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Performance of certain herbicides under two sources of nitrogen fertilization on broomrape growth and cabbage crop.

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ABSTRACT

Two experiments were conducted on cabbage at the wire – house in Weed Research Section, at Sakha Agricultural Research Station, Kafr - El-Sheikh Governorate during 2009/10 and 2010/11 seasons. The objective of the present study was to investigate, the efficacy of some herbicides on controlling broomrape as parasite weed under two sources of mineral nitrogen fertilization (ammonium sulfate and ammonium nitrate). The cabbage cultivar, Brunzwick, was used. Broomrape control treatments were Bendimethalin at 750 ga.i./fed., incorporation in soil, Glyphosate at 36 g/a.i/fed., Imazapic at 20 g/a.i/fed. twice, hand pulling twice, and weedy check. Results indicated that ammonium sulfate decreased number and weight of broomrape spikes/m², spikes length and number of capsules/spikes, during 2009/10 and 2010/11 seasons, but increased cabbage yield (7.3 and 6.4%), as compared with ammonium nitrate during both seasons. Results also showed that all broomrape control treatments exerted significant efficiency in controlling broomrape: Imazapic twice, gave the best broomrape control and the highest increase in cabbage yield and quality , followed by Glyphosate, and hand pulling, twice. Thus, the herbicides Imazapic and Glyphosate decreased number and weight of broomrape spikes/m^2, spikes length and number of capsules/spike. Also, all tested herbicides gave the highest significant increase in the head quality characters in cabbage. The best treatments for increasing the number and weight of edible leaves were Glyphosate, Imazapic and hand pulling, twice; the highest head quality was obtained by Glyphosate and Imazapic; while the highest increase in head characteristics was observed by the hand pulling, twice, Glyphosate and imazapic treatments. Yield increases were estimated by 85.7, 73.1 and 62.1%, respectively in first season and by 65.4, 83.8 and 49.1%, in second one, respectively from Glyphosate, Imazapic and hand pulling, twice Glyphosate, Imazapic and hand pulling twice as compared with weedy check. Thus, these herbicides treatments can replace hand pulling for controlling broomrape weed in cabbage crop.

Keywords: Orobanche, Fertilization, Cabbage, Broomrape, Weed Control.

INTRODUCTION

Most of the vegetable crops are considered to be extremely poor competitor against weeds under field conditions. The branched broomrape is an obligate root parasite of many economically important dicotyledonous crops such as tomato, tobacco, potato, eggplant, carrot, mustard and sunflower. Within the last 15 years, John Nalewaja and Matysiak (1992) stated that nitrogen fertilizer have been more frequency added to the spray solution as an adjuvant to increase herbicide activity. Ammonium sulfate (NH4) appears to be the active component of these fertilizer solutions and has improved the performance consistency on some weeds. It is still unclear how ammonium sulfate improves herbicide performance. Hence, ammonium nitrate, ammonium sulfate and urea at 207 kg N/ha were the optimum level in controlling branched broomrape. Round up (glyphosate) is one product that specifically recommends on its label the addition of ammonium sulfate or a higher rate of round up for hard water, cool air temperature or drought conditions. Curran *et al*. (2014) reported that herbicides that appear to benefit from the addition of ammonium are relatively polar, weak acid herbicides such as basagran, sulfonylureas and imidazolinons. Americanos and Vouzounis (1995) found that the parasite was effectively controlled in the field by spraying twice with glyphosate at 60 to 100 g a.i./ha or imazaquin at 5-10 g a.i./ha. Some evidences, from pot experiments suggested that trifluralin at 0.9 kg a.i./ha may have a beneficial effect in reducing *Orobanche* infestation. Garcia Torres *et al.* (1995) showed that imazapic, applied post once at 10 to 15 g/ha on sunflower plants with 12 to 19 leaves effectively controlled sunflower broomrape without crop damage. Al-Rahban *et al.* (2009) found that the application of imazapic resulted in high level of *Orobanche* control up to 84.0% and 86.0% in both Idleb and Aleppo sites, respectively. Lentil seed yield was also increased by 100 % and 109.0% at the above-mentioned locations, respectively. Etagegnehu and Rungsit (2004) reveled that urea at 276 and 207 kg N/ha ammonium nitrate, and ammonium sulfate at 207 kg N/ha and the goat manure at 20 and 30 t/ha were found to be most effective in reducing parasitism and enhancing growth of tomato plants. Even though drastic reduction of branched broomrape infestation was obtained, ammonium nitrate and ammonium sulfate at 276 kg N/ha seemed to be injurious to tomato plants. As nitrogen rates increased, the numbers and dry weights of shoot of branched broomrape decreased and the yields of tomato increased linearly except the yields obtained from the highest rate of ammonium nitrate and ammonium sulfate. This result indicated that branched broomrape infestation of tomato was decreased with increases of soil nitrogen. Dixit *et al.* (2005) and Sonnenberg and Silva (2005) cited that the plants of plots weeded once (one month after transplanting) and twice (one and 2 months after transplanting) were significantly earlier than those weeded only once (2 months after transplanting) or no weeded. Semidey *et al* . (1999) stated that the oxyfluorfen at 0.16 kg a.i./ha, pendimethalin at 0.75 kg a.i./ha and metribuzin at 0.70 kg a.i./ha significantly reduced the weed population and dry weight accumulation at 45 days after transplanting cabbage and increased the cabbage yield above that of the untreated control. Dhiman *et al.* (2005) found that pendimethalin at 1.0 kg ha-1 resulted in the highest number of total cabbage heads per plot (26.67 kg),

