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RESEARCH ARTICLE

EFFECT OF BIO FERTILIZER IN ADDITION WITH PHOSPHORUS ON THE GROWTH OF MAIZE (ZEA MAYZ L.).

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sand, maize, bio fertilizer, single super phosphate, growth, height, weight.

Abstract

Pot experiments were carried out in the green house of the Soil Science Department, Faculty of Crop Production, Sindh Agriculture University Tandojam in 2017 summer season to determine the effects of different levels of bio fertilizer and single super phosphate (SSP) on maize. The experiments were based on three replications. The treatments used consist of three levels of bio fertilizer (0, 1.5 and 3 gram per pot), three levels of single super phosphate (SSP) (1, 1 and 1 gram per pot) and third replications were without amendments because it is a control. Results obtained showed that maximum plant height (T3) shoot (21cm) and root (13 cm), plant maximum weight (T3) fresh shoot (1.13 g) and dry shoot (0.03 g), and fresh root (0.46 g) and dry root (0.09 g) were achieved with amendments of bio fertilizer. The results obtained bio fertilizers were better than single super phosphate (SSP). The study suggests that the study sandy soil should be make improvement with bio fertilizers for advanced maize growth performance.

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Introduction:-

Maize (*Zea mays*) or corn is the most important cereal crop in Pakistan and with rice and wheat, maize is one of the three most important cereal crops in the world. Maize is high yielding, easy to process, readily digested and cheaper than other cereal crops. It is also a versatile crop, growing across a range of agro ecological zones. Every part of the maize plant has economic value which the grain, leaves, stalk, tassel and cob can all be used to produce a large variety of food and non food production. Corn is a very versatile grain that benefits mankind in many ways. Each year, 6 billion bushels of corn are used as feed for cattle, hogs and poultry in the United State. Another 2 billion bushels were exported, which is an integral part of this country's balance are converted to sweeteners, starch, flower cereal, liquor, animal feed, vegetable oil, alcohol for fuel and hundreds of other products (Audrac Erickson, 2006). Biofertilizer is a material containing microorganism(s) added to a soil to directly or indirectly make certain essential elements available to plants for their nutrition. Various sources of biofertilizers include nitrogen fixers, phytostimulators, phosphate solubilizing bacteria, plant growth promoting rhizobacteria, etc. (Shekh, 2006). Application of biofertilizers became of great necessity to get a yield of high quality and to avoid the environmental pollution (Shevananda, 2008). Bio-fertilizer usually contains microorganisms having specific function such as *Azospirillum* to fix N₂ and P solubilizing bacteria to solubilize P from the soil and fertilizer to be available to the plants (Saraswati&Sumarno, 2008). Several researchers had conducted the experiments to evaluate the responses of various plants such as young Robusta coffee (Junaedi et al., 1999), soybean (Noor, 2003; Totok&Rahayu, 2007), and turfgrass (Guntoro et al., 2007) to the biofertilizer application, but the results were still inconsistent. Further

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research is still needed in this area. Phosphate and nitrogen are important for plant growth, however plants have a limited ability to extract them from the environment, and thus need microbes involved in “nutrient recycling,” to help a plant uptake and absorb these nutrients at optimal concentration, while plants donate waste byproducts to microbes for food.

With this symbiotic relationship, plants develop stronger and bigger root systems. The larger the plants' roots, the more living space and food there is for the microbes to use. In a way, microorganisms serve as biofertilizers (El-kholy., 2005). An example is the fungus *Penicillium bilaii*, which allows plants to absorb phosphates from the soil. It does this by producing an organic acid which dissolves soil phosphates into a form which plants may use. In field experiments in Argentina, corn inoculated with *Azospirillum lipoferum* showed double the seeds per ear, an increase in seed dry weight by 59 %, and a significant stimulation in root development at harvest time (Fulchieri and Frioni, 1994). Another example is the bacterium *Rhizobium*. (Shekh., 2006). Use of these microorganisms as environment friendly biofertilizer helps to reduce the much expensive phosphatic fertilizers. Phosphorus biofertilizers could help to increase the availability of accumulated phosphate (by solubilization), efficiency of biological nitrogen fixation and increase the availability of Fe, Zn etc., through production of plant growth promoting substances (Kucey., 1989). Increased root, shoot weight with dual inoculation in maize have been reported by (Chabot et al ., 1993), while grain yields of the different maize genotypes treated with *Azospirillum* spp. Seed inoculation with *Rhizobium* , phosphorus solubilizing bacteria, and organic amendment increased seed production of the crop (Panwar et al., 2006). Increasing yield was attributed to the plant growth promoting substances by root colonizing bacteria more than the biological nitrogen fixation, (Lin et al., 1983) stated that yield increased due to promoting root growth which in turn enhancing nutrients and water uptake from the soil. There were positive and synergistic interactions between factors like interactions between mycorrhizal inoculation and phosphate biofertilizer on N concentration and phosphate biofertilizer and vermicompost on P concentration (Darzi et al., 2009). For give to highest seed yield in agriculture addition to both nitrogen and phosphate fertilizer is very important (Shaban, 2013a, b). Therefore this study was planned to examine effect of different biofertilizers on yield and yield components of maize.

