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Influence of Foliar Nutrition Through Boron on Growth and Yield Components of Some Field Bean (*Vicia Faba* L.) Varieties

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ABSTRACT

A field trial was carried out in the district of Kothi (Jableh) North of Babil Governorate, in soil by a silty clay mixture in the winter season of 2021/2022, to study the influence of foliar nutrition through boron (B) on growth and yield components of some field bean varieties. The research was carried out in split-plot design arranged in a randomized complete blocks with three replications. The filed bean varieties (Turkish aquadlge "V1", American aquaduice a longue cross :V2:, Spanish luz de Otono "V3" and Holandotono star "V4") were devoted in the main-plots. While, the sub-plots were assigned with boron (B) concentrations of 0, 150, 200 mg/liter as foliar feeding twice, the first at 50% flowering stage, and the second at 75% flowering stage. The obtained results showed significant differences among studied field bean varieties, where the V3 variety gave a significant superiority for all studied traits. Foliar sprinkling field bean plants with B at various concentrations significantly affect all studied traits. Sprinkling with 200 mg B/L significantly increased all studied characters as compared with sprinkling with boron at a concentration of 150 mg/L or control treatment. The interaction had a significant influence on some of the studied traits. From the obtained results in this study, it could be recommending planting Luz De Otono variety and sprinkling plants with 200 mg /L twice, the first at 50% flowering stage, and the second at 75% flowering stage under the ecological circumstances of studying area.

Keywords: *Vicia faba*, varieties, cultivars, foliar nutrition, boron (B) concentrations.

INTRODUCTION

Field bean (*Vicia faba* L.) is considered as a solitary of the imperative leguminous crops from an economic and nutritional point of view, where its seeds contain a high-quality protein, which reaches 25-40% (Natalia *et al.*, 2008) and carbohydrates up to 56%, fibers, minerals, oils, and vitamins, in particular vitamin B, and phytic acid % (Mahmoud, 2010). It is important in improving soil qualities by setting up atmospheric N in the root nodes in coexistence with Rhizobium bacteria that stimulate the formation of those root nodes.

One of the imperative practicalities in intensifying the cultivation of the field bean crop and elevating construction is planting high yielding varieties and effective method to adding nutrients likes foliar nutrition (Al-Hasany, 2018).

There is no hesitation in selecting high yielding varieties which is critical to raising crop yield and quality. Field bean cultivars differed significantly in their growth characteristics and potential yield. In this relationship, Mulualem*et al.* (2013) and Abido, W.A.E. and S.E. Seadh (2014) discovered that significant differences were shown between field bean cultivars in plant height, No. of pods/plant, weight of 100 seeds and seed yield per unit area. Therefore, this study aims to evaluate field bean cultivars to direct light on promising cultivars that can be widely used in the study area..

Sprinkling nutrients on the leaves is considered a constructive and effective technique with nutrients such as micro and macro elements, besides being inexpensive, simple and quick to respond through the plant's ability to meet its nutritional necessities throughout dissimilar growth stages (Ali *et al.*, 2014 and Salem *et al.*, 2014).

Boron (B) is one of the mainly imperative nutrients because of its position in scheming the faction of sugars within the plant and in its luggage compartment places, besides its influence on the incorporation of N and K and its meaning in the arrangement of plant hormones for example oxides, stimulating many physical processes in the stages of plant growth and flowering stages, which helps in the growth of pollen, as it stabilizes pollen grains and increases fertilization (Shireen *et al.* 2018). B is frequently found in the soil in imperfect quantities, so it is preferable to add plants through foliar nutrition with suitable concentration (Leite *et al.*, 2008).

So, this investigation was accomplished to establish the influence of foliar nutrition through boron on growth and yield components of some field bean varieties under the environmental conditions of North of Babil Governorate, Iraq.

MATERIALS AND METHODS

A field trial was conducted during the agricultural winter season of 2021/2022 in a special field South of Baghdad in the district of Kothi (Jableh) Al-Hamiri region, North of Babil Governorate, to study the influence of FOLIAR NUTRITION THROUGH boron on growth and yield components of some field bean (*Vicia faba* L.) varietiesin a clayey mixture of soil, where its physical and chemical properties are shown in Table 1.

