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Efficacy of plant growth regulator (GA_3) on growth and yield attributes of cauliflower (*Brassica oleracea* var. *botrytis* L.) at Dehradun valley

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Abstract
An experiment entitled "Efficacy of plant growth regulator (GA_3) on growth and yield attributes of cauliflower (*Brassica oleracea* var. *botrytis* L.) at Dehradun Valley" was conducted at Horticulture Research Block, Shri Guru Ram Rai University, Dehradun, Uttarakhand during winter season from November 2018 - February 2019. The experiment was laid out in Randomized Block Design (RBD) with three replications. Ten different concentrations of GA_3 viz. (20, 40, 60, 80, 100, 120, 140, 160,180 and 200 ppm) were used over control. Among all the treatments it was concluded that for growth attributes GA_3 @ 60 ppm gave maximum plant height (49.57 cm), minimum number of days taken to 50% marketable curd size (94.53 days) and also increases yield attributing characters such as curd diameter (17.9 cm), Gross yield (3.53g/plant), Net yield (1040g), yield per plot (12.28 kg) and yield per hectare (365.63 q). From this experiment, it was concluded that 60 ppm of GA_3 can be recommended in cauliflower for higher yield.

Keywords: Cauliflower, GA_3, plant height, curd, gross yield

Introduction
Cauliflower (*Brassica oleracea* var. *botrytis* L.) is the major growing crop amongst the cole crops belongs to the family Brassicaceae (2n=18). The cole crops, including cauliflower and cabbage have descended from a common kale like ancestor, the wild cabbage (*Brassica oleracea* var. *sylvestris* L.) still found in Western and Southern Europe and North Africa. Cabbage, cauliflower, broccoli, Brussels sprouts etc. have been separated morphologically on the basis of few gene differences Sulphur containing compounds viz; hydrogen sulfide methanethiol, ethanethiol, propanethiol and dimethyl sulfide in addition to acetaldehyde and 2-methyl propanol have been identified in cooked cauliflower. lt is major Rabi season vegetable crop (Winter season) grown as annual plant and biennial for seed production. The edible part of the cauliflower is called as 'Curd'. It is a highly nutritious and delicious vegetable, rich in Vitamin A, C and minerals like calcium, iron and iodine (Haque, 1999) [2]. It also contains vitamin A. 100 g edible part of cauliflower contains 89% moisture, 8.0 g carbohydrates, 2.3 g proteins, 40 IU carotene, 0.13 mg B1, 0.11 mg B2, 50 mg vitamin C, 30 mg calcium and 0.8 mg iron and also contains 30 calories (Rashid, 1999) [7]. Also it contains high amount of glucosinolates the hydrolysis of which produces substances isothiosinolate and Indole-3-Carbinol which are responsible for assigning it anti-cancerous properties. It is rich in minerals such as potassium, sodium, iron, phosphorus, calcium, magnesium etc. Cauliflower follows cabbage in importance with regard to area and production in the world. However, in India cauliflower is more widely grown than cabbage. This crop grows at latitude 11°N to 60°N with average temperature ranging from 5-8 °C to 25-28 °C. In India, cauliflower cultivation is done in almost all the states, but main states are Bihar, U. P., Orissa, Assam, M.P., Gujarat and Haryana. According to National Horticulture Board (2017-18) the total vegetable area (Ha), Production (MT) and Productivity (T/Ha) in India are 10259, 184394 and 17.8 respectively. Out of total area and production cauliflower area is 453ha and production is 8668Mt.
At present growth hormones are widely used in horticultural crop production all over the world. Growth hormones play a vital role in growth and development of cauliflower.

