Iraqi Journal of Agricultural Sciences –2026:57(3):909-919
P-ISSN: 0075- 0530 /E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/x6ssxv31

EFFECT OF ADDING ORGANIC NUTRIENTS AND FRUIT SET REGULATOR ON CHEMICAL CHARACTERISTICS AND VEGETATIVE GROWTH OF BROAD BEAN

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ABSTRACT

A field experiment was conducted at the research station of the College of Agricultural Engineering Sciences, University of Baghdad, during the fall season of 2023–2024. The study aimed to investigate the effect of adding an organic nutrient and spraying a fruit-set regulator on the concentration of nutrient elements and vegetative growth traits of the broad bean. The experiment included two factors: the first was the type of fertilization (chemical fertilization recommendation for broad bean and different levels of the organic nutrient Karmino bloom with the addition of 25% NPK). The second factor was the application of the pod-set regulator (Oraset-x) at three concentrations (0, 0.3, 0.6 g L^{-1}). The results showed that using chemical fertilization significantly increased the concentrations of major elements (N, P, K), chlorophyll concentration, and vegetative growth traits. Additionally, applying the organic nutrient Karmino bloom at a rate of 5 L ha^{-1} with 25% NPK resulted in significant increases in the concentrations of Zn and B. The interaction between this treatment and spraying Oraset-x at a concentration of 0.6 g L^{-1} led to superior results in the concentrations of Zn, B, and major elements (N, P, K), as well as improved vegetative growth traits. These findings highlight the effectiveness of this combination in enhancing the nutritional content of leaves and vegetative growth traits in broad bean plants.

Keywords. ***Vicia faba* L, Organic Extract, Setting nutrient, Macro and Micro.**
***Part of M.S.C. Thesis of the [1]St author.**

Received: 12/9/2024, Accepted: 15/12/2024, Published: 31/3/2026

INTRODUCTION

Broad bean (*Vicia faba* L.) belongs to Fabaceae and is believed to be native to North Africa and Southwest Asia, with Algeria being its original home. It is one of winter crops grown in large areas of world. Board beans are a major source of protein and energy and have the ability to fix atmospheric nitrogen with help of root nodule bacteria of genus *Rhizobium* that are symbiotic with its roots (Shyaa et al, 2024). Board beans are one of most important seeds rich in protein, as their protein content about 21% based on dry weight. Dry board beans also contain 3% fat, 48% starch, 3% mineral salts, 2% glucose, and also contain 23% other substances, board beans are a nutritional supplement because they contain high levels of proteins, so they sometimes replace meat proteins. Deficiency of some macro and micro nutrients, including magnesium and boron, negatively affects productivity of broad beans due to their important role in processes of pollination and fruit set, as it causes a decrease in percentage of fruit set (Al-Mharib et al, 2020). Therefore, organic nutrients extracted with high purity from their natural sources have recently spread and are used either as foliar spray on plant or as a soil addition Organic nutrients which contain amino acid. Khiniab et al., (2022) found when studying effect of spraying organic nutrient (Al-Nibras) on board bean plant at different concentrations and for a number of sprays, where spray treatment was

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significantly superior to foliar nutrient three times at a concentration of (3 ml L^{-1}) in producing the highest traits compared to other treatments for trait Vegetative of beanys and yield. Shyaa and Kisko (2024) concluded that adding three levels of humic acid (0, 6, 12 kg ha^{-1}), soil addition treatment for beans at a concentration of 12 kg ha^{-1} was significantly superior in recording the highest means for some of studied traits, such as leaf area, stem dry weight, and root dry weight. Plant growth regulators are defined as a group of organic compounds that are neither nutrients nor vitamins. This group includes compounds naturally produced in plants, known as plant hormones, as well as compounds synthesized outside of plants in laboratories or by specialized chemical companies, referred to as synthetic plant growth regulators; which are used in very low concentrations to stimulate, inhibit, or modify vital and physiological processes necessary for plant growth, development, and productivity. Among these synthetic plant regulators are NAA, IBA, and D-2,4, which are related to auxins (Al-Khafaji and Al-Khamisi. 2012) . Hussein (2011) concluded that spraying broad bean crop with Setter_2 (which consists of citric and ascorbic acids with some macro and micro nutrients) at a concentration of 1.6 ml L^{-1} had a significant advantage on reducing days for flowering of 50% of plants for two planting dates used in experiment, while spraying with Setter at a concentration of 0.8 ml L^{-1} had given best weight of broad bean seeds for two planting dates. Ahmed and AbdulKafoor (2023) investigated the effect of spraying the growth regulator triacontanol at four concentrations (0, 40, 50, and 60 mg L^{-1}) on three soybean cultivars. The results revealed that the application of triacontanol at 60 mg L^{-1} significantly outperformed other treatments in most of the studied traits. This concentration resulted in a plant height of 110.0 cm, an average of 7.40 branches per plant, a leaf area of 44.87 cm^2 per plant, and a leaf area index of 2.38. Additionally, it recorded the shortest duration from planting to the onset of flowering, with an average of 58.33 days. Consequently; The study aims to investigate the effect of organic nutrient application and pod-setting growth regulator spraying on the concentration of nutrients in leaves and the vegetative growth of broad bean.

