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Effect of Si/Al Ratio of Allophane on Competitive Adsorption of Phosphate and Oxalate

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Allophane is a soil clay constituent with high adsorption capacity for cationic and anionic solutes and the adsorption characteristics depend on its Si/Al molar ratio. Adsorption experiments of phosphate and oxalate on two natural allophane samples with low (0.67; KyP) and high (0.99; KnP) Si/Al ratios were conducted at initial adsorbate concentration of up to 0.6 mM and at pH of 5.0 to 7.0. In both single and binary (equimolar phosphate and oxalate) adsorbates systems, KnP had less capacity for adsorption of both phosphate and oxalate than KyP had, because in the structure of KnP, accessory Si is already adsorbed onto aluminol groups to which phosphate and oxalate will be adsorbed. For KyP with lower Si/Al ratio and higher adsorption capacity, the efficiency of phosphate to depress the adsorption of coexisting oxalate, $E_{\text{OX-P}}$, was always greater than the reverse efficiency, $E_{\text{P-OX}}$ at a same condition; the ratio of oxalate/phosphate adsorbed in the binary system was less than unity and the ratio decreased with increasing pH and initial adsorbate concentration. These indicated higher selectivity of KyP for phosphate than for oxalate and the selectivity increased with increasing the competition between phosphate and oxalate toward KyP. KnP with higher Si/Al ratio showed higher selectivity for phosphate than KyP did, but the ratio of oxalate/phosphate adsorbed was almost constant when pH and initial adsorbate concentration were raised. This means that even under the lowest pH and the lowest adsorbate concentration examined (pH 5.0, 80 μM), the competition between phosphate and oxalate toward KnP was already severe and further increase in the phosphate selectivity was not caused. (*International Journal of Soil Science* 4 (1): 1-13, 2009; doi: 10.3923/ijss.2009.1.13)

Determination of Critical Levels of Micronutrients by Plant Response Column Order Procedure for Dryland Wheat (*T. aestivum* L.) in Northwest of Iran

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Plant response column order procedure was used to determine critical levels of Fe, Mn, Zn, Cu and B for dryland wheat in West Azarbaijan, East Azarbaijan, Kurdistan and Kermanshah Provinces of Iran. Series of experiments were conducted in randomized complete block design with 4 treatments of each micronutrients (0, 5, 10 and 15 kg ha⁻¹ Fe as iron chelate (NaFeEDDHA); 0, 5,

10 and 15 kg ha⁻¹ Mn as manganese sulfate; 0, 5, 10 and 15 kg ha⁻¹ Zn as zinc sulfate; 0, 2.5, 5 and 7.5 kg ha⁻¹ Cu as copper sulfate and 0, 1.5, 3 and 4.5 kg ha⁻¹ B as boric acid) with three replications for four years (1998-2002). The collected data were used in plant response column order procedure and interaction chi-square (probability of no interaction between soil classes) models. The results for boundary of between soil deficient and sufficient classes or critical levels by plant response column order procedure and interaction chi-square model for Fe, Mn, Zn, Cu and B critical values were determined as 4.7, 11.2, 0.7, 1.4 and 0.5 mg kg⁻¹ soil, respectively; predictable values for critical levels of micronutrients were also calculated as 99.5, 94, 87, 88 and 78%, respectively. From the results, it can be concluded that soil Fe, Mn, Zn, Cu and B requirements and dryland wheat response relationships can be determined by plant response column order procedure and interaction chi-square methods. These methods can be applicable for classifying and prediction of soil micronutrient needs in dryland wheat cultivation in Northwest region of Iran. (*International Journal of Soil Science* 4 (1): 14-26, 2009; doi: 10.3923/ijss.2009.14.26)

Effects of Ammonium and Iranian Natural Zeolite on Potassium Adsorption and Desorption Kinetics in the Loess Soil

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Information about the adsorption and desorption kinetics of potassium and the consequent alterations with zeolite additions are limited in Golestan Province loess soils with illite dominance in the clay fraction. The kinetics of potassium adsorption and desorption with different KCl concentrations (0, 40, 60, 80, 110 and 140 mg L⁻¹) and KCl+NH₄Cl concentrations (K80,N60; K80,N120; K60,N60; K110, N120; K80, N90 and K110, N90 mg L⁻¹) on the soil, the zeolite and their incorporation (within 2 and 1800 h) were investigated with this research using batch method. Potassium adsorption and desorption was initially fast (first 48 h) but continued with low speed (after 48 h) until the end of the experiment. Results shown increasing of K⁺ concentration increased rate of adsorption and desorption in soil, zeolite and their incorporation and zeolite increased adsorption and decreased desorption rate by incorporation with soil. Ammonium presence decreased potassium adsorption and it increased potassium desorption. K/NH₄ desorption rate did not follow exactly K/NH₄ adsorption ratio for all treatments. The kinetic equations used to estimate data were zero order, first order, simple Elovich, parabolic diffusion and power function. The Elovich model described the adsorption and desorption processes on soil and soil with zeolite (0.88<R²<0.99). Elovich and power function models described adsorption and desorption

processes, respectively for zeolite well ($0.65 < R^2 < 0.97$). The models indicated that K^+ adsorption and desorption was diffusion controlled. Potassium adsorption and release by batch method did not simulate potassium uptake by wheat. (*International Journal of Soil Science*, 4 (2): 27-45, 2009; doi: 10.3923/ijss.2009.27.45)

Copper Correlation of Irrigation Water, Soils and Plants in the Cukurova Region of Turkey

Seyyid Irmak

In this study, copper content of soil and irrigation water and copper content of leaves and grain of wheat (*Triticum* spp.) were studied. Study samples of soil, leaf and grain were collected from wheat (*Triticum* spp.) fields in Cukurova Region of Turkey. Soil samples taken from the root area of plants where the leaf and grain samples were collected and analyzed for copper (Cu) content. The leaf samples taken during the stem elongation and the grain samples taken at the time of maturation were also analyzed for Cu content. The correlation analysis between soil-Cu contents and leaf and grain-Cu contents was performed to determine the relationships among the variables. The Cu content of the soil samples collected in 2005 was between 0.78 and 1.56 mg kg⁻¹. The Cu content of the soil samples collected in 2006 was between 1.12 and 1.96 mg kg⁻¹. The copper content of the majority of soil samples, collected in 2005 was observed above the critical level which is 1 mg kg⁻¹. The Cu content of the leaf samples was ranged from 26.30 to 67.60 mg kg⁻¹ in 2005 and 3.06 to 18.02 mg kg⁻¹ in 2006, whereas the copper content of the grain samples was ranged from 11.77 to 17.89 mg kg⁻¹ in 2005 and 7.37 to 14.06 mg kg⁻¹ in 2006. According to data analysis performed in collected samples, the Cu content of the leaf and grain samples was directly correlated with the Cu content of the soil. Correlation between copper content of soil and copper content of leaf in 2006 are significant at the 0.01 level based on the statistical analysis. Also, correlation between copper content of soil and weight of 1000 grain in 2005 and in 2006 are significant at the 0.01 level in respect of statistical analysis. (*International Journal of Soil Science*, 4 (2): 46-56, 2009; doi: 10.3923/ijss.2009.46.56)

Influence of Compaction Curve Modeling on Void Ratio and Pre-Consolidation Stress

S. Narra

The objective of this study is to investigate the influence of different consolidation curve models on the initial void ratio values and through which on the obtained

pre-consolidation stress. Further, this study verifies the dependence of pre-consolidation stress on the initial void ratio value measured at 1 kPa. This was done in order to check the trend between the consolidation curve models and the deviation in pre-consolidation stresses. Three different Oedometer tests have been carried out which were denoted as undisturbed, disturbed and disturbed-rewetted. The curves were fitted using two different curve models (Assouline and Van Genuchten models) and the graphical calculation of the pre-consolidation stress was done using two different methods (Casagrande and Silva methods). The curve models are applied on the compaction data obtained from the soil classified as loamy sand. A good consolidation curve fit to the data (R^2 ranging between 0.97 and 0.99) has been verified for a wide range of applied stresses (0 to 2500 kPa), including stresses less than the pre-consolidation stress. Huge differences in the initial void ratio values (Δe ranging between 0.003 and 0.423) have been observed with different curve models and with which a huge difference in pre-consolidation stresses (ΔP ranging between 0 and 57 kPa) have been observed. This study clearly showed that the pre-consolidation value obtained was mainly dependent on the curve fitting model and also on the calculating method. This study also showed a dependence of pre-consolidation stress over the void ratio measured at 1 kPa. (*International Journal of Soil Science*, 4 (2): 57-66, 2009; doi: 10.3923/ijss.2009.57.66)

Soil Enzymes Activities in Irrigated and Rain-Fed Vertisols of the Semi-Arid Tropics of Sudan

