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Efficiency of some weed control treatments and some bio-stimulants on growth, yield and its components of faba bean and associated weeds.

El-Metwally I. M.

Botany Department, Research Department, National Research Centre, 33 El-Bohooth st., (former El-Tahrirs st.), Dokki, P.O. Code 12622, Cairo, Egypt.

Abstract: Field evaluation of the efficiency of five weed-control treatments (Unweeded, oxadiargyl, butralin and prometryn and two hand hoeing) and seven bio-stimulants levels (folic acid at the rate of 5,10 and 15 mg/L, and seaweed extract 50, 100 and 150 mg/L as well as and untreated) and their interactive effects on faba bean growth, yield, yield attributes and determine the protein and total carbohydrate percentages were performed in two successive seasons at the agricultural experimental station of the National Research Centre, 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 (93.92 and 92.27%) compared with unweeded treatments. 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 oxadiargyl treatments. Application of two hand hoeing and oxadiargyl provided 46.62 and 27.76% more grain yield than weedy check. Folic acid at the rate of 15 mg/L or seaweed extract at the rate of 150 mg/L enhanced growth, yield and chemical composition of faba bean seeds. The interaction between weed control and bio-stimulants had significant effect on total dry weight of weeds, leaf area index, seed yield and protein percentage in seeds. Two hand hoeing or oxadiargyl herbicide integrated with Folic acid at the rate of 15 mg/L or seaweed extract at the rate of 150 mg/L application produced the maximum values of leaf area index and seed yield. It could be concluded that two hand hoeing or herbicide oxadiargyl combined with folic acid application up to 15 gm/L could effectively improve growth and productivity of faba bean under sandy soil conditions.
Keywords: folic acid, seaweed, herbicides, protein and carbohydrate .

Introduction

Faba bean (*Vicia faba* L.) is the fourth most important pulse crop in the world. It is an important source of dietary protein. Faba bean is the most important food legume in the Egypt. It constitutes the main dish on the breakfast and supper tables for a large sector of the population, especially low income groups in the urban areas. In addition it contributes to soil fertility through biological nitrogen fixation, the crop is also an important source of income for farmers in Egypt. Low production and yield instability of faba bean are caused by weeds [1]. Weeds compete for water, nutrients, light space and/or carbon dioxide[2]. The major problem facing the production of faba bean in Egypt is weeds, because of the low competitive ability of faba bean crop during the early stages of its growth . Unrestricted weed growth and delayed weeding reduced seed yield of faba bean by up/to 80%[3]. According to[4] four weeks from sowing is the most critical period, in determining weed competition,

in faba bean. Herbicides constitute a new and highly efficient technique for controlling weeds, increasing yield, improving quality and reducing labour in crop production[1]. Worldwide several investigators have reported that satisfactory weed control in faba bean was achieved by application of a number of herbicides [5,6].

Liquid extracts obtained from seaweeds have gained importance as foliar sprays for several crops [7,8] because the extract contains growth promoting hormones (IAA and IBA), cytokinins and trace elements (Fe, Cu, Zn, Co, Mo, Mn and Ni) as well as vitamins and amino acids [9]. Aqueous extract of *Sargassum wightii* when applied as a foliar spray on *Zizyphus mauritiana* showed an increased yield and quality of vegetable crops [10]. Applying seaweed extract increased the response of different growth parameters and yield responses of watermelon [11]. In the same respect, [12] on Celeriac plants,[13] on Chinese garlic plants and on tomato plants [14] found that foliar spraying of seaweed extract obtain the highest values of vegetative growth, yield and its fruit quality. However, [15] on sweet pepper plants reported that spraying seaweed extract led to positive significant difference in plant height, leaves chlorophyll content % and total yield as well as fruit diameter, fruit length, fruit dry weight, TSS %, Vitamin C, fruit weight, yield per plant and total yield as compared to untreated plants.

Folic acid (FA) is a central cofactor for one-carbon transfer reactions which are involved in many cellular reactions such as synthesis of purines, metabolism of amino acids, a glycine to serine conversion, synthesis of methionine and the formation of lignin, chlorophyll and choline and also in the photorespirations cycle [16,17]. It can be used as a new, convenient, and affordable organic fertilizer to increase the efficiency of the plant and preserve its nutrients [18]. On the other hand, FA has become the most prominent of B complex vitamins despite its essential biochemical function in amino acid metabolism and nucleic acid synthesis [19]. In this respect, [20] reported that exogenous FA increased weight of pea seeds and yield. Amino acid analysis revealed a notable increase in the content of folate-dependent amino acids. In these words, treatment of the plants with exogenous FA increased both the content of chlorophyll in the leaves and their continuance function. In strawberry,[21] reported that folate is one of the most important micronutrients and has many forms, but only FA form has cofactor activity. In this respect, a few literatures reported that exogenous FA has positive effect on growth, yield and quality of some plants such as flax [22], faba bean [23] and winter wheat [24].