The research was carried out in split-plot design arranged in randomized complete block with three replications. The main-plots were allocated with filed bean varieties *i.e.* Turkish Aquadlge "V1", American Aquaduice a Longue Cross :V2:, Spanish Luz De Otono "V3" and

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HolandOtono Star "V4"). While, the sub-plots were assigned with boron concentrations of 0, 150, 200 mg L^{-1}as foliar feeding twice, the first at 50% flowering stage, and the second at 75% flowering stage. The comparison treatment was sprinkling with tap water only. The sprinkling was done using the back sprinkler size 16 liters in the early morning on the vegetative group and a drop of Al-Zahi detergent was additional to lessen tension as a diffuser to the solution to get the full wetness of the plant.

Each experimental basic unit (sub – plot) included four ridges, each of 60 cm width and 2.0 m long, resulted an area of 4.8 m^2. Planting time of seeds on soil was 13/11/2021 on both sides of ridges at the rate of 2 seeds/hill, 25 cm between hills and 60 cm between ridges. After that, the plants were thinned to one plant after germination. Weeds control was carried out by hand and irrigated as needed, the plants were harvested from the middle ridges (take three plants per experimental unit).

Table 1. Physical and chemical soil characteristics of the experimental site during 2021/2022 season.

Physical characteristics						
Properties Seasons	Sand(gkg^{-1} soil)	Silt(g kg^{-1} soil)		Clay(g kg^{-1} soil)	Soil texture	
2021/2022	330.0	582.0		88.0	Silty mixture	
Chemical characteristics						
Properties	pH	EC	Organic matter	Available nutrients (mg kg^{-1} soil)		
Seasons	soil paste	dSm^{-1}	(g kg^{-1} soil)	N	P	K
2021/2022	7.11	3.30	6.30	25.11	8.34	80.61

Studied traits:

1. Plant height (cm): The average of plant height was taken from measuring the lengths of all branches from the area of contact with the soil to the growing top of the branch and using the tape measure.
2. No. of branches plant^{-1}: The No. of branches of the experimental unit plants was calculated and the average was taken.
3. The content of total chlorophyll in the leaves (SPAD): It was estimated by a SPAD type chlorophyll meter locally and directly on the leaves of the plant by taking an average of three readings per leaf.
4. Pod length (cm). Measurements were made for all pods of the sample, with an average of three plants
5. No. of pods plant^{-1}. It includes all fully developed pods and as an average of the studied plants.
6. Pod weight (g): It includes the weight of all fully developed pods.
7. No. of seeds pod^{-1}: It was calculated from the average of 10 pods for the experimental unit.
8. Average weight of 100 seeds in grams.
9. Total seed yield (tons ha^{-1}). Whole plants in the two inner ridges of each plot were harvested and left for air drying, then they were threshed and the seeds (which were at 12 % moisture) were weighted (kg), then converted to tons per hectare.

All data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split – plot design as outlined by Gomez and Gomez (1984) using means of "MSTAT-C" computer software package. LSD method was used to test the differences among treatment means at 5 % level of probability as explained by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Plant height (cm):

The results in Table 2 showed that there was significant influence of field bean varieties and foliar nutrition through boron on plant height. The V3 variety recorded the highest average plant height of 90.53 cm, with a significant difference from the V4 variety, which recorded the lowest plant height of 66.60 cm. The reason may be due to the differences in the genetic markup of the varieties. Sprinkling field bean plants with 200 mg boron L^{-1}significantly increased plant height, which recorded the highest means (80.50 cm) as compared with control treatment (without boron foliar feeding) which recorded the lowest mean (73.23 cm).The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on plant height, and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1},which recorded 93.11 cm.While, the shortest field bean plants (60.00 cm) resulted from V1 plants without boron foliar feeding. This outcome is dependable with what get hold of Hassan (2019) and Sabah *et al.* (2019).

Table 2. Influence of faba bean varieties and foliar nutrition through boron on plant height (cm).

