Effect of planting dates and different levels of phosphate fertilizer on some vegetative growth characteristics of faba bean.

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Abstract:

A field experiment was carried out during winter seasons2023-2024 in the field experiments field of college of Agriculture / Al-Qasim Green University, south of Babylon Governorate, at a latitude of 32.40 north and a longitude of 44.39 east. This is to know the effect of planting dates and levels of phosphate fertilizer on the growth and yield of faba beans. The experimental design was carried out in the arrangement of splat plot according to the design of complete random blook (RCBD) in three repeats, as the planting dates included the main panels while the secondary panels included phosphate fertilizer levels, the results showed that planting on October 15 achieved the highest average in all the studied characteristics plant height, number of branches, number of leaves of plant. leaf area, percentage of chlorophyll in the plant and the number of days from planting until reaching 50% flowering amounted to 116.96 cm, 11.601 plant branches-1, 25.97 leaf-1, 1204.00cm2, 51.01 SPAD and 56.67 days respectively, while the date of November 1 achieved the lowest average in the previously mentioned qualities, while for the levels of phosphate fertilizer, the level was achieved 160 kg h-1 The highest average in the studied traits (plant height characteristic 121.17 cm, number of branches 12.268 plant branches-1, number of leaves in the main stem 29.03 leaf-1, leaf area 1046.1 cm2, chlorophyll percentage in the plant 50.22 SPAD unit and the number of days from planting until reaching 50% flowering 60.11 days, while the level of 100 kg h-1 achieved the lowest average for the studied traits.

Key words: Faba Beans , planting date , phosphate fertilizer

Introduction

Faba Beans Vicia faba L. of the important field crops belongs to the family Leguminous (Fabecea) and is among the crops that enter the diet of millions of people in the world such as China and Ethiopia [1] Beans are grown for the purpose of obtaining green pods or obtaining dry seeds or as fodder for livestock, Iraq's production of beans reached 33,354 tons [2]. Bean seeds contain a percentage of proteins and carbohydrates, where the percentage of proteins reaches 41% and the percentage of carbohydrates reaches 68% [3] . faba beans have a role in improving the characteristics of the soil by fixing atmospheric nitrogen by bacteria that coexist in its roots [4] Iraq suffers from low production of faba beans [5] .so the addition of chemical fertilizers, including phosphate fertilizers, have a role in regulating vital processes as it increases the number of branches and increases the speed of plant maturity [6] In addition to its role in improving the qualities of fruits [7] The limited readiness of phosphorus is a problem experienced by about 30% of Iraqi soils, which is the cause of production [8[

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Determining the date of planting is one of the important requirements for crop management to obtain a satisfactory yield in quantity and quality, because planting at the ideal date provides the best suitable environment for the growth of the crop and that the high temperature in the flowering stage results in the non-formation of pods due to flower damage[9] . In addition to its effect on the length of the photometric period and its role in determining crop production and flowering and the length of the growth period [10. [

The importance of the research lies in knowing the effect of the date of planting and phosphate fertilization in the growth qualities of the pea crop and to know the extent of the crop's response to the date of planting and phosphate fertilizer.

