrobrachium lamarrei*) under forced convection mode has been performed. The experiment has been performed during July 2006 for the composite climate of New Delhi. The hourly data for the rate of moisture evaporation, wind velocity, fish temperature and relative humidity inside greenhouse have been recorded for complete drying of fish under both natural and forced convection mode. These data were used for determination of the coefficients of convective heat transfer. Convective heat transfer coefficients are higher for forced convection than natural convection drying. Also the drying time required for forced convection is lesser than natural convection drying. It is mainly dependent on the rate of moisture transfer under the drying process. The curve fitting was carried out for different available model out of various observations. A quadratic curve exhibited best relation between convective heat transfer coefficient and drying time. This model gives the maximum coefficient of determination. (*International Journal of Agricultural Research* 3 (1): 69-76, 2008; doi: 10.3923/ijar.2008.69.76)

Dormancy Spreads Seed Germination over a Long Period with a Discontinuous Procession in *Aegilops tauschii*, the D-genome Donor Species of Bread Wheat

Qi-Jiao Chen, Lian-Quan Zhang, You-Wei Yang, Zhong-Wei Yuan, Zhi-Guo Xiang, You-Liang Zheng, Zheng-Song Peng and Deng-Cai Liu

Aegilops tauschii Coss. is the donor species of D-genome of bread wheat. This species has been widely utilized in wheat improvement. However, *Ae. tauschii* has

been becoming the high-risk weed in the bread wheat fields of China. Dormancy is the vital factor for the weed reproduction during its life cycle. In the present study, we firstly observed the dormancy for a long time by monitoring the germination procession of three *Ae. tauschii* accessions under laboratory conditions for 120 days. The results revealed that all *Ae. tauschii* accessions had long and discontinuous dormancy. There were differences between intact spikelets and threshed seeds. Intact spikelets of all the three *Ae. tauschii* accessions displayed two obvious peaks of germination at about 50 and 90th day. However, time of peak appearance of threshed seeds was different among accessions. The dormancy characteristic of *Ae. tauschii* provides the possibility for this species as weed under a wide range of environments. (*International Journal of Agricultural Research* 3 (1): 77-82, 2008; **doi**: 10.3923/ijar.2008.77.82)

Computer Modeling of Dissolved Oxygen Performance in Greenhouse Fishpond: An Experimental Validation

Lopa Ghosh and G.N. Tiwari

Aegilops tauschii Coss. is the donor species of D-genome of bread wheat. This species has been widely utilized in wheat improvement. However, *Ae. tauschii* has been becoming the high-risk weed in the bread wheat fields of China. Dormancy is the vital factor for the weed reproduction during its life cycle. In the present study, we firstly observed the dormancy for a long time by monitoring the germination procession of three *Ae. tauschii* accessions under laboratory conditions for 120 days. The results revealed that all *Ae. tauschii* accessions had long and discontinuous dormancy. There were differences between intact spikelets and threshed seeds. Intact spikelets of all the three *Ae. tauschii* accessions displayed two obvious peaks of germination at about 50 and 90th day. However, time of peak appearance of threshed seeds was different among accessions. The dormancy characteristic of *Ae. tauschii* provides the possibility for this species as weed under a wide range of environments. (*International Journal of Agricultural Research* 3 (1): 83-97, 2008; **doi**: 10.3923/ijar.2008.83.97)

Invasion of *Chromolaena odorata* in the Lowveld Region of Swaziland and its Effect on Herbaceous Layer Productivity

Solomon Tefera, B.J. Dlamini and A.M. Dlamini

A study was conducted to investigate pattern of *Chromolaena odorata* invasion and its effect on grass layer in three land use systems (communal, government

ranch and game reserve) and two soil classes (lithosol and raw mineral soil). Six sites (2 ha each) were selected, one on each of the two common soil classes for each land use system. The communal land had significantly lowest ($p < 0.05$) density (465 SE ha^{-1}) of *C. odorata* compared to the game reserve and there was no significant difference in total density in the two soil classes (mean = 691 SE ha^{-1}). The greatest proportion occurred in height class of $>1-1.5 \text{ m}$ and the lowest in $>0-0.5 \text{ m}$. Shrub ($>0.5-3 \text{ m}$) and seedling ($>0-0.5 \text{ m}$) densities were significantly ($p < 0.05$) highest in the game reserve and commercial ranch, respectively. Total dry matter (DM) grass production within and outside invaded areas showed significant differences ($p < 0.05$) in many sites. More pronounced trends of DM production were observed for the most dominant palatable species which included *Urochloa mozambicensis*, *Panicum deustum* and *P. maximum*. It is concluded that the invasion of *C. odorata* was rated to be moderate or high while past land management may be the major factor in the difference between land use systems. The effect of invasion of *C. odorata* on the grass layer was also severe to constitute a threat to livestock and game industries. Adaptive control strategies are therefore recommended while further work will be required to identify the causes of difference between land uses, to determine soil characteristics and overall productivity potential as affected by *C. odorata* invasion as well as interaction effects between biotic and abiotic factors. (*International Journal of Agricultural Research* 3 (1): 98-109, 2008; doi: 10.3923/ijar.2008.98.109)

Design, Construction and Testing of Hybrid Photovoltaic Integrated Greenhouse Dryer

P. Barnwal and Arvind Tiwari

In this study, a hybrid Photovoltaic (PV) integrated greenhouse (roof type even span) dryer has been designed and constructed at Solar Energy Park, Indian Institute of Technology (IIT), New Delhi, India. The testing of the proposed hybrid dryer (without load) has been carried out by using the thermal loss efficiency factor. The dryer has floor area of $2.50 \times 2.60 \text{ m}$ with 1.80 m central height and 1.05 m side walls height from ground. The roof has slope of 30° . Two PV modules (glass to glass) were used in its construction for thermal heating of greenhouse environment and to provide electrical power to operate a DC fan under forced mode condition. The experiments have been conducted under natural and forced mode operation without load. It has been observed that the direct thermal loss efficiency under forced mode is higher as expected for crop drying. The coefficient of diffusion under natural mode has also been determined. (*International Journal of Agricultural Research* 3 (1): 110-120, 2008; doi: 10.3923/ijar.2008.110.120)

