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EFFECT OF BIOFERTILIZERS WITH AND WITHOUT FARMYARD APPLICATION ON THE AVAILABILITY OF SOME NUTRIENT ON CALCAREOUS SOIL AND SORGHUM PLANTS

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ABSTRACT: *A field experiment was carried out in calcareous soil at Nubaria Agriculture Research Station in summer season 2010 to study the efficiency of farmyard manure and bio-fertilizers application on the availability of some nutrient on calcareous soil as well as yield and mineral contents of sorghum plants. The treatments include farmyard at rate 10 ton/fed (Fyd) and two types of bio-fertilizers N-fixing bacteria (Nb) and P-dissolving bacteria (Pb), added individual or mixing with each other, nitrogen fixing bacteria, and P-dissolving bacteria (NbPb), mixture from all (FydNbPb) and control.*

The results indicated that the application of farmyard manure and bio-fertilizers increasing soil organic matter (%) and decrease soil salinity, as well as emphasized the role of treatments on increasing the availability of N, P, K, Fe, Mn and Zn (mg/kg soil). The combination of the different treatments (FydNbPb) had the highest effect on the studied soil parameters.

The dry mater yield of the two cuts of sorghum were significantly increased when soil was treated either farmyard or bio-fertilizers. The combination of farmyard and mixture of N-fixing bacteria (Nb) and P-dissolving bacteria (Pb) resulted in greater value of sorghum yield than those obtained when each applied individually. Also, the N, P, Fe, Mn and Zn contents (mg/kg plant) for two cuts of sorghum plants were remarkably increased with different degrees by the application of the treatments under consideration. The highest uptake and concentration of each nutrients were associated with farmyard and mixture of and N-fixing (Nb) and P-dissolving bacteria (Pb) application (FydNbPb).

Key word: *Farmyard, bio-fertilizers, calcareous, sorghum*

INTRODUCTION

Egypt vitally needs sustained agricultural development to cope with the social and economic obligations that a the normal consequences of the continued high rates of population growth. This urgent need requires continuous scientifically based implementation of effective agricultural practices. Use of soil microorganisms which can either fix atmospheric nitrogen, solubilize phosphate, synthesis of growth promoting substances or by enhancing the decomposition of plant residues to release vital nutrients and increase humic content of soils, will be environmentally begin approach for nutrient management and ecosystem function(Wu *et al.,* 2005).

Application of bio-fertilizer is considered today to limit the use of mineral fertilizers and supports an effective tool for desert development under less polluted environments, decreasing agricultural costs, maximizing crop yield due to providing them with an available nutritive elements and growth promoting substances (Metin *et al.,* 2010).

Soil microorganisms are important components in the natural soil sub ecosystem because not only can they contribute to nutrient availability in the soil, but also bind soil particles into stable aggregates, which improve soil structure and reduce erosion potential (Shetty *et al.,* 1994).

Many authors have shown the positive effect inoculation of wheat with Azotobacter chroococcum or yeast (Badr *et al.,* 2009 and Bahrani *et al.,* 2010).

Organic agriculture is a holistic production management system which promotes and enhances agro ecosystem, health, including biodiversity, biological

cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions and locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system. Organic agriculture is a system that relies on ecosystem management rather than external agricultural inputs Samman *et al*., (2008). Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy food and long term sustainability and concerns on environmental pollution.

Govindarajan and Thangaraju (2001) reported dual inoculation of *Azospirillum* with phosphate solubilizing bacteria resulted in additional benefit by increasing the plant height in Chilli. Anburani and Manivannan (2002) reported that FYM + press mud 12.5 ton/ha each along with 100 percent NPK + bio-fertilizers recorded the highest plant height (108.90 cm), number of primary branches (11.66) and number of leaves (94.05), whereas FYM at 25 ton/ha along with 100 percent NPK + bio-fertilizers (*Azospirillum* + phosphate solubilizing bacteria) recorded the highest stem girth (3.71 cm), number of secondary branches (15.58) in brinjal cv. Annamalai.

Wange and Kale (2004) reported that the results revealed significant improvement in vegetative characters such as plant height, number of leaves per plant in brinjal recorded more over the recommended rate of N-fertilizer due to inoculation with mixture of Azotobcter+ *Azospirillum* and followed by application of 75 kg N per ha. Naik and Hosamani (2003) attributed the increase yield of green chilli (*Capsicum annuum* L. cv. Byadagi Dabbi) by *Azospirillum* inoculation to improve vegetative growth and maximum number of fruits per plant. Shashidhara (2000) noticed significantly higher fruit length (11.7 cm), lower fruit number (8.9) and fruit yield (400.1 kg/ha) with application of *Azospirillum* (0.5 kg/ha) and phosopho-bacteria (0.5 kg/ha) compared to 50 percent RDF (10.2 cm, 12.6 and 500.6 kg/ha) alone in chilli. Nanthakumar and Veeraraghavathatham (2001) reported that the yield of brinjal plant was significantly increased due to application of FYM, *Azospirillum* and phosphobacteria in addition to NPK than the application of inorganic fertilizer alone. The highest yield of 36.94 ton per ha was recorded in the plots treated with 100% NPK + FYM + *Azospirillum* + phosphor-bacteria which was closely followed by 36.48 ton per ha with application of 75:75:100 kg NPK per ha + FYM + *Azospirillum* + phosphor-bacteria. The lowest yield of 20.13 ton per ha was obtained from application of 75:75:100 kg NPK per ha alone in brinjal cv. Palur-1. Anburani and Manivannan (2002) reported that, FYM at 25 ton per ha along with 100% NPK + biofertilizers (*Azospirillum* + phosphate solubilizing bacteria) recorded the highest fruit set percentage (65), number of fruits (26.64), fruit yield per plot (62.92 kg/ha) and estimated fruit yield (31.67 ton/ha) in brinjal cv. Annamalai.

