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Effect of different micronutrients on growth and yield of cauliflower (*Brassica oleracea* var. *botrytis* L.) cv. Pusa Sharad

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Abstract
A Field experiment was conducted to evaluate the effect of different micronutrients on growth and yield of cauliflower. The whole research experiment was carried out for two years (*i.e., rabi* season 2017-18 and 2018-19 at Research cum Instructional farm of Horticulture, Department of Vegetable Science, IGKV, Raipur. The experiment was laid down under randomized block design in three replication, and consisting of fifteen treatments. The important growth parameters and curd yield encompassed in the study were plant height (cm), number of leaves plant^{-1}, width of leaves (cm), length of leaves (cm), length of root (cm), stem length (cm), stem diameter (cm), days to first curd initiation, days of 50% curd maturity and curd yield (q ha^{-1}). The experimental findings revealed that almost all the treatments showed a positive effect on growth and yield, however treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) exhibited most significant influence on all above mentioned parameters when compared to T_1- Control (100% RDF). Therefore, on the basis of experimental it can be concluded that the application of micronutrients is an effective approach in cauliflower to enhance the growth, curd maturity and curd yield.

Keywords: Micronutrients, growth, curd yield and cauliflower

Introduction
Cauliflower (*Brassica oleraceae* var. *botrytis* L.) is one of the most popular cruciferous vegetable crops cultivated for its white curds as edible part. It is the crop being grown round the year for its white and tender curd vegetables. The crop comes well in cool, moist climate and susceptible to very low temperature or too much heat (Din *et al.*, 2007) [9]. The curd has high amount of protein (2.6 g) rich source of nutrient including vitamin A (51 mg), vitamin C (56 mg), carbohydrates (4.0 g), fat (0.4 g), fiber (1.2 g), and iron (1.5 mg) as per 100 g of edible portion of cauliflower (Singh 1998; Fageria *et al*., 2012) [42, 10]. The crop respond well to both macro (nitrogen, phosphorus, potassium) and micro nutrients (boron, molybdenum and zinc) as these are also essential for proper crop growth and development (Rahman *et al.*, 2007) [28]. The crucial role of these macronutrients (Kodithuwakku and Kirthisinghe 2009; Das 2012; Sharma 2016) [18, 7, 36] and micronutrients (Cakmak 2000; Alam and Raza 2001; Narayanamma *et al*., 2007; Kumar *et al*., 2012; Ningawale *et al*., 2016) [5, 2, 30, 31, 20] during plant developmental process are well reported by previous researchers in many crops including cauliflower. However, among the many factors responsible for low productivity of cauliflower, inadequate and imbalanced nutrient supply occupies the top position, particularly of boron, molybdenum and zinc. The rate of fertilizer application has increased than earlier in crop production, whereas application of micronutrients has largely been neglected and deficiency of micronutrients is more prevalent in Indian soils. In addition, over mining of soil nutrient by plants which causes most of the micronutrients run short in supply to the crops and appearance of disorders, resulting in low yields (Joshi 1997) [13]. Decreasing yield trend and the deteriorated quality and curd production in India. Therefore, rational and optimum use of micronutrient coupled with recommended fertilizers would be beneficial for increasing curd yield per unit area in cauliflower. On the other hand, the most of available literatures are confined to studies where either single or interaction of only two micronutrient were taken into considerations (Lashkari *et al*., 2008; Dhakal *et al*., 2009; Ahmed *et al*., 2011; Singh *et al*., 2011; Kant *et al*., 2013; Ningawale *et al*., 2016) [26, 8, 1, 40, 15, 31].

Keeping in view this scenario the research work on effect of different micronutrient in relation to growth and yield of cauliflower during consecutive seasons has been studied carried out to generate scientific information.

