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EFFECT OF MINERAL, ORGANIC FERTILIZATION AND SOME FOLIAR APPLICATION TREATMENTS ON GROWTH AND BULB YIELD OF ONION

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ABSTRACT

Two field experiments were conducted during the two successive winter seasons of 2008/2009 and 2009/2010 in a private Farm in Bani-Ebeed District, Dakahlia Governorate . It was aimed to study the effect of mineral, organic fertilization and some foliar application treatments (Effective micro organisms and Agrispon) as well as their interactions on growth, bulb yield and some chemical constituents of onion “behairy red” variety.

The obtained results could be summarized as the following:

1- Fertilizing with 100% NPK gave the highest values of plant height and number of leaves after 60 days from transplanting and at harvesting stage in both studied seasons.

2- Fertilizing with 100% NPK has achieved the highest values of fresh and dry weight/ plant after 60 days from transplanting in both seasons.and also gave the highest values of bulb fresh weight in both seasons.

3- The previous treatment achieved the highest values of total bulb yield (t/fed)

4- Concerning N, P and K concentrations in bulbs, data illustrated that fertilizing with 50 % NPK+ 50 % FYM was the highest among the organic and mineral fertilization treatments.

5- Foliar application with Agrispon + EM gave the highest yield (21.94 t/fed) in the both seasons of study.

INTRODUCTION

Onion (*Allium cepa* L.) is amongst the main vegetable crops in Egypt for consumption processing and exportation .It is one of the most important sources for hard currency. Onion is highly valued herb possessing culinary (chopped, kippled or minced) and medicinal value. Onion contains many active compounds that appear to prevent of cardiovascular disease.

Many investigators reported that the vegetative growth of onion plants, mineral uptakes yield and its components were increased with increasing the level of NPK fertilizes (Katwale and Saraf 1994 and Khalid *et al.*, 2004). Excessive of mineral fertilization cause many damage to public health for humans as well as pollution of the environment. So, the use of organic and bio fertilizers became an important need. The role of organic manure is very important for plant growth and yields as it is a source of nutrients, and enhancements of physico-chmical and biological characteristics of soil, which in turn influence the growth and plant production (Malherbe, 1984).

Allison (1973) suggested that a combination of organic manures sources of minerals produced higher beneficial effects on crop production

and development compared with their application. Cambardella *et al.* (2003) revealed that organic manures can be applied to soils as compost or in their fresh state. It causes clear improvement in the characteristics of the soil and provide plants with nutrients, which is reflected in the improvement of crop quality and quantity in many plants.

Some researchers reported that the use of biofertilizers such as EM and Agrispon cause a positive impact on crop quality and quantity and reduces the use of mineral fertilizer ,which reduces costs and positively affect human health.

EM contains selected species of microorganisms, including predominant population of lactic acid bacteria, yeast, smaller numbers of photosynthetic bacteria, actinomycetes and other types of organisms. Higa and parr (1994) showed that inoculation of the soil or plant ecosystem with EM cultures can improve soil quality, soil health, growth of crops. Several of researchers have confirmed the important role and the positive effect of EM (Yamanda *et al*., 1996 and Daly and Stewart, 1999)

Agrispon is a biologically derived biostimulant for soil and plants. It is a natural solution for healthier soils, it enhances root zone actively and improves soil structure. Few information and researches are available on the effect of Agrispon on onion growth and yields. In this respect, Syltine (1983) reported that Agrispon has been shown to be effective in producing greater harvested weights and harvested number of cantaloupes as compared with treatments receiving nitrogen fertilizer only.

There for,the present investigation was aimed to study the effect of mineral ,organic fertilization and some foliar application treatments (EM and Agrispon)as well as their interactions on growth, bulb yield and quality of onion behairy red cultivar.

MATERIALS AND METHODS

This work was carried out during the two seasons successive winter seasons of 2008/2009 and 2009/2010 in Bani – Ebeed District, Dakahlia Governorate. Two field experiments were laid out in split –plot design with three replications. The experiment included twelve treatments, three treatments of mineral and organic fertilization as soil addition and four treatments of foliar applications.