Keeping these points of view, this investigation was planned to study the effect of some weed management practices and bio-stimulants on faba bean yield and associated weeds.

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. 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, oxadiargyl, butralin and prometryn and two hand hoeing). The treatments consisted of prometryn, oxadiargyl and butralin, two hand hoeings {20 and 40 days after sowing (DAS)} and unweeded (control). Prometryn herbicide [Gesagard 500 FW, N, Nbis (1-methylethyl-6-(methylthio)-1, 3, 5- triazine – 2, 4-diamine] at the rate of 1.5 kg ha-1 (a.i.), oxadiargyl [Topstar 400 SC, 3-[2, 4-dicloro-5-(2-Propynyloxy) phenyl]-5- (1, 1-dimethylethyl)-1, 3, 4, oxdiazol-2(3H)-one] at the rate of 480 g ha-1 (a.i.), and butralin [Amex, 820, 4-(1, 1dimethylethyl)-N- 1-methyl propyl)-2, 6-dinitrobenzenamine] at the rate of 2.40 kg ha-1 (a.i.) were sprayed on the soil surface as pre-emergence immediately before irrigation, using Knapsack sprayer with one nozzle boom and 476 liter water ha-1 as carrier. The 10.50 m^2 experimental unit area contained 5 ridges (3.5 m long and 3 m wide). Sub-plots were assigned to growth regulators. (5, 10 and 15 folic acid and 50, 100 and 150 seaweed extract as well as untreated treatments). Folic acid produced by Mepaco Medifood Company Egypt,. A commercial seaweed extract product "Alga 600" (Techno green company) mixed of three seaweed viz.,*Ascophyllum nodosum, Laminaria spp* and *Sargassum sp*. Seaweed extract also contains N (1%), K (18.5%), Ca (0.17%), Mg (0.42%), Fe (0.06%), S (2.2%), alganic acids (10-12%) and plant hormones (600 ppm). Folic acid and seaweed extract applied after 30, 40 and 50 days from planting as foliar application.

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 20 th November in the first and second seasons, respectively.

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.

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)	$Caco_3$ (%)
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 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 broadleaves, grasses as well as total weeds was estimated was determined after drying in a forced draft oven at 70 $^{\circ}$C to constant weight.

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,[25]).

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 [26]. Total nitrogen content of the seeds was determined according to [27]. N values were multiplied by 6.25 to calculate total crude protein

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 [28] .

Results and Dissections

Weed species

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 (*Avena fatua* L.) and Ryegrass (*Lolium temulentum* L.).

Effects on weeds

Data presented in Table 2 reveals that the dry weights of broadleaved, grassy and total weeds were significantly reduced by weed management practices, compared to the unweeded treatment. In this regard, two hand hoeing achieved the highest weed depression expressed in the lowest dry matter of the mentioned weed groups. Reduction percentage in dry matter recorded relative to weed check treatment amounted to 94.75, 92.70 and 93.92% after 60 days from sowing and 92.19, 92.48 and 92.27% after 90 days from sowing in broad-leaved, grassy and total weeds, respectively. Combined data also reported that herbicide application reduced significantly the dry weight of broad-leaved, grassy and total weeds, compared to the unweeded treatment. Oxadiargyl came in the second rank after two hand hoeing followed by that of prometryn and butralin. Several reports have confirmed that hoeing twice is the most effective weed control practice for reducing weed dry matter accumulation in faba bean and soybean fields [1,6,29,30]. Thus, oxadiargyl was more effective in controlling total weeds and resulted in the highest reduction of dry matter when compared with prometryn and butralin. The reduction of weed dry weight may be due to the inhibition effect of herbicide treatments on growth and development of weeds. Our findings are consistent with those obtained by [31].