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Soil management practices that involve intensive traditional ploughing and disking may affect soil quality. Soil enzymes activities were investigated from crop rotations in irrigated and rain-fed areas. Soil samples collected from long term (79 years), medium-term (46 years) and short-term (22 years) irrigated cotton (*Gossypium hirsutum*) schemes and rainfed cultivation of sorghum (*Sorghum bicolor*) and sesame (*Sesamum indicum*) in a semi-arid tropical Vertisol. Alkaline phosphatase was significantly higher in both short-term (661 $\mu\text{g p-nitrophenol g}^{-1} \text{ soil h}^{-1}$) and rain-fed cultivation (605-747 $\mu\text{g p-nitrophenol g}^{-1} \text{ soil h}^{-1}$). Long- and medium-term cultivation in the irrigated sector had significantly less protease activity [3.75-4.73 $\mu\text{g tyrosine g}^{-1} \text{ soil (2 h}^{-1})$] compared to other cultivation systems [11.54-15.09 $\mu\text{g tyrosine g}^{-1} \text{ soil (2 h}^{-1})$]. Except, long-term cultivation, there was a general separation in the activity of β -glucosidase between irrigated [average of 21.9 $\mu\text{g saligenin g}^{-1} \text{ soil (3 h}^{-1})$] and rainfed Vertisols [17.9 $\mu\text{g saligenin g}^{-1} \text{ soil (3 h}^{-1})$]. Correlation analysis and Principal Component Analysis (PCA) revealed that only alkaline

phosphatase activity was positively correlated with total soil N and carbon contents. These results may draw attention on the impact of intensive application of agro-chemicals (pesticides, herbicides and fertilizers) on soil health in the world biggest Gezira cotton scheme. (*International Journal of Soil Science* 4 (3): 67-79, 2009; doi: 10.3923/ijss.2009.67.79)

Reuse of Date Palm by-Products for Efficient Use of Nitrogen Fertilizer

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The present study aims to improve the efficiency of nitrogen fertilizer applied to soil by reuse of date palm by-products after grinding and mixing with sandy loam soil. The date palm by-products collected from different areas, then air dried and grinded. Two fractions selected (i.e., less than 0.5 and 1-2 mm size). The powder mixed with sandy loam soil at the rates of 0.0, 1.0, 2.5, 5.0, 7.5 and 10.0% (w/w). The treated soil incubated at field capacity in plastic container for 30 days. After the incubation period, the soil was air dried and passed through a 2.0 mm sieve. The physical and chemical analyses of sandy loam and treated soils performed. The PVC transparent columns with of 6.0 cm diameter and 30.0 cm length packed with sandy soil at 1.6 g cm^{-3} soil bulk density to 20 cm depth and then a 5 cm surface layer of treated soil applied. The soil columns arranged as follows: 1) size fraction of date palm by-product, 2) the rate of date palm by-products applications and 3) rate of water applied (5 and 10 pore volumes). The fertilizer applied at the required rate (250 mg L^{-1}) to soil surface and then the water applied at required rates (0.2 and 0.4 cm min^{-1}). The leachate out of soil columns received. Volume of leachate and concentration of NO_3 was determined. At the end of experiment, the soil was cut to 2.5 cm slices for determining the soluble NO_3 . Total NO_3 in soil and percolate were calculated and then the loss of fertilizers and fertilizer use efficiency calculated under the experimental conditions. The results showed that increasing the rate of date palm by-products reduced the NO_3 in leachate and increased NO_3 in soil columns. In addition, increasing water application rate increased fertilizers loss in the leachate. The fine fraction of date palm by-products reduced the NO_3 leaching out of soil by about 14.86 and 5.90% for low and high water application rate, respectively in case of fine fraction, reduced nitrate losses. The corresponding values for coarse fraction were 9.73 and 4.35%, respectively. According to the present results, it is possible to reuse the date palm by-products for increasing the fertilizers use efficiency and reduces the problems of groundwater pollution and accumulation of these by-products in farm. (*International Journal of Soil Science* 4 (3): 80-92, 2009; doi: 10.3923/ijss.2009.80.92)

Spatial Variability of Soil Organic Carbon in Oil Palm

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This study aimed at quantifying the spatial variability of SOC and estimating SOC concentration in oil palm. This study was carried out in a commercial oil palm plantation bearing 27 year old palms. A systematic design was employed for soil sampling at the 0-20 cm depth based on a cluster of 4 palms that included three operational areas Weeded Circle (WC), Frond Heap (FH) and Harvesting Path (HP). A total of 60 sampling clusters were established. SOC was analyzed using dry combustion method. All measurement points were geo-referenced by a differential Global Positioning System (dGPS). The SOC data were first explored using descriptive statistics, normality check and outlier detection. This followed by variography and interpolation techniques to quantify the spatial variability of SOC. Results showed that all three operational areas exhibited a definable spatial structure and were described by either spherical or exponential models. SOC from WC and HP showed moderate spatial dependence while that from FH showed a strong spatial dependence. The FH had a shorter effective range than other operational areas. Contour maps for WC, FH and HP clearly showed spatial clustering of SOC values. All three operational areas fulfilled the interpolation accuracy criteria. This study suggests that site-specific management could be considered as a strategy to increase SOC sequestration in oil palm. (*International Journal of Soil Science* 4 (4): 93-103, 2009; *doi*: 10.3923/ijss.2009.93.103)

Carbon and Nitrogen Storage in Soil Aggregates from Different *Terminalia superba* Age Plantations and Natural Forest in Kouilou, Congo

J. Goma-Tchimbakala

A comparative study was carried out in Mayombe, between the soil of natural forest and the soil under three *Terminalia superba* plantations of 7, 12 and 48 year-old. In each plantation type and natural forest composite soil samples were taken in 0-10 cm layer. The goal was to investigate the dynamic of total carbon and nitrogen in whole and soil aggregate fraction in order to assess the impact of reforestation on the soil fractions. Organic carbon was analyzed by the modified Walkey and Black method. Total nitrogen was determined using the Kjeldhal procedure. Statistically differences between the sites were tested using

the Analysis of Variance (ANOVA). The results showed that in the surface soil the carbon content and total nitrogen were respectively 22.2 and 1.56 $\mu\text{g g}^{-1}$ in the forest. The carbon content was between 14.9 and 23.5 mg g^{-1} while total nitrogen was between 1.31 and 2.24 $\mu\text{g g}^{-1}$ in the plantations. The results also revealed that plantation aging had a marked impact on the total carbon and nitrogen concentration of soil aggregate fractions. The carbon and the nitrogen associated with the sand and the clay exhibited a significant increase. The carbon concentration was between 1.51 and 2.09 mg g^{-1} in the light aggregate fractions and between 0.95 and 1.04 mg g^{-1} in the organomineral aggregate fraction. The accumulation of total carbon in the whole soil and soil aggregate fractions and their increase during plantation aging suggested that the *T. superba* plantations could facilitate significant carbon storage. (*International Journal of Soil Science* 4 (4): 104-113, 2009; doi: 10.3923/ijss.2009.104.113)

Correlation Study Between Soil Nutrient Indices and Yield of Wheat and Barley in the Ganjabasar Region of Azerbaijan

V.V. Bashirov

The objective of this study is to investigate the correlation between soils nutrient regime indices and the yield of winter wheat (*Triticum aestivum*) and barley (*Hordeum vulgare*), the main cereal crops of the Ganjabasar region. Using experiments planning method a regional (the Ganjabasar region of Azerbaijan) conceptual and mathematical model was developed for soils fertility management. In this regional fertility model, all indices of fertility criteria of researched soils were combined in 5 blocks (agroecology, soil content, soil nutrient regime, soil properties and agromelioration). Unlike the prior models, included are Immediate Nutrient Reserve (ImdNR), Intermediate Nutrient Reserve (IntNR) and Potential Nutrient Reserve (PNR) forms to the list of criteria of soil nutrient regime block in the regional fertility model using the Gorbunov method. The majority of the correlation relations were consistent ($0.56 < r < 0.89$). Among the variables of soil nutrient regime, total nitrogen content, Cation Exchange Capacity (CEC), Immediate Nutrient Reserve (ImdNR) of phosphorus and potassium consistently correlated and Intermediate Nutrient Reserve (IntNR) of phosphorus and potassium were slightly correlated in yield, of which CEC and IntNR of P and K was steady but others were dynamic variations. It revealed that in the final mathematical models, 71% of wheat yield variability was accounted for variation in above dynamic indices. (*International Journal of Soil Science* 4 (4): 114-122, 2009; doi: 10.3923/ijss.2009.114.122)

Irrigation Water Quality Evaluation of Al-Mendasah Groundwater and Drainage Water, Al-Madenah Al-Monawarah Region, Saudi Arabia