Materials and methods:-

This study was conducted in the department of soil science Sindh Agriculture University Tandojam, the sandy textured soil was used, which was manually collected from experimental field of agronomy section ARI Tandojam, Sindh, collected sand was brought in green house the experimental area of department of soil science, then the sand was washed and dried at room temperature and followed by putting in an oven at 105 centigrade for 72 hours. The experiment was laid out in order to evaluate the effect of different doses of bio fertilizer and single super phosphate (SSP) on basis of weight and height of the roots and shoots of the maize crop (*zeamays L.*). Disposable glasses were used as a pot , there were three treatments of bio fertilizers (T1=Control, T2= 1.5g/pot, T3=3g/pot) and three treatments of single super phosphate (SSP) (T1=1g/pot, T2= 1g/pot, T3=1g/pot) there was one replication without any application of biofertilizer or SSP fertilizer, the number of seeds sown 4-5 seeds/pot, every seed was inserted into sand up to the depth of 3-5cm.

Results:-

Plant height:-

The effect of all treatments on plant height was significant. The comparison of the mean values of plant's shoot and root height showed that among bio fertilizers treatment three (T3) has the highest shoot (21 cm) and root (13 cm) and control treatments have the lowest height of (T1) shoot (14 cm) and root (12 cm) and differences were significant among single super phosphate (SSP) treatments the first treatment (T1) the highest plant shoot height (21 cm) and root (11cm). The interaction between SSP x bio fertilizer shows that height of (T3) has the highest shoot (21 cm) and root (13 cm) and (T1) the lowest plant shoot height (21 cm) and root (11cm).

Plant Weight (Fresh and Dry):-

The effect of all treatments on plant weight was significant. The comparison of the mean values of plant's shoot and root showed among the bio fertilizers (T3) has the highest shoot fresh weight (1.13 g) and dry weight (0.03 g), and highest root fresh weight (0.46 g) and dry weight (0.09g), and control treatment has lowest (T3) shoot fresh weight (0.90 g) and dry weight (0.07 g), and lowest root fresh weight (0.21 g) and dry weight (T1) (0.06 g), and the differences were significant among single super phosphate (SSP) treatments, (T1) has the highest shoot fresh weight (0.87 g) and dry weight (T3) (0.09 g), and highest (T1) root fresh weight (0.69 g) and dry weight (T3) (0.09 g), The interaction between SSP x bio fertilizer shows that weight of (T3) has the highest shoot fresh weight (1.13 g)

and dry weight (0.03 g), and highest root fresh weight (0.46 g) and dry weight (0.09g), and the lowest weight of (T1) shoot fresh weight (0.87 g) and dry weight (T3) (0.09 g), and lowest (T1) root fresh weight (0.69 g) and dry weight (T3) (0.09 g),

Length, fresh weight, dry weight of shoots and roots of maize crop.

