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GROWTH AND DEVELOPMENT OF GUAVA (*PSIDIUM GUAJAVA* L.) SEEDLINGS AGAINST SODIUM CHLORIDE SALINIZED WATER

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ABSTRACT

The categorization of genotypes having varying potential to salt-tolerance is an efficient approach to cope with the problems of saline soils and saline irrigation. A glasshouse experiment was carried out to evaluate the growth, development, and ions content in guava seedlings against sodium chloride salinized water. Sixty-day-old two commercial guava genotypes (Ramzani and Thadharamy) were irrigated with water of four salinity levels (control (distilled water), 1.5, 3.0 and 5.0 dS m^{-1}). The results indicate that increasing salinity levels negatively affected agronomic traits of both guava genotypes. A significant decline in height, stem girth, number of leaves $plant^{-1}$, dry weight of shoot and roots was noted at salinity level of 3.0 and 5.0 dS m^{-1}. Similarly, the seedlings grown under treatments of EC 1.5, 3.0 and 5.0 dS m^{-1} had higher Na^+ and Cl^- contents and less K^+ and Ca^{2+} content in comparison to control treatment. The significant variation was recorded among the guava genotypes. Ramzani produced taller plants, thicker stem, more leaves $plant^{-1}$, greater shoot and root dry weights, and less Na^+ and Cl^- contents in comparison to Thadharamy. We conclude that guava seedlings should not be irrigated with saline water having EC greater than 1.5 dS m^{-1}. Cultivation of Ramzani is a better choice in saline environment than Thadharamy.

Keywords: agronomic parameters, genotypes, guava, ions content, saline water

INTRODUCTION

Guava (*Psidium guajava* L.) is a perennial fruit tree of tropics and subtropics offering great economic potential (Kosky *et al*., 2005). It is highly known for its great aroma and protein content (Gonzaga *et al.,* 1999). It contains significant quantity of calcium, vitamin A, phosphorous, sulphur, potassium, chlorine, sodium, magnesium, iron, riboflavin, pantothenic acid, niacin and thiamin (FAO, 2009). It is originated in tropical America and now it is primarily produced in China, India, Pakistan, Thailand, Indonesia, Mexico, Bangladesh and Brazil (Ishtiaq *et al.,* 2012).

In arid and semi-arid regions, guava plants are irrigated with saline water and its growth is badly affected due to salinity (Cavalcante *et al.,* 2005). The causes behind decline in guava growth under salt stressed conditions are osmotic stress, nutritional inequality, specific ion toxicity and combination of overhead factors (Al-Yasin, 2004). The salinity has adverse interaction with high temperature of semi-arid regions which affect the salt uptake owing to increase in transpiration (Mittler, 2006). The adverse effect of salinity is more noticed at the seedling stages of many fruit plants e.g. mango, guava and passion fruit (Cavalcante *et al.,* 2001; Ebert, 2002; Raya *et al.,* 2004). Saline water present in soil and its constant application with varying salinity levels badly affects the plants and deteriorate soil physico-chemical properties. Under these conditions checking the quality of water for irrigation has great significance in relation to seedling production (Ayers and Westcot, 1999).

Guava is a salt-sensitive plant. Excess buildup of salts in mature leaves of sensitive species show negative effects, such as, quicker leaf chlorosis, necrosis and reduced photosynthetic activity (Neumann, 1997). The adverse effects of salts also vary with the type of salt present in soil and/or irrigation water. For

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Assessment of zinc fertilization techniques for effective Zn biofortification in rice crop

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Abstract

Agronomic biofortification can enhance Zn concentration in cereal grains for minimizing Zn malnutrition in humans. Therefore, a field experiment was executed to assess the effect of Zn fertilization methods on growth and yield components, grain Zn concentrations and Zn bioavailability in rice crop (cv. Shandar). The Zn application methods included, control (No Zn), soil application (10 kg Zn ha^{-1}), foliar application twice (0.3% Zn, at booting and one week after flowering), and foliar Zn application thrice (0.3% Zn, at booting, one week and two weeks after flowering). Application of Zn (either soil or foliar) significantly improved some growth and yield components (number of productive tillers, grains per panicle, weight of 1000-grains, and grain yield) and Zn concentrations in polished and unpolished rice while reduced Phytic acid (PA) concentration with respect to control. Enhancement in Zn concentration and reduction in PA concentration in rice grains resulted in higher Zn bioavailability (less PA: Zn molar ratio and high total daily absorbed Zn (TAZ) values). Among different application methods, foliar application thrice produced more grain yield, higher Zn concentrations, lesser PA concentrations and PA: Zn molar ratio, and higher TAZ values in polished and unpolished rice grains. Foliar application thrice also ensured the target value (28 mg Zn kg^{-1}) in polished rice grains. In terms of Zn bioavailability parameters, only the PA: Zn molar ratio in unpolished rice grains nearly met the optimum ratio value (< 18), while the increase in TAZ values accounted for 33% in polished rice and 53% in unpolished rice.