Application of bio-fertilizer is considered today as a promising alternative for mineral fertilizers and supports an effective tool for desert development under less polluted environments, decreasing agricultural costs, maximizing crop yield due to providing them with an available nitrogen source and growth promoting substances. (Hegazi *et al* ., 1998; Amer *et al*., 2002) seed inoculation of wheat verities with phosphate solubilizing and phyto-hormone–produced by *A. chroococcum* showed a better response over the control.

Ahmed *et al* (2011) stated that Bio-fertilizers inoculation significantly increased most growth and yield parameters, yeast had superiority on Azotobacter. Moreover, mixed inoculums, generally, had more favorable effect on the majority of studied parameters than single inoculants. Significant differences were recorded between interactions of cultivars and organic fertilizer, cultivars and bio-fertilizers as well as organic and bio-fertilizer for most of the studied characters. As for the interaction effect between cultivars, organic and bio-fertilization, the highest dry matter

accumulation in shoot system and spikes and the highest yield and yield components recorded in Gemmiza-10 cultivar fertilized with 20 m^3/fad and inoculated with yeast and Azotobacter.

Yassen, *et al* (2010) showed that, application of farmyard manure and filter mud residue gave a significant increase in grain and straw weight, total yield, crop index, harvest index, curd protein, N, P and K compared to the control treatment. They also indicated that significant increase grain, straw and total yield in sandy soil compared with calcareous soil under study in all treatments. On the other hand, the addition of organic materials (Farmyard manure and filter mud) were effective either individual or mixed with other. The pronounced increase in grain and straw weight, N, P and K content and uptake was noticed when farmyard manure was combined with filter mud at the rate of 2% compared with 1% of organic residues Thamodharan *et al.* (2003) mentioned that PDB population in the rhizosphere was consistently high on pigeon pea. Akbari *et al* (2011) revealed that bio-fertilizer improved plant productivity and quality in sunflower seed. Ismail *et al* (2009) stated that nutrient uptake of marjoram plants positively responded to bacterial inoculation and the concerned organic phosphorus sources. High proportions of phosphate solubilizing microorganisms (PSMs) are concentrated in the rhizosphere of plants. Many studies have shown an increase in growth and P-uptake by plants through the inoculation of PSMs in pot experiments and under field conditions (Vassilev *et al*. 2006).

The present investigation aims to study the effect of application of bio-fertilizers individually or in combination with each other on some availability of some nutrient of calcareous soil grown with sorghum plant, with and without farmyard manure application

MATERIALS AND METHODS

A field experiment was carried out in calcareous soil at Nubaria Agriculture Research Station during 2010 summer season. Some soil properties and farmyard manure properties are given in Tables 1 and 2. The experimental plots were arranged in randomized completely blocks design with three replicates for each treatment. The applied treatments were; N-fixing bacteria (Nb), P-dissolving bacteria (Pb) , mixture of N-fixing and P-dissolving bacteria (NbPb), farmyard manure at rate 10 ton/fed (Fyd), farmyard manure + N-fixing bacteria (FydNb), farmyard manure + P-dissolving bacteria (FydPb), farmyard manure + P-dissolving bacteria + N-fixing bacteria (FydNbPb) and Control. Farmyard manure was added to the soil and thoroughly mixed with soil surface layer about weeks before cultivation. However, bio-fertilizers treatments were mixed with the sorghum seeds during the cultivation. Each plot was fertilized with superphosphate (15% P_2O_5) at rate of 150 kg/fed, during soil preparation. Ammonium nitrate was added through two doses during the growing season i.e, the first application was after 10 days from planting and the second application was after the first cut. Each dose was at the rate 30 kg N/fed. Potassium was applied twice at rate of 15 kg (k_2O/fed), with the two doses of N application treatment. The first cut was after 50 days from planting and the second, 45 days later. The yield of each treatment was recorded and statistically analysis (Snedecor and Cochran 1973) for each cut. Plant samples of each treatment were divided into two parts, the first one was oven dried at 105ºC to estimate dry weights for statistical analyzed, and the second part was oven dried at 70ºC for chemical analysis. The dried plant samples were wet ash with ternary acid mixture (HNO_3-$HClO_4$-H_2SO_4) to determination P, Fe, Mn and Zn following the method reported by VanSchowenburg (1968). Phosphorus was determined according to the method of ascorbic acid described by Frie *et al* (1964). Fe, Mn and Zn were determined using atomic absorption. N was determined by Kjedahl method as described by FAO (1970) using H_2SO_4 +digestion mixture.

