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EFFECT OF GIBBERELLIC ACID (GA) ON GROWTH AND YIELD OF *CICER ARIETINUM* (GRAM) VARIETY C-727

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Seeds of *Cicer arietinum* variety C-727 were soaked in five concentrations (0, 100, 150, 200 and 250 ppm) of Gibberellic acid for 24 hrs. GA treated plants significantly increased the plant height, number of nodes, number of internodes, number of branches, number of leaves per plant and shoot dry weight. Number of pods per plant, yield per plant and total yield increased in plants treated with 100 ppm GA but the root dry weight and number of flowers per plant decreased.

INTRODUCTION

Growth regulators are known to influence morphological and physiological changes in plants. Gibberellic acid (GA) is one of the regulators applied in various ways to a number of plant species. The most striking response of various plant species has been to greatly enhance stem elongation [1]. The size of fruit of litchi was increased by GA application [2]. The growth of shoots, the number of internodes and total dry weight of both pea and wheat were increased by GA application [3]. GA application also increased the grain yield in *Pennisetum typhoides, Sorghum vulgare* and *Cyamopsis tetraganoloba* [4].

The high nutritive value of gram *(Cicer arietinum)* makes it important for human and animal diet. There is therefore a great need to increase the yield of this crop by the treatment of GA in order to supplement the dwindling supply of animal protein. The present paper, therefore, reports the growth and yield responses of seeds of *Cicer arietinum* to GA treatment.

MATERIALS AND METHODS

Seeds of *Cicer arietinum* variety C-727 were soaked in 100, 150, 200, and 250 ppm GA for 24 hrs. The control seeds were soaked in distilled water for the same period. The seeds were then sown in the plots of Department of Botany, University of Agriculture, Faisalabad. A randomized complete block design was used with four replications. Each block comprised an area of 200 sq. ft. (25 x 8′). The area of individual plot was 40 sq. ft. (8 x 5′). Seven harvests were carried out at fortnightly intervals. At each harvest three plants were harvested at random from each treatment and data on growth parameters were recorded. Three plants per treatment were earmarked to record the number of flowers, number of pods, yield per plant and total yield. The data were analysed statistically and the treatments were compared by Duncan's New Multiple Range Test [5].

RESULTS AND DISCUSSIONS

GA treatment significantly increased the plant height, number of nodes, number of internodes, number of leaves per plant and shoot dry weight. No significant differences were observed among the various treatments in any of the above parameters (Table 1). The plant height was increased by the treatment in all the harvests while the number of nodes, internodes and leaves per plant were influenced by the treatment in fifth, sixth and seventh harvest. The results of the shoot dry weight were significant in sixth and seventh harvest. The results of the present investigations agree with the findings of Kausar [6] on okra and Brain *et al.* [3] on wheat and pea. GA application at 100 ppm level significantly increased the number of branches per plant. The results of the present investigations indicated that the root dry weight and length of leaves were not significantly influenced by the treatment. These results are in agreement with Melin [7] who reported that the application of various concentrations of GA to plants of *Periploca graeca* grown under uniform conditions temporarily stimulated the growth. The results are contrary to the findings of Chhonkar and Singh [8] and Kausar [6] who observed that root growth was inhibited and decreased by the application of GA on late drum-head cabbage and okra respectively. The variation in the results between the present and those of Chhonkar and Singh [8]

Table 1. Effect of Gibberellic acid (GA) on vegetative characteristics of *Cicer arietinum.*

