EFFECT OF FOLIAGE CUTTING, ROOT SIZE AND GA_3 FOLIAR SPRAY ON CARROT FLOWERING, SEED YIELD AND ITS QUALITY

By

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ABSTRACT

The field experiment was conducted at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University during the summer season of 1990 and 1991, to study the effect of foliage cutting, root size and gibberellic acid foliar spray (0, 100, 150 and 200 ppm) on flowering, seed yield and seed quality expressed as seed index (weight of 100 seeds) and the percentage of seed germination in the Red Cored Chantenay carrot.

Obtained results show that, cutting plant foliage to 2/3 of its length before planting increased the number of survival plants, enhanced flowering parameters, i.e., flowering stalks, number of umbels per plant and umbel diameter, length and weight, and increased the total seed yield and its quality.

The same results show also that, using large size roots in planting reflected the maximum increase in number of survival plants and the studied flowering and seed aspects compared with medium and small size roots.

In this regard, spraying the plants with GA_3 four times at 200 ppm proved to be the best treatment in increasing the number of survival plants, length of flowering stalks, number of umbels per plant, umbel diameter, length and weight, and seed yield per plant as well as the total seed yield and its quality.

Generally, it could be concluded that cutting 2/3 of plant foliage, using large

size roots in planting and spraying the plants four times with GA_3 at 200 ppm were the best treatment for producing carrot seeds with good quality under experiment conditions.

INTRODUCTION

Carrot (Daucus carota, L.) is one of the most important rooty vegetable crops grown in Egypt. The imported cultivar, Red Cored Chantenay, have never been reported to produce seeds under our local conditions in a satisfactory manner hence its need to certain chilling requirements, which is not available under Egyptian weather conditions. Thus, this work was carried out to study the effect of some agrotechnical treatments, i.e., pruning plant foliage to two third, sorting roots pre-planting to large, medium and small and spraying plants with GA_3 at different concentrations on inducing flowering and increasing seed yield of carrot plants.

In this regard, Lal and Pandey (1988) reported that, carrot foliage cutting before replanting is one of the methods used for inducing flowering. However, Hiller et al. (1979) indicated that the presence of absence of foliage during cold stimulus had no effect on rate of carrot bolting.

Many investigators mentioned that, the size of replanting roots could affect carrot flowering and seed yield (Arya and Saini, 1977; Bujdoso and Hrasko, 1983; Paradisi and Montanari, 1985).

Gibberellic acid foliar spray 2-3 times with a concentration of 100-300 ppm led to increments in length of flowering stalks, number of umbels per plant, average weight of the main inflorescence, length and diameter of umbel and seed yield per plant (Joshi et al., 1975; Shaheen, 1988; Nieuwhof, 1984; Malash, 1988).

Seed viability expressed as germination percentage and seed index (1000 seed weight) were also found to be affected by GA_3 treatment (Shaheen, 1983 and El-bblia and Cantliffe, 1987).

Therefore, this study was carried out to investigate the possibility of inducing flowering and increasing seed yield of carrot with or without pruning for plant foliage, using proper size of roots and or spraying GA_3 at different concentrations.

MATERIALS AND METHODS

The field experiment was conducted at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University during early summer seasons of 1990 and 1991. The soil of the Experimental Farm was clay loam in texture with pH 7.7 and contain 0.103% available N, 2.747 ppm soluble-P, 0.5 meq/L.K.

For production of carrot roots (stecklings), seeds of carrot (Daucus carota, L.) cv. Red Cored Chantenay were sown on September 15th and 17th in 1989 and 1990, respectively. All agricultural practices required for carrot production were carried out as commonly followed in the district. At harvest (120 days from seed sowing) plants were sorted into three orders according to the root length, small (11-13 cm), medium (13-15 cm) and large (15-17 cm). Plants for each size were divided into two halves, one half, plants were left without foliage cutting (intact foliage) and the other half, plant foliage was cut to 2/3 of their length.

The stecklings were replanted directly on 15th and 17th of January in 1990 and 1991, respectively, on one side of ridges 60 cm wide at 25 cm apart. Replanting was done in the presence of water.

The experiment included 24 treatment which were the combination of two foliage treatment (foliage left intact or cut to 2/3), three root sizes (small, medium and large) and four GA_3 concentrations (0, 100, 150 and 200 ppm).