Table (1): Some physical and chemical properties of soil under investigation

Sand %	Silt %	Clay %	Texture classes	OM %	$CaCO_3$ %	pH	EC dS/cm
65	13	22	SCL	0.43	19	7.9	5.9

Table (2): Some chemical properties of farmyard manure

Manure	EC dS/m	OM %	N %	P %	Fe mg/kg	Mn mg/kg	Zn mg/kg
Farmyard manure	1.4	16	0.5	0.2	5752	615	82

After the second cut, representative soil samples were collected from the soil surface layer of each replicate and measured total N was determined according to the modified kjeldahl method after Chapman and Pratt (1961), available phosphorus was determined according to Olsen *et al* (1954), exchangeable potassium was determined according to Jackson (1973) and available Fe, Mn and Zn were extracted by DTPA according to Lindsay and Norvell (1978) and determined by atomic absorption.

RESULTS AND DISCUSSION

1. The effect of treatments on some chemical properties of the studied soil

Data presented in Table 3 showed the effect of bio-fertilizers and farmyard at 10 ton/fed on some chemical properties of the studied soil

1.1.Organic matter content (%):

Data in Table (3) revealed that all treatments increased soil organic matter as compared to the control treatment. Soil organic matter content increased with increasing application of farmyard (Fyd) at 10 ton/fed.

Also the application of bio-fertilizer increased organic matter, which the mixture of (nitrogen fixing bacteria and phosphate dissolving bacteria (NbPb)) was superior as compared to nitrogen fixing (Nb) or phosphate dissolving bacteria (Pb) treatments. The results indicated that the increment of the soil organic matter content with, bacteria fixing nitrogen (Nb), farmyard with nitrogen fixing bacteria (Fyd Nb) and farmyard with mixture nitrogen fixing bacteria and phosphate dissolving bacteria (FydNbPd) related to control were 13.79% , 65.52% and 93.10%, respectively.

The results showed that phosphate dissolving bacteria (Pb) and nitrogen fixing bacteria (Nb) individually or with each other had the lower value than (Fyd) individually or with bio-fertilizers treatment, in soil organic matter content. These results were supported by (Ali *et al*. 2002 and Beheiry *et al*. 2005).

1.2. Soil salinity (dSm^{-1}):

Data in Table (3) clearly revealed that soil EC values were remarkably decreased by the treatments under consideration. Data showed that the EC values decreased as compared to the control treatment. The decrement of soil EC values reached 23.3% due to farmyard at 10 ton/fed (Fyd) compared to control treatment. The decomposition of organic matter is the main factor responsible for increasing acidity and by turn, decrease EC. The efficiency of farmyard manure on reducing EC values may have a role on increasing the infiltration rate of the studied calcareous soil and consequence in reducing the soil EC values (El-Maghraby 2001).

Table (3): the effect of treatments on some chemical properties of the studied soil.

Treatment	Organic matter %	EC (dSm^{-1})
Control	0.58	4.98
Fyd	0.86	3.82
Nb	0.66	4.12
Pb	0.62	4.36
NbPb	0.72	3.82
FydNb	0.96	3.66
FydPb	0.92	3.7
Fyd NbPb	1.12	3.2
Mean	0.81	3.95

With respect to the effect of bio-fertilizers, data showed very similar trend to those obtained of farmyard manure at rate 10 ton/fed with respectively decrement the valus to 17.3, 12.5 and 23.3 % due to nitrogen fixing bacteria (Nb), phosphate dissolving bacteria (Pb) and mixture of nitrogen fixing bacteria and phosphate dissolving bacteria (NbPb) treatment respectively. As well as decrement the valus 26.5% , 25.7% and 35.7% due to (FydNb), (FydPb) and (FydNbPb) treatments respectively as compared to control on EC values. Such results were in a harmony with Ali *et al* (2002). The combined (FydNbPb) treatment was superior to all treatments on reducing EC values with the decrement of EC values reached 35.7 % as compared to the control treatment.

2. The effect of treatments on the availability of some nutrient (mg/kg soil):

The positive effect of the studied materials on increasing total N% and P% are true reflection by improving some physical and chemical properties of the calcareous soil under investigation. Moreover, the role of farmyard manure on the supply of nutrients by the decomposition of such material that induce the slow release of N% and P% in a readily available from makes it accessible to plants for better growth and nutrient uptake.

Table (4) showed that the application of farmyard manure at 10 ton/fed, individually or in combination with bio-fertilizers led to increase the availability of. N, P, Fe, Mn and Zn (mg/kg soil). The highest values of nutrient was found with the farmyard at 10 ton/fed. The highest increment over control due to farmyard at rate 10 ton/fed treatment reached 31.43%, 41.67%, 17.07%, 10.26% and 13.04% for N, P, Fe, Mn and Zn, respectively. The results may be attributed to the higher initial content of nutrients in farmyard manure and its effect on lowering pH through biodegradation by soil micro organisms.

