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INFULENCE OF SPRAYING TIMES OF SOME CHEMICAL SUBSTANCES ON YIELD AND SHEDDING OF FIELD BEAN

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ABSTRACT

Two field experiments were conducted during the two winter growing seasons of 2003/2004 and 2004/2005 at Meet-El Ameel village, Dakhlia, Egypt. Accordingly, the present study was designed to investigate the influence of spraying times of some chemical substances (Berelex [GA3], Amcotone [NA+NAA] and Ridomil [Mancozeb + Metalaxyl]) as well as water (control treatment) and their interactions on growth, flowers and pod setting and shedding as well as yield components and seed yield of faba bean (*vicia faba*, L.) cv. Sakha1. Strip plot design with four replicates was used. The most important findings could be summarized as follows:

1- Applying chemical substances (Berelex at 100 ppm), (Amcotone at 600 ppm) and (Ridomil at 2500 ppm) as foliar spraying on faba bean plants markedly increased plant height, leaf area index (LAI), number of setting flowers per plant, seed yield and its attributes.
2- Times of spraying of chemical substances showed different effects on growth and yield attributes. More, foliar spraying at 35 followed by 45 DFS markedly improved growth and faba bean yields compare
d with the other of times of spraying.
3- The interaction between chemical substances and times of spraying had significant effects on plant height, setting flowers, number and weight of pods, 100-seed weight and seed yield (Ardab/fad).
4- Generally, the maximum vegetative growth characters, controlling shedding of flowers and pods, seed yield as well as yield components were achieved due to chemical regulating (Berelex and Amcotone) when spraying at early times (35 and 45 DFS).

INTRODUCTION

Faba bean has been cultivated in many countries, 60% of total world production comes from China (FAO, 1994)[1] . Feeding value of faba bean is high, and is considered in some areas to be superior to field peas or other legumes. It is one of the most important winter crops for human consumption in the Middle East. The inadequate pollination and reduced seed setting can be major constraints to yield. Flower drop and seed abortion and pests are also major constraints to yield. This study takes place to investigate the influence of applying some chemical substances on faba bean plants at various times of spraying on abortion and drop of flowers, buds and pods, also the impact on vegetative growth and seed yields.

Chemical substances (Berelex and Amcotone) are growth regulators and organic ingredient which, in small concentration, somehow regulate physiological plant process and rarely affects alone. Gibberellins (GA3) play an essential role in many aspects of plant growth and development, such as

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seed germination, stem elongation and flower development (Yamaguchi & Kamiya, 2000). More, these growth regulators improved plant growth, number of flowers and pods, increased seed yields and yield components, as mentioned by El-Abd *et al*. (1989), El-Beheidi *et al*. (1991), Rashad and Ahmed (1996) and Abd-El-Fattah (1997). Chemical substance (Ridomil) is fungicide which, attributed mainly to a reduction in the percentage of missing plants in the field and partly to an increase in plant productivity as a result of controlling the chocolate spot (*Botrytis fabae*) as mentioned by Yeoman *et al*. (1987) and Filipowicz and Soczynski (1997).

Spraying times of chemical substances showed that the earlier times markedly improved plants vegetative growth, increased No. of flowers and pods/plant, decreased shedding and increased seed yields and yield components, as mentioned by Khare *et al*. (1993) and Nowak *et al.* (1997).

The interaction between the two factors (Chemical substances × spraying times) showed that foliar spraying of Berelex and Amcotone at early times and Ridomil at 65 DFS indicated the best values with all vegetative growth and yield characters, as mentioned by Bellucci *et al*. (1982), El Metwally (1984) and Diethelm *et al*. (1986).

Therefore, the present study was performed in order to seek the influence of some chemical substances and their application times on vegetative growth, shedding of flowers and pods as well as yields of faba bean plants under the environmental conditions of Dakhlia Governorate.

MATERIALS AND METHODS

The present study was carried out in a private field at Meet-El Ameel Village, Dakhlia, Egypt, during 2003/2004 and 2004/2005 seasons to find out the influence of some chemical substances and their times of spraying on shedding and yields of faba bean (*vicia faba* L) cv. Sakha1.