The main plots were assigned to three treatments of mineral and organic fertilization as follows:

1- 100 % of NPK fertilizers (100 kg N + 30 kg P_2O_5 + 24 kg K_2O/fed)as recommended by the Ministry of Agriculture and soil Reclamation (MASR) for onion plants.
2- 100 % of farmyard manure (FYM) (15 m^3/fed, 27.6 kg/plot).
3- 50 % of FYM (50 % of NPK fertilizers (50 kg N + 15 kg P_2O_5 + 12 kg K_2O/fed + 7.5 m^3/fed, 13.8 kg/plot).

Mineral fertilizers used were: Ammonium nitrate (33.5 % N), Calcium – super phosphate (15.5 % P_2O_5) and potassium sulphate (48% K_2O).

All doses of phosphorus was incorporated with soil into the experimental unites before transplanting . Only half dose of nitrogen and potassium were applied after two weeks from transplanting (before the first irrigation). The remaining portions of N and k were applied after four weeks from transplanting (before the second irrigation).The Experimental soil was mixed with FYM (as a source of organic manure) at previously mentioned rates 15 days before transplanting of onion seedlings.

The sub – plots were occupied with the following four foliar application treatments:

1- Foliar application with tap water (control treatment).
2- Foliar application with Agrispon at the rate of 40 ml/10 L.
3- Foliar application with EM at rate of 20 ml/10 L.
4- Foliar application with Agrispon + EM at the same rates of single addition.

Foliar fertilization with Agrispon and EM fertilizers as well as their mixture were carried out twice at the aforementioned rate after 20 and 35 days from transplanting. Diffuser material was added to every previous solution.

Each experimental basic unit (sub –plot) included five ridges, each of 70 cm width and 3.0m length, with an area of 10.5 m^2 (1/400 fed).

Transplanting took place during the first week of January after soil preparation. Seedling were hand transplanted on both ridge sides (70 cm width) at 7 cm apart. The top portion of the seedling was pruned to a considerable extent, immediately before transplanting . All agronomic practices were followed in the same manner on bulb crop in the region.

Studied Characters:

1- Vegetative growth parameters:

At 60 days after transplanting , five plants were chosen at random from the outer ridges from every sub –plot to determine the following characters;

1- Plant height (cm): It was measured from the soil surface to the top of the plant .
2- Number of leaves /plant
3- Fresh and dry weight /plant (g)

Plant samples were oven dried at 70 ^{O}C till constant weight and then, dry weight of plant (g) was calculated, the dried leaves were thoroughly ground and stored for determination of N, P and K %.

2- Yield and its component:

At harvesting time (120 days after transplanting) fresh onions bulbs in the central area of three inner ridges were pulled and left in the field to cure for about 10 days tops. Tops and roots were removed then the following characteristics were estimated:

1- Bulb fresh weight (g/plant).
2- Bulb diameter (cm).
3- Total bulbs yield (t/fed).

3- Chemical constituents:

N, P, K, nitrate and nitrite percentages were determined in bulbs at harvesting time as follow:

The dry bulb (oven dry basis) were wet digested with an H_2SO_4 + $HClO_4$ mixture as described by Peterburgski (1968). Nitrogen, phosphorus, potassium, nitrate and nitrite were determined in the digested product and percentages were calculated on oven dry matter basis.

1- Nitrogen was determined by using micro-kjeldahl method described by (Jackson, 1967).
2- Phosphorus was estimated colorimetrically at a wave length of 725 mm using Zeiss spectrophotometer (Spekol) as described by Jackson (1967).
3- Potassium was determined by using flame photometer as described by Jackson (1967).
4- Nitrate and nitrite determinations were measured as described by Singh (1988).