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Groundwater and drainage water samples were collected from Al-Mendasah area, North-West of Al-Madinah Al-Munawarrh for irrigation water quality evaluation. The well waters were classified as C4S2 to C4S4 waters i.e., very high salinity and medium sodium to severely saline and very high sodium waters. The drainage waters were classified as C3S2 to C4S3 i.e., high salinity and medium sodium to severely saline and high sodium waters. The groundwater is dominated by Na and Cl ions. The Saturation Indices (SI) showed that the groundwater is unsaturated with respect to anhydrite, halite, gypsum and fluorite; and saturated with respect to calcite and dolomite. The concentration of calcium is much higher than that of Mg. The nitrate contents are much higher than the recommended safe limits of 30 mg L^{-1} for drinking and other uses. The fluorite (F) concentration in 40% of well waters was higher than the recommended safe limits for drinking water. The strong correlation between SAR vs. adj. SAR and adj. R_{Na} , Na vs. Cl, Mg vs. Cl and Mg vs. SO_4 ions indicate the dissolution and precipitation reactions in the rock-water interface that affect groundwater chemistry. The soil infiltration rate will not be affected either by well water or drainage water irrigation. Only, 12% well waters are safe for irrigation directly without serious soil and crop production problems. The use of remaining 78% well waters requires the adoption of certain management practices such as adequate drainage, selection of salt tolerant crops and application of leaching requirements. (*International Journal of Soil Science* 4 (4): 123-141, 2009; doi: 10.3923/ijss.2009.123.141)

Olive Mill Wastewaters: Diversity of the Fatal Product in Olive Oil Industry and its Valorisation as Agronomical Amendment of Poor Soils: A Review

S. Hanifi and I. El Hadrami

Discharge of olive mill wastewaters is known to have adverse effects on environment. Several scientific treatment technologies were proposed for these effluents. However, they are limited by some economical and technical constraints. Olive mill wastewaters direct agronomical recycling is both classical and innovative alternative for removal of these pollutant effluents. However, this procedure can still not be recommended as safe practice because data is often inconsistent and

the physico-chemical characteristics of olive mill wastewaters are not the same depending on several intrinsic and extrinsic aspects. This review compiles and discusses the results of studies conducted worldwide over the last two decades on the effects of olive mill wastewaters as soil amendment. It particularly focuses on OMW associated eco-toxicity and the capability of the biotic and abiotic components of soils to overcome it. Moreover, it explores olive mill wastewaters bio-transformation in soils and also their potential environmental impact. (*Journal of Agronomy* 8 (1): 1-13, 2009; **doi**: 10.3923/ja.2009.1.13)

Impacts of Conservation Tillage Systems on Long-Term Crop Yields

Kenneth R. Olson and Stephen A. Ebelhar

The 20 year study was conducted in Southern Illinois (USA) on land similar to that being removed from Conservation Reserve Programme (CRP) to evaluate the effects of conservation tillage systems on maize and soybean yields and for the maintenance and restoration of soil productivity of previously eroded soils. The effects of tillage on soil loss from erosion and Soil Organic Carbon (SOC) change were determined. The No-Till (NT) system had significantly less soil loss from erosion and maintained more SOC than the Mouldboard Plough (MP) and Chisel Plough (CP) tillage systems. The 10 year average maize yields were slightly higher for MP than NT and CP systems as a result of a significantly higher maize yield in the first year. The 10 year average NT soybean yield was slightly higher than for the MP and CP tillage systems. Crop yields for 10 years maize and 10 years soybean appear to show long-term productivity of NT compared favorably with that of MP and CP tillage systems. (*Journal of Agronomy* 8 (1): 14-20, 2009; **doi**: 10.3923/ja.2009.14.20)

Effects of Design Parameters of a Cultivator Share on Draft Force and Soil Loosening in a Soil Bin

T. Marakoğlu and K. Çarman

This experimental study was performed with the aim to evaluate effects of design parameters of a cultivator share on draft force and soil loosening in a soil bin. The test tool variables included rake angle to the horizontal of 12.5, 17.5 and 22.5°, working depths of 70, 110 and 150 mm and forward velocity of 1.08, 1.55 and 2.08 m sec⁻¹. Measurements were taken of draft force and disturbed area of soil by the cultivator share. The resulting draft force was increased with increasing rake

angle, forward velocities and working depth. The draft force in different trials varied from 42 to 202.5 daN. The area disturbed of soil was larger when tool rake angle, forward velocity and working depth were increased. The greatest disturbed area occurred at rake angle of 22.5°, forward velocity of 2.08 m sec⁻¹ and depth of 150 mm. The soil loosening increased with rake angle and forward velocity but loosening decreased with increased working depth. The soil loosening varied from 21.07 to 40.45%. (*Journal of Agronomy* 8 (1): 21-26, 2009; doi: 10.3923/ja.2009.21.26)

Influence of Genotypes and Potassium Application Rates on Yield and Potassium Use Efficiency of Potato

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Two year experiment (1999-2001) was conducted at Tal Amara Research Station in the Bekaa Valley of Lebanon to evaluate the influence of progressive application of Potassium fertilizer on yield, tuber quality, potassium uptake and potassium use efficiency (KUE) of 4 potato (*Solanum tuberosum* L.) genotypes. Four levels of potassium [0 (K₀), 96 (K₉₆), 192 (K₁₉₂) and 288 (K₂₈₈) kg K₂O ha⁻¹] and 4 genotypes (Spunta and Derby in 1999; Shepody and Umatilla in 2001) were used in a split-plot design. Medium and large grade tubers and aggregate tuber yield increased quadratically with increasing K application rates up to 192 kg K₂O ha⁻¹, reaching a plateau thereafter, indicating the luxury consumption of the nutrient at 288 kg K₂O ha⁻¹. When averaged over year and K application rates, Spunta, Derby and Umatilla followed by Shepody exhibited the highest aggregate yield. Tuber K uptake increased in all genotypes with increasing K application rates. A genetic variation in tuber potassium uptake was recorded, with the highest values observed on Derby and Umatilla, followed by Shepody and finally on Spunta. When averaged over genotypes, K₁₉₂ treatment resulted in 19 and 61% higher KUE value than those recorded by K₉₂ and K₂₈₈ treatments, respectively. Finally, when averaged over K rates, the KUE of Spunta was higher by 2, 36 and 11% than those observed on Derby, Shepody and Umatilla. (*Journal of Agronomy* 8 (1): 27-32, 2009; doi: 10.3923/ja.2009.27.32)

A Study on the Morphological and Physicochemical Characteristics of Five Cooking Bananas

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The objective of the present study conducted during July 2006 to July 2008 seasons was to evaluate 5 varieties of cooking bananas under calcareous soil and

irrigation conditions. The number of suckers per mat, height at flowering, cycling time, bunch number and weight, productivity index (PIX), brix and color were determined. Mean total fruits were highly significantly different for Bom, Pelipita and Blue Torres with 107, 63 and 51 total fruits, respectively. Mean total number of hands per bunch was highly significant for Bom (8.30) followed by Pelipita (6.0). Gypungusi and Cacambou demonstrated the lowest number of hands with 4.5 and 4.2, respectively. Pelipita, Cacambou and Blue Torres had the highest brix levels with 14.65, 12.72 and 12.57, respectively. Results obtained demonstrate that the color of skin can be objectively measured by the use of a colorimeter. The susceptibility of the varieties to yellow or black Sigatoka, caused by *Mycosphaerella* sp., was also evaluated. External (visual) evaluation of disease graveness was made three times during the experiment. A skewed scale of 1-5 where, 1 = vigorous and 5 = dead was used. Results showed that all the varieties have resistance/tolerance to Sigatoka and should be considered for production in areas affected by this disease. All cultivars but Blue Torres Island, produced reasonable to high yields of good to exceptional fruit, hence are recommended for use in tropical/subtropical areas with a dry season and limestone soils. (*Journal of Agronomy* 8 (1): 33-38, 2009; *doi*: 10.3923/ja.2009.33.38)

Technical and Economical Evaluation of Traditional vs. Advanced Handling of Tomatoes in Jordan

Najib El Assi, Amer Jabarin and Hmoud Al-Debei

Tomato (*Solanum lycopersicom* L.) fruit cv. "508" grown in plastic houses were obtained from two farms located in the Uplands and Jordan Valley. Fruits were harvested at the pink to light-red stages of development. Fruit samples were either kept as packed by the farmer (Group 1-traditional handling) or handled by the working team (Group 2-advanced handling). Harvesting was repeated three times with a week interval between harvests. Two main treatments were applied to the fruit samples: either held at 22°C continuously or at 12°C for 10 days and then removed to 22°C to the end of the experiment. Soluble Solid Content (SSC), firmness, water loss, decay and defects and shelf life were evaluated at 0, 10 and 20 days. Crop enterprise budgets are used in economic analysis to estimate the profitability of agricultural products. High temperature inflicted serious deteriorative consequence evident by accelerating the rate of loss of firmness (softening), increasing weight loss and decay incidence, aggravating defects and reducing the shelf life of the fruits held at 22°C. Similarly, improper and rough handling (traditional handling) exerted detrimental effects clearly pronounced in fruits from group 2. Higher economic profits are obtained from tomatoes of the advanced handling comparable to those of the traditional handling. (*Journal of Agronomy* 8 (1): 39-44, 2009; *doi*: 10.3923/ja.2009.39.44)