The experimental design was strip plots design with four replications. Each plot consisted of five ridges, 3.5 meters long and 60 cm apart. The size of each plot being 10.5m^2 (i.e. 1/400 fed). The vertical plots were occupied with the following chemical substances:

1- Berelex at 100 ppm, structure of Berelex material (Gibberellic Acid 9% as effective material 100%, Tartaric Acid 42.5%, Boly Glycole 4% and completing materials 44.5%).
2- Amcotone at 600 ppm (Amvac Chemical Corp., Newport Beach, CA) is a product with physiological action to induce fruit set and to stimulate plant growth in critical stages. It consists of (1.2% naphthylacetamide, 0.45% naphthylacetic acid, Sticking and Distributed materials 1.30% and Carrier materials 97.05%).
3- Ridomil at 2500 ppm (Metalaxyl 8% “w/w”, Mancozeb 64% “w/w” and Completing materials 28%).
4- Water as control treatment.

- The horizontal plots were occupied with these flowing times of spraying:

1- Spraying at 35 days from sowing, (all concentration).
2- Spraying at 45 DFS, (all concentration).

3- Spraying at 55 DFS, (all concentration).
4- Spraying at 65 DFS, (all concentration).
5- Spraying at (35 and 45) DFS, ($^1/_2$ + $^1/_2$ concentration).
6- Spraying at (35, 45 and 55) DFS, ($^1/_3$ + $^1/_3$ + $^1/_3$ concentration).
7- Spraying at (35, 45, 55 and 65) DFS, ($^1/_4$ + $^1/_4$ + $^1/_4$ + $^1/_4$ concentration).

Culture Practices:

Sowing date of faba bean (cv. Sakha1) was on 10th of November in both seasons. Preceding summer crop was Rice in both seasons. Faba bean seeds were soaked in water for 24 hours before planting to raise seed germination (wet method). Planting was performed on both sides of ridge at 25 cm between hills. Thinning was done at 21 days from sowing to leave healthy two plants/hill, expressed 112000 plants / fad. Hand hoeing was done every 21 days to control weeds (i.e. before time of irrigations).

The experimental units were fertilized with calcium super phosphate (15.5% p_2o_5) at 100 kg/fad added to soil during tillage operation and before sowing. 48 kg k_2o/fad of potassium sulphate (48%k_2o) was added to field in two equal portions, before the first and second irrigation. Nitrogen in the form of ammonium sulphate (20%N) at the rate of 15 kg N/fad as starter dose and was added before the first irrigation. However, other agricultural practices were done as commonly followed in the district. Harvesting was in April 13th and 17th in the 1st and 2nd seasons, respectively.

Studied Characters:

I- Vegetative growth:

During the growing period and the end of vegetative growth, randomized samples of ten plants were obtained from each experimental unit to estimate:

1- Leaf area index: It was measured as following formula out lined by Radford's (1967).

LAI = (Leaf area/Pant) / (Land area/Pant).

2- Number of setting flowers per plant.

II- Yield and its components:

At harvest, ten plants were obtained from each experimental unit to estimate:

3- Plant height (cm): Plant height was measured for each plant of the samples from the soil surface to the top of the plant.
4- Number of pods per plant.
5- Number of seeds per plant.
6- Seed yield / plant (g).
7- 100-seed weight (g).
8- Seed yield (Ardab/fad): plot area was harvested to estimate seed yield (Ardab/fad). (Ardab = 155 kg).
9- Protein percentage. Protein percentage was estimated by Micro-Kjeldahl method (A.O.A.C., 1970) in faba bean dry seeds.

Statistical analysis:

All data were subjected to statistical analysis by the technique of analysis of variance (ANOVA) of the strip plot design out lined by Gomez and

Gomez (1984).The differences among treatment means were tested at 5% levels of significance, according to revised LSD5% test, as mentioned by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

A: Chemical substances effects:

1- Vegetative growth:

1.1- Leaf Area Index.

It could be seen from Table1, in both seasons foliar spraying of Berelex at 100 ppm markedly increased LAI compared with Amcotone and the untreated control. Furthermore, Amcotone at 600 ppm markedly increased LAI compared with the control treatment. Finally, Ridomil at 2500 ppm posses marked increase in LAI compared with the control. The increase in LAI of faba bean plants could be attributed to the increase in both cell division and cell elongation. These results are in good agreement with those reported by Ibrahim *et a*l. (1988) El-Beheidi *et al*. (1991) and Abd-El-Fattah (1997).

Table 1: Leaf area index, number of setting flowers per plant and plant height (cm) of faba bean plants as affected by times of spraying of some chemical substances during 2003/2004 and 2004/2005 seasons.

