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Response of faba bean plants to weed control treatments and foliar spraying of some bio-stimulants under sandy soil condition

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Abstract: Weeds infestation is one of the major threats to crop yield. Field experiments were carried out to investigate the efficiency of weed control methods (Unweeded, Bentazon+ Fluazifop-butyl, Bentazon + Clethodium and two hand hoeing) and bio-stimulants (amino acid at the rate of 1000, 2000 and 3000 mg/L, α-tocopherol rate of 100, 200 and 300 mg/L and untreated treatments on faba bean crop and associated weeds in El-Nubaria, Egypt. Two hand hoeing achieved the highest weed depression expressed in the lowest dry matter of broadleaved, narrow-leaved and total weeds. Reduction in dry matter of total weeds was (90.0 - 89.3%) compared with unweeded treatments after 60 and 90 days from sowing. Two hand hoeing was the most superior treatment in increasing plant height, shoot dry weight, leaf area index and SPAD value at 60 and 90 days from sowing as well as yield, yield attributes and chemical composition of faba bean seeds followed by that of Bentazon + Clethodium treatments. Application of two hand hoeing and Bentazon + Clethodium provided 40.1, 35.5% more grain yield than weedy check. Amino acid application up to 3000 gm/L or α-tocopherol at 300 gm/L enhanced growth, yield and chemical composition of faba bean seeds. The interaction between weed control and amino acid levels had significant effect on total dry weight of weeds, leaf area index and seed yield. Two hand hoeing or Bentazon + Clethodium herbicide integrated with 3000 gm/L amino acid application produced the maximum values of leaf area index and seed yield. It could be concluded that two hand hoeing or Bentazon + Clethodium herbicide combined with amino acid application up to 3000 gm/L could effectively improve growth and productivity of faba bean under sandy soil conditions.
Keywords: amino acid ,α-tocopherol, Bentazon, Clethodiumand and Fluazifop-butyl.

Introduction

Faba bean (*Vicia faba*, L.) as the most popular seed legume, is an important source of carbohydrate and protein in the Egyptian food. It also improves the fertility of the soil via providing a substantial input of N_2 fixation. The increase in the faba bean crop as a result of weed control reached about 78%[1]. On contrast, the reduction of faba bean yield is mainly due to weed infestation which reached 30 to 44 %[2]. Thus, weed control is one of the essential cultural practices for raising faba bean yield and improving its quality. Two hand hoeing are recommended for effective weed control in faba bean[3]. Hand hoeing treatment in faba bean fields is the most widespread method of weed control, resulting in good control of weeds[4]. Using chemical compounds for weed control requires information in order to obtain the best results. The use of herbicides in faba bean production is increasing dramatically due to their efficiency and reliability in controlling weeds. Numerous herbicides were successfully used for controlling weeds in faba bean, with Fusilade (fluazifop–butyl), Basagran (bentazon), Gezagard (prometryn), Amex (butralin) and Topstar (oxadiargyl) being the most prominent. Application of fluazifop-p-butyl at the rate of 2L./ fed significantly reduced dry matter of narrow weeds and increased growth and seed yield[1].

Vitamins are organic compounds that required in trace amount to maintain normal growth and proper development of all organisms. These compounds act as coenzyme systems and play an essential role in the regulation of metabolism[5]. α-tocopherol (vitamin E) is the main non- enzymatic antioxidants in the cell membrane, which plays an important role in the protection of plants against free radicals which produced from the oxidation processes and assists in maintaining membrane stability[6] as well as intracellular signaling, and transport of electrons in the photosystem-II[7]. α-tocopherol is believed to protect chloroplast membranes from photo-oxidation and help to provide an optimal environment for the photosynthetic[8].

Amino acids are involved in the synthesis of other organic compounds, such as protein, amines, alkaloids, vitamins, enzymes, terpenoid[9]. Amino acids are crucial to stimulating cell growth, act as buffers, provide a source of carbon and energy and protect the cells from ammonia toxicity, with amid formation[10]. Amino acid formulations, mixtures of nutrients, hydrolyzed proteins, triacontanol, humic acids, sea weed extracts and brasinolides are proposed as a commonly used growth promoters[11]. The application of amino acids can stimulate the performance of plant[12]. Peptone applied foliar significantly promoted plant growth and development[9]. The yield-contributing characters and quality of plants could be improved by foliar application of putresin and /or glutamine[13]. Foliar application of active amino acid formulations significantly enhanced the physiological attributes of tea plants[11]. Many Studies have been proved that amino acids can directly or indirectly influence the physiological activities in plant growth and development. In addition, reported that the foliar application of amino acids caused an enhancement in plant growth, of garlic[14], potato[15] and sweet pepper[16,17].