Appraisal of Natural Resource Database for Alternate Agricultural Land Use at Village Level Under Saline Environment-A Case Study from Sagar Island, India

A. Seal, R. Bera, K.D. Sah, D. Sarkar, A.K. Chatterjee, P. Bhattacharyya, K. Kim and S.H. Kim

The study deals with village level land use planning for Sagar Island, West Bengal, India; conceived through the integration of various factors like available land and water resources as well as socio-economic factors viz. land holding sizes, social obligation and economic conditions of farmers. The study was conducted during the period 2002 to 2005, in Jeebantala village of Sagar block (South 24 Parganas district of West Bengal) which lies in between $88^{\circ}07'37.2$ and $88^{\circ}08'31.2$ E longitudes and $22^{\circ}41'38.4$ and $22^{\circ}42'35.4$ N latitudes covering an area of 146.42 ha. Four soil series identified through detailed soil survey were classified as Inceptisols and Entisols. They were evaluated for land capability classification and soil site suitability for rice, potato, sunflower, chilli, grass pea and fodder grass (Dinanath). Socio-economic study of the area revealed that marginal (<1 ha) group dominated the farming community sharing 77.25% of total population. Based on soil-site suitability evaluation of different crops, results obtained from crop experiments and constraints perceived by different group of farmers, various rice based crop sequences were formulated. Rainfed rice-chilli and rainfed rice-sunflower were suggested for saline soils where as rainfed rice-potato and rainfed rice-grasspea were suggested for non-saline soils. (*International Journal of Agricultural Research* 3 (1): 121-130, 2008; doi: 10.3923/ijar.2008.121.130)

Evaluating Past Surface Air Temperature Change in Tabriz, Iran Using Hourly-Based Analyzing

M. Gholipour

Past temperature (T) change has been extensively studied as evaluating increase/decrease in maximum (T_{max}) and minimum (T_{min}) Ts. This study aimed to evaluate trends of T, using hourly T data and comparing them with trends of T_{max} and T_{min} . Data set was years 1966-2004, for Tabriz, Iran and contained daily values for T_{max} and T_{min} . Firstly, hourly Ts were estimated and averaged over month, over growing period of 5 crops and over yearly period. Also, like hourly T, averaged values of T_{max} , T_{min} and mean T were calculated. Then, simple linear

regression model ($Y = a+bX$) was used to determine rate of change (b) in temperature. Results indicated that among months for which warming was significant, Jan and July tended to have warming only for 20 to 8 h am and 23 to 5 h am, respectively; Feb and Oct with faster warming rate at daytime h had highest warming rate for 13-15 h and 12-16 h, respectively; the difference for lowest warming rate was also sensible; despite of these two months, June and September with more prominent warming at daytime hours showed no difference for time of occurrence of highest and for that of lowest warming rate; in August, the negligibly faster warming was related to 20 to 8 h am. Warming rate was relatively more prominent across nighttime h for growing period of winter wheat, maize and for yearly period, but across daytime hours for chickpea and spring barley; for lentil it was negligible. Comparing these results with trends of T_{max} and T_{min} it is revealed that when trends of T_{max} and T_{min} are asymmetric, as it is most evident across the world, hourly-based analyzing provides more detailed information and increased insights; such information could be more useful for selecting appropriate climate-change-related managing/breeding programs for plants. (*International Journal of Agricultural Research* 3 (1): 131-139, 2008; doi: 10.3923/ijar.2008.131.139)

Soil Properties, Leaf Nutrient Composition and Yield of Okra (*Abelmoschus esculentus* (L.) Moench) as Affected by Broiler Litter and NPK 15:15: 15 Fertilizers in Ekiti State, Nigeria

S.O. Omotoso and O.S. Shittu

The effect of Broiler litter and NPK 15-15-15 fertilizers on soil properties, growth and yield of okra (*Abelmoschus esculentus* (L.) Moench) were investigated at the Teaching and Research Farm, University of Ado-Ekiti and a farmer's field at Omuo Ekiti (Southern guinea savannah soil), Nigeria. The treatments consisted of 0, 2, 4 MT ha⁻¹ Broiler litter (Poultry manure) and 150 kg ha⁻¹ NPK 15-15-15 fertilizer. The results indicated a significant increase in growth parameters in those plants planted in NPK 15-15-15 fertilized plot than poultry manure plot. However, growth parameters (plant height, stem girth and number of leaves) were increased significantly ($p < 0.05$) as manure rates increased. Poultry manure at 4 MT ha⁻¹ gave significant increase in fruit yield of okra in both location leading to 20.1 and 14.6% increase, respectively for Ado-Ekiti and Omuo Ekiti over the unfertilized plot (control). Leaf nutrient content was also increase with increasing rates of poultry manure. (*International Journal of Agricultural Research* 3 (1): 140-147, 2008; doi: 10.3923/ijar.2008.140.147)

Zeolite Application Affects Vegetative Phenology of Determinate and Indeterminate Soybean Grown on Allophanic Soil

