J. Agric. Sci. Mansoura Univ., 28(12): 8269 - 8280, 2003

EFFECT OF SOME AGRICULTURAL TREATMENTS ON ROQUETTE SEED PRODUCTION

Amer, S.S.A and F.M.M.El-Assiouty
Vegetable Res. Dept., Hort Res. Inst. Agric. Res. Center

ABSTRACT

This study was carried out at Kaha Farm of Horticultural Research Institute, Kaluobia Governorate during the two successive winter seasons of 1998/1999 and 1999/2000. to study the effect of cutting frequency ; i.e. without cutting, one cut and two cuts and gibberellic acid at 0 , 50 and 100 ppm, as well as their interaction on growth parameter, photosynthetic pigments (Total chloropyll content), flowering characteristics, seed yield and its components, in addition to germination characters of Rocket cv. Balady. Obtained results could be summarized as follows :

1- Cutting frequency caused significant increases in number of leaves, number of main branches, number of seed per pod, seed yield per fed. and seed index. On the other hand, contra results were obtained by cutting frequency with leaf area, chlorophyll content, and, seed-stalk height. These treatments delayed flowering and minimized significantly the number of days needed for germination while germination percentage and seedling length of the produced seed were not significantly affected by number of cuts. The maximum in increases in seed yield were obtained by one cut treatment. Such increases were 21.6 and 23.4% comparing with the control in the first and second seasons. respectively.
2- Spraying plants with GA_3 produced higher number of leaves/plant and chlorophyll content of leaves. Similar trend of response was noticed concerning leaf area, number of main branches, seed yield and its components as well as seedling length were significantly increased by these treatment comparing with the control. On the other hand, GA_3 reduced seed stalk height and favored early flowering but had no significant effect on germination percentage and germination rate of the produced seeds. The maximum increases in seed yield was obtained by 100 ppm GA_3 treatment, the percentage increases were 27.2 and 33.9% comparing with the control in the first and second seasons, respectively.
3- The interaction between cutting frequency and GA_3 treatments had no significant effect on growth parameters, chlorophyll content, flowering date and germination rate, while this effect was significant concerning seed-stalk height, number of main branches, seed yield and its components and seedling length, of the produced seeds :

It could be concluded that cutting roquette plants once interacting with spraying with 100 ppm GA_3 was found to be the best treatment for the production of high dry seed yield, such treatment could be recommended.

INTRODUCTION

Roquette or Rocket (Eruca sativa) is considered as one of the important leafy vegetable in Egypt. It cultivated for its leaves which were eaten fresh and also for its seeds. It is a rich source of vitamin A content, Calcium, phosphorus, Iodine, Iron, protein, carbohydrates, fats, and vitamin C. The Arabs knew this crop and its importance for man healthy. There are numerous factors affecting the plant productivity and seed yield as well as seed quality. Among, these factors were cutting frequency and foliar spray with GA_3.

With regard to the effect of cutting frequency on leafy vegetable crops, it was noticed that plants responded positively to cutting frequency. El-Dessoky, (2003) found that, number of rocket leaves was increased, while leaf area and chlorophyll content were decreased with increasing the number of cutting. On the other hand, El-Sherbeny and Hussein (1993), found that chlorophyll contents increased gradually from the 1st to the 3rd cut but showed no clear trend in some umbellieferae plants. Many investigators pointed out that, number of branches, number of seed per pod, seed index, seed yield and germination percentage were significantly increased by the cutting frequency up to two cuts (Singh and Gill 1983, Jehangir *et al.* 1994; Anisa *et al.* 1997 working on spinach; El-Assiouty and Amer, 1997 on Jew's mallow). On the other hand, El-Lithy *et al.* (1998) illustrated that no significant difference was noticed between cutting and without cutting of the spinach plants for seed index, seed yield and germination percentage.

Gibberellin was found to improve vegetative growth such as number of leaves and leaf area and to total chlorophyll content. Gibberellin supply also promote floral-bud initiation, favoure early flowering, and increase number of branches, seed yield and its components and improve germination characteristics. Many investigators mentioned the favorable effect of GA_3 on growth parameters, photosynthetic pigment, flowering characteristics, seed yield and its components and germination of some vegetable crops. i.e. Omran *et al.* (1973); Sadek (1976); Abo-Sedera (1981); El-Gizawy *et al* (1992); El-Lithy *et al.* (1998); Kamuro *et al.*(2001) on spinach, El-Assiouty (1983) on bean, Ghimire *et al.* (1991)on cabbage, Tie & Ciriciofolo (1991), Miccolis *et al.* (1993), Kochankov *et al.* (1996) and Lovato *et al.* (2000) on lettuce.