Materials and Methods

A field experiment was carried out during the agricultural season 2024-2023 in the field of the Field Crops Department of the college of Agriculture, Al-Qasim Green University, south of Babylon Governorate, at a latitude of 32.40 north and a longitude of 44.39 Eastward. To know the effect of planting dates on the yield qualities of beans and the effect of levels of phosphate fertilization. Five random sites were selected at a depth of 30-50 cm to take samples from the field soil before starting planting [11]. and the samples were examined in the laboratory of the Muradia Research Station of the Directorate of Agriculture of Babylon and a homogeneous sample was made resulting from mixing the samples taken and drying them after exposing them to sunlight and grinding them and then passing them through a 2 mm sieve for laboratory testing Table (1). Split Plot Design according to the design of complete random sectors (RCBD) with three replicates, including the first factor: included three dates for planting The first date is 10/1 and is symbolized by D1 The second date is 10/15 and is symbolized by D2Third date 11/1 and symbolized by D3 occupied the main panels .the second factor included four levels of phosphate fertilization 100 kg h1 – symbolized by P1 120 kg h 1 - P2140 kg h1 - P3 160 kg h1 - P4 [12] . The soil of the field was plowed by the plow dump at a depth of 30 cm with the division of the field into three repeaters includes one repeater 12experimental units separated between the experimental units Maroz width 80 cm and the area of the experimental unit 9 m2 (3 × 3) m The experimental unit contains four lines, the distance between the lines is 50 cm and between Joura and another 25 cm with a plant density of 80,000 Plant h-1

Table 1 Some physical and chemical qualities of field watering soil and water

Sample	PH	EC	Ready-made items (mg $^{kg-1}$)			Organic matter OM %	Soil separations %			Soil weaving
			N	P	K		clay	silt	sand	Clay blend
soil	7.2	2.11	55.44	8.6	336	1.4	409	336	255	
Watering water	7.3	1.96	22.7	9.3	1.17	-	-	-	-	

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1-2Studied qualities

Ten plants were randomly selected from the two lines from each experimental unit when flowering reached 100% to measure the following traits

-1Plant height (cm(

-2Number of branches (branches plant-1(

-3Number of leaves (leaves pllant-1(

-4Leaf area (cm2) [13. [

-5Chlorophyll guide in the leaves (Spad-502 (

-6Number of days to 50% flowering

-2-2Statistical analysis

After collecting and tabulating the data, all traits were analyzed statistically according to the GenStat program using the lowest significant difference LSD with a probability level of 0.05 to compare the arithmetic averages [14 [

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Results and discussion

1-3Plant height (cm(

The results of Table (2) showed that there were no significant differences for planting dates, while the results of the same table showed significant differences in the levels of phosphate fertilizer in the high characteristic, as the level of P4 was exceeded by giving it the highest average for this trait of 121.17 cm compared to the lowest average of 106.11 cm for the level of 100 kg h-1. The reason for this is attributed to the role of phosphorus in the growth of roots and raising their efficiency in absorbing nutrients. [15] and [16] . As for the interventions, the results of Table (2) showed that there is no significant difference between planting dates and phosphate fertilizer levels in the characteristic of plant height

Table 2 Effect of planting date and different levels of phosphate fertilizer and their overlap on plant height characteristic cm

Planting dates	Phosphate fertilization levels kg h $^{-1}$				Means Planting dates
	P1	P2	P3	P4	
D1	106.33	112.44	116.22	120.78	113.94
D2	111.00	116.11	118.11	122.63	116.96
D3	101.00	107.00	114.66	120.11	110.69
LSD 0.05	N.S				N.S
Means phosphate fertilization	106.11	111.85	116.33	121.17	
LSD 0.05	3.276				

2-3Number of branch branches plant-1

The results of Table (3) showed significant differences for planting dates and phosphate fertilizer levels in the number of branches, as the second planting date D2 was significantly higher by giving it the highest average number of branches in the plant amounting to 11.601 plant branches-1, while the date D3 achieved the lowest average number of branches amounted to 10.896 plant branches-1, perhaps due to the suitability of climatic conditions and appropriate temperatures, which led to

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good growth of the plant the penalty of vegetative and thus increasing the number of branches in one plant and this is consistent with what he found [17] .The results of Table (3) also showed significant differences in the levels of phosphate fertilization, as the level of P4 exceeded by giving it the highest average for this trait of 12.268 plant branches-1 compared to the lowest average achieved by the level P1 amounted to 10.243 plant branches-1, and perhaps the reason for this is due to the clear role of phosphorus in cell division and expansion, which led to the formation of branches new [18]. As for the interventions, the results of Table (3) showed a significant effect between planting dates and phosphate fertilizer levels in this characteristic, where the combination D2XP4 achieved the highest average of 12.630 plant branches-1.

