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RESPONSE OF ZUCCHINI TO THE BIO-FERTILIZERS AND THE NUMBER OF SPRAY TIMES BY THE BIOZYME

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ABSTRACT : A field experiment was carried out in the full randomized design (RCBD) for the 2018 spring season on the zucchini plant in the fields of the Department of Horticulture and Garden Engineering, Faculty of Agriculture, Anbar University for the purpose of developing the vegetative growth and study the response of the zucchini to the treated with bio-fertilizers and bio-enzymes. The fertilizer was added in four levels, without adding (comparison), a complete chemical fertilizer recommendation, a biomass fertilizer + half a fertilizer recommendation, and only a few fertilizers, and four sprayed levels. The results showed that all the treatments recorded a significant differences compared to the comparison. The treatment with biomass + half of the fertilizer recommendation in the height of the plant, the dry weight of the plant, the leaf area, the percentage of the dry matter in fruits, the number of fruits.

Key words : Zucchini, bio-fertilizers, bio-enzymes.

INTRODUCTION

Cucurbita pepo L. is one of the most important summer vegetable crops belonging to the cucurbitaceae family (Bardaa *et al*, 2016). It is an important vegetable that is consumed in the stage of mature gardener before the seeds are formed they are easy to digest, the fruits of pumpkin of high nutritional value,It contains fat, carbohydrate and fiber (Pinke *et al*, 2018). It also contains mineral elements, such as calcium, phosphorus, iron, sodium, potassium, magnesium, also contain vitamin A, thiamine, panthenic acid and moderate amounts of riboflavin, containing 5-8% of the dry matter and make up of sugars 3-5% and protein 1% and the amount of vitamin C 20-30 mg 100 g-1 soft weight and vitamin E 30-40 mg (Angourani *et al*, 2017). Planted in Iraq in the spring and autumn, it is also cultivated in greenhouses in the winter. The prevailing belief is that the original habitat of the plantation is in the north and south of Latin America (Leljak-Levaniæ *et al*, 2016). The gourd plant of vegetable annuals is a single-dwelling plant which carries a male and female flowers separately on the same plant (Prajapati *et al*, 2015). It needs a temperate of 15-27m as it is affected by low or high temperatures and requires a soil organic materials that retain moisture well and PH between 6.5-7.5. It is important for its seeds because it contains a high percentage of oils as well as its use as a food source for humans with its multiple medical uses, including the treatment of many prostate diseases (Barclay *et al*, 2016). Due to high environmental pollution caused by excessive mineral fertilization also the high cost led to use the biological fertilizers, which are vaccines containing some of microorganisms, whether fungal, bacterial or algal, or overlap between them (Tanaka, 2015).

Mycorrhase fungi is beneficial for plants, they help the plant absorb nutrients directly from the soil the relationship is symbiotic by supplying the host plant with fungus energy and environment suitable for growth, reproduction and fungi in turn provide the plant with a greater area of absorption on the surface of the root (Vangelisti *et al*, 2017). For the purpose of limiting the use of chemical fertilizers and minimizing their adverse impact on human health and the environment (Zheng *et al*, 2015). The microorganisms have a role in increasing the growth of the plant and not only its role in stabilizing atmospheric nitrogen but also due to the production of growth regulators and the production of antibiotics or participation in the analysis of organic waste and the production of solvents for the elements and the production of some vitamins such as vitamin B12 (Bonfante and Desirò, 2015).

Plant growth catalysts are instrumental in stimulating phylogenetic processes required for plant growth and developmentat a very low concentrations, as the dioxins affect or contribute with other hormones in the division, elongation and expansion of the cells (Lobos *et al*, 2016), which stimulates the enzymes analyzed and embedded

in some components of the cellular wall, gibberellic acid works to stimulate cellular division, elongation, production and building of phenols that work to stop the oxidizing enzymes of natural Auxins in plant tissues, Cytokinein has a role in stimulating cell division, size and aging, inhibiting capillary dominance and stimulating the growth of lateral buds in vegetable plants in general (Immanen *et al*, 2016).

