

RESPONSE OF CUMIN PLANT TO SOME ORGANIC, BIOFERTILIZATION AND ANTIOXIDANT TREATMENTS

I. VEGETATIVE GROWTH AND FRUITS YIELD

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ABSTRACT: The effect of farmyard manure (FYM) at 10, 15 and 20 m³/fed E.M. and/or vitamin E or vit. B₁ treatments on vegetative growth (plant height, number of branches/plant and dry weight of herb/plant), yield (number of umbels/plant, fruit yield/plant and /fed) of cumin plant were investigated during 2015/2016 and 2016/2017 at Samalot region (El-Byaho village) - Minia Governorate and Laboratory of Ornamental Plants, Fac. of Agric., Minia Univ. All treatments of FYM statistically increased vegetative growth characters and fruit yield as compared with control. The high level of FYM was the most effective in this concern. The treatments of E.M. + vit. B₁ followed by E.M. + vit. E, then mineral NPK (full dose) were the best results in increasing all the previous traits. Supplying cumin plants with FYM at 20 m³/fed in combination with E.M. + vitamins (B₁ or E) or FYM at 15 m³/fed plus E.M. + vit. B₁ resulted overall the highest values of the previous traits.

Key words: *Cuminum cyminum*, Effective microorganisms, vit. E, vit. B₁, vegetative growth, yield.

INTRODUCTION

Cumin (*Cuminum cyminum*, L.) is an aromatic plant within the Apiaceae Family that is used in foods, fragrances and medicinal preparations. Cumin is regularly used as a favoring agent in a number of ethnic cuisines. Cumin seeds have been found to possess significant biological activities, such as, antibacterial (Morton, 1976), antifungal, anti-carcinogenic (Gagandeep *et al.*, 2003), anti-diabetic, anti-thrombotic (Ferrie *et al.*, 2011) and antioxidant properties (Ferrie *et al.*, 2011 and Thippeswamy and Akhilender, 2005). Cumin seeds contain 7% essential oil and have therapeutic properties such as, antiseptic, anti-spasmodic, antitoxic, bactericidal, carminative, digestive, diuretic,

emmenagogue, nervine, stimulant and tonic (Willatgamuwa *et al.*, 1998).

Farmyard manure is very important due to its beneficial effects on the soil, growth and increase the productivity, as well as, improves the quality of plant production (Safwat and Badran, 2002 and Patel *et al.*, 2013 on cumin).

Mineral fertilizers especially N, P and K are very important for plant growth and productivity (Safwat and Badran, 2002 on cumin, Rekaby, 2013 on coriander, Abdou *et al.*, 2013 on caraway).

Effective microorganisms (E.M.) increase crop growth and productivity (Abdou *et al.*, 2009a on borage and Abdou *et al.*, 2009b on guar, Muthaura *et al.*, 2010 on

pigweed, Abdou *et al.*, 2012 on fennel and Ibrahim, 2014 on khella).

Vitamins as antioxidants have positive effect on plant growth and its production (Ismail, 2008 on black cumin; Ayad *et al.*, 2009 on geranium; Abdou *et al.*, 2013 on caraway, Abd El-Salam, 2014 and Abdou *et al.*, 2014 on sweet basil).

Therefore, the purposes of this research were to investigate the effect of FYM, E.M., mineral NPK and/or vitamins (vit. E or vit. B₁) treatments on growth and yield of cumin plants.

MATERIALS AND METHODS

This research was carried out at Samalot region (El-Byaho village) - Minia Governorate and Laboratory of Ornamental Plants, Faculty of Agriculture, Minia University during two consecutive seasons (2015/2016 and 2016/2017). Mechanical and chemical analysis of the experimental soil were performed according to Jackson (1973) as shown in (Table, a). Also, chemical characteristics of FYM are shown in (Table, b) which was obtained from a private farm.

Effective microorganisms (E.M., containing photosynthetic bacteria + lactic acid + yeast) was obtained from the Laboratory of Biofertilizers, Dept. of Genetics, Fac. of Agric., Minia Univ.