marketable heads per plot (18.83 kg), average head weight (0.632 kg), marketable yield (141.97 q/ha) and thus, the maximum returns (Rs. 26 517) per hectare. Caruso *et al.* (2000) found that the highest cabbage yield (26 t/ha-1) was obtained by herbicide treatment i.e. chlorthal- dimethyl (3.4 kg/ha) + propachlor (3.2 kg/ha) and no weed control) Neumann *et al.* (1999) cited that the fact that hydroxyproline –rich glycoprotein (H R G P) accumulation at the host side of the interface support the view of. At last, a partial defense reaction in the invaded host root tissues within houstoria. H R G P were restricted to differentiating xylem elements, implying a spatio-temporal regulation of H R G P in developmental processes.

MATERIALS AND METHODS

The present research work was carried out in the wire– house, Sakha Agricultural Research Station, Kafr El- Sheikh Governorate during 2009/10 and 2010/11 winter seasons. This study aimed to investigate the performance certain herbicides treatments under sources of nitrogen fertilization (ammonium sulfate and ammonium nitrate) on broomrape (*Orbanche ramosa*, Forsk.) control and cabbage crop (*Brassica Oleracea* var Capitata).

The soils of the two experiments were clay textured. Determination of soluble cations and onions and available N,P and K was done according to Jackson (1967). Soil pH was achieved in a 1: 2.5 soil- water suspension according to Black *et al* (1965).

Table a. Soil mechanical and chemical analyses of the experimental sites in 2009/10 and 210/11 seasons.

Soil analysis	2010 season	2011 season
Sand (%)	16.70	18.90
Silt (%)	33.14	32.73
Clay (%)	50.20	48.40
Soil textural class	Clay	Clay
pH (1:2.5 soil :water extraect)	8.00	8.09
Soil salts E.C.(m.mhos/cm)	2.49	3.01
Organic matter (%)	1.54	1.30
Available nitrogen (ppm)	19.35	22.00
Available phosphorus (ppm)	15.00	20.00
Available potasium (ppm)	278.1	283.00

Treatments of each experiment were arranged in a split plot design with four replicates. The main plot area was 10.5 m^2 which contains five rows. Each row was of 3.5 meter in length and 60 cm apart. The treatments were as follow:

Main plots (N sources):

1. Ammonium nitrate (33.5% N) which added at rate of 100 kg /fed.
2. Ammonium sulfate (21% N) which added at rate of 160 kg / fed.

Sub-plots (herbicides treatments):

3. Stomp (Pendimethalin50% CS) *N*-(1-ethylpropyl)-3,4-dimethyl-2,6- dinitrobenzenamine) at rate of 750g a.i./fed. which used through incorporation in soil before transplanting.
4. Round up (Glyphosate 48% WSC) *N*-(phosphonomethyl glycine) at rate of 36 g. a. i /fed. applied twice, at 40 days after transplanting and 21days later.
5. Orban (Imazapic 10%SL) (±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid) at rate of 20 g. a. i /fed. applied twice, at 40 days after transplanting and 21days later.
6. Hand pulling, applied twice at 55 and 75 days after transplanting.
7. Weedy check.