Results in Table 2 indicated that foliar application of bio-stimulants significantly increased dry weight of broadleaved, grasses and total weeds at 60 and 90 days from sowing as compared to untreated plants. Foliar spraying of folic acid at the rate of 15 mg/L produced the highest dry weight of weeds. In contrast, the lowest values were recorded when using water treatment (untreated). These results are in general agreement with those recorded by [32,33,34.]

Table 2 : Effect of weed control and bio-stimulants on 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						
Oxadiargyl	6.11	5.33	11.44	13.03	10.11	23.14
Prometryn	8.09	5.93	14.00	14.11	10.20	24.31
Butralin	10.70	7.00	17.70	15.2	12.00	27.20
Two hand hoeing	4.36	4.11	8.47	8.06	6.00	14.06
Unweeded	83.10	56.30	139.40	103.20	79.80	182.00
LSD 0.05	3.01	2.12	3.12	3.24	2.23	3.78
Bio-stimulants						
5 mg/L Folic acid	19.24	17.40	36.64	27.02	25.00	52.02
10 mg/L Folic acid	20.06	18.10	38.16	28.18	25.30	53.48
15 mg/L Folic acid	22.40	17.50	39.9	29.18	25.60	54.78
50 mg/L Seaweed	20.30	18.12	38.42	29.14	25.84	54.98
100 mg/L Seaweed	21.02	18.46	39.38	30.12	26.30	56.42
150 mg/L Seaweed	22.16	18.40	40.66	30.22	27.00	57.22
Untreated	18.14	15.60	33.74	26.12	24.00	50.12
LSD 0.05	1.17	1.11	1.56	1.29	1.45	1.64

Data in Table 3 showed that there were significant effect due to the interaction between weed control and bio-stimulants treatments on total number and dry weight of weeds at 60 and 90 days from sowing. Application of folic acid at the rate of 15 mg/L significantly increased total and dry weight of wheat weeds m^{-2} when two hand hoeing was applied. While, the lowest total dry weight of wheat weeds was recorded with unweeded treatment without bio-stimulants application. Similar results were obtained by [32]. No significant differences between application of folic acid and seaweed concentration on growth weeds.

Faba bean growth

Weed management practices had a significant effect on faba bean growth (Table 4). Two hand hoeing and all applied herbicides (prometryn, oxadiargyl and butralin) significantly increased plant height, shoot dry weight (g), leaf area index (LAI) and SPAD value at 60 and 90 days from sowing. Application of the previous treatments was effective in controlling weed and consequently competition was limited and lighter, and water and nutrients were available to promote soybean growth compared to other treatments. These results are in agreement with those recorded by [1,2,3,5]. Results also indicated that all faba bean characteristics mentioned above significantly decreased at levels higher than the recommended rates of the herbicides applied.

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						
	Folic acid mg/L			Seaweed extract mg/L			Untreated
	5	10	15	50	100	150	
	Total weeds at 60 days from sowing						
Weed control							
Oxadiargyl	10.2	11.3	13.5	10.7	11.5	14.2	8.7
Prometryn	13.1	14.5	15.3	14.1	14.9	15.8	10.3
Butralin	17.1	18.3	18.9	18.5	18.9	19.5	12.7
Two hand hoeing	7.1	8.5	8.9	8.7	9.3	10.5	6.3
Unweeded	135.7	140.8	142.9	140.1	142.3	143.3	130.7
LSD 0.05	4.53						
Weed control	Total weeds at 90 days from sowing						
Oxadiargyl	21.3	22.9	23.7	24.1	24.8	25.3	19.9
Prometryn	22.7	24.2	24.9	25.1	25.7	26.3	21.3
Butralin	25.7	26.3	27.1	28.3	29.4	29.9	23.7
Two hand hoeing	11.7	12.5	14.6	15.3	16.9	17.2	10.2
Unweeded	178.7	181.5	183.6	182.1	185.3	187.4	175.4
LSD 0.05	4.67						

