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EFFECT OF FOLIAR SPRAY OF MICRO-NUTRIENTS ON GROWTH AND QUALITY YIELD OF CAULIFLOWER (*BRASSICA OLERACEA* VAR.*BOTRYTIS* L.*)* CV PSB K-1

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ABSTRACT

A field experiment was carried out at Agricultural Research Farm, Department of Horticulture R.B.S College Bichpuri, Agra. During the Rabi season in the year 2023-24 to study the effect of foliar spray of micro-nutrients on growth and quality yield of cauliflower. The experiment was laid out in Randomized Block Design with 8 treatments and 3 replications. In this experiment the results revealed that treatment T_7 ($FeSO_4$ 0.5%+ $ZnSO_4$ 0.5%+ Boron 0.2%) showed maximum plant height (49.08 cm), number of fully open leaves (14.13), spread of plant (E-W & N-S) (38.97 cm & 38.39 cm) and length & width of longest leaf (45.12 cm & 25.11 cm). In case of yield and quality parameters treatment T_7 also show the maximum weight of trimmed curd (1.18 Kg), diameter of curd [E-W & N-S] (17.42 &19.52 cm), Yield of curd (297.07 q/ha), dry matter content of curd & leaves (8.31% & 10.39%) as compared to control.
Keywords **:** cauliflower**,** micro-nutrients, height of plant, spread of plant & dry matter contentof curd.

Introduction

The Cauliflower (*Brassica oleracea* var. *botrytis* L.*)* is one of the most important vegetable among the all cole crops in India. The edible portion of cauliflower is called curd is a 'prefloral fleshy apical meristem'. It is generally white in colour enclosed by inner leaves before its exposure. Cauliflower is the winter season vegetable grown in both plain and hilly area whole year for its white curd. India is the second largest producer in the world. It is grown commercially on an area of about 491.5lakh hectares with an annual production 95.48 lakh tonnes and productivity 19.4mt ha^{-1} in India. (Ministry of Agriculture & Farmers Welfare, 2022-2023). Cauliflower is rich source of potassium, calcium, iron, phosphorus, magnesium, carbohydrates and vitamins. It is also rich in antioxidant and used in both salad, vegetables, soup and pickles etc.

Micronutrients are essentially as important as macronutrients to have better growth, yield andquality in plants. Micronutrient improves the chemical composition of curd and general condition of the plant (Hall *et al.,* 2002). Boron is important for cell division and development in the growth regions of the plant. It also influences the absorption of nitrogen, regulates translocation of carbohydrates, cell wall development and synthesis of RNA. Zinc is considered as an important micronutrient for plant growth and development. Zinc also has key role during respiration, photosynthesis, chlorophyll formation. Iron acts a catalyst in synthesis of chlorophyll molecule and helps in absorption of other elements (Pandav *et al.,* 2016). Keeping in mind the above facts this experiment was conducted with the objective to find out the effect of micronutrients on vegetative growth, yield and quality of cauliflower.

Methods and Materials

The present experiment was carried out at, Agriculture Research Farm, Department ofHorticulture Raja Balwant Singh College Bichpuri, Agra. The farm is located at 27.17° N longitude and 77.9° E latitude at an altitude of 163.4m above sea level. The climate of