Split-split plot design with three replicates was adopted. The foliage cutting treatments were arranged in the main plots, while, the root size treatments were distributed in the sub-plot and the GA_3 concentrations were put in sub-sub-plots. Each experimental plot

included 5 ridges 3.5 m long and 60 cm wide with an area of 10.5 m^2 (1/400 of feddan). Plants were sprayed with GA_3 four times during the growing season, starting one month after root planting and at 10 days intervals. Plants were fertilized with NPK fertilizers at a rate of 45 kg N + 32 kg P_2O_5 + 24 kg K_2O/Fad. Ammonium nitrate (33.5% N), calcium superphosphate (16% P_2O_5) and potassium sulphate (48% K_2O) were used as a source of nitrogen, phosphorus and potassium respectively. The amounts of fertilizers were divided into two equal portions, the first was added one month after planting and the second one added one month later. Other agricultural practices were done as commonly followed in the district.

Data recorded:

A- Number of survival plants: 75 days after planting, the successful plants were counted and the percentage of survival plants were calculated.

B- Yield parameters: At seed maturity, plants of each experimental-plot were pulled and the following data were recorded.

1 - Number of umbels/plant (primary, secondary and tertiary umbels only).
2 - Length of seed stalk.
3 - Umbel diameter, length and weight for the first order umbel.
4 - Seed yield/plant including seeds harvested from primary, secondary and tertiary umbels only.
5 - Seed yield/fad.
6 - Weight of 1000 seeds harvested from (1st, 2nd and 3rd order only).
7 - Seed germination percentage.

All obtained data were subjected to statistical analysis according to Gomez and Gomez (1983).

RESULTS AND DISCUSSION

Data presented in Table (1-a) indicated that, pruning of plant foliage to two by third of its length before-replanting the roots significantly increased

number of successful plants, i.e., which survived after replanting, length of flowering stalks, number of umbels produced per plant as well as umbel length, diameter and weight. These results are true during both seasons of study. Obtained results may be due to that lefting the plant foliage without trimming led to higher evaportion and consuming the accumulative storage materials in roots before the formation of new roots on replanting roots and concequently reduced the ability of such roots to returne their growth and form well flowering stalks and flowering umbels. Obtained results are in agreement with those reported by Lal and Pandey (1988) they reported that carrot foliage cutting before replanting is one the methods used for inducing flowering.

The same data in Table (1-a) show clearly that sorting roots pre-planting into small, medium and large size affected significantly all the studied parameters, i.e., percent of survival plants and the flowering measurements, (length of flowering stalks, total number of umbels per plant, umbel diameter, length and weight) during both seasons of growth. In this respect, large size roots reflected the maximum values in all forementioned parameters. Such results may be attributed to that small and medium size roots affected largely by the environmental conditions and concequently higher percentage of roots did not restore their growth. In addition, large roots contain more accumulated nutrients required for new formed growth and flowering primordia especially in the period before the formation of the new roots. Similar results were reported by (Arya and Saini, 1977; Bujdosa and Hrasko, 1983; Paradisi and Montanari, 1985) they reported that the size of replanting roots could affect carrot flowering and seed yield.

Concerning the effect of GA_3 foliar spray, it is obvious from the same data in Table (1-a) that, the percentage of survival plants, length of flowering stalks, number of produced umbels per plant, umbel length, diameter and weight were statistically increased as a result of treating plants with GA_3 at its different used concentrations compared with the control. In this respect, the highest used concentration (200 ppm) reflected the highest increments in all studied parameters during both

ble (1-a): Percentage of survival plants and flowering characteristics of carrots as affected by foliage c ting, root size and GA_3 foliar spray.

