

## EFFECT OF IRRIGATION FREQUENCY AND GLYPHOSATE (ROUNDUP) APPLICATION ON BROOMRAPE CONTROL AND YIELD OF FABA BEAN (*Vicia faba* L.)

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### ABSTRACT

Two field experiments were conducted in naturally infested fields with broomrape (*Orobanche crenata* Forsk.) at Sids Agricultural Research Station, Beni Souif governorate during two successive seasons 2000/01 and 2001/02 to study the effect of both number of irrigations at two, four and six weeks intervals and glyphosate (Roundup) application at 6 & 8, 8 & 10, 6 & 8 & 10 and 7 & 10 & 13 weeks after sowing on controlling broomrape, yield and its components in faba bean (*Vicia faba* L.). Results revealed that irrigation after two weeks interval followed by four weeks intervals caused decreasing on number and dry weight of broomrape by 57.9 & 35.7% and 28.1 & 14.2% in 2000/01 season and 24.2 & 11.5% and 17.9 & 5.9% percent in 2001/02 season, respectively, as compared with six weeks intervals. The same treatment gave the highest values for plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) in both seasons. Irrigation for two and four weeks intervals increased significantly seed yield/fed. by 10.2 and 1.6% & 15.4 and 7.8%, respectively, in both 2000/01 and 2001/02 seasons compared with irrigation at six weeks intervals.

All broomrape control treatments decreased significantly number and dry weight of broomrape spikes and increased significantly plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) in both 2000/01 and 2001/02 seasons. The highest reduction percentage on number and dry weight of broomrape spikes obtained by glyphosate at three times 7 & 10 & 13 were 99.2 & 98.9% and 98.3 & 99.1%, respectively, in 2000/01 and 2001/02 seasons as compared with untreated plots. For seed yield (ardab/fed.) the same treatment gave increases by 56.9 and 266.7%, respectively, in both seasons as compared with untreated treatment.

The interaction between both times of irrigation and glyphosate application was significantly decreased number and dry weight of broomrape spikes and this reflected on yield and its components. These results indicate that heavy infested soil with broomrape it is possible to irrigate at two weeks intervals and spray glyphosate three times to get rid of broomrape injury in faba bean.

### INTRODUCTION

Broomrape (*Orobanche spp.*) are noxious root parasitic weeds cause reduction in quality and quantity of legumes and several other crops. In Egypt, the attention has been drawn to the broomrape problem in faba bean (*Vicia faba* L) since 1931 when Zaghloul started to study the nature of the problem and to seek its solution. There are many methods for controlling this parasitic weed but, every method was not sufficient by it self. There is a little work had been done about irrigation Al-Gibaly *et al.* (1968) and Tawdros *et al.* (1969). Abedl-Hamed (1996) reported that reduced irrigation decreased the numbers of *Orobanche crenata* attacking the crop, but resulted in significantly more damaging effect. Herbicides are the most important of the available methods for *Orobanche spp* control in diverse crops (Foy *et al.* 1989) and

Garcia-Torris (1994). Glyphosate at 60 g.ai./ha. applied late post emergence in broad bean (*Vicia faba*) as reported by Garcia-Torris *et al.* (1987). Glyphosate was recommended for controlling broomrape in faba bean field for several years in Egypt, Zahran *et al.* (1981), El-Shandidy *et al.* (1984), Hassanein *et al.* (1990 and 1998), Hassanein and Salim (1999) and Ibrahim *et al.* (1997) they reported that two or three sequential application of glyphosate at three weeks intervals, starting at the beginning of flowering of the host is the most effective method for controlling broomrape in faba bean fields. The correct use of glyphosate for broomrape control in faba bean is still very limited due to the low marginal safety to faba bean. The present study is an attempt to find the suitable intervals of irrigation and use glyphosate with different times of application to control broomrape in faba bean.