Alpha-tocopherol (vit. E) was supplied by Sigma chemical Company, U.S.A. and Thiamine (vit. B₁) was obtained from El-Gomhoria Company for chemicals, Egypt.

The experiment was arranged in a randomized complete blocks design in a split-plot with three replicates. The main plots (A) included four treatments of FYM (control, 10, 15 and 20 m³/fed), while six treatments of mineral NPK (full dose), E.M., vit. E, at 50 ppm, vit. B₁ at 50 ppm, E.M. + vit. E and E.M.+vit. B₁ were considered as sub plot.

The experimental unit (plot) was 3.0×3.0 m and containing 4 rows, 60 cm apart and seeds were cultivated in hills, 25 cm apart, therefore, each plot contained 48 hills and plants were thinned to two plants/hill after 5 weeks from sowing date (October, 10th for both seasons). Farmyard manure was added during preparing the soil to cultivation in both seasons.

Table a. Physical and chemical properties of the experimental soil.

Soil character	Values	Soil character	Values
Sand %	29.20	Available P %	15.16
Silt %	30.70	Exchangeable K ⁺ mg/100 g soil	2.09
Clay %	40.10	Exch. Ca ⁺⁺ mg/100 g soil	31.76
Soil texture	Clay loam	Exch. Na ⁺ mg/100 g soil	2.38
Organic matter %	1.64		
CaCO ₃ %	2.10	Fe	8.20
pH 1:2.5	7.86	DTPA Cu	2.10
E.C. m mhose/cm	1.03	Ext. ppm Zn	2.61
Total N %	0.08	Mn	8.11

Table b. Chemical analysis of FYM applied in the present study.

Properties	1 st season	2 nd season	Properties	1 st season	2 nd season
Organic matter %	28.0	27.5	K %	1.18	1.22
Carbon %	15.80	16.65	Fe ppm	239.0	237.5
Total N %	0.92	0.95	Zn ppm	271.2	273.1
C/N ratio	17.17	17.53	Mn ppm	233.5	235.8
Humidity %	8.00	7.91	pH	7.31	7.21
P %	0.23	0.25	E.C. (mhose/cm)	1.07	1.08

The recommended mineral NPK fertilization (full dose) was 200 kg ammonium nitrate (33.5 % N) + 300 kg calcium superphosphate (15.5 % P₂O₅) and 100 kg potassium sulphate (48 % K₂O)/fed according to Helmy (2015). All amounts of P fertilizer were added during preparing the soil, while, the amounts of NK fertilizers were divided into 3 equal doses and added at one month interval, starting from December, 5th in both seasons.

Fresh and active Effective microorganisms (E.M.) were applied three times to the soil beside the plants at 50 ml/hill (1 ml=10⁷ cells). The first dose was added after 7 days from the first dose of NK (starting December, 12th) and one month later and then plants were irrigated immediately.

Vitamins (E or B₁) were applied by hand sprayer, 3 times on the same schedule of E.M. The plants were sprayed till run off. All other agricultural practices were carried out as usual in the region.

At the end of experiment, the following data were recorded: Plant height (cm), number of branches/plant and herb dry weight (g), number of umbels/plant, fruit yield/plant (g) and /fed (kg). The statistical analysis was carried out according MSTAT-C (1986) at 0.05.

RESULTS AND DISCUSSION

Vegetative growth characters:

Data obtained in Table (1) indicated that plant height, number of branches/plant and herb dry weight/plant were significantly increased as the farmyard manure levels increased. So, the maximum values were obtained at 20 m³/fed. Similar results were obtained by Safwat and Badran (2002); Badran *et al.* (2007); Ahmadian *et al.* (2011); Seghatoleslami (2013); Patel *et al.* (2013) and Helmy (2015) on cumin plants.