Herbicidal treatments were sprayed with knapsack sprayer CP_3 with 200 liter water/ fed., during the two seasons. Calcium superphosphate (15.5% P_2O_5) at rate of 100 kg/fed. was added before planting. Ammonium nitrate (NH_4NO_3) and ammonium sulphate ($(NH_4)_2SO_4$) were splitted in two equal rates and applied before the first and second irrigation. The rest agricultural practices i e. irrigations, pest and diseases control and others were managed in accordance with the local recommendations.

The cultivar, cabbage Brunzwick seeds were sows in soil bed on October 20th in the two seasons. After 45 days, the seedlings were transplanted in the wire house in rows. the seedlings were transplanted at 45 cm within the row. Cabbage seedling were sown on one side of the row. The yields were harvested every three days from each plot area, and numbers of gathers were eleven beginning at January 25th until at February 26th The following data were recorded:

Collected data

The following data were recorded:

On broomrape: Prior cabbage harvesting, number of broomrape spike/m^2, weight of broomrape (g /m^2), spike length (cm) and number of capsules/spike were recorded.

On cabbage yield :

Vegetative growth

Random samples of five plants were selected from each sub plot at harvesting and separated to inner leaves (edible) and outer leaves (inedible) and the following data were recorded:

a- Number of inedible and edible leaves

b- Average fresh weight of inedible and edible leaves (g/head).

Leaf area /plant ((m^2)): It was determined by the fresh weight method according to the method described by koller (1972) using the following formula:

$$\text{Leaf area /plant(m2)} = \frac{\text{fresh wt. of inedible and edible leaves}}{\text{fresh weight of the 20 disks}}$$

x No. of disks x disk area.

Head yield:

Data on head yield included the weight of whole heads (outer and inner leaves and stem) of each plot expressed as ton/ fed.

Head quality:

It was determined for five plants randomly taken from each plot at harvesting. The data of head quality included:

a- Gross head weight (kg.)

b- Perimeter of net edible head(cm)
c- Diameter of net edible head (cm)
d- Stem length (cm)

$$\text{Head compression \%} = \frac{\text{head wt.}}{\text{head diameter}} \text{X100}$$

The data of all tested experiments were subjected to the statistical analysis as described Snedecor and Cochran (1980) and the least significant difference LSD at the 5 % level of significance was used for the comparison among the treatments means.

RESULTS AND DISCUSSION

Effect of nitrogen sources:

On broomrape

Data presented in Table (1) show that ammonium sulfate had significant effect on the number of spikes/m^2, weight of broomrape spikes/m^2, spike length (cm) and number of capsules/spike of broomrape parasite weed in the two seasons. Ammonium sulfate decreased these mentioned characters by 10.75, 13.68, 43.84 and 22.66 %, respectively in 2009/10 and by 15.42, 37.26, 27.27 and 23.18 %, in 2010/11, respectively as compared with ammonium nitrate.

The results may be due to the death of broomrape plants under ammonium sulfate, or difficulty of penetration of the haustorium into the host root, based on lignifications, mechanical barriers formation, or inhibition of broomrape seed germination by allelochemicales substances released by cereal roots. Therefore, it decreased the above- mentioned characters of broomrape. These results are similar to that obtained by Neumann *et al*. (1999) and Ghalwash (2003).

Table 1. Effect of nitrogen sources on broomrape growth in 2009/10 and 2010/11 seasons.