## **MATERIALS AND METHODS**

Two field experiments were carried out during 2000/01 and 2001/02 winter seasons at Sids Agricultural Research Station in Beni Souif governorate to study the effect both of irrigation intervals and number of glyphosate (Roundup) applications and their interactions on broomrape control, yield and its components of faba bean. Faba bean cultivars Yousef El-Sedeak was planted in 1<sup>st</sup> November in both seasons. The normal cultural practices i.e. fertilization, insects and diseases control were carried out according to the local recommendations. The herbicidal treatments were sprayed with a knapsack sprayer equipped with one nozzle boom. The water volume used was 200 liters/fed. Soil texture of the experimental plots in both seasons was clay. The treatments were arranged in a split plot design in four replications. The sub plot area was 10.5 m<sup>2</sup> contains five rows 3.5 m length and 60 cm apart as follows:-

### **A - Main plots (Irrigation):-**

1. Irrigation at two weeks intervals (9 irrigations).
2. Irrigation at four weeks intervals (4 irrigations).
3. Irrigation at six weeks intervals (3 irrigations).

Regime of irrigation systems had been started after first post planting irrigation (Mohaya).

### **B - Sub - plot (times of Roundup application):-**

- 1-Glyphosate {N - (phosphonomethyl) glycine} known commercially as Roundup (48% WSC) used at 2 times with rate of 75 cc/fed. at 6 and 8 weeks after sowing.
- 2-Roundup (48% WSC) used at 2 times with rate of 75 cc/fed. at 8 and 10 weeks after sowing.
- 3-Roundup (48% WSC) used at 3 times with rate of 75 cc/fed. at 6, 8 and 10 weeks after sowing.
- 4-Roundup (48% WSC) used at 3 times with rate of 75 cc/fed. at 3 weeks intervals starting from faba bean flowering (7 & 10 & 13).

- 5-Hand pulling at 12 and 14 weeks from sowing.
- 6-Untreated (Check).

**Data recorded:-**

**A – On broomrape:-**

- 1- Number of broomrape spikes/m<sup>2</sup>.
- 2- Dry weight of broomrape (g/m<sup>2</sup>).

**B – On yield and its components:-**

At harvest mid April, samples of ten plants were collected at random from the central random for the central rows of each plot to study the following criteria:-

- 1 - Plant height (cm).
- 2 - Number of branches/plant.
- 3 - Number of pods/plant.
- 4 - Weight of pods (g/plant).
- 5 - Seeds weight (g/plant).
- 6 - Seed yield (ardab/fed.)

Seed yield (ardab/fed.) was calculated from the weight of seeds obtained from each plot.

**Statistical analysis:-**

The collected data were subjected to proper statistical analysis of split plot design according to procedure outlined by Snedecor and Cochran (1967). Means were compared at 5% level of significance by the least significant different (L.S.D) test.

## **RESULTS AND DISCUSSION**

**A – Effect of main factors.**

**A1 – Effect of irrigation frequency.**

**A1 – 1- On broomrape.**

Table (1) shows that shortening irrigation intervals decreased number and dry weight of broomrape spikes in both 2000/01 and 2001/02 seasons. Irrigation at two and four weeks intervals decreased the number and dry weight of broomrape spikes by 57.9 & 35.7% and 28.1& 14.2%, respectively, in 2000/01 season and 24.2 & 11.5% and 17.9 & 5.9%, respectively, in 2001/02 season as compared with Irrigation for six weeks intervals. These decreases may be due to lightening stimulant secreted by the roots of faba bean by excessive water. The obtained data in this study are disagreement with results obtained by Abedl-Hamed (1996).

**1 - 2 - On yield and its components: -**

Data recorded in Table (1) shows that shortening irrigation intervals increased significantly plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) in both seasons. Irrigation after two weeks intervals gave the

highest values of plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) followed by at four weeks intervals in the two seasons except seed weight per plant in the first season. For seed yield (ardab/fed.) irrigation after two weeks and four weeks intervals increased seed yield by 10.2 and 1.6% & 15.4 and 7.8%, respectively, in 2000/01 and 2001/02 seasons as compared with irrigation for six weeks intervals. These results are in agreement with those of Al-Gibaly *et al.* (1968) and Tawdros *et al.* (1969).

