Eco. Env. & Cons. 29 (1) : 2023; pp. (86-89)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2023.v29i01.012

Effect of Growth promoters and Micronutrients on Performance of Onion under Hill Zone of Karnataka

PJ Nivethaa[1]*, Devaraju[2], V. Srinivasa[3], M. Ganapathi[4] and C.S. Ravi[5]

[1,2,3]Department of Vegetable Science, College of Horticulture, Mudigere 577 132, Karnataka, India
[4]Department of Crop Physiology, College of Horticulture, Mudigere 577 132, Karnataka, India
[5]Department of PSMAC, College of Horticulture, Mudigere 577 132, Karnataka, India

(Received 4 July, 2022; Accepted 1 September, 2022)

ABSTRACT

Onion (*Allium cepa*) is one of the commercial bulb crops cultivated throughout India. Onion has huge demand for its edible bulb and the productivity is to be increased. An experiment was conducted to investigate the influence of growth promoters and micronutrients in bulb yield of onion cv. Bhima Shakti during 2021-22 at experimental block of College of Horticulture, Mudigere under hilly conditions. The experiment was laid out in Randomised block design with eleven treatments and three replications. The treatments consist of growth promoters (GA_3 and NAA) applied at 75 ppm, 100 ppm, 125 ppm and micronutrients ($ZnSO_4$ and Boron) applied at 0.25% and 0.50%. Growth promoters and micronutrients made a significant impact on growth and bulb yield of onion. The obtained results showed that plant height (74.52 cm) was significantly higher in T_6-GA_3@125 ppm at 105 days after transplanting (DAT). Maximum leaf girth (3.23 cm) at 105 DAT, days for maturity (125 days), bulb yield (34.50t/ha)and bulb volume (96.35 cc) were recorded significantly in T_5-GA_3@100 ppm. The application of gibberellic acid at the concentration of 100 ppm was effective for obtaining higher bulb yield.

Key words: *Onion, Growth promoters, Micronutrients, Bulb yield*

Introduction

Onion (*Allium cepa* L.), also called queen of kitchen, is an important bulb crop in Alliaceae family. Onion is native to the Central Asia where India ranks second in the onion production among all the countries. In India, onion is grown in an area of 1.62 million hectare with a total production of 26.64 million tonnes (Anon., 2021). Onions are mainly produced in Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Rajasthan, Bihar, Andhra Pradesh and Tamil Nadu. In Karnataka, onion is grown throughout the year and is cultivated in an area of 0.20 million hectare with the production of 3.85 million tonnes (Anon., 2020). Onion is a commercial crop that earns more foreign exchange to the country for its edible bulb which possess both culinary uses and medicinal uses. Bulbs are rich in vitamins, minerals and antioxidants such as quercetin. Onion bulb emits a characteristic pungent flavour due to sulphur containing compound called Allyl propyl disulfide. Considering its huge economic value, there is a need to increase the productivity of onion. The growth and yield of onion are mainly influenced by the supply of adequate nutrition and growth substances. Plant growth promoters and micronutrients are involved in various physiological process as well as cellular functions within the plant. They actively

([1]M.Sc. Student, [2]Assistant Prof., [3]Prof. and Head, [4]Assistant Prof., [5]Assistant Prof.)

participate in the metabolic process of the plants and thereby improving the growth, yield and quality of onion. The present study was carried out to assess the effect of various plant growth promoters and micronutrients for improving the productivity of onion.

Material and Methods

The study was conducted at experimental block of Department of Vegetable Science, College of Horticulture, Mudigere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during *Rabi* season 2021- 22. The experimental site is located in hilly region of Western Ghats (Zone-9) at 13° 25′ North latitude and 75°25′ East longitude at an altitude of 982 m above mean sea level. The onion variety used in the present study was Bhima Shakti and all the standard cultivation practices were followed. The experiment was laid out in Randomized Block Design with 11 treatments replicated thrice. Onion bulbs were harvested at 105 days after transplanting and so the observations such as plant height (cm), leaf girth (cm), days taken for maturity, bulb yield (t/ha) and bulb volume(cc) were recorded. Analysis of variance (ANOVA) was used to test for differences among the treatments. The standard error of mean, critical difference was formulated at 5 per cent level of significance (Panse and Sukhatme, 1985).