Characters / Treatments	Leaf area index		No. of setting flowers / plant		Plant height (cm)	
	1st	2nd	1 st	2 nd	1 st	2 nd
A: Chemical Substances						
1- Berelex (100 ppm)	4.82	4.51	24.01	27.17	132.21	128.95
2- Amcotone (600 ppm)	4.75	4.46	21.66	24.11	130.23	127.51
3- Ridomil (2500 ppm)	4.55	4.38	20.51	22.06	125.57	123.15
4- Water (control)	4.48	4.28	17.25	18.70	125.49	122.94
F- Test	*	*	*	*	*	*
LSD 5%	0.05	0.06	0.7	1.16	1.59	1.13
B: Times of spraying						
1- Spraying at 35 DFS	4.73	4.47	23.49	24.90	129.85	127.50
2- Spraying at 45 DFS	4.66	4.43	21.74	23.63	129.15	126.26
3- Spraying at 55 DFS	4.67	4.40	21.38	22.92	128.05	125.15
4- Spraying at 65 DFS	4.64	4.43	20.75	22.99	128.19	124.59
5- Spraying at 35+45 DFS	4.64	4.42	20.31	23.34	127.92	126.94
6- Spraying at 35+45+55 DFS	4.61	4.37	19.46	21.81	127.71	125.36
7- Spraying at 35+45+55+ 65 DFS	4.57	4.32	18.88	21.48	127.73	124.65
F- Test	*	*	*	*	*	*
LSD 5%	0.07	0.07	1.32	1.26	1.28	1.23
Interaction A*B	NS	NS	*	*	*	*

1.2- Number of setting flowers per plant.

Data in Table 1 show that chemical regulating substances (Berelex at 100 ppm and Amcotone at 600 ppm) significantly improved number of flowers/plant compared with Ridomil and the untreated control. Moreover,

Ridomil at 2500 ppm increased number of setting flowers compared with the untreated control. GA3 may alter the concentration of endogenous IAA and/or GA3 and decrease the level of ABA, which in turn could decrease shedding of flowers (Abd-El-Fattah *et al*., 1997). Similar results were also obtained by Clifford *et al*. (1992), Aldesuguey and Gaber (1993) and Abd-El-Fattah (1997).

2- Yield and its components:

2. 1- Plant height (cm).

Data in Table 1 show that in both seasons, faba bean which received foliar applications of Berelex or Amcotone were significantly higher as compared with Ridomil and the untreated control. Moreover, no marked differences were detected between Ridomil and the control. The increase in plant height as a response to GA3 occurs as a consequence of cell elongation. GA3 elongates the primary stalk and growth centers which cause development of stem elongation, as reported by Yamaguchi and Kamiya (2000). These results are in fine with those reported by El-Beheidi *et al*. (1991) and Abd-El-Fattah *et al*. (1997).

2.2- Number of pods per plant.

Data in Table 2 showed that the application of chemical substances markedly increased number of pods/plant as compared with the untreated control. The highest values recorded by Berelex followed by Amcotone and Ridomil compared with the untreated control in the first and second seasons, respectively. It was suggested that GA3 leading to decreased ethylene production in the shoot and/or increased cytokinin and ABA levels in the xylem sap are those most likely to reduce premature reproductive abscission, as mentioned by Clifford *et al.* (1992). Moreover, Foliar spraying Ridomil (Mancozeb) significantly increased the number of green/dry pods per plant and refer that to a reduction in the percentage of missing plants in the field and high efficacy in controlling chocolate spot, as reported by El-Sayed *et al*. (1996). Similar results were obtained by El-Beheidi *et al*. (1991) and Abd-El-Fattah (1997) with respect to GA3 and NAA spray on faba bean plants and Yeoman *et al*. (1987) and El-Fiki (1994) respecting with spraying Mancozeb on faba bean.

2. 3- Number of seeds per plant.

Data in Table 2 showed that application of Berelex markedly increased number of seeds/plant as compared with Amcotone, Ridomil and the control. Moreover, foliar spraying of Amcotone significantly improved number of seed/plant compared with Ridomil and the untreated control treatment. Finally, the application of Ridomil significantly increased the number of seeds per plant as compared with the control treatment. The increment in each of number of flowers per plant, number of pods pre plant and number of seeds per pod contribute to increase the number of seeds per plant. These findings are in harmony with those obtained by El-Beheidi *et al*. (1991), Khare *et al*.(1993) and Nowak *et al*. (1997) with respect to GA3 and NAA spray on faba bean plants and El- Sayed *et al*. (1996) with regard to Mancozeb and Metalaxyl spray on faba bean plants.

2. 4- Seed yield per plant (g).