Nitrogen sources	No. of spikes/ m^2	weight of spikes $(g/m)^2$	spike length (cm)	No.of capsules/ spike
		2009/10 season		
Ammonium nitrate (100 kg /fed)	21.40	254.00	14.60	6.40
Ammonium sulphate (160 kg /fed)	19.10	219.25	8.20	4.95
LSD: at 5 % level	2.20	11.2	0.52	0.54
		2010/11 season		
Ammonium nitrate (100 kg /fed)	23.35	583.16	13.20	7.55
Ammonium sulphate (160 kg /fed)	19.75	365.85	9.60	5.80
LSD: at 5 % level	3.32	50.76	1.25	0.30

On cabbage growth, yield and its quality:

Data recorded in Table (2) show that ammonium sulphate significantly exceeded ammonium nitrate in cabbage vegetative growth in both seasons except for weight of inedible leaves and number of edible leaves in the two seasons as the differences were non-significant. Ammonium sulphate led to increase number of inedible, weight of edible leaves and leaf area /plant ($m^{2)}$ 6.4, 3.9 and 5.3% in the first season and 49, 1.9 and 4.6% in the second one as compared with ammonium nitrate.

Data in Table (3) show that ammonium sulphate significantly exceeded ammonium nitrate in head yield /fed in the two seasons**.**

Table 2. Effect of nitrogen sources on vegetative growth of cabbage in 2009/10 and 2010/11 seasons.

Nitrogen sources	Inedible leaves No.	Inedible leaves Wt.(g)	Edible leaves No.	Edible leaves Wt.(g)	leaf area/ plant(m^2)
			2009/10 season		
Ammonium nitrate (100 kg /fed)	10.0	1210	44.6	1728	5.69
Ammonium sulphate (160 kg /fed)	9.4	1281	43.9	1799	6.01
LSD: at 5 % level	0.45	NS	NS	45.34	0.35
			2010/11 season		
Ammonium nitrate (100 kg /fed)	10.0	1141	42.7	1754	6.2
Ammonium sulphate (160 kg /fed)	6.7	1180	40.3	1788	6.5
LSD: at 5 % level	0.61	NS	NS	40.34	0.23

Table 3. Effect of nitrogen sources on head yield and its quality 2009/10 and 2010/11 seasons.

Nitrogen sources	Cabbage yield and head quality 2009/10 season: Gross Wt. (kg)	Perimeter (cm)	Diameter (cm)	Yield ton/fed.	Stem length (cm)	Head Compression%
Ammonium nitrate (100 kg /fed)	5.25	86.05	24.80	46.87	12.9	20.15
Ammonium sulphate (160 kg /fed)	6.25	91.10	32.05	50.58	11.6	22.67
LSD: at 5 % level	0.52	2.32	3.10	1.93	1.09	2.70
			2010/11 season			
Ammonium nitrate (100 kg /fed)	5.30	62.75	25.95	49.38	14.15	20.99
Ammonium sulphate (160 kg /fed)	6.58	79.20	33.00	52.78	13.30	22.49
LSD: at 5 % level	1.99	2.02	4.47	1.96	0.66	1.30

Head quality of gross weight (kg), perimeter (cm) and diameter (cm) of cabbage from ammonium sulphate were higher (16, 5.5 and 22.6 %) and (19.5, 20.8 and 21.4 %), in first and second seasons, respectively than ammonium nitrate. These results are similar to those reported by Ghalwash (2003).

Additionally, data in Table (3) show also that ammonium sulphate significantly exceeded ammonium

nitrate in head quality (stem length, cm and head compression%) in both seasons. Ammonium sulphate recorded increased by, 11.2 and 11.1% and 6.4, 6.7 %, respectively as compared with ammonium nitrate in the two seasons. These results are similar to those reported by Ghalwash *et al.* (2008).

Effect of herbicides:

On broomrape growth :

Data presented in Table (4) indicate that all broomrape control treatments decreased significantly number of spikes/ m^2, weight of spikes/ m^2, spike length (cm) and number of capsules/spike of broomrape parasite weed in both seasons.

Spraying glyphosate and Imazapic, twice, efficiently decreased number of broomrape spikes/ m^2 by 66.78 and 65.04%; weight of spikes/ m^2 by 59.67 and 60.82%; broomrape spike length by 42.65 and 43.39%; and number of capsules/spike by 68.75 and 67.67%, respectively, in 2009/10 season and by 65.90 and 65.56%; 75.65 and 76.08%; and 42.54 and 40.19% and 62.75 and 62.07%, respectively, in 2010/11 season, followed by hand pulling (twice) in two seasons.

Table 4, Effect of herbicides treatments on broomrape growth in 2009/10 and2010/11 seasons.