In addition, (NbPb) treatment increased the availability of elements under investigation as compared to individually Nitrogen fixing bactria (Nb) or phosphate dissolving bacteria (Pb) treatment, which the increament when applied (NbPb) treatment reached 78.21%, 58.33%, 24.39%, 20.51 and 26.09% for N, P, Fe, Mn and Zn, respectively over the control. The highest rate of increament, when applied (Fyd) reached 42.14%, 100%, 39.02%, 30.77% and 100% for N, P, Fe, Mn and Zn, respectively over control treatment. Such results are in agreement with the finding of Beheiry *et al* (2005).

Table (4): The effect of treatments on the availability of some nutrient (mg/kg soil)

Treatment	Macronutrent		Micronutrient		
	N (mg/kg)	P (mg/kg)	Fe (mg/kg)	Mn mg/kg	Zn mg/kg
Control	560	4.8	8.2	7.8	0.46
Fyd	736	6.8	9.6	8.6	0.52
Nb	812	5.2	8.2	6.7	0.54
Pb	635	7.2	9.6	8.8	0.6
NbPb	998	7.6	10.2	9.4	0.58
FydNb	736	7.6	10.6	9.8	0.72
FydPb	998	8.3	9.8	9.1	0.76
FydNbPb	796	9.6	11.4	10.2	0.92
Mean	783.9	7.14	9.7	8.8	0.64

3. The effect of treatments application in sorghum dry weight (ton/fed):

The yield of sorghum (two cuts) as affected by farmyard manure (Fyd) or bio-fertilization are given in Table (5) & Fig (1). Obviously, the individual application of farmyard manure (Fyd) resulted in a significant increase in the two cuts. The highest rate of increment was associated with farmyard manure (Fyd) at rate 10 ton/fed as it reached 26.7 and 15.3 % for the first cut and the second cut respectively over the control treatment for cuts 1 and 2.

Data in Table (5) & Fig (1) indicated that the application of bio-fertilizers on the yields of both the first cut and the second cut were significantly increased. The highest rate of increment in the first and the second cuts of sorghum yield amounted to 19.5 and 26.92 due to mixture of nitrogen fixing and phosphorous dissolving bacteria (NbPb) treatment. The favorable effect of such material application on increasing sorghum yield may be rendered to their effect of enhancing some physical and chemical properties of soil. Such effects are reducing soil PH, EC values and increasing the availability of certain plant nutrients. These results are in harmony with results obtained by Ahmed *et al* (2011).

Data in Table (5) indicated that the effect of combined application of farmyard manure with bio-fertilizers on yield of two cuts was significantly increased. This positive effect may be due to the combinational application of any rate of farmyard or any type of bio-fertilizers. Generally, the mixture of nitrogen fixing bacteria, phosphorous dissolving bacteria and farmyard manure at rate 10 ton/fed (FydNbPb) treatment was superior to all other treatment on increasing the yield of two cuts. This may be due to the role of N in metabolism within plant tissue. In addition this may be due to a physiological relation of nutrients intake of complementary ions by plant roots.

4. The effect of treatments on Macronutrient content in sorghum plant

Macronutrients content reflect the importance of bio-fertilizers to plants, where it augmented dry weight of sorghum plants. This may be due to the beneficial effect of bio-fertilizers on plant growth by enhancing the availability of nutrients in soil as a result of increasing microbial activities in soil, whereas, the inoculation by bio-fertilizers promoted the values of available N and P and other nutrients in soil. This increment

may be ascribed to the ability of organisms to fix N in rhizosphere, which is reflected on increasing of available N and other nutrients in inoculated soils. On the other hand, it has an effective role in solubilizing the insoluble P and makes it available to plant. Nitrogenase activity in rhizosphere of sorghum plants with applied bio-fertilizer was greater. These materials encourage microbial activity in soil, increasing mineralization and nutrient availability. Karlidag *et al* (2007) suggested that, plant growth promoting rhizobacteria stimulate that plant growth by facilitating the uptake of mineral and micronutrients by the plant for a better growth and productivity.

Table (5): The effect of treatments on dry weight of sorghum plants (ton/fed)

Treatment	Cut1 (ton/fed)	Cut2 (ton/fed)
Control	1.877	2.277
Fyd	2.377	2.620
Nb	2.117	2.760
Pb	1.997	2.100
NbPb	2.243	2.890
Fyd Nb	2.683	3.143
Fydpb	2.513	2.903
Fyd NbPb	2.863	3.333
Mean	2.330	2.753
LSD at 5% treatment	0.085	