With respect to the effect of interaction between cutting and GA_3 treatments, El-Lithy *et al.* (1998) on spinach stated that, no significant effects were noticed on seed index and seed germination.

The aim of this investigation is to study the effect of cutting frequency, foliar spray with GA_3 and its interaction on seed yield and quality of rocket plants.

MATERIALS AND METHODS

The present study was conducted at Kaha Farm of Horticultural Research Institute, Kalubia Governorate. Two field experiments were carried out during the two successive winter seasons 1998 / 1999 and 1999 / 2000 to study the effect of cutting Frequency and foliar spraying with GA_3 on seed production of Rocket (*Eruca sativa*) cv. Balady. A split plot design with four replications was used in both experiments. Main plots were devoted for cutting frequency, while sub-plots represented GA_3 treatments.

Each experiment included 9 treatments which were the combination of three treatments of cutting i.e., without cutting, one cut and two cuts and three concentrations of GA_3 were, 0, 50 and 100 ppm.

The sub plot area was 10.8 m^2. It consisted of four ridges, each 4.5 m long and 60 cm width. Seed of rocket were sown on one side, on November 3rd and 9th in the first and second seasons, respectively.

The plants were cutting twice, the first cutting was 50 days from seed sowing, whereas the second cut was taken four weeks after the first one. Foliar spray of GA_3 treatments were done twice, the first spray was 14 days after the first cut and the second spray was 10 days after the second cut. All agricultural practices were carried out and follow ordinary as in field.

Studied characters

Samples of 5 plants were taken from each plot to record the following characteristics :

1- Growth parameters

1.1. Number of leaves per plant.

1.2. Leaf area : was calculated according to the following formula :

$$\text{Leaf area } (cm^2) = \frac{\text{Fresh weight of leaves}}{\text{Fresh weight of disks}} \times \text{leaf area of disks } (cm^2)$$

2- Photo synthetic pigments (mg/100mg fresh weight) in leaves :

Chlorophyll a , b and (a + b) in fresh leaves were determined according to the method advocated by Brougham (1960).

At flowering and seed harvest stages, the following data were recorded.

3- Flowering characteristics

3.1. Flowering date : calculated as days from sowing date to the first flower appearance.

3.2. Seed-stalk height (cm.).

3.3. Number of main branches per plant.

4- Seed yield and its components

4.1. No. of seed per pod.

4.2. Seed yield (Kg/fed.).

4.3. Seed index (weight of 1000 seed) in gram.

5- Germination characters

5.1. Germination percentage: According to the International Rules of (ISTA), 1993.

5.2. Germination rate was calculated according to Edmond and Drapala (1958): Mean number of days required for germination.

$$= \frac{(G_1 \times N_1) + G_2 \times N_2 + \ldots\ldots\ldots G_x \times N_x}{G_1 + G_2 + \ldots\ldots\ldots\ldots G_x}$$

Where :

G = Number of germinated seed in certain day

N = Number of this certain day.

5.3. Seedling length (cm) was calculated (7) days after germination of the produced seed.

All obtained data were statistically analyzed according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

A. Effect of cutting frequency

A.I. Growth parameters

Data presented in Table (1) exhibited significant increase in number of leaves per plant by the cutting frequency treatments. This trend was *significant during* both growing seasons of the investigation. The maximum increase was produced by the two cuts treatment. On the other hand, contra *results were obtained* by cutting frequency on leaf area, as one and two cut treatments caused a significant decrease in such character. Obtained *results are in* accordance with those found by El-Dessoky (2003) on roquette, who reported that number of leaves produced per plant was *significantly* increased while leaf area was significantly decreased using 2 cuts treatment comparing with the one cut one.

Table (1): Number of leaves and leaf area as affected by cutting frequency and spraying with GA_3 during the seasons of 1998/1999 and 1999/2000.