Key words: Agronomic Biofortification, Zn application methods, Rice growth and yield, Zn concentration and bioavailability, Phytic acid concentration

Comparative performance of composts and NPK fertilizer on growth and quality of maize fodder

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Abstract

Compost is a nutrient rich organic manure that can serve as an alternate source to inorganic fertilizers. To test this supposition, a field trial was performed to observe the effect of various composts and NPK fertilizer on the growth and macronutrients concentration in maize fodder (Zea mays L. cv. Akbar) at Latif experimental farm, SAU Tandojam. Five treatments were: Control (No amendment), Recommended NPK, Water Hyacinth Compost (15 t ha^{-1}), Fruits + Vegetables Compost (15 t ha^{-1}), and Banana Leaves Compost (15 t ha^{-1}). Each treatment was comprised of four replications. The experimental soil (at the depth of 0-15 cm and 15-30 cm) was clay and sandy clay in texture, slightly alkaline in reaction, non-saline, poor in organic matter content, calcareous in nature, low in total nitrogen, marginal in available phosphorus, and adequate in available potassium. The application of organic amendments and NPK fertilizer significantly increased the growth and yield parameters (plant height up to 26%, number of leaves $plant^{-1}$ up to 20%, stem girth up to 22%, and fresh weight of maize fodder up to 25%), and the concentrations of selected macronutrients (N up to 46%, P up to 27%, and K up to 38%) in maize leaves with respect to control. There was no significant variation among various compost treatments and NPK fertilizer application for defined parameters, except for P concentration in maize leaves. A noteworthy enhancement in macronutrients concentrations in surface and subsurface soil, over control plots, has also been observed where organic and inorganic applications were made. The comparative effects of composts to NPK fertilizer suggest that the application of compost can minimize the dependence on inorganic fertilizers and can improve the production and quality of maize fodder.

Key words: Compost, Inorganic fertilizers, Growth, Macronutrients, Maize

Influence of organic and inorganic fertilization on growth and yield of bottle gourd

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Abstract

The effect of organic and inorganic fertilizers is complementary to each other in terms of soil fertility improvement and sustainable agriculture. Therefore, it is necessary to make their judicious use in right proportion for harvesting better yield of different crops and for sustaining soil fertility. Bottle gourd belongs to the family curbitaceae and locally known as 'Lauki' is an important gourd having wide range of uses and is largely cultivated in the tropics and subtropics and used as vegetable, sweets, raita and pickles. Hence, a field experiment was conducted to evaluate the effects of organic and inorganic amendments on growth and yield of bottle gourd. The experiment was designed in randomized complete block design (RCBD) with six treatments. The treatments were: Control (No organic or inorganic fertilizer), recommended NPK (200:150:100 kg ha^{-1}), Compost 1 (Banana leaves + Poultry manure @ 10 t ha^{-1}), Compost 2 (Banana leaves + Cattle manure @ 10 t ha^{-1}), with three replications. The results highlighted that use of both organic and inorganic amendments significantly improved growth and fruit yield of bottle gourd with respect to control. The application of organic and inorganic fertilizers improved fresh fruit weight up to 39%, fruit length up to 9%, fruit diameter up to 25%, vine length up to 21% and number of branches vine-1 up to 36% in compare to control. Among different amendments, application of NPK and Compost made from banana leaves and poultry manure were found statistically equal and higher from other treatments for all of the plant growth parameters. The results of the study had shown that application of compost is equally effective as of chemical fertilizers and helps to increase crop productivity and quality besides maintaining soil fertility for subsequent crops.