**Table 1: The effect of irrigation on broomrape control, yield and yield components of faba bean in 2000/01 and 2001/02 seasons.**

Irrigation intervals	2000/01 season							
	No. of broomrape /m <sup>2</sup>	Weight of broomrape / m <sup>2</sup>	Plant height (cm)	No. of branches /plant	No. of pods /plant	Weight of pods (g) / plant	Seed weight (g) / plant	Seed yield ardab/fed.
At 2 W.A.S.	4.0	35.3	112.9	2.18	9.01	19.79	11.76	6.05
At 4 W.A.S.	7.2	48.6	112.3	2.15	8.36	19.46	10.73	5.58
At 6 W.A.S.	9.5	54.9	105.2	1.93	7.80	16.63	11.12	5.49
L.S.D. at 5% level	0.40	19.84	3.96	0.08	0.124	0.643	0.840	0.243
Irrigation intervals	2001/02 season							
	No. of broomrape /m <sup>2</sup>	Weight of broomrape / m <sup>2</sup>	Plant height (cm)	No. of branches /plant	No. of pods /plant	Weight of pods (g) / plant	Seed weight (g) / plant	Seed yield ardab/fed.
At 2 W.A.S.	6.4	77.6	116.2	3.68	13.84	18.84	10.03	5.16
At 4 W.A.S.	7.3	85.0	114.9	3.42	13.35	18.00	9.38	4.82
At 6 W.A.S.	8.9	90.4	110.1	2.82	10.66	16.44	8.93	4.47
L.S.D. at 5% level	1.51	N.S	2.20	0.05	0.206	1.204	0.320	0.255

W.A.S. Days after sowing

**2 - Effect of broomrape control treatments:-**

**2 - 1 - On broomrape control:-**

Data recorded in Table 2 shows that all broomrape control treatments decreased significantly both number and dry weight of broomrape spikes. (Roundup application at two times at 6 & 8, 8 & 10 weeks after sowing, three times at 6 & 8 and 10, 7 & 10 & 13 weeks after sowing and hand removal) decreased number and dry weight of broomrape spikes by 88.9 & 84.2%, 94.3 & 93.5%, 97.3 & 96.5%, 99.2 & 98.9% and 62.1 & 68.7%, respectively, in 2000/01 season and 86.8 & 96.4%, 93.7 & 97.2%, 95.0 & 98.4%, 98.3 & 99.1 and 77.5 & 89.4%, respectively, 2001/02 season. These results may be due to the stimulant is secreted by the roots at a certain stage of development of the host, namely the stage just before or during flowering causing broomrape germination and attachments to the host. Mahmoud and Mohamed (1959) found that the germination of *Orobanche crenata* seeds required a definite substance produced the host *Vicia faba* bean. This stimulant is secreted by the roots at a certain stage of development of the host, namely the stage just before or during flowering. The above results are in agreement with those Zahran *et al.* (1981), El-Shandidy *et al.* (1984), Hassanein *et al.* (1990) and Ibrahim *et al.* (1997).

**2 - 2 – On yield and its components of faba bean:-**

Data in Table (2) revealed that plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) were significantly increases by broomrape control treatments in both seasons. The highest values of plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) were obtained from Roundup three times at three weeks intervals (7 & 10 & 13) and the shortest plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and seed yield (ardab/fed.) were resulted from untreated check treatment in both seasons. Seed yield (ardab/fed.) increased by all Roundup application times application, the highest increases was obtained from Roundup three times at (7 & 10 & 13) followed by Roundup three times at 6 & 8 & 10 weeks after sowing, Roundup two times at 8 & 10 weeks after sowing, Roundup two times at 6 & 8 weeks after sowing and hand removal in both 2000/01 and 2001/02 seasons which were 56.9, 50.8, 42.4, 43.1 and 31.6%, respectively, in the first season and 266.7, 255.2 229.1, 221.2 and 180.6%, respectively, compared to untreated plot in 2001/02 season. This increase of seed yield may be due to the increase number of branches/plant, number of pods/plant, weight of pods/plant, seed weight/plant and due to the decrease to the number and dry weight of broomrape spikes.