Season		1998 / 1999		1999 / 2000	
Treatments Cutting	$GA_{3\ ppm}$	No. of leaves per plan	Leaf area Cm_2	No. of leaves per plan	Leaf area Cm_2
Without		7.6	79.7	8.6	81.9
One		9.6	74.2	10.6	76.2
Two		10.7	72.5	12.1	73.2
L.S.D	5%	0.74	1.5	1.03	0.57
	0	8.0	72.5	8.9	73.8
	50	8.9	75.7	10.3	77.5
	100	11.1	78.1	12.1	79.9
L.S.D	5%	0.79	2.05	0.95	1.47
Without	0	6.5	75.6	7.4	77.2
	50	7.1	80.5	9.2	83.2
	100	9.2	83.1	10.3	85.2
One	0	8.4	72.1	9.2	74.3
	50	9.5	74.3	10.2	76.2
	100	11.1	76.2	12.4	78.1
	0	9.1	69.6	10.3	70.2
Two	50	10.3	72.5	12.5	73.3
	100	12.9	75.1	13.7	76.2
L.S.D	5%	NS	NS	NS	NS

A.2. Photosynthetic pigments

Data illustrated in Table (2) show that, all estimated photosynthetic pigments i.e. *chlorophyll a, b and Total (a + b) in* fresh leaves were significantly decreased by cutting frequency up to the two cuts treatment in both seasons. *In this respect, El-Sherbeny and* Hussein (1993), found that chlorophyll contents increased gradually from the 1st to the 3rd cut in *Petroselinum sativum* but showed no clear trend in *Coriandrum sativum* and *Anethum graveolens*. On the other hand, El-Dessoky (2003), on *roquette, indicated that* chlorophyll a and b were significantly decreased with increasing the number of cutting, this result was similar with those in *Table (2).*

Table (2) : Chlorophyll a, b and total as affected by cutting frequency and spraying with GA_3 (mg/100 g fresh weight of leaves) during the seasons of 1998/1999 and 1999/2000.

Season		1998 / 1999			1999 / 2000		
Treatments Cutting	$GA_{3\ ppm}$	Chlorophyll a	Chlorophyll b	Total a + b	Chlorophyll a	Chlorophyll b	Total a + b
	Without	25.0	9 4	34.4	26.5	10 2	36.7
	One	22 2	8.4	30.6	23 6	9.1	32.7
	Two	18.4	7.2	25.6	22.1	8.5	30.6
L.S.D	5%	0.88	0.15	0.65	1.30	0.41	1.98
	0	18.6	7.3	25.9	21.1	8.3	29 4
	50	21.9	8.3	30.2	24.6	9.3	33.9
	100	25.1	7.2	32.3	26.6	10.3	36.9
L.S.D	5%	1.47	0.54	1.43	1.34	0.62	1.38
	0	21.2	8.5	29.7	23.1	9.3	32.4
Without	50	25.3	9.3	34.6	27.3	10.1	37.4
	100	28.4	10.4	38.8	29.1	11.3	40.4
	0	19.1	7.3	26.4	20.5	8.1	28.6
One	50	22.5	8.5	31.0	24.3	9.3	33.6
	100	25.1	9.8	34.7	26.1	10,0	36.1
	0	15.5	6.1	21.6	19.7	7 5	27.2
Two	50	17.9	7.2	25.1	22.3	8.6	30.9
	100	21.8	8.4	30.2	24.5	9.6	34.1
L.S.D	5%	NS	NS	NS	NS	NS	NS

A.3. Flowering characteristics

The results reported in Table (3) indicate that, number of days required from sowing to the anthesis of 1st flower (flowering date) was significantly increased by using cutting frequency compared with the untreated plants (without cutting). The highest value was obtained by the two cuts treatment in both seasons. The delaying of flowering may be due to that treated plants with cutting require longer period of time from seed sowing to grow then to flower than untreated plants.

Regarding the effect of cutting frequency, on seed-stalk height and number of the main branches, it is obvious from data at Table (3), that such treatment significantly reduced seed-stalk height, whereas number of branches were significantly increased by cutting frequency. The shortest plants and the highest number of branches were obtained by the two cuts treatment compared with the other treatments in both seasons. Similar finding were obtained by Anisa *et. al.* (1997) on spinach and El-Assiouty & Amer (1997) on Jew's mallow.