Performance of Some Tomato (*Lycopersicon esculentum* Mill.) Varieties under Heat Period in Northern Nigeria

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An experiment to evaluate the performance of five different varieties of tomato (*Lycopersicon esculentum* Mill.) under heat period was carried out at Maiduguri, Nigeria. The 5 varieties used were, Dan-Syria, Roma VFN, UTC, Dan-Baga and Tandino which were arranged in a Randomized Complete Block Design (RCBD), with three replications. The varieties varied in their yield characteristics. The varieties Roma VFN and Tandino started flowering 40 Days After Transplanting (DAT) earlier than the other varieties used. The Roma VFN, generally, produced significantly ($p \leq 0.05$) greater number of fruits/plant and fresh weight of fruits/plant than the other varieties used. Consequently, the Roma VFN, produced the highest fresh fruit yield of 6.1 mt ha^{-1} . The variety Dan-Baga produced the lowest fruit yield ha^{-1} , which was 2.6 mt ha^{-1} . The results of the study suggest that among the varieties used in the experiment, Roma VFN was more tolerant to heat followed by Tandino which surpassed the rest. (*Journal of Agronomy* 8 (1): 45-48, 2009; doi: 10.3923/ja.2009.45.48)

Field Application of Processed Manure upon Water Quality and Crop Productivity

Paul Walker, Walt Kelly, Ken Smiciklas and Tim Kelley

The purpose of this study was to conduct an applied field study investigating the feasibility of utilizing processed liquid swine manure in crop production. Four treatments were evaluated; unprocessed liquid swine manure, processed liquid effluent, inorganic nitrogen fertilizer and zero-rate control. For shallow subsurface water (as measured by lysimeters), the inorganic nitrogen fertilizer treatment had the greatest levels of nitrate-N. However, there were no significant differences for any measured chemical parameter for groundwater (as measured by sampling wells) among the four treatments. In general, the zero-rate control treatment was the lowest yielding treatment for corn (*Zea mays* L.), in contrast to the equivalent response of the other treatments. Nutrient accumulation was similar for the four treatments, with the exception of greater plant manganese content of the inorganic nitrogen fertilizer treatment. For soybean (*Glycine max* L.), all four treatments responded in a similar fashion. After 5 years of annual treatment application, the processed liquid effluent and unprocessed manure treatments were similar for most soil parameters. In addition, soil and plant tissue samples were

evaluated for pathogenic organisms (total coliform and *Escherichia coli*) and non-detectable levels were found for all treatments. The results of this study indicate the processed liquid swine effluent produced in this study, inorganic nitrogen fertilizer and unprocessed manure had similar effects on crop characteristics and subsurface water quality. (*Journal of Agronomy* 8 (2): 49-59, 2009; doi: 10.3923/ja.2009.49.59)

Biochemical Composition Effect of the Some Cereal Species' on the Behaviour of *Sitophilus granarius* L. and *Rhyzopertha dominica* F. Species in Semi-Arid Zone of Setif, Algeria

A. Mebarkia, A. Guechi, S. Mekhalif and M. Makhlouf

The aim of this study is the effect of the trophic medium on the biotic potential of the two species, *Sitophilus granarius* L. and *Rhyzopertha dominica* F. and the relationship between biological observations and the quantitative loss induced by the development of insects. The quality and sensibility of cereals influential the behaviour of the 2 pests. The average descent was influenced by the cereal type. Therefore, in specific mono-population, the average emergence per day, for the corn, varies from 0.61 for *S. granarius* L. to 0.12 for *R. dominica* F.; on the other hand for the soft wheat, it varies from 4.35 to 5.81, respectively. Whereas, in hetero-specific population, sensibility of the various cereals types to the attacks by *R. dominica* F. increases in the presence of *S. granarius* L., for an initial rate of infestation of 2 couples. The reverse was observed if the rate of infestation was doubled. The longest duration of development was observed for the corn with 40 and 55 days for *S. granarius* L. and *R. dominica* F., respectively. Shortest was recorded for the rice with 28 and 42 days for both. The highest loss of dry matter, in soft wheat with 4.74 and 6.09% for *R. dominica* F. and *S. granarius* L., respectively, while in corn was less than 1%. (*Journal of Agronomy* 8 (2): 60-66, 2009; doi: 10.3923/ja.2009.60.66)

Evaluation of Digital Hemispherical Photography and Plant Canopy Analyzer for Measuring Vegetation Area Index of Orange Orchards

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This study presents the results of an evaluation of two indirect methods (Plant Canopy Analyzer (PCA) and hemispherical photographs) for measuring

Vegetation Area Index (VAI) of two orange orchards, differing by their ground fraction cover (f_c). The evaluation is based on reference data obtained by destructive measurements on limited samples, which allow to calibrate and validate an exponential relationship between the diameter of branches and associated areas of leaves ($R^2 = 0.99$). The obtained results show that the two indirect methods underestimate the reference values of VAI. For the PCA device, the best estimates of VAI are obtained using the five rings for high f_c ($f_c = 0.7$) and using only four rings for low f_c ($f_c = 0.3$). For both case, the hemispherical photographs give accurate estimates of VAI: the relative errors are about 11 and 14% for high and low f_c , respectively. Alternatively, a simple method consisting of calculating VAI as the weighted average of the maximum (VAI_{max} , below the tree) and minimum (VAI_{min} , at the center of four trees) values using f_c as a weighting factor, was successfully tested ($R^2 = 0.90$). For both indirect methods, the tree volumes are well estimated with comparison to the values calculated assuming an ellipsoidal form. (*Journal of Agronomy* 8 (2): 67-72, 2009; doi: 10.3923/ja.2009.67.72)

Certain Physical and Chemical Traits in Selected Oilseed Crops

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Physical and chemical traits of oils from 5 soybean cultivars, three peanut cultivars, three sesame cultivars and 2 sunflower genotypes from two field experiments at the experimental station, Mansoura University, Egypt during the 2 summer seasons of 2006 and 2007 were studied. Results indicated that we can identify soybean. Giza 21 cultivar with highest values of oil percentage, saponification number, ester number and specific weight of seeds compared with other studies cultivars. Giza 35 cultivar could recognize with highest values of iodine number and Giza 22 cultivar can identify with more red and yellow color of oil compared with other studies cultivars in both seasons. Concerning peanut Giza 4 cultivar can identify by higher in moisture percentage and specific weight of seeds, more red color of oil and peroxide number compared with other studied cultivars. It possibly will be confirmed that Giza 6 cultivar could recognize with highest percentages of oil, iodine number, acid number, saponification number, ester number and more yellow color of the oil in both seasons compared with studied cultivars. Regarding sesame Taka 2 cultivar can identify by higher values of oil percentage, iodine number, saponification number, ester number, red and yellow color of oil and moisture percentage of seeds compared with studied cultivars. Giza 32 cultivar can recognize with highest values of acid number and peroxide number compared with studied cultivars in both seasons. In view of sunflower, Line 102 can identify with higher values of oil percentage, acid number peroxide number, saponification

number, ester number, red color of oil and specific weight compared with Line 53 in both seasons. (*Journal of Agronomy* 8 (2): 73-78, 2009; doi: 10.3923/ja.2009.73.78)

Effects of Arbuscular Mycorrhizal Fungus on the Mineral Nutrition and Yield of *Trifolium alexandrinum* Plants under Salinity Stress

S. Shokri and B. Maadi

The aim of this study was to evaluate the effects of arbuscular mycorrhizal fungus on the mineral nutrition and yield of *Trifolium alexandrinum* plants under different salinity levels (2.2, 5 and 10 dS m⁻¹). A pot experiment was conducted under glasshouse conditions in 2007. The results showed positive effects of inoculation with mycorrhizal fungi on total dry weight, root length and nutrient uptake of the *T. alexandrinum* at high and low salinity levels. Mycorrhizal colonization increased Total Dry Weight (TDW) of mycorrhizal plants 5.29 times more than control plants. In shoot system of non-AM plants, Na⁺ concentration was increased while the concentrations of K⁺, Mg²⁺ and Ca²⁺ were decreased with raising salinity stress. The Na⁺ level in shoots of AM plants showed slight increase with raising salinity levels. This experiment showed that phosphorus levels in the plants were reduced with increasing salinity but the AM plants showed higher values of phosphorus at all salinity levels. Thus, it could be concluded that AM fungi increased phosphorus uptake and saline stress in plants was thereby alleviated. (*Journal of Agronomy* 8 (2): 79-83, 2009; doi: 10.3923/ja.2009.79.83)

Impact of Irrigation and Nitrogen on Determining the Contribution of Yield Components and Morphological Traits on Corn Kernel Yield