The present work aimed to study the effect of weed control treatments and some bio-stimulants applied at different rates as foliar spraying on growth, yield , yield components, and chemical composition of faba bean seeds grown under sandy soil conditions.

Material and Methods

Two field experiments were conducted during the two successive seasons (2012/13 and 2013/14) at the experimental research and production station of National Research Centre, Nubaria region, Egypt (latitude 30.8667 N, and longitude 31.1667 E, and mean altitude 21 m above sea level). The soil of experimental site is classified as sandy soil. Some physical and chemical properties of the experimental soil are shown in Tables (1a) and (1b). The experiment was established with a split plot design having four replicates. The main plots included five weed control treatments(Unweeded, Bentazon+ Fluazifop-butyl, Bentazon + Bentazon + Clethodium and two hand hoeing). Sub-plots were assigned to bio-stimulant (100, 200 and 300 mg/L α tocophero and 1000, 2000 and 3000 mg/L amino acid mixture as well as untreated treatments). The experimental field was deep ploughed before planting. First disc harrow, then duck food was used for further preparation of the field for planting. The experimental unit was 3.5 X 3.0 m. Faba bean seeds (Nubaria 1) were inoculated with the specific Rhizobium strain and immediately sown in hills 25 cm apart on both sides of the ridge (150 kg/ha). Faba bean seeds were sown in 15 th and 20th November in the first and second seasons, respectively. After 40 days from sowing, spraying with bio-stimulant was done.

All treatment plots received the same amount of total fertilizer. A compound fertilizer was applied as follow: Nitrogen fertilizer as ammonium nitrate (33.5 % N) at the rate of 50 kg N/ha was added after 20 days from sowing, phosphorus fertilizer was applied in the form of single super-phosphate (15.5% P_2O_5) during land preparation at the rate of 357 kg/ha and 150 kg/ha potassium sulphate (48 % K_2O) applied once after 35 days from sowing.

Measurements

On weeds:

After 60 and 90 days from sowing in both seasons, weed samples from one square meter area were randomly collected from each plot. Dry weight of weeds was determined after drying in a forced draft oven at

70 °C to constant weight. The most dominant weeds in both growing seasons were: Wild beet (*Beta vulgaris* L.), Greater ammi (*Ammi majus* L.), Dock (*Rumex dentatus* L.), Bur clover (*Medicago hispida* L.), Annual yellow sweetclover (*Melilotus indicus* L.), Wild oat (*Avenafatua* L.) and Ryegrass (*Lolium temulentum* L.)

Table 1a: Soil physical characteristics of experimental site

Soil depth (cm)	Particle size distribution (%)			Texture class	Soil moisture constants		
	Coarse sand	Fine sand	Clay + Silt		SP (%)	FC (%)	WP (%)
20	47.76	49.75	2.49	Sandy	21.0	10.1	4.7
40	56.72	39.56	3.72	Sandy	19.0	13.5	5.6
60	59.40	59.40	3.84	Sandy	22.0	12.5	4.6

SP = saturation percentage; FC = field capacity; WP = wilting point

Table1b: Soil chemical properties of experimental site

Soil depth (cm)	OM (%)	pH (1:2.5)	EC (dS/m)	CaCo3 (%)
20	0.65	8.7	0.35	7.02
40	0.40	8.8	0.32	2.34
60	0.25	9.3	0.44	4.68

OM= Organic matter; pH= acidity or alkalinity in soils; EC= electrical conductivity

On faba bean plants:

Vegetative growth parameters:

After 60 and 90 days from sowing in both seasons samples of five random plants were taken from experimental plots to estimate the following characteristics:

1. Plant height (cm)
2. Shoot dry weight (g).
3. Leaf area index (LAI).
4. SPAD value of fourth faba bean leaves was determined by according to chlorophyll meter (SPAD-502, Minolta Camera Co., Osaka, Japan,[18].

Yield and yield attributes:

At harvesting, the following data were recorded:

1. Number of pods / plant.
2. Pods dry weight / plant (g.)
3. Seeds weight / plant (g).
4. 100- seed weight (g)
5. Seed yield (ton/ha) for the last traits the two central ridges of each experimental unit were devoted the determination.

