



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(3): 2805-2807
Received: 03-03-2018
Accepted: 08-04-2018

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Effect of foliar spray of NAA and GA₃ on the growth, curd formation and yield of cauliflower (*Brassica oleracea* L. var. botrytis)

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Abstract

The present experiment was conducted at School of Agriculture under Department of Vegetables Science at Lovely Professional University, Jalandhar during winter season from September 2017- January 2018. The experiment was laid out in Randomized Block Design (RBD) with three replications. The three different concentrations of NAA viz. (50, 75 and 100 ppm) and three different concentrations of GA₃ (50, 75 and 100 ppm) were used over control. Among all the treatments, it was concluded that GA₃@ 50 ppm gave maximum plant height (70.83 cm), minimum number of days taken to 50% curd initiation (63.67 days), minimum number of days taken to 50% marketable curd size (80.33 days) and also increase yield and yield attributing characters such as curd diameter (62.93 cm), individual curd weight (0.89 kg), yield per plot (10.72 kg) and yield per hectare (238.22 q). From this experiment, it was concluded that 50 ppm of GA₃ can be recommended in cauliflower for higher yield.

Keywords: cauliflower, NAA, GA₃, growth, yield

Introduction

Cauliflower (*Brassica oleracea* var. *Botrytis* sub-var. *cauliflora*) is the major important cole crop belongs to the family Cruciferae. It is major winter vegetable crop grown as annual plant and it can be grown without branching. It is a highly nutritious and delicious vegetable, rich in Vitamin A, C and minerals like calcium, iron and iodine (Haque, 1999) [2]. It is used as fry and ingredient of curry. In western countries it is used as pickle also. The edible part of the cauliflower is called as 'Curd'. According to botanical consideration, it is the pre-condition of inflorescence. The lifecycle of cauliflower can be divided into three phases i.e. growth phase, curd phase, flower or seed phase. It has been reported that better results on yield or yield attributes and quality of Cauliflower and other crops by using substances, such as Naphthaleneacetic acid (NAA), Gibberellic acid (GA₃) (Voronova and kozakov, 1983) [11].

Materials and Methods

The experiment was conducted at the experiment farm of Lovely Professional University, Jalandhar, Punjab during October 2017 to January 2018. The experiment was laid out in Randomized Block Design with 3 replications. There was 7 different concentrations viz. three different concentrations of both the plant growth regulators GA₃ (50, 75 and 100 ppm) and NAA (50, 75 and 100 ppm) and Control. On mid-September, the seeds of 'Coral white' variety of cauliflower were sown in pro trays using soilless media (vermiculite, perlite and coco peat). After sowing seeds were covered with very thin layer of vermiculite and the trays were kept under germination chamber.

25 days old seedlings were transplanted in the experimental field with recommended doses of N: P₂O₅: K₂O: 200:100:80 kg/ha. Full dose of P₂O₅ and K₂O was applied and Nitrogen was applied in 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 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 "Effect of foliar spray of NAA and GA₃ on the growth, curd formation and yield of cauliflower (*Brassica oleracea* L. var. Botrytis)". The significant result that was recorded is thoroughly discussed below:

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Growth attributes

Amongst the all treatments of growth regulators, GA₃@ 50 ppm gave maximum at the time of harvesting plant height (70.83cm), minimum days taken to 50% curd initiation (63.67 days), and minimum days taken to 50% marketable curd size (80.33 days) and mentioned in Table 1. Findings of Sitapara *et al.*, (2011) [9] in cauliflower, Roy and Nasiruddin (2011) [7] in cabbage, Meena *et al.*, (2018) [4] in cauliflower have also exhibited similar results in the growth parameters of plants of cauliflower.