ison		1990						1991					
Treatments	Characters	% of survival plants	Length of flowering stalks	Number of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)	% of survival plants	Length of flowering stalks	Number of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)
oliage(F)	Left	68.9	76.3	26.1	6.2	5.9	6.5	69.5	76.8	24.3	6.5	6.7	6.8
	Cut 2/3	76.6	79.6	27.3	7.4	6.9	7.2	77.5	81.6	27.5	7.7	7.2	7.7
.D. at 0.05		1.8	2.4	0.2	0.7	0.3	0.6	2.4	2.9	0.8	0.4	n.s.	0.4
t size(S)	Small	52.2	74.5	22.0	5.8	5.6	5.5	56.8	75.9	20.7	5.8	6.1	6.1
	Medium	80.8	76.5	26.5	6.8	6.3	6.8	78.6	78.6	27.0	7.1	6.8	7.5
	Large	85.4	82.7	31.6	7.9	7.3	8.2	85.1	83.1	29.8	8.4	7.9	8.4
.S.D. at 0.05		1.4	1.7	1.4	0.3	0.5	0.3	1.2	2.0	0.8	0.7	0.8	0.9
A_3(ppm)	0	70.5	73.7	24.4	6.4	6.1	6.2	52.9	76.5	22.5	6.6	6.4	6.2
	100	72.5	77.8	26.6	6.8	6.4	6.7	54.6	78.5	24.9	7.1	6.7	7.2
	150	73.6	79.3	27.6	6.9	6.5	6.9	55.4	80.2	27.2	7.3	7.2	7.5
	200	74.6	80.9	28.3	7.1	6.7	7.5	57.4	81.3	28.3	7.7	7.5	8.1
L.S.D. at 0.05		0.9	1.3	1.3	0.4	n.s.	0.3	2.9	2.9	0.8	0.6	0.5	0.4
Bi-interactions:													
F x S													
F. Left	Small	45.7	73.9	21.0	5.2	5.2	5.5	50.0	75.5	19.7	5.3	5.7	5.2
	Medium	78.4	75.4	25.8	6.2	5.9	6.6	75.6	75.8	24.9	6.8	6.8	7.3
	Large	82.9	79.4	31.4	7.3	6.8	7.3	82.9	78.9	28.1	7.5	7.7	8.1
F. cut 2/3	Small	58.7	75.0	22.9	6.4	6.1	5.5	63.6	76.3	21.7	6.4	6.5	6.6
	Medium	83.1	77.7	27.2	7.4	6.8	7.1	81.5	81.4	29.1	7.5	6.9	7.7
	Large	87.9	86.0	31.9	8.5	7.8	9.0	87.3	87.3	31.5	9.4	8.0	8.7
L.S.D. at 0.05		2.0	2.4	n.s.	n.s.	n.s.	0.5	1.7	0.7	n.s.	n.s.	n.s.	n.s

Table (1-b): Percentage of survival plants and flowering characteristics of carrots as affected by foliage cutting, root size and GA_3 foliar spray.

Season	Characters	1990						1991					
Treatments		% of survival plant	Length of flowering stalks	No. of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)	% of survival plant	Length of flowering stalks	No. of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)
F x GA_3													
Foliage without cut	0	67.9	70.9	23.4	5.6	5.6	5.8	67.1	74.1	20.7	6.0	6.3	5.8
	100	68.9	73.2	26.0	6.3	5.9	6.3	69.2	76.1	23.8	6.4	6.4	6.9
	150	69.3	78.3	27.1	6.4	6.0	6.6	69.7	77.7	25.3	6.7	6.8	7.1
	200	69.8	79.6	29.9	6.5	6.2	7.1	72.0	79.2	26.7	7.1	7.2	7.5
Foliage cut to 2/3	0	73.1	76.4	25.4	7.3	6.6	6.6	74.1	78.9	24.0	7.1	6.6	6.6
	100	76.1	79.4	27.2	7.3	6.7	7.1	76.5	80.8	26.9	7.8	6.9	7.6
	150	77.9	80.2	28.0	7.4	7.1	7.2	78.2	83.4	29.0	7.9	7.3	7.9
	200	79.3	82.3	28.7	7.6	7.1	7.8	81.1	83.4	29.8	8.2	7.7	8.6
L.S.D. at 0.05		1.4	1.7	n.s.	n.s.	n.s.	n.s.	1.0	2.3	n.s.	n.s.	n.s.	n.s.
Size x GA_3													
Small size roots	0	51.0	71.2	19.7	5.3	5.5	4.7	54.2	73.6	16.5	5.3	5.6	4.7
	100	51.7	74.8	21.9	5.9	5.5	5.4	56.0	76.0	19.8	5.9	5.7	6.0
	150	52.5	75.9	23.1	5.9	5.8	5.5	56.9	77.5	23.3	6.1	6.3	6.0
	200	53.6	76.1	23.6	6.0	5.8	6.4	60.1	76.5	23.3	6.2	6.7	6.9
Medium	0	78.4	72.3	25.0	6.7	6.1	6.0	76.2	76.6	24.6	6.7	6.5	6.8
	100	80.4	76.2	26.2	6.7	6.2	6.9	77.8	77.5	26.6	6.9	6.6	7.5
	150	82.1	77.8	26.7	6.8	6.4	7.0	79.7	79.3	28.1	7.1	7.1	7.5
	200	82.3	79.9	28.2	7.0	6.6	7.3	80.4	84.2	28.6	8.0	7.2	8.1
Large	0	82.2	77.5	28.6	7.3	6.7	7.8	81.4	79.2	26.0	7.8	7.3	7.2
	100	85.5	82.4	31.8	8.0	7.4	7.9	84.7	81.9	28.3	8.4	7.7	8.3
	150	86.3	84.2	33.0	8.1	7.5	8.2	85.2	84.7	30.2	8.6	7.9	9.0
	200	87.8	86.9	33.2	8.3	7.6	8.8	89.2	86.6	32.9	8.9	8.5	9.1
L.S.D. at 0.05		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Table (1-c): Percentage of survival plants and flowering characteristics of carrots as affected by foliage cutting, roots size and GA_3 foliar spray.