Also, data presented in Table (1) showed that adding E.M., vit. E and vit. B₁ resulted in a significant decrease on plant height, branch number/plant and herb dry

weight/plant in comparison with mineral NPK (100 %) in both seasons. Moreover, supplying cumin plants with E.M. plus vit. E or vit. B₁ resulted in a significant increase the previous characters in most cases, as comparing with mineral NPK (full dose) in both seasons. The response of plant height, branch number and herb dry weight/plant was reported by Tanious (2008) on fennel, Abd El-Naeem (2008) on caraway, Hemdan (2008) on anise and Rekaby (2013) on coriander. Also, Abdou *et al.* (2012) on fennel and Ibrahim (2014) on khilla mentioned that E.M. treatment significantly increased vegetative growth traits. Moreover, Ismail (2008) on black cumin and Hendawy and Ezz El-Din (2010) on fennel proved that foliar application of antioxidants including vitamins, E and B₁ increased the growth of plants.

The effect of interaction treatments was significant. The best results produced by using 20 m³/fed FYM in combination with either E.M. + vit. B₁ or vit. E.

Yield and its components:

Data presented in Table (2) indicated that number of umbels, fruit yield /plant and /fed were gradually increased, in both seasons, parallel to the increase in FYM level. The high level of FYM (20 m³/fed) gave significantly higher values in both seasons than other treatments. Similar results were obtained by Amin and Abd El-Wahab (1999); Safwat and Badran (2002); Ahmadian *et al.* (2011); Asl and Moosavi (2012); Seghatoleslami (2013); Forouzandeh *et al.* (2014) and Helmy (2015) on cumin.

Concerning the treatments of sub plot, data in Table (2) showed that fertilizing cumin plants with E.M. + vit. B₁ followed by E.M. + vit. E and mineral NPK (full dose) produced the highest values of umbels number and fruit yield/plant and /fed in both seasons comparing with other three used treatments.

The role of NPK in augmenting yield and its components of cumin was found by Safwat and Badran (2002); Valadabadi *et al.*

