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(Original Article)

Impact of Gibberellic Acid and Phosphorus Application Time on Yield and Its Attributes for Some Faba Bean Cultivars

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Abstract

A field experiment was carried out at the Experimental Farm of Agronomy Dept., Assiut University, during the 2021/2022 and 2022/2023 seasons. The work aimed to investigate the effect of three phosphate fertilizer applied dates (before the first P_1, second P_2, and third irrigation P_3) and four gibberellic acid levels (0, 50 G_1, 150 G_2, and 250 G_3 ppm) on three fab bean cultivars (Misr1, Sakha 4 and Giza 843). The experiment was laid out in randomized complete block design (RCBD) using a strip plot within a split plot with three replicates. The plot area was 9 m^2.

The results revealed that maximum seed yield in addition to yield attributes were produced from plants receiving 250 or 150ppm gibberellic acid with third and second phosphorus application in both seasons. Giza 843 cultivar was significantly higher seed index, biological and seed yield in both seasons. The maximum Pod number/plant and seeds number/pod in the 1st season were recorded by 250ppm gibberellic acid concentration under the first and second phosphorus application dates ($G_3 \times P_1$ and $G_3 \times P_2$) in the 2nd season. Moreover, the maximum seeds and biological yield were recorded by 250ppm gibberellic acid concentration under the third phosphorus application date ($G_3 \times P_3$) in both seasons. Furthermore, the tallest plants, maximum seed index and biological yield were recorded by Giza 843 cultivar under the second and third phosphorus application dates ($V_3 \times P_2$ and $V_3 \times P_3$) in both seasons. Maximum pod number/plant and seed yield were recorded by Misr1 cultivar under the first and third phosphorus application dates ($V_1 \times P_1$ and $V_1 \times P_3$) in both seasons.

Keywords: *Cultivars interaction, Faba bean, Gibberellic acid, Phosphorous fertilizer.*

Introduction

Faba bean is one of the world's important pulse crops. It is used as human food and animal feed as well as a significant crop in cereal rotation systems. The yield of faba bean fluctuated from year to year, this is due to inadequate growth, less reproductive organs, and low pod setting. These traits are affected mostly by environmental factors, cultivation methods among other factors. Therefore,

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cultural practices such as timing of phosphorus fertilization and gibberellic acid application were used to improve faba bean yield.

Gibberellic acid application was tested by several researchers. Kandil *et al*. (2011) found that plant growth regulators affect plant height, number of pods/plant, number of seeds/pod, seed index and seed yield/ha in both seasons. They added that spraying faba bean plants with GA_3 or IAA at 100 ppm significantly improved vegetative growth, yield, and yield components and markedly recorded the highest values of all studied traits.

Rahman *et al.* (2018) declared that significant effect of GA_3 on number of pods/plant, number of seeds/pod, 100 seed weight, seed yield and biological yield. Fadhil and Almasoudy (2021) mentioned that the spraying with gibberellic acid at concentration (300 mg/L) resulted in the highest average in all studied traits (plant height, pods number/plant, seeds number/pod, seed index and total plant yield/ha. Rathore *et al.* (2022) reported that the foliar spraying of 120 ppm GA_3 tended to produce plants with maximum height (116.4 cm) and number of seeds /pod. Teama *et al.* (2023) evaluated several growth regulators. They reported that 100 seed weight and seed yield/feddan (4200m^2), were significantly affected in plants treated with 200 ppm Gibberellic or Salicylic Acid.

As for phosphorus application, no literature was available regarding the effect of P time of application on faba bean. However, workers in this respect reported some response from other legumes to such treatments. Mahmoud *et al.* (1991) found that two doses of phosphorus at sowing and flowering stage produced the maximum, 100-seed weight in soybean. Setty *et al*. (1992) reported that the seed yield did not differ significantly among different concentration and number of times of spray of the single superphosphate on gram plants (Cicer arietinum). Dawood and Abou-Salama (1994) indicated that application of fertilizer rate of 180 kg calcium superphosphate/feddan in two doses at sowing and first irrigation in faba bean is beneficial to obtain high plant height, number of pods/plant, seed index and seed yield/fed. Amanullah and Zakirullah (2010) showed that the highest level of 90 kg P/ha at 10 days before sowing and sowing increased plant height and biomass yield in maize. El-Kholy *et al.* (2019) stated that application of P fertilizer up to 46.5 kg P_2O_5 significantly increased all traits under study such as pods number/plant and seed and biological yields/fad on faba bean. as compared to other traits. Meanwhile, 100 seed weight significantly increased by increasing P levels up to 31 kg P_2O_5/feddan.