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

The objective of this study was to quantify the effects of Zeolite and Allophane on vegetative phenology of determinate and indeterminate soybean. One determinate (Enrei, [MG] 1V) and indeterminate cultivar (Harosoy [MG] 11) were planted in pots on April 20th at the Faculty of Agriculture, Ehime University, Matsuyama Japan during 2007. Zeolite levels of 0, 20 and 40 g were used to determine the growth behavior of soybean cultivars grown on KyP and KnP of allophanic soil. Zeolite and allophanic soil application significantly affected vegetative phenological parameters of soybean cultivars. Minimum number of days to emergence, unifoliate first and second and 6th trifoliate leaf formation were taken by 20 and 40 g Zeolite application in both cultivars. KyP and KnP of allophanic soil took minimum days to all vegetative phenological parameters. Enrei cultivar took minimum days to emergence and in all respective vegetative developmental periods than Harosoy. Zeolite treated plots attained more plant height than control plots. Both KyP and KnP of allophanic soil gave maximum plant height as compared to paddy soil. Harosoy produced the tallest plants than Enrei. Present findings support the results of experiments by demonstrating that Zeolite application at planting time encourages the initiation of vegetative phenology of soybean cultivars grown on KyP and KnP of allophanic Soil. (*International Journal of Agricultural Research* 3 (1): 148-154, 2008; *doi*: 10.3923/ijar.2008.148.154)

Growth Responses of Marama Bean (*Tylosema esculentum*) to Water Deficit Conditions

I.S. Travlos and A.J. Karamanos

This study was undertaken in order to evaluate the influences of several water supply regimes on marama growth parameters. Therefore, glasshouse-grown marama plants were subjected to several water treatments by applying different irrigation doses. Measurements of several growth parameters were taken during all the experimental period. Vegetative growth of the more intense water-stressed plants was significantly restricted, while there was a 31-66% reduction of total dry matter production compared to the plants of the rest three water treatments.

Irrigation clearly promoted greater biomass allocation to the shoot and leaves and thereby increased the above ground: Below ground dry matter ratio. In conclusion, this study revealed the beneficial effect of an adequate water supply on growth and dry matter production of marama, which seems not to be drought tolerant-as long as it cannot grow well without a good water supply but a rather drought avoiding species, using its tubers as water reservoirs. (*International Journal of Agricultural Research* 3 (1): 155-160, 2008; **doi**: 10.3923/ijar.2008.155.160)

Production of Bacteriocins by Root Nodule Bacteria

M. Sridevi and K.V. Mallaiah

Twenty *Rhizobium* species were isolated from root nodules of 20 legume hosts and studied for their ability to produce bacteriocins. Among the 20 species, the *Rhizobium* sp. isolated from root nodules of *Crotalaria alata*, *C. juncea* and *C. laburnifolia* produced bacteriocins after 72 h of growth. It was observed that *Rhizobium* sp. from *C. alata* produced small type and highly effective bacteriocin against *Rhizobium* sp. from *Arachis hypogaea*, *Cajanus cajan*, *Clitorea ternatea*, *Dolichos lablab*, *Indigofera linnaei* and *Vigna mungo*. The bacteriocin was isolated and partially purified by chloroform extraction and ammonium sulphate fractionation. The bacteriocin was sensitive to protease and insensitive to DNase and RNase. It was stable up to temperature 80°C for 15 min. The bacteriocin fraction consistently migrated as a 29 kDa polypeptide on SDS-PAGE. (*International Journal of Agricultural Research* 3 (1): 161-165, 2008; **doi**: 10.3923/ijar.2008.161.165)

Manure and Soil Fertility Management in Sub-Humid and Semi-Arid Farming Systems of Sub-Saharan Africa: Experiences from Kenya

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A study was conducted in the sub-humid Kiambu and in the semi-arid Mbeere districts of Kenya to determine smallholder farmers' manure management practices and quantity and quality of on-farm available manure under different livestock management systems. Data collected from 60 smallholder farmers identified manure management practices to be variable and poor irrespective of management system. The quality of cattle manure in the open grazing systems of Mbeere was poorer (1.22% N; 0.09% P; 2.14% K) and of higher variability than manures from

zero-grazing systems of Kiambu (1.41% N; 0.53% P; 1.54% K) where animals are supplied with high quality feed supplements. We calculated the potential manure production to be 3.1 and 0.7 tonnes DM year⁻¹ farm⁻¹ for Kiambu and Mbeere, respectively. Faced with low manure availability, farmers adopted manure management strategies that included accumulation in livestock pens and or removal from livestock pens and storing over time before spatial and temporal application to selected crops and plots in a rotational pattern. In both study sites, the sole application of manure or inorganic fertilizers proved limited in providing a comprehensive solution to crop nutrient supply. Given this limitation and the differential farmer resource endowments in sub-humid and semi-arid study sites, appropriate strategies for improving manure storage, quantity and quality, efficient manure use and application methods and integrated soil fertility management need to be developed, separately for each livestock management system, to enhance crop nutrient supply. (*International Journal of Agricultural Research* 3 (1): 166-187, 2008; doi: 10.3923/ijar.2008.166.187)

Resource-Poor Farmers' Constraints Regarding Integrated Soil Fertility and Nutrient Management System Practices: A Study in Rural Bangladesh

M.G. Farouque and H. Takeya

The main focus of this study was to determine the constraints faced by resource-poor farmers concerning the practice of ISF and NM systems of crop production. Field work was conducted in eight villages from four districts in Bangladesh and data were collected from 92 resource-poor farmers through group discussions and personal interviews. Four-point rating scales were used and summed to quantify farmers' constraints. Frequency distributions and a Constraint Index (CI) were used to measure the constraints faced by the different categories of resource-poor farmers. Present findings indicate that landless and marginal categories of resource-poor farmers faced comparatively more constraints than resource-poor small farmers did. Present findings also revealed that the constraint on landless and marginal farmers were similar, while the situation, faced by small farmers was different. Based on the Constraint Index (CI), the top two constraints for landless and marginal farmers were a lack of knowledge about ISF and NM systems and the lack of financial resources to buy fertilizers in time. On the other hand, the unavailability and unstable market price of fertilizers during crop seasons and limited initiatives by the agricultural extension department to motivate farmers to practice ISF and NM were the major constraints on small farmers according to the CI concerning the practice of ISF and NM regarding crop production. (*International Journal of Agricultural Research* 3 (1): 188-195, 2008; doi: 10.3923/ijar.2008.188.195)