Treatment Details

Treatment notation	Treatment details
T_1	NAA@75ppm
T_2	NAA@100ppm
T_3	NAA@125ppm
T_4	GA_3@75 ppm
T_5	GA_3@100 ppm
T_6	GA_3@125 ppm
T_7	$ZnSO_4$@0.25%
T_8	$ZnSO_4$@0.50%
T_9	Boron@0.25%
T_{10}	Boron@0.50%
T_{11}	Control

Results and Discussion

Based on the observations recorded in the present study, the results obtained were significantly interpreted and enumerated in Table 1.

Plant height (cm)

The maximum plant height (74.52 cm) was recorded significantly in T_6-GA_3@125ppm compared to the T_{11}-Control which observed minimum (60.57cm) at 105 DAT. This might be due to gibberellins stimulate cell division and cell elongation in sub apical meristem region. This may result in internodal elongation which can trigger the shoot growth and favour increased plant height. The higher concentration of gibberellic acid increased the plant height than the lower concentrations as reported byAkshya *et al.* (2021) in onion.

Leaf girth (cm)

Leaf girth (3.23 cm) was significantly higher in T_5-

Table 1. Effect of growth promoters and micronutrients on growth and bulb yield of onion

Treatment	Plant height (cm)	Leaf girth (cm)	Days taken for maturity	Bulb yield (t/ha)	Bulb volume (cc)
T_1- NAA@75ppm	64.73	2.80	121.00	27.58	84.61
T_2- NAA@100ppm	71.64	3.18	124.00	31.32	94.89
T_3- NAA@125ppm	64.00	2.43	119.00	26.72	81.80
T_4- GA_3@75ppm	68.90	2.96	124.67	28.00	88.12
T_5- GA_3@100ppm	73.02	3.23	125.00	34.50	96.35
T_6- GA_3@125 ppm	74.52	2.85	124.00	27.75	86.28
T_7- $ZnSO_4$@0.25%	65.38	2.72	120.00	27.33	83.00
T_8- $ZnSO_4$@0.50%	70.81	3.11	123.00	28.33	91.05
T_9- Boron@0.25%	64.52	2.67	119.67	26.81	82.43
T_{10}- Boron@0.50%	67.33	3.04	122.67	28.30	89.54
T_{11}- Control	60.57	2.35	117.00	25.26	80.67
Mean	67.77	2.85	121.82	28.35	87.16
S.Em±	0.85	0.05	0.84	0.45	1.22
CD(P=0.05)	2.51	0.14	2.47	1.34	3.60

GA_3@100ppm than T_{11}-Control which observed minimum (2.35cm) at 105 DAT. Gibberellic acid at optimal concentration of 100ppm increased the leaf girth due to the accumulation of more food reserves than higher and lower concentrations. These results are in line with the findings of Dwivedi *et al.* (2019) in onion.

Days taken for maturity

The number of days (125 days) required for maturation of onion bulbs were significantly maximum in T_5-GA_3@100ppm, while, T_{11}-Control recorded the minimum days (117 days) for maturity. This might be due to that of gibberellins which was involved in delaying of senescence and so maintains the greenery of the plant. Since, vegetative growth increased with the gibberellic acid, reproductive growth occurred slowly. This in turn increased the number of days taken for bulb maturity and harvest. In control, plants lack these treatment effects. Similar findings were reported by Sravani *et al.* (2020) in onion.

Bulb yield (t/ha)

Bulb yield was the significantlyhighest (34.50t/ha) in T_5-GA_3@100 ppm and lowest (25.26 t/ha) was recorded in T_{11}-Control. Since the number of days for harvesting the bulb was higher in gibberellic acid, the plants stay in the field for long time and thus, more photosynthesis occurs. This might be due to the accumulation of more food reserves in bulb which resulted in increased bulb size and bulb yield. Manipulation of source sink relationship may also increase the bulb yield since the large amount of food materials in the source gets transferred into the sink during the reproductive stage. As the gibberellins were involved in cell membrane permeability, there may better uptake of nutrients for the bulb development. Bulb yield might be positively correlated with leaf girth and bulb volume (Figure 1). Singh *et al.* (2019) in onion reported the same results.