Data in Table 2 showed that in both seasons application of Berelex at 100 ppm markedly increased seed yield/plant (31.69 and 35.14 g) followed by Amcotone at 600 ppm (28.23 and 32.63 g) and Ridomil at 2500 ppm (26.24 and 30.21 g) compared with the untreated control (22.44 and 24.24 g) in the first and the second seasons, respectively. The increase in seed yield/plant could be attributed to the more increases in vegetative growth characters, increases pod setting percentage, reduction in abscission percentage and increasing seed number/pod, as mentioned by Abd-El-Fattah (1997). Similar results were obtained by Aldesuguey and Gaber (1993) with respect to GA3 and NAA spray on faba bean plants and El-Sayed *et al*. (1996) with respect to Mancozeb on faba bean plants.

2. 5- 100-seed weight.

It could be observed from Table 3in both seasons, that foliar spraying of Berelex at 100 ppm markedly increased 100-seed weight followed by Amcotone at 600 ppm and Ridomil at 2500 ppm compared with untreated control in the first and second seasons, respectively. It is important to state that the increases in number of pods per plant, weight of pods per plant and seed weight per plant lead to increase in 100-seed weight. These results are in line with those reported by Ibrahim *et al*. (1988), El-Abd *et al*. (1989) and Abd-El-Fattah (1997) with respect to GA3 and NAA on faba bean plants and El-Fiki (1994) with regard to Mancozeb on faba bean.

Table 2: No. of pods/plant, No. of seeds/plant and seed yield/plant of faba bean plants as affected by times of spraying of some chemical substances during 2003/2004 and 2004/2005 seasons.

Characters / Treatments	No. of pods/plant		No. of seeds/plant		Seed yield/plant (g)	
	1st	2nd	1st	2nd	1st	2nd
A: Chemical Substances						
1- Berelex (100 ppm)	20.64	22.13	38.85	41.62	31.69	35.14
2- Amcotone (600 ppm)	19.03	20.79	36.07	38.96	28.23	32.63
3- Ridomil (2500 ppm)	18.43	20.05	34.80	36.62	26.24	30.21
4- Water (control)	14.93	17.19	29.85	30.91	22.44	24.24
F- Test	*	*	*	*	*	*
LSD 5%	0.66	0.76	0.73	1.01	1.17	1.36
B: Times of spraying						
1- Spraying at 35 DFS	19.19	21.84	37.22	39.08	28.88	32.49
2- Spraying at 45 DFS	18.60	20.55	36.02	38.00	27.80	31.74
3- Spraying at 55 DFS	18.04	20.09	35.63	36.52	27.49	30.83
4- Spraying at 65 DFS	18.65	20.05	34.32	37.63	27.37	30.74
5- Spraying at 35+45 DFS	18.19	19.66	34.03	37.13	26.86	30.18
6- Spraying at 35+45+55 DFS	17.52	19.28	33.88	35.65	26.22	29.26
7- Spraying at 35+45+55+ 65 DFS	17.62	18.80	33.13	35.18	25.44	28.64
F- Test	*	*	*	*	*	*
LSD 5%	0.79	1.00	1.17	1.31	1.13	1.14
Interaction A*B	*	*	*	*	*	*

2. 6- Seed yield (Ardab/fad).

From Table 3, it could be seen that, foliar spraying of Berelex markedly increased seed yields Ardab/fad (11.82 and 12.13 Ardab/fad), followed by Amcotone (11.62 and 11.74 Ardab/fad) and Ridomil (11.52 and 11.57 Ardab/fad) compared with the untreated control treatment (11.21 and 11.19 Ardab/fad) in the first and second seasons, respectively. Review of literature showed positive correlation between seed yield and each of number of branches and pods per plant, number of seed per pod, 100-seed weight as well as seed dry matter content, as reported by El-Fieshawy and Fayed (1990) and Abd-El-Fattah (1997). With regard to increasing seed yield/fad by Ridomil, it was attributed mainly to a reduction in the percentage of missing plants in the field and partly to an increase in plant productivity because of controlling the chocolate spot and BYMV in plots, as reported by El-Sayed *et al*. (1996).These findings are in harmony with those obtained by , Ibrahim *et al*. (1988), El-Beheidi *et al*. (1991), Khare *et al*. (1993) and Abd-El-Fattah (1997) with respect to GA3 and NAA spray on faba bean plants and Yeoman *et al*. (1987) and El-Sayed *et al*. (1996) with respect to Mancozeb on faba bean plants.

Table 3: 100-seed weight, seed yield (Ardab/fad) and protein % of faba bean plants as affected by times of spraying of some chemical substances during 2003/2004 and 2004/2005 seasons.