Chemical composition of seeds:

Total soluble carbohydrates were determined as described by [19]. Total carbohydrates were determined according to[20]. Phenolic contents were determined as the[21]. Total flavonoid contents were measured by the aluminum chloride colorimetric assay as described by[22]. The free radical scavenging activity was determined according to[23] the 1.1-diphenyl-2-picrylhydrazil (DPPH) reagent.

Statistical analyses:

The combined analysis of variance for the data of the two seasons was performed after testing the error homogeneity and Fisher's Least Significant Difference(LSD) method at 0.05 level obtained data from each season were subjected to the proper statistical analysis of variance of significance was used for the comparison between means according to[24].

Results andDiscussion

Weed growth:

Effect of weed management:

Data in Table 2 reveal that all weed control treatments significantly decreased the dry weight of broadleaved, narrow-leaved and total weeds at 60 and 90 days from sowing as compared to the unweeded check. Two hand hoeing was more effective than other weed control treatments against broadleaved and narrow-leaved weeds. Bentazon + Clethodium came in the second rank followed by Bentazon+ Fluazifop-butyl. The highest significant reductions in total dry weight of weeds were obtained by two hand hoeing (90.0 - 89.3%) followed by Bentazon + Clethodium (86.6-85.6 %) and Bentazon+ Fluazifop-butyl (83.1–83.2%), in comparison with unweeded treatment after 60 and 90 days from sowing, respectively. These reductions may be due to the inhibition effect of hand hoeing treatment on growth and development of weeds. These results are in harmony with those obtained by[1,25,26].

Amino acid application at the rate of 3000 mg/L caused significant increases in dry weight of total weeds compared with untreated plants. According to results in Table (2) dry weight of broadleaved, narrow-leaved and total weeds after 60 and 90 days from sowing were insignificantly affected by α-tocopherol and amino acid treatments. The positive effect of weeded practices on weed wheat have been confirmed by[13,26].

Remarkable impact of the interaction between weed management and bio-stimulants on dry weight of total weeds as presented in Table (3). In this regard, application of two hand hoeing and untreated plots achieved the highest decreases in dry weight of total weeds. On the other hand, the highest in dry weight of total weeds was produced at 3000 mg/L amino acid treatment and unweeded plots. The similar conclusion was mentioned by[26].

Table 2: Effect of weed control and bio-stimulants on total dry weight of faba bean weeds g/m^2 at 60 and 90 days from sowing (combined analysis of two seasons).

Treatments	At 60 days from sowing			At 90 days from sowing		
	Broadleaved	grasses	Total	Broadleaved	grasses	Total
Weed control						
Unweeded	90.1	78.9	169.0	127.1	103.4	230.5
Bentazon+ Foluzfop-butyl	13.1	15.4	28.5	17.9	20.9	38.8
Bentazon + Clethodium	11.4	11.3	22.7	15.6	17.5	33.1
Two hand hoeing	7.9	9.0	16.9	12.1	12.5	24.6
LSD 0.05	1.5	1.9	3.2	3.4	4.3	5.8
Bio-stimulants						
100 mg/L α tocopherol	30.0	27.6	57.6	41.2	36.2	77.4
200 mg/L α tocopherol	31.2	28.8	60.0	40.4	39.3	79.7
300 mg/L α tocopherol	31.9	29.9	61.8	45.0	40.6	85.6
1000 mg/L amino acid	30.3	28.3	58.6	42.8	37.6	80.4
2000 mg/L amino acid	31.3	29.5	60.8	44.9	41.8	86.7
3000 mg/L amino acid	32.1	30.4	62.5	46.0	41.8	87.8
Untreated	27.6	26.2	53.8	38.9	33.5	72.4
LSD 0.05	NS	NS	3.1	2.1	3.7	4.6

Table 3 : Effect of the interaction between weed control and bio-stimulants on total dry weight of weeds g/m^{2}faba bean at 60 and 90 days from sowing (combined analysis of two seasons).