MATERIALS AND METHODS

Seeds of broad beans (Claro de luna variety) were planted, as experimental unit included three lines with a distance of 75 cm between lines, and 2 seeds were planted in each hole on (5 – 10 - 2023) and with a distance of 30 cm between holes, thinning process was carried out for one plant in each hole, thus experimental unit included 16 plants, Experiment included two factors, first included 5 levels of adding different soil fertilizers, second factor was spraying set regulator at three concentrations, experiment was designed according to complete randomized block design RCBD and experiment included 45 experimental units with three replicates, thus each replicate included 15 treatments, and treatments were distributed randomly, data were analysed statistically using GenStat program and results were compared by least significant difference (L.S.D) test between averages at a probability level of 0.05. first factor was addition of different fertilizers, (A1) control with (25% of chemical fertilizer recommendation, and treatment (A2) chemical fertilizer recommendation for board beans 100 kg N, 120 kg P2O5, 100 kg K2O h^{-1} (Al-Garbawi and Aljuboori, 2023), (A3) organic nutrient Karmino bloom at a level of 3 $L.h^{-1}$ + adding 25% of NPK, (A4) organic nutrient Karmino bloom at a level of 4 $L.h^{-1}$ + adding 25% of NPK, (A5) organic nutrient Karmino bloom at a level of 5 $L.h^{-1}$ + 25% of NPK. According to company's recommendation of four sprays per level, 10 Karmino bloom organic nutrient contains 8% amino acids, 20% organic matter, 4% organic nitrogen, 4% organic carbon, 3% boron, 3% zinc, 0.25% molybdenum. Second factor was spraying fruit set regulator Oraset-x, control without spraying, E1 spraying regulator Oraset-x 0.3 g L^{-1}, E2 spraying regulator Oraset-x 0.6 g L^{-1} with two sprays, first spray at flowering and second spray after first harvest. Growth regulator contains Naphthyl acetic acid 1.5% and 0.45% Naphthoxy acetic acid and lactose 85% with fillers. Study traits: leaves chemical properties were percentage of N in leaves

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(Micro Kjeldahl device) by (Jackson, 1958), leaves P percentage was estimated by (Spectrophotometer -UV) by Olsen and Sommers (1982), leaves K percentage was estimated by (Flame photometer) by Page et al., (1982), leaves Zn content (mg kg^{-1}) was estimated by Atomic Absorption device by Al-Sahaf (1989), leaves B content (mg kg^{-1}) was estimated by Carmin dye by Black (1965), and concentration of chlorophyll in leaves (mg 100 g^{-1} fw) by Goodwin (1976), and according to equation of chlorophyll content of leaves = (chlorophyll content of sample (mg L^{-1}) X final volume of extract / weight of sample) X 100. Vegetative growth characteristics were plant height (cm), branch number per $plant^{-1}$, dry weight of vegetative mass (g) and leaf area (dm^2 $plant^{-1}$) according to equation Watson and Watson (1953), Leaf area (dm^2) = dry weight of plant leaves X leaf area of discs / dry weight of discs.