Varieties (V)	**Foliar nutrition through boron (B) mg L^{-1}**			**Varieties means**
	0	**150**	**200**	
V_1	60.00	65.30	70.10	67.13
V_2	80.50	86.80	91.00	86.10
V_3	87.23	91.26	93.11	90.53
V_4	65.20	66.60	67.80	66.60
Boron means	73.23	77.49	80.50	
LSD 0.05	V	B	V×B	
	6.40	5.50	9.15	

No. of branches plant $^{-1}$:

The results in Table 3 showed significant differences amongfield bean varieties in No. of branches of the plant, as the variety V3 gave the highest average of 6.28 branch plant^{-1}, while the variety V1 gave the lowest average of 5.41 branch plant^{-1}. The results in the Table 3 also showed significant differences due to boron concentrations on No. of branches per the plant, where the boron concentration 200 mg gave the highest mean of 6.55 branchs plant $^{-1}$, compared to the treatment without spraying, which gave the lowest average of 5.06 branchs plant $^{-1}$. These results is due to the positive role of boron in transporting carbohydrates from source to downstream and protecting and transporting IAA and then increasing cell division and expansion in growth centers gave the highest chance of growth (Barry and Marentes, 2006) and this is agreed with Sharaf *et al.* (2009) who noticed that boron was sprayed at a concentration of 75 mg/L gives encouragement in the No. of branches, and there was a significant increase in this trait of beans, which amounted to 12.4 branch plant^{-1} when sprayed with boron at a concentration of 25 mg/L compared to without sprinkling (Al-Amiri, 2014). The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on No. of branches of the plant, where

and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1}, which recorded 7.02branch $plant^{-1}$.While, the lowest No. of branches of the plant (4.68 branch $plant^{-1}$) resulted from V1 plants without boron foliar feeding.

Table 3. Influence of faba bean varieties and foliar nutrition through boron on No. of branches $plant^{-1}$.

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	4.68	5.22	6.33	5.41
V_2	5.02	5.88	6.54	5.81
V_3	5.69	6.15	7.02	6.28
V_4	4.88	5.94	6.32	5.71
Boron means	5.06	5.79	6.55	
LSD	V	B	V×B	
0.05	0.45	0.61	NS	

Total chlorophyll content in the leaves (SPAD):

The results in Table 4 showed that the V3 variety significantly outperformed the rest of the varieties for the chlorophyll content of the leaves, which scored 54.8 SPAD, while the V1 variety recorded the lowest average of chlorophyll content of the leaves as 41.8 SPAD. Data in Table 4 shows the superiority of the sprinkling treatment with a concentration of 200 mg for the chlorophyll content of the leaves with a significant difference from the rest of the other treatments, which recorded the highest mean of 53.1 SPAD, while the control treatment (sprinkling with tap water only) recorded the lowest mean of 44.4 SPAD. This result may be attributed to the increase in the leaves' content of nutrients, starting from the stage before flowering and holding the pods, including the boron element, which plays an important role in increasing the vegetative growth and thus increasing the content of chlorophyll in the leaves and then increasing the efficiency of photosynthesis (Al-Anbari, 2009). The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on the chlorophyll content of the leaves, where and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1},which recorded 58.7SPAD. Even though, the lowest chlorophyll content of the leaves (36.1 SPAD) resulted from V1 plants without boron foliar feeding.

Table 4. Influence of faba bean varieties and foliar nutrition through boron on total chlorophyll content in the leaves (SPAD).

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	36.1	40.6	48.7	41.8
V_2	42.7	47.8	50.2	46.9
V_3	50.4	55.3	58.7	54.8
V_4	48.4	51.1	55.0	51.5
Boron means	44.4	48.7	53.1	
LSD	V	B	V×B	
0.05	1.54	2.03	3.21	

Pod length (cm):

The results in Table 5 cleared that the V3 variety significantly outperformed the rest of the cultivars under study, as it recorded 22.56 cm, while the V4 variety recorded the lowest average of 16.36 cm.The results in Table 5 also showed that showed a significant influence of sprinkling with boron for the characteristic of pod length, where the concentration of 200 mg/liter gave the highest mean of 21.51 cm, while the control treatment recorded the lowest mean of pod length of 17.95 cm. The reason for increasing spraying with boron may be due to its important role in increasing the efficiency of photosynthesis and dry matter production in a way that helps to increase the length of the pod. This consequence is reliable with Reda *et al.* (2014). The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on pod length, where and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1},which recorded 25.50 cm. Even though, the lowest mean of pod length (16.53 cm) resulted from V4 plants without boron foliar feeding.

