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**SHORT COMMUNICATION**

# EFFECT OF BIOREGULATORS ON GROWTH, BULB YIELD, QUALITY AND STORABILITY OF ONION CV. PUSA RED

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**An experiment was carried out at G.B. Pant Univ. of Agric. and Tech., Pantnagar during 1994-95, 1995-96 and 1996-97 to study the effect of bioregulators on bulb yield, quality and storability of onion cv. Pusa Red. Spraying of bioregulators appeared more beneficial than root dipping. Spraying of etherel (25 ppm) gave the highest bulb yield (153.76 q/ha) and plant height (58.33 cm). Application of GA (50 ppm) produced the maximum number of leaves per plant both as spray (12.33) and as root dip (12.53). Spray of etherel (50 ppm) resulted in significantly bigger (4.07 cm) and heavier (30.66 g) bulbs. TSS content of bulbs was highest (13.33° brix) under spray of GA (25 ppm). Rate of physiological loss in weight was comparatively slow in NAA (50 ppm) sprayed onion over control and other treatments.**

*Key words*: **Bioregulators, onion, quality, storability, yield.**

Onion (*Allium cepa.* L.) is extensively grown in India for the bulb production. Yield performance and the quality of the produce is greatly influenced by the nutrition and season of planting. The premature bolting in bulb crop, uneven and improper physiological maturity, more production of twin bulbs are some of the important characters associated with the quality and storage behaviour of onion bulbs. Premature bolters and physiologically immature bulbs do not store well and have poor market acceptance. Growth regulators like auxins, gibberellins, and ethephon have been found to improve the bulb yield and quality (Hore *et al.* 1988, Deore and Bharud 1991, Nandekar and Swarkar 1992). As the information regarding the effect of bioregulators on yield, quality and storability of Pusa Red, the widely used variety of rabi onion in the region, is poor, the present investigation was undertaken to study the effect of various bioregulators and their application methods on the yield, quality and storability of onion bulbs.

The experminet was carried out at Vegetable Research Centre of G.B. Pant Univ. of Agric. and Tech., Pantnagar during the rabi seasons of 1994-95, 1995-96 and 1996-97. The experiment consisted of 14 treatments including control. $T_1$, $T_2$ and $T_3$ were as 24 hours root dipping before transplanting in solutions of Naphthlene acetic acid (NAA), Gibberellic acid (GA) and etherel each of 50 ppm concentration. $T_4$ was root dipping in urea (0.1%) solution for 24 hours before transplanting. $T_5$, $T_6$ and $T_7$ were spray of NAA at 25, 50 and 75 ppm concentration, while $T_8$, $T_9$ and $T_{10}$ as 25, 50 and 75 ppm spray of $GA_3$ and $T_{11}$, $T_{12}$ and $T_{13}$ as 25, 50 and 75 ppm spray of etherel, respectively. $T_{14}$ was control. Six weeks old seedlings were transplanted in flat beds of size 2.0 × 1.5 m at 15 × 10 cm spacing. Fertilizers were applied at the rate of 100 : 80 : 60 kg/ha of N, P and K respectively. Half dose of nitrogen and full dose of phosphorus and potash were applied as basal dose at the time of sowing. Remaining nitrogen was applied as top dressing in equal splits at 30 and 40 days after transplanting. Spray of bioregulators was done as per treatment after 85 days of transplanting. The bulbs were harvested when there was general yellowing and self-topping of plants and observations recorded for plant

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height, number of leaves per plant, neck diameter, bulb diameter, volume, weight and yield and TSS. Shelf life of onion bulbs was studied under ambient conditions of storage where temperature varied from 26 – 32°C (max) and 16–23°C (min) and relative humidiy (63–85%) during the period of study.

The average values for three years revealed that application of various bioregulators affected the plant height significantly. Among the root dip methods, urea and GA application showed slight increase in plant height. Among the etherel spray treatments, plant height decreased with increasing etherel concentration. Spray of NAA (75 ppm) and etherel (25 ppm) resulted in tallest plants (58.33 cm) whereas the smallest plants were observed in control (48.53 cm) (Table 1). Beneficial effect of auxin spray has also been shown by Deore and Bharud (1991) in onion. Number of leaves per plant were also affected significantly and application of GA (50 ppm) produced the maximum number of leaves in both the root dip and foliar spray methods. Sachs (1961) documented that exogeneously applied GA has modified the growth and development in wide range of plants. Mulge *et al.* (1998) also reported beneficial effect of GA spray on shoot length and seedling growth in onion. The average performance over three years revealed non-significant effect of various bioregulators on neck diameter. Effect on bulb size was also non-significant in various treatments nevertheless, spray of etherel (50 ppm) produced bigger bulbs as compared to control. Beneficial effect of ethephon on bulbing has also been reported by Sobeih and Wright (1987) in onion. Effect on bulb volume was also non-significant in various treatments but root dipping in urea exhibited notable improvement in bulb volume. Sprays of NAA (50 ppm) and etherel (25 ppm) also showed considerable improvement in bulb volume over control. This may be attributed to the fact that treated plants remain physiologically more active to build up of sufficient food reserves. Three years average also showed non-significant effect of various treatments on bulb weight and yield. However, plots treated with bioregulators exhibited improvement in bulb weight. Spray with etherel (25 ppm) and NAA (50 ppm) resulted in comparatively better yields 153.76 and 150.10 q/ha, respectively over control (123.93 q/ha) (Table 1). Increased growth and development due to exogenous application of growth regulators may be attributed to enhanced cell division, increased carbohydrate hydrolysis and cell wall plasticity as reported by Sachs