Materials and Methods

The whole experimental trial was designed and carried out for two consecutive *rabi* seasons 2017-18 and 2018-19 at Horticultural Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experimental site is comes under sub-tropical conditions and located at 21°16´ N latitude and 81°36´ E longitude with an altitude of 298.56 meters above the mean sea level. The soil at experimental site was clay-loam in texture (vertisols), having good drainage capacity and whole study was undertaken according to Randomized Block Design (RBD) in three replications, comprised of 15 treatments. The seeds of variety 'Pusa Sharad' were sown in nursery bed under polyhouse conditions and transplanted in fields after five weeks. The recommended package of practices was followed to raise healthy seedling in the nursery and need based plant protection measures were taken up as and when necessary. The treatment combinations were T_1 - Control (100% RDF), T_2 -100% RDF + Borax @ 20 kg ha^{-1}, T_3 - 100% RDF + Ammonium molybdate @ 2 kg ha^{-1}, T_4 -100% RDF + $ZnSO_4$ @ 25 kg ha^{-1}, T_5 -100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}, T_6 -100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + Borax @ 20 kg ha^{-1}, T_7 -100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}, T_8 -100% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}, T_9 - 75% RDF + Borax @ 20 kg ha^{-1}, T_{10} - 75% RDF + Ammonium molybdate @ 2 kg ha^{-1}, T_{11} - 75% RDF + $ZnSO_4$ @ 25 kg ha^{-1}, T_{12} - 75% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} +$ZnSO_4$ @ 25 kg ha^{-1}, T_{13} -75% RDF + Ammonium molybdate @ 2 kg ha^{-1}+ Borax @ 20 kg ha^{-1}, T_{14} -75% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}, T_{15}- 75% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}. During the growth parameters and curd yield encompassed in the study were plant height (cm), number of leaves plant^{-1}, width of leaves (cm), length of leaves (cm), length of root (cm), stem length (cm), stem diameter (cm), days to first curd initiation, days of 50% curd maturity and curd yield (q ha^{-1}). The growth parameters and curd yield were recorded at harvest stage from five tagged plants. The data collected from five randomly selected plants for above said parameters were subjected to analysis of variance technique (ANOVA) and least significance difference test was applied to separate different treatment means (Panse and Sukhatme 1967) [32].

Results and Discussion

The growth characters and curd yield of cauliflower increased significantly with the different micronutrients (Table 1and 2).

Table 1: Effect of different micronutrients on growth parameters of cauliflower

Treatment	Plant height (cm)		Number of leaves plant^{-1}		Width of leaves (cm)		Length of leaves (cm)		Length of root (cm)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1: Control (100% RDF)	49.82	49.32	17.03	15.94	17.83	16.42	35.14	33.22	16.17	14.77
T_2: 100% RDF + Borax @ 20 kg ha^{-1}	56.11	54.62	18.63	17.67	19.31	18.67	39.36	38.19	19.34	18.64
T_3: 100% RDF +Ammonium molybdate @ 2 kg ha^{-1}	56.27	55.64	18.77	18.33	19.63	18.90	38.44	37.64	19.81	19.67
T_4: 100% RDF + $ZnSO_4$ @ 25 kg ha^{-1}	55.18	53.38	18.38	17.52	19.17	18.48	39.02	37.92	19.14	18.07
T_5: 100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	63.22	61.75	22.74	21.96	22.77	21.87	45.62	44.28	23.67	22.36
T_6: 100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + Borax @ 20 kg ha^{-1}	59.52	58.74	20.91	19.72	21.36	20.43	43.20	42.67	21.42	20.41
T_7: 100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	56.67	56.26	20.18	18.79	20.52	19.73	41.99	41.20	22.16	20.66
T_8: 100% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	58.73	57.08	19.24	18.63	20.85	19.98	40.07	39.70	20.62	19.85
T_9: 75% RDF + Borax @ 20 kg ha^{-1}	54.01	52.04	17.20	16.33	18.44	17.81	36.87	35.38	17.33	17.28
T_{10}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1}	53.31	51.72	18.35	17.20	19.11	18.14	37.22	35.67	18.55	17.67
T_{11}: 75% RDF + $ZnSO_4$ @ 25 kg ha^{-1}	54.15	53.16	18.29	17.16	18.27	16.92	36.18	33.55	17.01	15.78
T_{12}: 75% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	60.70	59.55	21.32	20.13	21.49	21.42	44.48	43.20	22.57	21.33
T_{13}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1} + Borax @ 20 kg ha^{-1}	57.21	56.38	20.44	19.67	20.63	19.80	42.34	41.56	20.97	20.18
T_{14}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	56.31	55.83	19.48	18.74	19.82	19.33	40.90	40.14	21.60	20.57
T_{15}: 75% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	59.18	57.22	18.86	18.37	21.14	20.34	39.83	38.92	20.25	19.73
Mean	56.69	55.51	19.32	18.41	20.02	19.22	40.04	38.88	20.04	19.13
S.Em±	2.11	2.20	0.72	0.77	0.75	0.66	1.67	1.50	0.79	0.66
CD (P=0.05)	6.10	6.37	2.09	2.22	2.17	1.92	4.84	4.35	2.29	1.90