Some plant growth hormones like Auxin, Gibberellins, Cytokinin etc. are involved with the physiological activities in plants. Gibberellins are also an important Plant Growth Regulator which control plant growth and development with the most interesting with respect to the photoperiodic control of flowering. Reports so far have been made indicated promising results on yield and quality of cauliflower and other crops due to the use of bio-chemical substances, such as Napthalene acetic acid (NAA), Gibberellic acid (GA_3), Indole acetic acid (IAA) etc. (Voronova and Kozakov, 1983) [14]. Several experiments were conducted to increase the yield of cauliflower. GA_3 and IAA a positive role on curd formation and curd size of cauliflower (Sharma and Mishra, 1989) [11]. The experiment was conducted to find out the concentration of GA_3, best suited in terms of yield and quality for cauliflower. Hence the objective of experiment was to maximize the yield of cauliflower with the minimum use of inputs so as to fetch the maximum profits with least cost of production.

Materials and Methods

Present experiment was conducted at the Horticulture Research Block, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India. The experiment was laid out in Randomized Block Design (RBD) with three replications. There were ten different treatment levels of GA_3 concentrations viz. (20, 40, 60, 80, 100, 120, 140, 160,180 and 200 ppm) and Control. Seedlings of cauliflower variety Sapna were brought from Kisan Vigyan Kendra, Dhakrani, Dehradun and 25 days old seedlings were transplanted in the experimental field with recommended doses of N: P_20_5: K_2O: 200:100:80 kg/ha. Full dose of P_2 O_5 and K_2O were applied and Nitrogen was applied into two split doses, 1st at the time of transplanting and 2nd half dose was applied after 45 days of transplanting to avoid the leaching losses. All the intercultural operations were performed in the experimental field as per the requirement of the crop such as irrigation, weeding and earthing up etc. From each plot randomly five plants were selected and used for taking observations for growth and yield attributes.

Results and Discussion

The findings that were obtained from the execution of the experiment were recorded and are thoroughly discussed below:

Growth attributes

The treatments used influenced the morphological characters of cauliflower to a varying extent among which GA_3 @ 60 ppm gave maximum at the time of harvesting plant height (49.64cm), minimum days taken to 50% marketable curd size (94.53 days) and mentioned in Table 1. Findings of Sitapara *et al*., (2011) [12] in cauliflower, Roy and Nasiruddin (2011) [9] in cabbage, Meena *et al*., (2018) [4] in cauliflower have also shown similar results in the growth parameters of plants of cauliflower. The other growth characters viz, number of leaves (17.06), leaf length (26.42cm), leaf width (10.96cm), stalk length11.04cm) and stalk width (11.48cm) have also exhibited satisfactory increment. The plant height (49.64cm) significantly increased with application of GA_3 over control this might be due to increase the cell division and elongation of cells in sub apical meristem.GA_3 stimulate growth and cell expansion of cells through increasing the plasticity of cells (Dhengle and Bhosle, 2007) [1] Early initiation of curd resulted into the decrease in number of days (94.53 days) for 50% marketable curd size. This might be due to increase in transportation of nutrient from root to aerial parts of plant (Reddy, 1989) [8].

Yield attributes

Plant growth regulator i.e. GA_3 yielded significant results for yield attributes as well by maximizing curd diameter and curd weight therefore increasing the Net yield, Gross yield, yield per plot and yield per hectare as compared to control. Among all the concentrations of GA_3 used, GA_3 @ 60 ppm gave maximum curd diameter (17.9), individual curd weight (1.04 kg), yield per plot (12.28 kg) and yield per hectare (365.63 q/ha) as mentioned in Table 2. Findings of Thapa *et al*., (2013) [13] in broccoli and Sawant *et al*., (2010) [10] and Lendve *et al*., (2010) [3] in cabbage have also exhibited similar results. The maximum curd diameter (17.9 cm) was obtained in seedling treatment of GA_3 @ 60 ppm which was at par with GA_3 @ 140 ppm, GA_3 @ 160 ppm. This might be due to the effect of GA_3 on enlargement of cells, elongation of cells and cambial activity. Also increase in accumulation of carbohydrates may due to GA_3 which give better photosynthesis in plant (Mishra and Singh, 1986) [5]. The maximum individual curd weight (1.04 kg) was recorded by the foliar application of GA_3 @ 60 ppm which was maximum than control. This might be due to more accumulation of carbohydrates by maximum rate of photosynthesis (Thapa *et al*., 2013) [13]. The maximum yield per plot (12.28 kg) and yield per hectare (365.63 q/ha) were recorded by seedling treatment of GA_3@ 60 ppm than other concentrations and control. This might be due to higher accumulation of storage food and increasing cell elongation, cell division and cell expansion which directly lead to increase in yield. Similar findings were also observed by Thapa *et al*., 2013 [13] in broccoli and Yadav *et al*., (2000) [15] in cabbage.

