



## Effect of seedling treatment with gibberellic acid (GA<sub>3</sub>) on growth and yield of onion (*Allium cepa* L.) cv. Pusa Red

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### Abstract

A field experiment was carried out at Horticulture Research farm, R.B.S. College, Bichpuri, Agra during rabi season of two consecutive years i.e. 2012-13 and 2013-14. The experiment was laid out in Randomised Block Design (RBD) with three replications and twelve treatment combinations. The seedlings of onion (*Allium cepa* L.) were treated with different concentrations of GA<sub>3</sub> (0, 25, 50 and 75 ppm) for 6, 12 and 18 hrs before transplanting. The treatment with GA<sub>3</sub>@ 75ppm for 12 hrs was found to be the best treatment combination for improving vegetative growth and onion yield attributes.

**Key words** :gibberellic acid, soaking hrs, onion yield.

### Introduction

Onion (*Allium cepa* L.) is an important bulbous vegetable and spice crop of India belongs to family Alliaceae. Onion is a bulbous, biennial herb which is consumed all over the world through out the year. India is the 2nd largest producer of onion, in the world next only to China but the productivity of onion in India is very low i.e. 14.21 tons/ha as compared to China and other countries like, Egypt, Netherland. Iran etc. Maharastra and Karnataka are two leading. states occupying more than half of the total area and contribute nearly 46 percent of the total production of onion in India. The export of onion during 2013-14 was 13,11,369.39 thousand tons with a value of Rs. 2,85,212.90 crore (Mathur, 2013).

It is important as rich source of mineral like Sulphur, Phosphorus, Calcium, Iron and other mineral and carbohydrates. It is good source of protein and vitamins. It is useful for medicinal point of view i.e. anti-diabetic, reduction in the total blood pressure, coronary artery, stroke etc. As a result the area under

this crop is increasing in general and Agra region. The ideal combination from the proposal treatments of this study would have a good scope for the better yield and quality production of onion bulbs in the region.

The present investigation was, therefore, proposed on effect of seedling treatment with gibberellic acid on growth and yield of onion (*Allium cepa* L.) cv. Pusa Red.

### Research Methods

The present investigation was carried out during rabi season of 2012-13 and 2013-14 at research farm, Deptt. of Horticulture, Raja Balawant Singh College, Bichpuri, Agra (U.P.), which is situated at an elevation (altitude) of 168 m above mean sea level, 27.2° N Latitude and 77.9° E Longitude, in semi-arid eco-system/region IV (AESR 4.1) and Agroclimatic zone, 'NWPZ' (North Western Plains Zone). Twelve treatment combinations comprising of four levels of GA<sub>3</sub> (0, 25, 50 and 75 ppm) and three levels of soaking duration (6, 12 and 18 hrs) were replicated three times in randomized block design. The slightly alkaline soil of experiment field had 174.0 kg/ha available N, 25.80 kg/ha available P and 222.70 kg/ha available K with pH 7.84.

The experiment plots size 2.10m x1.80 m and recommended dose of fertilizers (100:50:50 : : N:P:K) incorporated in soil. The seedling of Pusa Red variety about 8 week old were



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treated in the above plant growth regulator at its respective concentrations for 6, 12 and 18 hrs soaked separately, while control, seedlings were soaked in tap water only for same period.

After the treatment period was over, the solution was drained. The seedlings were taken out and transplanted by keeping a distance of 15 cm from row to row and 10 cm from plant to plant. Standard cultural practices were followed. The collected data regarding experimental observations were subjected for statistical analysis.

### Research Findings And Discussion

Table 1 revealed that different levels of GA<sub>3</sub> and soaking hrs had a significance influence on vegetative growth parameters like plant height, length and width of longest leaf, leaves /plant and fresh weight of bio-mass (g) at peak stage of growth. The maximum plant height (54.70 and 59.27 cm), length of longest leaf (48.96 and 49.56 cm), width of longest leaf (1.81 and 1.81 cm), leaves /plant (11.55 and 10.66) and fresh weight of top (56.20 and 60.52 g) both the years were observed to be significant higher concentration of GA<sub>3</sub>@ 75 ppm as compared to minimum in control. Soaking of seedlings for 12 hrs resulted in length of longest leaf (46.75 cm) and leaves/plant (10.70) maximum in first year, while maximum fresh weight of top (47.55 g) in second year. However, height of plant, width of longest leaf during both the years were not significantly influence due to variation in soaking duration. The results obtained are in agreement with the work by Mandal *et al* (2003) and Tyagi and Yadav (2007) in onion.

The increasing in growth may be attributed to accelerating effect of GA<sub>3</sub> due to cell elongation and enlargement as a consequence of better vegetative growth for GA<sub>3</sub> treated seedling. The higher concentration of GA<sub>3</sub> and medium soaking duration (12h) proves optimum and advantageous with respect to the growth parameters.