Table 5. Influence of faba bean varieties and foliar nutrition through boron on pod length (cm).

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	16.77	18.17	19.64	18.19
V_2	18.67	21.33	24.50	21.50
V_3	19.83	22.33	25.50	22.56
V_4	16.53	16.13	16.41	16.36
Boron means	17.95	19.49	21.51	
LSD	V	B	V×B	
0.05	0.91	0.55	1.25	

No. of pods plant $^{-1}$:

The results in Table 6 showed significant differences among field bean varieties in No. of pods of the plant, as the variety V3 gave the highest average of 15.48pods $plant^{-1}$, while the variety V1 gave the lowest average of 12.55pods$plant^{-1}$.The results in Table 6 also showed a significant influence of sprinkling with boron on the No. of pods for each plant, as the concentration of 200 mg/liter recorded the highest average for the characteristic of the No. of pods for each plant amounted to 15.74 pods $plant^{-1}$, with a noteworthy dissimilarity from the concentrations of 0 and 150 mg L^{-1}, and the control treatment (without sprinkling with boron) recorded the lowest the mean of this attribute as 11.58 pods $plant^{-1}$. The reason for the increase may be the important role of boron in the pollination process by stimulating fertilization and biological processes in the growth and flowering stages, and this leads to increased fertilization and thus an increase in the number of pods per plant. These consequences are dependable with the consequences reached by Al-Hasany *et al.* (2019 a). The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on No. of pods of the plant, where and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1}, which recorded 17.33pods plant $^{-1}$. While, the lowest No. of pods of the plant (10.67pods plant $^{-1}$) resulted from V1 plants without boron foliar feeding.

Table 6. Influence of faba bean varieties and foliar nutrition through boron on the No. of pods $plant^{-1}$.

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	10.67	11.33	15.65	12.55
V_2	11.67	14.00	16.00	13.89
V_3	13.00	16.11	17.33	15.48
V_4	11.00	13.67	14.00	12.89
Boron means	11.58	13.77	15.74	
LSD	V	B	V×B	
0.05	1.95	2.10	3.10	

Pod weight (g):

The results in Table 7 shows significant differences for the field bean varieties, where the V3variety gave the

highest average of pod weight (24.61 g), while the V1 variety gave the lowest average of pod weight (20.11 g). Data in Table 7also showed significant differences for the pod weight (g), where the concentration of 200 mg/liter gave the highest average of pod weight (24.58 g), while the treatment without sprinkling with boron gave the lowest average of pod weight (19.99 g). This result may be due to the influence of boron on increasing chlorophyll, which is reflected in the improvement of photosynthesis and the increase of products and their transfer to the seeds. Reda *et al.* (2014) confirmed this conclusion. The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on pod weight, where and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1}, which recorded 26.88 g. While, the lowest mean of pod weight (18.67 g) resulted from V1 plants without boron foliar feeding.

Table 7. Influence of faba bean varieties and foliar nutrition through boron on pod weight (g).

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	18.67	19.00	22.67	20.11
V_2	19.00	21.67	23.67	21.44
V_3	22.31	24.66	26.88	24.61
V_4	20.00	22.30	25.12	22.47
Boron means	19.99	21.90	24.58	
LSD	V	B	V×B	
0.05	3.25	3.60	4.10	

No. of seeds pod $^{-1}$:

The results founded in Table 8 confirmed the existence of significant differences among the studied field bean varieties in the average No. of seeds per the pod, where the V3 variety achieved the highest average of 6.27 seeds pod^{-1}. While, the V1variety gave the lowest average of 4.56 seeds pod^{-1}. The results in Table 8 also indicates that sprinkling with 200 mg B/L of boron gave the highest mean of the No. of seeds in the pod amounting by 5.57 seeds pod^{-1}, while the control treatment gave the lowest average of 4.87 seeds pod^{-1}. Al-Isawi and Khrbeet (2011) confirmed these results. The interaction between field bean varieties and foliar nutrition through boron rates had insignificant influence on No. of seeds per the pod.