Characters / Treatments	100-seed weight (g)		seed yield (Ardab/fad)		Protein %	
	1st	2nd	1st	2nd	1st	2nd
A: Chemical Substances						
1- Berelex (100 ppm)	78.26	78.69	11.82	12.13	27.83	27.16
2- Amcotone (600 ppm)	76.51	77.03	11.62	11.74	27.00	26.85
3- Ridomil (2500 ppm)	75.76	76.29	11.52	11.57	26.48	25.98
4- Water (control)	74.47	74.58	11.21	11.19	26.19	25.75
F- Test	*	*	*	*	*	*
LSD 5%	0.9	1.23	0.06	0.09	0.45	0.66
B: Times of spraying						
1- Spraying at 35 DFS	77.00	78.27	11.68	11.82	27.47	26.86
2- Spraying at 45 DFS	76.98	76.80	11.57	11.76	26.95	26.46
3- Spraying at 55 DFS	75.96	76.55	11.55	11.69	26.90	26.44
4- Spraying at 65 DFS	76.05	76.70	11.53	11.61	27.20	26.52
5- Spraying at 35+45 DFS	76.40	76.74	11.53	11.67	26.40	26.70
6- Spraying at 35+45+55 DFS	75.74	76.17	11.49	11.55	26.59	26.26
7- Spraying at 35+45+55+65 DFS	75.63	75.29	11.41	11.50	26.63	25.79
F- Test	N.S	*	*	*	NS	NS
LSD 5%	-	0.93	0.06	0.05	-	-
Interaction A*B	N.S	*	*	*	NS	NS

2. 7- Protein percentage.

From Table 3, it could be observed that foliar spraying of Berelex markedly increased protein followed by Amcotone and Ridomil compared with control treatment in both seasons, respectively. Such increases may be attributed to the increment in dry matter content as a result of chemical application the regulation effect of GA3 on nucleic acids, synthesis that direct

protein synthesis and stimulate the formation of some enzymes and other essential compounds for plant growth, as reported by Ibrahim *et al*. (1988). These results are in good agreement with those of Abd-Alla and Abdel-Wahhab (1995), Abd-El-Fattah (1997) and Gaber *et al*. (2000).

B: Times of spraying effects.

1- Vegetative growth:

1.1- Leaf Area Index.

Looking for the data in Table 1, it could be seen that in the first season, time of foliar application at 35 DFS markedly improved LAI compared with foliar application at 65, (35 and 45), (35, 45 and 55) or spraying at (35, 45, 55 and 65) DFS. In the second season, foliar spraying at 35 DFS recorded the most significant increase in LAI compared with foliar application at (35, 45 and 55) or (35, 45, 55 and 65) DFS, respectively. El-Abd *et al*. (1989) and Abd-El-Fattah *et al*. (1997) obtained similar results with our study.

1.2- Number of setting flowers per plant.

Data in Table 1 show that foliar spraying at 35, 45, 55 or 65 DFS or at (35 and 45) DFS significantly increased number of setting flowers as compared with the application at (35, 45 and 55) or (35, 45, 55 and 65) DFS in both seasons. It is suggested that the early one time foliar spraying is more effective in increasing flowering set. Similar results were found by Khare *et al*. (1993), Abd-El-Fattah *et al*. (1997) and Nowak *et al.* (1997).

2- Yield and its components:

2.1- Plant height (cm).

From Table 1 it could be seen the highest values were recorded with foliar spraying at 35 DFS, which were (129.85 and 127.50 cm) followed by 45 DFS (129.15 and 126.26 cm) in the first and second seasons, respectively compared with other spraying times. Moreover, foliar spraying at 35 DFS did not differ significantly with foliar spraying at 45 DFS in both seasons. Data were in meat with those found by El-Abd *et al.* (1989) and Nowak *et al*. (1997).

2.2- Number of pods per plant.

Data in Table 2 showed that time of foliar spraying at 35 DFS significantly increased number of pods per plant compared with the other times of foliar spraying. The greatest values obtained with foliar spraying at 35 DFS (19.19 and 21.84) followed by spraying at 45 DFS (18.60 and 20.55) compared with the rest of spraying times. Similar results are reported by other investigator among them Clifford *et al*. (1992), Khare *et al*. (1993) and Nowak *et al*. (1997).

2.3- Number of seeds per plant.

The Table 2 showed that in both seasons, spraying time of chemical substances at 35 DFS markedly increased number of seeds per plant as compared with rest of different times. Moreover, no differences were recorded between foliar spraying at 45 or 55 DFS. Similar results obtained by

Khare *et al*. (1993) respecting GA3 and NAA before flowering and Abd-El-Fattah *et al*. (1997) regarding GA3 at 30 and 50 DFS.