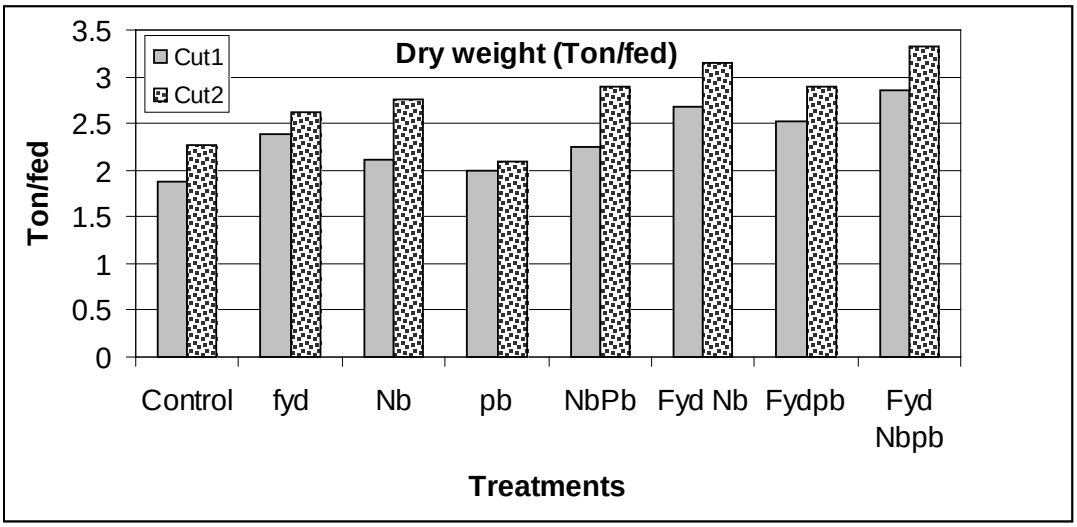

Fig. (1): The effect treatments on dry weight (ton/fed) of sorghum plant.

A. Nitrogen (%):

Data in Table (6) & Fig (2) exhibited that increasing farmyard application at 10 ton/fed the concentration of nitrogen in both two cuts of sorghum plants. The highest values of such elements are associated with farmyard manure at rate 10 Ton/fed application .The increase of concentration of nutrients in the first cut of sorghum plant due application farmyard at 10 Ton/fed treatment application reached 23.27% over the control treatment.

Data in Table (6) & Fig (2) showed application of bio-fertilizers increased the concentration of nutrients in sorghum plant cut 1and cut2 as compared to control treatment. Also Nb treatment increased the concentration of total N in sorghum plant compared to Pb. Generally NbPb treatment increased the concentration of nutrients in two cut of sorghum plant which the increment reached 25.48 for N% in cut of sorghum plant over the control treatment.

Table (6) : The effect of treatments on Content N % in sorghum plants

Treatment	N (%)	
	Cut1	Cut2
Control	1.82	2.04
Fyd	2.24	2.42
Nb	2.12	2.28
Pb	1.96	2.17
NbPb	2.05	2.17
Fyd Nb	2.49	2.58
Fydpb	2.31	2.42
Fyd NbPb	2.69	2.82
Mean	2.21	2.36
LSD at 5% treatment	00.012	

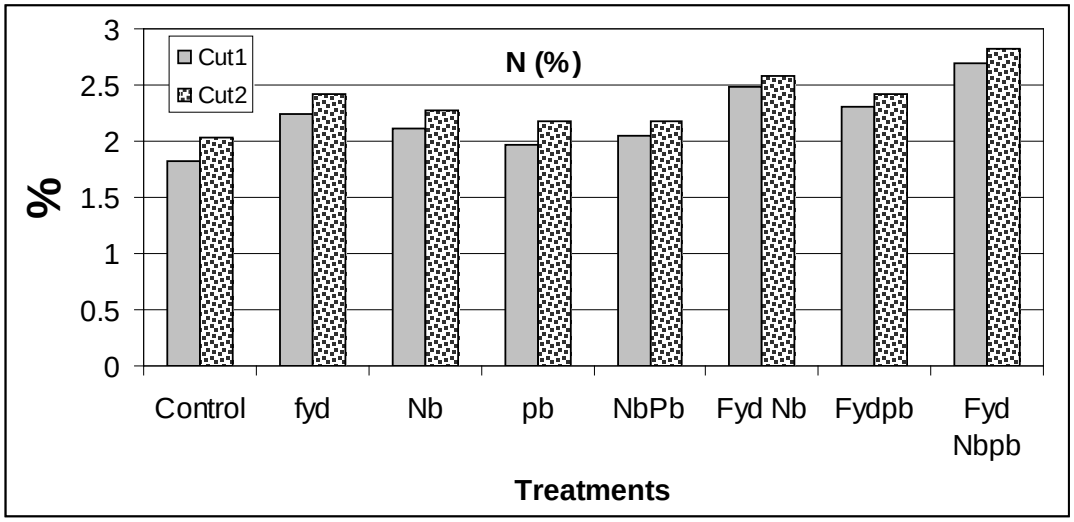

Fig. (2): The effect of treatments on Content N (%) in sorghum plants

This positive effect of bio-fertilizers upon nutrient concentration and uptake could be ascribed to the high efficiency of bacteria presence in this bio-fertilizer to fix atmospheric N or to produce some biologically active substance e.g. IAA, gibberellin and cytokinins would help in increasing the root biomass (proliviration) and indirectly of sorption of nutrients from surrounding environment (Awad, 1998).

Regarding the combined application of treatments data show an increase was estimated in concentration of N % as compared to individual treatment.

Generally FydNbPb treatment was superior to all treatments on increasing of concentration of N% in sorghum plant, which the increment in the first cut reached 47.80% and 38.24 % for the first cut and the second cut respectively over the control treatment.

Also similar trends are obtained for the uptake of these elements where they are increased significantly with increasing of farmyard manure application with no exception. The favorable effect of farmyard manure and/or bio-fertilizers on increasing the uptake of such nutrients may be refer to their role on decreasing the soil pH soil EC values increasing the availability of plant nutrients yield and consequently the uptake of the studied nutrients increased in both cuts of sorghum plants.

