Effect of fertility levels and boron on growth and yield of cauliflower

Abstract: A field experiment consisting five levels of fertility and four levels of boron in RBD with three replications was conducted at Horticulture Farm, SKNAU, (Jaipur) during *Rabi* season. Results revealed that different fertility levels influenced growth, yield and quality of cauliflower significantly, plant height at 30 and 60 DAT, number of leaves par plant at 30 and 60 DAT and leaf area were recorded highest with application of 75% RDF through inorganic fertilizers and 25% RDF through vermicompost. It is also revealed that average weight of curd volume, curd yield per plant and per ha (190.89 q/ha), were found highest with application of 50% RDF through inorganic fertilizers and 50% RDF through vermicompost treatment.

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Keywords: Cauliflower, RDF, Boron, growth, yield

Introduction: Cauliflower (*Brassica oleracea var. botrytis* L.) is the most popular vegetable crop among Cole crops belong to the family cruciferae. It is being grown round the year for its white and tender curd. It is widely cultivated all over India and Abroad for its special nutritive values, high productivity and wider adaptability under different ecological conditions. Cauliflower is a heavy feeder crop of mineral elements, it removes large amount of macronutrients from the soil. Heavy manuring has been recommended for getting good yield of cauliflower by different workers in India. Despite the fact, that cauliflower has one important place in Rajasthan where much attention has to be given to solve various problems connected with better crop production and profitable yield. Among them most important factors which can ensure curative returns from cauliflower growing is the judicious use of nutrients. The yield of cauliflower is directly influenced with manuring and fertilization. Being heavy feeder crop, balanced fertilization is very important for better productivity. It is evident that without use of macro and micro nutrients, not possible to get the maximum benefit in cauliflower. It is well established fact that growth and yield of plants are greatly influenced by a wide range of nutrients. Nitrogen is the most deficient element in coarse textured sandy soils of Rajasthan. It is main constituent of protein, nucleic acid, chlorophyll and pigments. Optimum application of nitrogen favours the transformation of carbohydrates into protein and promotes the formation of protoplasm and is highly sense the plant become more succulent. An adequate supply of nitrogen is associated with vigorous vegetative growth and more efficient use of available inputs. This leads to higher productivity. Besides macronutrients like NPK, micronutrients are also having great importance for growth and production of cauliflower. Boron is also an essential plant micro nutrient for a constituent of cell membrane and essential for cell division. Deficiency of boron causes abnormal cell division at the points which especially lead to disorder like hollow stem in cauliflower. Boron is also concerned with the precipitation of excess cation, buffer action, maintenance of conducting tissues and help in absorption of nitrogen. Its primary role is concerned with metabolism both uptake and its efficient use in plants. Boron also affect the cambial and phloem tissues of storage root or stem apical meristems and leaves, vascular cambia of fruits and other organs which are capable of meristematic activities (Singh, 1991) According

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toShirvona*et al*. (1988) boron stimulates auxin activity and reduces the growth retarding endogenous inhibitors. There by it stimulates the growth characters of plants specially stem and curd peduncle.

Keeping in view the above facts, an experiment entitled "Effect of Fertility Levels and Boron on Growth, and Yield of Cauliflower (*Brassica oleraceavar. botrytisL.*) were taken.

Materials and Methods: Thefieldexperimententitled"EffectofFertilityLevelsandBoronon Growth and YieldofCauliflower(*Brassicaoleraceavar.botrytis L.)*wasconductedatHorticulturefarm,S.K.N.CollegeofAgriculture,Jobner, Jaipur during *Rabi* season during Nov, 2016 to Feb, 2017.The experiment consisting five levels of fertility (Control, 100% RDF through inorganic fertilizers, 75% RDF through inorganic fertilizer + 25% through vermicompost, 50% RDF through inorganic fertilizer + 50% through vermicompost and 25% RDF through inorganic fertilizer + 75% through vermicompost) and four levels of boron (0, 1.5, 2.0 and 2.5 kg boron/ha) tested alone and is combination. The total 20 treatment combinations were evaluated in RBD with three replications.