Season			1990						1991					
Foliage	Root size	Characters GA_3 (ppm)	% of survival plants	Length of flowering stalks	No. of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)	% of survival plants	Length of flowering stalks	No. of umbels/ plant	Umbel diameter (cm)	Umbel length (cm)	Umbel weight (g)
foliage without cut	Small	0	45.0	70.1	14.1	4.3	5.1	4.3	48.5	73.0	15.1	4.6	4.9	4.2
		100	45.2	74.3	20.5	5.4	5.1	5.5	49.1	75.1	18.7	5.3	5.1	5.3
		150	46.1	74.4	22.9	5.3	5.2	5.6	49.6	76.3	22.5	5.7	6.4	5.4
		200	46.3	76.0	23.0	5.6	5.3	6.5	53.0	77.7	22.6	5.7	6.6	6.2
	Medium	0	77.6	71.0	24.0	6.1	5.7	6.2	73.0	74.7	23.0	6.4	6.6	6.3
		100	78.3	75.1	25.1	6.1	5.8	6.4	75.4	76.0	25.3	6.6	6.7	7.5
		150	78.7	77.3	26.0	6.2	5.8	6.6	76.4	76.0	25.3	6.8	7.0	7.5
		200	79.0	78.2	28.0	6.3	6.1	7.0	77.6	76.6	26.2	7.9	7.0	7.9
	Large	0	81.2	71.5	28.2	6.4	6.1	7.0	79.9	74.7	25.0	7.1	7.4	7.1
		100	83.3	79.2	32.5	7.4	7.0	7.1	83.1	77.3	27.6	7.3	7.6	8.0
		150	83.0	82.3	32.4	7.6	7.0	7.5	83.2	81.0	28.3	7.7	7.8	8.6
		200	84.0	84.6	32.6	7.7	7.2	7.7	85.5	83.3	31.0	7.9	8.2	8.6
foliage cut to 2/3	Small	0	57.0	72.2	21.2	6.3	5.9	5.0	60.0	74.3	17.9	6.0	6.3	5.3
		100	58.2	75.3	23.3	6.3	5.9	5.3	63.0	77.0	21.0	6.5	6.3	6.7
		150	58.8	76.4	23.2	6.4	6.3	5.3	64.3	78.7	24.1	6.6	6.7	6.7
		200	60.9	76.1	24.1	6.4	6.3	6.2	67.3	75.3	24.1	6.7	6.8	7.7
	Medium	0	79.2	73.6	26.0	7.3	6.5	6.1	79.0	78.6	26.2	7.0	6.5	7.3
		100	82.4	77.4	27.2	7.3	6.5	7.3	80.3	79.0	28.0	7.3	6.6	7.5
		150	85.3	78.3	27.3	7.4	7.0	7.4	83.1	83.0	31.0	7.5	7.3	7.6
		200	85.6	81.5	28.4	7.6	7.0	7.5	83.2	85.1	31.0	8.2	7.4	8.4
	Large	0	83.2	83.5	29.0	8.2	7.3	8.6	83.0	84.0	28.0	8.5	7.2	7.3
		100	87.6	85.6	31.1	8.5	7.8	8.7	86.3	86.6	31.7	4.6	7.9	8.6
		150	89.6	86.0	33.6	8.5	7.9	8.8	87.2	88.5	32.1	9.6	8.0	9.5
		200	91.5	89.2	33.7	8.8	8.0	9.5	92.9	90.0	34.3	9.9	9.1	9.7
L.S.D. at 0.05			n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	3.1	2.0	n.s.	n.s.	1.0