The plant height (70.83cm) significantly increased with application of GA₃ over control this might be due to increase the cell division and elongation of cells in sub apical meristem. GA₃ stimulate growth and cell expansion of cells through increasing the plasticity of cells (Dhenge and Bhosle, 2007) [1]. Minimum days (63.67 days) were taken to 50% curd initiation with the application of GA₃. This was might be due to maximum division of cells and elongation of cell with the increase in photosynthetic activity and better accumulation of food (Yadav *et al.*, 2000) [12]. Early initiation of curd resulted into the decrease in number of days (80.33 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) [6].

Yield attributes

All the growth regulators such as GA₃ and NAA proved to be significant by maximizing curd diameter, individual curd weight, yield per plot and yield per hectare the as compared to

control. Amongst the growth regulators, GA₃ was found to be effective than NAA. Amongst all growth regulators GA₃ @ 50 ppm gave maximum curd diameter (62.93), individual curd weight (0.89 kg), yield per plot (10.72 kg) and yield per hectare (238.22 q/ha) and mentioned in Table 2. Findings of Thapa *et al.*, (2013) [10] in broccoli and Sawant *et al.*, (2010) [8] and Lendve *et al.*, (2010) [3] in cabbage have also exhibited similar results.

The maximum curd diameter (62.93 cm) was recorded in the foliar application of GA₃ @ 50 ppm which was at par with foliar spray of GA₃ @ 75 ppm, GA₃ @ 100 ppm, NAA @ 50 ppm and NAA@ 75 ppm. This might be due to the effect of GA₃ on enlargement of cells, elongation of cells and cambial activity. Also increase in accumulation of carbohydrates may due to GA₃ which give better photosynthesis in plant (Mishra and Singh, 1986) [5]. The maximum individual curd weight (0.89 kg) was recorded by the foliar application of GA₃@ 50 ppm which was maximum than control. This might be due to more accumulation of carbohydrates by maximum rate of photosynthesis (Thapa *et al.*, 2013) [10]. The maximum yield per plot (10.72 kg) and yield per hectare (238.22 q/ha) was recorded by the foliar application of GA₃@ 50 ppm than other concentrations and control. This might be due to increasing the cell elongation, cell division and cell expansion that might be effect the increase in yield and also due to higher accumulation of food. Similar findings were also observed by Thapa *et al.*, 2013 in broccoli and Yadav *et al.*, (2000) [10, 12] in cabbage.

Table 1: Effect of Foliar spray of NAA and GA3 Growth attributes of Cauliflower

Treatment	Plant height (cm)	Days taken to 50% curd initiation	Days taken to 50% marketable curd size
T ₀ Control	52.61	78.85	95.00
T ₁ GA 50PPM	70.83	63.67	80.33
T ₂ GA 75 ppm	67.77	66.33	83.00
T ₃ GA 100ppm	63.83	69.33	86.00
T ₄ NAA 50ppm	61.35	72.03	88.70
T ₅ NAA 75ppm	58.60	75.97	90.00
T ₆ NAA 100ppm	55.87	76.22	90.71
C.D.	2.13	2.48	2.33
SE(m)	0.68	0.79	0.75
SE(d)	0.97	1.12	1.06
C.V.	1.92	1.92	1.48

Table 2: Effect of Foliar spray of NAA and GA3 Yield attributes of Cauliflower

Treatment	Curd Diameter (cm)	Individual Curd Weight (kg)	Yield/plot (kg)	Yield ha ⁻¹ (q)
T ₀ Control	50.57	0.36	4.28	95.11
T ₁ GA 50PPM	62.93	0.89	10.72	238.22
T ₂ GA 75 ppm	61.63	0.81	9.72	216.00
T ₃ GA 100ppm	60.58	0.74	8.84	196.44
T ₄ NAA 50ppm	59.61	0.63	7.60	168.88
T ₅ NAA 75ppm	58.87	0.54	6.52	144.89
T ₆ NAA 100ppm	55.87	0.44	5.24	116.44
C.D.	5.15	0.02	0.26	5.82
SE(m)	1.65	0.01	0.08	1.87
SE(d)	2.33	0.01	0.11	2.64
C.V.	4.86	1.93	1.92	1.92

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