Treatments	Bio-stimulants						
	α Tocopherol (mg/L)			Amino acid (mg/L)			Untreated
	100	200	300	1000	2000	3000	
Weed control	Total weeds at 60 days from sowing						
Unweeded	167.7	171.9	175.0	169.2	172.2	175.2	158.7
Bentazon+ Foluzfop-butyl	25.4	27.8	29.1	26.7	219.2	30.9	23.0
Bentazon + Clethodium	21.8	23.4	24.5	22.1	23.2	24.3	19.7
Two hand hoeing	15.5	16.9	18.4	16.1	18.4	19.4	13.6
LSD 0.05	4.5						
Weed control	Total weeds at 90 days from sowing						
Unweeded	222.8	232.5	236.8	227.9	237.4	240.2	215.7
Bentazon+ Foluzfop-butyl	34.4	39.5	42.8	37.4	43.4	45.1	29.0
Bentazon + Sotosdum	30.4	34.1	35.8	32.2	35.7	37.6	25.3
Two hand hoeing	21.8	25.3	27.0	24.0	26.9	28.0	19.3
LSD 0.05	6.3						

Faba bean growth:

Results in Table 4 reveal the significant impacts of weed control treatments on plant height, shoot dry weight (g), leaf area index (LAI) and SPAD value at 60 and 90 days from sowing. In this connection, two hand hoeing significantly increased aforementioned traits compared to other treatments. The treatments proved to be effective in controlling weeds and consequently the competition was limited and lighter, water and nutrients were available to promote the faba bean growth if compared to the other treatments. Herein, no significant differences between two hand hoeing and Bentazon + Clethodium treatments on obvious characters. These results are in harmony with those obtained by[1,26].

Regarding amino acid mixture and α-tocopherol effects, it was found that all growth parameters under investigation were significantly increased by all amino acid mixture and α-tocopherol treatments at two growth stages (60 DAS and 90 DAS) relative to control (Table 4). The highest significant increases in plant height, shoot dry weight (g), leaf area index (LAI) and SPAD value resulted from 3000 mg/L amino acid mixture followed by 2000 mg/L amino acid mixture. It is worthy to mention that 3000 mg/L amino acid mixture was the optimum treatment caused the highest pronounced and significant effect in enhancing growth of faba bean plants. The enhancement effect of amino acid mixture and α-tocopherol on growth parameters of faba bean plants are in good agreement with those reported by[13, 14,26, 27,28] on faba bean and cowpea plants. These increments in plant growth may be due to the enhancement effects of α-tocopherol and amino acid mixture on cell division or cell enlargement[27], DNA replication[29] and endogenous phytohormones in plant[30].

The interaction between weed control treatments and some bio-stimulants significantly affected by leaf area index (Table 5). Two hand hoeing produced the highest values of leaf area index when amino acid at 3000 mg/L treatments was used. Moreover, the minimal values of all obvious characters were obtained with unweeded and untreated plots with bio-stimulants. Similar results have been reported by[26].

Faba bean seed yield and yield attributes

It is obvious from the data in Table 6 which reveal that weed control treatments significant influence on yield and yield attributes. Two hand hoeing treatments significantly increased number of pods / plant, pods dry weight / plant, seeds weight / plant, 100- seed weight and seed yield ton/ha as compared to the other treatments. Vice-versa, the lowest values of pervious characters were recorded with control plots. Two hand hoeing followed by Bentazon + Clethodium and Bentazon+ Foluzifop-butyl treatments gave higher values of seed yield ton /ha. These treatments significantly increased seed yield ton /ha over the unweeded check by 40.1, 35.5 and 27.9 % respectively. The increase in yield attributes by different weed control treatments may be due to good control of faba bean weeds and minimizing weed competition which gave good chance of faba bean growth and improved good characters. The promoting effect of weed control treatments on growth characters of plants may be reflected on increasing the yield attributes of faba bean. These results are in coinciding with those detected by[1, 4,26,321,32,33].

Table 4: Effect of weed control and bio-stimulants on growth parameters of faba bean at 60 and 90 days from sowing (combined analysis of two seasons)