Variable responses of various faba bean cultivars and/or genotypes to some cultural practices were reported by many researchers. Bakry *et al.* (2011) found that Nubaria 1 variety produced a highly significant effect on seed yield compared with the other varieties, seed index value, and pods number/plant. Likewise, Nubaria 1 variety had the highest values in plant height and seed yield. Ibrahim (2016) reported significant differences among the studied cultivars and entries in studied characters. Giza 843, Nubaria 3, Rena Mora, Misr 1, and ILB 450 were among the best cultivars in seed yield. However, the number of pods/plant for Giza 843 and Misr 1 were the highest. Nubaria 3 and Rena Mora were the best in terms

of 100 seed weight. Mehasen *et al*. (2017) concluded that faba bean genotypes were significantly different in weight of seeds per plant, 100 seed weight, and seed yield/feddan. Qabil *et al.* (2018) reported highly significant differences between faba bean cultivars for yield and its attributes (plant height, number of pods/plant, number of seeds/pod, and 100 seed weight). Sheha *et al*. (2020) indicated that Giza 843 had higher number pods/plant, seed number/pod, 100 seed weight, and seed yield/fed. than the other tested cultivars. Abdelstarr (2023) found that Sakha 1 cultivar produced the highest seed yield and its components. Fertilizing faba bean plants with 50 kg P_2O_5 produced the highest values of growth characters, seed yield, and its components during two seasons. Their results revealed that Sakha 1 variety produced the highest values of seeds and biological yields in both seasons. Espain cultivar recorded the highest values of 100 seed cultivar recorded the highest values of 100 seed weight and numbers of seeds/pod during the two growing seasons, while the highest values of plant height number of pods per plant were obtained by Mariout 2 variety.

Ghareeb *et al*. (2023) mentioned that the studied cultivars significantly differed in most of the studied characteristics such as plant height, number of pods/plant, seeds number/pod, 100 seed weight, biological yield and seed yield/fed.

The objective of this study is to determine the impact of gibberellic acid levels and proper time to phosphorus application on yield and its attributes for some faba bean cultivars.

Materials and Methods

An experiment was carried out in the Assiut Univ. Exp. Farm during 2021/22 and 2022/23 seasons to study the impact of gibberellic acid and timing of phosphorus application on yield and yield attributes for some faba bean cultivars. The soil texture was clay with a pH value of 7.7 and organic matter of 1.72%. Total N was 0.9% and available P in soil at 12 ppm. The experiment was laid out in randomized complete block design (RCBD) using a strip plot within a split-plot with three replicates. The three phosphorus application times was assigned vertically while the four gibberellic acid levels were allocated horizontally, and the three fabe bean cultivars were put in sub-plot. Seeds were sown ridges 3 m long, 0.60 m apart and 0.10 m between hills and thinned to two plants per hill in the sub plot. The plot area was 9 m^2 (3.0 m length × 3.0 m width). Seeds were sown on Oct. 19th and Oct. 26th in the first and second seasons, respectively. Other cultural practices were carried out throughout the growing season. At harvest, a sample of five guarded plants was taken from each sub plot. The following measurements were recorded: plant height, number of pods and seeds/plant. Seed and biological yields per feddan were calculated based on seed and straw yield per plot. Seed samples from each plot were drawn to determine 100 seed weight (seed index).

Analysis of variance was performed on the data of all studied traits according to Gomez and Gomez (1984). The revised least significant difference (LSD) test at probability level of 5% was used for means comparisons.

Results and Discussion

Data in Table 1 highlighted that gibberellic acid had insignificant influence on all studied traits in both seasons except for pod number/plant in the 1st season and seed yield/fed. in both season where a significant effect was shown.

The data in the same Table declared that all the studied traits increased with increasing gibberellic acid levels up to 150 ppm and 250 ppm. Thus, the highest mean values were recorded by G_3 (250 ppm) for plant height in the 2nd season and both of each seeds number per/pod, biological yield and seed yield/fed. in both seasons. However, plant height in the 1st season, number of pods/plant and seed index in both seasons had the highest values. Fadhil and Almasoud (2021) mentioned that gibberellins (GA) as phytohormones play a role in balancing and regulating the growth of internodes cell elongation and the growth seed growth, and development of the leaves. These results are in harmony with those stated by Kandil *et al.* (2011), Rahman *et al.* (2018), Rathore *et al.* (2022) and Teama *et al.* (2023).