Table 1. Effect of farmyard manure (FYM), mineral NPK fertilization, E.M. biofertilizer and some vitamins (vitamin E and vitamin B₁), as well as, their combination treatments on plant height (cm), number of branches/plant and herb dry weight/plant (g/plant) of *Cuminum cyminum*, L. plants during 2015/2016 and 2016/2017 seasons.

NPK, E.M. and some vitamins (vitamin E and vitamin B ₁) (B)	FYM levels (m ³ /fed) (A)										
	1 st season (2015/2016)					2 nd season (2016/2017)					
	0	10	15	20	Mean (B)	0	10	15	20	Mean (B)	
Plant height (cm)											
NPK	22.0	23.4	24.5	26.3	24.1	23.8	25.3	26.5	28.4	26.0	
E.M. at 50 ml/plant	21.3	22.0	23.5	24.0	22.7	23.0	23.8	25.4	26.0	24.5	
Vit. E at 50 ppm	23.0	23.3	24.1	24.3	23.7	24.8	25.2	26.0	26.2	25.6	
Vit. B ₁ at 50 ppm	23.2	23.3	24.6	24.9	24.0	25.1	25.2	26.6	26.9	25.9	
E.M.+Vit. E	23.4	24.5	24.9	25.5	24.6	25.3	26.5	26.9	27.5	26.5	
E.M.+Vit. B ₁	24.7	25.6	26.1	27.2	25.9	26.7	27.6	28.2	29.3	28.0	
Mean (A)	22.9	23.7	24.6	25.4		24.8	25.6	26.6	27.4		
L.S.D. at 5 %	A : 0.4		B : 0.5		AB : 1.0		A : 0.5		B : 0.6		AB : 1.2
Number of branches/plant											
NPK	9.0	10.2	10.4	10.7	10.1	9.8	11.1	11.3	11.6	10.9	
E.M. at 50 ml/plant	7.7	9.1	9.8	9.9	9.1	8.4	9.9	10.6	10.7	9.9	
Vit. E at 50 ppm	7.8	9.4	10.2	10.5	9.5	8.5	10.2	11.1	11.4	10.3	
Vit. B ₁ at 50 ppm	8.7	9.5	10.3	10.6	9.8	9.4	10.3	11.2	11.5	10.6	
E.M.+Vit. E	9.4	10.4	10.6	10.9	10.3	10.2	11.3	11.5	11.8	11.2	
E.M.+Vit. B ₁	9.9	10.6	10.8	11.2	10.8	10.7	11.5	11.7	13.5	11.9	
Mean (A)	8.8	9.9	10.4	10.8		9.5	10.7	11.2	11.8		
L.S.D. at 5 %	A : 0.3		B : 0.4		AB : 0.8 0.8		A : 0.5		B : 0.5		AB : 1.0
Herb dry weight/plant (g/plant)											
NPK	2.94	3.12	3.18	3.36	3.15	3.03	3.21	3.28	3.46	3.24	
E.M. at 50 ml/plant	2.70	2.88	2.94	3.12	2.91	2.78	2.97	3.03	3.21	3.00	
Vit. E at 50 ppm	2.82	2.94	3.06	3.18	3.00	2.90	3.03	3.15	3.28	3.09	
Vit. B ₁ at 50 ppm	2.88	3.06	3.12	3.24	3.08	2.97	3.15	3.35	3.48	3.24	
E.M.+Vit. E	3.16	3.28	3.34	3.52	3.33	3.25	3.38	3.50	3.69	3.46	
E.M.+Vit. B ₁	3.31	3.43	3.75	3.93	3.61	3.41	3.53	3.76	4.00	3.68	
Mean (A)	2.97	3.12	3.23	3.39		3.06	3.21	3.35	3.52		
L.S.D. at 5 %	A : 0.11		B : 0.08		AB : 0.16		A : 0.14		B : 0.11		AB : 0.22