The interaction effect among the studied parameters showed the higher values of concentration of the studied element N% are associated with applied 10 ton/fed farmyard with NbPb bio-fertilizer .Also the highest values of element uptake showed different combination if compared with their concentration.

B. Total phosphorus (%):

Data in Table (7) & Fig (3) exhibit that increasing farmyard application at 10 ton/fed the concentration of phosphorus in both two cuts of sorghum plants. The highest values of such elements are associated with farmyard manure at rate 10 ton/fed application .The increase of concentration of nutrients in the first cut of sorghum plant due to application farmyard at 10 ton/fed treatment application reached 19.04% over the control treatment.

Data in Table (7) & Fig (3) show that, application of bio-fertilizers increased the concentration of nutrients in sorghum plant cut1 and cut2 as compared to control treatment. Also Pb treatment increased the concentration of total P in sorghum plant compared to Nb treatments. Generally NbPb treatment increased the concentration of nutrients in two cut of sorghum plant which the increment reached 14.28 for P% in the first cut of sorghum plant over the control treatment.

Table (7): The effect of treatments on Content P (%) in sorghum plants.

Treatment	P (%)	
	Cut1	Cut2
Control	0.21	0.24
Fayd	0.25	0.27
Nb	0.22	0.25
Pb	0.24	0.29
NbPb	0.26	0.31
Fyd Nb	0.24	0.28
Fydpb	0.25	0.31
Fyd NbPb	0.33	0.36
Mean	0.25	0.28
LSD at 5% treatment	0.051	

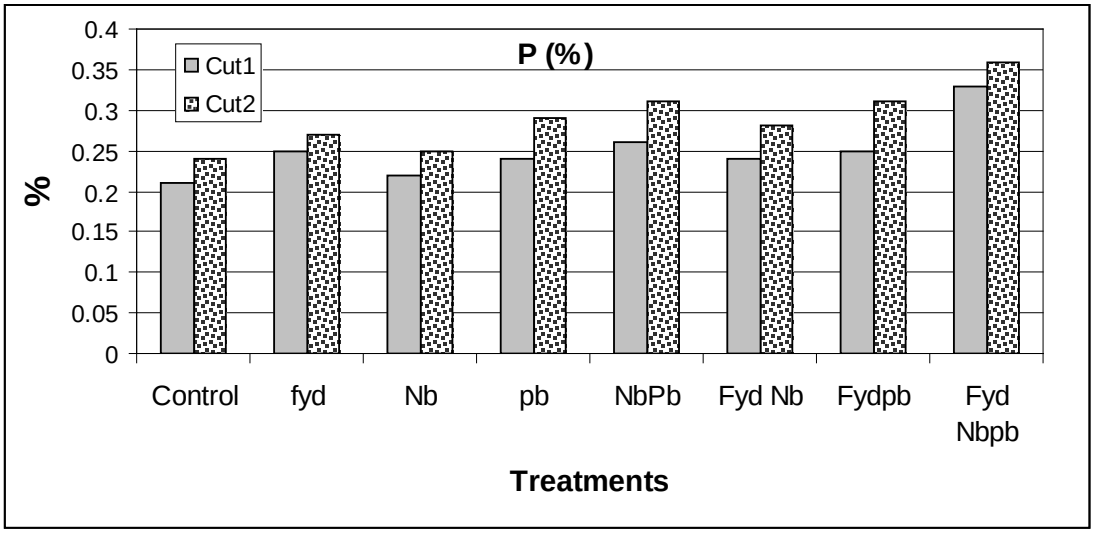

Fig. (3) : The effect of treatments on Content P (%) in sorghum plants

Regarding the combined application of treatments data show an increase was estimated in concentration of P % as compared to individual treatment.

Generally FydNbPb treatment was superior to all treatments on increasing of concentration of P% in sorghum plant, which the increment in the first and second cuts reached 57.14 % and 50 % respectively over the control treatment.

The interaction effect among the studied parameters showed the higher values of concentration of the studied element P% are associated with applied 10 ton/fed farmyard with NbPb bio-fertilizer .Also the highest values of element uptake showed different combination if compared with their control.

5. The effect of treatments on Micronutrient content (mg/kg) in sorghum plant:

Data in Table (8) & Figs (4-6) exhibited that increasing farmyard application at 10 ton/fed the concentration of Fe, Mn and Zn in both two cuts of sorghum plants. The highest values of such elements were associated with farmyard manure at rate 10 ton/fed application .The increase of concentration of nutrients in the first cut of sorghum plant due application farmyard at 10 ton/fed treatment application reached 22.72% ,12.08 % and 19.36 %over the control treatment.

Data in Table (8) & Figs (4-6) showed application of bio-fertilizers increased the concentration of micronutrients in sorghum plant cut1and cut2 as compared to control treatment. Also Nb treatment increased the concentration of total Fe and Zn in sorghum plant compared to Pb , however Pb treatment increased the concentration of Mn in sorghum plants as compared to Nb treatment. Generally NbPb treatment increased the concentration of nutrients in two cut of sorghum plant. Which the increment reached 41.66%, 31.21 % and 41.89 %for Fe, Mn and Zn in cut1 respectively of sorghum plant over the control treatment.