Herbicides treatments	No. of spikes /m^2	Wt. of spike (g/ m^2)	spike length (cm)	No .of capsules
		2009/10 season		
Pendimethalin750ga.i. /fed.	25.88	285.0	12.38	4.88
Glyphosate(36g/a.i/fed) (twice)	12.00	153.8	9.25	3.75
Imazapic(20g/a.i/fed) (twice)	12.63	149.4	9.13	3.88
Hand pulling (twice)	14.63	213.8	10.13	3.88
Control (weedy check)	36.13	381.3	16.13	12.00
LSD: at 5 % level	3.25	42.38	1.55	1.37
2010/11 season				
Pendimethalin750ga.i. /fed.	28.63	659.3	12.13	5.50
Glyphosate (36 g/a.i/fed) (twice)	13.00	234.8	9.25	4.89
Imazapic(20g/a.i/fed) (twice)	13.13	230.6	9.63	4.98
Hand pulling (twice)	14.88	274.9	9.89	5.00
Control (weedy check)	38.13	964.3	16.10	13.13
LSD: at 5 % level	2.35	86.25	1.32	1.03

These results are in agreement with those of Americanos *et al*. (1995) Ghalwash (2003) and Ismail, (2013). who reported that the action of glyphosate on broomrape is attributable to its selective accumulation in the young parasite plant up to a level four times as high as that in faba bean host root three days after spraying

On cabbage growth, yield and its quality:

Data presented in Table (5) indicate that all herbicides treatments as well as hand pulling (twice) increased number and weight of inedible leaves, edible leaves and leaf area /plant (m^2) in the two seasons.

Herbicidal treatments except pendimethalin gave the heighest values as the increases in weight of edible leaves over control were 79.52, 68.59, and 68.15%, for glyphosate, twice, imazapic, twice and hand pulling, twice in season 2009/10, respectively and 82.36, 63.29 and 69.62% in season 2010/11, respectively from the same treatments. In regard to leaf area/plant(m^2), the results were similar in both seasons. In first season, glyphosate, imazapic and hand pulling (twice) increased this parameter by 19.62, 12.71 and 13.83% , respectively and by 31.93, 21.61 and 27.72% over weedy check in the second season, respectively.

Table 5. Effect of herbicides treatments on cabbage growth in 2009/10 and 2010/11 seasons

Herbicides treatments	Inedible leaves		Edible leaves		Leaf area/ plant(m^2)
	No.	Wt.(g)	No.	Wt.(g)	
			2009/10 season		
Pendimethalin 750 g a. i. /fed.	8.50	1394.4	42.88	1639.4	5.36
Glyphosate (36g/a.i/f) (twice)	10.50	1391.6	44.38	2091.4	6.40
Imazapic (20 g/a.i/f) (twice)	11.00	1303.9	45.88	1963.9	6.03
Hand pulling (twice)	11.00	1315.0	46.5	1959.0	6.09
Control (weedy check)	7.50	911.50	41.38	1165.0	5.35
LSD: at 5 % level	0.90	67.79	1.19	104.24	0.40
			2010/11season		
Pendimethalin750ga. i. /fed.	7.75	1186.3	41.38	1485.0	5.60
Glyphosate(36g/a.i/f) (twice)	8.63	1298.8	44.89	2183.9	6.90
Imazapic (20 g/a.i/f) (twice)	9.63	1228.8	43.50	1955.0	6.36
Hand pulling (twice)	8.75	1238.9	43.75	2031.3	6.68
Control (weedy check)	7.00	848.8	33.89	1197.5	5.23
LSD: at 5 % level	0.97	74.41	2.07	98.94	0.34

It is clear from Table (6) that the herbicides treatments beside hand pulling increased significantly the gross head weight of cabbage, perimeter and diameter of the head / plant in both seasons. However, imazapic, glyphosate and hand pulling (twice) gave the best results as the gross weight of the head was increased by 64.4, 64.4 and 61.1% in the first season

Table 6. Effect of herbicides treatments on cabbage yields and its quality in 2009/10 and 2010/11 seasons