(2010) and Sedigh *et al.* (2014) on cumin. Biofertilizers have positive effect on cumin plant (Safwat and Badran, 2002, Sedigh *et al.*, 2014). Also, vitamins as antioxidants were greatly efficient in increasing fruit yield (Ismail, 2008 on black cumin and Botros, 2013 on caraway concerning vit. E. Moreover, Hendawy and Ezz El-Din, 2010

on fennel and Botros, 2013 on caraway regarding vit. B₁).

The effect of interaction treatments was significant in both seasons and the highest values were obtained with the interaction treatments of FYM at 20 m³/fed × E.M. +

Table 2. Effect of farmyard manure (FYM), mineral NPK fertilization, E.M. biofertilizer and some vitamins (vitamin E and vitamin B₁), as well as, their combination treatments on number of umbels/plant, fruit yield/plant and /fed of *Cuminum cyminum*, L. plants during 2015/2016 and 2016/2017 seasons.

NPK, E.M. and some vitamins (vitamin E and vitamin B ₁) (B)	FYM levels (m ³ /fed) (A)										
	1 st season (2015/2016)					2 nd season (2016/2017)					
	0	10	15	20	Mean (B)	0	10	15	20	Mean (B)	
Number of umbels/plant											
NPK	26.5	27.8	29.5	32.7	29.1	28.8	30.2	32.0	35.5	31.6	
E.M. at 50 ml/plant	23.5	26.3	27.6	31.9	27.3	25.5	28.5	29.9	36.4	30.1	
Vit. E at 50 ppm	24.5	27.4	29.1	32.6	28.4	26.6	29.7	31.6	37.2	31.3	
Vit. B ₁ at 50 ppm	26.0	27.7	29.4	33.2	29.1	28.2	30.1	31.9	37.9	32.0	
E.M.+Vit. E	27.6	29.4	30.7	35.2	30.7	29.9	31.9	33.3	40.0	33.8	
E.M.+Vit. B ₁	30.7	32.5	33.9	36.8	33.5	33.3	35.3	36.8	41.8	36.8	
Mean (A)	26.5	28.5	30.0	33.7		28.7	30.9	32.6	38.13		
L.S.D. at 5 %	A : 1.2		B : 1.0		AB : 2.0		A : 1.3		B : 1.1		AB : 2.2
Fruit yield/plant (g/plant)											
NPK	9.01	10.06	10.75	11.79	10.40	9.37	10.46	11.18	12.26	10.82	
E.M. at 50 ml/plant	7.32	8.87	9.52	10.82	9.13	7.61	9.22	9.90	11.25	9.50	
Vit. E at 50 ppm	8.12	9.11	10.21	10.97	9.60	8.44	9.47	10.62	11.41	9.99	
Vit. B ₁ at 50 ppm	8.67	9.64	10.34	11.52	10.04	9.02	10.03	10.75	11.98	10.44	
E.M.+Vit. E	9.52	10.34	11.28	12.93	11.02	9.90	10.75	11.73	13.14	11.38	
E.M.+Vit. B ₁	11.28	11.55	13.56	13.92	12.58	11.73	12.01	14.11	14.48	13.08	
Mean (A)	8.99	9.93	10.94	12.00		9.35	10.33	11.38	12.42		
L.S.D. at 5 %	A : 0.48		B : 0.55		AB : 1.10		A : 0.61		B : 0.68		AB : 1.36
Fruit yield/fed (kg/fed)											
NPK	384.4	429.2	458.7	503.0	443.8	399.8	446.4	477.0	523.2	461.6	
E.M. at 50 ml/plant	312.3	378.5	406.2	461.7	389.7	324.8	393.6	422.4	480.1	405.2	
Vit. E at 50 ppm	346.4	388.7	435.6	468.1	409.7	360.2	404.2	453.1	486.8	426.1	
Vit. B ₁ at 50 ppm	369.9	411.3	441.2	491.5	428.5	384.7	427.8	458.8	511.2	445.6	
E.M.+Vit. E	406.2	441.2	481.3	552.4	470.3	422.4	458.8	500.5	567.4	487.3	
E.M.+Vit. B ₁	481.3	492.8	578.7	593.9	536.7	500.5	512.5	601.9	617.7	558.2	
Mean (A)	383.4	423.6	466.9	511.8		398.8	440.6	485.6	531.1		
L.S.D. at 5 %	A : 18.4		B : 21.1		AB : 42.2		A : 21.8		B : 25.3		AB : 50.6

vit. B₁ or vit. E followed by FYM at 15 m³/fed × E.M. + vit. B₁.

Applying organic manure not only relieved material inhibition an autotoxic substance in the root exudates by cinnamic acid but also promoted growth, increased the content and composition of plant secondary

metabolites. The stimulatory effect of NPK full dose may be due to that mineral NPK has an important role in essential oil biosynthesis, influence on photosynthesis and respiration for carbon skeleton production.