Statistical analysis:

All obtained data were subjected to statistically analysis according to the technique of analysis of variance (ANOVA) for the split –plot design for each experiment as published by Gomez and Gomez (1984) by using "MSTAT-C" computer software package. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1. Vegetative growth parameters:

1.1. Effect of organic and mineral fertilization:

Obtained data in Table 1 show clearly that organic and mineral fertilization significantly affected vegetative growth parameters which estimated after 60 days from transplanting in both seasons. Application of 100 % NPK fertilization gave the highest values of plant height (60.40cm and 65.25 cm), number of leaves/plant (8.37 and 8.46), fresh weight (113.41 and 117.13 g/plant) and dry weight (11.68 and 13.30 g/plant), followed by the treatment of 50 % NPK + 50 % FYM during the two seasons of the study, respectively. On the other hand, the lowest values studied vegetative growth characters were resulted from application of 100 % organic fertilization (FYM) in the first and second seasons. In this case the differences among mineral and organic fertilization treatments were significant in both seasons.

These results may be due to the important role played by mineral elements on onions growth. Nitrogen is essential for synthesis of chlorophyll, enzymes and proteins. Phosphorus essential for root growth, phosphorproteins, phospholipids, ATP and ADP formation (Yadav et al., 2005). Potassium plays an important role of promotion of enzymes activity and enhancing the translocation of assimilates and protein synthesis. Also, the favorable and superiority effect of the mineral fertilizers obtained on

vegetative growth parameters may be attributed to the quick release of mineral nutrients in the soil and the availability for the plant roots. These results are in agreement with those reported by Katwale and Saraf (1994), Cambardella *et al.* (2003) and Khalid *et al.* (2004).

Table 1: Plant height, number of leaves/plant, fresh and dry weight (g/plant) at 60 days after transplanting of onion as affected by mineral and organic fertilization and some foliar application treatments as well as their interactions during 2008/2009 (I) and 2009/2010 (II) seasons.

Characters	Plant height (cm)		Number of leaves/plant		Fresh weight (g/plant)		Dry weight (g/plant)	
Treatments	I	II	I	II	I	II	I	II
A- Mineral and organic fertilization:								
100 % NPK	60.40	65.25	8.37	8.46	113.41	117.13	11.68	13.30
100 % FYM	45.70	44.41	6.42	6.45	78.23	84.38	9.83	10.28
50 % NPK + 50 FYM	53.95	56.16	7.59	7.56	99.60	107.59	10.64	12.06
LSD at 5 %	3.13	2.42	0.18	0.11	6.42	5.24	0.76	0.81
B- Foliar application treatments:								
Control	45.66	51.33	7.15	7.15	86.62	94.57	10.11	10.91
Agrispon	54.10	55.00	7.40	7.45	96.71	101.16	10.51	11.57
EM	54.86	55.77	7.43	7.50	98.26	103.70	10.77	11.78
Agrispon + EM	58.77	59.00	7.86	7.87	106.73	112.70	11.49	13.25
LSD at 5 %	3.28	1.66	0.12	0.13	4.56	2.92	0.46	0.43
D- Interaction:								
A X B	NS	NS	NS	NS	NS	NS	NS	NS

1.2. Effect of foliar application treatments:

Data in Table 1 indicated that, foliar spraying onion plants with the mixture of Agrispon + EM significantly surpassed other treatments and produced the highest values of plant height (58.77cm and 59.00 cm), number of leaves/plant (7.86 and 7.87), fresh weight (106.73 and 112.70 g/plant) and dry weight (11.49 and 13.25 g/plant) in the first and second seasons, respectively. While, the control treatment (water application) resulted in the lowest values of plant height (45.00 and 51.33 cm), number of leaves/plant (7.15 and 7.15), fresh weight (86.62 and 94.57 g/plant) and dry weight (10.11 and 10.91 g/plant) in both seasons, respectively. It can be also noticed that the differences between spraying onion plants with Agrispon or EM were not reached level of significance.