Herbicides treatments	Gross weight (kg)	Perimeter (cm)	Diameter (cm)	Stem length (cm)	Head Compression (%)	yield (ton/fed)
			2009/10 season			
Pendimethalin750ga.i. fed.	5.88	89.63	27.63	12.88	19.34	45..66
Glyphosate(36g/a.i/f) twice)	6.38	99.13	30.75	11.88	20.71	55.19
Imazapic(20g/a.i/f) (twice)	6.38	95.88	30.75	12.63	21.18	59. 21
Hand pulling (twice)	6.25	87.50	33.13	11.25	21.15	51.68
Control (weedy check)	3.88	70.75	19..38	15.75	16.66	31.87
LSD: at 5 % level	0.89	2.85	2.58	1.07	1.90	2.28
			2010/11season			
Pendimethalin750ga.i. /fed.	6.18	74.63	30.50	13.25	20.78	49.88
Glyphosate(36g/a.i/f) twice)	6.25	78.63	33.63	12.50	22.93	55.35
Imazapic(20g/a.i/f) (twice)	6.07	72.25	32.38	13.63	21.95	59..51
Hand pulling (twice)	6.25	74.13	29.75	13.50	21.29	53. 68
Control (weedy check)	3.56	55.25	20.87	15.75	15.75	35. 98
LSD: at 5 % level	0.48	2.35	4.53	1.09	2.30	3.03

Likewise, glyphosate, imazapic and hand pulling (twice), increased significantly the perimeter and diameter of the head by 40.11, 35.52 and 23.67 % and 58.67, 58.67 and 70.95% in the first season and by 42.31, 30.77 and 34.17% and 61.14, 55.15 and 42.55% over the weedy check in second one, respectively.

Data give in Table (6) demonstrate that pendimethalin, glyphosate, imazapic, and hand pulling treatments decreased the stem length by 18.22, 24.57, 19.80 and 28.57 % compared with weedy check in the first season and by 15.87, 20.63, 13.46 and 14.28 % from these treatments in second one.

For head compression %, the results obtained were similar in both seasons. Thus, imazapic, glyphosate, hand pulling and pendimethalin treatments increased its parameter by 27.13, 24.30, 26.95 and 16.08% in first season and by 39.36, 45.78, 35.17 and 31.93 % in the second one in a decreasing order .

Imazapic gave the largest cabbage yield (ton/fed) followed by glyphosate and hand pulling in both seasons. These treatments gave rise to increased yield by 85.78, 73.17 and 62.15%, in the first season and by 65.40, 53.83 and 49.19%, respectively, in second one, as compared with weedy check. It is worthwhile to mention that, these treatments which gave the highest values of cabbage yield also gave the lowest numbers of broomrape spikes/ $m^2$and capsules per spike and the smallest weight of spikes These results are similar to those reported by Ghalwash *et al.* (2008) and Ismail, (2013).

3. Interaction between N sources and herbicides treatments:

Results presented in Table (7) show that spike length (cm), yield (ton/fed.) in both seasons and weight of edible leaves (g /plant) in 2009/10 season and weight of spikes /m^2 in 2010/11 season were highly significant affected by the interaction between N sources and herbicides treatments, while the remainder parameters for both broomrape and cabbage were not appreciably affected by the interaction. Therefore, the non-significant results were not included in the table.

Table (7): Effect of the interaction between N sources and herbicides treatments on broomrape and cabbage yield in 2009/10 and 2010/11 seasons

N sources	Herbicides treatments	2009/10 season			2010/11 season		
		Spike length (cm)	Weight of edible leaves(g / plant)	Yield (ton/fed.)	Spike length (cm)	Weight of spikes (g /m)^2	Yield (ton/fed.)
Ammonium nitrate(100 kg /fed)	Pendimethalin 750 g a. i. /fed.	8.25	1496	43.11	10	593.5	49.79
	Glyphosate (36 g/a.i/f) (twice)	4.75	2110	51.55	6.5	189.5	59.49
	Imazapic (20 g/a.i/f) (twice)	6.50	1937	49.75	8.25	163.0	56..20
	Hand pulling (twice)	5.50	1930	58.80	6.75	226.0	45.75
	Control (weedy check)	16.00	1167	31.12	16.5	639.8	35.64
Ammonium Sulphate(160 kg /fed)	Pendimethalin 750 g a. i. /fed.	16.50	1782	48.21	14.25	725.0	49..97
	Glyphosate (36 g/a.i/f) (twice)	13.75	2072	58.82	13.25	280.0	59..51
	Imazapic (20 g/a.i/f) (twice)	13.75	1990	53.62	11.00	298.3	56..50
	Hand pulling (twice)	12.75	1987	59.63	11.75	323.8	61..59
	Control (weedy check)	16.25	1162	32.62	15.75	1289	36.30
LSD: at 5 % level		2.20	1.47	0.32	1.87	122.0	0.43

