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The Effect of biological fertilizer biosuperphosphate and triple super phosphate fertilizer phosphate on yield and phosphorus use efficiency of spring corn in The climatic conditions izeh

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Abstract

To evaluate the performance of triple superphosphate fertilizers for bio superphosphate and different amounts of corn represents 704 research was conducted in February 1391 in a field located in the city izeh. This research was a split plot in a randomized complete block design with split plot design with three replications was conducted. In this experiment, triple super phosphate as the main factor of 4, the application of 0, 65 130, 195 kg ha subplots in both application and non-application of bio-fertilizer was applied bio superphosphate . The results showed that the effect of phosphorus on yield, biological yield, harvest index, seed and fertilizer use efficiency of P was significant at P. With the increasing use of triple super phosphate fertilizer, seed yield and harvest index and percentage increases in phosphorus and phosphorus fertilizer use efficiency, showed a significant decrease. bio superphosphate biological fertilizer application significantly increased grain yield, biological yield, harvest index and percentage of seed phosphorus and phosphorus fertilizer use efficiency was. bio superphosphate and triple super phosphate fertilizer, bio-fertilizer combination treatments increased grain yield values were . The use of bio-fertilizer and 195 kg ha triple super phosphate bio superphosphate highest grain yield was significant difference was observed with the application of 130 kg ha triple super phosphate.

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Introduction

Although the use of biological fertilizers in agriculture has a long history, but scientific exploitation of these sources has no long previous record. However, the application of the fertilizers has decreased in recent decades, but nowadays with respect to the problems that uncontrolled use of fertilizers has posed, their use has been reintroduced in agriculture (Moalem and Eshghizadeh, 2007). Biological fertilizers have a considerable advantage compared with other chemicals including that they participate in the food chain of toxic and microbial substances, have the self-reproducibility and cause to reform physical and chemical properties of soil (Stark Condron *et al*., 2007). In recent decades, the use of chemical inputs in agriculture has given rise to environmental problems such as water pollution, poor quality crops and reducing soil fertility (Sharma, 2002). Biological fertilizers are not exclusively referred to organic substances from animal fertilizers and plant residues, but it does apply to products from the activity of microorganisms that are active in relation to nitrogen fixation and availability of phosphorus and other nutrients in soil (Rastin, 1998). One of the ways to achieve sustainable agriculture is the use of microorganisms that play an important role in plant nutrient (Jackson *et al* ., 1992).

The capability of low-phosphorus in most non-fertilized soils has been considered as a major limiting factor in plant growth (Hinsinger , 2001). This does not mean that the amount of phosphorus in the soil is low, but it means that part of the phosphorus that can be absorbed in plant is limited due to complex chemical reactions of phosphorus in the soil that led to its preservation and maintenance in soil. In low-usable phosphorus soils, different plants and even different varieties of one species have different abilities in growth and development (Wang *et al* ., 2005). In other words, they have different use efficiency of phosphorus. “Use efficiency” of phosphorus in the soil depends on two factors (Moll *et al*., 1982) 1- Consumption efficiency, which, is the plant’s ability to convert small amounts of absorbed nutrient element in yield, is relatively high. 2 - Absorption efficiency in fact is the plant's ability to extract nutrient elements from the soil in the deficiency of the elements conditions. For most agricultural plants, phosphorus-absorption efficiency is of special importance in the growth and development of the plant (Föhse *et al*., 1988). Phosphorus-absorption efficiency from soil primarily depends on two factors: The first one is the size of the root system and the second one the flow towards the inside (Bhadoria *et al* ., 2001). The flow towards the inside of phosphorus actually is the phosphorus movement into plant root based on mole per area unit or root length that is expressed per time unit. The flow towards the inside of phosphorus on the one hand is related to the plant's ability in absorption and on the other hand to restrictions of the movement of phosphorus in the soil (Claassen *et al* ., 1991). This research investigated the possibility of bio superphosphate fertilizer as a source of fertilizing sources and comparing its effect on the characteristics of single cross 704 maize compared with triple superphosphate in Izeh region.

Materials and methods

Field experiment

This experiment was conducted in Izeh city in February 2012 with geographical longitude of 45 degrees, 42 minutes east, 33 degrees of geographical latitude, 21 minutes north with 19.5 meters height and using maize Mobin 704. The experimenting soil texture was silty clay loam with pH of 6.7 and EC of 1,7.

