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Effect of Foliar Application of GA_3 on Growth and Yield of Sprouting Broccoli (*Brassica Oleracea* Var. Italica)

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Abstract

An experiment was conducted during winter season to find out the influence of GA_3 on growth and yield of sprouting broccoli in the year of 2017 at research field of Department of Vegetables Science at Lovely Professional University, Jalandhar. This experiment designed in Randomized Block Design (RBD) with three replications. Seven different concentrations of GA_3 viz. 20, 30, 40, 50, 60, 80 and 100 ppm were used over control. Among all the treatments, it was found that foliar application of GA_3 @ 50 ppm gave maximum plant height (19.48 cm) and number of leaves (11.00), minimum number of days to 50% curd initiation (46.67) and days to first harvesting (56.67) and also highest yield and yield attributing characters such as curd diameter (26.97 cm), individual curd weight (209.80 g) and yield per hectare (26.33 t) but maximum stem diameter was recorded with the foliar application of GA_3@ 40 ppm i.e. (24.55 cm). Thus, it was concluded that foliar application of GA_3 @ 50 ppm in broccoli is beneficial for higher growth and yield.

Keywords: sprouting broccoli; GA_3; growth; curd formation; yield.

Introduction

Sprouting Broccoli (*Brassica oleracea* var. italica) is an important cole crop which belongs to the family *Brassicaceae*. Sprouting broccoli has about 130 times more vitamin A contents than cauliflower and 22 times more than cabbage (Singh, 2007). Now a day's plant magnification regulators have been endeavored to ameliorate magnification and ultimately yield. It is organic in nature which are capable of modifying growth of the plant(Leopold, 1963). Among the growth regulators, auxin enlarged plant cell and cell enlargement and cell division stimulates by gibberellins (Nickell, 1982). Gibberellic acid (GA) exhibited beneficial effect in several crops (Thapa *et al*., 2013; Mello *et al*., 2012; Sharma and Sardana, 2012;Gayakvad*et al*., 2014; Roy and Nasiruddin, 2011).GA_3 have close relation with growth and yield of broccoli and

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determination of exact concentrations of GA is important for growth and yield of broccoli. GA singly influence growth of the plant and yield of broccoli(Reza *et al*., 2015) but the foliar application of different concentrationsGA_3 of provide more yield (Jiang *et al*., 2008). This experiment was undertaken to find out the optimum level of $GA_3$for obtaining higher yield in sprouting broccoli.

Materials and methodology

The field experiment washeld at the researchfarm of the Department of Horticulture, Lovely Professional University, Punjabduring winter season 2017, on Sprouting broccoli cv**.** Punjab Broccoli –1to study the effect of GA_3. The different concentration ofplant growth regulators viz. GA_3@ 20, 30, 40, 50, 60, 80 and 100 ppm were applied over control. The spraying was done at 30 and 45 Days after transplanting (DAT), all the standard packages and practices were being fallowed. The design used to conduct thisexperiment was randomized block design (RBD) replicated three times. On the month of September, seeds were sown in portrays using soilless media (vermiculite, perlite and coco peat) and at 14DAS seeds were germinated and young seedling started emerging. After 4-6 weeks, when plant height reaches 15 cm and 5-8 leaves it is transplanted in main field with recommended doses of manures and fertilizers *i.e.*15-20 tonnes well rotten FYM+ 100-125 kg N, 60-80 kg P_2O_5 and K_2O, 1/2 doseof N and total amount of P_2O_5 andK_2O was applied as basal. The remaining half dose of N was applied after 45 days of transplanting to avoid the leaching losses. All the intercultural operations such as irrigation, weeding and earthing up etc. were performed in the field as per the requirement of the crop.Seedlings are transplanted with a spacing of 60cm×30cm. From each plot five plants were selected randomly recording observations for growth and yield attributes. Data were collected on height of the plant, leaves number per plant, stem diameter, diameter of curd, individual weight of curd, days taken to 50% curd initiation, days taken to first harvesting and yield per hectare(t/ha).The data obtained from the experiment was statistically analysed by appropriate procedure for randomized block design as described by Panse and Sukhatme (1985).