The great reduction for above-mentioned characters were obtained by the interaction between ammonium sulfate with herbicides treatments as compared with ammonium nitrate with the same herbicides treatments. The combined interaction between ammonium sulphate with glyphosate gave the largest cabbage yield (ton /fed) while, the lowest one was obtained from ammonium nitrate with weed check treatment in the two seasons.

Therefore, the best cabbage yield was 51.55 and 59.49 ton/fed after obtained by the combined interaction between ammonium sulphate with glyphosate (twice) in 2009/10 and 2010/11 seasons, respectively, followed by imazapic twice, while, the lowest yield (32.62, 36.31 ton/fed), were after the interaction between ammonium nitrate with weedy check treatment in both seasons.

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أداء بعض مبيدات الحشائش تحت تأثيرمصدرين من التسميد الأزوتى على نمو الهالوك و محصول الكرنب.

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أجريت تجربتان حقليتان للكرنب بالصوبة السلكية بمعمل الحشائش بمحطة البحوث الزراعية بسخا محافظة كفر الشيخ خلال موسمى ٢٠١٠/٢٠٠٩ ، ٢٠١١/٢٠١٠ . وكان الهدف من الدراسة بحث فاعلية بعض مبيدات الحشائش لمكافحة حشيشة الهالوك المتطفلة تحت تأثير نوعين من السماد الآزوتى (نترات آمونيوم و سلفات آمونيوم) على محصول وجودة الكرنب صنف برونزويك.. وكانت معاملات مكافحة الهالوك هى بندامثلين ٧٥٠ جم مادة فعالة خلط فى التربة قبل الزراعة وجليفوسيت ٣٦ جم مادة فعالة وامازابيك ٢٠ جم مادة فعالة مرتين بعد ٤٠ يوم من الشتل و٢١ يوم من الرشة الأولى بالإضافة إلى النقاوة اليدوية مرتين ومعاملة الكنترول . أكدت النتائج أن سلفات الامونيوم قللت من عدد ووزن الهالوك / م^{٢} وطول الشمراخ وعدد الكبسولات / شمراخ و لكن سجلت أعلى قيم في كمية المحصول و حودته بنسبة ٧.٣ و٦.٤ % مقارنة بنترات أمونيوم في كلا الموسمين. وكما أكدت النتائج أن جميع معاملات مكافحة الهالوك أدت إلى زيادة معنوية فى مكافحة الهالوك حيث أعطى مبيد أمازابيك (مرتين) أحسن مكافحة للهالوك وأكبر زيادة فى محصول الكرنب وجودته يليه معاملتى الجليفوسيت ثم النقاوة اليدوية (مرتين) . أدى استخدام امازابيك والجليفوسيت إلى نقص في عدد ووزن شماريخ الهالوك فى المتر المربع ومتوسط طول الشماريخ وعدد كبسولات الشماريخ، كما أعطت زيادة معنوية فى صفات الجودة للكرنب .وهذه النتائج تعكس زيادة المحصول ومكوناته وكانت أحسن المعاملات لزيادة عدد ووزن الأوراق الداخلية هى معاملات امازابيك وجليفوسيت والنقاوة اليدوية مرتين ، كما أدت لزيادة في جودة الرأس بينما كانت أعلى زيادة في صفات الرأس من معاملة امازابيك وجليفوسيت مرتين والنقاوة اليدوية مرتين. وقدرت نسبة الزيادة في المحصول ب ٨٥.٧ ،٧٣.١ ،٦٢.١ و ٦٥.٤ ، ٥٣.٨ و ٤٩.١ % على الترتيب من المعاملات السابقة في الموسمين. بناء على ذلك يمكن التوصية باستخدام مبيدى امازابيك والجليفوسيت لتحل محل النقاوة اليدوية لمكافحة الهالوك وزيادة إنتاجية وجودة محصول الكرنب.