This increase in vegetative growth parameters by foliar fertilization treatments with Agrispon or EM that contains macro and micronutrients as well as microorganisms, include predominant populations of lactic acid bacteria, yeasts, smaller number of photo synthetic bacteria, actinomycetes and other types of organisms may be due to the role of macro and micronutrients as well as micro organisms in increasing meristematic activity and production of some growth regulators such as Indol Acetic Acid (IAA), which is essential for the elongation reflecting increases in plant and foliage height. These results are in agreement with those obtained by Syltine (1983), Yamanda *et al*. (1996) and Daly and Stewart (1999).

1.3. Effect of interaction:

The effect of interaction between mineral and organic fertilization and foliar application treatments on plant height, number of leaves/plant, fresh and dry weight per plant at vegetative growth stage was insignificant in both seasons (Table 1).

2. Yield And Its Components.

2.1. Effect of organic and mineral fertilization:

Referring to the effect of organic and mineral fertilization, data in Table 2 indicate that the application of 100 % mineral NPK was superior for more increasing the average values of bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) at harvesting of onion than those obtained from the other treatments. Comparing with the other treatments; the average values were 99.59 g/plant, 6.63 cm & 20.59 t/fed in the 1st season and (102.83 g/plant, 6.76 cm and 19.41t/fed) in the 2nd season for bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) , respectively. Using of 50 % mineral NPK and 50 % FYM came in the second order with regard its effect on bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) at harvesting of onion during both seasons. Whereas, the lowest values of bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) at harvesting of onion were resulted from using of 100 % FYM, where data were 83.26 & 77.37 g/plant, 5.02 & 4.92 cm and 15.93 & 15.32 t/fed in the first and second season, respectively.

These results may be due to the role of mineral fertilizer such as nitrogen on chlorophyll, enzymes and protein synthesizes, phosphorous on root growth and development and potassium on promotion of enzymes activity and enhancing the translocation of assimilates (Yadav *et al.*, 2005). Also, the increments in vegetative growth parametes, due to the application of 100NPK as shown in table (1) the enhancing effect of the application of 50% of FYM + 50% of NPK may be altribated to the role of organic fertilizer (FYM) in improving the physical conditions of soil, provided energy for microorganisms activity, increased nutrient supply and improved the efficiency of microelements as well as its ability to meet some microelements requirements. These results are in agreement with those reported by Allison (1973), Malherbe (1984), Katwale and Saraf (1994) , Cambardella *et al.* (2003) and Khalid *et al.* (2004).

2.2. Effect of foliar application treatments:

Data in Table 2 show also that foliar application treatments of onion significantly affected bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) at harvesting in both seasons. Foliar spraying onion plants with the mixture of Agrispon + EM had a positive effects on onion bulb fresh weight/plant, bulb diameter and total bulbs yield (t/fed) at harvesting and recorded the highest values as compared with the other treatments, where values recorded 103.48 & 101.39 g/plant, 6.55 & 6.64 cm and 21.94 & 20.05 t/fed in the first and second season, respectively. The control treatment (water application) resulted in the lowest values of bulb fresh weight/plant (76.53 and 78.44 g/plant), bulb diameter (5.10 and 5.27 cm) and total bulbs yield (15.30 and 14.72 t/fed) in both seasons, respectively.

Table 2: Average Bulb fresh weight, bulb diameter and total bulbs yield/fed at harvesting of onion as affected by mineral and organic fertilization and some foliar application treatments as well as their interactions during 2008/2009 (I) and 2009/2010 (II) seasons.

Characters / Treatments	Bulb fresh weight (g/plant)		Bulb diameter (cm)		Total bulbs yield (t/fed)	
	I	II	I	II	I	II
A- Mineral and organic fertilization:						
100 % NPK	99.59	102.83	6.63	6.76	20.59	19.41
100 % FYM	83.26	77.37	5.02	4.92	15.93	15.32
50 % NPK + 50 FYM	93.82	94.70	5.96	6.40	18.58	17.66
LSD at 5 %	2.31	2.55	0.43	0.45	1.32	0.99
B- Foliar application treatments:						
Control	76.53	78.44	5.10	5.27	15.30	14.72
Agrispon	93.63	92.66	5.82	6.03	18.12	17.11
EM	95.25	94.05	6.01	6.16	18.12	17.98
Agrispon + EM	103.48	101.39	6.55	6.64	21.94	20.05
LSD at 5 %	2.44	3.87	0.24	0.18	0.51	0.46
D- Interaction:						
A X B	NS	NS	NS	*	NS	NS