RESULTS AND DISCUSSIONS

Leaves chemical traits : The results presented in Table 1 indicate the significant effect of different fertilizer applications on the nitrogen (N) percentage in leaves. Treatment A2 demonstrated a significant superiority over other treatments, recording the highest nitrogen content of (4.240%), compared to the control treatment (A0), which had the lowest percent (2.990%). The results also show significant impact of spraying the pod-setting regulator on leaf nitrogen content. Treatment E2 resulted in the highest nitrogen percentage (3.882%), significantly surpassing the control treatment (E0), which recorded the lowest value of (3.732%). Furthermore, the interaction between fertilizer application and the pod-setting regulator showed that the A2E2 combination significantly outperformed most treatments, achieving the highest nitrogen percentage in leaves at (4.310%). This value did not differ significantly from the A5E2 interaction. In contrast, the lowest nitrogen content (2.910%) was recorded in the A1E0 interaction (control treatment). Results also shows significant effect of adding different fertilizers on leaves of broad bean plant, as treatment A2 was significantly superior to other treatments in produce highest percentage of phosphorus, (0.440%), followed by treatment A5, which did not record a significant difference with treatment A2 compared to lowest percentage of P recorded by treatment A1, amounting to (0.297%). The results also show that effect of spraying pod set regulator helped increase leaves P percentage, as treatment E2 was superior in produce highest percent, amounting to(0.404%), which did not differ significantly from treatment E1 compared to E0 treatment, which recorded lowest values, amounting to(0.388%). results show that interaction between adding fertilizers to different sprays of fruit set regulator led to an increase in leaves P percentage, as interaction treatments A2E2 and A5E2 were significantly superior to other treatments in recording highest leaves P percentages (0.450%), which did not differ significantly from A2E1 treatment, compared to control treatment, which recorded lowest values , which amounted to (0.290%), which did not differ significantly from A1E1 and A1E2 interaction treatments. Results of same table indicate positive and significant effect of adding different fertilizers in increasing leaves K percentage, as treatment A2 outperformed by recording highest concentration of (2.883%), which outperformed other treatments, while A1 treatment recorded lowest leaves K percentage, which amounted to 1.987%. The results of table (1) also shows effect of spraying fruit set regulator on leaves K percentage, as treatment E2 outperformed significantly in produce highest values of (2.590%), which outperformed other treatments, while E0 treatment gave lowest values of (2.518%). results of same table(1) also shows effect of interaction between adding different fertilizers and spraying pod set regulator, as interaction treatment A2E2 outperformed significantly, as it produced the highest K leaves percentage (2.910%), which did not differ significantly from interaction treatments A2E1, A2E0 and A5E2, while treatment A2E1 which produced the highest K leaves percentage, (2.910%), which did not differ significantly from interaction treatments A2E0, A5E2, while treatment A2E2 produced the highest K leaves percentage, (2.910%). A1E0 interaction, lowest percent (1.960%), did not differ significantly from A1E1 and

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A1E2 interactions. (Kandil and Gad. 2009) It can also be noted from table(1) results that effect of adding different fertilizers in increasing concentration of Zn in leaves of board bean plant was significant, as treatment A5 significantly outperformed other treatments in recording highest concentration, which amounted to (61.767 mg kg^{-1}), compared to control treatment A1, which recorded lowest concentration, which amounted to (41.567 mg kg^{-1}). Results of same table shows positive effect of spraying pod set regulator, as treatment E2 significantly outperformed in recording highest zinc concentrator (53.040 mg $kg^{-1)}$, compared to E0 treatment, which recorded the (52.540 mg kg^{-1}), which did not differ significantly from treatment E1. As for interaction factors between adding different fertilizers and spraying pod set regulator, it was noted that interaction treatment A5E2 significantly outperformed other treatments in recording highest increase in concentration of Zn in leaves, which amounted to(62.300 mg kg^{-1}), which did not differ significantly from treatment E1. Morally, it was higher than A5E1 interaction treatment, while A1E0 treatment recorded lowest concentration of Zn in leaves, amounting to (41.200 mg kg^{-1}), which did not record a significant difference from A1E0 interaction treatment. Results of table show that adding different fertilizers led to a significant increase in concentration of Boron in leaves, as treatment A5 outperformed other treatments in produce highest concentration of element B, amounting to(43.400 mg kg^{-1}), while control treatment A1 recorded lowest concentration, amounting to (28.700 mg kg^{-1}). The same table also shows that there were no significant differences in treatments of spraying pod set regulator, as treatments E2, E1 and E2 did not record significant differences between them. The results also show that interaction between adding different fertilizers and spraying pod set regulator had positive and significant effects in increasing concentration of B in leaves, as interaction treatment A5E2 significantly outperformed other treatments, as it recorded highest values, amounting to (43.800 mg kg^{-1}), which did not differ significantly from interaction treatments A5E1 and A5E0, while control treatment A1E0 recorded lowest values, amounting to (28.300 mg kg^{-1}) which did not differ significantly from interaction treatment A1E1 and A1E2. Results of Table (1) also show significant effect of chlorophyll concentration in leaves when adding different fertilizers, as addition treatment of different fertilizers A2 achieved highest concentration of chlorophyll in leaves, reaching (235.47 mg 100 g^{-1} F.W), while control treatment A1 recorded lowest concentration of chlorophyll in leaves, amounting to (169.17 mg 100 g^{-1} F.W). The significant superiority in increasing concentration of chlorophyll in leaves of board bean plant when spraying pod set regulator was also shown, as treatment of spraying pod set regulator E2 achieved highest increase in chlorophyll concentration, amounting to (210.54 mg 100 g^{-1} F.W), compared to control treatment E0, which recorded lowest increase, amounting to (198.64 mg 100 g^{-1} F.W). The interaction treatments between adding different fertilizers and spraying pod set regulator achieved a positive and significant effect in increasing concentration of chlorophyll in leaves, as interaction treatment was significantly superior A2E2 over other treatments recorded highest increase amounting to(238.40 mg 100 g^{-1} F.W) without any significant difference with two interaction treatments A5E2 and A2E1 compared to control treatment which recorded lowest values amounting to (161.30 mg100 g^{-1} F.W). The increase in the concentration of N, P, and K, as well as chlorophyll concentrator, is attributed to the application of the recommended fertilization to the soil. Nitrogen is considered an essential nutrient for plants and a fundamental component of proteins and chlorophyll. It plays a crucial role in enhancing the efficiency of the photosynthesis process, which imparts a dark green color to plants (28). Phosphorus plays a crucial role in enhancing plant growth, root development, and increasing root branching, which improves the plant's ability to absorb both macro- and micronutrients. It is one of the essential nutrients that support plant growth by contributing to the formation of mitochondria and nucleic acids. Additionally, phosphorus is