The aim of the study is to determine the response of the zucchini plant to add the mycorrhizia and spray the Biozyme.

MATERIALS AND METHODS

The experiment was carried out in vegetable field of the of Horticulture and Garden Engineering Department, Faculty of Agriculture, Anbar University for the spring season 2018. The seeds were planted directly in the field in 16/3/2018 in bags size (40 × 60) cm weight of 9 kg soil per bag, 15 plants per experimental unit.Drip irrigation was used. The experiment was carried out with the two factors: the bio-fertilization of the Mycorrhiza fungi, which included four levels F_0: without addition (comparison) and F_1: complete chemical fertilizer recommendation and F_2: 50 g fertilizer + half fertilizer recommendation and F_3: 50 g fertilizer only, 50 g fertilizer added per plant for all treatments Except for the comparison transaction. The second factor is the number of spray with the growth catalyst (s): S_0: without spray and S_1: spray one and S_2: spraying for two times and S_3: spray for three times. A randomized complete blocks design experiment was carried out with three replicates and each duplicate (16) transactions. Thus, the total number of treatments for the field experiment (48) was treated and analyzed according to the Genstate program. The mean was compared using the least significant difference of LSD at the probability level of 0.05.

Characteristic of study

Plant height (cm) : The plant height measured from the surface of the soil to and then the rate is calculated.

Dry weight of the plant (g) : The dry weight of five plants is calculated at the end of the experiment and the rate is calculated.

Leaf area : The leaf area of five plants of each experimental unit is measured according to the following formula:

(Dry leaves weight × disk space) / (for dry weight tablets).

The percentage of dry matter in the fruit : Calculated by taking three fruits of each transaction, cut them, take 100 g and dried at a temperature of 65 C until the stability of weight and then calculated according to the following equation:

Dry matter ratio = (dry weight) / (wet weight) 100.

Number of fruits (fruit/plant^{-1}) : The number of fruits per plant is calculated by dividing the cumulative number of fruits on the number of sample plants.

Plant yield (kg. plant^{-1}) : It is calculated by dividing the cumulative total of the treatments on the number of plants of experimental unit.

Total yield : Calculated by the basis of plant density by multiplying the plant yield with the total number of plants per hectare (23500) plants.

RESULTS AND DISCUSSION

The results was mentioned in Table 1 showed the superior of F_2 which recorded the highest plant height reached 45.92 cm while the lower treatment was recorded in F_0 reached to 32.83 cm, as for the spraying of Biozyme, the treatment S_3 was recorded the highest ratio of 43.17 cm compared with S_0, which recorded the lowest ratio of 37.25 cm. As for the interaction between the study parameterswas recorded F_2S_3 the highest of plant height was 52.67 cm compared with the F_0S_0, which recorded the lowest plant height reached 32.00 cm.

The results in Table 2 showed superior of F_2 with the highest ratio of dry weight of plant reached 129.08 g compared with the control treatments (F_0) was recorded the lowest dry weight of the plant was 66.51 g, while the highest ratio of dry weight was recorded in S_3 was 103.97 g compared to the lowest dry weight of the plant, 84.22 g was recorded in the comparison treatment S_0. The interaction of F_2S_3 recorded the highest ratio of dry weight was 148.23 g compared to the F_0S_0, which gave the lowest ratio reached 60.33 g.

Table 3 showed the superiority of F_2 with the highest ratio of reached 26.07 desm compared with the control treatments F_0 was give the lowest ratio reached 20.23 desm. The treatment of S3 was recorded a significant increase was 25.02 desm,compared with S_0 (control) which recorded the lowest rate was 21.83 desm. The interaction of F_2S_3 was recordeda significant increase reached 29.27 cm^2 compared to the interaction F_0S_0, which recorded the lowestratio of dry weight reached 19.37 cm^2.

The F_2 was recorded a significant superiority with the highest number of fruits reached 14.09 fruit compared with F_0, which recorded the lowest number of fruits was 7.36 fruit.Plants^{-1} (Table 5). The S_3 was recorded the highest number of fruits was 11.53 fruit. Plants^{-1} compared with S_0, which recorded the lowest number of fruits 10.17

Table 1 : Effect of bio-fertilizers and the number of spray times in the plant height (cm).