Table 8. Influence of faba bean varieties and foliar nutrition through boron on the No. of seeds pod^{-1}.

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	4.50	4.52	4.68	4.56
V_2	4.65	4.95	5.30	4.96
V_3	5.80	6.26	6.76	6.27
V_4	4.56	5.40	5.56	5.17
Boron means	4.87	5.28	5.57	
LSD	V	B	V×B	
0.05	0.92	0.64	NS	

100-seed weight (g):

Data in Table 9 shows the significant superiority of sprinkling with boron at a concentration of 200 mg/liter by giving it the highest average weight of 100 seeds amounted by 177.9 g, while the control treatment gave the lowest average of 167.0 g. The reason for this is because of boron increasing chlorophyll, which is reflected in improving photosynthesis and increasing products and their transmission to seeds. This result is consistent with what was reached by Alhasany *et al.* (2019 b). The results in the Table 9 showed a significant superiority of the V3 variety over the rest of the varieties, as it recorded the highest average weight of 100 seeds amounting by 182.1 g, while the V1 variety recorded the lowest average of 157.6 g. The reason of theses results may be attributable to the actuality that this attribute is genetically related with varieties more than the external influence and the influence of ecological factors, and these results are consistent with what was obtained by Kubure *et al.* (2015). The interaction between field bean varieties and foliar nutrition through boron rates had significant influence on weight of 100 seeds, where and the best treatment was foliar sprinkling V3 variety with 200 mg boron L^{-1}, which recorded 190.2 g. While, the lowest mean of weight of 100 seeds (154.3 g) resulted from V1 plants without boron foliar feeding.

Table 9. Influence of faba bean varieties and foliar nutrition through boron on 100-seed weight (g).

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	154.3	157.6	161.0	157.6
V_2	158.8	163.5	169.3	163.9
V_3	172.3	184.0	190.2	182.1
V_4	162.7	170.8	178.0	173.5
Boron means	167.0	171.5	177.9	
LSD	V	B	V×B	
0.05	6.0	4.1	8.5	

Total seed yield (ton ha^{-1}):

It was found in Table 10 that there were significant differences among the studied field bean varieties in total seed yield per hectare, where the V3 variety recorded the highest average of total seed yield per hectare, which amounted by 2.821 $tonsha^{-1}$, while the V1 variety recorded the lowest average of total seed yield per hectare (2.268 $tonsha^{-1}$). There are significant differences in the characteristic of the total seed yield per hectare, where the boron concentration of 200 mg/liter gave the highest total seed yield per hectare of 2.840 $tonsha^{-1}$, while the control treatment (without sprinkling with boron) gave the lowest average of total seed yield per hectare (2.308 tons ha^{-1}). The reason for this is due to the influence of sprinkling boron during growth, which contributed to improving the growth and flowering of the seeds and then increasing the total yield of the plant (Kassab, 2005). The results in Table 10 also indicated that there were significant differences for the interaction between field bean varieties and foliar nutrition through boron rates, as the interaction between B 200 and V3 variety awarded the uppermost standards of total seed yield per hectare amounting by 3.266 tons ha^{-1} compared to other interaction treatments.

Table 10. Influence of faba bean varieties and foliar nutrition through boron on total seed yield (ton ha^{-1}).

Varieties (V)	Foliar nutrition through boron (B) mg L^{-1}			Varieties means
	0	150	200	
V_1	2.162	2.285	2.357	2.268
V_2	2.275	2.487	3.052	2.604
V_3	2.573	2.624	3.266	2.821
V_4	2.222	2.354	2.687	2.472
Boron means	2.308	2.437	2.840	
LSD	V	B	V×B	
0.05	0.064	0.095	0.098	

CONCLUSION

From the obtained results in this study, it could be concluded that the variety V3 (Luz De Otono) and boron at the concentration of 200 mg/liter gave the highest average for all studied traits (plant height, No. of branches plant $^{-1}$,the content of total chlorophyll in the leaves, pod length, No. of pods plant $^{-1}$,pod weight, No. of seeds pod $^{-1}$,average weight of 100 seeds and total seed yield ton ha^{-1}). Therefore, it could be recommending planting Luz De Otono variety and foliar sprinkling plants with boron at a concentration of 200 mg/L twice, the first at 50% flowering stage, and the second at 75% flowering stage under the environmental conditions of studying area.