**Table 1.** Effect of bioregulators on growth, bulb yield and quality traits of onion (3 years average).

| Treatment | Plant height (cm) | No. of leaves/ paint | Neck diameter (cm) | Bulb diameter (cm) | Bulb volume (ml) | Bulb weight (g) | Bulb yield (q/ha) | TSS (°brix) | PLW (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 50 DAS | 100 DAS | 150 DAS |
| $T_1$ | 50.93 | 11.27 | 0.800 | 3.72 | 32.0 | 30.0 | 110.14 | 11.33 | 10.00 | 26.25 | 38.55 |
| $T_2$ | 53.67 | 12.53 | 0.873 | 3.51 | 27.0 | 25.0 | 101.03 | 12.20 | 9.00 | 33.00 | 39.21 |
| $T_3$ | 49.93 | 11.33 | 0.807 | 3.64 | 28.0 | 27.70 | 137.76 | 13.06 | 10.00 | 26.50 | 39.50 |
| $T_4$ | 53.13 | 11.33 | 0.847 | 3.84 | 28.33 | 27.00 | 137.00 | 12.33 | 9.10 | 31.50 | 42.79 |
| $T_5$ | 50.93 | 10.53 | 0.767 | 3.43 | 28.67 | 27.30 | 140.23 | 12.66 | 10.50 | 32.00 | 46.90 |
| $T_6$ | 54.13 | 11.13 | 0.887 | 3.70 | 30.67 | 30.0 | 150.10 | 11.80 | 5.00 | 19.90 | 29.81 |
| $T_7$ | 58.33 | 11.60 | 0.640 | 3.83 | 27.67 | 27.00 | 142.76 | 12.93 | 13.50 | 30.25 | 38.36 |
| $T_8$ | 52.73 | 11.73 | 0.780 | 3.68 | 30.67 | 30.00 | 132.30 | 13.33 | 12.00 | 29.30 | 37.09 |
| $T_9$ | 57.80 | 12.33 | 0.720 | 3.69 | 27.33 | 26.00 | 142.53 | 11.40 | 20.90 | 44.05 | 62.58 |
| $T_{10}$ | 53.47 | 12.00 | 0.800 | 3.73 | 26.33 | 25.60 | 142.66 | 12.06 | 23.75 | 50.85 | 66.27 |
| $T_{11}$ | 58.33 | 11.00 | 0.747 | 3.94 | 30.67 | 30.00 | 153.76 | 11.66 | 20.00 | 32.85 | 38.76 |
| $T_{12}$ | 54.13 | 12.13 | 0.700 | 4.07 | 31.33 | 30.66 | 129.63 | 13.00 | 14.00 | 28.20 | 34.21 |
| $T_{13}$ | 53.00 | 12.00 | 0.780 | 3.72 | 26.67 | 25.60 | 134.06 | 11.80 | 13.00 | 28.55 | 41.58 |
| $T_{14}$ | 43.53 | 9.33 | 0.813 | 3.69 | 27.33 | 25.60 | 123.93 | 12.20 | 6.25 | 35.20 | 47.92 |
| CD (5%) | 4.739 | 1.189 | NS | NS | NS | NS | NS | 1.02 | 0.680 | 6.50 | 9.89 |

DAS = Days after storing

(1961). The above results revealed the superiority of bioregulator spraying over root dipping. The results are in accordance with the findings of Deore and Bharud (1991) and Hore *et al.* (1988) who reported increase in bulb yield with GA and NAA application. TSS content of bulbs was affected significantly due to bioregulators application. Spray of GA (25 ppm) resulted in bulbs with significantly higher TSS (13.33° brix) over control. Sobeih (1988) stated that ethephon and GA cause increase in amount of assimilates in leaf, which stimulate early bulbing and also increase the movement of assimilates to leaf bases. Increase in dry matter and TSS has also been reported in onion with application of GA and NAA by Hore *et al.* (1988).

Effect of various treatments showed significant difference in the physiological loss in weight (PLW) during storage of bulbs at various intervals (Table 1). In first 50 days of storage, the weight loss was lowest in bulbs sprayed with NAA (50 ppm). Application of NAA (50 ppm) spray exhibited significantly slow rate of weight loss up to 150 days of storage. At 150 days of storage, the weight loss was maximum in GA (75 ppm) followed by GA (50 ppm). Further, spray of NAA (50 ppm), GA (25 ppm) and etherel (50 ppm) revealed significantly lower rate of weight loss than in control. The low rate of weight loss in the bulbs treated with bioregulators (GA and etherel) may be attributed to their thin necks. Shoemaker (1947) reported that thick neck bulbs are more prone to sprouting due to greater access of oxygen and moisture to central growing point which ultimately lead to loss in marketable quality of bulb. Since foliar spray of NAA (50 ppm) after 85 days of transplanting showed comparatively higher yield and minimum loss during the storage over control, it can therefore be advocated to the farmers for better returns.

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