Treatments	At 60 days from sowing				At 90 days from sowing			
	Plant height (cm)	Shoot dry weight (g)	LAI	SPAD value	Plant height (cm)	Shoot dry weight (g)	LAI	SPAD value
Weed control								
Unweeded	53.9	11.3	2.33	36.1	61.3	20.7	4.42	37.3
Bentazon+ Foluzfop-butyl	57.3	14.7	2.55	38.7	72.7	26.7	4.63	39.9
Bentazon + Clethodium	59.4	16.9	2.83	42.4	76.3	29.3	4.91	43.6
Two hand hoeing	61.0	17.3	2.97	43.0	77.9	30.3	5.07	44.0
LSD 0.05	2.1	1.4	0.11	2.2	3.7	3.4	0.24	2.8
Bio-stimulants								
100 mg/L α tocopherol	56.0	13.4	2.41	39.3	68.7	24.7	4.34	40.0
200 mg/L α tocopherol	57.8	15.9	2.76	41.0	73.3	27.3	4.83	42.5
300 mg/L α tocopherol	58.5	17.0	2.87	42.8	75.8	29.7	5.18	43.0
1000 mg/L amino acid	56.8	14.2	2.55	39.8	70.0	26.5	4.72	40.7
2000 mg/L amino acid	59.5	16.6	2.85	40.5	73.8	30.3	5.04	42.9
3000 mg/L amino acid	62.5	17.2	3.03	41.3	77.4	31.5	5.26	43.7
Untreated	52.5	11.5	2.14	36.3	66.7	18.3	4.05	37.7
LSD 0.05	2.4	1.9	0.21	2.1	4.2	3.3	0.29	2.6

LAI :leaf area index

Table 5 : Effect of the interaction between weed control and growth regulators on LAI at 60 and 90 days from sowing (combined analysis of two seasons).

Treatments	Bio-stimulants						
	α Tocopherol (mg/L)			Amino acid(mg/L)			Untreated
	100	200	300	1000	2000	3000	
Weed control	LAI at 60 days from sowing						
Unweeded	2.11	2.43	2.56	2.21	2.51	2.65	1.89
Bentazon+ Foluzfop-butyl	2.33	2.65	2.75	2.40	2.67	2.93	2.09
Bentazon + Clethodium	2.57	2.95	3.03	2.75	3.07	3.25	2.22
Two hand hoeing	2.63	3.04	3.13	2.85	3.15	3.30	2.35
LSD 0.05	0.23						
Weed control	LAI at 90 days from sowing						
Unweeded	4.03	4.53	4.79	4.21	4.75	5.01	3.64
Bentazon+ Foluzfop-butyl	4.20	4.77	5.15	4.39	4.84	5.15	3.90
Bentazon + Clethodium	4.53	4.99	5.32	4.82	5.17	5.36	4.21
Two hand hoeing	4.61	5.05	5.45	5.09	5.39	5.50	4.43
LSD 0.05	0.29						

The results in Table 6 indicated that foliar application of bio-stimulants had significant effect on yield and its attributes. Amino acid mixture application at a rate of 3000 gm L-1 or 2000 gm L^{-1}significantly produced the highest grain yield and its components compared to other treatments. This increase in grain yield amounted to 21 and 19% more than untreated plants without significant between them. Also, α-tocopherol at the rate of 300 mg/L gave the maximum values of grain yield. No significant differences between α-tocopherol at the rate of 300 gm/L and 3000 mg/L amino acid mixture on seed yield of faba bean. This increase in grain yield amounted to 18% more than untreated plants. The increase in yield and yield attributes by different amino acid mixture and α-tocopherol concentration may be due to which stimulate and/or enhance the metabolism processes in plant tissues. Moreover, the application of amino acid mixture as foliar application, could supply the plant organism which promote synthesis of plant organs consequently[15].

The results (Table 7) show that there were significant interactions between weed control treatments bio-stimulants on yield. The highest values were obtained from spraying of 3000 gm/L integrated with Two hand hoeing or Bentazon + Clethodium treatments. On the other hand, the lowest values were recorded from the unweeded treatment with spraying of water treatment. Such superiority of two hand hoeing or herbicides treatments combined with amino acid or α-tocopherol treatments, mainly due to the higher weed control efficiency and poor competition ability of weeds gave a competitive advantage for the faba bean plants in utilizing the essential demands of nutrients and water, leading to increasing the faba bean growth and yield. The results of the present investigation are in trend with those obtained by[26].

Chemical composition of seeds

These results revealed that all weed control treatments significantly increased total soluble carbohydrates%, total carbohydrates%, phenolic contents%, antioxidant activity% and flavonoid % as shown in Table 6. The highest values of the characters previous were recorded with two hand hoeing treatment followed by that of Bentazon + Clethodium and Bentazon+ Foluzifop-butyl. While, the lowest aformintined characters resulted from untreated plots. The increase in total soluble carbohydrates%, total carbohydrates%, phenolic contents%, antioxidant activity% and flavonoid % may be due to less competition for nutrients water and light through limiting weeds infestation with two hand hoeing or herbicidal treatments due to increasing the uptake of different nutrients. Similar results were obtained by[1, 4,26.]