REFERENCES

Abido, W.A.E. and S.E. Seadh (2014). Rate of variations between field bean cultivars due to sowing dates and foliar sprinkling treatments. World Res. J. of Agron., 3(1): 40-50.

Al-Amiri, A.S.U. (2014). Influence of foliar fertilizers in growth and yield of leguminous crops *Vicia faba* L. Thesis, Master Degree, Faculty of Agriculture, University of Baghdad, Iraq.

Al-Anbari, M.A. A., H. A. Khashan and A.S. Mahdi (2009). Response of broad bean crop to sowing date and boronfoliar application. J. Kerbala Univ. Agric Sci., 7(3): 99-103.

Al-Hasany, A.R.K., F.M. Al-Tahir and Y.K. Chllab (2019 a). Influence of sprinkling with proline and hormonal and nutritional mixture in the growth and yield of the Faba bean (*Vicia faba* L.). Muthanna J. Agri. Sci., 7(2): 122-132.

Alhasany, A.R., D.S. K. Altai and A.H. Noaema (2019 b). Influence of foliar nano-fertilizers of marine algae extract and boron on growth and yield of faba bean (*Vicia faba* L.). Indian J. of Eco., 8: 251-253.

Al-Hasany, A.R., D.S.K. Altai and A.H. Noaema (2018). Influence of foliar nano-fertilizers of marine algae extract and boron on growth and yield of faba bean (*Vicia f*aba L.). Indian J. of Eco., 8: 251-253.

Ali, N.S., H.S.Rahi, A.A. Shaker (2014). Soil fertility, Scientific Book House. College of Agriculture, University of Baghdad, pp. 88.

Al-Isawi, Y.J. and H.K. Khrbeet (2011). Influence of foliar application with boron on yield and its components offaba bean. Iraqi J. Agric. Sci.,42(2): 10-19.

Barry, J.S., E.A.Marentes,M. Kitheka and P. Vivekanadan (2006). Boron mobility in plants. Physiology Plantarum, 94 (2): 356- 361.

Gomez, K.N. and A.A. Gomez (1984). Statistical procedures for agricultural research. 2ndEdn., John Wiley and Sons, Inc., New York, pp: 95-109.

Hassan, R.K. (2019). Influence of the concentrations and dates of leave fertilization in the growth and yield of two varieties of broad bean. MasterThesis, Al-Musaib Technical College at Al-Furat Al-Awsat Technical University.

Kassab,O.M. (2005). Soil moisture stress and micronutrients foliar application effects on the growth and yield of mung bean plants. J. Agric. Sci. Mansoura Univ., 30: 247-256.

Kubure, T.E., V.R. Cherukuri, C. Arvind and H. Ibrahim (2015). Influence of faba bean (*Viciafaba* L.) genotypes, plant densities and phosphorus on productivity, nutrients uptake, soil fertility changes and economics in central high lands of Ethiopia. Intern. J. of Life Sci., 3(4): 287-305.

Leite, S.M., F.V. Celina, A.V.B. Cesar and L.M. Celso (2008). Boron influence on concentration of polyols and other sugar in Eucalyptus. R. Arvore, VicosaMG, 32(5): 815-820.

Mahmoud, A.N. (2010). Economic analysis of response of broad beans to level of N and P fertilizers. J. Agric. Sci., 41(5): 125-132.

Mulualem, T., T. Dessalegn and Y. Dessalegn (2013). Participatory varietal selection of faba bean (*Vicia faba* L.) for yield and yield components in Dabat district, Ethiopia. Wudpecker J. of Agric. Res., 1(7): 270-274.