A.4 . Seed yield and its components

It is clear from data in Table (4) that, seed yield per feddan and seed index (1000-seed weight)., were significantly increased by the application of cutting frequency in both seasons. On the other hand, number of seed per pod was not significantly affected in the first season and it was significantly increased up to one cut in the second one. The maximum increases in seed yield were produced by one cut in the two seasons of study. The increases

were 21.6 and 23.4% over untreated plants in the first and second seasons respectively. Similar results were obtained by Singh & Gill (1983); Jehangir *et al.* (1994); Anisa *et al.* (1997), working on beet spinach and spinach and El-Assiouty & Amer (1997) on Jew's mallow. They found that, the highest seed yield was obtained from plants cut once or twice. On the other hand, Verma *et al.* (1992) pointed out that, leaf cutting in beet spinach (Beta *vulgaris* L) caused a dramatic reduction in seed yield with each successive cutting.

Table (3) : Flowering date, seed-stalk height and number of branches as affected by cutting frequency and spraying with GA_3 during the seasons of 1998/1999 and 1999/2000.

Season		1998 / 1999			1999 / 2000		
Treatments Cutting	$GA_{3\ ppm}$	Flowering date (days)	Seed-stalk height Cm	No. of branches	Flowering date (days)	Seed-stalk height Cm	No. of branches
	Without	56	152.0	4.3	58.0	153.8	4.3
	One	65	143.0	6.0	66.0	152.9	7.3
	Two	102.6	124.7	6.3	104.6	136.4	6.0
L.S.D	5%	0.66	3.17	0.11	0.94	4.37	0.09
	0	76.6	152.2	4.6	78.3	153.3	5.4
	50	74.6	136.7	5.5	76.3	147.6	5.6
	100	72.3	130.8	6.5	74.0	142.3	6.8
L.S.D	5%	0.82	2.53	0.19	0.80	2.46	0.14
	0	58	159.5	3.5	60.0	163.8	4.0
Without	50	56	152.0	4.0	58.0	152.5	4.0
	100	54	144.5	5.5	56.0	145.2	5.0
	0	67	153.0	5.0	68.0	156.3	6.0
One	50	65	139.0	6.0	66.0	153.8	8.0
	100	63	137.0	7.0	64.0	148.8	6.0
	0	105	144.0	5.5	107.0	139.8	6.3
Two	50	103	119.0	6.5	105.0	136.6	6.8
	100	100	111.0	7.0	102.0	132.8	8.8
L.S.D	5%	NS	4.39	0.33	NS	4.27	0.24

Accordingly, it could be concluded that the highest seed yield per feddan which produced from cutting leaves once may be attributed to its higher number of branches and seed per pod, also the heaviest weight of seed (seed index).

A.5. Germination characters

As shown in Table (5), germination percentage and seedling length of the produced seed were not significantly affected by number of cuts (cutting frequency) in both seasons except seedling length in the first season, where this character was significantly increased, producing the highest value by two cuts. On the other hand, two cuts treatment minimized significantly the number of days needed for germination, i.e. increased the rate of germination in both seasons. In this respect, Jehangir *et al.* (1994) and Anisa *et al.* 1997, working on spinach, found that cutting leaves once or twice gave the highest value of seed quality (measured as germination percentage).

Table (4) : Seed yield components as affected by cutting frequency and spraying with GA_3 during the seasons of 1998/1999 and 1999/2000.

Season / Treatments Cutting	GA_3 ppm	1998 / 1999 No. of Seed per pod	1998 / 1999 Seed yield Kg / fed.	1998 / 1999 Wt. of 1000 seed g.	1999 / 2000 No. of seed per pod	1999 / 2000 Seed yield Kg / fed.	1999 / 2000 Wt. of 1000 seed g.
	Without	19 2	192 1	1 89	19 2	202 7	1 85
	One	18.2	237 0	1.95	20 0	246 4	1.98
	Two	17.5	212 1	1.94	17 2	230.7	1 93
L.S.D	5%	NS	3.2	0.03	0.66	1.9	0.05
	0	15 3	191.1	1 76	16.7	196 8	1.73
	50	18.5	207 1	1 97	19.0	219.5	1 95
	100	20.0	243.0	2.08	20.7	263.5	2.08
L.S.D	5%	0.93	5.2	0.08	0.97	3.7	0.06
	0	17.5	180 9	1 85	18.0	190.0	1.80
Without	50	18.0	194.3	1.87	19 0	200.1	1.85
	100	19 0	201.1	1.95	20.5	218.0	1.90
	0	15 5	194 3	1.50	18.0	210.0	1 60
One	50	18.0	226.8	2.05	20.0	230.0	2.00
	100	21.0	289 8	2.30	22.0	299.3	2.35
	0	13.0	198.0	1.92	14 0	190.5	1 80
Two	50	19.5	200.1	1.93	18.0	228.4	2.00
	100	20.0	238.2	1.98	19 5	273.1	2.00
L.S.D	5%	1.6	9.1	0.01	NS	6.3	0.01