Effect of L-Ascorbic Acid and Sodium Metabisulfite in the Inhibition of the Enzymatic Browning of Minimally Processed Apple

William Renzo Cortez-Vega, Angelica Maria Becerra-Prado, Juliana Marques Soares and Gustavo Graciano Fonseca

The browning of fruits after the harvest, storage or in consequence of damage has great visual impact and diminishes the commercial, sensorial and nutritional quality of these fruits. The enzymatic browning that occurs in the cut surface of eatable tissue minimally processed affects the shelf life of these products. It was analyzed the inhibitory effect of ascorbic acid and sodium metabisulfite on the enzymatic browning of minimally processed apples stored at 5°C, packed or not. The region with stronger enzymatic browning was more intense near to the epidermis, in the central part and around the vascular bundles. The direct application of the sodium metabisulfite solution 10 mM on minimally processed apples packed with PVC film and cooled at 5°C conserved the original color of the minimally processed apples up to seven days. (*International Journal of Agricultural Research* 3 (1): 196-201, 2008; *doi*: 10.3923/ijar.2008.196.201)

Assessing Potential Drought Avoidance for Five Crops in Iran Using Long-Term Weather Data

M. Gholipoor and A. Soltani

Drought may be avoided by matching crop phenology with periods during the cropping season, when water supply is likely to be more abundant. We evaluated long-term (39 to 44 years) weather data for 5 crops (chickpea, spring barley and wheat, lentil and winter wheat) in 5 locations in Iran to assess the potential for drought avoidance. For each day of the year, water deficit was estimated as the difference between the 7 days running sums of rainfall and potential evapotranspiration. For comparative purposes across locations, across crops and across seasons, a 7 days water deficit >50 mm was considered as a drought. Results indicated that among locations, Kermanshah had relatively higher, but Isfahan and Mashhad had lower Drought Risk (DR) for spring crops. Tabriz appeared to have lower DR for spring barley and wheat. The higher DR for winter wheat was also obtained for Kermanshah. Averaged over locations, winter wheat had the highest possibility for Potential Drought Avoidance (PDA). The spring crops with lower base temperature (like spring barley and spring wheat) tended to experience higher PDA than those with higher base temperature (like lentil). It

was evident that delayed sowing dates would result in higher DR and decreased water use efficiency. Therefore, other strategies, including dormant sowing and use of cultivars with lower base temperature for earlier sowing should be chosen for increased PDA in Iran. (*International Journal of Agricultural Research* 3 (1): 202-210, 2008; doi: 10.3923/ijar.2008.202.210)

Agronomy and Processing Attributes of Some Cassava (*Manihot esculenta*, Crantz) Genotypes as Affected by Location and Age at Harvest in Ghana

E. Baafi and O. Safo-Kantanka

The influence of age on tuber yield, dry matter content, cooking quality and flour, gari and starch yield were studied on 4 cassava accessions (DMA-002, WCH-037, NKZ-009 and NKZ-015) at six selected locations in the Forest and the Transition ecozones of Ghana in 2004/2005. The aim was to determine the effect of age, variety and location on agronomic and processing characteristics of cassava genotypes at the Forest and the Transition ecozones of Ghana. Data were collected for the tuber yield, dry matter content, cooking quality, flour, gari and starch yields. Planting was done at 1×1 m with each genotype occupying half of an acre to facilitate continuous harvesting and for large tuber samples of 25 kg to be processed into flour, gari and starch. Harvesting which began at 12 months after planting was continued monthly until 15 months of age. Tuber yield of the genotypes was generally higher in the Transition than the Forest. In addition, DMA-002 and WCH-037 produced the higher tuber yield than the NKZ-lines in the Transition belt but not in the Forest ecozone. Genotypes did not only vary in dry matter content at the two ecozones but also the age at harvest. Cooking quality of the DMA-002 and WCH-037 was better than the NKZ-lines. Obtained results revealed that the optimum age for root tuber yield did not coincide with that of the flour, gari and starch. Similar observation was made between the starch, flour and gari. (*International Journal of Agricultural Research* 3 (1): 211-218, 2008; doi: 10.3923/ijar.2008.211.218)

Alteration of Cellular Nutritional Elements and Nucleic Acids of Papaya Leaves Infected with Seven Symptomatic Isolates of PRSV-P

H. Rahman, M.M. Alam and A.M. Akanda

The diverse nature of shift in the amount of cellular nutritional elements and nucleic acids as affected by the infection of different isolates of Papaya Ring Spot Virus-

Papaya strain (PRSV-P) was studied in this experimentation. The symptomatic isolates used in the present study were mild mosaic, mosaic, fern leaf, severe mosaic, vein clearing, leaf distortion and chlorotic leaf spot. Parameters measured to quantify the alteration of cellular components comprised different nutritional cellular elements (C, N, P and K) and nucleic acids (DNA and RNA). In all occasion of measured parameter, the highest alteration was found in leaf distortion. Almost in all cases the lowest effect was determined with the Mild Mosaic infected plants followed by the mosaic, severe mosaic, vein clearing, chlorotic leaf spot, fern leaf and leaf distortion. Infection of seven different symptomatic isolates of PRSV-P created striking and responsive variability in all parameters studied. And the dependency of the cellular nutritional elements and nucleic acid on seven symptomatic variants of PRSV-P was found significantly correlated in respect to the corresponding yield. (*International Journal of Agricultural Research 3 (1): 219-226, 2008; doi: 10.3923/ijar.2008.219.226*)