The analysis of variance in Table 1 revealed that the timing of P application had a highly significant influence on biological yield in both seasons as well as No. of pods/plant and seed index in the 1st season. Moreover, the seed yield/fed. in both seasons and seeds number/pod in the 1st season had significant response. Other traits either in both seasons of in 2nd season had non-significant response.

Data in Table 1 revealed that the tallest plant and the highest seeds number/pod were detected by P2 (P application at 2nd irrigation, in both seasons, while the highest mean values for pods number/plant were observed by P1 (P application at 1st irrigation). Moreover, the maximum mean values for seed index, biological yield, and seed yield/fed. were obtained by P3 (P application at 3rd irrigation). Therefore, obviously, the best time of P application for increasing the most yield attributes. These findings are confirmed with those mentioned by Dawood and Abou-Salama (1994), Amanullah and Zakirullah. (2010) and El-Kholy *et al.* (2019). However, Setty *et al.* (1992) reported that the seed yield did not differ significantly among number of time of spraying of the single superphosphate on gram plants (*Cicer arietinum*).

Data in Table 1 indicated that plant height in 2nd season and pods number/plant and seed index in 1st season as well as biological and seed yields/fed. in both seasons showed highly significant response for the tested cultivars.

Table 1. Main effects of gibberellic acid and phosphorus application dates on the plant height, yield components and yield for faba bean cultivars in 2021/2022 and 2022/2023 seasons.

Characters	Plant height		Number of pods/ plants		Seeds number per pod		Seed index		Biological Yield/fed (ton)		Seed yield /fed (ard.)	
	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023
Gabrillec(G)												
G0	89.63	94.13	13.57	12.27	3.32	3.64	77.25	70.47	3.27	3.38	7.46	7.56]
G1	99.83	98.89	14.04	13.06	3.55	3.68	79.72	70.20	3.44	3.40	7.96	9.15
G2	101.69	99.36	15.67	15.35	3.57	3.78	83.95	72.36	3.65	3.73	8.20	9.17
G3	100.86	101.04	15.34	13.02	3.88	3.80	81.78	72.18	3.84	3.79	8.76	9.49
F- test	**N.S**	**N.S**	**N. S**	*	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	*	*
RL.S.D	**10.25**	**6.01**	--	**1.37**	--	--	--	--	--	--	**0.77**	**1.14**
Phosphorus(P)												
P1	97.21	98.78	17.27	16.07	3.51	3.77	78.71	71.89	3.24	3.34	7.48	8.11
P2	99.18	99.71	15.65	13.51	3.69	3.84	78.62	70.30	3.16	3.40	7.87	8.54
P3	97.61	96.58	11.04	10.69	3.54	3.55	84.69	71.71	3.85	3.83	8.93	9.68
F- test	**N.S**	**N.S**	**	**N.S**	*	**N.S**	**	**N.S**	**	**	*	*
RL.S.D	**N.S**	**N.S**	**3.36**	**2.90**	**0.13**	--	**2.54**	--	**0.79**	**0.40**	**0.94**	**0.82**
Varity(V)												
V1	98.38	100.85	17.73	18.01	3.69	2.61	82.53	71.30	3.56	3.68	8.79	9.08
V2	94.77	94.05	12.42	10.71	3.43	2.60	73.76	71.15	3.21	3.26	7.00	8.14
V3	100.86	100.17	13.82	13.56	3.62	2.74	85.74	71.45	3.78	3.95	8.49	9.11
F- test	**N.S**	**	**	**N.S**	N.S	**N.S**	**	**N.S**	**	**	**	**
RL.S.D	--	**6.01**	**2.59**	**1.01**	--	--	**3.69**	--	**0.35**	**32**	**0.47**	**0.75**

G0= 0 ppm Gibberellic acid G1= 50 ppm, Gibberellic acid G2= 150 ppm Gibberellic acid, G3= 250 ppm Gibberellic acid, P1 = The first irrigation P2= The second irrigation, P3= The Third irrigation, V1= Misr1 , V2= Sakha 4and V3=Giza 843.

*, ** indicated significant and highly significant at 5% and 1% probability levels, respectively. NS: Non-significant differences.