seasons of growth. Obtained results are due to the main role of GA_3 in increasing the cell size and cell elongation and concequently, increased the number of umbels formed on the main flowering stalks. Obtained results are coincided with those obtained by Joshi et al. (1975), Shaheen (1983), Neiuwhof (1984) and Malash (1988) on carrots they indicated that spraying GA_3 2-3 times with a concentration of 100-300 ppm led to increments in length of flowering stalks, number of umbels/plant, and length, diameter and weight of umbel.

Regarding the interactional effect, only the percentage of successful plants (survived after replanting roots) and the length of flowering stalks were significantly increased as a result of the interaction between foliage cuttings to 2/3 and each of the size of replanted roots and GA_3 foliar spray as shown in Table (1-a & b).

In this respect, no significant differences were noticed in all studied parameters as a results of the different other interactions, i.e., size of roots within GA_3 spray and foliage cutting within root size and GA_3 spray as shown in Tables (1-a & b). However, the maximum increments in all studied parameters were obtained in case of cutting plant foliage to 2/3, using large size roots and spraying plants three times with GA_3 at its highest used concentration (200 ppm).

Seed yield and its quality:

Data presented in Table (2-a) show clearly that pruning plant foliage to 2/3 of its length pre-planting the roots enhanced the produced total yield and its quality, i.e., seed yield per plant, weight of 1000-seed and seed germination percentage during both seasons of study. In this respect, such increment in seed yield and its quality reached only the level of significancy in case of the total yield. These results may be due to increasing the number of survival plants (Table, 1-a). Obtained results are in agreement with those obtained by Lal and Pandey (1988) on carrot.

The same data in Table (2-a) indicated that, seed yield per plant and total yield per faddan as well as

weight of 1000 seed yield and seed germination percentage were significantly increased as a result of sorting roots to its different studied size before planting. In this regard, large roots reflected the highest total seed yield with good seed quality followed by the medium size roots and small roots, respectively during both seasons of growth. Such results may be attributed to the large roots which contain more accumulated nutrient materials required for vigor growth of flowering stalks and conceq-uently increased the number of umbels produced per plant and umbel weight (Table, 1-a). Similar results were reported by Arya and Saini (1977), Bujdoso and Hrasko (1983) and Paradisi and Montanari (1985).

Obtained data in Table (2-a) show also that spraying plant with GA_3 at its different studied concentrations increased significantly all the studied yield parameters compared to the control treatments. Obtained results may be attributed to the role of GA_3 in increasing the number of umbels produced per plant as a result of increasing the length of flowering stalks. These results agree with those reported by Joshi et al. (1975), Shaheen (1983), Nieuwhof (1984) and Malash (1988). They reported that gibberellic acid foliar spray at 100-300 ppm led to incre-ments in flowering stalks, number of umbels per plants, average weight of the main inflorescence and seed yield per plant.

Concerning the interaction effects, it is obvious from the same data in Table (2-a) that the maximum values in all studied yield parameters were obtained as a result of cutting the plant foliage to 2/3 of its length and using large roots. This may be due to increasing the number of successful plants (survival) per experimental plot.

Data recorded in Tables (2-b & 2-c) revealed that all studied yield measurements, i.e., seed yield per plant, total seed yield and weight of 1000 seeds as well as seeds germination percentage tended to increase due to the interaction effect within foliage pruning before planting and spraying GA_3 at its different concentrat-ions, sorting roots and spraying GA_3 or the interaction of the three treatments. Such increments reached the level of significance in case of total seed yield only

Table (2-a): Effect of foliage cutting, root size and GA_3 spray on seed yield and its quality.