The data in Table 2 clearly show that different concentration of GA<sub>3</sub> exhibited significant role in the character pertaining to yield of onion bulbs. The higher concentration of GA<sub>3</sub> (75 ppm) significantly increased diameter of bulb, weight of bulb, specific gravity of bulb and bulb yield (q/ha). This might be due to the fact that maximum vegetative growth have been changed to bulb yield and diameter of bulb is one of the most important yield attributing characters, which ultimately affect the total of onion bulbs yield q/ha. The application of GA<sub>3</sub>@75 ppm in resulted maximum diameter of bulb (6.46 and 6.42 cm), weight of bulb (101.42 and 101.58 g), specific gravity of bulb (0.99 and 1.01) and total bulb yield (539.45 and 517.47 q/ha) in both the years. It was also observed that soaking of onion seedlings for 12hrs produced significantly more weight and specific gravity of bulb in second year and total bulb yield (516.40 and 542.20 q/ha) in both years, while soaking duration did not affect the diameter of bulb significantly in both years. Treatment with GA<sub>3</sub> might have enhance bulb yield due to accumulation of greater food reserves. These results are in close conformity with the findings of Bahadur and Maurya (2001) in onion, Paromita *et al* (2008) in garlic; Patel *et al* (2010) in onion.

Table 1: Effect of GA<sub>3</sub> concentration and soaking duration on vegetative growth parameters in onion cv. Pusa Red

Treatments GA <sub>3</sub> conc.	Plant height (cm)			Length of longest leaf (cm)			Width of longest leaf (cm)			No. of leaves/plant			Fresh weight of top (g)		
	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean
C <sub>0</sub> (0 ppm)	44.44	45.74	45.09	40.92	40.51	40.71	1.40	1.47	1.43	8.18	8.70	8.44	33.08	30.20	31.62
C <sub>1</sub> (25 ppm)	49.55	48.69	49.12	45.07	45.99	45.53	1.59	1.66	1.62	9.26	9.36	9.31	30.29	41.57	39.93
C <sub>2</sub> (50 ppm)	52.14	53.18	52.65	46.11	47.62	46.86	1.71	1.76	1.73	10.01	10.18	10.095	47.49	50.36	48.92
C <sub>3</sub> (75 ppm)	54.70	59.27	56.98	48.96	49.56	49.26	1.81	1.81	1.81	11.55	10.66	11.105	56.20	60.52	58.36
SE ±	0.807	1.851	-	0.793	1.3744	-	0.055	0.41	-	0.295	0.306	-	2.923	2.3451	-
C.D. (P 0.05)	2.37	3.8391	-	2.33	2.85	-	0.16	0.086	-	0.87	0.7328	-	8.57	4.8638	-
<b>Soaking hrs</b>															
D <sub>1</sub> (6 hrs)	49.38	50.53	49.95	43.86	44.89	44.37	1.57	1.66	1.61	8.83	9.57	9.20	41.05	42.22	41.63
D <sub>2</sub> (12 hrs)	51.00	53.35	52.17	46.75	46.35	46.55	1.68	1.69	1.68	10.70	9.94	10.32	47.55	47.12	47.33
D <sub>3</sub> (18 hrs)	50.23	51.27	50.75	45.19	46.52	45.855	1.63	1.68	1.65	9.75	9.66	9.70	42.69	47.64	45.16
SE ±	0.669	1.603	-	0.687	1.190	-	0.047	0.0361	-	0.255	0.306	-	2.531	2.0309	-
C.D. (P 0.05)	NS	NS	-	2.01	NS	-	NS	NS	-	0.75	NS	-	NS	4.2112	-

Table 2: Effect of GA<sub>3</sub> concentration and soaking duration on bulb production in onion cv. Pusa Red

Treatments GA <sub>3</sub> conc.	Diameter of bulb (cm)			Fresh weight of bulb (g)			Specific gravity of bulb			Onion bulb yield (q/ha)		
	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean
C <sub>0</sub> (0 ppm)	5.62	5.37	5.49	85.47	74.44	79.95	0.87	0.75	0.81	482.90	405.22	444.06
C <sub>1</sub> (25 ppm)	6.06	5.98	6.02	89.72	89.61	89.66	0.94	0.88	0.91	509.00	434.26	471.63
C <sub>2</sub> (50 ppm)	6.27	6.22	6.24	96.36	96.08	96.22	0.96	0.93	0.945	519.72	460.06	489.89
C <sub>3</sub> (75 ppm)	6.46	6.42	6.44	101.42	101.58	101.50	0.99	1.01	1.00	539.45	495.54	517.475
SE ±	0.083	0.114	-	3.349	1.4358	-	0.018	0.01722	-	10.875	2.3610	-
C.D. (P 0.05)	0.24	0.2377	-	9.82	2.978	-	0.05	0.03571	-	31.90	4.8968	-
<b>Soaking hrs</b>												
D <sub>1</sub> (6 hrs)	6.05	5.91	5.98	91.15	87.60	89.375	0.92	0.87	0.895	494.72	430.93	462.825
D <sub>2</sub> (12 hrs)	6.17	6.06	6.11	94.82	92.63	93.725	0.95	0.91	0.93	527.18	463.18	495.18
D <sub>3</sub> (18 hrs)	6.09	6.02	6.055	93.72	91.05	92.385	0.95	0.80	0.875	516.40	452.20	484.30
SE ±	0.072	0.099	-	2.901	1.2435	-	0.015	0.01491	-	9.418	2.0447	-
C.D. (P 0.05)	NS	NS	-	NS	2.579	-	NS	0.03093	-	27.62	4.2407	-

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