This increases in bulb fresh weight/plant, bulb diameter and total bulbs yield/fed at harvesting of onion by foliar fertilization treatments with Agrispon or EM that contains macro and micronutrients as well as micro organisms, include predominant populations of lactic acid bacteria, yeasts, smaller number of photo synthetic bacteria , actinomycetes and other types of organisms may be due to the role of macro and micronutrients as well as micro organisms in increasing meristematic activity and production of some growth regulators such as Indol Acetic Acid (IAA), which is essential for the elongation reflecting increases in plant height as shown in Table (1) and in turn in creased bulb yield . These results are in agreement with those obtained by Syltine (1983), Higa and parr (1994), Yamanda *et al*. (1996) and Daly and Stewart (1999).

2.3. Effect of interaction:

The effect of the interaction between mineral and organic fertilization X foliar application treatments on both bulb fresh weight/plant, bulb diameter and total bulbs yield/fed at harvest of onion was not significant in both seasons, except bulb diameter in the second season only which was significant.

The comparison among the means of the various combined treatments of mineral and organic fertilization and some foliar application treatments as shown in Table 3 reflects a significant differences among the average values of onion bulb diameter at harvesting stage just in the 2nd season. Obtained data illustrate that an application of 100 % mineral NPK in addition foliar spraying with the mixture of Agrispon + EM was considered as the most suitable treatment for realizing the highest bulb diameter of onion (7.30 cm) in the 2nd season.

Table 3: Bulb diameter (cm) at harvesting of onion as affected by the interaction between mineral and organic fertilization and some foliar application treatments during 2009/2010 season.

Organic and mineral fertilization	Foliar application treatments			
	Control	Agrispon	EM	Agrispon + EM
2008/2009 season				
100 % NPK	6.22	6.74	6.77	7.30
100 % FYM	4.22	4.58	5.09	5.78
50 % NPK + 50 FYM	5.37	6.76	6.63	6.85
LSD at 5 %	0.52			

3. Chemical constituents:

3.1. Effect of organic and mineral fertilization:

Obtained data in Table 4 show clearly that mineral and organic fertilization had a significant effect on nitrogen, phosphorus, potassium percentage, nitrate and nitrite concentrations in onion bulbs at harvesting of onion in both seasons. The different comparison tabulated in Table 4 indicate that applying 50 % NPK + 50 FYM significantly increased N, P and K % and produced the highest values. Where recorded values were 3.02, 0.387 and 3.14 % in the 1st season and 2.85, 0.382 and 3.05 % in the 2nd season for N, P and K, respectively. On the contrary, the lowest values of N (2.81 and 2.59 %), P (0.348 and 0.296 %) and K (2.97 and 2.99 %) were obtained as a result of applying 100 % FYM in the first and second season, respectively. The maximum values of NO_2 and NO_3 (2.55 and 134.75 ppm) in the 1st season and (2.53 and 131.25 ppm) in the 2nd season, respectively were resulted from plants fertilized with 100 % mineral NPK. Treating onion plants with100 % FYM significantly decreased the values of NO_2 and NO_3 ppm to be 1.18, 67.50 and 1.27, 74.58 ppm for the first and second seasons, respectively.

The increases in nitrogen, phosphorus and potassium percentages at harvesting of onion ascribed to mineral and organic fertilization may be has the same reason for increasing vegetative growth parameters at green growth stage (60 days from transplanting) of onion as mentioned before.