Results and Discussion

Plant height significantly varied among the treatments (Table 1). The tallest plant height was recorded from T_4 (19.47 cm) which was significantly *at par*with T_3 (18.13 cm) and T_2 (17.43 cm)

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while the shortest plant height found in T_0 (12.83cm) followed by T_1 (15.87 cm). Leaves number per plant was found to be significant variations among the treatments (Table 1). The maximum number of leaves was found from T_4 (11.00/plant), whereas the minimum from T_0 (7.33/plant). The maximum diameter of stem was found from T_3 (24.55 cm) which is non-significant and the minimum diameter of stem was recorded from T_0 (20.20 cm) (Table 1).Significant variation was found in diameter of curd among the GA_3 levels (Table 1). The maximum diameter of curd was found from T_4 (26.97 cm) which was *at par* with T_3 (26.53 cm). Whereas the minimum diameter was recorded from T_0 (21.74 cm).

Table 1:Effect of GA_3 levels on plant height, number of leaves per plant, diameter of stem, curd diameter

Treatment	**Plant height(cm)**	**Leaves number per plant**	**Stem diameter(cm)**	**Diameter of curd(cm)**
T_0-Water spray(Control)	12.83	7.33	20.20	21.74
T_1- GA_3 20 ppm	15.87	8.00	21.31	22.97
T_2- GA_3 30 ppm	17.43	9.00	23.68	25.17
T_3- GA_3 40 ppm	18.13	9.67	24.55	26.53
T_4- GA_3 50 ppm	19.47	11.00	21.36	26.97
T_5- GA_3 60 ppm	15.88	7.83	20.39	23.15
T_6- GA_3 80 ppm	16.30	8.00	20.99	22.27
T_7- GA_3 100 ppm	16.83	8.50	23.26	18.80
SEm (±)	0.83	0.70	1.22	0.59
C.D. (P = 0.05)	2.54	2.16	NS	1.65
C.V.	8.65	14.08	9.66	3.98

The individual weight of the curd showed significant variation among the GA_3 levels (Table 2). The maximum value was recorded from T_4 (209.80 g) which was *at par* with T_3 (207.60 g) and T_2 (203.03 g) while, the minimum value was recorded from T_0 (144.80 g). Significant variation was found for days to 50% curd initiation (Table 2). The minimum number of days to 50% curd

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initiationrecorded in T_4 *i.e.*46.67 days while the maximum 51.33 days was taken by T_0.Significant variation was found in days to first harvesting (Table 2).The minimum was taken by T_4 (56.67) while the maximum days were taken byT_0 (61.00) andT_6 (61.00).Significant variation was observed among the GA_3 levels for yield of broccoli (Table 2). The maximum yield was found from T_4 (26.33 t/ha)followed by T_5 (24.67 t/ha)and T_6 (23.33t/ha) whereas, the minimum from T_0 (16.33 t/ha).

Table 2: Effect of GA_3 levels on individual weight of curd, days taken to 50% curd initiation, days taken to first harvesting and yield per hectare(t/ha)

Treatment	**Individual weight of curd(g)**	**Days taken to 50% curd initiation**	**Days taken to first harvesting**	**Yield per hectare(t/ha)**
T_0-Water spray(Control)	144.80	51.33	61.00	16.33
T_1- GA_3 20 ppm	158.67	50.00	60.67	18.00
T_2- GA_3 30 ppm	203.03	48.33	60.00	19.33
T_3- GA_3 40 ppm	207.60	48.00	57.33	19.67
T_4- GA_3 50 ppm	209.80	46.67	56.67	26.33
T_5- GA_3 60 ppm	198.07	50.67	58.33	24.67
T_6- GA_3 80 ppm	197.57	51.00	61.00	23.33
T_7- GA_3 100 ppm	167.27	50.00	59.50	23.13
S. Em (±)	2.91	0.62	0.73	0.48
C.D. (P = 0.05)	8.91	1.91	2.24	1.49
C.V.	2.72	2.19	2.14	3.91

The result of the present study clearly indicated that growth and yield parameters like plant height, number of leaves per plant at harvesting, curd diameter, individual weight of curd, days taken to 50% curd initiation, days taken to first harvesting, yield per hectare (t/ha) significantly increased by application of foliar application of GA_3 levels as compared to control.