**Table 2: The effect of different times Roundup application on broomrape control, yield and yield components of faba bean in 2000/01 and 2001/02 seasons.**

Times of Roundup applications (W. A. S.)	2000/01 season							
	No. of broomrape /m <sup>2</sup>	Weight of broomrape /m <sup>2</sup>	Plant height (cm)	No. of branches /plant	No. of pods /plant	Weight of pods (g) / plant	Seed weight (g) / plant	Seed yield ardab/fed.
6 & 8	2.9	27.8	106.4	2.12	8.52	17.75	11.45	5.94
8 & 10	1.5	11.4	111.6	2.17	8.77	21.00	11.62	5.91
6 & 8 & 10	0.7	6.1	115.9	2.21	9.89	21.42	12.16	6.26
7 & 10 & 13	0.2	1.8	120.8	2.39	10.61	22.00	12.84	6.51
Hand pulling (twice)	9.9	55.0	106.4	1.90	7.54	19.92	11.23	5.46
Untreated (check)	26.1	175.7	99.2	1.76	5.01	9.67	7.90	4.15
L.S.D. at 5% level	1.08	18.3	2.83	0.113	0.364	1.012	1.16	0.320
2001/02 season								
6 & 8	4.0	15.2	110.6	3.26	11.93	18.63	10.23	5.30
8 & 10	1.9	11.9	114.1	3.36	13.88	19.39	10.64	5.43
6 & 8 & 10	1.5	6.9	118.0	3.58	15.53	20.76	11.39	5.86
7 & 10 & 13	0.5	3.6	126.5	3.96	16.58	21.83	11.74	6.05
Hand pulling (twice)	6.8	44.9	108.6	3.12	11.12	17.37	9.38	4.63
Untreated (check)	30.2	423.4	105.1	2.58	6.65	8.56	2.89	1.65
L.S.D. at 5% level	1.68	38.92	2.904	0.119	0.386	1.048	0.469	0.338

W.A.S. Days after sowing

**B - Interactions between times of irrigation and different times Roundup application on broomrape control, yield and its components of faba bean:-**

**1- 2000/01 season.**

Table 3, show that number and dry weight of broomrape spikes were highly significant affected by the interaction between irrigation and different times of Roundup application.

**Table 3: The interaction effect between irrigation and Roundup application on broomrape control, yield and its components in 2000/01 seasons**