3.2. Effect of foliar application treatments:

Results in Table 4 show that of foliar application treatments significantly affected N %, P %, K %, NO_2 and NO_3 ppm at harvesting of onion in both growing seasons. Data at the same table also reveal that foliar spraying of onion plants with the mixture of Agrispon + EM gave the highest values of N (3.27 and 3.20 %), P (0.421 and 0.393 %) and K (3.28 and 3.36 %) as compared with the other treatments in the first and second season, respectively. While, foliar spraying onion onion plants with Agrispon only resulted in the lowest values of N (2.62 and 2.53 %), P (0.309 and 0.313 %) and K (2.67 and 2.76 %) in the first and second season, respectively. Where, the highest values of NO_2 (2.06 and 2.06 ppm) and NO_3 (112.00 and 118.88 ppm) were resulted from control treatment (spraying with water) in the first and second seasons, respectively. On the other hand, application the mixture of Agrispon + EM had a favorable effect for decreasing the values of NO_2 and NO_3 in onion bulbs than the other treatment, which recorded the lowest values (1.52 and 85.66 ppm) in the 1st season and (1.59 and 87.33 ppm) in the 2nd season for NO_2 and NO_3 ppm, respectively.

Table 4: Nitrogen, phosphorus and potassium percentages as well as nitrite and nitrate concentrations in bulbs at harvesting of onion as affected by mineral and organic fertilization and some foliar application treatments as well as their interactions during 2008/2009 (I) and 2009/2010 (II) seasons.

Characters	N %		P %		K%		NO_2 ppm		NO_3 ppm	
Treatments	I	II	I	II	I	II	I	II	I	II
A- Mineral and organic fertilization:										
100 % NPK	2.86	2.83	0.353	0.365	3.02	3.00	2.55	2.53	134.75	131.25
100 % FYM	2.81	2.59	0.348	0.296	2.97	2.99	1.18	1.27	67.50	74.58
50 % NPK + 50 FYM	3.02	2.85	0.387	0.382	3.14	3.05	1.79	1.61	102.91	107.00
LSD at 5 %	0.04	0.12	0.007	0.004	0.14	0.03	0.03	0.09	6.71	5.03
B- Foliar application treatments:										
Control	2.83	2.57	0.362	0.323	3.10	2.93	2.06	2.06	112.00	118.88
Agrispon	2.62	2.53	0.309	0.313	2.67	2.76	2.03	1.77	111.00	111.55
EM	2.87	2.74	0.358	0.360	3.13	3.01	1.73	1.78	98.22	99.33
Agrispon + EM	3.27	3.20	0.421	0.393	3.28	3.36	1.52	1.59	85.66	87.33
LSD at 5 %	0.02	0.15	0.009	0.005	0.15	0.10	0.02	0.06	4.24	5.11
D- Interaction:										
A X B	*	*	*	NS	*	*	*	*	NS	NS

The increases in nitrogen, phosphorus and potassium percentage at harvesting of onion as a result of foliar fertilization treatments may be has the same reason for increasing nitrogen, phosphorus and potassium percentage at green growth stages of onion as mentioned before. These results are similar to those suggested by Yamanda *et al*. (1996) and Daly and Stewart (1999).

3.3. Effect of interaction:

According to the data illustrated in Table 5, it can be observed that the interaction between mineral and organic fertilization and some foliar application treatments significantly affected N %, P %, K % and NO_2 at harvesting of onion, except for P % in the second season only, which had no significant effect among values of these parameters.

The interaction between mineral and organic fertilization X foliar application treatments significantly affected nitrogen percentage in onion bulbs at harvest in both seasons (Table 5). The highest percentages of nitrogen (3.42 and 3.34 %) were obtained from fertilizing onion plants with 50 % NPK + 50 FYM in addition foliar spraying with Agrispon + EM in both seasons, respectively. On the other hand, the lowest percentages of nitrogen (2.47 and 2.51%) were obtained from fertilizing onion plants with 100 % FYM and without foliar fertilization in the first and second season, respectively.