Treatment application: The recommended dose of fertilizer for cauliflower is 120:100:100 kg/ha nitrogen, phosphorus and potash were applied respectively through urea (46% N), single super phosphate (16% P) and muriete of potash (60%K) as per treatment combination. Full dose of single super phosphate, muriate of potash andhalfdoseofureainvarioustreatmentswere applied as the basal dose at the time of transplanting of seedling of in main field.Remaininghalfdoseofureawasgivenastopdressingintwosplitdoses at 30 and 45 days aftertransplanting. The required quantity of vermicompost was given as per treatment combination.Thewholequantityofvermicompostwasuniformlyspreadatthe time of bed preparation and then thoroughlymixed.Boron was applied in the bed as per treatment combination through agriculture grade elemental borax contenting 11% boron was broadcasted before transplanting and incorporated in the soil.

Results and Discussion:

Growth: The results as reported in preceding chapterrevealed that different fertility levels significantly increased the plant height, number of leaves per plant and leaf area (Table 1 to 4). Application of 75 per cent RDF through inorganic fertilizer and 25 per cent through vermicompost exhibited maximum plant height (30.99 cm and 56.47 cm at 30 DAT and 60 DAT respectively), number of leaves per plant (12.12 and 22.54 at 30 DAT and 60 DAT respectively) and leaf area (151.96 cm2 and 319.21 cm2 at 30 DAT and 60 DAT, respectively) followed by application of 50 per cent RDF through inorganic fertilizers and 50 per cent through vermicompost. However, different fertility levels were found to be nonsignificant to curd initiation of cauliflower.

This might be due to the better nutritional environment in the root zone for growth at development of the plant. The significant influence of inorganic fertilizers in combination with vermicompost on plant growth of cauliflower seems to be account of urea, SSP and MOP supplied at initial growth stages whereas, vermicompost provided the nutrients throughout the

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cropping season matching to the need of the plants. An added advantage of vermicompost is that besides supplying all the essential nutrient it improves the physical and biological properties of soil in respect of granulation, friability, porosity and water holding capacity. The positive effect of inorganic fertilizers and vermicompost on growth by providing a balanced nutritional environment favorable both in soil rhizospheres and in plant system. The results are close conformity with findings of Kumhar*et al.* (2004) in cauliflower, Patil (2003) in tomato and Mahmood*et al.* (2007) in cauliflower.

There was significant increase in the growth parameters viz. plant height, number of leaves per plant, leaf area, chlorophyll content and fresh weight of plant of cauliflower with the application of 2.5 kg boron per hectare but remained at par with 2.0 kg boron per hectare (Table 1 to.5). These findings clearly indicated that boron played a significant role for enhancing the growth of cauliflower. It might be due to supply of micronutrients and availability of uptake nutrients in soil due to favorable conditions.

These results are close conformity with findings of Moniruzzaman*et al*. (2007) in broccoli, Singh *et al.* (2011) in cauliflower, Kumar *et al.* (2012) in also cauliflower and Devi *et al*. (2012) in cabbage.

Yield and yield attributes: The application of 50 per cent RDF through inorganic fertilizers and 50 per cent through vermicompost significantly increased the average weight of curd (386.56 g), curd yield per plot (4.64 kg/plot), curd yield per ha (190.89/ha) and volume of curd (261.27 cc). However, 25 per cent RDF through inorganic fertilizers and 75 per cent through vermicompostwas statistically at par in all the above characters (Table 5 to 7). The significant improvement in yield and yield attributes an account of application fertilizers along with vermicompost might have attributed to the plant location of nutrients from soil. Further, increased vegetative growth might have provided more sites of translocation of photosynthetes, which ultimately resulted in increased yield. The findings of previous investigation are supported of Kumhar*et al.* (2004) in cauliflower, Mahala (2011) in spouting broccoli, Choudhary*et al* (2012) in broccoli and Rai*et al.* (2013) in cabbage.

The application of 2.5 Kg Boron per hectare significantly increased the average weight of curd (375.51 g), curd yield per plot (4.51 kg), total curd yield per ha (185.49 q) and volume of curd (246.58 cc). While, 2.0 Kg boron per hectare was found statistically at par with this treatment in all the above characters (Table 6 and 8). The beneficial effect of boron on yield attributes and yield might be due to enhanced supply of micronutrients during entire growing season, significant increase in yield under the influence of boron was largely function of improved growth and the consequent increase in different yield attributes and yield. These, results are in accordance with the findings of Batal*et al.* (1997) and Ghosh and Hasan (1997) in cauliflower, Mukhopadhayay and Chattopadhyay (1999) and Khadka*et al.* (2005) in cauliflower, Moniruzzaman*et al.* (2007) in broccoli where head yield per plant and per hectare highest up to 1.5 kg boron per ha.