Averages of total soluble carbohydrates%, total carbohydrates%, phenolic contents%, antioxidant activity% and flavonoid % of faba bean seeds were appreciably influenced by amino acid and α-tocopherol concentration as shown in Table 7. In this respect, with each increase in amino acid mixture and α-tocopherol level there was a progressive increase in previous parameters. Amino acid application at a rate of 3000 m g/ L significantly produced the highest aforementioned characters compared to untreated plants. Our results indicated that the application of amino acids mixture and α-tocopherol as a foliar spray caused increases in the contents of total soluble sugars and total carbohydrates. The promoting effect of the amino acids mixture on the total soluble sugars and total carbohydrates may be due to their promotive role in biosynthesis of chlorophyll molecules[9,10].

Table 6 : Effect of weed control and bio-stimulants on yield and yield attributes as well as chemical composition of seeds (combined analysis of two seasons)

	Yield and yield attributes					Chemical composition of seeds				
	No. of pods /plant	Pod dry weight (g)	Seed weight / plant (g)	100-seed weight (g)	Seed yield ton/ ha^{-1}	Soluble carbo-hydrate %	Total carbo-hydrate %	Phenolic compound %	Antio-xidant Activity	Flavonoid %
Weed control										
Unweeded	14.4	22.7	26.9	49.7	2.62	6.53	52.64	3.32	44.80	1.29
Bentazon+ Foluzfop-butyl	20.4	36.7	34.7	54.4	3.35	6.74	53.44	3.11	45.67	1.45
Bentazon + Clethodium	24.9	39.1	36.5	55.2	3.55	6.90	53.78	2.86	46.04	1.63
Two hand hoeing	25.5	41.9	39.6	55.8	3.67	7.03	54.05	2.49	46.58	1.68
LSD 0.05	2.11	3.12	2.7	1.6	0.18	NS	0.24	0.36	0.59	NS
Bio-stimulants										
100 mg/L α tocopherol	19.7	31.8	32.5	53.1	3.15	6.66	53.22	2.85	45.56	1.48
200 mg/L α tocopherol	22.5	35.8	34.8	54.2	3.36	7.02	53.71	3.08	46.07	1.66
300 mg/L α tocopherol	23.3	40.0	35.5	54.9	3.43	7.17	54.00	3.28	56.44	1.79
1000 mg/L amino acid	19.9	33.0	33.3	53.5	3.27	6.56	53.18	2.76	45.39	1.36
2000 mg/L amino acid	23.8	36.3	36.4	54.5	3.45	6.80	53.58	2.96	45.80	1.49
3000 mg/L amino acid	24.5	41.8	37.9	55.0	3.53	6.99	53.85	3.14	46.07	1.59
Untreated	16.7	27.3	30.3	52.3	2.91	6.43	52.81	2.62	45.08	1.24
LSD 0.05	2.25	3.24	1.9	NS	0.21	NS	0.27	0.24	0.51	NS

Regarding α-tocopherol effect, the increments in soluble and total carbohydrates under the effect of α-tocopherol treatments are similar to those obtained by[34] who mentioned that α-tocopherol application stimulated the accumulation of total soluble sugars and total carbohydrates in the salt-affected sunflower cultivars, either via increasing endogenous levels of certain phytohormones or by acting as activators of carbohydrates synthesis. Further, the increments in carbohydrate contents probably, may be attributed to the protective effects of α-tocopherol on photosynthetic systems.Regarding phenolics, flavonoids and antioxidant activity, it was found earlier that phenolic compounds act as a substrate for many antioxidants enzymes and protect cells from potential oxidative damage and increase stability of cell membrane, mitigates the stress injuries and regulates metabolic processes and consequently overall plant growth[35].

Further,[27 and 9]mentioned that α-tocopherol had effective role in elevating and tolerating the adverse effects of biotic and abiotic stresses on plant growth and yield. Since, α-tocopherol plays a critical role in the protection of cell membranes and their binding with transporter proteins, as well as decreased the toxic effects of reactive oxygen species during stress, and increased absorption and translocation of minerals. [26]concluded that α-tocopherol at 200 ppm partially alleviated the harmful effects of salinity stress on the nutritive value of the yielded lupine seeds. The antioxidant activities, free radical scavenging capacity of all treated plants were more than untreated control plants. These increases may be attributed to the increases in total phenolic content and flavonoids under all applied treatments.

Table 7 : Effect of the interaction between weed control and bio-stimulants on seed yield of faba bean (combined analysis of two seasons).