This research was carried out in split plot in form of randomized complete block design, in three replications and two factors. The main factor consisted of four levels of triple superphosphate (application P0=0, P1=65, P2=130, P3=195 kg per hectare of phosphorus) and the sub-factor in two levels (B1 application or B2 in application of bio superphosphate fertilizer) were performed. The needed maize seeds were treated and wet with a little water and then mixed with bio superphosphate fertilizer and finally seeds were planted by hand with consideration of a density of 75,000 shrubs per

hectare with a gap of 18 cm in a bed. Planting the seeds was carried out in early February. Each plot was consisted of six lines with a length of 5 m and a distance of 75 cm. Nitrogen was applied according to the amount of 200 kg of net nitrogen from urea in two stages that 100 kg of it was given simultaneously with planting and the rest as the surplus. Triple superphosphate fertilizer also was given to meet the need of phosphorus according to the amount of each treatment. The first irrigation was performed immediately after planting and during the growing period totally 9 times it was done according to the plants' needs and irrigation period common of the area.

In this experiment, grain yield, biological yield, harvest index and percentage of seed phosphorus and phosphorus fertilizer use efficiency were studied.

Data Analysis

The SAS software was employed to analyze the data variance and comparison of the means was done using Duncan test at 5% and 1% level.

Results and discussion

Phosphorous of seed

The amount of phosphorous content The results showed that the effect of triple super phosphate fertilizer and bio superphosphate the amount of phosphorous content was significant (Table 1). Triple super phosphate fertilizer increased, the amount of phosphorous content increased with higher phosphorous content of 0.51, with an average yield of 65 kg per ha and the lowest yield was zero, with a mean of 0.25 (Table 2). bio superphosphate with biological application, the maximum amount of phosphorous content increased phosphorous content of 0.48 and a minimum amount of application bio superphosphate biological treatment for non-life application bio superphosphate value was 0.45 (Table 2). Rashidi *et al* (1390) reported that combined application of phosphate fertilizers and phosphate solubilizing bacteria due to increased absorption of phosphorus and nitrogen in wheat plants increased yield, seed protein content and phosphorus.

Table 1. Results of variance analysis of seed yield, seed yield and other traits of maize.

S.O.V	D.F	Phosphorous of seed	PUE	Yield of seed	Biological yield	HI
R	2	0/001164	81.23	2013	4791	11.712
P	3	**0.119927	372.52	**70110	**47199	**293.187
Ea	6	0.000041	19.35	1461	1291	6.826
B	1	**0.007825	269.34	**23141	**5818	**637.151
BP	3	0.000249	8.06	*6832	172	1.892
E b	8	0.000120	2.43	1450	161	0.706

ns and * and ** respectively indicate no significant difference, and the difference is significant at the one percent level five.

Table 2. Comparison of effects mean of triple superphosphate fertilizer and bio superphosphate fertilizer on seed yield and other traits.

Treatment	Phosphorous of seed gm-2	Phosphorus use efficiency g / g	Seed yield (gm-2)	Biological yield (gm-2)	HI
P0(0)	0.25 c	-	312/9 c	1276.47 c	24.53 c
P1(65)	0.51 b	31.46 b	458/2 b	1396.88 b	34.74 b
P2(130)	0.55 a	21.28 b	557/4 a	1466.53 a	37.98 ab
P3(195)	0.55 a	15.95 c	591/8 a	1462.50 a	40.41 a
B1	0.45 b	19.03 b	444/7 b	1381.76 b	31.90 b
B2	0.48 a	26.77 a	529/1 a	1419.43 a	36.93 a

Mean Treatments with similar letters are based on Duncan's multiple range test, 5% are not statistically significantly different from each other.

Phosphorus use efficiency

The results showed that the effect of treatment on efficacy of triple super phosphate fertilizer P was not significant (Table 1). Triple super phosphate fertilizer increased, decreased phosphorus use efficiency, yield the highest efficiency phosphor with an average of 31.46 and the lowest is 65 kg per hectare yield of 195 kg per ha, with an average of 15.95 was obtained (Table 2). bio superphosphate treatments on the amount of phosphorus use efficiency was significant (Table 1). bio superphosphate fertilizer application rate of phosphorus use efficiency increased with the application of biological phosphorus use efficiency bio superphosphate maximum value of 26.77 and the minimum treatment for non-life application bio superphosphate value was 3.19 (Table 2). Soil phosphorus use efficiency primarily to two factors: 1 - the size of the root system and (2) - flows into the pores. Flow into the root system as compared to a greater share of the efficiency is high. Yazdani and colleagues (1386) reported that inoculation of bacteria enhancing the growth of biological fertilizers and phosphate solubilizing bacteria significantly increased crop yields, fertilizer use efficiency in corn is SC 704.