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	32.00	32.67	33.00	33.67	32.83
F_1	35.33	36.00	37.33	38.67	36.83
F_2	41.67	42.67	46.67	52.67	45.92
F_3	40.00	41.33	43.67	47.67	43.17
Rate S	37.25	38.17	40.17	43.17	
LSD 0.05	F	S	F×S		
	0.78	0.78	1.56		

Table 2 : Effect of bio-fertilizers and the number of spray times in the dry weight of the plant.

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	60.33	62.50	69.80	73.40	66.51
F_1	72.90	77.63	81.07	86.90	79.62
F_2	114.53	124.37	129.20	148.23	129.08
F_3	89.10	93.83	104.10	107.33	98.59
Rate S	84.22	89.58	96.4	103.97	
LSD 0.05	F	S	F×S		
	2.78	2.78	5.57		

Table 3 : Effect of bio-fertilizers and the number of spray times in the leaf area.

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	19.37	19.97	20.10	21.47	22.23
F_1	21.17	21.52	22.66	23.87	22.30
F_2	24.03	24.63	26.34	29.27	26.07
F_3	22.73	15.41	24.43	25.50	22.02
Rate S	21.83	20.38	23.38	25.02	
LSD 0.05	F	S	F×S		
	2.74	2.74	5.48		

Table 4 : Effect of bio-fertilizers and the number of spray times in the percentage of dry matter in fruits.

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	3.36	3.34	3.66	3.80	3.56
F_1	4.03	4.10	4.20	4.30	4.15
F_2	4.26	4.43	4.66	4.86	4.55
F_3	4.06	4.20	4.26	4.46	4.25
Rate S	3.93	4.04	4.20	4.35	
LSD 0.05	F	S	F×S		
	0.14	0.07	0.07		

fruit.Plants^{-1}. The interaction F_2S_3 was recorded the highest number of fruits was 15.06 fruit.Plants^{-1} compared with F_0S_0 which recorded the lowest number of fruits of 6.73 fruit.Plants^{-1}.

Table 4 showed the superiority of F_2 with the highest percentage of dry matter in fruits was 4.55%, while F_0 recorded the lowest percentage of dry matter in fruits reached 3.36% while S_3 recorded the highest ratio reached 4.35% compared with the lowest ratio reached 3.93%. The interaction F_3S_3 was recorded the highest percentage of dry matter in the fruits of pumpkin with 4.86% compared with F_0S_0, which recorded the lowest rate was 3.36%.

The F_2 was recorded a significant superiority of the highest number of fruits 14.09 fruit compared with F_0 which recorded the lowest number of fruits was 7.36 fruit.Plants^{-1} (Table 5). The S_3 was recorded a significantly higher with 11.53 fruits compared with S_0 which recorded the lowest number of fruits reached 10.17 fruit. The interaction F_2S_3 was recorded the highest number of fruits was 15.06 fruit with a significant increase compared with F_0S_0, which recorded the lowest number of fruits was 6.73 fruit.

The results of Table 6 indicated that the F_2 treatment was recorded a significantly higher on the all treatments where was recorded dry weight of the plant reached 1.735 kg.Plant^{-1} while F_0 recorded the lowest rate of 0.830 kg. Plant^{-1}, which surpassed all the transactions while the comparison S_0, the lowest ratio of dry weight of the plant reached of 1.203 kg.

As for the interaction between the bio-fertilizers and Biozyme, there was recorded a significant difference between the treatments. The F_2S_3 showed a significant difference over all the transactions where was recorded 1.893 kg.Plant^{-1} compared with F_0S_0, which recorded the lowest rate,was 0.746 kg.