Table 1: Effect of different GA_3 concentrations on growth attributes of cauliflower

Treatments	Plant height (cm)	Number of leaves	Length of leaves (cm)	Width of leaves (cm)	Stalk length (cm)	Stalk width (cm)	Days taken to 50% Marketable curd size
GA_3 20ppm	23.777	10.730	10.730	6.950	6.257	6.027	102.73
GA_3 40ppm	27.650	12.560	14.627	7.760	8.853	7.920	96.87
GA_3 60ppm	31.83	17.063	26.423	10.960	11.040	11.480	94.53
GA_3 80ppm	29.890	12.663	12.540	8.747	9.057	8.350	97.93
GA_3 100ppm	28.66	14.617	13.730	9.290	8.463	7.180	99.87
GA_3 120ppm	29.33	12.977	20.820	8.503	8.733	9.297	100.67
GA_3 140ppm	31.12	15.167	16.540	9.680	9.237	6.877	97.80
GA_3 160ppm	29.91	13.687	13.633	8.910	8.527	7.503	96.07
GA_3 180ppm	30.50	15.690	20.900	8.160	10.183	9.877	98.83
$GA_3$200ppm	29.95	15.043	24.393	9.163	9.103	8.437	95.53
Control	20.029	10.193	25.253	9.993	10.463	9.093	96.23
C.D.	1.020	1.797	1.439	1.511	1.728	1.736	0.571

SE(m)	1.442	0.605	2.177	0.509	0.582	0.584	3.27
SE(d)	2.997	0.856	1.494	0.719	0.822	1.826	1.025