Enzyme Polymorphism and Genetic Diversity in *Xanthomonas oryzae* pv. *oryzae* Isolates Causing Rice Bacterial Leaf Blight Disease in West Africa

A. Onasanya, M.M. Ekperigin, Y. Sere, F.E. Nwilene and J.O. Ajele

Genetic diversity of 30 *Xanthomonas oryzae* pv. *oryzae* (Xoo) isolates, causing rice bacterial leaf blight disease in West Africa, was carried out using isozyme PAGE analysis. Of 13 enzyme systems evaluated, SKDH, EST and G6PH showed adequate resolution, enzyme activity and polymorphism and were used to analyze the total proteins from all the 30 isolates. The study revealed 23 isozyme loci in which SKDH produced 33.3-93.3% polymorphism, EST and G6PH equally gave 40-96.7% polymorphism within the Xoo isolates enzyme profile. These 23 isozyme loci were used to construct phylogenetic relationship cluster among 30 Xoo isolates, of which the Xoo isolates were classified into two major genetic groups (Xoo-A and Xoo-B) with two subgroups each (Xoo-A1 and Xoo-A2) and (Xoo-B1 and Xoo-B2). The 23 isozyme markers obtained clustered into 3 major groups (Gp-1, Gp-2 and Gp-3). Genetic study revealed that Gp-1 is genetically linked to the identification of Xoo-A1 genotype, Gp-2 to Xoo-A2 and Gp-3 characterized Xoo-B1 and Xoo-B2 genotypes. The distinct pattern of each isolate obtained suggests high level of genetic variation and frequent occurrence of mutants in Xoo isolates in different host cells. This information could be useful in rice breeding programs aiming at development of durable Xoo resistant rice cultivars to different rice ecologies and localities in West Africa. (*International Journal of Agricultural Research 3 (1): 227-236, 2008; doi: 10.3923/ijar.2008.227.236*)

Physico-Chemical and Anti-Nutritional Properties of Some Lesser Known Tree and Leguminous Seeds

M.A. Belewu, T. Fagbemi, O.O. Dosumu and M.O. Adeniyi

Seeds of *Adansonia digitata*, *Voandzeia subterranean* (L.) Thouars, *Bilighia sapida*, *Entada africana*, *Leucana leucocephala* and *Mucuna preta* were evaluated for their nutritional quality and possible inclusion in ruminant diet. The seeds were analysed for their proximate composition, fibre fractions, mineral composition, energy value and the anti-nutritional factors. The results revealed that the seeds contained between 10.5 and 41.4% crude protein, 7.5 and 22.5% ether extract, 15.5 and 19.5% crude fibre, 17.0 and 39.0% acid detergent fibre, 41.0 and 84.0% neutral detergent fibre and 4.38 and 5.46 kcal/100 g ME. It was also observed that the sodium content was between 0.10 and 0.30 mg/100 g, 1.9 and 15.5 mg/100 g calcium, 8.95 and 46.10 mg/100 g magnesium while the potassium was between 8.95 and 45.15 mg/100 g and the iron content falls between 0.17 and 0.95 mg/100 g. Some anti-nutritional factors (tannin and saponin) were detected and quantified. In conclusion, all the seed samples are potential good sources of dietary energy, protein and mineral content in livestock diet. (*International Journal of Agricultural Research* 3 (1): 237-242, 2008; doi: 10.3923/ijar.2008.237.242)

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

Nsalambi V. Nkongolo, Kanta Kuramochi and Hatano Ryusuke

We studied the spatial variability of soil physical properties and related these properties to N₂O emissions. The study was conducted in a Japanese lowland soil cropped to onion in Mikassa, Hokkaido (Japan). N₂O emissions measurements and soil sampling were conducted along a 100×100 m (1999) and 60×60 m (2000) grids with samples taken at 10 m spacing. Air samples for N₂O determination were collected using the closed-chamber technique. Air samples were stored in vial bottles for analysis with a gas chromatograph with electron capture detector within 24 h after sampling. Soil samples were collected with a 5 cm diameter and a 5 cm height cylinder. Soil physical properties measured were soil temperature (T), bulk density (ρ_b), volumetric water content (θ_v), gravimetric water content (θ_g), air-filled porosity (f_a), total pore space (TPS), relative gas diffusivity coefficient (D_g/D_o) and the pore tortuosity factor (τ). Results showed

that N₂O emissions were highest in 1999 as compared to 2000. They were fitted to a linear variogram in 1999 while they responded to a spherical variogram model in 2000. Positive first degree surface trends were also found in N₂O emissions data in both years and the removal of these trends did not change variogram models, but significantly improved them by increasing the R² and Q values. Soil physical properties responded to a range of variograms, from linear to spherical models. Detrending soil physical properties either increased (T) or decreased (θ_v) the range and R² values. Soil T, τ, D_s/D_φ, WFPS were significantly correlated with N₂O emissions. N₂O emissions and soil properties varied considerably in space and time. More studies are needed to identify other soil physical properties which might better correlate with N₂O emissions, besides the traditional T and WFPS. (*International Journal of Agricultural Research* 4 (1): 1-16, 2009; doi: 10.3923/ijar.2009.1.16)

