The Bioscan 9(3): 1139-1141, 2014
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFECT OF GA_3 AND NAA ON GROWTH AND YIELD OF CABBAGE (*BRASSICA OLERACEA* VAR. *CAPITATA* L.) CV. PRIDE OF INDIA

JAGDEEP CHAURASIY [1]*, M. L. MEENA[2], H. D. SINGH [2], A. ADARSH[1] AND P. K. MISHRA[3]
[1]Department of Horticulture (Vegetable and Floriculture)
Bihar Agricultural University, Sabour, Bhagalpur Bihar - 813210, INDIA
[2]Department of Applied Plant Science (Horticulture)
Babasaheb Bhimrao Ambedkar University, Vidya -Vihar, Rae-Bareli Road, Luck now - 226 025, INDIA
[3]Department of Horticulture (Fruit & Fruit Technology)
Bihar Agricultural University, Sabour, Bhagalpur Bihar - 813210, INDIA
e-mail: jdch143@gmail.com

KEYWORDS
Cabbage
NAA
GA_3
Foliar spray

Received on :
14.04.2014

Accepted on :
26.07.2014

***Corresponding author**

ABSTRACT
The experiment was conducted during rabi season 2012-13 at the Horticultural Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya Vihar Raebareli Road Lucknow -226025 (U.P.), India to study the response of cabbage cv. Pride of India to foliar application of PGRs namely GA_3 and NAA with different concentrations. The experiment was laid out in Randomized block design with three replications and seven treatments, the treatments comprised of three levels of each PGRs namely GA_3 (30, 60, 90 ppm) and NAA (40, 80, 120 ppm) along with control. Foliar spray of GA_3 and NAA was given at 30 and 45 DAT of cabbage. Looking to the results, it was noticed that GA_3 60ppm significantly increased the plant height (33.26 cm), number of leaves (21.48), plant spread (55.59 cm), stem diameter (3.05 cm), plant weight (2.44 kg), head weight (1.73 kg), head diameter (18.88 cm) as well as head yield (51.26 t/ha) than the other treatments and control. Therefore it may be concluded that foliar application GA_3 60 ppm or NAA 80 ppm can be recommended to cabbage growers for obtaining better growth and yield of cabbage.

INTRODUCTION

Cabbage (*Brassica oleracea*var. *capitata*L.) is popular as winter season vegetable in India. The flavour in cabbage is due to presence of a glycoside 'sinigrin'. To increase the yield of cabbage application of major and micronutrients is helpful. Now a day's plant growth regulators have been tried to improve growth and ultimately yield. Growth regulators are organic compounds other than nutrients; small amounts of which are capable of modifying growth (Leopold, 1963). Among the growth regulators, auxin causes enlargement of plant cell and Gibberellins stimulates cell division, cell enlargement or both (Nickell, 1982). Gibberellic acid (GA) and Naphthalene acetic acid (NAA) exhibited beneficial effect in several crops (Thapa *et al.*, 2013; Mello *et al.*, 2013; Sharma and Sardana, 2012; Gayakvad *et al.*, 2014 Roy and Nasiruddin, 2011). Due to diversified use of productive land, it is necessary to increase the food production and growth regulators may a contributor in achieving the desired goal. In north Indian plains the production of cabbage is hampered by in fluctuation of temperature and sometimes crop fails to form head or very small which are not suitable for marketing. Cabbage was found to show a quick growth, early head formation and higher yield when treated with plant growth regulators especially GA_3 and NAA (Dhengle *et al.,* 2008; Yadav *et al.*, 2000; Kumar *et al.,* 1996). There were very little research work had been done on this aspect. Hence, the present experiment was undertaken to find out the effect of appropriate concentration of GA_3 and NAA for better growth and yield of cabbage under the climatic conditions of central Uttar Pradesh region.