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								
Oxadiargyl	63.21	20.87	3.24	42.90	83.00	36.10	4.87	42.40
Prometryn	61.41	19.80	3.09	41.50	82.00	34.80	4.66	43.00
Butralin	60.52	19.00	3.23	41.35	81.00	34.30	4.77	43.60
Two hand hoeing	68.31	22.80	3.27	43.90	84.10	38.40	5.67	44.20
Unweeded	56.72	13.81	2.88	37.37	75.13	24.90	4.19	38.40
LSD 0.05	1.26	1.23	0.23	1.33	1.65	2.34	0.35	1.55
Bio-stimulants								
5 mg/L Folic acid	60.70	18.11	3.06	41.18	80.17	33.11	4.77	42.30
10 mg/L Folic acid	62.74	20.50	3.43	42.50	83.40	34.90	5.07	43.40
15 mg/L Folic acid	64.60	21.13	3.66	43.60	85.20	36.17	5.29	44.20
50 mg/L Seaweed	60.03	17.50	2.94	40.75	80.20	32.50	4.62	41.00
100 mg/L Seaweed	62.23	19.70	3.09	41.30	82.40	34.00	4.83	42.60
150 mg/L Seaweed	63.68	20.90	3.39	42.50	84.30	34.20	5.00	43.50
Untreated	60.23	17.00	2.84	38.20	70.32	31.21	4.27	39.10
LSD 0.05	1.12	0.45	0.18	1.45	1.87	0.56	0.29	1.63

Although no visual phytotoxicity by using prometryn, oxadiargyl and butralin under investigation. The promoting effect of weed control treatments on growth characters may be due to 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.

Application of folic acid at the rate of 15 mg/L gave the greatest values of , shoot dry weight (g), leaf area index (LAI) and SPAD value at 60 and 90 days from sowing (Table 4). Also, using seaweed extract at the rate of 150 mg/L came in the second rank after folic acid without differences significantly. Vice- versa untreated treatment was recorded the lowest values. It could be concluded that, the increase in vegetative growth characters caused by folic acid has become the most prominent of B complex vitamins despite its essential biochemical function in amino acid metabolism and nucleic acid synthesis[19]. In this respect,[20] reported that exogenous FA increased weight of pea seeds and yield. Amino acid analysis revealed a notable increase in the content of folate-dependent amino acids. In these words, treatment of the plants with exogenous FA increased both the content of chlorophyll in the leaves and their continuance function. Also, seaweed extracts may be due to the role of Seaweed extracts as bio stimulants for plant growth and development because of presence of trace elements, organic substances like amino acids and plant growth regulators such as auxin, cytokine and gibberellins which improve nutritional status, vegetative growth [13, 14,15]. However, [35] showed that seaweed extract contain many of micro elements (Co, B, Mo, Zn, Cu) as well as macro elements, Auxins, Gibberellins and Cytokinins and when sprayed on plants increased root ability for growth and nutrient absorption and enhanced stem thickness and strong vegetative and root growth. These results are in accordance with those recorded by [14, 15,18,19,35].

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 folic acid at 15 mg/ L or seaweed extract at 150 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 [32].

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						
	Folic acid mg/L			Seaweed extract mg/L			Untreated
	5	10	15	50	100	150	
	LAI at 60 days from sowing						
Weed control							
Oxadiargyl	3.10	3.60	3.85	2.95	3.12	3.25	2.70
Prometryn	3.00	3.40	3.75	2.95	3.05	3.40	2.80
Butralin	3.00	3.50	3.70	2.90	3.10	3.45	2.93
Two hand hoeing	3.40	3.75	3.90	3.15	3.40	3.65	3.10
Unweeded	2.80	2.90	3.10	2.75	2.80	3.10	2.70
LSD 0.05	0.24						
Weed control	LAI at 90 days from sowing						
Oxadiargyl	4.75	5.20	5.45	4.50	4.90	5.10	4.20
Prometryn	4.60	4.90	5.05	4.50	4.65	4.85	4.10
Butralin	4.70	4.95	5.20	4.65	4.80	4.93	4.15
Two hand hoeing	5.70	5.95	6.15	5.40	5.60	5.70	5.20
Unweeded	4.10	4.35	4.60	4.00	4.20	4.40	3.70
LSD 0.05	0.45						

Yield and yield attributes:

Significant differences were observed in function of weed management practices in yield and its attributes (Table 6). Two hand hoeing treatments provided the maximum values in number of pods / plant, pods dry weight / plant, seeds weight / plant, 100- seed weight and seed yield ton/ha compared to the unweeded treatment. The increases in grain yield resulting from two hand hoeing amounted to 46.62%. In addition, oxadiargyl was the best treatment to promote seed yield (kg ha-1) exceeding the unweeded check by 27.76 %, respectively. Such superiority of these weeded treatments may be related with minimizing weed-crop

competition (Table 2). This in turns increased faba bean growth (Table 4) and reflected on increasing the yield and yield attributes of faba bean. The positive effect of weeded practices on faba bean yields and its components have been confirmed by [1,2,3,5].