2.4- Seed yield per plant (g).

Data in Table 2 show that in the first season, foliar spraying time at 35 DFS markedly improved seed yield per plant as compared with the rest of times of spraying except at 45 DFS. In the second season, each foliar spraying once i.e. at 35, 45, 55 or 65 DFS significantly increased seed yield g/plant as compared with the rest of foliar spraying times. These results are in harmony with those reported by Khare *et al*. (1993) and Abd-El-Fattah *et al*. (1997).

2.5- 100-seed weight.

From Table 3 in the second season, foliar spraying of chemical substances in the early growth stage at 35 DFS markedly increased 100-seed weight as compared with the rest times of applications. Similar results were obtained by Abd-El-Fattah *et al*. (1997).

2.6- Seed yield (Ardab/fad).

From Table 3it could be observed that in the first season, foliar spraying at 45, 55, 65 or (35 and 45) DFS significantly increased seed yields/fad if compared with foliar spraying at (35, 45 and 55) or (35, 45, 55 and 65) DFS. More, in the second season, foliar spraying at 45 DFS significantly increased the seed yield as compared with foliar application at 55 DFS. Furthermore, the single application at 55 DFS statistically increased the yield as compared with foliar spraying at 65 DFS. The maximum seed yields (Ardab/fad) were observed with foliar spraying at 35 DFS (11.68 and 11.82 Ardab/fad) followed by foliar spraying at 45 DFS (11.57 and 11.76 Ardab/fad) compared with the lowest seed yields (Ardab/fad) which were recorded by foliar spraying at (35, 45, 55 and 65) DFS (11.41 and 11.50 Ardab/fad) in the first and second seasons, respectively. These results are in harmony with those obtained by Khare *et al*. (1993) and Abd-El-Fattah *et al*. (1997).

2.7- Protein percentage.

Data in Table 3 showed that in both seasons, no differences were detected by foliar spraying at all times of spraying in protein %. Foliar spraying at 35 DFS recorded maximum protein % as compared with the minimum values were recorded by foliar spraying at (35 and 45) and (35, 45, 55 and 65) DFS in the first and second seasons, respectively.

C: Interaction effects between chemical substances and times of spraying:

1- Vegetative growth:

1.1- Number of setting flowers per plant.

It can also, be observed from Table 4 that the highest number of flowers/plant was obtained by Berelex when sprayed at 35 DFS (30.93 and 32.77) as compared with the lowest value obtained with the control treatment (16.17 and 16.84) in the first and second seasons, respectively. Results obtained by El Metwally (1984) and Diethelm *et al.* (1986) respecting with GA3 on faba bean plants are in harmony with our study.

2- Yield and its components:

2. 1- Plant height (cm).

Data from Table 4 showed that treatments Berelex and Amcotone significantly increased plant height compared with Ridomil and the untreated plants (control). These results are in agreement with those reported by El Metwally (1984) respecting with GA3 on faba bean plants.

2.2- Number of pods per plant.

Data in Table 5 showed that Berelex at 35 DFS recorded the highest values compared with the lowest values were recorded with the control at 55 and (35 and 45) DFS in the first and second seasons, respectively. Similar results were also reported by Bellucci *et al*. (1982) and El Metwally (1984) respecting with spraying GA3 on faba bean.

2.3- Number of seeds per plant.

Data showed in Table 5 that the greater number of seeds per plant was observed by Berelex at 35 DFS (45.37 and 46.67), while the lowest values recorded with water treatment at 35and45 DFS (28.71 and 29.29) in the first and second seasons, respectively. These results are in harmony with those indicated by Bellucci *et al*. (1982) and El Metwally (1984).

2.4- Seed yield per plant (g).

Data in Table 6 indicated that Berelex at 35 DFS markedly increased seed yield g/plant as compared with the rest of treatments. The greatest values recorded by Berelex at 35 DFS, while the lowest values were obtained with the untreated control at (35 and 45) and (35, 45, 55 and 65) DFS in the first and second seasons, respectively. These results are in line with those reported by Bellucci *et al*. (1982), El Metwally (1984) and Diethelm *et al*. (1986).

2.5- 100-seed weight.

Data from the Table 6 show that in the second season, spraying Berelex at 100 ppm at 35 DFS markedly increased 100-seed weight compared with the other values of the interactions.

2.6- Seed yield (Ardab/fad).