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

Nsalambi V. Nkongolo, Kanta Kuramochi and Hatano Ryusuke

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

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

M.G. Farouque and H. Takeya

The major purpose of the study was to determine the extent of preferences of different categories of farmers for effective extension teaching methods aimed at encouraging adoption of the Integrated Soil Fertility (ISF) and Nutrient Management (NM) approach. Data were collected from 120 farmers from eight villages in four districts in Bangladesh between December 2007 and January 2008. Of these farmers, 39 landless, 34 marginal, 19 small, 20 medium and 8 were large farmers. A four-point rating scale was used to analyze the preferences: strongly resist, mildly resist, mildly prefer and strongly prefer corresponded to scores of 0, 1, 2 and 3, respectively. The majority of the landless, marginal and small farmers preferred individual extension teaching methods; on the other hand, the largest segment of medium and large farmers preferred group and mass extension teaching methods. Inadequate education, poor training and low income were the major reasons for the landless, marginal and small farmers' relatively higher preferences for individual teaching methods. The channel of transfer of crop production technology showed that extension service providers had very little involvement in pre-extension activities. Conversely, farmers and farmers' representatives played very little role in planning, implementing, evaluating and verification of trials undertaken by the extension department. Present different farmers' groups require different types of extension teaching methods in order to adopt the ISF and NM approach. (*International Journal of Agricultural Research* 4 (1): 29-37, 2009; doi: 10.3923/ijar.2009.29.37)

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

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

A novel HMW-GS of Bx6** , with slightly slower migration rate than that of Bx7 presented in wheat cultivar Chinese Spring, was found in a Tibet bread wheat landrace using SDS-PAGE. The gene for this subunit was isolated and its sequence was obtained. This gene was very similar to Bx7 both in nucleotide and

deduced amino acid sequence. At the nucleotide sequence level, Bx6** different from Bx7 by the deletion of an 18 bp fragment and three nucleotides replacement at position 455 A/G, 2046 G/A and 2208C/G, respectively. At the deduced amino acid sequence level, the only difference is that Bx6** shorter than Bx7 by the deletion of a hexaploid peptide unit (PGQGKQ). These results suggested that Bx6** was a derivation of Bx7 and was formed by replication slippage. (*International Journal of Agricultural Research 4 (1): 38-45, 2009; doi: 10.3923/ijar.2009.38.45*)

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

Mohd Razi Ismail and S. Phizackerley

The aim of the experiment was to examine the application of partial rootzone drying and deficit irrigation on growth and plant development of tomatoes. Potted fresh market tomatoes (*Lycopersicon esculentum* Mill.) in pots were subjected to partial root zone drying (PRD) and controlled deficit irrigation (CDI) under glasshouse conditions. Roots of plants were remained attached to plants and half the volume divided in one plant and the other half planted in the other adjacent pot. The treatments were: well-watered continually maintained close to field capacity in both pots (control), CDI₅₀ (half the amount of water in control divided equally to both pots with each watering), PRD₅₀ (half the amount of water in control applied to one pot while water was withheld from the other pot until soil water declined to 50-70% the field capacity and then water was applied to the other pot), PRD₂₅ (half the amount of water in control was applied to one pot while water was withheld from the other pots until soil moisture declined to 25-50% field capacity and then water was applied to the other pot) and CDI₂₅ (quarter amount of water in control divided equally to both pots with each watering). Imposing water deficit reduced fruit yield up to 18% in PRD₅₀ and 33% in CDI₅₀ which coincided with an impairment of fruit expansion. The percentage of fruit dry matter and osmotic potential increased in both PRD and CDI compared with the control. The incidence of blossom end rot increased in both CDI and PRD₂₅ compared with the control and PRD₅₀ treatments. Cell wall peroxidase in the epidermal layer of fruit may have a role in cessation of fruit expansion towards fruit maturity under reduced water availability. (*International Journal of Agricultural Research 4 (1): 46-52, 2009; doi: 10.3923/ijar.2009.46.52*)

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

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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

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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

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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

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A field experiment has been conducted at garden lands (*Vertic ustochrept*) of Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during Kharif (June to October) season of 2004 to ascertain the optimum nutrient requirement for groundnut+sunflower intercropping system under irrigated conditions with replacement series to enhance the productivity of groundnut+sunflower inter cropping system. Groundnut was raised as main crop and sunflower was planted as intercrop with 3:1 ratio. There were ten treatments viz., control (T₁), 100% Recommended Dose of Fertilizers (RDF) to main and inter crops (T₂), 100% RDF to main crop+no fertilizer to intercrop (T₃), 100% RDF to main crop+100% RDF to intercrop (T₄), 100% RDF to main crop+50% RDF of intercrop (T₅), T₃+50% RDF to intercrop as basal+50% N to intercrop as top dress (T₆), T₃+50% N to intercrop as basal (T₇), T₃+100% PK of intercrop as basal+50% N as basal+50% N as top dress (T₈), pure crop of sunflower with RDF (T₉) and pure crop of groundnut with RDF (T₁₀) were tested in randomized block design with three replications. All the above fertilizer

treatments were imposed based on the area. 100% RDF to groundnut (main crop)+100% RDF P and K to sunflower (intercrop)+50% of N basal and 50% of N as top dressing to sunflower increased yield attributes, yield and oil contents of groundnut and sunflower. So, 100% recommended doses of NPK fertilizer to groundnut+100 RDF PK to sunflower with 50% N as basal and 50% (T_0) as top dressing will be optimum to realize maximum yield under groundnut+sunflower intercropping system in irrigated conditions. (*International Journal of Agricultural Research* 4 (2): 97-106, 2009; doi: 10.3923/ijar.2009.97.106)

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

M.A. EL-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 $0.13 \text{ t kg}^{-1} \text{ N}$ 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 ($12783.7 \text{ kg ha}^{-1}$) 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 $12413.8 \text{ kg ha}^{-1}$, respectively. 1552.6°C day in Gina and Nassau, 795.3°C day in Gina and 958.7°C day in Volare were calculated as the highest thermal times for a, b and c, respectively. (*International Journal of Agricultural Research* 4 (3): 124-130, 2009; doi: 10.3923/ijar.2009.124.130)

