INDIAN JOURNAL OF ARID HORTICULTURE
2013 Vol. 8 (1-2): 88-90

SHORT COMMUNICATION

Influence of IAA, IBA and GA_3 on growth and yield of onion (*Allium cepa* L.)

P. K. Singh*, N. S. Nathawat, Yogendra Sharma, R. Sharma and Govind Singh
Plant Biotechnology Center, S. K. Rajasthan Agricultural University, Bikaner, Rajasthan
*Present: Indian Institute of Vegetable Research, Seed Production Center, Sargatia, Kushinagar (UP) 274 406
(Received 20.12.2013; Accepted 19.01.2014)

Onion (*Allium cepa* L.) is among the most important vegetable / medicinal crop grown in India. This crop introduced in India from Central Asia, the primary centre of origin. Onion must have been grown in India from very ancient times as their utility as medicinal herbs has been mentioned in the medicinal treaties like "*Charka Samhita*" dated to be around 600 B.C. (Swarup, 2006). About 47.63 million tonnes of onion is produced in the world from about 2.71 million hectares of land (Anonymous, 2009). India ranks second in area (0.81 million ha), production (12.16 million tonnes) and productivity 15.1 mt/ha (Anonymous, 2008).

Onion is an indispensable item in every kitchen as condiment and vegetable. Hence, this crop has gained the importance of a cash crop, rather than a vegetable crop, because of its high marketable value. The bulbs of onion are rich in calories, vitamins and minerals and endowed with medicinal properties. It is a unique vegetable, which is consumed by almost all the sections of the society throughout the year, not only at the maturity, but also at different stages of growth.

Plant growth regulators modify the plant characters by influencing the physiological processes within the plant body, which ultimately affect the growth and yield of the crop. The present investigation was, therefore, carried out to study the effect of IAA, IBA and GA_3 on growth and yield of onion cv. RO-59 a newly released variety of Agriculture Research Station, Durgapura, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India.

The experiment was conducted during *rabi* season of the year 2006-2007 at the farm area of Landscape and Nursery Unit, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India. The city of Bikaner is situated 28.01^0 N and 73.22^0 E at an elevation of 234.70 meter above sea level. The soil was sandy loam with pH 8.4, organic carbon 0.15, available P 21 kg ha^{-1} and available K 124 kg ha^{-1}. Forty tonnes of FYM was mixed in soil before one month of transplanting of the seedlings. 100 Kg nitrogen (N), 50 Kg phosphorous (P) and 100 Kg potash (K) as recommended for Bikaner zone (Anonymous 1996) was applied. Full amount of P and K and half of N was added just before transplanting. Rest of the N was given as a single dose 25 days after transplanting. All other recommended cultural practices were adopted to raise a good crop. Each plot consisted of five rows of 3 m length with 15 cm spacing between rows and 10 cm between plants. Furrow method of irrigation was followed.

The experiment comprising of 16 treatments viz. IAA 30 ppm D, IAA 30 ppm DS, IAA 50 ppm D, IAA 50 ppm DS, IAA 50 ppm S, IBA 30 ppm D, IBA 30 ppm DS, IBA 50 ppm D, IBA 50 ppm DS, IBA 50 ppm S, GA_3 30 ppm D, GA_3 30 ppm DS, GA_3 50 ppm D, GA_3 50 ppm DS, GA_3 50 ppm S and untreated control, with three replications planted in a randomized block design. Six weeks old healthy seedlings of onion (cv. RO-59) were uprooted from nursery bed. Roots of the plants were dipped in solution of respective treatments for 14 hours and then transplanting was done in the field. Spray treatments were followed after 45 days of transplanting. Observations on growth and yield contributing characters *viz.* height (cm), number of leaves, fresh weight of plants (g), diameter of bulbs (cm), weight of bulbs (g) and yield of bulbs (Kg ha^{-1}), were recorded.

The maximum mean plant height (Table 1) as recorded on 45, 90 and 120 days after transplanting was 43.85 cm, 55.12 cm and 61.65 cm, respectively for treatment IAA 50 ppm DS. This was followed by GA_3 50 ppm DS, and IAA 30 ppm DS. Whereas the least mean plant height values in the untreated control. Such growth behavior might be due to enhancement of growth and apical dominance under the influence of IAA. These results are in confirmation with the findings of Shakhda and Gajipara (1998) and Poonam *et al.* (2002) in onion crop.