MATERIALS AND METHODS

The field experiment was conducted at the Horticultural Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya Vihar Raebareli Road Lucknow -226025 (U.P.) during rabi season 2012-13 on cabbage cv. Pride of India. The two plant growth regulators *viz*. GA_3 @ 30, 60, 90 ppm and NAA@ 40, 80, 120 ppm were tried and compared with control. The spraying was done at 30 and 45 Days after transplanting (DAT), all the standard packages and practices were fallowed. The experiment was laid out in the randomized block design (RBD) replicated three times. Plots of 1.35x2.4 m^2 in size andspacing 45x60 cm, the experimental plotswere fertilized with FYM @ 25 t/ha and N:P:K @ 150:100:100 kg/ha respectively. Total amount of FYM, P_2O_5, K_2O and half dose of nitrogen were added to the soil at the time of final land preparation while remaining nitrogen was applied 3 split doses through broadcasting as top dressing.Intercultural operations were done as and when necessary. Data were collected on Plant height, Number of leaves per plant, plant spread, Days to head formation, Days to head maturity,Diameter of stem, Plant weight, head weight, Yield per plot and Yield per hectare.Five randomly selected plants are taken from each plot for

Table 1: Effect of GA_3 and NAA on growth of Cabbage

Treatment	Plant height (cm)	Number of leaves	Stem diameter (cm)	Plant spread (cm)	Days taken for head initiation	Days taken for head maturity
T_0 - Control	23.31	14.38	1.81	44.57	46.36	72.36
T_1 - GA_3 30 ppm	28.35	17.44	2.36	50.35	40.44	63.47
T_2 - GA_3 60 ppm	33.26	21.48	3.05	55.59	38.57	61.25
T_3 - GA_3 90 ppm	30.35	19.26	2.61	53.17	39.42	63.62
T_4 - NAA 40 ppm	29.35	18.45	2.42	51.08	41.09	63.96
T_5 - NAA 80 ppm	31.37	20.42	2.73	53.98	42.11	64.61
T_6 - NAA 120 ppm	29.41	19.55	2.65	52.66	42.32	65.43
SEm (±)	0.59	0.62	0.09	0.61	0.58	0.46
C.D. (P = 0.05)	1.82	1.90	0.29	1.89	1.80	1.40

Table 2: Effect of GA_3 and NAA on yield of Cabbage

Treatment	Plant weight (kg)	Head weight (kg)	Head diameter (cm)	Head Yield (kg/ plot)	Head yield (t/ha)
T_0 - Control	1.22	0.74	10.87	8.88	21.93
T_1 - GA_3 30 ppm	1.93	1.21	14.11	14.52	35.85
T_2 - GA_3 60 ppm	2.44	1.73	18.88	20.76	51.26
T_3 - GA_3 90 ppm	2.02	1.44	15.95	17.28	42.67
T_4 - NAA 40 ppm	1.84	1.36	15.12	16.32	40.30
T_5 - NAA 80 ppm	2.26	1.64	16.77	19.68	48.59
T_6 - NAA 120 ppm	2.12	1.53	14.24	17.96	44.35
SEm (±)	0.16	0.04	0.58	0.40	1.00
C.D. (P = 0.05)	0.48	0.11	1.79	1.24	3.07

observations at the time of harvesting of crop.The data obtained from experimentwas statistically analysed by appropriate procedure to randomized block design as described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Effect of GA_3 and NAA on growth parameters of cabbage

The result of present experiment indicates that foliar application of GA_3 and NAA significantly increased the growth parameters (number of leaves per plant, plant spread, plant height, Stem diameter, Days taken for head initiation and maturity) of cabbage over the control.The data from Table 1 clearly indicated that when plants were sprayed with different concentrations of GA_3 and NAA, the highest plant height (32.26 cm) recorded with the treatment GA_3 at 60 ppm fallowed by NAA 80 ppm (31.37cm), more number of leaves per plant (21.48) was recorded with the treatment GA_3 at 60 ppm fallowed by NAA 80 ppm (20.42), stem diameter (3.05cm) highest with GA_3 60 ppm fallowed by NAA 80 ppm (2.73cm) and GA_3 60 ppm resultedhighest plant spread (55.59cm) fallowed by NAA 80 ppm (53.98cm) where as earlier head initiation and head maturity (38.57 days and 61.25 days respectively) was resulted with the treatment GA_3 60 ppm fallowed byGA_3 90 ppm (39.42 days and 63.62 days respectively). The superiority in growth parameters of different treatments over control due to foliar application of $GA_3$and NAA,the possible reason for increasein the growth parameters was due to the physiological effects of Auxins and gibberellins on growth parameters of plants e.g. cell elongation and cell division, increase in photosynthetic activity and better food accumulation and the early head initiation and maturity may be due to the suppressive action of GA_3 on apical meristem and interference with gibberellins synthesis. The fall in indigenous gibberellins levels which are responsible for delayed head initiation and head maturity recorded by control. The similar trend was also reported by Yadav *et al*. (2000) in cabbage, Patil *et al*. (2003) in Knol-khol and Manjit *et al*. (2011) in cabbage.