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

Haiqing Yu, Chunbang Ding, Chun Zhang and Yonghong Zhou

In order to obtain more cytological data, the karyotypes of *Pseudoroegneria gracillima* and *P. kosaninii* were investigated. Root tips of *P. gracillima* and

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

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

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

Whole body extracts and air collections from *Creontiades dilutus* males and females were analyzed to identify the sex pheromone components. The major component, hexyl hexanoate was found in whole body extracts and air collections from both sexes, while the minor component, (*E*)-2-hexenyl hexanoate, was only present in the female air collections. Field trapping experiments were conducted to determine the attractiveness of either of the single components and various binary blends to males. The optimum blend that consistently caught males in pheromone traps was a 5:1 ratio of hexyl hexanoate and (*E*)-2-hexenyl hexanoate. Trapping studies also showed that green mirids came to pheromone traps only between 18:00 and 06:00 h, suggesting that they might be nocturnal rather than diurnal insects as previously thought. (*International Journal of Agricultural Research* 4 (4): 137-145, 2009; doi: 10.3923/ijar.2009.137.145)

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

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

In order to measure the impact of planting on the ground, the present study was undertaken to evaluate the evolution of particle size, chemical and physicochemical properties of soil during two consecutive cycles of cultivation of palm oil trees. The

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

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

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

Attempts were made at applying green mirid pheromones in a sprayable formulation for mating disruption and attract-and-kill in *Creontiades dilutus* (Stål), an emerging significant pest of cotton and other crops in Australia. In the mating disruption trials, a total trap shutdown for 2 days was observed. The short trap shutdown period is thought to have arisen from the formulation used. In the attract-and-kill work, efforts made to locate and count dead mirids for quantification did not work. Either the insecticide did not kill the mirids fast enough, resulting in their moving away from the treated row before dying, or the low numbers of mirids present made the sampling method ineffective. However, the trap results suggest that attract-and-kill for male green mirids remains a promising option. As with mating disruption, however, further work needs to be done on a long lasting formulation to overcome potential problems with reinvasion of treated fields. (*International Journal of Agricultural Research* 4 (4): 153-162, 2009; doi: 10.3923/ijar.2009.153.162)

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

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

Feasibility study of biohydrogen production from Palm Oil Mill Effluent (POME) using POME sludge as a mixed culture of natural inoculum was conducted. The

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

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

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The effect of pre-sowing seed treatments in direct-seeding rice production system on the germination, seedling vigor of rice cv. KDML 105 was evaluated through investigating the biochemical changes during storage following seed coating techniques. The seeds were coated by traditional fungicide (captan; CA), biological fungicide polymers [chitosan-lignosulphonate polymer (CL) and eugenol incorporated into chitosan-lignosulphonate polymer (E+CL)] and un-coated seeds as control (CO). CA significantly affected the rice seed storability and the associated biochemical deterioration. After 12 months storage, seed moisture content and seed water activity increased that affected the germination rate and spread, seedling vigor; seedling dry weight, shoot and root length, seedling growth rate and susceptible to stress conditions. The loss of viability is associated with disturbances of the cell membranes, the loss of enzymes; α -amylase, ascorbate peroxidase APX and superoxide dismutase SOD activity, sugars and lipid content accompanied by increased free fatty acid FFA and activated lipoxygenase enzyme LOX. CL and E+CL performed the best of seed vigor, because they could maintain the antioxidative scavenging enzymes are APX and SOD and a high antioxidant activity. In addition, α -amylase activity and sugar content increased which was positive correlated with seed germination and vigor. These improvements were attributed to maintain the nutritive reserve and dehydrogenase activity in seeds. Moreover, the biological seed treatments stimulated the embryo growth and so speeding up the seedling emergence. (*International Journal of Agricultural Research* 4 (5): 169-184, 2009; doi: 10.3923/ijar.2009.169.184)

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

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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

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An experiment to determine the effects of different levels of nitrogen and phosphorus fertilizers on the growth and yield of maize was conducted between June and October, 2007 at the Teaching and Research Farm of the Federal University of Technology, Akure. The experiment was laid out in a Randomized Complete Block Design (RCBD) consisting of twelve treatments with three replicates. The treatments were, 0 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₁), 60 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₂), 120 kg N ha⁻¹ + 0 kg P ha⁻¹ (T₃), 0 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₄), 0 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₅), 0 kg N ha⁻¹ + 60 kg

P ha⁻¹ (T₆), 60 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₇), 60 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₈), 60 kg N ha⁻¹ + 60 kg P ha⁻¹ (T₉), 120 kg N ha⁻¹ + 20 kg P ha⁻¹ (T₁₀), 120 kg N ha⁻¹ + 40 kg P ha⁻¹ (T₁₁) and 120 kg N ha⁻¹ + 60 kg P ha⁻¹ (T₁₂). The result of the study showed that application of 120 kg N ha⁻¹ + 0 kg P ha⁻¹ and 60 kg N ha⁻¹ + 40 kg P ha⁻¹ significantly increased the growth of maize than other treatments. The application rate of 120 kg N ha⁻¹ + 40 kg P ha⁻¹ significantly ($p = 0.05$) enhanced grain yield. The study therefore suggests that, for optimum grain yield, 120 kg N ha⁻¹ + 40 kg P ha⁻¹ should be applied particularly in the study area and its environment. (*International Journal of Agricultural Research* 4 (6): 193-203, 2009; doi: 10.3923/ijar.2009.193.203)