Table 3 Effect of planting date and different levels of phosphate fertilizer and the overlap between them on the characteristic of the number of branches (plant branch-1(

Planting dates	**Phosphate fertilization levels kg h $^{-1}$**				**Means Planting dates**
	P1	**P2**	**P3**	**P4**	
D1	10.520	10.970	11.523	12.183	11.299
D2	10.680	11.260	11.833	12.630	11.601
D3	9.530	10.663	11.400	11.990	10.869
LSD 0.05	0.3397				0.1802
Means phosphate fertilization	10.243	10.964	11.586	12.268	
LSD 0.05	0.2106				

3-3Number of leaves in the main stem

The results of Table (4) indicated that there are significant differences for planting dates and phosphate fertilizer levels in the number of leaves in the main stem, as the second planting date D2 significantly exceeded by giving it the highest average number of leaves amounting to 25.97 leaf-1, while date D3 achieved the lowest average for this trait of 22.03 leaf-1, and the reason for this may be due to the superiority of the same date in the characteristic of plant height, which results in an increase in the number of leaves in addition to the suitability of climatic conditions and temperatures. The results of Table (4) also showed significant differences in the levels of phosphate fertilization in the number of pods, as the level of P4 was superior by giving it the highest average for this trait of 29.03 leaf-1 compared to the lowest average achieved by the level P1 of 19.66 leaf-1, and the reason for this may be attributed to the superiority of the fourth level in the characteristic of plant height, which results in an increase in the number of leaves [20] and [21]. As for the interventions, the results of Table (4) showed

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that there is no significant effect between planting dates and phosphate fertilizer levels in the number of leaves.

Table 4 Effect of planting date and different levels of phosphate fertilizer and the overlap between them on the characteristic of number of leaves

Planting dates	Phosphate fertilization levels kg h $^{-1}$				Means Planting dates
	P1	P2	P3	P4	
D1	19.66	21.11	24.33	28.22	23.33
D2	21.22	23.67	26.55	32.43	25.97
D3	18.11	19.78	23.78	26.44	22.03
LSD 0.05	N.S				1.405
Means phosphate fertilization	19.66	21.52	24.89	29.03	
LSD 0.05	2.213				

4-3leaf area (cm2(

The results of Table (5) showed significant differences in planting dates and phosphate fertilizer levels, in the characteristic of the leaf area, as the second planting date D2 significantly exceeded by giving it the highest average leaf area in the plant amounted to 1204.0 cm 2 while the date D3 achieved the lowest average leaf area of 720.0 cm 2, and perhaps the reason for this is due to the suitability of climatic conditions and appropriate temperatures, which led to an increase in the paper area [22]. Phosphate fertilization in the leaf area, as the P4 level exceeded by giving it the highest average for this trait of 1046.1 cm2, while the P1 level achieved the lowest average of 845.3 cm2, and the reason for this may be attributed to the clear role of phosphorus in increasing the size of the root system and thus increasing the efficiency of the process of transporting nutrients to produce an increase in the leaf area [23]As for the bilateral interactions between the study factors, the results of Table (5) showed that there is no significant effect between planting dates and phosphate fertilizer levels in the characteristic of the leaf area of the plant.