It is clear from the results of Table 7 that the F_2 has a significant increase compared with all the treatments in the total yield reached 58.12 tons e^{-1}. While the lowest ratio was recorded in F_0 reached 27.83 tons e^{-1}. As shown by the results of the same table, the treatment of S3 significantly exceeded all spray treatments at a rate of 46.87 tons e^{-1} while S_0 recorded the lowest rate of the total mass of 40.31 kg. As for the interaction between the addition of biological fertilizers and spray the treatments in the Biozyme, it was found t a significant differences in the F_2S_3 compared with all otherinteractions whererecorded the highest totalyield was 63.43 tons e^{-1} while F_0S_0 was recorded the lowest rate reached 25.01 tons e^{-1}.

The positive effect of studied parameters may be due to the role of the biological fertilizers was added to the plant include maximizing the use of beneficial microorganisms in order to improve the natural, chemical

Table 5 : Effect of bio-fertilizers and the number of spray times in the number of fruits (fruit-plant^{-1}).

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	6.73	7.10	7.56	8.06	7.36
F_1	8.60	8.83	9.06	9.43	8.98
F_2	13.23	13.46	14.60	15.06	14.09
F_3	12.13	12.56	13.03	13.56	12.82
Rate S	10.17	10.49	11.06	11.53	
LSD 0.05	F	S	F×S		
	0.14	0.14	0.28		

Table 6 : Effect of bio-fertilizers and the number of spray times in the plant yield (kg^{-1}).

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	0.746	0.796	0.856	0.923	0.830
F_1	0.983	1.026	1.073	1.120	1.050
F_2	1.610	1.636	1.800	1.893	1.735
F_3	1.473	1.533	1.600	1.660	1.566
Rate S	1.203	1.248	1.332	1.399	
LSD 0.05	F	S	F×S		
	0.010	0.010	0.21		

Table 7 : Effect of bio-fertilizers and the number of spray times in the total yield (tons e^{-1})

Transactions	S_0	S_1	S_2	S_3	Rate F
F_0	25.01	26.69	28.70	30.93	27.83
F_1	32.94	34.39	35.96	37.52	35.20
F_2	53.94	54.83	60.30	63.43	58.12
F_3	49.36	51.37	53.60	55.61	52.48
Rate S	40.31	41.82	44.64	46.87	
LSD 0.05	F	S	F×S		
	0.73	0.73	1.47		

and biological properties of the soil. It also increases the cell density, which increases plant height, also the photosynthesis was positively reflected, which leading to increase the dry matter and increased the plant growth (Timmusk *et al*, 2017). Bio fertilizers have the ability to produce the growth-enhancing substances such as cytokines, Auxins, Gibberilic acid and vitamins that increase vegetative growth (Chanclud and Morel, 2016). Bio fertilizers have increased the plant length and dry weight in two varieties of tomato by increased the ability of bacteria to produce the plant hormones such as indole Phenol and Gibberilic acid (Al-Shaheen and Soh, 2018).

The significant increase in the vegetative growth of leaf with the spray of growth hormone may be attributed to the Auxins, cytokines and Gibberilic acid, all of which stimulate the absorption of nutrients, thus stimulating vegetative growth (Al-Shaheen *et al*, 2018). The substances containing plant hormones were increasing of many vegetative traits because they stimulate cell division and elongation by influencing the biological processes, such as photosynthesis and breathing (Al-Shaheen *et al*, 2018). Gibberilic acid, cytokines and Auxins are encouraged thenutrients absorb also these hormones can increase the leaves area and increase the absorption by increasing the opening of holes (Al-Shaheen *et al*, 2018). The presence of plant hormones, especially cytokinein and Auxins, are instrumental by increasing the vegetative growth and stimulating cell division, which was positively reflected on the plant content of dry matter and leaf content of major and minor elements, which will be reflected on the plant growth (Shuai *et al*, 2017).

CONCLUSION

The ratio of the dry matter in the fruit, the number of fruits, the yield of the plant and the total yield, as for the interaction between the biological fertilizers and the number of spray times in the Biozyme, + Half of the fertilizer recommendation with spraying of Biozyme,three times have a significantly higher in plant height, dry weight in plant, leaf area, percentage of dry matter in fruits, number of fruits, plant yield and total yield.

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