Regarding the combined application of treatments data showed that an increase was estimated in concentration of micronutrient (mg/kg) as compared to individual treatment.

Generally FydNbPb treatment was superior to all treatments on increasing the concentration of micronutrient (mg/kg) in sorghum plant, which the increment in the first cut reached (56.06, 36.80 and 40.08)% and (41.27,31.52 and 91.03) % for the first cut and the second cut respectively over the control treatment.

Table (8): The effect of treatments in micronutrient (mg/kg plant) in sorghum plant.

Treatment	Fe (mg/kg)		Mn (mg/kg)		Zn (mg/kg)	
	Cut1	Cut2	Cut1	Cut2	Cut1	Cut2
Control	132.00	172.00	60.67	74.00	20.67	26.00
Fyd	162.00	195.00	68.00	81.00	24.67	31.33
Nb	156.00	188.00	64.33	77.00	27.33	33.33
Pb	141.00	179.00	76.33	82.67	24.00	30.00
NbPb	187.00	212.00	79.00	86.33	29.33	37.00
Fyd Nb	192.00	224.00	72.00	85.33	35.33	30.00
Fydpb	175.00	205.00	78.00	91.33	32.33	39.33
Fyd NbPb	206.00	243.00	83.00	97.33	39.33	49.67
Mean	168.87	202.25	72.66	84.37	29.12	34.58
LSD at 5% Treatment	2.17		1.66		1.50	