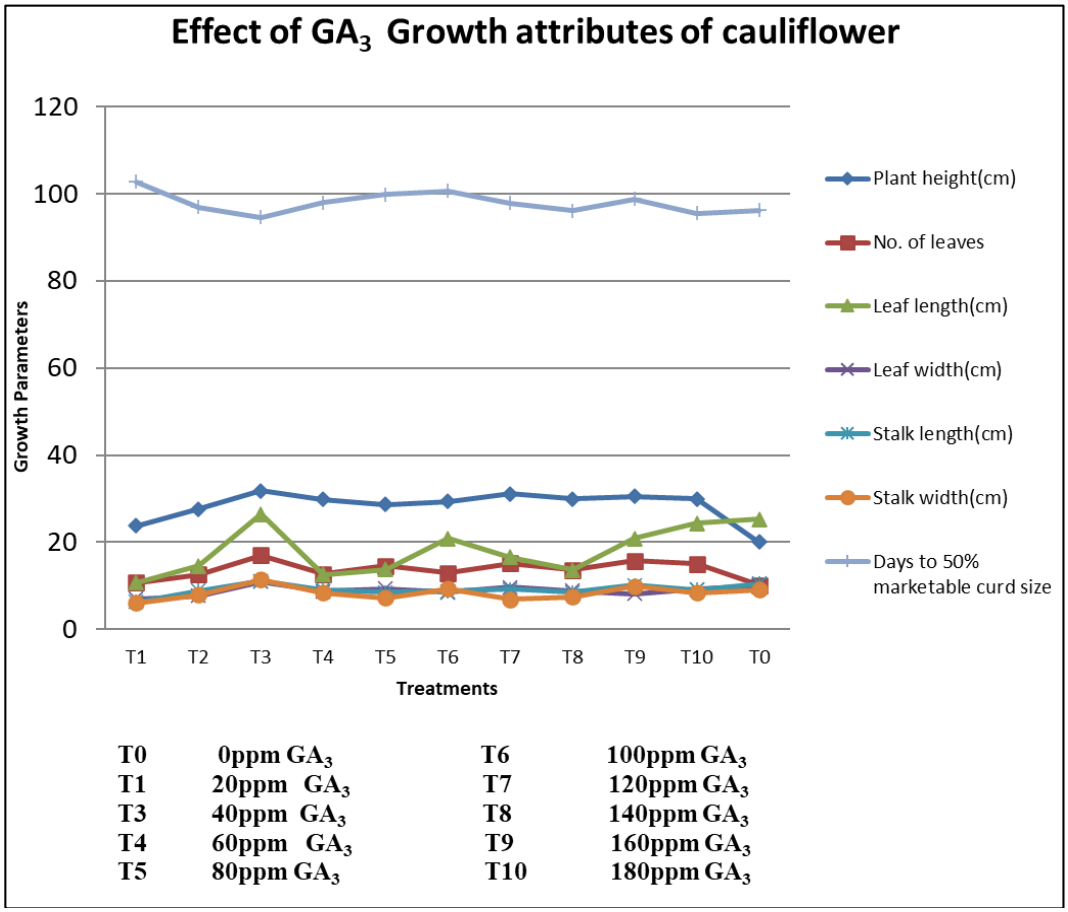

Fig 1: Representation of the growth attributes of cauliflower due to influence of GA_3

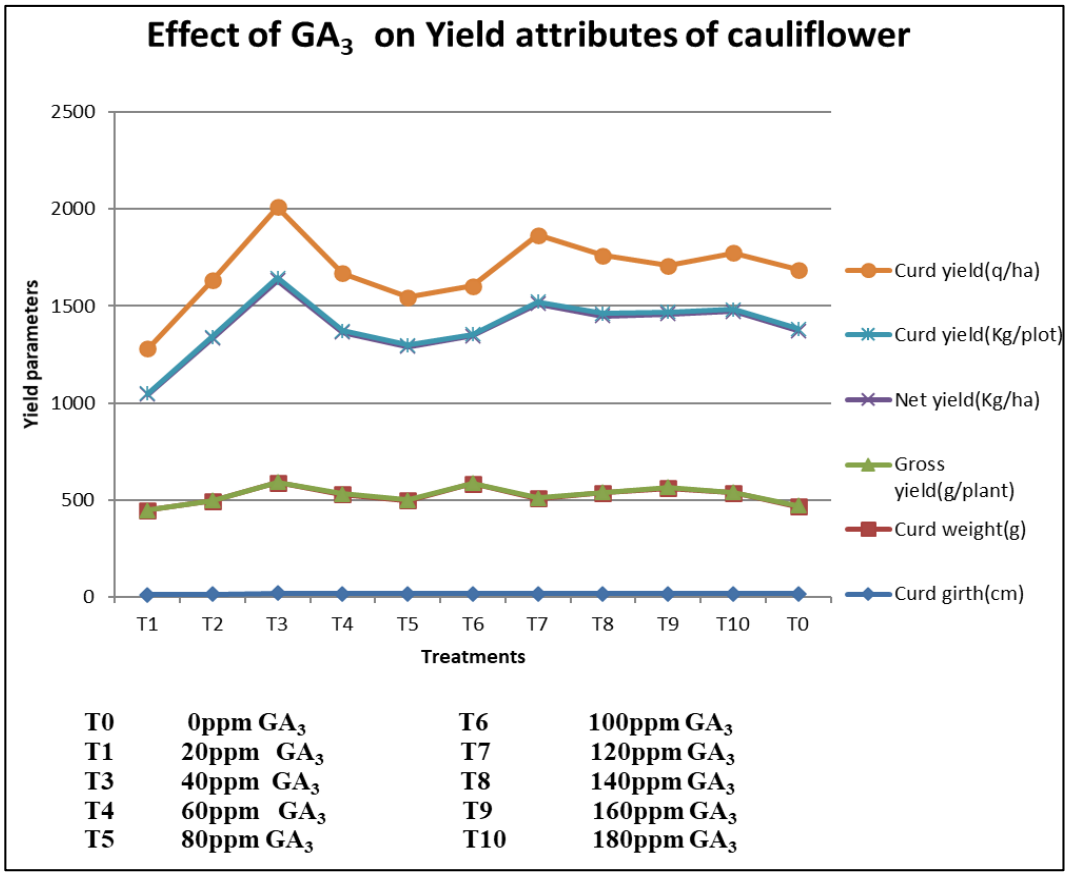

Fig 2: Representation of the yield attributes of cauliflower due to influence of GA_3.