The number of leaves per plant counted at 45 days after transplanting (Table 1) was non-significant. However, the number of leaves as on 90 and 120 days after transplanting were significantly maximum (8.72 and 10.52, respectively) in GA_3 50 ppm DS. The minimum number of leaves per plant at 90 and 120 days after transplanting (5.78 and 6.72, respectively) was obtained in the untreated control. A similar trend was observed by Deore and Bharad (1991) and Poonam *et al.* (2002).

Maximum fresh weight of plant (162.14 g) was found under concentration of GA_3 50 ppm DS, where as the

minimum fresh weight (106.66 g) was found under untreated control (Table 2). Highest bulb diameter and bulb weight was found at 200 ppm each of GA_3 and IAA and the highest bulb yield (15.57 t ha^{-1}) was observed at 200 ppm GA_3 followed by 200 ppm of IAA (15.53 t ha^{-1}) in onion which complements the findings of Abdul *et al.* (2002).

Significantly the maximum diameter of bulb (7.26 cm) and bulb weight (41.25 g) were found in the treatment GA_3 50 ppm DS and the minimum bulb diameter (4.75 cm) and weight (25.0g) were observed in untreated control (Table 2.). These results corroborate the findings of Deore and Bharad (1991), Nandekar and Sawarkar (1992) and Abdul *et al.* (2002) in onion. Pogroszewska *et al. (2007)* reported that GA_3 (500 $mg \cdot dm^{-3}$) applied in the form of bulb soaking had a positive effect on the total yield expressed in the number of bulbs, while applied in bulb soaking and

Table1. Effect of tre atments on plant height and number of leaves per plant at 45, 90 and 120 days after transplanting

Treatment	Height (cm)			Number of leaves		
	45 days	90days	120 days	45days	90 days	120 days
IAA 30 ppm D	40.18	44.05	53.32	5.98	7.45	8.38
IAA 30 ppm DS	39.95	50.62	57.05	6.05	7.78	8.72
IAA 50 ppm D	43.65	45.18	55.18	6.25	7.52	8.45
IAA 50 ppm DS	43.85	55.12	61.65	6.38	8.25	9.12
IAA 50 ppm S	33.65	44.38	56.05	4.95	7.58	8.52
IBA 30 ppm D	38.05	44.32	52.98	5.72	7.32	8.32
IBA 30 ppm DS	39.52	45.25	54.98	5.85	7.18	8.58
IBA 50 ppm D	37.65	44.18	52.12	5.65	7.05	8.25
IBA 50 ppm DS	37.72	43.98	52.45	5.52	7.32	8.32
IBA 50 ppm S	33.48	43.85	52.38	4.98	6.78	8.12
GA_3 30 ppm D	39.32	44.32	53.05	6.12	7.72	8.65
GA_3 30 ppm DS	39.42	48.25	54.98	6.52	8.38	8.95
GA_3 50 ppm D	41.72	45.05	53.52	6.32	7.85	8.85
GA_3 50 ppm DS	42.52	53.92	58.05	6.72	8.72	10.52
GA_3 50 ppm S	33.05	44.85	54.78	5.05	8.05	8.98
Untreated control	32.95	39.37	43.85	4.98	5.78	6.72
CD at 5%	3.915	4.318	7.422	NS	1.352	1.400
CV %	6.049	5.613	8.178	14.71	10.35	9.450

Table 2. Effect of treatments on fresh weight, diameter of bulb, weight of bulb and yield of bulbs

Treatment	Fresh weight of plant (g)	Diameter of bulb (cm)	Weight of bulb (g)	Yield of bulb (kg/ha)
IAA 30 ppm D	131.56	5.70	29.96	29960
IAA 30 ppm DS	143.80	5.75	31.17	31170
IAA 50 ppm D	135.23	5.72	30.13	30131
IAA 50 ppm DS	154.76	6.65	38.64	38640
IAA 50 ppm S	132.70	5.77	30.48	30481
IBA 30 ppm D	134.56	5.72	29.79	29790
IBA 30 ppm DS	138.70	5.73	30.83	30830
IBA 50 ppm D	126.80	5.70	29.44	29440
IBA 50 ppm DS	129.03	5.71	30.44	30441
IBA 50 ppm S	127.23	5.69	29.61	29611
GA_3 30 ppm D	137.73	5.73	30.31	30310
GA_3 30 ppm DS	152.83	6.75	38.46	38461
GA_3 50 ppm D	141.43	5.76	31.87	31870
GA_3 50 ppm DS	162.14	7.26	41.25	41250
GA_3 50 ppm S	144.43	5.73	31.53	31530
Untreated control	106.66	4.75	25.00	25000
CD at 5%	16.67	0.86	6.96	6968.7
CV %	7.14	8.45	13.34	12.22