Table 2: Effect of different micronutrients on growth parameters and curd yield of cauliflower

Treatment	Stem length (cm)		Stem diameter (cm)		Days to first curd initiation		Days to 50% curd maturity		Curd yield (q ha^{-1})	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1: Control (100% RDF)	7.98	7.66	3.11	2.99	48.92	49.67	65.81	67.11	172.50	151.75
T_2: 100% RDF + Borax @ 20 kg ha^{-1}	9.89	9.12	3.48	3.39	47.66	48.27	64.35	65.33	228.50	213.00
T_3: 100% RDF +Ammonium molybdate @ 2 kg ha^{-1}	10.06	9.36	3.64	3.52	47.03	47.94	63.48	64.77	238.00	219.00
T_4: 100% RDF + $ZnSO_4$ @ 25 kg ha^{-1}	9.67	8.83	3.42	3.26	47.49	48.12	63.71	64.91	221.00	201.50
T_5: 100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	12.46	11.84	4.52	4.21	43.75	45.14	60.27	61.44	293.25	268.75
T_6: 100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + Borax @	10.61	9.81	3.84	3.76	45.34	46.05	61.85	62.36	269.25	257.25

20 kg ha^{-1}										
T_7: 100% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	10.19	9.50	3.92	3.88	46.33	47.25	62.28	63.22	247.25	226.25
T_8: 100% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	10.82	10.21	3.74	3.68	45.92	46.78	62.77	63.89	258.00	237.75
T_9: 75% RDF + Borax @ 20 kg ha^{-1}	9.07	8.33	3.25	3.18	48.51	48.65	64.91	65.71	201.25	184.50
T_{10}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1}	9.25	8.54	3.33	3.24	47.88	48.54	64.48	65.48	210.25	189.25
T_{11}: 75% RDF + $ZnSO_4$ @ 25 kg ha^{-1}	8.88	8.30	3.14	3.12	48.67	49.08	65.01	66.27	195.00	169.00
T_{12}: 75% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	11.53	10.81	4.18	3.94	44.09	45.80	61.33	61.74	281.00	264.25
T_{13}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1} + Borax @ 20 kg ha^{-1}	10.40	9.68	3.80	3.72	45.73	46.33	62.04	63.15	262.00	242.75
T_{14}: 75% RDF + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	10.11	9.44	3.71	3.63	46.76	47.81	62.39	63.58	246.50	220.50
T_{15}: 75% RDF + Borax 20 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}	10.74	9.94	3.88	3.82	46.24	47.16	63.22	64.18	256.25	233.00
Mean	10.11	9.42	3.66	3.56	46.69	47.51	63.19	64.21	238.67	218.57
S.Em±	0.34	0.27	0.13	0.13	1.03	0.81	0.99	0.85	14.69	10.78
CD (P=0.05)	0.98	0.79	0.38	0.37	3.00	2.34	2.87	2.47	42.57	31.23

Plant height (cm)

The plant height varied significantly during both first 49.82 to 63.22 cm), and second year (49.32 to 61.75 cm). The utmost plant height 63.22 cm (year 2017-18) and 61.75 cm (year 2018-19) were recorded from treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) when compared to T_1 - control (10% RDF). These results are found in well accordance with findings of Sitapara *et al*., (2011) [43]; Islam *et al.*, (2014) [12] and Singh *et al.*, (2017) [38] in broccoli and cauliflower. Application of different micronutrients accelerates the rate of metabolic activities in the plant system that might result in increasing height of the plant (Sitapara *et al*., 2011) [43]. Furthermore, it can also be assume that the application of different micronutrients could be attributed to increased cell division and subsequent inter nodal elongation that subsequently leads to increased plant height.