Concerning the interaction between mineral and organic fertilization X foliar application treatments, it had a significant effect on phosphorus percentage in onion bulbs at harvesting in the first season (Table 5). Fertilizing onion plants with 50 % NPK + 50 FYM and foliar spraying with the mixture of Agrispon + EM produced the highest value of phosphorus percentage (0.437 %). Meanwhile, using organic fertilization only (100 % FYM), spraying with water and the treatment of Agrispon foliar application

produced the minimum value (0.303 %) of phosphorus percentage in onion bulbs at harvesting.

Table 5: Nitrogen, phosphorus, potassium percentages and nitrite concentrations in bulbs at harvesting of onion as affected by the interaction between mineral and organic fertilization and some foliar application treatments during 2008/2009 (I) and 2009/2010 (II) seasons.

Characters / Treatments		N %		P %	K%		NO_2 ppm	
		I	II	II	I	II	I	II
100 % NPK	Control	2.84	2.38	0.213	3.13	2.71	2.77	2.58
	Agrispon	2.58	2.48	0.327	2.74	2.81	2.77	2.81
	EM	2.73	2.65	0.353	3.05	3.16	2.47	2.49
	Agrispon + EM	3.11	2.87	0.290	3.19	3.28	2.20	2.24
100 % FYM	Control	2.47	2.51	0.323	2.81	2.80	1.27	1.47
	Agrispon	2.75	2.64	0.330	2.63	2.91	1.35	1.36
	EM	2.92	2.79	0.363	3.15	2.93	1.15	1.21
	Agrispon + EM	3.30	3.38	0.443	3.28	3.36	0.93	1.04
50 % NPK + 50 FYM	Control	3.19	2.81	0.403	3.38	3.27	2.15	2.14
	Agrispon	2.53	2.47	0.313	2.65	2.56	1.98	1.15
	EM	2.96	2.79	0.363	3.18	2.93	1.57	1.65
	Agrispon + EM	3.42	3.34	0.447	3.37	3.43	1.44	1.50
LSD at 5 %		0.10	0.17	0.008	0.20	0.36	0.06	0.29

The interaction between mineral and organic fertilization X foliar application treatments significantly affected potassium percentage in onion bulbs at harvesting in both seasons (Table 5). The highest percentages of potassium (3.37 and 3.43 %) were resulted from fertilizing onion plants with 50 % NPK + 50 FYM and foliar spraying with the mixture of Agrispon + EM in the first and second seasons, respectively. On the contrary, the lowest ones (2.63 and 2.80%) were obtained from fertilizing onion plants with 100 % organic fertilizer (FYM) and foliar spraying with Agrispon in the first and second seasons, respectively.

As shown from data illustrated in Table 5, the interaction between mineral and organic fertilization X foliar application treatments significantly affected nitrite concentrations in onion bulbs at harvesting in both seasons. The highest nitrate concentrations in onion bulbs at harvesting (2.77 and 2.81 ppm) were obtained from fertilizing onion plants with 100 % mineral NPK and spraying with water and also from 100 % NPK and foliar application with Agrispon in both seasons, respectively. On the other hand, the lowest nitrate concentrations in onion bulbs at harvesting (0.93 and 1.04 ppm) were associated with onion plants bulbs fertilized by 100 % FYM in addition foliar sprayed with the mixture of Agrispon + EM in the first and second season, respectively.

REFERENCES

Allison, F. E. (1973). Soil organic matter and its role in crop production. Developments in Soil Science. Elsevier, Amsterdam, The Netherlands (C.F. Computer search).

Cambardella, C. A.; T. L. Richard and A. Russell (2003). Compost mineralization in soil as a function of composting process conditions. European Journal of Soil Biology 39, 117 - 127.

Daly, M.J. and D. P.C. Stewart (1999). Influence of "Effective Microorganisms" (EM) on vegetable production and carbon mineralization - A Preliminary Investigation. J. Sustain. Agric., 14(2/3):15-25.

Gomez, K.N. and A.A. Gomez (1984). Statistical procedures for agricultural research. John Wiley and Sons, New York, 2nd ed., 68 P.

Higa, T. and J. F. Parr (1994). Beneficial and effective microorganisms for a sustainable agriculture and environment. International Nature Farming Research Centre, Atami, Japan p. 16.