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vital for photosynthesis and energy production within the plant (Aljuboori and Mohammed. 2021; Havlin et al. 2005). The addition of potassium to the soil enhances the plant's biological activities by promoting the growth of root hairs, which improves the plant's efficiency in absorbing and transporting nutrients from the soil. This, in turn, enhances overall plant growth and development. (Al-Karawi and Al-Jumaily, 2022). The application of organic nutrients contributed to an increase in the concentration of zinc (Zn) and boron (B), as the organic nutrient contains micronutrients, including boron. Boron plays a crucial role in various physiological processes in plants, such as enhancing the absorption and translocation of both macro- and micronutrients. It also promotes cell elongation and division in meristematic tissues and actively growing regions, including root tips. Additionally, boron regulates enzyme activity to support plant growth and helps control the rate of water uptake, exerting positive effects on plant development. (Al-Tameemi and Al-Juboori. 2020), which helped increase concentration of elements in board bean leaves. Zinc plays a vital role in photosynthesis, nitrogen absorption, respiration, and auxin synthesis, contributing to cell division and elongation. It is also involved in various physiological activities essential for plant growth. Zinc deficiency disrupts key biological processes, including photosynthesis, leading to reduced chlorophyll concentration. Additionally, zinc is crucial for root growth and development, enhancing the plant's ability to absorb nutrients from the soil. (Al-Garbawi and Aljuboori, 2023). It also noticed an increase in concentration of elements N, P, K, Zn and chlorophyll when spraying pod set regulator with treatment (E2). This is due to its containing auxins that encourage cell division and elongation (Al-Khafaji, 2014), which increases vegetative and root group of plant, which encourages absorption and increases concentration of elements. The result of synergistic effect of organic nutrient with spraying pod set regulator, as adding nutrient at highest concentration led to an increase in concentration of nutrients in leaves of board bean plant because nutrient contains major elements and compact structure contains auxins and sugars that help absorb elements.

Table 1. Effect of different fertilization treatments, pod set regulator spraying and their interaction on concentration of N, P, K, Zn, B and chlorophyll in broad bean leaves

Treatments	%N	%P	%K	Zn	B	Chlorophyll
A1	2.990	0.297	1.987	41.567	28.700	169.17
A2	4.240	0.440	2.883	47.800	36.000	235.47
A3	3.693	0.397	2.460	53.733	37.178	187.47
A4	3.970	0.417	2.637	58.833	41.267	204.20
A5	4.193	0.433	2.813	61.767	43.400	229.73
L.S.D 0.05	0.028	0.010	0.037	0.510	0.555	3.12
E0	3.732	0.388	2.518	52.540	37.087	198.64
E1	3.838	0.398	2.560	52.640	37.087	206.44
E2	3.882	0.404	2.590	53.040	37.500	210.54
L.S.D 0.05	0.021	0.008	0.028	0.395	N.S	2.42
			A * E			
A1E0	2.910	0.290	1.960	41.400	28.300	161.30
A1E1	3.020	0.300	1.990	41.200	28.700	173.40
A1E2	3.040	0.300	2.010	42.100	29.100	172.80
A2E0	4.150	0.430	2.850	47.500	35.600	232.20
A2E1	4.260	0.440	2.890	47.800	36.100	235.80
A2E2	4.310	0.450	2.910	48.100	36.300	238.40
A3E0	3.630	0.390	2.420	53.700	37.633	184.60
A3E1	3.710	0.400	2.470	54.300	37.100	186.30
A3E2	3.740	0.400	2.490	53.200	36.800	191.50
A4E0	3.890	0.410	2.600	58.900	41.000	193.20
A4E1	3.990	0.420	2.630	58.100	41.300	206.30
A4E2	4.030	0.420	2.680	59.500	41.500	213.10
A5E0	4.080	0.420	2.760	61.200	42.900	221.90
A5E1	4.210	0.430	2.820	61.800	43.500	230.40
A5E2	4.290	0.450	2.860	62.300	43.800	236.90
L.S.D 0.05	0.048	0.017	0.063	0.884	0.961	5.40