Bulb volume (cc)

Bulb volume was significantly maximum (96.35cc) in T_5-GA_3@100ppm while lowest bulb volume (80.67cc) was recorded in T_{11}-Control. This might be due to better accumulation of food material in bulbs coupled with increasing the growth and development through cell division, cell elongation and cell enlargement which ultimately increased the bulb size and bulb volume. This was in accordance with the findings of Patel *et al.* (2010) in onion.

Conclusion

It may be concluded from the investigation that application of growth promoters and micronutrients responded significantly to the growth and yield of onion. Among the different treatments under study, T_5-GA_3@100ppm recorded the highest leaf girth, days taken for maturity, bulb yield, bulb volume. Plant height was found to be superior with T_6-GA_3@125 ppm in onion cv. Bhima Shakti under hillzone of Karnataka.

Acknowledgement

The authors would like to thank Department of Veg-

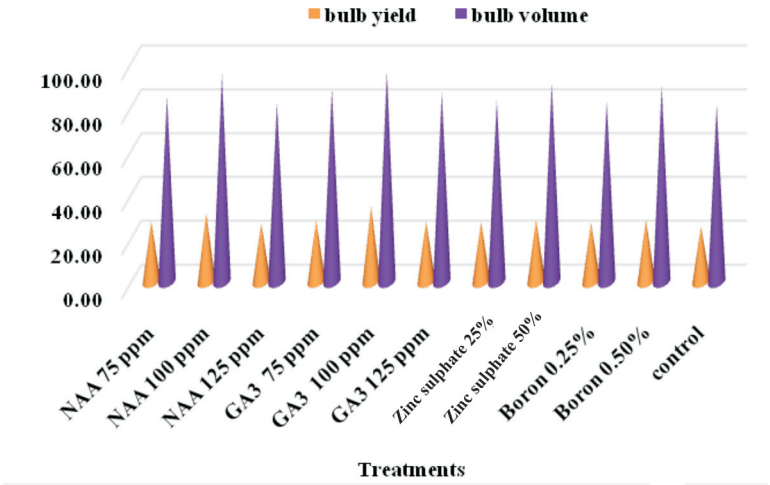

Fig. 1. Bulb yield and bulb volume of onion under plant growth promoters and micronutrients

etable Science for facilities provided during the study.

References

Anonymous, 2020. Annual report on area and production of horticultural crops (2019-2020), Department of Horticulture, Government of Karnataka.

Anonymous, 2021. Annual report on area and production of horticultural crops (2020-2021), Department of Agriculture and Farmers Welfare, Government of India.

Akshya, K., Pavitra, D., Jitendra, K., Krishna, C., Vinuj, K., Bijender, S. and Pandey, P.S. 2021. Effect of plant growth regulators on growth and yield performance of onion cv. Pusa Red. *Prog. Agric.* 21(1): 12-16.

Dwivedi, B., Asati, K.P. and Diwan, G. 2019. Effect of plant growth regulators and their methods of application on growth of *Kharif* onion cv. Agrifound Dark Red. *Int. J. Curr. Microbiol. App. Sci.* 8 (9): 1597-1610.

Panse, V.G. and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers*. Indian council of Agricultural Research, New Delhi.

Patel, M.J., Patel, H.C. and Chavda, J.C. 2010. Influence of plant growth regulators and their application methods on yield and quality of onion. *J. Asian Hortic.* 5 (2): 263-265

Singh, L., Barholia, A.K., Gurjar, P.K.S., Lekhi, R. and Gurjar, J. 2019. Influence of exogenous application of sulphur, gibberellic acid and NAA on yield and quality of *Kharif* onion cultivar N – 53. *Int. J. Chem. Stud.* 7 (1): 1737-1742.

Sravani, V., Saravaiya, S.N., Patel, B.N., Chhatrola, H.N., Patel, H. and Vashi, J.M. 2020. Response of plant bioregulators on growth parameters and plant growth analysis of onion. *Int. J. Chem. Stud.* 8 (3): 1312-1316.