Irrigation intervals	Times of Roundup applications (W. A. S.)	2000/01 season							
		No. of broomrape /m <sup>2</sup>	Weight of broomrape / m <sup>2</sup>	Plant height (cm)	No. of branches /plant	No. of pods /plant	Weight of pods (g) / plant	Seed weight (g) / plant	Seed yield ar/ab/fed.
Irrigation at 2 D.A.S.	6 & 8	2.1	26.3	105.3	2.20	9.33	19.75	12.23	6.32
	8 & 10	1.2	9.8	114.5	2.23	9.60	23.50	12.26	6.33
	6 & 8 & 10	0.6	3.0	118.9	2.23	10.45	23.50	13.08	6.59
	7 & 10 & 13	0.0	0.0	110.9	2.30	10.55	24.50	13.35	6.75
	Hand pulling (twice)	4.5	24.8	111.7	2.18	7.73	19.00	11.28	5.94
	Untreated (check)	15.6	148.3	106.4	1.98	6.43	8.50	8.35	4.36
Irrigation at 4 D.A.S.	6 & 8	2.4	20.5	111.4	2.20	7.95	18.50	11.10	5.78
	8 & 10	1.6	12.0	115.5	2.15	8.10	21.50	11.18	5.63
	6 & 8 & 10	0.7	8.3	116.8	2.25	10.20	21.75	11.70	6.01
	7 & 10 & 13	0.3	2.8	118.0	2.63	11.55	22.25	12.00	6.20
	Hand pulling (twice)	11.4	66.5	110.9	1.93	7.70	23.00	10.50	5.62
	Untreated (check)	27.1	181.8	100.8	1.78	4.55	9.75	7.90	4.26
Irrigation at 6 D.A.S.	6 & 8	4.4	36.8	102.3	1.95	8.28	15.00	11.03	5.72
	8 & 10	1.9	12.3	104.9	2.13	8.60	18.00	11.43	5.79
	6 & 8 & 10	0.7	7.0	112.2	2.15	8.93	19.00	11.70	6.02
	7 & 10 & 13	0.3	2.8	123.5	2.25	9.73	19.25	13.18	6.75
	Hand pulling (twice)	13.9	73.9	96.5	1.60	7.20	17.75	11.93	4.81
	Untreated (check)	35.7	197.0	91.9	1.53	4.05	10.75	7.45	3.85
L.S.D. at 5 % level		2.71	50.30	4.901	0.19	0.61	1.754	2.009	0.56

W.A.S. Days after sowing

All interactions between irrigation intervals and times of Roundup application gave the highest reduction on number and weight of broomrape spikes. The greatest reduction percentage for the number and dry weight of broomrape spikes were obtained by the interaction between irrigation after two weeks intervals and Roundup three times at (7 & 10 & 13) were 100 and 100% respectively, compared to irrigation for two weeks and control treatments, followed by irrigation after four or six weeks intervals and Roundup three times at (7 & 10 & 13) were 98.9 & 98.5% and 99.2 & 98.6%, respectively, compared to irrigation for four and six weeks intervals and control treatments, respectively, in 2000/01season. All interactions between irrigations intervals and times of Roundup application significantly increased plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seeds

weight/plant and seed yield ardab/fed in 2000/01 season The tallest plants were obtained from irrigation for six weeks intervals and Roundup application three times at (7 & 10 & 13) but, the shortest plants were resulted from irrigation after six weeks intervals and untreated plot. The interaction between irrigation for four weeks intervals and Roundup three times (7 & 10 & 13) gave the highest values for number of branches/plant and number of pods/plant while, the lowest values was obtained from the interaction between irrigation for six weeks intervals and untreated plot. The greatest weight of pods/plant was obtained from irrigation for two weeks intervals and Roundup three times at (7 & 10 & 13) while, the lowest value was obtained from the interaction between irrigation for two weeks intervals and untreated plot. The greatest seed weight/plant was obtained from irrigation for two weeks intervals and Roundup application three times at (7 & 10 & 13) and the lowest value was from the interaction between irrigation for six weeks intervals and untreated plot. The best seed yield ardab/fed. (6.75 ardab/fed.) was obtained from the interaction between irrigation for two weeks intervals and Roundup application three times at (7 & 10 & 13) but, the lowest seed yield (3.85 ardab/fed.) was resulted from the interaction between irrigation for six weeks intervals and without any broomrape control treatments in 2000/01 season.

#### **2- 2001/02 season.**

Data in table 4 indicate that the interaction between irrigation intervals and different times of Roundup applications was highly significant on number of broomrape spikes only. The greatest reduction percentage for the number and dry weight of broomrape spikes were obtained by the interaction between irrigation after two weeks intervals and Roundup three times at (7 & 10 & 13) were 99.2 & 99.9%, respectively, as compared to irrigation for two weeks intervals and control treatment 2001/02 seasons, followed by irrigation after four weeks intervals and Roundup three times at (7 & 10 & 13) were 99.0 & 99.3%, respectively, as compared to irrigation for four weeks intervals and control treatment and irrigation after six weeks intervals and Roundup three times at (7 & 10 & 13) were 97.4 & 98.4%, respectively, in 2001/02 season compared to irrigation for six weeks intervals and control treatments. All interactions between irrigation intervals and times of Roundup application were highly significant for plant height, number of branches/plant, number of pods/plant, weight of pods/plant, seeds weight/plant and seed yield ardab/fed in 2001/02 season. The tallest plant was obtained from irrigation for six weeks intervals and Roundup three times at (7 & 10 & 13) but, the shortest plants were resulted from irrigation after six weeks intervals and untreated plot.