Table (5) : Seed quality as affected by cutting frequency and spraying with GA_3 during the seasons of 1998/1999 and 1999/2000.

Season / Treatments Cutting	GA_3 ppm	1998 / 1999 Germination %	1998 / 1999 Germination speed (days)	1998 / 1999 Seedling length Cm.	1999 / 2000 Germination %	1999 / 2000 Germination rate (days)	1999 / 2000 Seedling length Cm.
	Without	97.0	3.10	7.2	97.0	3.20	7.5
	One	96.0	3.20	7.4	96.0	3.20	7.4
	Two	96.0	3.00	7 8	95.7	3.10	7.3
L.S.D	5%	NS	0.08	0.12	NS	0.07	NS
	0	96.0	3 1	7.2	96.3	3.2	7.4
	50	97.0	3.1	7.8	97.0	3.2	7.7
	100	97.0	3 1	7.2	95.3	3.2	7.1
L.S.D	5%	NS	NS	0.22	NS	NS	0.22
	0	96.0	3.0	7.1	97.0	3.3	7 5
Without	50	99.0	3.3	7.6	99.0	3.2	7 7
	100	96 0	3.0	6.8	95.0	3.2	7.3
	0	96.0	3.0	7.2	96.0	3 1	7.5
One	50	98.0	3.0	8.0	96.0	3.3	8.0
	100	96.0	3.3	8.9	96.0	3.3	6.7
	0	98.0	3.3	7.5	96.0	3 1	7.2
Two	50	96.0	3.1	7.8	96 0	3.2	7.4
	100	96.0	3.0	8 1	95.0	3.0	7.3
L.S.D	5%	NS	NS	0.39	NS	NS	0.39

B. Effect of gibberellic acid (GA_3)

B.I. Growth parameters

The Data given in Table (1) showed that roquette plants sprayed with GA_3 at 50 and 100 ppm produced greater number of leaves which were larger in area than untreated plants. The best value was obtained from GA_3 at 100 ppm in both seasons. Similar trend of response were obtained by Sadek (1976) found that GA exerted a progressive increase in number of leaves of spinach with increment in GA concentration. With regard to leaf

area, a greatest value was obtained by spraying plants with 20 ppm GA. Moreover, El-Assiouty (1983) pointed out that foliar application of 50 ppm enhanced number of bean leaves per plant.

B.2. Photosynthetic Pigments

Results in Table (2) demonstrate clearly that there was a progressive and consistent increase in chlorophyll content (a , b and total) by increasing the concentration of GA_3 application from 0 to 100 ppm. Therefore, the maximum chlorophyll content was found in plants sprayed with 100 ppm GA_3 in both seasons except chlorophyll (a) in the first season where it was similar with untreated plants. These results are in agreement with those of El-Assiouty (1983) and disagree with Sadek (1976) and Abo-Sedera (1981) on spinach. They found that the content of chlorophyll a , b in spinach leaves decrease as GA_3 concentration increase.

B.3. Flowering Characteristics

Flowering date, expressed as the number of days from sowing to the anthesis of the first flower was presented in Table (3). Such data show that, the number of days required from sowing to the anthesis of the first flower was decreased as a result of spraying plants with GA_3 . The most promotive and effective GA_3 treatment in this concern was 100 ppm in both seasons since this treatment accelerated flowering by four days compared with untreated plants. Miccolis *et al.* (1993); Kochankov et. al. (1996) working on lettuce and Kamuro *et al.* (2001) on spinach, mentioned that GA_3 promoted floral-bud initiation and favoured early flowering. One of the most significant developmental effects of gibberellin in its ability to push certain plants to flower, i.e. to cause the conversion of vegetative apices into flower apices (Abd-El-Fattah *et al.*, 1985).