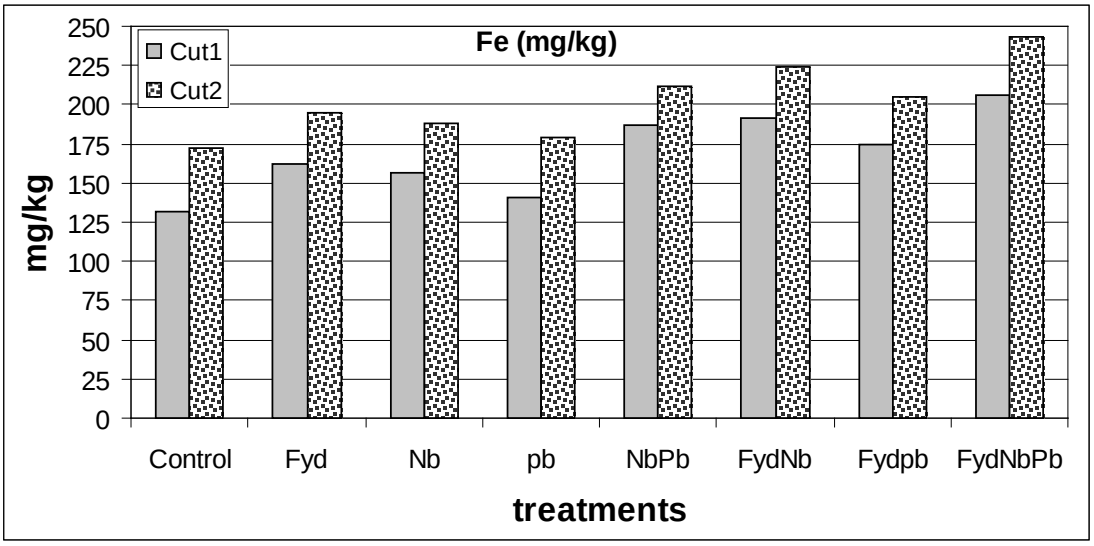

Fig (4): The effect of treatments on Fe (mg/kg) in the two cuts of sorghum plant

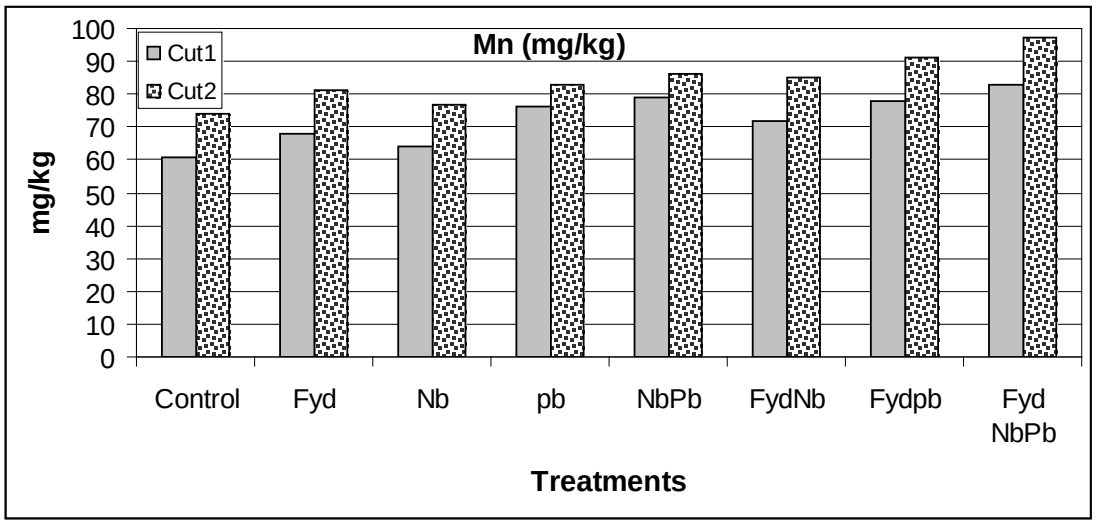

Fig (5): The effect of treatments on Mn (mg/kg) in the two cuts of sorghum plant

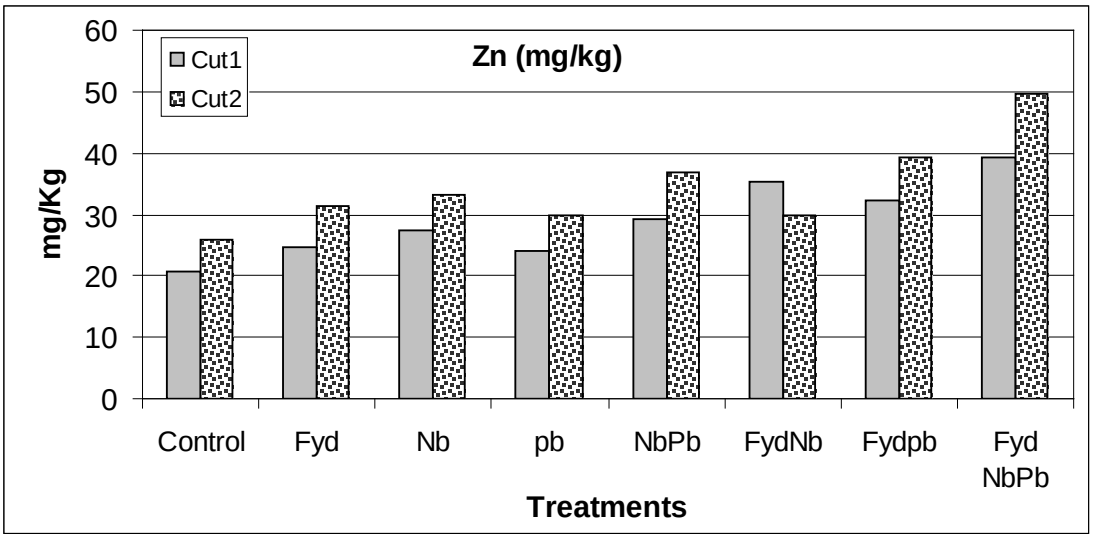

Fig (6): The effect of treatments on Zn (mg/kg) in the two cuts of sorghum plant

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تاثير التسميد الحيوى فى وجود او بدون اضافه السماد البلدى على بعض خواص الارض الجيريه وانتاجية ومحتوى الذره الرفيعة

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الملخص العربي

اجريت تجربه حقلية فى ارض جيرية بمحطه النوباريه للبحوث الزراعية فى الموسم الصيفى 2010 لدراسه تاثير التسميد الحيوى مع اضافه اوبدون اضافه السماد البلدى على خواص الاراضى الجيريه وعلى انتاجيه نبات الذره الرفيعه. وأشتمل التسميد الحيوى على سماد حيوى نتروجينى Nb وسماد حيوى فوسفاتى Pb وخليط بينهما NbPb وخليط مع اضافه السماد البلدى بمعدل 10 طن/للفدان مع ايهما FydNb و FydPb وكذلك معهما

FydNbPb وذلك فى تجربة قطاعات تامة العشوائية فى ثلاث مكررات. وتم اخذ عينات التربة لدراسة التغيرات التى حدثت باضافة المعاملات كما اخذ من المحصول حشتين وتم تسجيل اوزان العينات وتقدير الوزن الجاف ومحتواها من العناصر وكانت النتائج كمايلى:

أظهرت النتائج ان إضافة المعاملات كان لها تأثير واضحا على خواص الأرض وتيسر العناصر ولكن كان لأضافة خليط من كل المعاملات من سماد المزرعه والتسميد الحيوى FydNbPb الأثر الأكبر على محتوى التربة من المادة العضوية وانخفاض ملوحة التربة وزيادة تيسر العناصر الكبرى (النتروجين والفوسفور) والعناصر الصغرى (الحديد والمنجنيز والزنك) فى التربه.

كما ادت المعاملات المضافة الى زيادة الماده الجافه لنبات الذره الر فيعه سواء باضافه السماد البلدى اوسماد المزرعه وكانت اعلى قيمه عند التسميد بمعدل 10طن للفدان مع خليط كل من السماد الحيوى النتروجينى والسماد الحيوى الفوسفاتى (FydNbPb) لكل من الحشتين بالمقارنه بالكنترول.

كما زاد محتوى نبات الذره الرفيعه من النتروجين والفوسفات وكذلك العناصر الصغرى الحديد والمنجنيز والزنك زياده ملحوظه باضافه خليط من سماد المزرعه والتسميد الحيوى وكانت افضل معامله اضافه السماد البلدى بمعدل 10طن للفدان مع كل من السماد الحيوى النتروجينى والسماد الحيوى الفوسفاتى نتيجه تاثير تحسن خواص الاراضى الجيريه وزياده انتاجيتها من الوزن الجال لنباتات الذره الرفيعه.