Conclusion

On the basis of present investigation on efficacy of GA_3 on growth and yield of cauliflower cv. Sapna it can be concluded that GA_3 at 60ppm found to be the most effective treatment for increasing plant height, stalk length, number of leaves, days taken to 50%marketable curd, head diameter, gross and net weight, head yield kg per plot and head yield q/ha.

References

1. Dhengle RP, Bhosale AM. Effect of NAA and GA_3 along with urea on certain quality attributes of cabbage (*Brassica oleracea* L. var. *capitata*). The Asian Journal of Horticulture. 2007; 70(2):30-32.
2. Haque MR. Effect of fertilizer and manure on curd and seed yield of cauliflower. M.Sc Thesis, Department of Horticulture, BSMRAU, Salna, Gazipur, 1999.
3. Lendve VH, Chawan SD, Barkule SR, Bhosale AM. Effect of foliar application of growth regulators on growth and yield of cabbage cv. Pride of India. Asian Journal Horticulture. 2010; 5(2):475-478.
4. Meena MK, Aravindakshan K, Dhayal M, Singh J, Meena SL. Effect of Biofertilizers and Growth Regulators on Growth Attributes of Cauliflower (*Brassica oleracea* var. *botrytis* L.) cv. Pusa Paushja, 2018.
5. Mishra HP, Singh BP. Studies on the nutrients and growth regulator interaction in Snowball-6 cauliflower (*Brassica oleracea* var. *botrytis* L.). Programme Horticulture. 1986; 18(1, 2):77-82.
6. National Horticulture Board, National Horticulture database. National Horticulture Board. Govt. of India, Gurugram, India. 2017-18; http://www.nhb.gov.in.
7. Rashid MM, Sabji Bijnan. Text Book Division, Bangla Academy, Dhaka, Bangladesh. 1999, 221
8. Reddy SA. Effect of foliar application of urea and gibberellic acid on cauliflower (*Brassica oleracea* var. *botrytis* Linn.). Journal-of-Research-Andhra Pradish Agricultural University. 1989; 17(1):79-80; 8.
9. Roy R, Nasiruddin KM. Effect of different level of GA_3 on growth and yield of cabbage. Journal of Environmental Science and Natural Research. 2011; 4(2):79-82.
10. Sawant VP, Naik DM, Barkule SR, Bhosale AM, Shinde SB. Effect of foliar application of growth regulators on growth, yield and quality of cabbage cv. Golden Acre. Asian Journal of Horticulture. 2010; 5(2):495-497.
11. Sharma SK, Mishra RC. Effect of growth-regulators on flower morphometries with reference to insect pollinators. Indian-Journal-of- Agricultural-Sciences.1989; 59(8):546-547.
12. Sitapara HH, Vihol NJ, Patel MJ, Patel JS. Effect of growth regulators and micro nutrient on growth and yield of cauliflower cv. Snowball-16. Asian Journal of Horticulture. 2011; 6(2):348-351.
13. Thapa U, Das R, Mandal AR, Debanath S. Influence of GA_3 and NAA on growth, yield and quality attributing characters of sprouting broccoli [*Brassica oleracea* (L.) var. *Italica* Plenk]. Crop Research (Hisar). 2013; 46(13):192-195.
14. Voronova NL, Kozyakov VI. Effect of growth regulators on spring wheat yield, Sibirskii Vestniksel's Kokhpzyaistve-nno Nauki. [Field Crops Abstract, 1983, 1985; 38(4):160-161.
15. Yadav RL, Dhaka RS, Fageria MS. Effect of GA_3, NAA and succinic acid on growth and yield of cabbage cv. Golden acre. Haryana Journal Horticulture Sciences. 2000; 29(3, 4):269-270.