Natalia, G., C.M. Avila, M.T. Moreno and A.M. Torres (2008). Development of SCAR markers linked to zt-2, one of the genes controlling absence of tannins in faba bean. Aust. J of Agric. Res., 59: 62- 68.

Reda, F., T.A. Magdi and S.R. El-Lethy (2014). The role of Zn and B for improving (*Vicia faba* L.) tolerance to salinity stress. Middle East J. of Agric. Res., 3(4): 707-714.

Sabah, L.A., M. Tarkhan and H.K. Abdul-Ameer (2019). Influence of foliar application of boron and seed scarification on some vegetative growth and yield of broad bean (*Vicia faba* L.) Local Var. J. of Univ. of Babylon for Pure and Applied Sci., 5(27): 75-87.

Salem, A.K., E.H. El-Harty, M.H. Ammar and S.S. Alghamdi (2014). Evaluation of faba bean (*Vicia faba* L.) performance under various micronutrient foliar applications and plant spacing. Life Sci. J., 11(10): 1298-1304.

Sharaf, A.E.M., I.I. Farghal and M.R. Sofy (2009). Response of broad bean and lupin plants to foliar treatment with boron and zinc. Aust.J. Basic Appl. Sci., 3(3): 2226-2231.

Shireen, F., M.A.Nawaz, C.Chen, Q.Zhang, Z.Zheng, H.Sohail, J.Sun, H.Cao, Y.Huang and Z.Bie (2018). Boron: Functions and approaches to enhance its availability in plants for sustainable agriculture. Intern. J. Mol. Sci., 19(7): 1856-1870.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods. 7th ed. Iowa State Univ. Press, Iowa, USA.

تأثير الرش الورقي بالبورون على نمو ومكونات المحصول لبعض أصناف الفول البلدى

جزران جرد كاظم

وزارة التربية - قسم التعليم المهني - بابل – العراق.

الملخص

نفذت تجربة حقلية في قضاء الكوثي (جبلة) شمال محافظة بابل – العراق، في تربة مزيجة طينية غرينية في الموسم الشتوى ٢٠٢١/٢٠٢٢ لدراسة تأثير الرش الورقي بالبورون على نمو ومكونات المحصول لبعض أصناف الفول البلدى. أجريت التجربة في تصميم القطع المنشقة المرتبة في قطاعات كاملة العشوائية في ثلاث مكررات. تم تخصيص القطع الرئيسية لأصناف الفول البلدى وهي؛ التركي (aquadlge) "V1"، الأمريكي (aquaduice a longue coss) "V2"، الإسباني ((luz de otono) "V3"والهولاندى (otono star)"V4". بينما خصصت القطع الشقية لتركيزات الرش الورقى بالبورون وهي؛ ٠ ، ١٥٠ ، ٢٠٠ ملجم / لتر مرتين، الأولى عند مرحلة التزهير ٥٠٪ والثانية في مرحلة التزهير ٧٥%. أظهرت النتائج المتحصل عليها وجود فروق معنوية بين أصناف الفول البلدى المدروسة ، حيث أعطى الصنف V3 تفوقاً معنوياً على جميع الصفات المدروسة. كما أثر الرش الورقي على نباتات الفول البلدى بالبورون بتركيزات مختلفة معنوياً على جميع الصفات المدروسة. حيث أدى الرش بالبورون بتركيز ٢٠٠ مجم / لتر إلى زيادة معنوية لجميع الصفات المدروسة مقارنة بالرش بالبورون بتركيز ١٥٠ مجم / لتر أو معاملة المقارنة. كما كان للتفاعل بين عاملى الدراسة تأثيراً معنوياً على بعض الصفات المدروسة. من النتائج التي تم الحصول عليها في هذه الدراسة، يمكن التوصية بزراعة الفول البلدى الصنف الأسبانى Luz De Otono مع الرش الورقي بالبورون بتركيز ٢٠٠ مجم / لتر مرتين، الأولى عند مرحلة التزهير ٥٠٪ والثانية في مرحلة التزهير ٧٥% تحت الظروف البيئية لمنطقة الدراسة.