With regard to the effect of GA_3 on seed-stalk height, data of Table (3), show that of foliar spray with all used concentrations of GA_3 led to a significant reduce in this character compared to untreated plants. Spraying with GA_3 at 100 ppm gave the lowest value in this concern. On the contrary, number of branches significantly increased using any of GA_3 concentrations comparing with the untreated plants in both seasons. The highest concentration of GA_3 (100 ppm) was significantly more effective. In this respect, Sadek (1976) and El-Gizawy *et al.* (1992) on spinach, reported that GA_3 treated plants gave more No. of branches than did the control plants.

B.4. Seed yield and its components

Data of Table (4), reveal that, all concentrations of GA_3 affected number of seed per pod, seed yield per feddan and seed index (1000-seed weight), GA_3 at 100 ppm gave the highest value in this regard compared with other treatments. Differences between GA_3 treatments were significant for all studied characters in both seasons. The increases in seed yield were 27.2 and 33.9% in the first and second seasons respectively. In this connection, Omran *et al.* (1973); Sadek (1976); Abo-Sedera (1981); El-Gizawy *et al.* (1992) and El-Lithy *et al.* (1998), on spinach. Moreover, Ghimire *et al.* (1991) on cabbage, Tie & Ciriciofolo (1991) and Lovato *et al.* (2000) on lettuce,

poinated out that spray plants with GA_3 resulted in increasing seed yield. It is evident that the treatment which yielded the highest seed yield (i.e. 100 ppm GA_3) was the same which expressed the highest number of main branches, number of seed per pod and the heaviest seed weight.

B.5. Germination Characteristics

Data illustrated in Table (4) show that GA_3 treatments had no significant effect on germination percentage and germination rate of produced seeds in both seasons. On the other hand, GA_3 at 50 ppm gave the tallest seedlings compared to other treatments. Similar results were obtained by Sadek (1976) on spinach, who found that, no significant difference was noticed in seed germination and germination rate (days) of the produced seed with different concentrations of GA_3 , on the other hand, GA_3 caused insignificant increases in hypocotyl and radical length over the control.

C. Effect of interaction between treatments

C. I. Growth parameters

Concerning the effect of interaction between cutting frequency and GA_3,. Data of Table (1) show clearly that no significant effects were noticed on number of leaves and leaf area.

C. 2. Photosynthetic pigments

Data in Table (2) reveal that chlorophyll a , b and Total (a + b) contents in fresh leaves were not affected by the interaction between cutting frequency and GA3 in both seasons.

C. 3. Flowering characteristics

The interaction effect between the two studied factors i.e. cutting frequency x GA_3 had insignificant effect on flowering date (Table: 3). On the other hand, it could be markedly noticed that, seed-stalk height and number of main branches were significantly affected by the interaction between the two factors. Cutting plants twice combined with folior spray with GA_3 at 100 ppm was found to be the most effective treatment as such treatment produced the shorter plants and the highest number branches in the two seasons of study.

C. 4. Seed yield and its components

The effect of interaction between cutting frequency and GA_3 on number of seed per pod, seed yield per feddan and seed index (1000-seed weight) are shown in Table (4). It is evident that the highest number of seed per pod, the maximum seed yield and the heaviest seed weight were obtained from one cut x 100 ppm GA_3 treatment in both seasons of study except number of seed per pod in the second season only, where, that character was not significantly affected. On the other hand, the lowest value for seed yield was obtained by (without cutting X zero GA_3 treatment) in both seasons.

C. 5. Germination characters

Data of Table (5), show clearly that, cutting plants once combined with spraying with GA_3 at 50 ppm gave the tallest seedling comparing with the other treatments in the two seasons of study. On the other hand, no significant effect was noticed on germination percentage or germination rate. Similar results were obtained by El-Lithy *et al.* 1998 on spinach.

Accordingly, it could be concluded that the highest seed yield per feddan which produced from combined treatment (one cut x 100 ppm GA_3) may be attributed to its higher number of seed per pod and the heaviest seed weight.

REFERENCES

Abd-El-Fattah, M.A.; R.S.Farag and M.A.Fatma (1985). Effect of some growth regulators on plant growth of bean (*Phaseolus vulgaris*,L.) Agric. Res.Rev., 63 (3): 97-110.