Characteristics	Treatment	$Harvest_1$	$Harvest_2$	$Harvest_3$	$Harvest_4$	$Harvest_5$	$Harvest_6$	$Harvest_7$
Height of plant (cm)	0	9.62 a	10.47 a	13.25 a	16.92 a	22.30 a	32.15 a	30.65 a
	100	19.57 b	9.15 b	24.40 b	26.25 b	27.60 b	35.52 ab	31.42 ab
	150	19.02 b	21.42 bc	23.75 b	26.32 b	30.75 c	36.05 b	34.17 b
	200	19.75 b	22.85 c	24.57 b	26.50 b	27.90 bc	35.50 ab	38.50 c
	250	21.75 b	22.70 c	26.75 b	27.25 b	25.57 b	38.92 b	34.15 b
Number of nodes per plant	0	7.75 a	9.65 a	11.65 a	14.07 a	16.52 a	17.67 a	21.90 a
	100	8.67 a	11.00 a	14.32 a	17.22 a	19.92 b	25.57 a	25.07 b
	150	8.52 a	10.65 a	14.32 a	16.90 a	21.25 b	24.50 a	25.65 b
	200	8.57 a	10.90 a	12.97 a	17.00 a	19.07 ab	24.00 a	27.42 b
	250	8.75 a	11.25 a	14.42 a	16.65 a	17.90 a	26.00 a	20.67 a
Number of internodes per plant	0	6.75 a	8.65 a	10.40 a	13.07 a	15.10 a	15.72 a	21.02 a
	100	7.67 a	9.82 a	13.32 a	16.30 a	19.75 b	24.90 b	23.35 ab
	150	7.52 a	9.40 a	12.82 a	15.57 a	20.20 b	22.65 b	26.35 b
	200	7.57 a	9.90 a	12.82 a	15.92 a	18.07 ab	23.10 b	26.42 b
	250	7.75 a	10.25 a	12.25 a	15.65 a	16.90 ab	25.85 b	25.85 b
Number of branches per plant	0	3.07 a	3.22 a	2.92 a	2.72 a	2.85 a	3.07 a	2.25 a
	100	3.85 a	4.00 a	2.90 a	3.50 a	3.57 a	3.42 a	2.97 ab
	150	3.75 a	4.00 a	2.42 a	2.40 a	2.67 a	2.57 a	3.57 b
	200	3.20 a	3.92 a	3.07 a	3.00 a	2.50 a	3.90 a	3.00 ab
	250	4.10 a	4.02 a	2.67 a	2.90 a	2.42 a	3.90 a	2.82 ab
Number of leaves per plant	0	7.75 a	9.55 a	11.65 a	14.07 a	16.52 a	17.67 a	21.90 a
	100	8.67 a	11.00 a	14.32 a	17.22 a	19.92 b	25.57 b	25.07 b
	150	8.52 a	10.65 a	14.32 a	16.90 a	21.25 b	24.50 b	25.65 b
	200	8.57 a	10.90 a	12.97 a	17.00 a	19.07 ab	24.00 b	27.42 b
	250	8.75 a	11.25 a	14.42 a	16.65 a	17.90 a	26.00 b	20.67 a
Shoot dry weight per plant (g).	0	0.0991 a	0.1451 a	0.2785 a	0.5940 a	1.2798 a	1.8831 a	1.9326 a
	100	0.0111 a	0.1655 b	0.4335 b	0.5840 a	1.0860 a	1.5984 a	2.5131 b
	150	0.0873 a	0.1488 a	0.2875 a	0.4319 b	0.8640 a	0.9885 b	2.6764 b
	200	0.0973 a	0.2632 c	0.4477 b	0.6398 c	0.8688 a	0.9352 b	3.9004 c
	250	0.1252 a	0.1630 b	0.2952 a	0.5740 a	0.7003 a	1.6993 a	2.5382 b
Root dry weight per plant (g)	0	0.0216 a	0.0448 a	0.0692 a	0.1115 a	0.2203 a	0.3373 a	0.3897 a
	100	0.0186 a	0.0413 a	0.0769 a	0.0755 a	0.1282 a	0.2344 ab	0.2722 a
	150	0.0189 a	0.0399 a	0.0729 a	0.1103 a	0.1669 a	0.1803 b	0.3542 a
	200	0.0133 a	0.0301 a	0.0696 a	0.0962 a	0.1399 a	0.2274 ab	0.3025 a
	250	0.0560 a	0.0474 a	0.0571 a	0.0898 a	0.1361 a	0.2835 ab	0.2812 a

(Continued.....)

Table 1. contd.

GA concentration ppm	Treatment means						
	Plant height (cm)	Number of nodes per plant	Number of internodes per plant	Number of branches per plant	Number of leaves per plant	Shoot dry weight per plant (g)	Root dry weight per plant (g)
0	19.33 a	14.17 a	12.90 a	2.87 a	14.17 a	0.8502 a	0.1706 a
100	26.27 b	17.40 b	16.44 b	3.45 b	17.40 b	1.8545 b	0.1260 a
150	27.35 b	17.40 b	16.36 b	3.05 ab	17.40 b	1.8731 b	0.1298 a
200	27.93 b	17.30 b	16.25 b	3.22 ab	17.13 b	1.9309 b	0.1256 a
250	27.92 b	16.37 b	16.32 b	3.26 ab	16.37 b	1.8808 b	0.1359 a

Means followed by common letter are not significantly different at $P > 0.05$.

Table 2. Effect of gibberellic acid on the reproductive characteristics of *Cicer arietinum*.

Treatment ppm	Number of flowers per plant	Number of pods per plant	Yield per plant (g.)	Total Yield per plot (g.)
0	100.70 a	88.20 a	12.79 a	545.08 a
100	99.00 a	93.30 a	14.07 a	599.50 a
150	96.55 a	88.00 a	12.23 a	521.53 a
200	93.05 a	84.90 a	9.40 a	463.80 a
250	93.90 a	84.05 a	10.46 a	476.35 a

Means followed by a common letter are not significantly different at $P > 0.05$.

and Kausar [6] may be due to variation in dosages, times and methods of application and species of the plant used.

GA treatment failed to influence significantly the reproductive characteristics of gram *(Cicer arietinum)* plants (Table 2). Small increases in the number of pods, yield per plant and total yield (10%) were observed in plants treated with 100 ppm GA. These results agree with the findings of Pal *et. al* [9], who reported that almost all the treatments (except NOA 400 ppm which resulted in maximum number of branches, flowers, fruits per plant and greatest yield) had some beneficial effect on growth and yield characteristics studied when they applied GA, IAA and NOA (0, 10, 50, 100, 200 and 400 ppm) on okra as presowing seed treatment. The results of the present investigations are contrary to the findings of Kausar [6] and Misra and Bhattacharya [4]. Kausar [6] observed that 150 ppm GA produced more flowers, higher number of fruits and subsequently more yield when 0, 100, 150 and 200 ppm GA was applied to okra. Misra and Bhattacharya [4] recorded that the application of NPK and GA at 25 ppm increased the grain yield of *Pennisetum typhoides*, *Sorgham vulgare* and *Cyamopsis tetraganoloba* by 56.2, 54.8 and 14.5 per cent respectively. These differences may be due to the differences in dosages, times, methods of applications used and sensitivity of the experimental material to GA.

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