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EFFECT OF HORMONES ON GROWTH AND YIELD CHARACTERS OF SEED CROP OF KHARIF ONION (*ALLIUM CEPA* L.)

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SUMMARY

Studies were conducted at farmer's field of village Pithala (near N.D. University of Agriculture and Technology. Kumarganj, Faizabad, U.P.) to determine the effect of different concentrations of Gibberellic acid, Napthalene acetic acid and Ethephon on growth and yield characters of *Kharif* onion. GA_3 and NAA increased plant height, number and size of leaves, and umbels per plant when their concentrations were increased from 150 to 300 ppm, whereas higher concentration (450 ppm) had depressive effect. Ethephon on the other hand showed continuous decrease in plant height with increasing concentrations from 150 to 450 ppm. Among different hormones used, NAA 300 ppm treated plants produced highest seed weight and yield of onion seeds.

INTRODUCTION

The use of plant growth regulators has resulted in significant increase in growth and yield of a number of vegetable crops. The vegetative growth of onion as measured by plant height, number of leaves per plant, fresh and dry weight of plant increased with increasing level of GA_3 and NAA (Salah and Abd, 1989). Pre -soaking treatment of onion seed with 20 ppm (IAA, NAA and GA_3) for 8 hours produced highest yield (Singh *et al.*, 1982). The present investigation was undertaken to find out the effect of growth hormones on different growth and yield characters of *Kharif* onion.

MATERIALS AND METHODS

Onion bulbs were dipped in different concentrations (150, 300 and 450 ppm) of GA_3, NAA and ethephon solution for six hours. In case of control, bulbs were dipped in water. After six hours bulbs were taken out and dried in the shade before planting. The whole experiment was planned under Randomized Block Design with three replications for each treatment. The number of umbels of different orders (first, second and third) on the each representative sample were counted separately. The seeds from first, second and third order of umbels on each representative plant selected at random in each plot were collected separately and their weights were recorded. The average weight of all umbels of different orders per plant were worked out.

RESULTS AND DISCUSSION

Different growth hormones had different effect on plant height. Gibberellic acid (GA_3) and Napthalene acetic acid (NAA) both increased plant height at 150 to 300 ppm while higher level of GA_3 and NAA (450 ppm) significantly depressed the plant height. Ethephon on the other hand behaved differently, it showed continuous

decrease in plant height with increasing concentrations from 150 to 450 ppm. Increase in plant height with the application of NAA was also reported by Mehrotra (1983) in wheat. The reduction in plant height by ethephon may be attributed to restriction in cell division activity, resulting in shortening of internodal length. Similar results were also observed by Shukla and Tewari (1974) and Guardia *et al.* (1977). Higher level of NAA and lower level of ethephon were found to be beneficial for increasing the number of leaves per plant (Table I.) An increase in number of leaves per plant in okra and maize by application of CCC was observed by Mehrotra *et al.* (1970).

The hormone treated plants showed early flowering than the control. However, the differences among the treatments were non-significant (Table I). Among different hormones used, ethephon treated plants gave 50% flowering 6 to 8 days earlier than control. Chakravarty and Abraham (1958) reported an early termination of the vegetative cycle in certain annual and biannual plants with two distinct phases of growth. Yield attributing characters and yield are the most important criteria to judge the merit of a particular treatment. In general, significant and progressive increase in number of umbels was observed with increasing levels of plant hormones as compared to control (Table II). Among different hormones, NAA was more effective to increase the number of umbels as compared to other hormones, closely followed by ethephon. The highest increase in number of umbels was recorded with 300 ppm NAA.

Table I: Effect of various levels of growth hormones on plant height, number of leaves per plant and days required to 50% flowering of Kharif onion.

Growth hormones	Plant height (cm)		Number of leaves per plant		Days to 50% flowering	
	1991-92	1992 -93	1991-92	1992-93	1991-92	1992-93
			Gibberellic acid (ppm)			
GA_3 (150)	82.20	79.47	16.04	14.72	72.00	65.93
GA_3 (300)	85.14	81.00	17.46	16.02	70.00	64.23
GA_3 (450)	78.80	76.24	15.78	14.43	75.00	70.25
			Ethephon (ppm)			
E (150)	80.56	77.60	19.00	17.41	79.00	64.66
E (300)	78.72	75.85	18.36	16.85	73.00	68.35
E(450)	75.25	72.48	16.18	14.87	71.00	66.50.
			Napthalene acetic acid (ppm)			
NAA (150)	78.83	76.21	18.58	17.03	72.00	67.42
NAA (300)	82.56	79.63	19.57	18.59	67.00	66.06
NAA (450)	78.98	76.21	17.74	16.29	75.00	70.77
Control	73.64	70.94	15.29	13.96	77.60	73.29
L.S.D. (P = 0.05).	5.50	5.58	2.82	2.86	NS	NS

Table II: Effect of various levels of growth hormones on number of umbels and size of umbels of Kharif onion.