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This study was conducted to investigate the impact of irrigation and nitrogen on determining the contribution of yield components and morphological traits on corn kernel yield. Treatments were nitrogen in four levels (0, 75, 150 and 225 kg N ha⁻¹) and three irrigation intervals (7, 10 and 14 days) in 2005 and 2006 at the Kooshkak Agricultural Experiment Station, Fars, Iran. The result of stepwise regression between kernel yield and yield components showed that,

kernel number per ear ($R^2 = 0.8192$) and kernel weight per ear ($R^2 = 0.0697$) had the most proportion in kernel yield variation (Cumulative $R^2 = 0.8889$). Irrigation levels significantly affected kernel yield. Similar to kernel yield, maximum biological yield (17090 kg ha^{-1}) was obtained at 7 days intervals. With increasing nitrogen levels plant height was increased and its maximum value (201.2 cm) was observed at 225 kg N ha^{-1} . Results of N and irrigation interaction effects showed that the highest kernel yield obtained at 225 kg N ha^{-1} and 7 days intervals irrigation (10213 and 8570 kg ha^{-1} , respectively). (*Journal of Agronomy* 8 (2): 84-88, 2009; doi: 10.3923/ja.2009.84.88)

Characterization of Oil and Fatty Acid Composition in Seed Produced by Canola Regrowth

Harbans L. Bhardwaj and Anwar A. Hamama

Canola (*Brassica napus* L.) and its relatives are known to regrow after harvesting of the foliage. However, yield and oil characteristics of seed harvested from regrowth are unknown. An experiment was conducted to obtain such information. Pre-flowering foliage was harvested from 48 plots (cut plots) grown in virginia during 2001-02 season. A group of 48 companion plots (uncut plots) was left unharvested. Upon harvesting of foliage, these plots received a factorial combination of four rates each of P and K fertilizers (0, 50, 100 and 200 kg ha^{-1}). Both sets of plots had previously received 100 kg ha^{-1} each of N, P and K. All 96 plots were harvested at maturity and data on seed yield and oil characteristics were recorded. The results indicated that seed yield from regrowth was 67% of uncut plots (1349 vs. 2020 kg ha^{-1}). The oil content in regrowth plots was significantly lower than that in uncut plots (34.7 vs. 37.1%). However, the oil from regrowth plots was considered healthier since, it contained less saturated and more unsaturated fatty acids. Effects of P and K fertilizers on canola regrowth were variable. An additional experiment with a factorial combination of three rates each of N, P and K (0, 50, 100 kg ha^{-1}) applied to the cut plots indicated that N rate effects were non-significant whereas increasing rates of P and K increased C18:0 and C18:3 fatty acids. Earlier research in virginia has established that pre-flowering canola foliage can be harvested to yield 11 Mg ha^{-1} of fresh greens and 1 Mg ha^{-1} of dry matter. Present results demonstrate the potential of canola as a dual purpose crop to enhance the income of small farmers. It could be harvested before flowering as a value-added feed/food product and the regrowth could be harvested for seeds to provide edible oil. (*Journal of Agronomy* 8 (2): 89-92, 2009; doi: 10.3923/ja.2009.89.92)

Effects of Flurenol on Soybean (*Glycine max* L. Merrill) Productivity and Electrophoretic Analysis of Seed and Root Nodule Proteins

Y.M. Awad, W.M. Hassan and Y. Sik Ok

Recently, numerous studies have been conducted to evaluate the development of soybean crop productivity and the formation of root nodules with respect to the management of nitrogen fertilizers. Objective of this research was to evaluate the effects of flurenol foliar application on the productivity and root nodules formation of soybean (*Glycine max* L. Merrill) plants and the total protein patterns in seed and root nodules. Soybean (*Glycine max* L. Merrill) plants cv. Crawford were cultivated in newly reclaimed sandy soil during two growing seasons and treated by foliar application of flurenol at 50, 100 and 200 mg L⁻¹ at 40 Days after Sowing (DAS). Furthermore, electrophoretic analysis of the seeds and root nodules was conducted to investigate the total protein bands and their similarity using sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) method. Most flurenol treatments resulted in significantly decreased plant height and increased the number of branches. Furthermore, the number of root nodules and the dry weight of the plants significantly increased in response to treatment with 100 mg L⁻¹ flurenol, with up to 47.67 and 35.67 root nodules and root nodule dry weights of 0.2287 and 0.1777 g being observed in 2006 and 2007, respectively. Evaluation of the root nodule protein patterns revealed a dissimilarity of 33.33% between all flurenol treatments and untreated plants. Based on these results, flurenol treatment at 100 mg L⁻¹ with inoculating seeds with *Bradyrhizobium japonica* is recommended to enable the reduction of N fertilizers and increase the yield productivity of soybean cv. Crawford in Egypt. (*Journal of Agronomy* 8 (3): 93-99, 2009; *doi*: 10.3923/ja.2009.93.99)

Characterization of *Ascochyta* as Pathological Species of Pea (*Pisum sativum* L.) at the North-West of Algeria

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It is the weakness of works on this pathogenic agent that pushed us to characterize *Ascochyta* on the plants morphological and molecular. Thirty seven samples of biological materials were isolated from three zones i.e., Mostaganem, Relizane and Mascara all located at North-West of Algeria. The samples are the isolated strains and are obtained from various organs of pea seedlings attacked by *Ascochyta* sp.

According to the morphological aspect, the results allowed to distinguish between three categories of strains representing the three species. Nevertheless, the distinction between these three categories is not very reliable for cause of the extreme variability of these species according to their middle of culture. According to the molecular data, all the isolated-strains who's Internal Transcript Space (ITS) regions in DNA have been amplified by Polymerase Chain Reaction (PCR) have expressed identical results with the same size of the PCR products (550 Pb). No polymorphism is noted at the set of the tested strains. On the other hand, the molecular sequencing permitted to distinguish *Ascochyta pisi* from *Ascochyta pinodes* and *Ascochyta pinodella*. These last two species remain similar in their ITS1 and ITS4 regions and don't show any difference. This study was done at the North-West of Algeria between 2004 and 2008. The prospection of other DNA regions with other molecular markers is to be planned in order to detect polymorphism between *Ascochyta pinodes* and *Ascochyta pinodella*. (*Journal of Agronomy* 8 (3): 100-106, 2009; doi: 10.3923/ja.2009.100.106)

Nitrate Leaching Losses from *Miscanthus x giganteus* Impact on Groundwater Quality

E.M. Curley, M.G. O'Flynn and K.P. McDonnell

The objective of this study was to determine whether there was an increase in nitrate concentrations in soil water samples as a result of fertilizer nitrogen (N), in the form of cattle slurry, being applied at various rates to an establishing crop of *Miscanthus*; this trial was conducted during 2008/09. The crop received either no fertilizer (0-unfertilized control) or an annual application of 60, 120 or 180 kg N ha⁻¹. Soil water solution samples were collected fortnightly from porous ceramic cup samplers. Nitrate (NO₃⁻) levels in these soil water samples were determined and monitored. In 2008, the soil water nitrate concentrations were high on all treatments, 14, 16 and 20 mg l⁻¹, respectively for 0, 60 and 120 kg N ha⁻¹. However, there was no significant difference between treatments. Soil water nitrate concentrations were again high (12-21 mg l⁻¹) in 2009, particularly at the 180 kg N ha⁻¹ levels which showed significantly higher levels of nitrate leaching when compared to all other treatments. A high level of nitrate is seen as a threat to both public health and natural waters. Of these threats the latter is the more immediate, but the health issue has attracted more public concern, as the presence of nitrate in drinking water has been linked to a number of medical conditions such as blue baby syndrome (*methaemoglobinaemia*) in infants. The results indicate that leaching losses were closer to those recorded under arable land than

extensively managed grassland; slurry application on an establishing *Miscanthus* crop does not appear to contribute adversely to levels of nitrate in groundwater when compared to other more extensive cropping systems. (*Journal of Agronomy* 8 (3): 107-112, 2009; *doi*: 10.3923/ja.2009.107.112)

The Effect of Steviol Glycosides Blending Liquid on Senescence after Flowering in Upland Rice

Yu Congmin, Lv Chengguo and Shi Yan

The effect of steviol glycosides blending liquid (SBL) on senescence after flowering in upland rice had been studied. By measured the superoxide dismutase (SOD) activity in using NBT method to inhibit photoreduction activity NBT 50% for a units; malondialdehyde (MDA) content by using the two-component spectrophotometry and also the catalase (CAT) activity measured by the method of ammonium molybdate. The results showed with different concentrations of SBL sprayed, the SOD activity and CAT activity in upland rice increased, the MDA content in rice flag leaves reduced. Compared the treatment of different concentration, the middle concentration was found to be the best one. The SOD activity could be kept the highest activity until 15 days after flowering in the middle concentration, but it could be started to be down at 5 days after flowering in control and the treatment of low concentration and high concentration. The MDA content increased slowly in the middle concentration and increased rapidly in control and the treatment of low concentration and high concentration. The CAT activity was significantly higher in the treatment of middle concentration and high concentration than that in the low-concentration and control at 5 days after flowering. So, the treatment of middle concentration of SBL has the best effect in delaying senescence of flag leaves. (*Journal of Agronomy* 8 (3): 113-116, 2009; *doi*: 10.3923/ja.2009.113.116)