Number of leaves plant^{-1}

The number of leaves/plant varied significantly during both the years *i.e*., from 17.03 to 22.74 during year 2017-18, and from 15.94 to 21.96 during year 2018-19. The maximum number of leaves 22.74 (year 2017-18) and 21.96 (year 2018-19) were noticed in treatment T_5 {100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}} over control. The mean performance clearly indicates that the number of leaves significantly increased and these results are well supported by earlier findings of Sharma and Sharma (2010) [35]; Sitapara *et al.*, (2011) [43] and Kumar *et al.*, (2012) [20] in cole crops. The increment in number of leaves/plant was due to positive effect of various macro and micro nutrients on vegetative growth of plants that causes higher photosynthetic activities. In the same line of agreement Kumari and Kebrom (2017) [23] were suggested that the increased application of nitrogen promotes the enhanced cell division and cell enlargement that further result in superior apical branching taller plants and more number of leaves.

Width of leaves (cm)

The width of leaves varied significantly during both first year and second year from 17.83 to 22.77 cm and 16.42 to 21.87 cm respectively. The highest width of leaves *i.e*., 22.77 cm during year 2017-18 and 21.87 during year 2018-19 were recorded from treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) over control. The experimental results showed that the width of leaves was significantly varied due to different application of micronutrient and in most treatments and similar evidences of agreement were also noted by earlier researchers (Kumar *et al.*, 2012) [20]. In the same view of present results, Singh *et al.*, (2015) [48] stated that the width of leaves significantly increased by application of nitrogen, which might be due to fact that nitrogen promotes the increased assimilation of photosynthetic material which ultimately enhanced activity of meristematic cells and subsequent width of leaf increases. On the other hand, Saha *et al.*, (2010) [34] suggested that the application of micronutrients probably enhance the protein synthesis, development of cell walls and carbohydrate metabolism which in turn increase the leaf width.

Length of leaves (cm)

Length of leaves were recorded from each treatment and was found to varied significantly during both first (35.14 to 45.62 cm) and second year (33.22 to 44.28 cm). The maximum Length of leaves *viz*., 45.62 cm (year 2017-18) and 44.28 cm (year 2018-19) were recorded from treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) when compared to control. The observed results exhibited that the application of different amount of micronutrients significantly affects the leaf length at different growth stags and these results were in similar agreement with various previous findings such as Montessori *et al.,* (2012) [29]; Kumar *et al.*, (2013) [21]; Singh *et al.*, (2014) [41] and Moklikar *et al.*, (2018) [27] in cauliflower. This increase in length of leaf might be due to higher boron content which helps in high vegetative growth (Kushwaha *et al.*, 2009) [24].

Length of root (cm)

The experimental findings revealed that the length of root varied significantly during both first (16.17 to 23.67 cm) and second 14.77 to 22.36 cm) year. The maximum length of root *viz*., 23.67 cm (year 2017-18) and 22.36 cm (year 2018-19) was recorded from treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + ZnSO4 @ 25 kg $ha^{-1)}$ when compared to control. The above findings indicated that the application of different amount of various fertilizers and micronutrients with different concentration were significantly enhance the root growth and similar reports were also observed by Arisha *et al*., (2003) [3] and Togun and Akanbi (2003) [44].

Stem length (cm)

The stem length significantly ranged from 7.98 to 12.46 cm during first year and from 7.66 to 11.84 cm during second year. The highest stem length 12.46 cm (year 2017-18) and 11.84 cm (year 2018-19) was recorded from treatment T_5

{100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}} when compared to control. Our experimental findings clearly indicated that the stem length significantly affected by various treatments of micronutrient at different growth stages and identical reports were also noticed by some previous reports *viz*., Singh 2003 [37] and Kanujia *et al.*, 2006 [16]. The application of micronutrients to cauliflower helps in cell elongation, cell differentiation and carbohydrate translocation. On the other hand, molybdenum is a component of several enzymes, including nitrogenase and nitrate reductase. These both enzymes are actively participated in nitrogen metabolism and promote plant growth and development. The applied micronutrients leads to an increase in stem length, which might be due to the pronounced effect of micronutrient especially boron that accelerate net photosynthesis, protein synthesis, dry matter content and also growth and yield of crops (Kalewar *et al*., 1993) [14].