Abo - Sedera, F.A. (1981). Effect of nitrogenous fertilizer and gibberellic acid (GA_3) on yield and quality of spinach. M.Sc. Thesis, Fac. Agric. Moshtohor, Zagazig Univ.

Anisa, I. Ismail; A.S.S. Amer and F.M.M. El-Assiouty (1997): Seed production of spinach (*Spinacia oleracea*, L.) as influenced by superphosphate foliar application and cutting frequency. Egypt. J. Appl. Sci., 12 (9): 284-294.

Brougham, R.W. (1960): The relation between critical leaf area, total chlorophyll and maximum growth rate of some pastures and crop plants. Ann. of Bot., 24:463-474.

Edmond, J.B. and W.J. Drapala (1958) : The effect of temperatures, sand and acetone on germination of okra seed. Proc. Amer Soc. Hort. Sci., 71: 428-434.

El - Assiouty, F. M .M . (1983). Effect of some minor elements and growth regulators on growth and dry seed yield of Gaza-3 common bean cultivar. M.Sc. Thesis, Fac. Agric. Moshtohor, Zagazig Unvi.

El-Assiouty, F.M.M. and A.S.S. Amer (1997). Influence of sowing date, plant spacing and cutting frequency on growth, seed yield and quality of Jew's mallow. J.Agric. Sci. Mansoura Univ., 22(11):3971-3978.

El-Dessoky, K.M.S. (2003). Response of some roquette genotypes to planting date and nitrogen levels. M. Sc. Thesis, Fac. Agric., Cairo Univ.

El-Gizawy, A.; A. Sharaf; I. El-Oksh and M. El-Habar. (1992a). Effect of gibberellic acid and Alar on growth and chemical composition of spinach plants. Egypt. J. Hort., 19 (2): 177-190.

El-Gizawy. A.M.; I. El-Oksh; A. Saraf and M. El-Habar (1992b). Effect of gibberellic acid and Alar on flowering and seed yield of spinach. Egypt. J. Hort., 19 (2): 191-200.

El-Lithy,Y.T.E.; Faiza A. Abd El-Bary and K.A. Abd El-Aziz (1998). Effect of spinach plant cutting and some growth regulators on growth, sex expression, seed yield and seed quality. J. Agric. Sci. Mansoura Univ., 23 (5) : 2182-2195.

El-Sherbeny, S.E. and M.S. Hussein (1993). Comprative study on three aromatic plants as affected by cutting frequency. Egypt. J. Physiol. Sci., 17 (1): 95-102.

Ghimire, A.J.; P.R. Neupane and R. Khanal (1991). Seed research on winter vegetable crops at Pakhribas Agricultural Centr. PAC- Tech. Paper-Pakhribas Agric. Cent. No.145, 16pp.(C.F.Comp. Res.).

International Seed Testing Association (1993). International Rules for Seed Testing. Seed Sci & Technol., 21.

Jehangir, K.; A. Nawab; D. Misbahud and S.A. Hussain (1994). Sowing time and cutting frequency affected yield and quality of spinach seed. Sarhad J. Agric. 10 (3): 307-312 (C.F. Comp. Res.).

Kamuro, Y.;A. Onwona and S.Matsui (2001). The promotive effect of applying mixtures of (S)-(+)- abscisic acid and gibberellic acid on flowering in long-day plants. Plant. Growth. Regu.,33(3):189-194.

Kochankov, V.G.; E.A. Zhivukhina; J. Borkowski; R. Gorecki and L.S. Jankiewicz (1996). Effect of gibberellic acid on growth, flowering, and seed production in crisphead lettuce (*Lactuca sativa* L.) folia-Hort.; 8 (1): 11-18 (C.F. Comp. Res.).

Lovato, A.; V. Dellacecca; M. Montanari; M. Macchia and G. Magnani (2000). A three-year research on lettuce (*Lactuca sativa* L.) seed production in two environmental conditions. Sementi-Elette., 46 (6): 19-23 (C.F. Comp. Res.).

Miccolis, V.; A. Lombardi and V.V. Bianco (1993). Transplanting date, gibberellic acid and seed yield of lettuce. Ann. della-Fac. Agric. Vide – Bari Univ., 33:101-110 (C.F. Comp. Res.).

Omran, A.F.; Abo-El-Saod and N.I. Ashour (1973). Growth and yield responses of spinach plants to foliar spray with Zn so_4 and GA_3. Gartenbouessenschaft, 38 (5): 441-446 (C.F. Hort. Abst., 45:9492).