**Table 4: The interaction effect between irrigation and Roundup application on broomrape control, yield and its components in 2001/02 season.**

Irrigation intervals	Times of Roundup applications (W. A. S.)	2000/01 season							
		No. of broomrape /m <sup>2</sup>	Weight of broomrape / m <sup>2</sup>	Plant height (cm)	No. of branches /plant	No. of pods /plant	Weight of pods (g) / plant	Seed weight (g) / plant	Seed yield ardab/fed.
Irrigation at 2 D.A.S.	6 & 8	4.1	15.2	112.3	3.45	13.00	19.25	10.73	5.70
	8 & 10	1.6	11.3	120.9	3.53	15.90	19.89	11.25	5.76
	6 & 8 & 10	1.4	4.0	121.8	3.78	17.35	21.25	12.05	6.15
	7 & 10 & 13	0.2	0.5	122.1	4.40	18.33	23.00	12.40	6.35
	Hand pulling (twice)	5.5	31.5	110.3	3.78	11.45	19.13	10.35	5.26
	Untreated (check)	25.1	403.1	109.9	3.18	7.00	10.53	3.43	1.74
Irrigation at 4 D.A.S.	6 & 8	2.6	18.6	113.8	3.43	12.43	19.75	10.53	5.38
	8 & 10	2.1	10.3	115.1	3.48	14.10	20.83	10.80	5.51
	6 & 8 & 10	1.5	10.7	118.7	3.80	15.15	21.00	11.65	6.05
	7 & 10 & 13	0.3	3.0	125.5	3.95	17.05	21.80	12.03	6.09
	Hand pulling (twice)	6.9	51.6	113.4	3.08	12.33	17.45	8.33	4.16
	Untreated (check)	30.5	415.9	103.4	2.80	9.03	7.15	2.93	1.75
Irrigation at 6 D.A.S.	6 & 8	5.4	11.8	105.9	2.90	10.35	16.90	9.43	4.81
	8 & 10	2.2	14.2	106.6	3.08	11.63	17.48	9.88	5.01
	6 & 8 & 10	1.6	5.9	113.6	3.15	14.10	20.03	10.48	5.38
	7 & 10 & 13	0.9	7.3	131.8	3.53	14.38	20.70	10.80	5.70
	Hand pulling (twice)	8.1	51.9	102.2	2.50	9.58	15.53	9.48	4.47
	Untreated (check)	35.1	451.2	102.1	1.75	3.93	8.00	2.33	1.45
L.S.D. at 5 % level		3.02	N.S	5.03	0.21	0.67	1.82	0.81	0.59

W.A.S. Days after sowing

The interaction between irrigation for two weeks intervals and Roundup three times (7 & 10 & 13) gave the highest values of number of branches/plant and number of pods/plant. While, the lowest value was obtained from the interaction between irrigation for six weeks intervals and untreated plot. The greatest weight of pods/plant was obtained from irrigation for two weeks intervals and Roundup three times at (7 & 10 & 13) and the lowest values were from the interaction between irrigation for four weeks intervals and untreated plot. The greatest seed weight/plant was obtained from irrigation for two weeks intervals and Roundup three times at (7 & 10 & 13) and the lowest values were from the interaction between irrigation for six weeks intervals and untreated plot. The best seed yield ardab/fed. (6.35 ardab/fed.) was obtained from the interaction between irrigation for two weeks intervals and Roundup three times at (7 & 10 & 13) but, the lowest seed yield (1.45 ardab/fed.) was resulted from the interaction between irrigation for six weeks intervals and without any broomrape control treatments in 2000/01 season.