Concerning to the effect of foliar application i.e. seaweed extract folic acid, on number of pods / plant, pods dry weight / plant, seeds weight / plant, 100- seed weight and seed yield ton/ha (Table 6). The resulted data showed that all concentration of folic acid and seaweed extract enhancement in yield and its components if compared with that plant no received (control). The presented data revealed that, foliar application of the folic acid at the rate of 15 mg/L or seaweed extract at the rate of 150 mg/L resulted the heaviest yield (38.06 and 25.25%) compared with untreated plots. In this respect,[20] reported that exogenous FA increased weight of pea seeds and yield. Amino acid analysis revealed a notable increase in the content of folate dependent amino acids. In these words, treatment of the plants with exogenous FA increased both the content of chlorophyll in the leaves and their continuance function. In strawberry,[21] reported that folate is one of the most important micronutrients and has many forms, but only FA form has cofactor activity. In this respect, a few literatures reported that exogenous FA has positive effect on growth, yield and quality of some plants such as flax [22], faba bean [23] and winter wheat [24]. Generally, it could be abstracted that, seaweeds have gained importance as foliar sprays for several crops because the extract contains growth promoting hormones (IAA and IBA), cytokinins, trace elements (Fe, Cu, Zn, Co, Mo, Mn and Ni) as well as vitamins and amino acids [36].

The results (Tables 7) show that there were significant interactions bio- stimulant and weed control treatments on yield. The highest values were obtained from spraying of folic acid at the rate of 15 mg/L or seaweed extract at the rate of 150 mg/L integrated with two hand hoeing or oxadiargyl treatment. On the other hand, the lowest values were recorded from the unweeded treatment with spraying of water treatment. Such superiority of herbicides treatments combined with bio- stimulant treatments, mainly due to the higher weed control efficiency and poor competition ability of weeds gave a competitive advantage for the wheat plants in utilising the essential demands of nutrients and water, leading to increasing the wheat growth and yield. The results of the present investigation are in trend with those obtained by [1,2,3,5].

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)

Treatments	No. of pods /plant	Pod dry weight (g)	Seed weight / plant (g)	100- seed weight (g)	Seed yield ton/ ha^{-1}	Soluble carbo-hydrate %	Protein %
Weed control							
Oxadiargyl	27.23	48.01	42.65	56.17	3.59	54.40	22.61
Prometryn	24.24	44.91	40.30	54.13	3.29	53.80	21.49
Butralin	26.31	46.81	41.70	55.30	3.44	54.20	22.27
Two hand hoeing	28.37	52.87	46.29	57.85	4.12	55.80	25.41
Unweeded	16.27	41.11	32.80	45.17	2.81	50.10	19.96
LSD 0.05	2.17	3.12	1.96	1.17	0.14	0.23	0.68
Bio-stimulants							
5 mg/L Folic acid	23.18	45.20	40.20	54.00	3.29	43.70	22.23
10 mg/L Folic acid	26.17	48.41	42.17	55.17	3.61	54.50	23.05
15 mg/L Folic acid	28.00	50.37	43.50	56.20	3.99	55.00	23.96
50 mg/L Seaweed	22.19	44.13	39.70	53.30	3.12	53.40	21.13
100 mg/L Seaweed	24.11	47.50	41.20	54.10	3.43	54.20	22.30
150 mg/L Seaweed	27.00	49.00	42.17	55.30	3.62	54.90	23.26
Untreated	20.73	42.12	36.30	48.00	2.89	51.30	20.44
LSD 0.05	2.34	1.89	0.57	0.88	0.11	0.57	0.29

Chemical composition of seeds

Weed management had a significant effect on protein and total carbohydrate percentages (Table 6). Two hand hoeing treatment increased significantly the concentration of protein and total carbohydrate percentages compared with other treatments. The increments in pervious characters exceeded the unweeded treatment by 27.30 and 11.38%, respectively. These results may be due to less competition for environmental

factors, particularly nutrients, water and light through limiting weeds infestation with herbicidal treatments due to increasing the uptake of different nutrients and reflected on chemical composition of grains. The positive effect of weeded practices on chemical analysis of cereal grains have been confirmed by [1,5].

Protein and total carbohydrate percentages were appreciably influenced by bio- stimulant (Table 6). In this respect, with each increase in folic acid and seaweed extract levels, there was a progressive increase in aforementioned traits.