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Vegetative growth

Results of Table (2) show that addition of different fertilizers had a significant effect on height of board bean plant, as treatment A2 significantly outperformed other treatments in produce the highest plants (129.31 cm), while control treatment A1 produced the lowest height, reaching (100.10 cm). results of same table show positive and significant effect of spraying pod set regulator, as spray treatment E2 significantly outperformed, as it recorded the highest height, reaching (118.77 cm), with a non-significant difference from treatment E1, compared to control treatment E0, which recorded lowest height, reaching (111.78 cm). Interaction treatments between adding different fertilizers and spraying pod set regulator achieved a significant increase in plant height, as interaction treatment A2E2 significantly outperformed other treatments in recording the highest plant height, reaching(133.47 cm), and did not differ significantly with interaction treatment A2E1, while treatment A2E0 recorded the lowest plant height, reaching (95.62 cm). Results of same table indicate effect of adding different fertilizers to soil in increasing shoot number of board bean plant. Treatment A2 was significantly superior to other treatments, as it produced highest increase in branches number, amounting to (16.06 branches.plant^{-1}), compared to control treatment A1, which recorded lowest increase in branches number, amounting (9.69 branches.plant^{-1}). The results also indicate positive the effect of spraying pod set regulator, as spray treatment E2 was significantly superior, as it produced the highest branches number, amounting to (13.95 branches.plant^{-1}), compared to control treatment E0, which produced the lowest branches number, amounting to(12.70 branches.plant^{-1}). The results of same table indicat that interaction treatments between adding different fertilizers and spraying pod set regulator achieved significant effects, as interaction treatment A2E2 was significantly superior to other treatments in produce the highest branches number, amounting to (16.78 branches.plant^{-1}), which did not differ significantly from interaction treatment A5E2 compared to control treatment A1E0 which produced lowest branches number, as (9.10 branches.plant^{-1}). Results of table (2) also show that adding different fertilizers had any effects on increasing vegetative mass dry weight of board bean plant, as treatment of adding different fertilizers A2 was significantly superior to other treatments, as it produced the highest increase in vegetative mass dry weight of reaching (200.64 g), while control treatment A1 the produced increase (130.60 g). The results of same table also show that there is a significant effect in increasing dry weight of vegetative mass when spraying pod set regulator, as E2 treatment was significantly superior in produce the highest increase, reaching (179.15 g), compared to control treatment E0, which gave lowest increase, reaching (168.44 g). As for interaction treatments between adding different fertilizers and spraying pod set regulator, it was found that there were significant differences between treatments, as interaction treatment A2E2 was significantly superior to other treatments in recording the highest increase in dry weight of vegetative mass, reaching(205.57 g), which did not record a significant difference with treatment A5E2 compared to control treatment A1E0, which recorded lowest increase of (126.57 g), and did not differ significantly from interaction treatment A1E1. Note from results of Table 2 that addition of different fertilizers had a positive effect on increasing leaf area, as addition treatment A2 was significantly superior in produce highest increase in leaf area trait, as it the produced (141.49 dm^2 plant^{-1}), which did not differ significantly with treatment A5, while control treatment A1 the produced lowest value for leaf area trait, as it reached (87.82 dm^2 plant^{-1}). It can be noted from results of same table significant effect of spraying pod set regulator, as treatment E2 was significantly superior to other treatments in recording highest increase in measuring leaf area, as it reached (127.32 dm^2 plant^{-1}), while lowest leaf area was recorded by control treatment E0, which reached(121.03 dm^2 plant^{-1}). As for interaction treatments between adding different fertilizers and spraying pod set regulator, treatment A2E2 was significantly superior in recording the highest leaf area, as