Key words: Banana leave Compost; Inorganic Fertilizer; Bottle gourd; Growth and yield;

Stimulation effects of amino acids application on growth and yield of wheat crop

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Abstract

Amino acids are organic compounds and are the building blocks of proteins, which perform structural, metabolic and transport functions in plants. Amino acids have various roles in plant metabolism, and exogenous application of amino acids may have benefits and stimulation effects on plant growth and quality. A field experiment was conducted to assess the effects of essential amino acids on growth and yield of wheat (cv. TD-1) during Rabi season (2017-18). The experiment was designed in randomized complete block design (RCBD) with four treatments and 4 replications. The treatments were T1 (Recommended NP @168 kg N and 84 kg P ha^{-1}), T2 (Recommended NP + foliar application of amino acids at 30 days of sowing), T3 (Recommended NP + foliar application of amino acids at 45 days of sowing), T4 (Recommended NP + foliar application of amino acids at 60 days of sowing). The results highlighted that the application of amino acids significantly enhanced growth and yield parameters of wheat ($P < 0.05$). The maximum plant height (78 cm), number of tillers $plant^{-1}$ (8), spike length (12 cm) and average yield (4760 kg ha^{-1}) were observed within T4 whereas, the minimum plant height (69.6 cm), number of tillers $plant^{-1}$(4), spike length (9.5 cm) and average yield (3480 kg ha^{-1}) were observed from T1. The application of amino acids increased the plant height up to 11%, number of tillers $plant^{-1}$ up to 60%, spike length up to 26% and average yield of wheat up to 37%. Based on these results, we suggest the application of amino acids in the wheat production technology for achieving higher production.

Key words: Amino acids; Growth and Yield; Foliar application

Appraisal of chelated iron in enhancing growth, yield and iron concentration in bread wheat grains

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Abstract

A field experiment was executed to quantify the effect of chelated iron on growth, yield and Fe concentration in bread wheat (Triticum aestivum L. cv. Moomal) at Southern Wheat Section, Agriculture Research Institute Tando Jam. The treatments included, Control (No Fe-EDTA), Soil application of Fe-EDTA (2 kg Fe ha^{-1}), Soil + foliar application of Fe-EDTA (2 kg ha^{-1} and 0.2% Fe thrice), and Foliar application of Fe-EDTA (0.2% Fe thrice). Wheat crop was grown in an experimental unit of 6 m2 (3 m x 2 m) following RCB design with three repeats for each treatment. The experimental soil was clay in texture, moderately alkaline in reaction, non-saline, marginal in organic matter content, moderately calcareous, and adequate in Fe concentration. The selected growth and yield components (plant height, number of tillers $plant^{-1}$, spike length, number of spikelets $spike^{-1}$, 1000 grain weight, straw yield, grain yield, and harvest index) of wheat were increased with Fe-EDTA application over control treatment. Among different Fe-EDTA application methods, there was no significant difference for most of the growth and yield parameters (except spike length and 1000 grain weight). The Fe concentration in wheat grains was significantly higher in all Fe-EDTA treatments over control, with maximum value in the treatment where Fe-EDTA was applied in soil + foliar. Similarly, a high Fe build up in surface soil (0-15 cm depth) was obtained with treatment of Fe-EDTA in soil + foliar. Overall with various Fe-EDTA treatments, a maximum increase of 29% in grain yield and 4.3 times in Fe concentration in wheat grains was achieved in current study. It is suggested that the Fe should be included in wheat production technology to attain better yield and Fe concentration in grains.

Key words: Fe-EDTA applications, Wheat crop, Growth and yield, Fe concentration

Efficiency and performance of hydroponic unit for spinach (Spinacia oleracea L.) Cultivation

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Abstract

The soil less cultivation has an exceptional edge over traditional cultivation methods in terms of economic benefits, growth performance, quality of crops grown and minimum use of fertilizer and water. Therefore, the study was conducted to compare the efficiency of manually designed and fabricated hydroponic model against soil cultivation for Spinach crop at Sindh Agriculture University Tandojam. There were two treatments, each with two replications. The treatments were two mediums for spinach cultivation: Hydroponic (Soil Less) and Geoponic (with soil). In order to get the results of set objectives, all the standard materials (made up of polythene-plastic) required for a perfect hydroponic model, purchased from local markets, were jointed accordingly. The area under geoponic cultivation was kept same as of fabricated hydroponic model size (4' × 4') and full-spectrum LED grow light was used to complete the light requirements of the plants. Under hydroponic cultivation, the stock solution (mix-up of water and nutrients) was used to feed the transplanted plants. Averagely, the efficiency of hydroponic model was 97.42 % compared to water consumption under geoponic cultivation. The growth performance of spinach crop under hydroponic cultivation was much better than the geoponic cultivation. Averagely, the leaf area was 24%, height was 25% and steam size was 24% better than geoponic cultivation. Statistically, there was significant ($p<0.05$) difference in leaf area, height and steam size of plants, which indicated that the yield of crop could also be increase upto 25% using hydroponic technology. From the results of this study it is concluded that, the hydroponic cultivation is an efficient technique for cultivation of spinach and can serve as alternative technique for crop production in areas with adverse soil, water and environmental conditions.