Moisture and Planting Density Interactions Affect Productivity in Cowpea (*Vigna unguiculata*)

G. Lemma, W. Worku and A. Woldemichael

The aim of this study was to examine the effects of planting density and inter-row spacing on cowpea (*Vigna unguiculata* L. Walp.) productivity at two contrasting moisture regimes. A field experiment was conducted under controlled moisture conditions during the 2007 off-season, at Hawassa University, College of Agriculture, Southern Ethiopia. Treatments were made from a factorial

combination of four densities (71428, 95238, 133333 and 200000 plants ha⁻¹), two inter-row spacings (50 and 70 cm) and two levels of water regimes (well watered and dry). The experiment was laid out in a split-split plot design and had three replications with watering regime, inter-row spacing and planting density as main plot, sub-plot and sub-sub-plot factors, respectively. Grain yield and all yield attributes, total biomass and harvest index were decreased by water limitation while none of those traits were significantly affected by inter-row spacing. Moisture x planting density interaction was significant for grain yield ha⁻¹, number of pods m⁻² and total biomass ha⁻¹. The interaction indicated that an increase in both grain and total biomass yield ha⁻¹ was observed with increasing planting density under the wet regime. Grain yield plateau was reached at a density of 160000 plants ha⁻¹ under the wet regime. On the other hand, an increase in planting density decreased grain yield and total biomass ha⁻¹ under the water-limited condition with the highest yield at the lowest density of 71428 plants ha⁻¹. Thus, farmers could get more out of cowpea by matching their planting density with available moisture. The two inter-row spacings can be used interchangeably by choosing whichever is convenient for management. (*Journal of Agronomy* 8 (4): 117-123, 2009; doi: 10.3923/ja.2009.117.123)

Response of Sorghum to Nitrogen Fertilizer and Plant Density in the Guinea Savanna Zone

S.S.J. Buah and S. Mwinkaara

Field experiments were conducted in 2007 and 2008 on sandy loam soil in Guinea savanna of Ghana to evaluate sorghum (*Sorghum bicolor* (L.) Moench) response to plant density and Nitrogen (N) fertilizer. A randomized complete block design, arranged in a split-plot was used with three replications. Four N levels (0, 40, 80 and 120 kg ha⁻¹) and plant densities (53300, 88800, 66600 and 133300 plants ha⁻¹) were assigned to subplots and main plots, respectively. Plant density and N levels showed no significant interactions for any parameter. Further, plant density had minimal effect on grain yield and yield components. However, grain yield had a quadratic response to N levels. Across years, application of 40, 80 and 120 kg N ha⁻¹ resulted in yield increases of 39, 43 and 45% over farmers' practice (0 kg N ha⁻¹), respectively. Marginal Rate of Return (MRR) to 40 kg N ha⁻¹ over the years was 281%, but negative to 80 and 120 kg N ha⁻¹. Increasing N level beyond 40 kg ha⁻¹ did not result in corresponding increase in yield, net benefit nor N use efficiency to merit the extra production cost that may be incurred. From the study, application of 40 kg N ha⁻¹ appeared adequate for maximizing sorghum yields, regardless of plant density. (*Journal of Agronomy* 8 (4): 124-130, 2009; doi: 10.3923/ja.2009.124.130)

Soil Properties as Influenced by Soil Fertility Management in Small Scale Maize Farms in Njoro, Kenya

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Most farmers are aware of soil fertility gradients within their farms which influence their management decisions and further accentuate these variations. The purpose of this study was to assess the effect of soil amendments on soil properties under farmers management. Soil sampling was done in 37 small scale maize farms in Njoro Division of Nakuru District at 0-20 cm depth. Results of a structured questionnaire showed that 65% of the farmers used inorganic fertilizers predominately diammonium phosphate (DAP), 15% used only farmyard manure, 15% used both organic and inorganic fertilizer, while 6% did not use any soil amendments. Most of the farms had a pH (CaCl_2) of less than 5.2, 27% of the farms had a pH lower than 4.0. Organic carbon (C) ranged from 1.6 to 5.8%, with a median value of 2.6%. Most of the farms were phosphorus (P) deficient with an Olsen-P of less than 10 mg kg^{-1} . All farms had sufficient amounts of extractable potassium (K). Total nitrogen (N) ranged from 0.12 to 0.33% with 97% of the farms with N content ($>0.12\%$). Farms amended with farmyard manure had higher organic C and total N levels in Kikapu with correspondingly lower C: N ratios. Soil pH and total N were higher for farms with gentle and undulating slopes. Overall most of the farms were acidic and of moderate fertility. Liming increased maize biomass production in Njoro. This study underscores the need for organic inputs and regular soil testing for small scale farmers. (*Journal of Agronomy* 8 (4): 131-136, 2009; doi: 10.3923/ja.2009.131.136)

A Survey of Cassava (*Manihot esculenta* Crantz) Planting Materials in Storage: A Case Study in Two Communities in the Ejisu District of Ashanti Region, Ghana

M.K. Osei, K.J. Taah, J.N. Berchie and C.K. Osei

This study was conducted in two cassava growing communities in the Ejisu District of Ashanti region to assess the problems associated with cassava planting material in storage. The study showed that most farmers (90%) obtained their source planting materials from other farmers or their own farms. Majority of the farmers (68%) also undertook the upright or vertical storage of their planting materials. Fifty two percent of respondents also reported that the initial quality of the planting material affects its quality after storage with 32% saying the weather conditions affects the quality after storage. The survey confirmed that cassava stem cuttings (planting material) do not store properly after 8 weeks under farmers conditions irrespective of the storage method used. Long-term storage under farmers'

conditions was also observed to be affected by pest and disease attack, dehydration and the quality of planting material. (*Journal of Agronomy* 8 (4): 137-140, 2009; doi: 10.3923/ja.2009.137.140)

The Relationships of Sorghum Kernel Pericarp and Testa Characteristics with Tannin Content

Suqin Cheng, Yi Sun and L. Halgreen

A practical approach for determining tannin contents is very useful for sorghum breeders. Tannin contents were determined with vanillin-HCl method for 24 sorghum entries varying in origin, pericarp color, presence or absence of testa and testa color. The relations of these kernel characteristics with their tannin contents were investigated. It was revealed that dark color pericarp produces trace amount of tannins, while the tannin contents in the sorghum cultivars with purple testa were much lower than those with brown testa. Subdivision of type 1 and type 2 sorghum was proposed to provide sorghum breeders more practical classification system for selecting cultivars with suitable tannin contents. (*Asian Journal of Crop Science* 1 (1): 1-5, 2009; doi: 10.3923/ajcs.2009.1.5)

Fixation of Urea to Polyacrylic Acid and Nitrogen Release Behavior of the Product (Polyurea)-A Comparison with Urea and Control (Without Nitrogen Fertilizer)

M.H. Rahman, B.K. Das, M.A.J. Miah and H. Ahmad

A slow-release nitrogen fertilizer was prepared by covalently immobilizing urea on a biodegradable acrylic acid based polymer matrix. Polyacrylic acid was prepared by solution polymerization of acrylic acid followed by covalent immobilization of urea through the activated carboxyl groups. The resulting product, termed as polyurea, was characterized by FTIR and NMR spectral analyses, thin layer chromatography measurement and elemental analyses. Results showed that polyurea contained 24.76% nitrogen and the solvency reduced to over 300 times as compared to urea. To clarify the performance of this polyurea in agriculture, a comparative study was then carried out on the growth of green chili *Capsicum annuum* plants using urea and control (no nitrogen fertilizer) as the basis. Polyurea showed improved yield in terms of average plant size over the cultivation period. The nitrogen release behavior in soil during cropping and plant uptake of nitrogen suggested that polyurea can be used as slow-release nitrogen fertilizer. (*Asian Journal of Crop Science* 1 (1): 6-14, 2009; doi: 10.3923/ajcs.2009.6.14)

Genotype×Environment Interaction for Resistance to Purple Blotch (*Alternaria porri* L. (Ellis) Cif.) in Onion (*Allium cepa* L.) in Nigeria

L. Abubakar and S.G. Ado

Five onion cultivars were crossed in a diallel and their progenies evaluated at Sokoto and Talata Mafara, during the 2004/2005 and 2005/2006 seasons. Thirty milliliter of 10^{-1} cfu of spore suspension of *Alternaria porri* was poured into each plot. Combined analysis indicated that location, recorded highly significant mean squares ($p < 0.01$) for disease incidence, fresh and cured bulb yields. Genotype recorded highly significant ($p < 0.01$) mean squares for all characters. Genotype×location interactions recorded highly significant ($p < 0.01$) mean squares for disease incidence and severity and fresh and cured bulb yields. (*Asian Journal of Crop Science 1 (1): 15-25, 2009; doi: 10.3923/ajcs.2009.15.25*)