REFERENCES

- Abd El-Naeem, L.M.A. (2008). Response of Caraway Plants to Some Organic and Biofertilization Treatments. M.Sc. Thesis, Fac. Agric., Minia Univ., Egypt.
- Abd El-Salam, N.M.K. (2014). Response of Sweet Basil Plants to Some Agricultural Treatments. Ph.D. Thesis, Fac. Agric., Minia Univ.
- Abdou, M.A.H.; El-Sayed, A.A.; Taha, R.A. and Botros, W.S. (2013). Physiological Studies on Caraway Plants. Proc. 1st Inter of Hort. Agric. Assuit.
- Abdou, M.A.H.; Aly, M.K.; Zaki, K.A.; Sadek, A.A. and El-Husseiny, R. (2009a). Response of borage plants to some organic and biofertilization treatments. Proc. 5th of Sustain, Agric. and Develop. Fac. Agric., Fayoum Univ. 21-23 December, pp:143-158.
- Abdou, M.A.H.; Attia, F.A.; Taha, R.A. and Shehata, A. (2009b). Physiological studies on guar plants. Proc. the 5th Inter. of Sustain, Agric. and Develop. Fac. Agric., Fayoum Univ., 21 – 23 December.
- Abdou, M.A.H.; Badran, F.S.; El-Sayed, A.A.; Taha, R.A. and Abd-El-Salam, N.M.K. (2014). Response of sweet basil plants to some agricultural treatments. Minia J. of Agric. Res. & Develop., 34(1):21-31.
- Abdou, M.A.H.; Taha, R.A.; Abd El-Raaf, R.M. and Salah El-Deen, R.M. (2012). Response of fennel plants to organic, bio and mineral fertilization. Proc. Second Inter. Conf. Physiological, Microbiological and Ecological Plant Sciences, (April 29th-30th) Fac. of science, Minia Univ.
- Ahmadian, A.; Tavassoli, A. and Amiri, E. (2011). The interaction effect of water stress and manure on oil yield components, essential oil and chemical composition of cumin (*Cuminum cyminum*). African J. Agric. Res., 6(10):2309-2315.
- Amin, I.S. and Abd El-Wahab, M.A. (1999). Effect of chemical fertilization on *Cuminum cyminum*, L. plants under North Sinai conditions. Desert Inst. Bull., Egypt, 48(1):1-19.
- Asl, S.G. and Moosavi, S.S. (2012). A study and evaluation in organic fertilizers' effects on seed yield and some main agricultural characteristics of cumin plant ardabil region conditions. Annals of Biological Research, 3(11):5130-5132.
- Ayad, H.S.; Gamal El-Din, K.M. and Reda, F. (2009). Efficiency of stigmasterol and α -tocopherol application on vegetative growth, essential oil pattern, protein and lipid peroxidation of geranium (*Pelargonium graveolens*, L.). Journal of Applied Sci. Res., 5(7):887-892.
- Badran, F.S.; Aly, M.K.; Hassan, E.A. and Shalaltet, Sh.G. (2007). Effect of organic and biofertilization treatments on cumin plants, Proc. the third conf. of Sustainable Agric. Dev., Fayoum, Egypt, Nov. 12-14, 2007 : 371-380.
- Botros, W.S.E. (2013). Physiological Studies on Caraway Plants. M.Sc. Thesis, Fac. Agric., Minia Univ. Egypt.
- Ferrie, M.; Bethune, T.; Arganosa, G. and Waterer, D. (2011). Field evaluation of doubled haploid plants in the Apiaceae: dill (*Anethum graveolens*, L.), caraway (*Carum carvi*, L.), and fennel (*Foeniculum vulgare*, Mill.). Plant Cell Tiss Organ Cult., 104, 407-413.
- Forouzandeh, M.; Karimian, M.A. and Mohkami, Z. (2014). Effect of water stress and different types of organic fertilizers on essential oil content and yield components of *Cuminum cyminum*. Indian Journal of Fundamental and Applied Life Sciences, 4(3):533-536.
- Gagandeep, S.; Dhanalakshi, E.; Mendiz, A.; Rao, R. and Kale, R. (2003). Chemopreventive effects of *Cuminum cyminum*, L. in chemically induced forestomach and uterine cervix tumors in