RL.S.D =Revised least significant difference

Data in the same Table indicates that, in general, V3 (Giza 843) had the best mean values for seed index, biological yield in both seasons and seed yield in second season. V1 (Misr 1) produces the tallest plants in the 2nd season**,** highest seed number/pod and seed yield/fed. in the 1st season, as well as highest pod number/plant in both seasons. Differences for this result may be attributed to genetic variation among cultivars. Here, the results declared that pods number/plant, seeds number/pod and seed index have positive effects on maximum seed yield/fed. These results are in agreement with those detected by Bakry *et al.* **(**2011**)**, Ibrahim (2016), Naglaa *et al.* (2018), Sheha *et al.* (2020), Ghareeb *et al.* (2023).

The interaction between gibberellic acid and phosphorus application (G×P) had insignificant effect on seed number/pod in both seasons, seed index, biological yield, and seed yield in the 1st season and pods number/plant in the 2nd season. The remaining traits had non-significant effect. The tallest plants in both seasons as well as the highest pods number/pod and seeds number/pod in the 2nd season were produced by G3×P1 (250 ppm with P application at 1st irrigation), while the highest pods number/pod and seeds number/pod were detected by G3×P2 (250 ppm at P application at 2nd irrigation) in the 2nd season. Moreover, the maximum biological and seed yields were detected by G3×P3 (250 ppm with P application at 3rd irrigation) in both seasons. The maximum seed index was detected by G2×P3 (150 ppm with P application at 3rd irrigation) in both seasons.

Regarding the interaction between gibberellic acid with cultivars (G×V), the results in Table 3 indicate that G×V interaction did not show any significant effect on all studied traits in both seasons. Despite the insignificant effect for this interaction, the highest mean values for plant height led to the maximum biological yield to G3×V1 in both seasons; the highest pods number/plant in both seasons led to seeds number/pod to G3×V3; the highest seed index in the 1st season led to the maximum seed yield in both seasons to G2×V3. These results suggested that 150 ppm and/or 250 ppm for Giza 843 and Misr 1 cultivars had the best mean values, and this may be due to the behavior of the cultivar being different according to the different in gibberellic acid concentration. Abdelstarr (2023) came to the same conclusion.

Obviously, the interaction between phosphorus application with cultivars (P×V) the results in Table 4 indicate that P × V interaction had significantly affected seed index and pods number per plant in the 1st season and both plant height and seeds number/plant in the 2nd season. The other interactions had non-significant effect in this regard. P2×V3 interaction had the highest plant height in both seasons and pods number/plant in the 1st season; P3×V1 interaction had the maximum seed yield in both seasons on pods number/plant in the 2nd season; P3×V3 had the best seed index and biological yield in both seasons and P3×V2 had the highest seeds number in both seasons. These results declared that adding P at the second and/or third irrigation with any cultivar gave the beset results. Hence, different behavior cultivars to timing P application may be due to genetic make-up. Similar findings were mentioned by Abdelstarr (2023)

Table 2. Interaction effect of gibberellic acid and phosphorus on the plant height, yield components and yield for faba bean in 2021/2022 and 2022/2023 seasons.

Characters / G*P		Plant height		Number of pods/ plant		Seeds number per pod		Seed index		Biological yield/fed(ton)		Seed yield/fed(ard.)	
		2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023
G0	P1	90.72	93.07	8.38	9.22	3.40	3.61	76.15	71.71	2.98	3.22	6.73	7.01
	P2	88.50	97.19	11.42	11.10	3.48	3.57	77.59	70.15	2.92	3.17	6.51	7.50
	P3	89.67	92.12	12.37	12.37	3.83	3.74	78.00	69.54	3.21	3.28	7.93	8.19
G1	P1	96.58	98.44	14.63	12.51	3.85	3.82	77.50	71.09	3.27	3.24	7.74	8.53
	P2	102.11	102.12	12.22	14.89	3.35	3.95	83.08	72.45	3.34	3.49	9.11	8.69
	P3	103.89	96.11	12.38	11.77	3.31	3.30	84.76	67.04	3.33	3.50	8.44	8.46
G2	P1	98.00	102.15	17.44	14.86	2.78	3.28	85.39	73.40	3.40	3.55	8.05	8.59
	P2	103.56	101.89	13.67	11.57	3.70	3.63	77.44	71.37	3.33	3.51	7.94	9.46
	P3	103.50	99.08	11.01	10.39	3.47	3.82	89.02	76.55	3.70	3.70	8.61	9.49
G3	P1	103.56	101.44	17.52	22.57	4.01	4.37	75.82	67.13	3.30	3.40	7.43	8.31
	P2	102.56	97.62	20.00	16.48	4.27	4.24	76.37	71.47	3.04	3.42	9.24	10.31
	P3	93.39	99.02	14.80	14.35	3.53	3.37	86.98	73.71	3.77	3.72	9.45	10.73
F- test		**N.S**	**N.S**	**N.S**	**	**	**	**	**N.S**	*	**N.S**	*	**N.S**
RL.S.D		--	--	**10.25**	**5.21**	**0.44**	**0.74**	**11.35**	**10.25**	**6.73**	--	**1.49**	--