Season		1990				1991			
Treatments / Characters		Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %	Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %
Foliage (F) left without cut		13.1	246.556	0.78	52.8	14.0	268.900	0.76	62.6
Cut to 2/3		14.2	295.671	0.73	58.1	14.4	304.934	0.77	65.1
L.S.D. at 0.05		n.s.	1.580	n.s.	n.s.	n.s.	1.329	n.s.	n.s.
Root size (S)	Small	11.1	121.425	0.70	51.1	10.9	165.570	0.75	54.1
	Medium	13.7	296.043	0.72	56.2	14.2	281.961	0.76	66.2
	Large	16.2	364.206	0.74	59.0	17.5	398.069	0.79	75.5
L.S.D. at 0.05		1.5	0.836	0.02	2.5	1.3	1.464	0.01	5.2
GA_3 (ppm)	0	9.2	237.702	0.70	52.5	12.9	250.749	0.75	60.6
	100	10.1	265.607	0.71	54.1	13.8	276.855	0.76	63.1
	150	10.5	266.226	0.72	56.1	14.3	291.859	0.77	65.1
	200	11.2	298.578	0.74	59.0	15.6	328.206	0.77	66.6
L.S.D. at 0.05		0.8	1.216	0.01	2.4	0.9	2.002	0.01	1.4
Bi interaction F x S :									
F. left	Small	11.4	138.633	0.70	47.5	10.8	144.894	0.74	51.5
	Medium	13.3	276.307	0.71	54.7	14.1	284.135	0.75	65.7
	Large	14.7	324.729	0.75	56.2	17.1	377.672	0.80	70.7
F. cut to 2/3	Small	10.7	167.551	0.71	54.7	10.9	270.721	0.75	56.7
	Medium	14.3	315.780	0.73	57.7	14.3	311.115	0.77	66.7
	Large	17.7	403.683	0.73	61.7	17.9	418.46[illegible]	0.79	72.0
L.S.D. at 0.05		1.1	1.178	n.s.	n.s.	1.0	2.071	n.s.	n.s.

Table (2-b): Effect of foliage cutting, root size and GA_3 spray on seed yield and its quality.

Season		1990				1991			
Characters / Treatments		Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %	Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %
F x GA_3									
Foliage without cut	0	11.5	222.995	0.69	49.3	12.7	237.753	0.75	59.3
	100	12.8	237.854	0.72	51.6	13.8	262.643	0.76	62.0
	150	13.6	256.335	0.72	52.5	14.2	273.093	0.77	64.3
	200	14.3	269.040	0.74	56.6	15.3	314.779	0.77	65.0
Foliage cut to 2/3	0	12.9	252.408	0.70	55.6	13.1	263.745	0.76	62.0
	100	14.0	293.360	0.72	56.6	13.9	291.067	0.76	64.3
	150	14.4	308.800	0.73	58.6	14.5	310.624	0.78	66.0
	200	15.5	328.117	0.75	61.3	16.0	354.299	0.78	68.3
L.S.D. at 0.05		n.s.	1.710	n.s.	n.s.	n.s.	2.812	0.01	n.s.
Size x GA_3									
Small size roots	0	9.2	125.267	0.68	48.5	9.5	138.035	0.74	51.0
	100	10.6	144.723	0.70	50.0	10.6	158.669	0.74	53.5
	150	11.5	159.866	0.72	51.5	10.8	164.255	0.75	55.0
	200	12.8	182.514	0.74	54.5	12.4	199.272	0.75	57.0
Medium	0	12.4	259.597	0.70	53.0	12.6	255.835	0.75	62.0
	100	13.8	292.125	0.71	55.0	14.2	293.322	0.76	66.5
	150	14.2	311.087	0.73	57.5	14.5	307.667	0.76	68.0
	200	14.7	322.126	0.73	59.5	15.6	333.678	0.76	68.5
Large	0	15.5	328.244	0.72	56.0	16.6	358.378	0.77	69.0
	100	15.8	359.974	0.74	57.5	16.8	378.575	0.78	69.5
	150	16.4	377.511	0.74	59.5	17.8	403.655	0.81	72.5
	200	17.2	391.096	0.76	63.0	19.0	451.668	0.81	74.5
L.S.D. at 0.05		n.s.	1.232	n.s.	n.s.	n.s.	1.672	0.01	n.s.

Table (2-c): Effect of foliage cutting, root size and GA_3 spray on seed yield and its quality.