- marine model system. Nutrition and Cancer, 7:171-180.
- Helmy, T.A. (2015). Influence of Some Agricultural Treatments on Cumin Plant. Ph.D. Thesis, Fac. Agric., Minia Univ., Egypt.
- Hemdan, S.H.O. (2008). Effect of Some Organic and Biofertilization Treatments on Anise Plants. M.Sc. Thesis, Fac. Agric. Minia Univ., Egypt.
- Hendawy, S.F. and Ezz El-Din, A.A. (2010). Growth and yield of *Foeniculum vulgare* var. Azoricum as influenced by some vitamins and amino acids. Ozean Journal of Applied Sciences, 3(1):113-123.
- Ibrahim, T.I.E. (2014). Influence of Some Agricultural Treatments on *Ammi visnaga* Plants. Ph.D. Thesis, Fac. of Agric. Minia Univ.
- Ismail, S.I.I. (2008). Anatomical and Physiological Studies on *Nigella sativa*, L. Plant. Ph.D. Thesis, Fac. Agric. Mansoura Univ., Egypt.
- Jackson, M.L. (1973). Soil Chemical Analysis Englewood Cliffs., New Prentice-Hall INC., New York.
- Morton, J.E. (1976). Herbs and Spices. Golden Press, New York, Western Publishing Company, Inc. Racine, Wisconsin.
- MSTAT-C (1986). A microcomputer program for the design management and analysis of Agronomic Research Experiments (version 4.0), Michigan State Univ., U.S.A.
- Muthaura, C.; Musyimi, D.M.; Joseph, A. and Okello, S. (2010). Effective microorganisms and their influence on growth and yield of pigweed (*Amaranthus dubians*). Arpn J. of Agric. and Biol. Sci., 5(1):17-22.
- Patel, N.D.; Patel, Y.B. and Mankad, A.U. (2013). Evaluating growth and development of *Cuminum cyminum*, L. under different fertigations. International Journal of Pharmacy and Life Science, 5(11):3977-3981.
- Rekaby, A.M. (2013). Improving the Productively of Coriander Plants by The Use of Some Unconventional Treatments. Ph.D. Thesis, Fac. of Agric. Minia Univ.
- Safwat, M.S. and Badran, F.S. (2002). Efficiency of organic and bio-fertilizers, in comparison with chemical fertilization on growth, yield and essential oil of cumin plants. The 9th Conf. of Medicinal and Aromatic Plants, Cairo, Egypt.
- Sedigh, A.; Azizi, K. and Azizi, F. (2014). Studying the effects of biological and chemical fertilizing systems on yield and yield components of cumin (*Cuminum cyminum*, L.). Int. J. Agric. and Crop Sci., 7(2):60-65.
- Seghatoleslami, M. (2013). Effect of water stress, bio-fertilizer and manure on seed and essential oil yield and some morphological traits of cumin, Bulgarian Journal of Agricultural Science, 19(6):1268-1274.
- Tanious, C.T.S. (2008). Effect of Some Organic Fertilization Treatments on Fennel Plants. M.Sc. Thesis, Fac. Agric., Minia Univ., Egypt.
- Thippeswamy, N. and Akhilender, K. (2005). Antioxidant potency of cumin varieties-cumin, black cumin and bitter cumin on antioxidant systems. Eur. Food Res. Technol., 220:472-476.
- Valadabadi, A.R.; Alibadi, F.H. and Moaveni, P. (2010). The effect of nitrogen fertilizer on seed yield and essence yield of different populations of cumin Ghazvin. Iranian Journal of Medical and Aromatic Plants, 26(3):348-357.
- Willatgamuwa, A.; Platel, K.; Saraswathi, G. and Srinivasan, K. (1998). Antidiabetic influence of dietary cumin seeds in streptozotocin induced diabetic rats. Nutrition Research, 18(1):131-142.

إستجابة نبات الكمون لبعض معاملات التسميد العضوي والحيوي ومضادات الأكسدة ١- النمو الخضري ومحصول الثمار

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تم دراسة تأثير السماد البلدي (١٠ - ١٥ - ٢٠ م^٣/فدان) والسماد المعدني والميكروبات الدقيقة النشطة و/أو الفيتامينات (ب١ أو هـ) على صفات النمو الخضري (ارتفاع النبات - التقريع - وزن العشب جاف) والمحصول (عدد النورات/نبات - محصول الثمار للنبات ولفدان) لنبات الكمون في موسمي النمو ٢٠١٥/٢٠١٦ و ٢٠١٦/٢٠١٧ في قرية البيهو التابعة لمركز سمالوط بمحافظة المنيا ومعمل كلية الزراعة - جامعة المنيا. وقد اوضحت النتائج ان: كل معاملات السماد البلدي أدت إلى زيادة معنوية في كل الصفات السابقة والمستوى العالي من السماد العضوي كان الأفضل. معاملات الميكروبات الدقيقة النشطة + فيتامين ب١ تليها الميكروبات الدقيقة النشطة + فيتامين هـ ثم ن فو بو (جرعة كاملة) كانت الأحسن في زيادة كل الصفات السابقة.

إمداد نباتات الكمون بالسماد البلدي ٢٠ م^٣/فدان مع الميكروبات الدقيقة النشطة + فيتامين ب١ أو فيتامين هـ (٥٠ جزء في المليون) أو استعمال ١٥ م^٣/فدان سماد بلدي + الميكروبات الدقيقة النشطة + فيتامين ب١ بتركيز ٥٠ جزء في المليون تحقق أفضل النتائج متفوقة على كل معاملات التفاعل.