Growth hormones	Total No. of umbels per plant		Size of umbels (cm)	
	1991-92	1992-93	1991-92	1992-93
		Gibberellic acid (ppm)		
GA_3 (150)	6.64	6.14	7.80	7.15
GA_3 (300)	6.61	6.12	8.25	6.56
GA_3 (450)	6.33	5.84	7.52	6.86
		Ethephon (ppm)		
E (150)	7.02	6.49	8.67	7.95
E (300)	6.82	6.29	8.30	7.60
E (450)	6.63	6.11	8.22	7.53
		Napthalene acetic acid (ppm)		
NAA (150)	6.95	6.36	8.83	8.09
NAA (300)	7.03	6.49	8.97	8.35
NAA (450)	6.56	6.16	8.23	7.53
Control	6.23	5.83	7.57	6.95
L.S.D. (P=0.05)	0.563	0.497	0.919	NS

The different levels of plant hormones also had significant effect on the size of umbels as shown in Table II. Maximum percent increase in size of umbels was observed with NAA. It showed 18.49% increase over control under 300 ppm treatment.

Different levels of hormones increased seed weight

over control. Among different hormones used, NAA (300 ppm) treated plants produced maximum seed weight (2.62 g) followed by 150 ppm (2.25 g) while GA_3 produced maximum seed weight (2.106 g) at 150 ppm.

The increase in each level of hormone increased 1000 seed weight compared to control (Table III). The maximum increase in 1000 seed weight was observed in

Table III: Effect of various level of growth hormones on total seed wt. (g), seed yield (q/ha) and 1000 seed weight (g) of Kharif onion.

Growth hormones	Total wt. of seed per plant (g)		Seed yield (Q/ha)		1000 seed wt (g)	
	1991-92	1992-93	1991-92	1992-93	1991-92	1992-93
			Gibberellic acid (ppm)			
GA_3 (150)	4.274	3.922	4.664	4.272	3.026	2.773
GA_3 (300)	4.707	4.313	4.819	4,501	3.015	2.779
GA_3 (450)	4.067	3.720	4.511	4.080	2.980	2.724
			Ethephon (ppm)			
E (150)	5.300	4.803	5.130	4.992	2.985	2.806
E (300)	4.897	4.500	4.891	4.447	3.103	2.845
E (450)	4.307	3.969	4.758	4.361	3.045	2.788
			Napthalene acetic acid			
NAA (150)	5.043	4.640	4.958	4.633	3.083	2.825
NAA (300)	5.605	5.213	5.417	5.131	3.096	2.904
NAA (450)	4.524	3.885	4.716	4.321	2.996	2.792
Control	3.722	3.433	4.378	3.982	2.983	2.737
L.S.D. (p=0.05).	0.521	0.415	0.391	0.312	NS	NS

300 ppm of ethephon followed by 300 ppm of NAA and 300 ppm of ethophon followed by 300 ppm of NAA and 300 ppm of GA_3. Among different levels of GA_3, 300 ppm gave maximum seed yield which was 10.07 % more than that of the control plants. While, ethephon at 150 ppm proved best in increasing the yield (10.80%) over control. NAA 300 ppm was found to be the best treatment in increasing the yield (5.41 Q/ha). The production of larger seeds of onion under hormonal treatment may be attributed due to the fact that plants from seed treated with plant growth regulators remain physiologically more active to build up sufficient food reserve for developing flowers and seeds. Thus, in the presence of such substances the plants can give earlier flower initiation with better seed development and ultimately higher yield.

Midan *et al.* (1986) also reported increase in seed yield with the application of auxin. In general, the PGR treatments enhanced translocation to the sinks. It stimulated sucrose translocation and this might be due to higher cell division activity, a crucial factor in attracting photosynthates to sink organs at early stage of development (Leonard *et al.*, 1983 and Kinet *et al.*, 1986).

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