Treatments	Bio-stimulants						
	α Tocopherol (mg/L)			Amino acid (mg/L)			Untreated
	100	200	300	1000	2000	3000	
Weed control							
Unweeded	2.43	2.59	2.63	2.55	2.73	2.82	2.30
Bentazon+ Foluzfop-butyl	3.20	3.42	3.50	3.35	3.58	3.67	3.01
Bentazon + Sotosdum	3.41	3.65	3.75	3.52	3.69	3.74	3.11
Two hand hoeing	3.55	3.77	3.85	3.65	3.80	3.87	3.23
LSD 0.05	0.24						

References

1. El – Metwally, I. M. and Shalby Sh. E. M., 2007. Bio – remediation of Fluazifop -P- Butyl herbicide contaminated soil with special reference to efficacy of some weed control treatments in faba bean plants. Research J. of Agric. and Biological Sci., 3(3): 157 – 165.
2. Hassan, S.M.M., 1987. Faba bean growth, yield characteristics and acompanied weeds as influenced by plant population and pre-emergence herbicides application. Egypt J. Agron., 12 (1-2): 47 -56.
3. Singh, G. and Jolly R.S., 2004. Effect of herbicides on the weed infestation and grain yield of soybean(*Glycine max*). Acta Argonomica Hungarica, 52(2): 199-203.
4. El – Metwally, I. M. and Abdelhamid M. T., 2008. Weed control under integrated nutrient management systems in Faba bean (*Vicia faba*) production in Egypt. Plant Daninha. Viçosa – MG, 26(3): 585 – 594.
5. Hassanein R.A., Bassuony F.M., Baraka D.M. and Khalil R.R., 2009. Physiological effects of nicotinamide and ascrobic acid on *Zea mays* plant grown under salinity stress. I-Changes in growth, some relevant metabolic activities and oxidative defense systems. Res. J. of Agri. and Biol. Sci., 5(1): 72-81.
6. Munné-Bosch, S. and Falk J., 2004. New insights into the function of tocopherols in plants. Planta, 218, 323-326.
7. Munné-Bosch, S.and Alegre L., 2002. The function of tocopherols and tocotrienols in plants. Critical Reviews in Plant Scinces, 21, 31-57.
8. Collin, V.C., Eymery F. B. Genty P. and Rey P., 2007. Vitamin E is essential for the tolerance of Arabidopsis thaliana to metal–induced oxidative stress. Plant Cell Environ. Doi., 10.1111/j.1365-3040.
9. Ibrahim S.M.M., Taha L.S. and Farahat M.M., 2010. Influence of foliar application of pepton on growth, flowering and chemical composition of *Helichrysum bracteatum* plants under different irrigation intervals. Ozean J Appl Sci. 3(1): 143-155.
10. Abdel Aziz N.G., Mazher A.A.M. and Farahat M.M., 2010. Response of vegetative growth and chemical constituents of *Thuja orientalis* L. plant to foliar application of different amino acids at Nubaria. J Am Sci. 6(3): 295-301.
11. Thomas J., Mandal A.K.A., Kumar R.R. and Chordia A.,2009. Role of biologically active amino acid formulations on quality and crop productivity of tea (*Camellia sp*.). Int J Agric Res. 1-9.
12. Abdel-Mawgoud A.M.R., El-Bassiouny A.M., Ghoname A. and Abou-Hussein S.D., 2011. Foliar application of amino acids and micronutrients enhance performance of green bean crop under newly reclaimed land conditions. Aust J Basic Appl Sci. 5(6): 51-55.
13. Amin, A.A., Gharib F.A.E., Awadi M. and Rashad E.M., 2011. Physiological response of onion plants to foliar application of putrescine and glutamine. Sci Hortic. 129: 353-360.
14. El-Shabasi, M.S., Mohamed S.M. and Mahfouz S.A., 2005. Effect of foliar spray with some amino acids on growth, yield and chemical composition of garlic plants. The 6th Arabian Conf. for Hort., Ismailia, Egypt.
15. Awad, El-M.M., Abd El-Hameed A.M. and El-Aimin Z.A., 2007. Effect of Glycine, Lysine and nitrogen fertilizer rates on growth, yield and chemical composition of potato. J. Agric. Sci. Mansoura Univ., 32(10): 8541-8551.
16. Al-Said, M.A. and Kamal A.M., 2008. Effect of foliar spray with folic acid and some amino acids on flowering, yield and quality of sweet pepper. J. Agri. Sci., Mansoura Univ., 33(10): 7403-7412.