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

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The effects of rye green manure application along with different levels of nitrogen fertilizer on wheat production was investigated under rainfed dryland condition. This study was carried out with or without rye green manure along with 4 nitrogen fertilization treatments (0, 26, 103 and 337 kg N ha⁻¹) in 3 rotation system (green manure-wheat) between 1999-2007 years. Results showed that the effects of green manure application with different amount of N fertilizers on wheat production tended to be significant. A maximum grain yield (2484 kg ha⁻¹) was obtained by application of rye green manure along with 26 kg N ha⁻¹ and minimum yield (1757 kg ha⁻¹) from rye green manure without nitrogen application. Furthermore, crop morphophysiological characteristics including harvest index, spike length, number of spikes per square meter, number of tillers and thousand kernel weight (TKW) in plant tended to increase compared with check (green manure without N). It can be concluded that, application of green manure with nitrogen could indirectly increase Sardari yield by increasing yield components such as TKW and number of spikes per square meter. (*International Journal of Agricultural Research* 4 (6): 204-212, 2009; doi: 10.3923/ijar.2009.204.212)

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

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The aim of this study was to evaluate the effects of nitrogen fertilizer rates on dry matter remobilization among three rice cultivars. A field study was carried out at

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

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

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The study was conducted to evaluate the effects of various sucrose concentrations on *Mokara* orchid shoots (0.5-1.0 and 1.0-1.5 cm) after precultured at 24 and 48 h. The 1.0-1.5 cm of *Mokara* shoots preculture at 0.25 M sucrose for 48 h was the best condition based on TTC assay and subsequently used for the following PVS2 vitrification treatment. The selected *Mokara* orchid shoots were subjected to PVS2 treatment at different time of exposure (min) and temperatures (0 and 24°C). The results showed that viability of shoots reached the highest absorbance value at 10 min and 24°C. However, for the overall treatment with the results shown that 0°C temperature treatment gave the higher absorbance value which could reduce the injurious effects of PVS2. For chlorophyll determination, cryopreservation of shoots at 0°C without LN (LN-) for 5 min exposure to PVS2 recorded as highest chlorophyll content. The result also shows that total chlorophyll a for shoot in all treatment were higher than chlorophyll b. (*International Journal of Agricultural Research* 4 (7): 218-227, 2009; *doi*: 10.3923/ijar.2009.218.227)

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

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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

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To evaluate High Molecular Weight (HMW) glutenin subunit comparison in *Triticum turgidum* sp. *polonicum*, HMW glutenin subunits of 22 accessions were analyzed using SDS-PAGE. The result showed that the variation in the number of HMW glutenin subunits in this taxon ranged from 1-3. A dwarfing accession of *T. turgidum* sp. *polonicum* (dwarfing polish wheat) from Xingjiang in China has two putative expressed HMW glutenin subunits. Three complete coding region sequences of HMW glutenin subunit genes were amplified from dwarfing polish wheat using PCR method. The PCR products were derived from 1Ax (1Ax-dp), 1Bx gene (1Bx-dp) and a silent 1Ay (1Ay-dp) gene. The complete ORF of x-type HMW glutenin genes, 1Ax-dp and 1Bx-dp, were 2508 and 2385 bp in size, encoding 836 and 795 amino acids, respectively. The silent 1Ay-dp

gene contained an in-frame internal stop codon and was 1806 bp in size. Sequence comparison indicated that they had primary structure identical to the published HMW glutenin subunits. Phylogenetic analysis suggested that *1Ax-dp* from dwarfing polish wheat was most closely related to 1Ax1 and 1Ax2* from *Triticum aestivum*, while *1Bx-dp* from dwarfing polish wheat was most closely related to 1Bx7 from *Triticum aestivum*. Based on sequence comparison, SDS-PAGE and phylogenetic analysis, it can be deduced that *1Ax-dp* and *1Bx-dp* are additional alleles at the *Glu-A1* and *Glu-B1* loci, respectively. (*International Journal of Agricultural Research* 4 (8): 237-249, 2009; doi: 10.3923/ijar.2009.237.249)

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

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In this study, Oil Palm Empty Fruit Bunch (OPEFB) were subjected to chemical and microbial pretreatment for bioconversion of lignocellulosic biomass to fermentable sugars. For chemical pretreatment, 2% (w/v) sodium hydroxide (NaOH) was been used for delignification while for microbial pretreatment, *Phanerochaete chrysosporium* ATCC 32629 was used as model microorganism by liquid and solid state culture techniques. Microbial pretreatment showed significant lignin removal with longer delignification time as compared to chemical pretreatment. For the same value of Klason lignin, delignification by chemical pretreatment need only 3 h as compared to 7 days for microbial pretreatment. The optimum value of Klason lignin for microbial pretreatment and chemical pretreatment were 5.89 and 5.93, respectively. In conclusion, delignification of OPEFB can be achieved via chemical and microbial pretreatment. (*International Journal of Agricultural Research* 4 (8): 250-256, 2009; doi: 10.3923/ijar.2009.250.256)

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

B. Chutichudet and P. Chutichudet

A study to evaluate boron, in terms of borax ($B_4O_5 \cdot 2Na \cdot 10H_2O$) or boric (H_3BO_3) by foliar spraying, on growth and external qualities was conducted on lettuce var. Grand Rapids under field conditions. A Factorial in Completely Randomized

Design was arranged with four replications and composed of two factors; two types of boron (borax or boric) with four concentration rates (0, 0.0625, 0.125 or 0.1875%). The results showed that plants-treated with 0.0625% boric had the maximal plant height and bush size. While two types of boron at any concentration had no effect to biomass, chlorophyll content and the leaf colour. Furthermore, plants treated with 0.0625% boric experienced the lowest browning appearance at harvesting stage. (*International Journal of Agricultural Research* 4 (9): 257-269, 2009; doi: 10.3923/ijar.2009.257.269)

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

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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)