It could be seen from Table 7 that the highest seed yields/fad recorded with foliar spraying Berelex at 35 DFS which were (12.10 and 12.47 Ardab/fad) compared with untreated control treatment at (35, 45, 55 and 65) and (35, 45 and 55) DFS (11.15 and 11.11 Ardab/fad) in the first and second seasons, respectively. Results reported by Bellucci *et al*. (1982), El Metwally (1984) and Diethelm *et al*. (1986) are in harmony with our study.

4+5

T6+7

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تأثير مواعيد الرش ببعض المواد الكيماويه على التساقط والمحصول في الفول البلدي

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أجريت تجربتان حقليتان خلال الموسمين الشتويين (٢٠٠٣/٢٠٠٤ و ٢٠٠٤/٢٠٠٥) بمزرعة خاصه بقرية ميت العامل محافظة الدقهلية، لدراسة تأثير الرش ببعض المواد الكيماويه (البيريلكس، الأمكوتون و الرودميل) ومواعيد الرش على صفات النمو الخضرية و تساقط الأزهار والقرون ومحصول الفول البلدي (صنف سخا واحد).

وقد أظهرت النتائج بوجه عام أن رش المواد الكيماوية أدى إلي تحسين صفات النمو الخضريه لنباتات الفول البلدي و إنخفاض نسبة تساقط الأزهار والقرون كما أدى إلي زيادة محصول بذور الفول البلدي.

وجد أن رش نباتات الفول البلدي بمنظمات النمو (البيرليكس والأمكوتون) في أوقات رش مبكرة من حياة النبات (٣٥ أو ٤٥ يوم من الزراعة) قد أدى إلي تحسين صفات النمو الخضري متمثلة في إرتفاع النبات ودليل مساحة الأوراق وعدد الأفرع على النبات وإنخفاض نسبة التساقط للأزهار والقرون وإعطاء عدد أكبر من القرون الجافه وزيادة محصول بذور الفول البلدي، وذلك مقارنة بمواعيد الرش المتأخرة أو الرش على أكثر من مرة. كما أدى رش النباتات بمادة الرودميل عند ٦٥ يوم من الزراعه إلى الحصول على أفضل النتائج عند مقارنة مادة الرودميل بمعاملة الكنترول.

وضح من نتائج التفاعلات تفوق النباتات التي عوملت بمادة البيرليكس عند ٣٥ يوم من الزراعة في جميع صفات النمو الخضرى والثمري لمحصول الفول البلدي.

وتوصي الدراسة باستخدام منظمات النمو (البيرليكس أو الأمكوتون) في مراحل مبكرة من عمر النبات ومادة الرودميل بعد ٦٥ يوم من الزارعه وذلك بالرش على نباتات الفول البلدي حيث تعمل على تشجيع النباتات على الإزهار وتقليل ومقاومة تساقط الأزهار والقرون وزيادة نسبة العقد وزيادة محصول البذور الكلي للفول البلدي تحت ظروف الدراسة.

Table (4): No. of setting flowers/plant and plant height of faba bean plants as affected by the interaction between chemical substances and times of spraying during 2003/2004 and 2004/2005 seasons.

Ch.Sub / S.Times	Number of setting flowers per plant								Plant height							
	1st				2st				1nd				2st			
	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water
1- At 35 DFS	30.93	25.37	20.05	17.62	32.77	27.12	21.02	18.70	135.76	132.71	125.40	125.52	133.35	130.16	123.95	122.53
2- At 45 DFS	26.31	23.21	21.06	16.37	28.06	25.73	22.03	18.71	133.54	131.65	125.22	126.20	130.60	128.76	123.28	122.39
3- At55 DFS	23.70	22.19	21.68	17.94	27.27	24.13	23.43	16.84	132.66	130.47	124.87	124.22	127.98	127.19	122.39	123.04
4- At 65 DFS	21.86	20.14	23.42	17.57	25.11	22.57	24.65	19.64	131.30	129.80	125.89	125.78	126.88	126.76	122.04	122.67
5- At 35+45 DFS	22.30	21.37	20.17	17.42	26.63	24.42	22.08	20.21	131.98	129.01	125.54	125.15	128.43	128.23	123.23	123.88
6- At 35+45+ 55 DFS	21.75	19.81	18.62	17.67	25.61	22.50	21.19	17.93	130.18	128.87	126.14	125.64	127.89	126.02	124.37	123.17
7- At 35+45 +55+65 DFS	21.25	19.53	18.56	16.17	24.73	22.28	20.06	18.85	130.05	129.08	125.91	125.90	127.51	125.42	122.79	122.88
F.Test	*				*				*				*			
LSD 5%	1.98				2.14				2.02				2.30			

Table (5): No. of pods/plant and No. of seeds/plant of faba bean plants as affected by the interaction between chemical substances and times of spraying during 2003/2004 and 2004/2005 seasons.