Sadek, M.A. (1976). Effect of photo and chemical induction on flowering and seed setting of spinach. Ph.D. Thesis; Fac. Agric. Ain Shams Univ.

Singh, H. and S.S. Gill (1983). Effect of spacings and leaf cutting on seed yield of spinach. (*Beta vulgaris*, L.) J. of Res. Punjab Agric. Univ., 20 (3): 261-265.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods, 7th Ed. Iowa State Univ. Press. Ames. USA.

Tei, F. and E. Ciriciofolo (1991). Effects of sowing date and gibberellic acid on lettuce (*Lactuca sativa*, L.) seed production. Sementi-Elett., 37 (2): 15-22 (C.F. Comp. Res.).

Verma, T.S.; R. Chand; K.D. Lakhanpal; A. Singh, and S. Dayal (1992). Vegetable and seed Productivity as influenced by seed size and leaf cutting in beet spinach (*Beta vulgris* L.) cv. Pusa Harit. Seed Reseach, puble. 1994, 20 (2): 149-152.

تأثير بعض المعاملات الزراعية على إنتاج تقاوى الجرجير

عامر سليمان سليمان عامر و فتحى محمد محمود الأسيوطى
أقسام بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزراعية

أجريت تجربتان حقليتان بمزرعة الخضر بقها – محافظة القليوبية فى الموسم الشتوى لعامى ١٩٩٨/٩٩ ، ١٩٩٩/٢٠٠٠ أستهدفت دراسة تأثير عدد مرات الحش .. وهى (بدون حش – حشة واحدة – حشتين) والرش بحمض الجبريلك بتراكيزات صفر ، ٥٠ ، ١٠٠ جزء/مليون والتفاعل بينهما على صفات النمو – الكلورفيل – الإزهار – محصول البذور ومكوناته – الإنبات لنباتات الجرجير صنف بلدى . ويمكن إيجاز أهم النتائج فيما يلى :

أولا : تأثير عدد مرات الحش

أدت زيادة عدد مرات الحش إلى زيادة معنوية فى عدد الأوراق – عدد الأفرع الرئيسية – عدد البذور فى القرن – محصول البذور للفدان – وزن الـ ١٠٠٠ بذرة ، وعلى النقيض أدت تلك المعاملات إلى تقليل مساحة الورقة ومحتوى الأوراق من الكلورفيل – طول الشمراخ الزهرى – كما أدت المعاملات إلى تأخير الإزهار وتقليل عدد الأيام اللازمة للإنبات – ولم تكن لهذه المعاملات أى تأثير معنوى على نسبة الإنبات وطول البادرة . وقد أدى حش النباتات مرة واحدة إلى زيادة فى محصول البذور بلغت ٢١,٦ ، ٢٣,٤% خلال موسمى التجربة بالمقارنة بالكنترول .

ثانيا : تأثير الرش بحمض الجبريلك

أدى الرش بالجبرلين إلى زيادة معنوية فى عدد ومساحة الأوراق ومحتواها من الكلورفيل وكذلك أدت هذه المعاملة إلى زيادة معنوية فى عدد الأفرع وكذا المحصول البذرى ومكوناته وطول البادرة بالمقارنة بالكنترول ومن ناحية أخرى إنخفض طول الشمراخ الزهرى وشجعت المعاملة بالجبرلين على الإزهار المبكر ولم يكن له أى تأثير معنوى على نسبة وسرعة الإنبات وكان الرش بالجبرلين بتركيز ١٠٠ جزء فى المليون أكثر فاعليه فى زيادة المحصول البذرى للفدان بنسبة ٢٧,٢ ، ٣٣,٩% للموسمين على التوالى بالمقارنة بالكنترول .

ثالثا : تأثير التفاعل بين المعاملات

لم يكن هناك أى تأثير معنوى للتفاعل بين المعاملات على صفات النمو و الكلورفيل والإزهار وكذا نسبة سرعة الإنبات بينما كان التأثير معنويا بالنسبة لطول الشمراخ وعدد الأفرع والمحصول البذرى ومكوناته وطول البادرة .

وللحصول على أعلى محصول بذرى ينصح بحش نباتات الجرجير مرة واحدة والرش بالجبرلين بتركيز ١٠٠ جزء/مليون .