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

Treatments	Bio-stimulants						
	Folic acid mg/L			Seaweed extract mg/L			Untreated
	5	10	15	50	100	150	
	Seed yield						
Weed control							
Oxadiargyl	3.40	3.85	3.95	3.10	3.40	3.60	2.80
Prometryn	3.20	3.45	3.60	3.00	3.30	3.55	2.95
Butralin	3.30	3.60	3.85	3.20	3.45	3.70	3.00
Two hand hoeing	3.95	4.40	4.65	3.80	4.30	4.45	3.30
Unweeded	2.60	2.75	3.90	2.50	2.70	2.80	2.40
LSD 0.05	0.16						
Weed control	Protein**%**						
Oxadiargyl	22.60	23.17	24.18	21.23	22.50	23.90	20.71
Prometryn	21.00	22.00	23.50	20.00	21.20	22.70	20.00
Butralin	22.15	23.00	24.00	20.50	22.30	23.30	20.30
Two hand hoeing	25.70	26.90	27.30	24.40	25.30	26.10	22.17
Unweeded	19.70	20.20	20.80	19.50	20.20	20.30	19.00
LSD 0.05	0.37						

Application of folic acid at the rate of 15 mg/L or seaweed extract at the rate of 150 mg/L led to the highest values of previous characters. On the other side, the lowest values were recorded with spraying of water treatment. These results are in coinciding with those detected by [37].

References

1. El- Metwally, I. M. and Abdelhamid M. T., 2008. Weed control under integrated nutrient management systems in Faba bean (*Viciafaba*) production in Egypt. Plant Daninha. Viçosa – MG, 26(3): 585 – 594.
2. Roberts, H.A., 1982. Herbicides and their properties, Weed Control Handbook Principles. Issued by British Crop Protection Council. National Vegetables Research Station, (7th edition.(106-157, 553.
3. Mohamed, E. S.; Babiker, A.G.; Ali, M.E.; Mohamed, G.E.; Mohamed, M.I. and Ahmed, A.K., 2004. Chemical weed control in faba bean in northern Sudan. Sudan J. of Agric. Research, 4: pp. 27-35.
4. Dawood, D.A., 1989. Effect of crop weed competition on faba bean production in Selaim basin (North Sudan) Annual report Hudeiba Research Station, Dongla Research Station, Shendi Research Station – Agric. Re. Corp. (ARC), Sudan, 120-124.
5. 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.
6. Singh, G. and Jolly R.S., 2004. Effect of herbicides on the weed infestation and grain yield of soybean (*Glycine max*). ActaArgonomicaHungarica, 52(2): 199-203.
7. Thivy, F., 1961. Seaweed manure for perfect soil and soiling Welds. Salt Res. Indust, 1: 1–4.
8. Bokil, K.K., V.C. Mehta, D.S. Datar, 1974. Seaweeds as manure: II pot culture manorial experiments on wheat Phykos, 13(1): 1-5.
9. Zodape S. T, Gupta A. and Bhandari S.C., 2011. Foliar application of seaweed sap as biostimulant for enhancement of yield and quality of tomato (*Lycopersicon esculentum* Mill.). J SciInd Res 70: 215–219
10. Rama Rao, K., 1991. Effect of seaweed extract on *Zizyphusm auratiana* Lamk. J. Indian Bot. Soc., 71: 19–21.