Key words: Hydroponics; Geoponic; Spinach; Growth and yield

Growth and yield of onion as influenced by organic and inorganic fertilization

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Abstract

Onion (*Allium cepa L.*) is one the very important condiments widely used in all households; it is rich source of minerals like phosphorus, calcium, protein and vitamin C. The usage of organic manures as alternative source of nutrients would give better result in growth and yield of onion. Therefore, a pot experiment was carried out to study the efficiency of various organic and inorganic amendments on growth and yield of onion. The experiment was conducted in cemented pots and already prepared compost was used. The treatments involved T1 control (no any fertilizer), T2 recommended dose of NPK (120-60-60 kg ha^{-1}), T3 compost A (Banana leaves + poultry manure @ 15 tons ha^{-1}) and T4 compost B (Banana leaves + Goat manure @ 15 tons ha^{-1}). The results showed positive effects of these fertilizers on growth and yield of onion ($P< 0.05$). The plants which were treated with NPK and compost B significantly produced higher plant length and bulb size then Compost A and control treatment. The weight of bulbs was significantly higher in T2, T3 and T4 in compare to T1 and among these treatments heaviest bulbs were from the NPK applied pots. The application of inorganic and organic composts enhanced length of plant up to 17%, bulb size up to 22%, weight of bulb up to 63% and onion yield per pot upto 50% in compare to control. Based on these results, we suggest that organic amendments are equally effective as of chemical fertilizers for higher onion production and better quality. The compost prepared from banana leaves and goat manure were found better in compare to other type of compost and on the basis of this study it is recommended that use of compost should be included in onion husbandry for better quality higher onion production.

Key words: Banana leave Compost; Inorganic Fertilizer; Onion growth, yield

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DEVELOPMENT OF CROP COEFFICIENT FOR WHEAT CROP UNDER VARIOUS SOIL MOISTURE DEPLETION LEVELS

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ABSTRACT

With increase in population, the development and management of water resources have become essential for sustainable agriculture. This study is an effort to assess the evapotranspiration rates, growth, yield, and to develop crop coefficient (Kc) curves for wheat crop under various soil moisture depletion levels using mini lysimeter. The treatments were T1: 25% Soil moisture depletion (SMD), T2: 50% SMD and T3: 75% SMD. The experimental soil was non saline, slightly alkaline, silty loam in texture with dry bulk density (1.45 to 1.48 g/cm^3) and field capacity values (26.5 to 28%). The results showed that irrigation water applied under different treatments was 264.5, 332 and 451.4 mm for T1, T2 and T3 respectively. The maximum plant height (86.8 ± 0.2 cm), spike length (10 ± 0.02 cm), number of tillers lysimeter-1 (137 ± 1.7 cm), test weight (0.59 ± 0.03 kg), grain yield (0.186 ± 0.02 Kg) and biological yield (0.376 ± 0.01 kg)was recorded under 50% SMD followed by 25% SMD and 75% SMD respectively. The Kc values recorded were 0.51, 0.58, 0.43 and 0.27 for T1, 0.64, 0.73. 0.55 and 0.34 for T2, and 0.87, 1,0, 0.74 and 0.47 for T3 at initial, development, mid and later stages respectively. The water use efficiency values for wheat crop were 21.15, 20.48 and 9.64 kg/ha/mm under T1, T2 and T3 respectively. This study concludes that wheat crop can be irrigated at 50% SMD for maximum growth, yield with better crop coefficient values and water use efficiency where water scarcity exists.

Keywords: Evapotranspiration; Crop coefficient; Soil moisture depletion; Wheat crop; lysimeter.