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it reached (143.52 dm^2 $plant^{-1}$), without a significant difference with Interaction treatments A5E2, A2E1 and A5E1 compared with control treatment which recorded the lowest leaf area of(85.26 dm^2 $plant^{-1}$). The reason for increase in vegetative growth characteristics when adding chemical fertilizer recommendations to board beans is due to role of nitrogen, as nitrogen helps in increasing formation of chlorophyll, which leads to an increase in amount of absorbed carbon and thus leads to an increase in energy required for plant cells division and elongation, as nitrogen also contributes to formation of amino acids, which leads to an increase in plant height ,branches and leaves number, which leads to an increase in plant dry weight (10,37g), as well as phosphorus plays a role in increasing characteristics of vegetative growth, and this is due to role of phosphorus in raising efficiency of root system and increasing roots size, which helped in increasing nutrients absorption from soil, Potassium also plays a role in plant cells division and elongation, as it activates some enzymes that work to build plant structure. It also helps to increase efficiency of photosynthesis process and increase its products. Potassium plays a role in process of opening and closing stomata, as this leads to increased absorption of water and nutrients, which helps in vital processes within plant (Claussen, 2004; Nur and Yuksel. 2006). The application of organic nutrients contributed to an increase in leaf area, as these nutrients contain organic compounds, amino acids, and essential elements. Amino acids serve as the building blocks of proteins, playing multiple roles within the plant, including nitrogen storage and the regulation of metabolic processes. This, in turn, enhances chlorophyll synthesis, improving photosynthetic efficiency and leading to the accumulation of assimilates such as carbohydrates (Mariush and Al-Mharib, 2020), this enhancement contributes to improved vegetative growth indicators, such as increased plant height, leaf area, and dry weight of the shoot system. Additionally, boron plays a key role in promoting cell division and leaf expansion, which further increases the plant’s leaf area, ultimately supporting overall growth and development (Al-Karawi and Al-Jumaily. 2022). Zinc also plays a crucial role in increasing leaf area by contributing to the synthesis of the amino acid tryptophan, which is essential for the production of indole-3-acetic acid (IAA), a key plant hormone that promotes cell division and expansion. This process enhances leaf growth and overall plant development. Conversely, zinc deficiency in leaves leads to a reduction in leaf area, negatively affecting plant growth and photosynthetic capacity. (Abed et al, 2022; Herman et al, 2023). The increase in vegetative growth traits following the application of the fruit-setting regulator is attributed to its content of the auxin *N*-naphthalene acetic acid (NAA), which plays a key role in regulating cell division and elongation. NAA promotes cell wall loosening and tissue expansion, facilitating cell growth and elongation. This contributed to increased plant height, leaf area, and the number of branches per plant, ultimately leading to higher dry weight accumulation in the shoot system (Kandil and Gad, 2009). The improvement in branch number, dry shoot weight, and leaf area was further enhanced when the organic nutrient was applied at a concentration of 5 L ha^{-1} combined with 25% of the recommended NPK fertilizer and fruit-setting regulator spraying. This effect is attributed to the presence of amino acids and essential nutrients in the organic fertilizer, which promoted vegetative growth traits. Additionally, the fruit-setting regulator, containing NAA, played a significant role in enhancing plant growth and development.

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Table2. Effect of different fertilization treatments, pod set regulator spraying and their interaction on vegetative growth characteristics

Treatments	Plant height (cm)	Branch number (Branch plant^{-1})	Vegetative dry weight (g)	Leaf area (dm^2 plant^{-1})
A1	100.10	9.69	130.60	87.82
A2	129.31	16.06	200.64	141.49
A3	108.24	12.03	159.32	121.95
A4	116.25	13.46	179.30	131.62
A5	124.99	15.64	197.60	140.56
L.S.D 0.05	2.59	0.33	2.01	1.07
E0	111.78	12.70	168.44	121.03
E1	116.79	13.47	172.88	125.72
E2	118.77	13.95	179.15	127.32
L.S.D 0.05	2.01	0.26	1.56	0.83
		A * E		
A1E0	95.62	9.10	126.57	85.26
A1E1	101.47	9.78	129.95	88.73
A1E2	103.20	10.19	135.28	89.48
A2E0	124.53	15.35	196.20	138.80
A2E1	129.92	16.04	200.15	142.16
A2E2	133.47	16.78	205.57	143.52
A3E0	106.31	11.17	152.34	117.66
A3E1	108.85	12.32	159.50	122.82
A3E2	109.57	12.59	166.11	125.38
A4E0	112.30	12.96	174.12	126.61
A4E1	117.50	13.60	178.63	133.14
A4E2	118.96	13.83	185.16	135.10
A5E0	120.13	14.91	192.98	136.82
A5E1	126.20	15.63	196.16	141.75
A5E2	128.63	16.37	203.65	143.11
L.S.D 0.05	4.48	0.57	3.49	1.85

It could be concluded from results of this research that adding organic nutrients Karmino Bloom at a level of 5 L. ha^{-1} for each of four additions + 25% of NPK fertilizer with spraying a pod set regulator at a concentration of 0.6 g. L^{-1} in two sprays had a great effect and increased leaf content of nutrients and improved vegetative growth characteristics.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received funding.

REFERENCES

Abed, I. A., A. Marzoog, A. M. S. Addaheri, and M. H. Al-Issawi. 2022. Isolation and diagnosis of cadmium-resistant bacteria and its potential phytoremediation with the broad bean plant. Sabrao Journal of Breeding and Genetics 54. (2) 416–425. DOI: http://doi.org/10.54910/sabrao2022.54.2.17

Ahmed, A. A., and A. H. AbdulKafoor. 2023. Response of vegetative growth traits of several soybean cultivars to spraying with the growth regulator triacontanol (TRIA). IOP Conference Series: Earth and Environmental Science 1213 (1): 012045.