11. Abdel-Mawgoud, A. M. R., Tantawy, Magda A. S. Hafez M. and Hoda A. Habib M., 2010. Seaweed extract improves growth, yield and quality of different watermelon hybrids Research Journal of Agriculture and Biological Sciences, 6(2): 161–186.
12. Shehata, S.M., Heba, S. Abdel- Azem, A. Abou El-Yazied and El- Gizawy A.M., 2011. Effect of foliar spraying with amino acids and seaweed extract on growth, chemical constitutes, yield and its quality of Celeriac plant. European Journal of Scientific Research, 58(2): 257-265.
13. Fawzy, Z.F., El-Shal, Z.S., Li Yunsheng, Ouyang Zhu and OmaimaSawan, M., 2012. Response of Garlic (*Allium sativum*, L.) Plants To Foliar Spraying of Some Bio-Stimulants Under Sandy Soil Condition. Journal of Applied Sciences Research, 8(2): 770-776.
14. Shabana, Abeer I.; Hoda I. Ahmed; Shafeek M.R. andFaten, S. AbdEl-Al, 2015. Improving the productivity of tomato crop grown under high temperature condition using some safe and natural substances. Middle East Journal of Applied Sciences,4 (2): 154-161
15. Ghurbat H. M., 2013. Effect of Seamino and Ascorbic Acid on Growth, Yield and Fruits Quality of Pepper (*Capsicum annum* L). Int. J. Pure Appl. Sci. Technol., 17(2) , 9-16
16. Hanson, A.D. and Roje, S., 2001. One-carbon metabolism in higher plants. Annu. Rev. Plant Physiol. Plant Mol. Biol., 52:119-137.
17. Jabrin, S., Ravanel, S. Gambonnet, B. Douce R. and Rebeille, F., 2003. One-Carbon metabolism in plants. Regulation of tetrahydrofolate synthesis during germination and seedling development. Plant Physiology, 131: 1431-1439.
18. Poudineh, Z., Moghadam Z.G. and Mirshekari, S., 2015. Effects of humic acid and folic acid on sunflower under drought stress. Biological Forum – An International Journal, 7(1): 451-454.
19. Andrew, W.J., Youngkoo, C. Chen X. and Pandalai, S.G., 2000. Vicissitudes of a vitamin. Recent Research developments in Phytochemistry, 4: 89-98.
20. Stakhova, L.N., Stakhov L.F. and Ladygin, V.G., 2000. Effects of exogenous folic acid on the yield and amino acid content of the seed of *Pisumsativum* L. and *Hordeumvulgare* L. Applied Biochemistry and Microbiology, 36(1): 98-103. 224
21. Li, D., Li, L Luo, Z. Mou, W. Mao L. and Ying, T., 2015. Comparative transcriptome analysis reveals the influence of abscisic acid on the metabolism of pigments, ascorbic acid and folic acid during strawberry fruit ripening. PLos One, 10(6): 1-15.
22. Emam, M. M., El-Sweify A.H. and Helal, N.M., 2011. Efficiencies of some vitamins in improving yield and quality of flax plant. African Journal of Agricultural Research. 6(18): 4362-4369.
23. Zewail, R. M., Khder Z. M. andMady, M. A., 2011. Effect of potassium, some antioxidants, phosphoric acid and napthalen acetic acid (NAA) on growth and productivity of faba bean plants (*Faba vulgaris*). Annals of Agric. Sci., Moshtohor, 49(1): 53-64.
24. Vician, M., P. Kovacik, 2013. The effect of folic application of mg-titanit fertilizer on phytomass, chlorophyll production and the harvest of winter wheat. Mendelnet, 3: 162-168.
25. Minolta Co., 2013. Manual for Chlorophyll Meter SPAD-502 plus. Minolta Camera Co., Osaka, Japan.
26. 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
27. A. O. A. C., 1990. Official Method of Analysis, 15th Ed., Association of Official Analytical Chemists, Inc.,USA.
28. 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
29. Mandloi, K. S.; Vyas, M. D.; Tomar, V. S. 2000. Effect of weed management methods in soybean (*Glycine max*) grown in vertisols of Madhya Pradesh. Indian J. Agron., v. 45, n. 1, p. 158-161.
30. Kushwah S. S.; Vyas, M. D. 2005. Herbicides weed control in soybean (*Glycine max*). Indian J. Agron., v. 50, n. 3, p. 225-227.
31. Behera, U. K.; Singh, U.; Singh, Y. V.2005. Influence of weed control on productivity of soybean (*Glycine max*) in vertisol of central India. Indian J. Agron., v. 50, n. 3, p. 221-224.
32. El_Metwally I. M., Abd El- Salam, M. S. and Ali O. 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.
33. 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.

34. 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.
35. Jensen, E, 2004. Seaweed, factor fancy, From the Organic Broadcaster, Published by Moses the Midwest Organic and Sustainable Education, From the Broadcaster, 12(3), 164-170.
36. Zodape ST, A. Gupta and S.C. Bhandari 2011. Foliar application of seaweed sap as biostimulant for enhancement of yield and quality of tomato (*Lycopersicon esculentum* Mill.). J SciInd Res 70: 215–219
37. RawaaBabilie, MouwafakJbour, Bassam Abu Trabi, 2015. Effect of foliar spraying with licorice root and seaweed extractson growth and seed production of onion (*Allium cepa* L.) International Journal of PharmTech Research, 8(11):557-563.

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