Unmarketable Tuber Yield and Other Agronomic Parameters of Four Varieties of Irish Potato (*Solanum tuberosum* L.) as Influenced by NPK Fertilizer Rate and Type of Seed Tuber at Samaru, Nigeria

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This research was initiated with the aim at finding varieties of Potato that can respond to graded levels of NPK fertilizer and form of seed tuber. The treatments tested consist of four rates of NPK fertilizer (0, 300, 600 and 900 kg ha⁻¹), two forms of seed tuber (whole and cut-tubers) and four varieties of Irish potato (Greta, Nicola, RC 767-2 and WC 732-1). A split-plot design was used in which the factorial combinations of fertilizer rate and form of seed tuber were assigned to the main plots while the varieties occupied the sub-plots. The treatments were replicated three times. Varieties Nicola and RC 767-2 had the heaviest and least leaf and stem dry weights, respectively. Nicola, RC 767-2 and WC 732-1 produced more tubers and unmarketable tuber yield than Greta. Greta and RC 767-2 produced larger tubers than Nicola and WC 732-1. The highest NPK rate of 900 kg ha⁻¹ resulted in the heaviest leaf and stem. Optimum tuber number and size was attained at the higher fertilizer rate of 600 kg ha⁻¹. Further increase above 600 kg NPK ha⁻¹ depressed tuber number and tuber weight in 1997/98 and tuber size in 1998/99. The same 600 kg NPK ha⁻¹ recorded the least unmarketable

tuber yield. None of the factor measured was affected by type of seed tuber. In conclusion RC 767-2 had the highest plant dry weights as well as more tubers and unmarketable tuber yield that were comparable to that of Nicola and WC 732-1. Greta and RC 767-2 had larger tubers than the other two varieties. The plant dry weights were optimized at 900 kg NPK ha⁻¹ while more tubers of larger size were maximized at 600 kg NPK ha⁻¹. The medium NPK rate of 600 kg ha⁻¹ had least unmarketable tuber yield. Planting of either whole or cut tuber sett did not affect any of the parameter. (*Asian Journal of Crop Science 1 (1): 26-33, 2009; doi: 10.3923/ajcs.2009.26.33*)

Effect of Sugarcane Molasses and Whey on Silage Quality of Maize

Gerardo Uriel Bautista-Trujillo, Mario A. Cobos, Lucía María Cristina Ventura-Canseco, Teresa Ayora-Talavera,

The potential of cane molasses and whey as additives to ensile maize plants (*Zea mays* Linnaeus) was investigated. Maize stem plus leaves were chopped, mixed with cane molasses and whey, placed in cylindrical plastic containers, hermetically closed and characterized. The pH of the silage decreased significantly in each of the treatments with a faster decrease found when whey was added. The lactic acid concentration was > 60 g kg⁻¹ in silage amended with molasses and/or whey and 41 g kg⁻¹ in the control treatment after 15 days. Acetic acid was the only volatile fatty acid detected in the silage of maize and its concentration was 7.3 g kg⁻¹ when whey was added, but 16.2 g kg⁻¹ in the control treatment. In conclusion it was shown that maize plants can be effectively ensiled with whey in combination with sugarcane molasses as additives inducing a faster production of lactic acid and resulting in a better silage product. (*Asian Journal of Crop Science 1 (1): 34-39, 2009; doi: 10.3923/ajcs.2009.34.39*)

Effects of Organic and Chemical Fertilizers on Forage Yield and Quality of Globe Artichoke (*Cynara scolymus* L.)

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To study the effect of organic and chemical fertilizers on forage yield and quality in globe artichoke (*Cynara scolymus* L.) an experiment was conducted using a randomized completed block design (RCBD) with four replications at the Research Farm of College of Agriculture, University of Tehran, Karaj, Iran in

2006. The treatments included five levels of chemical fertilizers, four levels of manure, five levels of mixture of different ratios of chemical fertilizers and manure (integrated system) and a control treatment without any fertilizers. Fertilization treatments significantly affected forage quantity and quality of artichoke. For chemical fertilizers, total DM yield was increased to 4.13 and 3.7 t ha⁻¹ by the treatments (kg ha⁻¹) N₂₀₀/P₂₀₀/K₂₄₀ and N₁₆₀/P₁₆₀/K₁₉₂, respectively. For organic systems, the highest yields of 2.86 and 2.77 t ha⁻¹ were obtained by treatments of 30 and 40 tones of cattle manure/ha, respectively. In the integrated system, the highest DM values of 4.86 and 4.06 t ha⁻¹ were obtained in treatments N₈₀/P₈₀/K₉₆/manure_{20,000} and N₁₂₀/P₁₂₀K₁₄₄/manure_{10,000}, respectively. The effects of three soil fertilization systems on forage quality traits were inconsistent. Chemical and integrated systems increased crude protein (CP), K and P contents in globe artichoke. For dry matter digestibility (DMD) there were no significant differences among fertilizing systems, although all of them produced higher DMD compared to control. For water-soluble carbohydrates (WSC), the positive effect of organic fertilization was higher than in the other two systems. It was concluded that artichoke, as a new forage crop, has a good yield and quality potential for livestock feeding in terms of soil fertilization systems. But further studies would be needed for considering of Artichoke as a new source of forage crops. (*Asian Journal of Crop Science* 1 (1): 40-48, 2009; doi: 10.3923/ajcs.2009.40.48)

Some Physiological Parameters and Sugar Concentration Changing of Sugar Beet (*Beta vulgaris* L.) Under Controlled Climatological Conditions

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This research was conducted to investigate the impact of night temperature and light intensity on growth indices and sugar content of sugar beet (Triploid Multigerm Iran-Karaj 1 variety, type N-E) in a Mediterranean climate (North West of Iran) at Moghan Agro-industry and Livestock Co. from April 2001 to February 2002. Its lower sugar contents were reported than those normally grown in other sugar beet growing regions. Sugar beet crops were cultivated with full automatic controlled environment (night temperature and light intensity) facilities in an experimental farm. Data were collected 80 days after planting using a completely randomized block design with four replications using 7 treatments. The treatments consisted of night temperature 15°C (T₁) and 10°C (T₂), increase of light intensity (L), night temperature 15°C and increase of light intensity (T₁L), night temperature 10°C and increase of light intensity (T₂L), a

greenhouse control (C_1) and a control without greenhouse (C_2). The total dry matter and leaves area of sugar beet were measured to calculate the growth indices including shoot crop growth rate, total crop growth rate, leaf area index and net assimilation rate from 20 days after planting. After 140 days, some samples were taken from the roots of sugar beet and pulp in order to determine the sugar content. This sampling procedure was carried out every 10 days up to 210 days after planting. Model development showed that the best equation, $Y = ae^{bx}$ (Y is the sugar content, e , the napery logarithm, a and b are coefficient and x is one of the growth indices), was obtained from data regression. The growth indices were negatively correlated well ($p < 0.001$) with sugar content. Hence, the low sugar content could be due to the warm nights and slight light intensity during days. (*Asian Journal of Crop Science 1 (1): 49-57, 2009; doi: 10.3923/ajcs.2009.49.57*)

Optimum Rice Density and Herbicide Application in Direct Seeding in Ahwaz Region, Iran

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In order to investigate of rice and barnyard-grass in different levels of herbicide and crop density, an experiment was conducted in split plot design with four replicate, in research farm of Ramin Agriculture and Natural Resources University in 2006. Four herbicide doses (0, 3, 5 and 7 L ha⁻¹) was arranged in main plots and three seeding rates (100, 120 and 140 kg seed ha⁻¹) in subplots. Interaction of herbicide and crop density on dry matter and yield of rice and barnyard-grass was significant. Therefore, response of variance trends of these traits to herbicide in different densities was different. While no herbicide was be used, rice yield in density 120 was higher than other densities, that showed that optimum crop density could increased crop competition ability and decreased herbicide use. In other hand, it be observed that highest and lowest yield of crop and weed, respectively, was be related to 5 L herbicide ha⁻¹. In this case, there was little difference between different densities. With more herbicide use, probably due to toxicity effect, crop yield decreased. However, in this herbicide dose, density 120 showed lesser changes in crop yield. In density 120, crop and weed yield relationship have lesser slope in comparison with other densities. Ultimately, it seems that optimum crop density can lessen crop sensitivity to other environmental and agronomic factors including weed competition and herbicide use. (*Asian Journal of Crop Science 1 (1): 58-62, 2009; doi: 10.3923/ajcs.2009.58.62*)

Identification of *Stevia rebaudiana* Bertoni Proteins by Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis

Ma Lei and Shi Yan

Four diverse genotypes of *Stevia rebaudiana* Bertoni were included for Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis (SDS-PAGE) analysis. Total proteins were analyzed through slab type SDS-PAGE. Based on SDS-PAGE, specific bands were suggested to be used for identifying *Stevia rebaudiana* Bertoni. This method has the advantages of simplicity, high sensitivity and good accuracy and the SDS-PAGE proved to be a powerful tool for differentiating *Stevia rebaudiana* Bertoni varieties. (*Asian Journal of Crop Science* 1 (1): 63-65, 2009; doi: 10.3923/ajcs.2009.63.65)