G0= 0ppm Gibberellic acid G1=50ppm Gibberellic acid, G2= 150ppm Gibberellic acid, G3=250ppm Gibberellic acid, P1 = The first irrigation P2= The second irrigation and P3= The Third irrigation.

*, ** indicated significant and highly significant at 5% and 1% probability levels, respectively. NS: Non-significant differences.

RL.S.D =Revised least significant difference

Table 3. Interaction effect of gibberellic acid and cultivars on the plant height, yield components and yield for faba bean in 2021/2022 and 2022/2023 seasons.

Characters / G*V		Plant height		Number of pods/ plant		Seeds number per pod		Seed index		Biological yield/fed(ton)		Seed yield/fed(ard.)	
		2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023
G0	V1	87.89	95.28	12.42	14.95	3.23	3.54	66.88	69.9	3.43	3.57	8.64	8.07
	V2	86.28	86.91	11.73	10.6	2.83	3.30	72.03	70.35	2.79	2.76	7.17	6.91
	V3	94.72	100.19	15.35	13.16	3.70	3.85	82.19	69.94	3.59	3.7	8.08	8.45
G1	V1	101.22	101.28	15.68	10.95	3.53	3.68	78.73	70.45	3.63	3.68	9.1	9.49
	V2	98.69	95.71	12.4	10.42	3.38	3.67	83.78	72.54	3.54	3.27	6.78	7.72
	V3	102.67	100.29	14.41	10.89	3.73	3.70	82.85	67.59	3.46	3.44	7.54	9.27
G2	V1	99.94	104.26	16.1	20.68	3.76	3.67	89.69	72.08	3.59	3.37	8.68	9.25
	V2	100.33	96.861	12.95	10.17	3.32	3.76	84.09	71.8	3.21	3.42	6.69	8.37
	V3	104.78	102	13.08	11.71	3.69	3.74	90.37	73.2	3.41	3.56	9.8	9.95
G3	V1	104.44	102.58	20.2	17.51	3.70	3.75	77.4	71.58	3.69	3.86	8.05	9.2
	V2	93.78	97.33	12.61	12.2	4.19	3.93	86.13	71.11	3.28	3.44	7.4	8.81
	V3	101.28	98.18	18.93	18.86	3.84	4.09	81.01	75.07	3.64	3.71	9.23	9.81
F- test		**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	N.S	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**
RL.S.D		**--**	**8.00**	**--**	**--**	**--**	**0.70**	**--**	**--**	**--**	**--**	**1.41**	**--**

G0= 0ppm Gibberellic acid G1=50ppm, Gibberellic acid, G2= 150ppm Gibberellic acid, G3=250ppm Gibberellic acid, V1= Misr1 , V2= Sakha 4and V3=Giza 843
*, ** indicated significant and highly significant at 5% and 1% probability levels, respectively. NS: Non-significant differences.
RL.S.D =Revised least significant difference

Table 4. Interaction effect of phosphorus and cultivars on the plant height, yield components and yield for faba bean in 2021/2022 and 2022/2023 seasons