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Conclusion: On the basis of results ofpresent investigation it can be concluded that the combined application of 50 per cent RDF through inorganic fertilizers and 50 per cent through vermicompost along with 2.5 kg boron per ha as soil application was found best in terms of growth, yield and quality parameters for better cauliflower crop with maximum yield (220.22 q/ha).

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References:

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Table: 1.Effect of fertility levels and boron on plant height at 30 and 60 DAT of cauliflower

Treatments	Plant height (cm)	
	30 DAT	**60 DAT**
Fertility levels		
F_0– Control	22.36	40.74
F_1 – 100% RDF through inorganic fertilizers	28.17	51.34
F_2 – 75% RDF through inorganic fertilizers + 25 % through VC	30.99	56.47
F_3 – 50% RDF through inorganic fertilizers + 50 % through VC	30.64	55.85
F_4 – 25% RDF through inorganic fertilizers + 75 % through VC	27.83	50.71
SEm±	0.78	1.41
CD (P=0.05)	2.24	4.04
Boron levels		
B_0– Control	25.05	45.22
B_1 – 1.5 kg/ha	27.05	48.84
B_2 – 2.0 kg/ha	29.21	53.67
B_3 – 2.5 kg/ha	30.67	56.36
SEm+	0.70	1.26
CD (P=0.05)	2.01	3.61

VC = Vermicompost

Table: 2.Effect of fertility levels and boron on number of leaves per plant at 30 and 60 DAT of cauliflower

Treatments	Number of leaves per plant	
	30 DAT	60 DAT
Fertility levels		
F_0– Control	8.75	16.27
F_1 – 100% RDF through inorganic fertilizers	11.02	20.50
F_2 – 75% RDF through inorganic fertilizers + 25 % through VC	12.12	22.54
F_3 – 50% RDF through inorganic fertilizers + 50 % through VC	11.99	22.30
F_4 – 25% RDF through inorganic fertilizers + 75 % through VC	10.88	20.25
SEm+	0.30	0.57
CD (P=0.05)	0.87	1.63
Boron levels		
B_0– Control	9.71	18.05
B_1 – 1.5 kg/ha	10.48	19.50
B_2 – 2.0 kg/ha	11.52	21.43
B_3 – 2.5 kg/ha	12.10	22.50
SEm+	0.27	0.51
CD (P=0.05)	0.78	1.46

VC = Vermicompost

Table: 3.Effect of fertility levels and boron on leaf area at 30 and 60 DAT of cauliflower

Treatments	Leaf area (cm^2)	
	30 DAT	60 DAT
Fertility levels		
F_0 - Control	109.64	230.31
F_1 – 100% RDF through inorganic fertilizers	138.14	290.19
F_2 – 75% RDF through inorganic fertilizers + 25 % through VC	151.96	319.21
F_3 – 50% RDF through inorganic fertilizers + 50 % through VC	150.29	315.70
F_4 – 25% RDF through inorganic fertilizers + 75 % through VC	136.46	286.65
SEm+	3.80	7.98
CD (P=0.05)	10.88	22.85
Boron levels		

B_0 - Control	121.68	255.61
B_1 – 1.5 kg/ha	131.42	276.07
B_2 – 2.0 kg/ha	144.43	303.39
B_3 – 2.5 kg/ha	151.65	318.57
SEm+	3.40	7.14
CD (P=0.05)	9.73	20.43

VC = Vermicompost

Table: 4.Effect of fertility levels and boron on curd yield per plot and per hectare of cauliflower

Treatments	**Curd yield (Kg/plot)**	**Curd yield (q/ha)**
Fertility levels		
F_0– Control	2.69	110.74
F_1 – 100% RDF through inorganic fertilizers	3.59	147.78
F_2 – 75% RDF through inorganic fertilizers + 25 % through VC	4.09	168.15
F_3 – 50% RDF through inorganic fertilizers + 50 % through VC	4.64	190.89
F_4 – 25% RDF through inorganic fertilizers + 75 % through VC	4.52	186.07
SEm+	0.05	1.95
CD (P=0.05)	0.14	5.58
Boron levels		
B_0– Control	2.79	114.69
B_1 – 1.5 kg/ha	3.94	162.27
B_2 – 2.0 kg/ha	4.39	180.52
B_3 – 2.5 kg/ha	4.51	185.43
SEm+	0.04	1.74
CD (P=0.05)	0.13	5.04

VC = Vermicompost