the Research farm has a semi- arid and sub tropical climate with hot and dry summers and extremely cold winters. In summer, the temperature reaches up to 46 to 48 ^{o}C with dry western winds locallycalled Loo and in winters it falls to about 2-3 ^{o}C with occasional frost on the ground. The soil of experimental area was gangeticalluvial with a calcareous layer at the depth of about 1.5m to 2.0m. It was slightly alkaline with pH-7.9 and was well drained. The experiment was laid out in Randomized Block Design having three replications and eight treatments. The treatments were T_0 (Control), T_1 ($FeSO_4$ @ 0.5%), T2 (ZnSO4 @ 0.5%), T3 (Boron @ 0.2%), T_4 ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5%), T_5 (ZnSO4 @ 0.5% + Boron @ 0.2%), T_6 ($FeSO_4$ @ 0.5% + Boron @ 0.2%), T_7 ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Boron @ 0.2%). The first spray of micronutrient was done after 30 DAT and second was done after 45 DAT. The following observations was recorded in plant height (cm), number of fully open leaves, length and width of longest leaf(cm), and spread of plant (E-W & N-Scm). Yield and quality parameters were recorded weight of trimmed curd (kg), yield of curd (q/ha), diameter of curd (E-W & N-S cm), Dry matter of 100g curd & leaves. The data was statistically analyzed by standard procedure of Panse & Sukhatme (1967). CD were computed at 5% level of significance if results were significance.

Results And Discussions

Growth study

The study revealed that all growth parameters influence significantly by using different micro-nutrients and its combinations. It was represented in (Table 1). Plant height was increased significantly, the maximum plant was observed (49.08 cm) under treatment T_7($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Boron @ 0.2%) which was statistically at par with T_5 and T_6. The minimum was observed (41.85 cm) under control. This might be due to boron, it took part in sugar translocation which might have helped to increase plant height. Similar results were also observed in Hassan *et al.* (2013) and Chaudhari *et al.* (2017). The maximum number of fully open leaves was counted (14.13) under treatment T_7 ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Boron @ 0.2%) followed by treatment T_5, T_6 and T_4 however the minimum was observed (11.63) control this might be due to availability of essential plant nutrients at various growth stage to leading to increasethe number of fully open leaves. Similar result was also agreed with Chaudhari *et al*., (2017) in cabbage. The maximum length (45.12 cm), width (25.11 cm) and plant spread (E-W) and (N-S) were observed (38.97 cm and 38.39 cm) in T_7 which were closely followed with T_5 and T_6 and the minimum were observed in control. This increase in length and width of leaves might be due to boron content which helps in high vegetative growth on the other hand width of laves increase due to the application of micronutrients enhance the protein synthesis, development of cell walls and carbohydrates metabolism which in turn increase the leaf width and plant spread. The similar finding was also observed in Kumar *et al*., (2012).

Yield & Quality parameters

The study revealed that all yield and quality parameters were influenced significantly by using different micro- nutrients and its combinations. It was represented in table 2. The maximum weight of trimmed curd (1.18 Kg) and curd yield (297.07 q/ha) was observed in T_7 ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Boron @ 0.2%) followed by treatment T_5 and T_6 as compared to control. This might be due to zinc and boron acts as a catalyst in the oxidation and reduction process and its great importance in sugar metabolism which might have in curd weight. These finding was agreed with Ranjan *et al*. (2020) and Shivani *et al*. (2020). The maximum diameter of curd (E-W 17.42 cm) and (N-S 19.52 cm) were observed in T_7 ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Boron @ 0.2%) which was statistically at par with T_5 and T_6, where as the minimum was observed (E-W 12.83cm) and (N-S 13.18cm) under control. This might be dueto application of combine effect of micronutrients enhanced the curd diameter. The similar result was agreed with Nahar *et al*., (2014) in cabbage. The maximum dry weight of 100g leaves and curd was observed (10.39% and 8.31%) with T_7 which was followed by treatments T_5 and T_6, whereas minimum was observed (5.47% and 5.05%)in control. Increase in dry weight of curd and leaves was might be due to particularly work of boron, which further cause the precipitation of higher cation, action of buffer, which is finally promote absorption of nitrogen. The similar result was alsofound by Hasan *et al*., (2013) and Singh *et al*., (2017).

Conclusion

On the basis of present investigation, it can be concluded that foliar application of ($FeSO_4$ @ 0.5% + $ZnSO_4$ @ 0.5% + Bo @

0.2%) (T_7) was found most effective to increase in vegetative growth, yield andquality of cauliflower curd at Agra region.

Table 1: Growth parameter was influenced by foliar spray of micronutrients oncauliflower.