Characters / P*V		Plant height		Number of pods/ plant		Seeds number per pod		Seed index		Biological yield/fed(ton)		Seed yield/fed(ard.)	
		2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023	2021/2022	2022/2023
P1	V1	98.08	100.61	21.4	21.75	3.52	3.69	88.38	73.53	3.28	3.53	8.15	8.93
	V2	95.64	96.8	14.18	13.33	3.36	3.71	71.36	69.55	2.78	2.77	6.34	7.26
	V3	97.92	98.92	16.25	13.15	4.01	4.31	76.42	70.76	3.65	3.23	7.96	8.17
P2	V1	97.33	101.09	18.07	17.00	3.92	4.01	83.29	70.84	3.2	3.41	8.41	8.28
	V2	97.83	92.92	13.41	10.03	3.15	3.30	73.52	69.27	2.96	3.17	6.92	8.14
	V3	102.37	105.11	15.48	13.51	3.66	3.97	79.05	70.79	3.31	3.61	8.29	9.16
P3	V1	99.71	100.84	13.72	15.26	3.63	3.67	76.4	71.38	3.70	3.70	9.81	10.15
	V2	90.83	92.44	9.67	8.77	3.78	3.72	85.56	71.28	3.58	3.51	7.78	8.88
	V3	102.29	96.47	9.72	8.03	3.20	3.26	92.13	74.3	3.77	3.84	9.21	10.01
F- test		**N.S**	*	**	**N.S**	**N.S**	**	**	**	**N.S**	**N.S**	**N.S**	**N.S**
RL.S.D		--	**5.98**	**7.37**	--	--	**0.50**	**7.37**	--	--	--	--	--

P1 = The first irrigation P2= The second irrigation P3= The Third irrigation. , V1= Misr1 , V2= Sakha 4and V3=Giza 843

*, ** indicated significant and highly significant at 5% and 1% probability levels, respectively. NS: Non-significant differences.

RL.S.D =Revised least significant difference

Conclusion

From the obtained results in this work, it could be concluded that applying gibberellic acid and phosphorus application dates for the faba bean cultivars gave the highest values for the most of growth, yield components and yield traits in both seasons. So, it was recommended to apply gibberellic acid 150 ppm and 250 ppm in combined with second and third phosphorus application dates. with Giza 843 cultivar for maximized faba bean productivity under the environmental condition of Assiut Governorate, Egypt.

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تأثير حمض الجبرلين ووقت إضافة السماد الفوسفاتي على المحصول ومكوناته لبعض أصناف الفول البلدي

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الملخص

اقيمت تجربة حقلية بمزرعة قسم المحاصيل البحثية بكلية الزراعة، جامعة اسيوط خلال موسمي 2022/2021، 2023/2022 لدراسة تأثير ثلاث مواعيد لإضافة التسميد الفوسفاتي (مع الرية الاولى، والثانية والثالثة) وأربعة تركيزات من حمض الجبرلين (بدون جبرلين، 50، 150 و250 جزء في المليون) على ثلاثة أصناف من الفول البلدي (مصر 1 ، سخا 4 وجيزة 843) وكان التصميم المستخدم هو قطاعات كاملة العشوائية بترتيب الشرائح المنشقة مرة واحدة في ثلاث مكررات، ومساحة الحوض 9م^2.

يمكن تلخيص اهم النتائج كما يلي

تم الحصول على أعلى قيم لمحصول البذور والمحصول البيولوجى وصفات المحصول من النباتات المعاملة بحمض الجبرلين بمعدل250،150 جزء في المليون والتسميد مع الرية الثالثة والثانية خلال موسمي النمو.

سجل الصنف جيزة 843 زيادة معنوية في كلا من معامل البذرة والمحصول البيولوجى ومحصول البذور خلال موسمي النمو.

أعطى التفاعل بين حمض الجبريللين ومواعيد التسميد الفوسفورى أطول النباتات خلال الموسمين وعدد القرون بالنبات وعدد البذور بالقرن في الموسم الاول حيث نتج من $G_3 \times P_3$ و$G_3 \times P_1$ ينما نتج من $G_3 \times P_3$ أعلى قيمة لعدد البذور والمحصول البيولوجي في الموسمين.

لم ينتج عن التفاعل بين حمض الجبرلين والأصناف أي تأثير معنوي على الصفات المدروسة.

تم الحصول على أطول النباتات من إضافة السماد الفوسفوري مع الرية الثانية للصنف جيزة 843 مع وبمعاملة نفس الصنف بإضافة السماد الفوسفورى مع الرية الثالثة تم الحصول على اعلى القيم لمعامل البذرة والمحصول البيولوجي.

بينما أدى إضافة السماد الفوسفور مع الرية الاولى والثالثة للصنف مصر 1 إلى الحصول على أعلى القيم لعدد القرون بالنبات ومحصول البذرة.

الكلمات المفتاحية: *السماد الفوسفورى، الفول البلدي، تفاعل الاصناف، حمض الجبرلين*