Jackson, M. L. (1967). "Soil Chemical Analysis" Prentica Hall Inc, Engleweed Cliffs, N. J.

Katwale, T. R. and R. K. Saraf (1994). Studies on response of onion to varying levels of fertilizer doses during monsoon season on Satpura Plateau. Orissa J. Hort., 22 (1/2): 13-18.

Khalid, M. K.; M. A. Khokhhar, T. Mahmood, S. I. Huussain, H. Ullah and M. H. Laghari (2004). Comparative economic, monetary and yield advantages from NPK fertilization to onion. Pakistan J. Agric., Res., 18 (1): 46-50.

Malherbe, I. D. (1984). Soil Fertility. 5th Edn. Oxford University Press; London. UK.

Peterburgski, A.V. (1968). "Hand Book of Agronomic Chemistry" Kolop Publishing House, Moscow (in Russian). pp. 29-86.

Singh, J.P. (1988). A rapid method for determination of nitrate in soil and plant extracts. Plant and Soil, 110: 137-139.

Snedecor, G.W. and W.G. Cochran (1980). "Statistical Methods" 7th Ed. The Iowa State Univ. Press, Iowa, USA.

Syltine, P.W. (1983). Agrispon: effect on cantaloupe as seed, soil and folair treatment in North Texas. Sncorp and Appropriate Technology Limited (ATL), 3601 Garden Brook, Dallas, Texas 75234, USA.

Yadav, B. D. ; R. B. Khandelwal and Y. K. Sharma (2005). Use of bio-fertilizer (*Azospirillum*) in onion. Indian J. Hortic. Hort. Soc. India, New Delhis, 62: 168-170.

Yamanda, K.; S. Kato, M. Fujita, H. L. Xu, K. Katase and H. Umemura (1996). An organic fertilizer inoculated with EM used in nature farming practice. Asia-Pacific Nature Agriculture Network, Oct 8-12, 1996, Bangkok, Thailand.

تأثير التسميد العضوى والمعدنى وبعض معاملات الرش على نمو ومحصول البصل

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أجريت التجارب الحقلية فى مزرعة خاصة بمنطقة بنى عبيد – محافظة الدقهلية خلال الموسمين الزراعيين الشتويين 2008/2009 و2009/2010 لدراسة تأثير التسميد العضوى (15م3) والتسميد المعدنى (100كجم نيتروجين و 30 كجم فوسفور و 24 كجم بوتاسيوم / للفدان وبعض معاملات التسميد الورقى رشا (ال EM والآجرسبون) والتفاعل بينها على النمو والمحصول ومكوناته وكذلك صفات جودة الأبصال لصنف البصل البحيرى الأحمر.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١ - أعطت معاملة التسميد 100% من الأسمدة المعدنية (NPK) أعلى القيم بالنسبة لآطوال النباتات وأعداد الأوراق بعد 60 يوم من الشتل وكذلك عند مرحلة الحصاد فى كلا الموسمين.
٢ - أظهرت المعاملة السابقة تفوقا فى الوزن الغض والجاف للنباتات بعد 60 يوم من الشتل وكذلك أعطت أعلى القيم بالنسبة لوزن الآبصال فى كلا الموسمين .
٣ - أعطت المعاملة السابقة أعلى محصولا بين المعاملات .
٤ - بالنسبة لتركيز كلا من النيتروجين والفوسفور والبوتاسيوم للآبصال فقد أظهرت معاملة التسميد 50% NPK + 50% FYM تفوقا على معاملات التسميد العضوى والمعدنى .
٥ - معاملة رش EM + الآجرسبون معا أعطت أعلى محصول فى كلا الموسمين .

وتوصى الدراسة باستخدام الآجرسبون +EM رشا على النمو الخضرى لنباتات البصل عند عمر ستون يوما من الشتل للحصول على أعلى محصول من الآبصال مع صفات جودة عالية .

قام بتحكيم البحث

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