Stem diameter (cm)

The stem diameter varied significantly during both first (3.11 to 4.52 cm) and second year (2.99 to 4.21 cm). The maximum stem diameter *i.e*., 4.52 cm (year 2017-18) and 4.21 cm (year 2018-19) was recorded from treatment T_5 {100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}} over control. The experimental results clearly indicated the significant variations during both the years which might be due to application of micronutrients in various combinations and these results are well supported by findings of Moniruzzaman *et al.*, (2007) [28] in broccoli.

Days to first curd initiation

Days to first curd initiation is an important character and it was found to varied significantly from 43.75 to 48.92 days during first year and from 45.14 to 49.67 days during second year. The earliest days to first curd initiation 43.75 days (year 2017-18) and 45.14 days (year 2018-19) were recorded in treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) when compared to control. The results from our study indicate that the application of micronutrients reduces the number of days taken to curd initiation significantly. Plants absorb the micronutrients in balanced concentration and exert a positive effect along with that micronutrients promote various plant physiological activities that in turn leads to synthesis of hormones and subsequent early curd initiation in cauliflower. The present results were in well accordance with the reports of Lashkari *et al.*, (2007) [25] and Verma (2009) [46] in cauliflower. Also, Arora *et al.*, (1983) [4] suggested that the application of zinc improved the translocation of photosynthate towards the curd and it will help in early appearance of curd.

Days of 50% curd maturity

Days to 50% curd maturity varied significantly during both first (60.27 to 65.81 days) and second year (61.44 to 67.11 days). The earliest 50% curd maturity *i.e*., 60.27 days (year 2017-18) and 61.44 days (year 2018-19) was recorded from treatment T_5 (100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate@ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}). The highest days to 50% curd maturity 65.81 days during year 2017-18 and 67.11 days during year 2018-19 was observed in T_1-Control (100% RDF). These findings are well supported by reports of Singh (2003) [37] and Chattopadhyay and Mukhopadhyay (2003) [6] who also noticed similar trends in cauliflower. Furthermore, Kotur (1998) [19] stated that boron acts as the key element for increasing the movement of photosynthetic material from leaves to reproductive tissues in cauliflower; whereas, Mo promoted the photosynthetic activities and also increase the metabolic process.

Curd yield (q ha^{-1})

The curd yield significantly ranged from 172.50 to 293.25 q ha^{-1} during first year and from 151.75 to 268.75 q ha^{-1} during second year. The highest curd yield *viz*., 293.25 q ha^{-1} during first year and 268.75 q ha^{-1} during second year was recorded in treatment T_5 {100% RDF + Borax @ 20 kg ha^{-1} + Ammonium molybdate @ 2 kg ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}} over and above the control. These results showed that the application of different treatment leads to the increase in curd yield and it was found highest with combined application of micronutrient B, Mo and Zn. The higher curd yield might be attributed due to application of micronutrient that in turn promotes the distribution of food material from leaves to the storage tissue in the curd and our interpretation is in close conformity with the findings of Singh (2003) [37]; Varghese and Duraisami (2005) [45] and Gabhale *et al.*, (2014) [11]. The contribution of soil application of different micronutrient mixture to increase in yields can be attributed to the enhanced availability of essential plant nutrients at the required growth stages which promote the metabolic rate. Increased metabolic activities caused higher assimilation of proteins and carbohydrates that further leads to higher uptake of nutrients and yields. The obtained results corroborated with the reports of Kanujia *et al.*, (2006) [16] and Yadav *et al.*, (2009) [8].

Conclusion

The investigation carried out during two consecutive seasons showed that the combined application of all three micronutrients *viz*., boron, molybdenum and, zinc in various combinations significantly improves the crop growth parameters and curd yield among different treatments application of 75% and 100% RDF + Boron at 20 kg ha^{-1} + molybdenum at 2 kg ha^{-1} + zinc at 25 kg ha^{-1} was found most promotive. Hence, it can be concluded that from the present investigation that the application of micronutrients is beneficial in enhancing and improving the growth characters as well as yield of cauliflower.

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