## CONCLUSION

To overcome broomrape as a parasitic weed infested faba bean fields heavily, by using the integration between irrigation at two weeks interval continuously and glyphosate herbicide at 75 CC / fed. three times (7 & 10 & 13 weeks after sowing) application.

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### تأثير فترات الري ومواعيد إضافة الراوندآب على مكافحة الهالوك وإنتاجية الفول البلدى

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أقيمت تجربتان حقليتان بمزرعة محطة بحوث سدس الزراعة - محافظة بنى سويف خلال الموسمين الشتويين ٢٠٠١/٢٠٠٠ ، ٢٠٠٢/٢٠٠١ لدراسة تأثير كل من مواعيد الري وإضافة مبيد الراوندآب على عدد ووزن الهالوك والمحصول ومكوناته فى الفول البلدى. وكانت معاملات الري ( كل أسبوعين ، كل أربعة أسابيع ، كل ستة أسابيع من رية المحياة وذلك حتى نهاية الموسم) ومعاملات مكافحة الهالوك بإضافة مبيد الراوندآب (بعد ٨&٦ ، ١٠&٨ ، ١٠&٨&٦ ، ١٣&١٠&٧ أسبوع من الزراعة) ثم معاملة إزالة الهالوك مرتان يدويا عند ١٤&١٢ أسبوع من الزراعة عند ظهور الهالوك ومعاملة المقارنة.

تشير النتائج أن الري كل أسبوعين وكل أربعة أسابيع قلل من عدد ووزن شمراخ الهالوك بنسبة ٣٥,٧&٥٧,٩ ، ١٤,٢&٢٨,١% خلال الموسم الأول وبنسبة ١١,٥&٢٤,٢ ، ٥,٩&١٧,٩% فى الموسم الثانى على الترتيب ، كما أدى إلى زيادة محصول البذور للقدان بنسبة ١٠,٢ ، ١,٦% فى الموسم الأول ، ١٥,٤ ، ٧,٨% فى الموسم الثانى على الترتيب وذلك مقارنة بالري كل ستة أسابيع.

أدت معاملات مكافحة الهالوك تحت الدراسة إلى نقص معنوى فى كل من عدد ووزن نباتات الهالوك للقطعة فى الموسمين بنسبة ٩٨,٩ ، ٩٩,٢% على الترتيب فى الموسم الأول وذلك مقارنة بمعاملة الكونترول وفى الموسم الثانى بلغت نسبة النقص ٩٨,٣ ، ٩٩,١% على الترتيب وذلك مقارنة بمعاملة الكونترول. كما وأدت معاملة إضافة المبيد بعد ٧ & ١٠ & ١٣ أسبوع من الزراعة إلى زيادة معنوية فى المحصول ومكوناته. وقد أعطت أعلى قيم فى كل من ( طول النبات ، عدد أفرع النبات ، عدد قرون النبات ، وزن قرون النبات ، وزن بذور النبات ، محصول القدان) فى كلا الموسمين وذلك مقارنة بمعاملة الكونترول ، كما أدت نفس المعاملة إلى زيادة المحصول بنسبة ٥٦,٩ & ٢٦٦,٧% على الترتيب فى كل من الموسم الأول والموسم الثانى وذلك بالمقارنة بمعاملة الكونترول.

وأدى للتأثير المشترك بين مواعيد الري ومواعيد إضافة الراوندآب إلى نقص معنوى فى كل من عدد ووزن الهالوك فى الموسمين والذي يعكس على المحصول ومكوناته.

من هذه الدراسة نستنتج أنه فى حالة الحقول الملوثة ببذور الهالوك بكثافة عالية يمكن التوصية بتقريب فترات الري والرش بمبيد راوندآب ٣ مرات من بداية للتزهير (٧ & ١٠ & ١٣ أسبوع من الزراعة).