Recycling of banana plant residues for nutrient rich compost

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Abstract:

Agricultural waste management by *Composting* offers a viable solution to increasing organic wastes. The process of composting offers many benefits including enhanced soil fertility and soil health improved soil biodiversity and reduced environmental risks. This study is an effort to prepare composts from banana plant residues and animal manures and to determine their nutrients concentration. The composts were prepared in cemented pits at Sindh Agriculture University Tandojam. Banana plant residues (trunk and leaves), and various animal manures (cattle, goat and poultry) were collected from selected farms around Tando Jam. Three different composts having variable recipes were prepared, namely banana plants + cattle manure, banana plants + goat manure, and banana plants + poultry manure in 3:1 ratio. Banana trunk and leaves were chopped into smaller pieces (≤ 1 inch) and were filled in the bottom of the pit in a 9 inches layer, followed by 3 inches layer of animal manures (cattle manure or goat manure or poultry manure). This alternate layering pattern remained continued until the pit became full (in total 4 unit layers were prepared). Composts were turned after every 15 days interval, and at each turning temperature was noted and the composts were moistened, if required. The turning process was remained continued for five months, followed by one month for stabilization. Afterwards, composts were sampled, processed and analyzed for EC, pH, total C, N, P, K, and C:N ratio. There was significant difference among various composts with respect to most of the selected parameters ($P< 0.05$). However, the values of selected parameters in all three composts were within the acceptable limits proposed for mature compost. Hence, the defined agricultural waste recycling technique for banana plant residues should be adopted to attain nutrient rich material for crop husbandry and soil health.

Keywords: Agricultural waste management, Banana plant residues, Animal manures, Compost, Nutrients concentration and Soil fertility

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recorded in NIA-MC-7. Hence, it is concluded that efficient PGPR isolates were highly potential for the higher wheat growth and showed their ability to enhance the nutrient uptake in wheat plants.

Keywords: Crop productivity, inoculation, growth enhancement, nutrient uptake, solubilization.

DOES TIME AFFECTS THE PHYSICO-CHEMICAL PROPERTIES OF MIANI SOIL SERIES?

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ABSTRACT

A representative soil profile of Miani soil series (Fluventic Haplocambids) was searched in the experimental field of Agriculture Research Institute Tandojam, using Soil Survey of Pakistan report and survey map. The profile was exposed by making a pit of 1 m depth x 1 m width x 1.5 m length using spade. Soil sampling was done from each evident horizon with soil profile knife. In-situ field observations (soil color, number and thickness of horizons) were also recorded. The samples were processed for the analysis of some physico-chemical properties, macronutrients (NPK) status, and salinity and sodicity parameters. The results obtained in the study were compared with the previous report of Soil Survey (1971). The results indicate that the color of Miani series was variable (Brown-dark brown, Dark grayish brown and Grayish brown). Miani series was non saline to slightly saline, slightly alkaline to moderately alkaline in reaction, low to medium in organic matter content, strongly calcareous, fine to moderately fine textured, very low in total N content, low in available P content, and low to marginal in available K content. Soluble Na+, Ca2+, Mg2+, CO3-2, HCO3-, Cl- and SO4-2, CEC, SAR and ESP were found in variable proportions. In Miani series, most parameters (EC, O.M., CaCO3, soluble Ca2+, Mg2+, CO32-, HCO3-, Cl- and CEC) have increased, two parameters (P and K) have decreased, some parameters (horizons thickness, color and texture) have changed, while two parameters (N and pH) remained same in comparison to the previous report of Soil Survey (1971).

Keywords: Miani soil series, Physico-chemical properties, Soil survey

CAN AGRONOMIC BIOFORTICATION OF RICE ALLEVIATE ZINC MALNUTRITION?

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ABSTRACT

Zinc (Zn) malnutrition in humans can be corrected by agronomic Zn biofortification of cereal crops. Hence, a field experiment was conducted to study the effect of Zn application methods on growth and yield parameters, Zn concentrations and Zn bioavailability in rice grains of NIA-Mehran. The Zn application methods included control (No Zn), soil Zn application (10 kg Zn ha-1), foliar Zn application (0.3% Zn twice, at panicle initiation and one week after flowering), and foliar Zn application (0.3% Zn thrice, at panicle initiation, one week and two weeks after flowering). Application of Zn (either soil or foliar) significantly improved number of productive