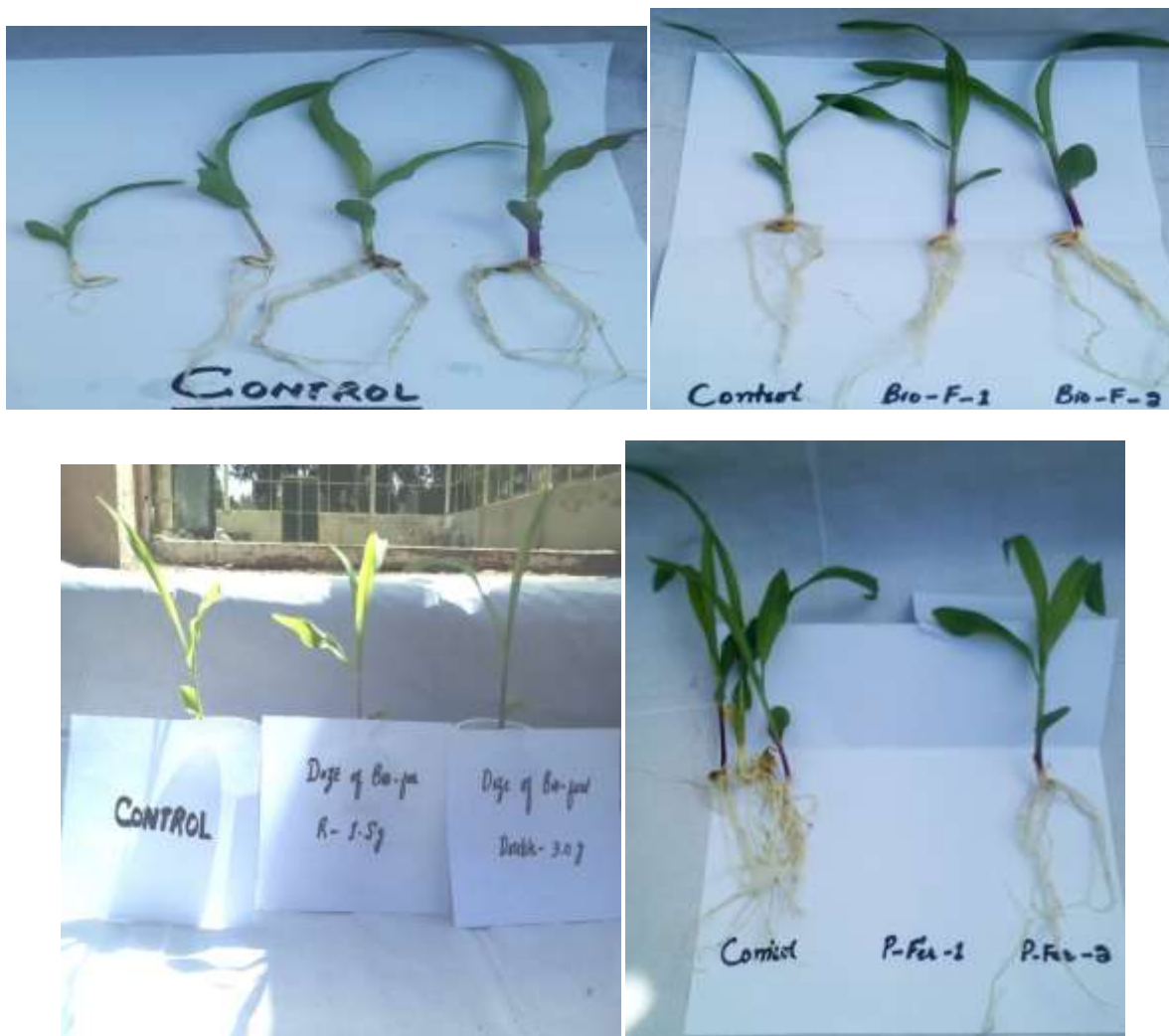
Table of shoots

Samples	Shoot fresh weight	Shoot dry weight	Length (cm)
Bio fertilizer, control	0.55	0.02	17.5
Bio fertilizer (1.5g)	0.85	0.02	20
Bio fertilizer (3g)	1.13	0.03	21
P + (1g)	1.16	0.07	(14) ¹ , (20) ² , (16) ³
P+ (1g)	0	0	0
P+ (1g)	0.90	0.07	20.5
P- control	0.87	0.07	21
P- control	0.36	0.02	(17) ¹ , (16) ²
P- control	0.20	0.09	9

Table of roots

Samples	Root fresh weight	Root dry weight	Length (cm)
Bio fertilizer, control	0.25	0.02	11
Bio fertilizer (1.5g)	0.29	0.06	11.5
Bio fertilizer (3g)	0.46	0.09	13
P+ (1g)	0.38	0.06	(12) ¹ , (10) ² , (12) ³
P+ (1g)	0	0	0
P+ (1g)	0.21	0.07	12.5
P- control	0.69	0.06	11
P- control	0.23	0.03	(11) ¹ , (10) ²
P- control	0.1	0.09	2





Photos Gallery

Discussion:-

The main purpose of this experiment was to check the root and shoot growth of maize crop with different doses of bio-fertilizer and in organic fertilizer, the effect of bio-fertilizer and in organic fertilizer was very clear and very quickly soluble and plant was up take very rapidly because sand was well dried and well washed and no any other thing was present in the sand but the different doses were give a significant data in T3 where we applied (3g bio-fertilizer) and 1g of in organic fertilizer the plant was up take the more and more nutrients from T3 and give a very good result then the other.

Conclusion:-

In conclusion, the soils of the study area were low in major macronutrients. This suggests poor soil fertility that may require some extenuating measures to improve. Furthermore, the results indicated that individual application of organic and inorganic fertilizers had significant effect on all agronomic growth parameters like plant height, and weight (shoot and root) of maize. Maize growth performances as measured in terms of the above parameters were generally enhanced and better with application of 3g bio fertilizer per pot and 1g of SSP per pot. For optimum maize growth and vigour, therefore, individual application of organic and inorganic fertilizers at moderate (1.5g bio fertilizer per pot and 1g SSP) rates may be recommended particularly in the study of pot experiment.

Summary:-

A pot experiment was conducted for check the growth parameters of maize crop in the different doses of bio-fertilizer and in organic fertilizer (phosphorus) we have take 200g of oven dried sand and well washed and we have

made (3T and 3R) in T1 recommended in T2 (1.5g/pot) (T3 3g/pot) the verity was (cv Akbar) in every treatment we were applied 1g of in organic fertilizer we were compare all these treatment with treatment 1 where we not applied any kind of fertilizer and that was our controlled treatment but in treatment 3 we gate a maximum result then the other treatment like 1 and 2 this is our pot experiment result.

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