17. Faten, S. A., Shaheen A.M. Ahmed A.A. and Mahmoud A. R., 2010. Effect of foliar application of urea and amino acids mixtures as antioxidants on the growth and yield and characteristics of squash. Res. J. Agric. Biol. Sci., 6(5): 583-588.
18. Minolta Co., 2013. Manual for Chlorophyll Meter SPAD-502 plus. Minolta Camera Co., Osaka, Japan.
19. Bogdan A. S., W. Guenter and Campbell L. D., 1993. New approach to water-soluble carbohydrate determination as a tool for evaluation of plant cell wall- egrading enzymes. J. Agric. Food Chem., 41 (12), pp 2304–2308
20. Smith, F. Gilles M.A., Hamilton J.K. and Godees P.A., 1956. Colorimetric method for determination of sugar related substances. Anal Chem 28:350–356.
21. Zhang, W. and Wang S.Y., 2001. Antioxidant activity and phenolic compounds in selected herbs. J Agric Food Chem 49:5165–5170.
22. Ordoñez, A.A.L., Gomez J.D., Vattuone M.A. and lsla M.I., 2006. Antioxidant activities of *Sechium edule* (Jacq.) Swartz extracts. Food Chemistry, 97: 452-458.
23. Brand-Williams, W., Cuvelier M.E. and Berset C., 1995. Use of a free radical method to evaluate antioxidant activity. Lebensmittel Wissensch aftenund Technologi, 28: 25- 30.
24. Gomez K. A. and Gomez A. A., 1984. Statistical Procedures for Agriculture Research., A Wiley − Inter Science Publication, John Wiley & Sons, Inc., New York, USA.
25. Abd El-Razik M. A., 2006. Effect of some weed control treatments on growth, yield, yield components and some seed technological characters and associated weeds of faba bean plants. J Agric Sci Mansoura Univ, 31:6283–6292.
26. Dawood, M. G., El-Metwally I. M. and Abdelhamid M. T.,2016. Physiological response of lupine and associated weeds grown at salt-affected soil to α-tocopherol and hoeing treatments. GesundePflanzen, 68:117–127.
27. Baffel, S.O. and Ibrahim, M.M., 2008. Antioxidants and accumulation of α-tocopherol induce chilling tolerance in Medicago sativa. Int. J. Agric. Biol., 10: 593-598.
28. Hussein, M.M., Balbaa L.K. and Gaballah M.S., 2007. Developing a salt tolerance cowpea using alpha tocopherol., J. Appl. Sci. Res., 3:1234-1239.
29. Arrigoni, O., Calabrese G., DeGara L., Brronti M.B. and Liso R., 1997. Correlation between changes in cell ascorbate and growth of *Lupines albus* seedlings. J. Plant Physiol., 150: 302-308.
30. Bartoli, C.G., Simontacchi, M. E. Ambussi T.,Beltrano J., Montaldi E. and Puntarulo S., 1999. Drought and watering dependent oxidative stress: Effect on antioxidant content in *Triticum aestivum* L. Leaves. J. Expt. Bot., 332: 375-383.
31. El_Metwally I. M., Abd El- Salam, M. S. and Osama Ali A.M., 2015. Effect of zinc application and weed control on wheat yield and its associated weeds grown in zinc-deficient soil. International Journal of ChemTech Research, 8(4): 1588-1600
32. Abd El-Salam M. S., El-Metwally, I. M., Abd El Lateef E.M. and Ahmed M. A., 2016. Effect of weed control and proline treatment on wheat productivity and weed nutrient removal under water stress conditions. International Journal of ChemTech Research, 9(7): 18-31.
33. El-Metwally I.M. and Aml E.A. El-Saidy .2016. Physiological and chemical response of faba bean to water regime and cobalt supplement in sandy soils. International Journal of PharmTech Research,9(9): 158-169.
34. Rady M.M., SadakM.S.h, El-Bassiouny H.M.S, Abd El-Monem A.A., 2011. Alleviation the adverse effects of salinity stress in sunflower cultivars using nicotinamide and α-tocopherol. Aust J Basic ApplSci 5:342–355
35. BurguieresE,McCxue P, Kwon Y., Shelty K., 2006. Effect of vitamin C and folic acid on seed vigour response and phenolic-antioxidant activity. Bioresour Technol 95:1393–1404

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