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The increased in plant height by application of growth regulators over control might be due to action of GA_3which increase the cell division and cell elongation in sub apical meristem. The increase in leaves number per plant with application of GA_3might be due to the activity of GA_3at the apical meristem resulting in more nucleo -protein synthesis responsible for increasing leaf initiation (Dhengle and Bhosle, 2007).Foliar application increases the shoot system,plant high and number of leaves (Davis and Nunez, 2000). The incrementation in weight of head and yield might be due to accumulation of carbohydrates owing to more preponderant photosynthesis, higher pabulum accumulation and better plant magnification. The another probable reason for incrementing yield attributes might be due to the incrementing magnification characters by cell division, cell elongation and cell expansion that might have ultimately incremented in the yield. Similar trend was also observed by,Yadav *et al*. (2000); Sawant *et al*. (2010) and Lendve*et al*.(2010) in cabbage and Thapa *et al*. (2013) in sproutingbroccoli.

Conclusion

Foliar application of 50 ppm of $GA_3$is beneficial as it enhanced the growth and yield attributes of broccoli; thereby giving maximum yield.

References

Santos, P., Nunez, J. J., & Davis, R. M. (2000). Influence of gibberellic acid on carrot growth and severity of Alternaria leaf blight. *Plant disease*, *84*(5), 555-558.

Dhenglel, R. P., & Bhosale, A. M. (2007). Effect of NAA and GA along with urea on certain quality attributes of cabbage (*Brassica oleracea* var. capitata). *Asian Journal of Horticulture*, *2*(2), 30-32.

Gayakvad, P., Jadeja, D. B., Tandel, M. B., Parmar, M. R., Bhalawe, S. & Nayak, D. (2014). Effect of foliar application of GA3, ethrel and copper sulphate on flowering behaviour and yield of Jatropha Curcas Agriculture Workers (4thed.) ICAR Publication

Jiang, X. M., Dan, L., & Wang, F. J. (2008). Effects of exogenous GA3 on flower bud differentiation and flower-ball development of Broccoli (*Brassica oleracea* var. italica). *Plant Physiol. Commun*, *44*, 639-642.

Leopold, A. C. (1963). *Auxins and plant growth*. Univ of California Press.

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Vol-22-Issue-16-August-2019

Reza, M., Islam, M., Hoque, A., Sikder, R. K., Mehraj, H., & Uddin, A. J. (2015). Influence of Different GA Concentrtions on Growth and Yield of Broccoli. *American-Eurasian Journal of Scientific Research*, *10*(5), 332-335.

Mello, S. C., Matsuzaki, R. T., Campagnol, R., &Mattiuz, C. F. (2010). Effects of plant growth regulators in ornamental kale (*Brassica oleracea* var. acephala). In *XXVIII International Horticultural Congress on Science and Horticulture for People (IHC2010): International Symposium on 937* (pp. 245-251).

Nickell, L. G. (1982). Plant Growth Regulators, Springer-Verlag Berlin Heidelberg, NewYork. pp.13.

Singh, M., Rana, D. K., Rawat, J. M. S., & Rawat, S. S. (2011). Effect of GA3 and kinetin on growth, yield and quality of sprouting broccoli (*Brassica oleracea* var. italica). *Journal of Horticulture and Forestry*, *3*(9), 282-285.

Roy, R., & Nasiruddin, K. M. (2011). Effect of different level of GA 3 on growth and yield of cabbage. *Journal of Environmental Science and Natural Resources*, *4*(2), 79-82.

Sharma, P., & Sardana, V. (2012). Effect of growth regulating substances on the chlorophyll, nitrate reductase, leghaemoglobin content and yield in groundnut (*Arachis hypogaea*). *The bioscan*, *7*(1), 13-17.

Singh, N.P., (2007). Basic Concept of Vegetable International Book Distributing Co. Lucknow, pp.444.

Thapa, U., Das, R., Mandal, A. R., &Debanath, S. (2013). Influence of GA 3 and NAA on growth, yield and quality attributing characters of sprouting broccoli [*Brassica oleracea* (L.) var. ItalicaPlenk]. *Crop Research (0970-4884)*, *46*.