Al-Garbawi, R. S. J., and A. W. Aljuboori. 2023. The effect of adding phosphorus and zinc spraying on the nutrient content and root growth of cabbage. IOP Conference Series: Earth and Environmental Science 1262: 042015.

Ali, N. S., H. S. Rahi, and A. A. Shaker. 2014. Soil Fertility. Scientific Books House for Printing, Publishing and Distribution, First Arabic Edition.

Aljuboori, A. W., and M. M. Mohammed. 2021. Effect of phosphorous and amino acid on growth and yield of pea. International Journal of Agricultural and Statistical Sciences 17, (1): 81–84. DOI:https://connectjournals.com/03899.2021.17.81

Iraqi Journal of Agricultural Sciences –2026:57(3):909-919
P-ISSN: 0075- 0530 /E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/x6ssxv31

Al-Karawi, A. W., and J. M. Al-Jumaily. 2022. Study of some growth criteria and yield of soybean crop with the effect of boron and some growth regulators. Iraqi Journal of Market Research and Consumer Protection 14,. (1): 137–145. http://dx.doi.org/ 10.28936/jmracpc14.1.2022.(15).

Al-Khafaji, Hamid Jalub, and Saif bin Ali Al-Khamisi. 2012. Principles of Statistics and Design and Analysis of Agricultural Business. Al-Falah Library for Publishing and Distribution, Amman, Jordan.87-99

Al-Khafaji, Maki Alwan. 2014. Plant Growth Regulators, Their Applications and Horticultural Uses. Ministry of Higher Education and Scientific Research, University of Baghdad, University House for Printing, Publishing and Translation.Pp.1-348.

Al-Mawsili, Muzaffar Ahmed. 2015. Soil Fertility and Plant Nutrition. Dijlah Library for Printing, Publishing and Distribution, Baghdad, Iraq.

Al-Mharib, M. Z. K., F. M. J. Al-Saadi, and A. H. Almashhadany. 2020. Studies on growth and yield indicators for kohlrabi (Brassica oleracea) plant treated with mineral fertilizers and root enhancers. Research on Crops 21, (2): 333–338 DOI:https://connectjournals/ 10.31830/2348-7542.2020.056.

Al-Mharib, M. Z. K., M. M. A. Alrawi, A. R. Naser, A. M. Alwan, and M. J. Ferhan. 2021. Effect of foliar spray with magnesium and boron on growth and yield of broad bean. Int. J. Agricult. Stat. Sci. 17, (1):1787–1792. DOI: https://connectjournals. com / 03899.2021. 17.1787

Al-Sahaf, Fadhel Hussein. 1989. Applied Plant Nutrition. University of Baghdad, Ministry of Higher Education and Scientific Research, Iraq.

Al-Tameemi, A. J., and A. W. Al-Juboori. 2020. Effect of levels and frequency of nitrogen application and the foliar spraying of boron on growth and yield of red cabbage. Int. J. Agricult. Stat. Sci. (16): 1667–1671. DOI: https://connectjournals.com/03899.2020.16.1667

Black, C. A. 1965. Methods of Soil Analysis, Part 2: Chemical and Microbiological Properties. American Society of Agronomy Inc., Madison, Wisconsin, USA.

Claussen, W. 2004. Proline as a measure of stress in tomato plants. Plant Science 168: 241–248.

Goodwin, T. W. 1976. Chemistry & Biochemistry of Plant Pigments. 2nd ed. Academic Press, London, New York, San Francisco.

Havlin, J. K., J. D. Beaton, S. L. Tisdale, and W. L. Nelson. 2005. Soil Fertility and Fertilizers: An Introduction to Nutrient Management. 7th ed. Pearson Prentice Hall.

Herman, H., A. R. Wansyah, R. I. Asmania, D. N. Anzaelina, Z. Oktaviano, W. Lestari, Adiwirman, and D. I. Roslim. 2023. The ability of matK and trnL-trnL-trnF intergenic spacer to discern certain species accessions of the families Solanaceae and Fabaceae. Sabrao J. Breed. Genet. 55. (1): 97–106. DOI: http://doi.org/10.54910/sabrao2023.55.1.9

Hussain, I., A. A. Khakwani, I. Bakhsh, A. Khan, and A. Sheheryar. 2021. Effect of naphthalene acetic acid (NAA) on grain yield and bioeconomic efficiency of coarse rice (Oryza sativa L.). Pak. J. Bot 53. (6): 2017–2023. DOI: http://dx.doi.org/ 10.30848/PJB2021-6(21)

Hussein, Maha Ali. 2011. Effect of Spraying with Some Nutrients on the Growth, Floral Viability, Early and Total Yield of Broad Beans (Vicia faba L.). M.Sc. Thesis, College of Agriculture, University of Baghdad.Pp.1-124.