Table 3. Comparison of the combined analysis means of triple superphosphate fertilizer and bio superphosphate fertilizer on seed yield.

Treatment		Grain yield gm^{-2}
b	p	
1	0	280.7e
2	0	345.2d
1	1	451.6c
2	1	518.8b
1	2	512.1b
2	2	602.6a
1	3	534.2b
2	3	649.3a

Grain yield

The effect of bio superphosphate fertilizer interaction, triple superphosphate and interaction of bio superphosphate fertilizer and triple superphosphate on the yield of seed was significant (Table 1). The results of means comparison showed that the highest of seed to the treatment of triple superphosphate fertilizer application of 195 kg per hectare and the treatment of bio superphosphate fertilizer application were observed (Table 2). The highest yield of seed from the treatment of B2P3 (application of bio superphosphate fertilizer 195 kg per hectare of triple superphosphate) and the lowest from the treatment of B1P0 (in application of bio superphosphate fertilizer without triple superphosphate) were obtained 649.3 and 280.7 gm^{-2}respectively (Table3). It seems that solubility of insoluble phosphates by microorganisms is done through the production of organic acids, chelating oxo acids of sugars and interchanging of reactions in the environment of root growth are of the other mechanisms of microorganisms in increasing of nutrients absorption and consequently it results in increasing yield components and seed yield. The results were consistent with those of Tavhidi moghadam and colleagues (2007) that in the presence of phosphate soluble bacteria, the amount of phosphate chemical fertilizers decreases by 50 percent. Ghasemi and colleagues (2009) reported that the beneficial effect of combining phosphatized bio fertilizer with phosphorus chemical fertilizer was quite evident from the standpoint of seed yield increase under the condition of dehydration tension in maize single cross 704.

Biological yield

The results showed that the effect of triple super

phosphate fertilizer and bio superphosphate fertilizer biological yield was significant (Table 1). Triple super phosphate fertilizer rate increased, biomass increased with 1466.53 grams per square meter, with an average maximum biomass yield of 130 kg per ha and the lowest yield was obtained with zero mean 1276.47 gm^{-2} (Table 2). The biological application bio superphosphate, biomass increased, the maximum yield of bio-fertilizers bio superphosphate 1419.43 gm^{-2} and the minimum value of the non-application of biological treatment bio superphosphate value was 1381.76 gm^{-2} (Table 2). Seems to be dissolving insoluble phosphates by microorganisms through the production of organic acids to chelate Agzvasydha and exchange reactions of sugars in root growth of these microorganisms to increase nutrient uptake and other mechanisms to increase grain yield be. The results of the research Kazemi *et al* (1386) were consistent increase in the availability of soil phosphorus in the form of either inorganic fertilizer or bio superphosphate on many traits of two varieties of bean plants had a positive effect on the amount of the highest yields biological fertilizer biological yield was obtained.

Harvest index

The results showed that the effect of triple super phosphate fertilizer and bio superphosphate on harvest index was significant (Table 1). Triple super phosphate fertilizer rate and harvest index increased harvest index was highest with an average yield of 195 kg per ha, 40.41 and 24.53 with a mean of zero, the lowest yield was obtained (Table 2). The biological application bio superphosphate, increased harvest index, biological fertilizers bio superphosphate maximum harvest index of 36.93 and the minimum value of the non-application of biological treatment bio superphosphate value was 31.90 (Table 2). The reason is said to be in good nutritional condition of the materials produced in the plant matter was more devoted to the extremities of Economic nuts of the the more increase in grain yield, (HI), as well as the significant (the Malakooti *et al*, 1387). Sani *et al* (1386) reported that application of manure together with seed inoculation Aztobactria and azspyryluvm has increased harvest index.

The results showed that treatment with triple super phosphate fertilizer, seed yield, biological yield, grain P content, harvest index was significant. Triple super phosphate fertilizer increased grain yield, biological yield, harvest index and P increased. So that the highest yield of 195 kg per ha, respectively. But with the increase of triple super phosphate fertilizer, phosphorus use efficiency decreased and the highest yield of 65 kg per ha, respectively. superphosphate phosphate biofertilizer on seed yield, biological yield, harvest index, the efficiency of P, P was significantly increased with the amount of phosphate fertilizers for bio bio superphosphate and triple super phosphate fertilizer, bio-fertilizer combination treatments increased grain yield values were. The use of bio-fertilizer and 195 kg ha triple super phosphate bio superphosphate highest grain yield was significant difference was observed with the application of 130 kg ha superphosphate.

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