spraying (both forms), it increases the bulb weight of the total yield of *Allium karataviense*.

Maximum yield of 41,250 kg per hectare was found under the treatment of GA_3 50 ppm DS, and the minimum yield of 25,000 kg per hectare was observed under the treatment, untreated control. It revealed from the Table 2 that when IAA or GA_3 was applied twice *i.e.* dip and spray, then yield increased significantly 38,640 (kg ha^{-1}) and 41,250 (kg ha^{-1}) higher than only single dip application 30,161 (kg ha^{-1}) and 31,870 (kg ha^{-1}), respectively. This suggests that both growth regulators helped in root growth as well as vegetative growth because dip application alone v/s dip + spray application showed significant difference. An increase in *onion* bulb yield after the application of GA_3 was observed by Shakhda and Gajipara (1998), Anant and Maurya (2001), Abdul *et al.* (2002)**,** Poonam *et al.* (2002), Subimal *et al.* (2003), although Kurtar and Ayan (2005) noted a decrease in the tulip bulb yield after the application of Ga_3.

References

Abdul, K.M., Shahidul, H.Md. and Abdul, H.Md. 2002. Yield of onion influence of growth regulators and their time of application on onion. *Pakistan Journal of Biological Science*, 5 (10): 1021-23

Anant, B. and Maurya, V.N. 2001. Effect of GA_3 and foliar feeding of urea on bulb production of onion (*Allium cepa* L.). *Vegetable Science*, 28(1): 9091.

Anonymous. 1996. *Pyase ki kheti*. *In: Rajasthan me Udhayaniki Phasale*, Pant Krishi Bhawan, pp 86-88.

Anonymous. 2008. Indian Horticulture Database 2008, National Horticulture Board, pp 12.

Anonymous. 2009. From www.onion-usa.org/about/production.php

Deore, B.P. and Bharad, R.W. 1991. Effect of growth substances on growth and yield of onion cv. N-2-4-1. *Maharastra Journal of Horticulture*, 5(2): 64-67.

Kurtar, E.S. and Ayan, A.K., 2005. Effect of gibberellic acid (GA_3) and indole-3-acetic acid (IAA) on flowering, stalk elongation and bulb characteristics of tulip (*Tulipa gesneriana* var. Cassini). *Pakistan Journal of Biological Science*, 8(2): 273277.

Nandekar, D.N. and Sawarkar, S.D. 1992. Note on effect of growth regulators on growth, yield and quality of *Kharif* onion. *Indian Journal of Horticulture*., 49(3): 267-69.

Pogroszewska, E., Laskowska, H. and Durlak, W. 2007. The effect of gibberellic acid and benzyladenine on the yield of (*Allium karataviense* Regel.) 'Ivory Queen'. *Acta Sci. Pol., Hortorum Cultus*, 6(1): 15-19.

Poonam, S., Nalini, T. and Katiyar, P.K. 2002. Pre-transplant seedling treatment with growth regulators and their effect on the growth and bulb production of onion (*Allium cepa* L.). *Progressive Agriculture*, 2(2): 181-182.

Shakhda, V.P. and Gajipara, N.N. 1998. A note on influence of IAA, IBA and GA_3 on growth and yield of onion (*Allium cepa* L.). *Vegetable Science*, 25: 185-186.

Subimal, M., Subhadeep, N., Ghanii, P. and Shukla, N. 2003. Effect of doses and methods of application of GA_3 and NAA on growth and yield of onion (*Allium cepa*) cv. N-53. *Environment and Ecology*, 21(3): 568-571.

Swarup, V. 2006. Bulb Crops. *In*: Vegetable science and technology in India. Kalyani Publishers, Ludhiana. pp 534.