Jackson, M. L. 1958. Soil Chemical Analysis. Prentice Hall, Inc., Englewood Cliffs, N.J., USA, 225–276.

Kandil, H., and N. Gad. 2009. Effects of inorganic and organic fertilizers on growth and production of broccoli (*Brassica oleracea* L.). Factori si Pedogenetice din Zona Temperata (8): 61–69.

Khiniab, T. A., H. A. Hamid, and Z. J. Hashem. 2022. Effect of spraying different concentrations of foliar nutrient (Al-Nibras) on growth and yield of Vicia faba L. Int. J. Agricult. Stat. Sci. 18, no. (1): 1325–1333.

Iraqi Journal of Agricultural Sciences –2026:57(3):909-919
P-ISSN: 0075- 0530 /E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/x6ssxv31

Mariush, A. H., and M. Z. Al-Mharib. 2020. Effect of nano-fertilizers and amino acids on the growth and yield of broccoli. International Journal of Agricultural & Statistical Sciences 16 (Supplement 1): 1661–1665.

Mattlob, Ad. N., Ezz El-Din Sultan, and Karim Saleh Abdul. 1989. Vegetable production, part one. University of Mosul, Ministry of Higher Education and Scientific Research, Republic of Iraq, 680.

Nur, D. G. S., and T. Yuksel. 2006. Effect of organic manure application and solarization of soil microbial and enzyme activities under greenhouse conditions. Biol. Agric. Hortic. (23): 305–320.

Olsen, S. R., and L. M. Sommers. 1982. Phosphorus. In Methods of Soil Analysis. Part 2. Chemical And Microbiological Properties, edited by A. L. Page, 2nd edition, 74. Madison, Wis., USA: American Society of Agronomy Inc., Soil Science Society of America Inc.

Page, A. L., R. H. Miller, and D. R. Kenny. 1982. Methods of Soil Analysis, Part 2, 2nd ed. Agronomy 9. Madison, Wisconsin: American Society of Agronomy.

Shyaa, T. A., and M. F. K. Kisko. 2024. Effect of humic acid, cytokinin, and arginine on growth and yield traits of bean plant Phaseolus vulgaris L. under salt stress. Baghdad Science Journal 21, (3): 919–936. DOI: https://doi.org/10.21123/ bsj.2023.8617

Watson, D. J., and M. A. Watson. 1953. Comparative physiological studies on the growth of field crops. III-Effect of infection with beet yellow. Ann. Appl. Biol. 40. (1). DOI: https://doi.org/10.1 111/j. 1744-7348.1953.tb02364.x

Iraqi Journal of Agricultural Sciences –2026:57(3):909-919
P-ISSN: 0075- 0530 /E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/x6ssxv31

تأثير اضافة المغذي العضوي ومنظم عقد الثمار في الصفات الكيميائية والنمو الخضري للباقلاء

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المستخلص

أجريت تجربة في محطة البحوث التابعة لكلية علوم الهندسة الزراعية، جامعة بغداد اثناء الموسم الخريفي 2023-2024 لدراسة تأثير إضافة المغذي العضوي ورش منظم عقد القرنات على تركيز العناصر المغذية في الاوراق وصفات النمو الخضري الباقلاء. تضمنت التجربة عاملين: الأول هو نوع التسميد (التوصية السمادية الكيميائية للباقلاء، ومستويات مختلفة من المغذي العضوي Karmino bloom مع إضافة 25% من NPK ، والثاني هو رش منظم عقد الثمار (ORASET-X) بثلاث تراكيز (0، 0.3، 0.6 غم لتر$^{-1}$.أظهرت النتائج أن استخدام التوصية السمادية الكيميائية زاد من تركيز العناصر الكبرى (N، P، K)والكلوروفيل وصفات النمو الخضري. كما حقق المغذي العضوي Karmino bloom بمستوى 5 لتر هكتار$^{-1}$ مع NPK 25 %زيادات معنوية في تركيز Zn و .Bأظهر التداخل بين هذه المعاملة مع رش Oraset-x بتركيز 0.6 غم لتر$^{-1}$ تفوقًا في تركيز Zn و B وكذلك العناصر الكبرى NوPوK وتحسين صفات النمو. تشير النتائج إلى فعالية هذه التوليفة في تحسين المحتوى الغذائي للأوراق وصفات النمو الخضري للباقلاء.

الكلمات المفتاحية: الباقلاء، مستخلص عضوي، مثبت عقد، عناصر كبرى وصغرى

***البحث مستل من رسالة ماجستير للباحث الأول**