Ch.Sub / S.Times	Number of pods per plant								Number of seeds per plant							
	1st				2st				1nd				2st			
	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water
1- At 35 DFS	23.65	20.89	17.99	14.24	27.03	23.22	19.57	17.53	45.37	40.19	33.43	29.89	46.67	43.20	35.53	30.93
2- At 45 DFS	21.83	19.36	18.21	15.01	23.00	21.24	20.43	17.54	41.23	37.16	35.23	30.48	43.04	40.56	36.21	32.18
3- At55 DFS	20.74	18.93	18.64	13.84	21.66	20.72	21.03	16.96	39.11	36.48	35.99	30.96	40.43	38.29	37.22	30.14
4- At 65 DFS	19.45	18.41	20.66	16.08	20.40	19.93	21.81	18.05	36.81	34.02	37.21	29.22	39.38	38.17	40.13	32.84
5- At 35+45 DFS	19.92	18.68	19.22	14.94	21.39	20.21	20.11	16.93	37.39	36.12	33.92	28.71	41.86	39.87	37.48	29.29
6- At 35+45+ 55 DFS	19.58	18.36	17.21	14.92	21.24	20.38	19.07	16.42	36.71	34.35	33.97	30.49	40.07	36.52	35.00	31.00
7- At 35+45 +55+65 DFS	19.33	18.59	17.11	15.45	20.16	19.83	18.34	16.87	35.33	34.15	33.89	29.13	39.89	36.09	34.79	29.96
F.Test	*				*				*				*			
LSD 5%	**1.59**				**1.84**				**2.42**				**1.74**			

Table (6): Seed yield/plant and 100-seed weight as affected by the interaction between chemical substances and times of spraying during 2003/2004 and 2004/2005 seasons.

Ch.Sub / S.Times	Seed yield/plant (g)								100-seed weight (g)			
	1st				2nd				2nd			
	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water
1- At 35 DFS	36.83	32.10	24.91	21.66	39.90	35.34	28.57	25.42	82.62	79.65	77.31	73.51
2- At 45 DFS	33.07	29.24	26.36	22.54	36.45	33.65	30.63	26.23	79.56	77.82	76.37	73.46
3- At55 DFS	31.09	28.16	26.86	23.85	34.86	32.17	31.68	24.64	78.57	76.67	76.14	74.83
4- At 65 DFS	30.27	27.81	29.00	22.39	33.44	30.83	33.69	25.01	77.52	76.52	77.48	75.29
5- At 35+45 DFS	31.85	27.77	26.50	21.33	35.26	32.60	29.88	22.99	78.46	76.94	76.09	75.47
6- At 35+45+ 55 DFS	30.06	26.60	25.26	22.97	33.22	31.91	28.62	23.29	77.25	76.36	76.01	75.06
7-At 35+45 +55+65 DFS	28.67	25.95	24.76	22.37	32.84	31.19	28.42	22.12	76.87	75.26	74.62	74.41
F.Test	*				*				*			
LSD 5%	1.93				2.31				2.11			

Table (7): Seed yield (Ardab/fad) as affected by the interaction between chemical substances and times of spraying during 2003/2004 and 2004/2005 seasons.

Ch.Sub / S.Times	Seed yield (Ardab/fad)							
	1st				2nd			
	Berelex	Amcotone	Ridomil	Water	Berelex	Amcotone	Ridomil	Water
1- At 35 DFS	12.10	11.80	11.50	11.23	12.47	12.07	11.58	11.16
2- At 45 DFS	11.91	11.67	11.52	11.18	12.31	11.86	11.62	11.26
3- At55 DFS	11.81	11.65	11.56	11.19	12.18	11.74	11.65	11.21
4- At 65 DFS	11.68	11.51	11.66	11.29	11.99	11.62	11.70	11.13
5- At 35+45 DFS	11.79	11.61	11.57	11.17	12.19	11.72	11.54	11.22
6- At 35+45+ 55 DFS	11.71	11.54	11.49	11.24	11.95	11.62	11.51	11.11
7- At 35+45 +55+65 DFS	11.64	11.54	11.33	11.15	11.81	11.52	11.41	11.25
F.Test	*				*			
LSD 5%	0.16				0.12			