Effect of GA_3 and NAA on yield parameters of cabbage

The result (Table 2), of this study indicated significant variation in treatments from control due to effect of GA_3 and NAA on yield and its attributes. The highestplant Weight (2.44 kg), Head weight (1.73 kg), diameter of head (18.88 cm), yield per plot (20.76 kg)and per hectare(51.26 t/ha) were recorded with treatment GA_3 60 ppm fallowed by NAA 80 ppm and lowest in control (1.22 kg , 0.74 kg,10.87cm, 8.88 kg, 21.93 tones/ ha respectively). The increase in weight of head and yield might be due to accumulation of carbohydrates owing to grater photosynthesis, higher food accumulation and better plant growth because the economic part of cabbage is head and which is formed by thick overlapping of leaves. The another probable reason for increasing yield attributes might be due to the increasing growth characters by cell division, cell elongation and cell expansion that might have ultimately increased 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 sprouting broccoli.

REFERENCES

Dhengle, R. P. and Bhosale, A. M. 2008. Effect of plant growth regulators on yield of cabbage (*Brassica oleracea* var. *capitata*). *International J. Plant Sciences.* **3(2):** 376-378.

Gayakvad, P., Jadeja, D. B., Tandel, M. B., Parmar, M. R., Bhalawe, S. and Nayak, D. 2014. Effect of foliar application of GA_3, ethrel and copper sulphate on flowering behaviour and yield of *JatrophaCurcas*

L. *The Bioscan*. **9(2):** 485-490.

Kumar, D., Gujar, K. D. and Singh, K. 1996. Effect of GA and NAA on growth, chlorophyll content and maturity of cabbage. *Crop Research (Hisar)*. **12(1):** 116-119.

Lendve, V. H., Chawan, S. D., Barkule, S. R. and Bhosale, A. M. 2010. Effect of foliar application of growth regulators on growth and yield of cabbage cv. Pride of India. *Asian J. Horticulture*. **5(2):** 475-478.

Leopold, A. C. 1963. Auxins and Plant Growth, Berkeley and Los Angeles, University of *California Press*.p. 5.

Manjit, Rana, D. K., Rawat, J. M. S. and Rawat, S. S. 2011. Effect of GA_3 and kinetin on growth, yield and quality of sprouting broccoli (*Brassica oleracea* var. italica). *J. Horticulture and Forestry*. **3(9):** 282-285.

Mello, S. C., Matsuzaki, R. T., Campagnol, R., and Mattiuz, C. F. 2012. Effects of plant growth regulators in ornamental kale (*Brassica oleracea* var. *acephala*). *ActaHorticulturae*. **937:** 245-251.

Nickell, L. G. 1982. Plant Growth Regulators, Springer-Verlag Berlin Heidelberg, NewYork. pp.1-3.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical Method for Agriculture Workers (4thed.) ICAR Publication New Delhi.

Patil, S. S., Patil, B. S. and Ingle, V. G. 2003. Effect of foliar application of growth regulators on growth and yield of knol-khol cv. White Vienna. *Annals of Plant physiology*. **17(1):** 56-59.

Roy, R. and Nasiruddin, K. M. 2011. Effect of different level of GA_3 on growth and yield of cabbage. *J. Environment Science and Natural Resources.* **4(2):** 79-82.

Sawant, V. P., Naik, D. M., Barkule, S. R., Bhosale, A. M. and Shinde, S. B. 2010. Effect of foliar application of growth regulators on growth, yield and quality of cabbage cv. Golden Acre. *Asian J. Horticulture*. **5(2):** 495-497.

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

Thapa, U., Das, R., Mandal, A. R. and Debanath, S. 2013. Influence of GA3 and NAA on growth, yield and quality attributing characters of sprouting broccoli [*Brassica oleracea* (L.) var. ItalicaPlenk].*Crop Research (Hisar)*. **46(1/3):** 192-195.

Yadav, R. L., Dhaka, R. S. and Fageria, M. S. 2000. Effect of GA_3, NAA and succinic acid on growth and yield of cabbage cv. golden acre.*Haryana J. Horticultural Sciences.* **29(3/4):** 269-270.