Heterosis and Combining Ability in a Diallel Cross of Eight Faba Bean (*Vicia faba* L.) Genotypes

Salem S. Alghamdi

The present investigation was carried out under insect-free cages during the three successive seasons 2004-2006. A diallel cross excluding reciprocals among eight faba bean genotypes was used to estimate the heterotic effects of F_1 crosses and F_2 populations relative to their respective mid and better parents and combining ability analysis for yield and some of its variables. Highly significant differences among the tested entries were detected for different traits, indicating wide genetic variability for all traits. Heterosis percentages relative to mid-parents were significantly positive in several crosses with a range of 15.6-19.7, 38.0-59.8, 85.0-131.4, 74.3-79.4, 54.4-127.2 and 69.8-142.0% for plant height, number of branches per plant, number of pods per plant, number of pods per main stem, number of seeds per plant and seed yield per plant, respectively. However, heterosis percentages relative to better parent were significantly positive in some crosses and recorded a range of 19.0-19.0, 54.2-73.7, 62.9-97.7 and 47.6-129.9% for plant height, number of pods per plant, number of seeds per plant and seed yield per plant, in the same order. Some crosses exhibited significantly negative heterosis compared to respective mid-parent for days to flowering (from -9.0-23.5%). The ratios of (σ^2_s/σ^2_a) exceeded the unity for number of pods per plant, number of pods per main stem and 100-seed weight indicating that the genetic variation among these traits appeared to be additive. However, low (σ^2_s/σ^2_a) (less than unity), revealed the predominance of non-additive gene action for days to flowering, plant height, number of branches per plant, number

of seeds per plant and seed yield per plant. The three parental genotypes: Aquadulce, Luz and Giza 716 were found to be a good combiners for 100-seed weight. Moreover, the parental genotype Geizera 2 was a good combiner for both number of pods and seed yield per plant. Three parents Geizera 2, Giza 402 and Triple white were good combiners for earliness. Five crosses Geizera 2×Giza 716, Geizera 2×Sakha 1, Geizera 2×Giza 402, Giza 716×Sakha 1 and Giza 716×Giza 402 had significant Specific Combining Ability (SCA) for most studied traits. (*Asian Journal of Crop Science 1 (2): 66-76, 2009; doi: 10.3923/ajcs.2009.66.76*)

Response of Different Tomato Cultivars to Diluted Seawater Salinity

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Pot experiments were carried out to evaluate the effects of saline irrigations on five varieties of tomato (4, 22, 38, 46 and 54). Plants were irrigated with diluted seawater adjusted to three levels of electrical conductivity; freshwater (control), 3 and 6 dS m⁻¹. The results of the experiment showed that saline water remarkably affected the evapo-transpiration rate, soil moisture, salts accumulation and plant biomass production. Saline irrigation had the ability to keep much water in the soil with higher value of salt content. Low salinity treatment exhibited highest plant growth and lowest soil moisture and salts deposition. Varieties number 38 and 46 gave the highest values for fruits number and weight. Whereas, variety number 22 got the lowest values. However, variety No. 4 was the tallest and had the highest value for green matter even under high salinity treatment. Overall, under saline condition it was observed that all plant parameters of different varieties were reduced compared to the control except for the number of fruits of some varieties such as 38, 46 and 54. However, fruit fresh weight for variety number 38 was enhanced by saline irrigation which could be a good sign for salt tolerance in saline conditions. (*Asian Journal of Crop Science 1 (2): 77-86, 2009; doi: 10.3923/ajcs.2009.77.86*)

Effects of Humic Substances on Plant Growth and Mineral Nutrients Uptake of Wheat (*Triticum durum* cv. Salihli) Under Conditions of Salinity

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The effects of foliar and soil application of humic substances on plant growth and some nutrient elements uptake of wheat (*Triticum durum* Salihli) grown on

various salt concentrations were examined. Sodium chloride was added to soil to obtain 15 and 60 mM saline conditions. The solid humus was applied to the soil one month before planting and the liquid humic acid was sprayed twice on the leaves on day 20 and 35 after seedling emergence. The application doses of solid humus were 0, 1 and 2 g kg⁻¹ and the liquid humic acids were 0, 0.1 and 0.2%. Salinity negatively affected the growth of wheat; also decreased the dry weight and the uptake of nutrient elements except for Na and Mn. Soil application of humus increased the N uptake of wheat and foliar application of humic acid increased the uptake of P, K, Mg, Na, Cu and Zn. Although the effect of interaction between salt and soil humus application was found statistically significant, the interaction effect between salt and foliar humic acid treatment was not found significant. Under salt stress, the first doses of both soil and foliar application of humic substances increased the uptake of nutrients. (*Asian Journal of Crop Science* 1 (2): 87-95, 2009; doi: 10.3923/ajcs.2009.87.95)

Agronomic Performance of Paprika (*Capsicum annuum* L.) in Response to Varying Plant Populations and Arrangement in the Smallholder Sector of Zimbabwe

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The effect of plant population and spatial arrangement on the agronomic performance of paprika (*Capsicum annuum* L.) was studied on-farm in the Chinyika Resettlement Area (CRA) of Zimbabwe during 2000-2003 cropping seasons. The treatments were factorial combinations of four plant population densities (35000, 50000, 65000 and 80000 plants ha⁻¹) and two plant arrangements (single and double-row planting). The experimental design was a randomized complete block design with four replications. When plant population increased from 35000 through to 65000 plants ha⁻¹ total fruit yield increased 21.6-64.7% but yield declined 23.7% at 80000 plants ha⁻¹ in the 2000/01 season. Significant response to plant population was up to 80000 plants ha⁻¹ in the 2001/02 season. In the 2000/01 season, marketable fruit yield increased by 48.1% when plant population was increased from 35000 to 65000 plants ha⁻¹. Total fruit yield per plant and number of fruits per plant responded significantly ($p < 0.05$) to variation in plant population in the 2000/01 season up to 65000 plants ha⁻¹. Above this population fruit yield per plant and plant height declined significantly. In the 2001/02 season, number of fruits per plant and plant height did not respond to variation in plant population. Generally, row arrangement had no significant influence on fruit yield except total fruit yield and number of fruits/plant that were higher under 2-row planting than under one-row in the 2000/01 season. Results suggest that increasing plant population from 55000

to above 65000 plants ha⁻¹ caused significant increase in total fruit yield and that 2-row planting can give higher fruit yields per hectare and per plant as against the one-row planting. (*Asian Journal of Crop Science* 1 (2): 96-104, 2009; doi: 10.3923/ajcs.2009.96.104)

Study on Differences of Nitrogen Efficiency and Nitrogen Response in Different Oilseed Rape (*Brassica napus* L.) Varieties

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Field experiment was carried out to evaluate the nitrogen efficiency and nitrogen response under no nitrogen application and nitrogen application conditions. The differences of grain yield, nitrogen absorption amount, nitrogen response and nitrogen use efficiency among 16 winter varieties of oilseed rape (*Brassica napus* L.) were systematically studied and the contribution of nitrogen absorption efficiency and nitrogen use efficiency to nitrogen efficiency in different oilseed rape varieties were preliminarily discussed. Results showed that, the differences of grain yield, nitrogen use efficiency and nitrogen response among the 16 oilseed rape varieties were significantly, regardless of N application level; but only under no N application conditions, the differences of nitrogen absorption amount among varieties were significantly. The 16 oilseed rape varieties were divided into four different genotypes in accordance with the nitrogen use efficiency and nitrogen response under no nitrogen application condition: (1) Nitrogen High Efficiency-Nitrogen High Response, included Xy1, Xy16, Xy17, Xh19, Xh20 and Xy21. (2) Nitrogen Low Efficiency-Nitrogen Low Response (NLE-NLR), included Xy6, Xy8 and Xy9. (3) Nitrogen High Efficiency-Nitrogen Low Response (NHE-NLR), included Xy7, Xy12, Xy14, Xy15 and Xy24. (4) Nitrogen Low Efficiency-Nitrogen High Response (NLE-NHR), included Xy11 and Xy13. The variation coefficient of nitrogen use efficiency was higher than nitrogen absorption efficiency, regardless of N application level; it was also showed that the contribution of nitrogen use efficiency to nitrogen efficiency was higher than nitrogen absorption efficiency. However, variation coefficient of nitrogen absorption efficiency under nitrogen application condition was higher than under no N application condition; variation coefficient of nitrogen use efficiency was reverse. It was indicated that, under no N application condition, the variation of nitrogen efficiency because of nitrogen use efficiency was decreased and variation of nitrogen efficiency because of nitrogen absorption efficiency was increased. (*Asian Journal of Crop Science* 1 (2): 105-112, 2009; doi: 10.3923/ajcs.2009.105.112)