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Table 5 Effect of planting date and different levels of phosphate fertilizer and the overlap between them on the characteristic of leaf areacm2

Planting dates	Phosphate fertilization levels kg h $^{-1}$				Means Planting dates
	P1	P2	P3	P4	
D1	816.5	877.4	963.9	1019.2	919.2
D2	1083.0	1181.1	1216.8	1335.2	1204.0
D3	636.6	698.7	760.9	783.8	720.0
LSD 0.05	N.S				17.17
Means phosphate fertilization	845.3	919.1	980.5	1046.1	
LSD 0.05	30.21				

5-3Plant Guide of Chlorophyll (SPAD

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The results of Table (6) showed significant differences for planting dates and phosphate fertilizer levels, in the chlorophyll index in the leaves, as the second planting date D2 significantly exceeded by giving it the highest average of the chlorophyll index in the leaves amounted to 51.01 SPAD units, while the date D3 achieved the lowest average for this trait of 43.63 SPAD units this may be due to the suitability of climatic conditions and appropriate temperatures, which led to raising the percentage of chlorophyll in the plant and that there is a direct relationship between chlorophyll content and recipes the result, as it works to increase the paper area and thus increase the efficiency of photosynthesis. The results of Table (6) also showed significant differences in the levels of phosphate fertilization in the chlorophyll index in the leaves, as the level of P4 was exceeded by giving it the highest average for this trait of 50.22 SPAD units, while the P1 level achieved the lowest average of 44.83 SPAD units, and the reason for this may be attributed to the clear role of phosphorus in raising the percentage of chlorophyll in the plant [24.[

As for the interventions, the results of Table (6) showed a significant effect between planting dates and phosphate fertilizer levels for chlorophyll index in the leaves, as the combination D2XP4 gave the highest average of 54.40 SPAD units

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Table 6 Effect of planting date and different levels of phosphate fertilizer and their interaction on the characteristic of plant chlorophyll content SPAD.

Planting dates	Phosphate fertilization levels kg h $^{-1}$				Means Planting dates
	P1	P2	P3	P4	
D1	46.23	48.07	49.07	49.33	48.17
D2	48.60	50.10	50.93	54.40	51.01
D3	39.67	43.20	44.73	46.93	43.63
LSD 0.05	1.667				0.743
Means phosphate fertilization	44.83	47.12	48.24	50.22	
LSD 0.05	1.060				

6-3Number of days to 50% flowering

The results of Table (7) showed that there are significant differences in planting dates and phosphate fertilizer levels, in the number of days to 50% flowering, as the second planting date D2 significantly exceeded by giving it the lowest average number of days to 50% flowering in the plant amounted to 56.67 days, while the date D3 achieved the highest average for this trait amounted to 70.25 days, and the reason for this may be attributed to the suitability of climatic conditions and appropriate temperatures, which increased the indicators of crop growth, especially the leafy area, and thus led to Raising the efficiency of photosynthesis and development of reproductive organs [24] . The results of the same table showed significant differences in the levels of phosphate fertilization in the number of days up to 50% flowering, as the level of P4 exceeded by giving it the lowest average number of days needed to reach 50% flowering amounted to 60.11 days, while the level P1 gave the highest average for this trait amounted to 69.33 days, and the reason for this may be due to the clear role of phosphorus in activating flowering and the growth rate to reach reducing the number of days required for 50% (25(

As for the interventions, the results of Table (7) showed that there is no significant difference between planting dates and phosphate fertilizer levels in the number of days to 50% flowering.

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Table 7 Effect of planting date and different levels of phosphate fertilizer and the overlap between them on Number of days to 50% flowering.

Planting dates	Phosphate fertilization levels kg h $^{-1}$				Means Planting dates
	P1	P2	P3	P4	
D1	71.00	67.67	66.00	63.00	66.92
D2	61.00	58.00	55.00	52.67	56.67
D3	76.00	72.33	68.00	64.67	70.25
LSD 0.05	N.S				0.886
Means phosphate fertilization	69.33	66.00	63.00	60.11	
LSD 0.05	1.235				

Conclusions:

From the results obtained, we conclude the following

-1We conclude from the study that the cultivation of the bean crop on the date 15/10 achieved the highest average in the qualities of vegetative growth and is an ideal date for planting beans compared to other dates.

-2We conclude that the levels of phosphate fertilizer have an upward impact on the bean crop, as the level of 160 kg h-1 achieved the highest growth rate of the bean crop.

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