Season	Characters	1990				1991			
Treatments		Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %	Seed yield per plant (g)	Seed yield per fad. (kg)	Weight of 1000 seeds (g)	Seed germination %
Foliage without cut	Small 0	8.9	106.514	0.67	45	9.4	121.258	0.74	48
	100	11.2	134.634	0.70	46	10.7	139.726	0.74	51
	150	12.3	150.822	0.71	48	10.9	143.793	0.75	53
	200	13.2	162.564	0.74	51	12.4	174.800	0.75	54
	Medium 0	12.6	260.072	0.69	50	12.5	242.706	0.74	61
	100	12.9	262.086	0.71	54	14.1	281.276	0.75	66
	150	13.5	282.606	0.72	57	14.4	292.638	0.76	68
	200	14.3	300.466	0.72	58	15.5	319.922	0.76	68
	Large 0	14.0	302.404	0.73	53	16.4	349.296	0.79	69
	100	14.3	316.844	0.75	55	16.6	366.928	0.79	69
	150	15.2	355.578	0.75	56	17.3	382.850	0.81	72
	200	15.4	344.090	0.77	61	18.1	411.616	0.81	73
Foliage cut to 2/3	Small 0	9.5	144.020	0.69	52	9.7	154.812	0.75	55
	100	10.0	154.812	0.71	54	10.6	177.612	0.75	56
	150	10.8	168.910	0.73	55	10.8	184.718	0.76	57
	200	12.5	202.464	0.74	58	12.5	223.782	0.76	60
	Medium 0	12.3	259.122	0.72	56	12.8	268.964	0.77	63
	100	14.7	322.164	0.72	56	14.3	305.368	0.77	67
	150	14.9	338.048	0.74	58	14.6	322.696	0.77	68
	200	15.1	343.786	0.75	61	15.7	347.434	0.77	69
	Large 0	16.0	354.084	0.71	59	16.8	367.460	0.76	69
	100	17.3	403.104	0.73	60	17.0	390.222	0.78	70
	150	17.6	419.444	0.74	63	18.3	424.460	0.81	73
	200	18.0	438.102	0.76	65	19.9	491.720	0.	76
L.S.D. at 0.05		n.s.	3.002	n.s.	n.s.	n.s.	4.902	n.s.	n.s.

and total seed yield and seed index in the first and second interaction or total seed yield in case of the third interaction during the first and second season of growth.

Generally, it could be concluded that, under conditions of the experiment, cutting the plant foliage and selecting the large sized roots pre-planting and spraying the plants four times with GA_3 at 100-200 ppm were best treatment for production higher seed yield with good quality.

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تأثير قطع المجموع الخضرى وحجم الجذور والـــرش بالجبريللين على الازهار والمحصول البذرى وجودته لنباتات الجـــذر

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اجريت التجربة بمزرعة ابحاث كلية الزراعة بمشتهر خلال الموسم الصيفى لعامى ١٩٩٠ ، ١٩٩١ لدراسة تأثير قطع ($\frac{2}{3}$) المجموع الخضرى وحجم الجذور وكذلك الرش بالجبريللين بتركيزات (صفر، ١٠٠ ،١٥٠ ، ٢٠٠ جزء فى المليون) على الازهار والمحصول البذرى وجودته لنباتات الجذر .

وقد أوضحت النتائج المتحصل عليها ما يلى :

أدى قطع $\frac{2}{3}$ المجموع الخضرى قبل الزراعة الى زيادة نسبة النباتات الناجحة بعد الزراعة كما شجع ذلك على الازهار معبرا عنه بزيادة طول الحوامل النوريه وعدد النورات للنبات وكذلك طول وقطر النوره كما ادى ذلك الى زيادة محصول البذور وجودته .

أدى استخدام البذور الكبيرة الحجم فى الزراعة الى زيادة نسبة النباتات الناجحة بعد الزراعة كما ازدادت جميع قياسات الازهار والمحصول وجودة البذور الناتجة .

كذلك كانت معاملة الرش بالجبريللين خصوصا بتركيز ٢٠٠ جزء فى المليون اربع مرات خلال موسم النمو هى افضل المعاملات فى زيادة نسبة النباتات الناجحة بعد الزراعة وزيادة طول الحوامل النوريه وطول وقطر النورات والمحصول البذرى الناتج سواء كان ذلك للنبات أو للفدان كما ادت الى تحسين جودة البذور الناتجة .

وعموما تعتبر معاملة قطع $\frac{2}{3}$ المجموع الخضرى واستخدام الجذور الكبيرة الحجم فى الزراعة وكذلك الرش بالجبريللين اربع مرات بتركيز ٢٠٠ جزء فى المليون هى افضل المعاملات لانتاج اعلى محصول بذرى مع افضل جودة تحت ظروف هذه التجربة .