Treatments		Plant height(cm)	Number of fully open leaves	Length of longest leaf (cm)	Width of longest leaf (cm)	Plant spread(cm)	
						E-W	N-S
(T_0)	Control	41.85	11.63	41.17	20.50	31.76	30.94
(T_1)	$FeSO_4$ 0.5%	43.93	12.35	42.15	22.29	33.96	34.97
(T_2)	$ZnSO_4$ 0.5%	46.27	12.89	42.79	21.90	35.11	35.87
(T_3)	Borax 0.2%	45.30	13.06	42.98	23.70	34.57	35.53
(T_4)	$FeSO_4$ 0.5% + $ZnSO_4$ 0.5%	44.27	13.22	43.18	23.81	35.30	35.91
(T_5)	Borax 0.2% + $ZnSO_4$ 0.5%	48.42	13.64	42.95	24.85	37.89	38.23
(T_6)	$FeSO_4$ 0.5% + Borax 0.2%	47.08	13.41	43.27	24.55	36.60	37.98
(T_7)	$FeSO_4$ 0.5% + $ZnSO_4$ 0.5% + Borax 0.2%	49.08	14.13	45.12	25.11	38.39	38.97
SEm ±		1.01	0.33	0.27	0.43	0.45	0.90
CD at 5%		**3.09**	**1.00**	**0.83**	**1.31**	**1.36**	**2.74**

Table 2: Yield and quality parameters were influenced by foliar spray of micronutrientson cauliflower.

Treatments		Fresh weight oftrimmed curd (kg)	Curd yield (q/ha)	Diameter of curd(cm)		Dry weight content of chopped (%)	
				E-W	N-S	Curd (100g)	Leaves (100g)
(T_0)	Control	0.84	231.41	12.83	13.18	5.05	5.47
(T_1)	$FeSO_4$ 0.5%	0.89	254.61	14.29	15.79	6.12	6.93
(T_2)	$ZnSO_4$ 0.5%	0.96	258.08	14.80	15.97	7.01	7.36
(T_3)	Borax 0.2%	1.06	265.01	15.05	14.33	6.69	7.90
(T_4)	$FeSO_4$ 0.5% + $ZnSO_4$ 0.5%	1.13	274.56	13.43	16.17	7.03	8.10
(T_5)	Borax 0.2% + $ZnSO_4$ 0.5%	1.17	291.25	17.08	18.27	8.15	9.22
(T_6)	$FeSO_4$ 0.5% + Borax 0.2%	1.15	280.25	16.21	17.02	7.13	8.60
(T_7)	$FeSO_4$ 0.5% + $ZnSO_4$ 0.5% + Borax 0.2%	1.18	297.07	17.42	19.52	8.31	10.39
SEm ±		0.052	5.642	0.63	0.91	0.47	0.38
CD at 5%		**0.16**	**17.113**	**1.92**	**2.77**	**1.44**	**1.14**

A field experiment was carried out at Agricultural Research Farm, Department of Horticulture R.B.S College Bichpuri, Agra. During the Rabi season in the year 2023-24 to study the effect of foliar spray of micro-nutrients on growth and quality yield of cauliflower. The experiment was laid out in Randomized Block Design with 8 treatments and 3 replications. In this experiment the results revealed that treatment T_7 ($FeSO_4$ 0.5%+ $ZnSO_4$ 0.5%+ Boron 0.2%) showed maximum plant height (49.08 cm), number of fully open leaves (14.13), spread of plant (E-W & N-S) (38.97 cm & 38.39 cm) and length & width of longest leaf (45.12 cm & 25.11 cm). In case of yield and quality parameters treatment T_7 also show the maximum weight of trimmed curd (1.18 Kg), diameter of curd [E-W & N-S] (17.42 &19.52 cm), Yield of curd (297.07 q/ha), dry matter content of curd & leaves (8.31% & 10.39%) as compared to control.

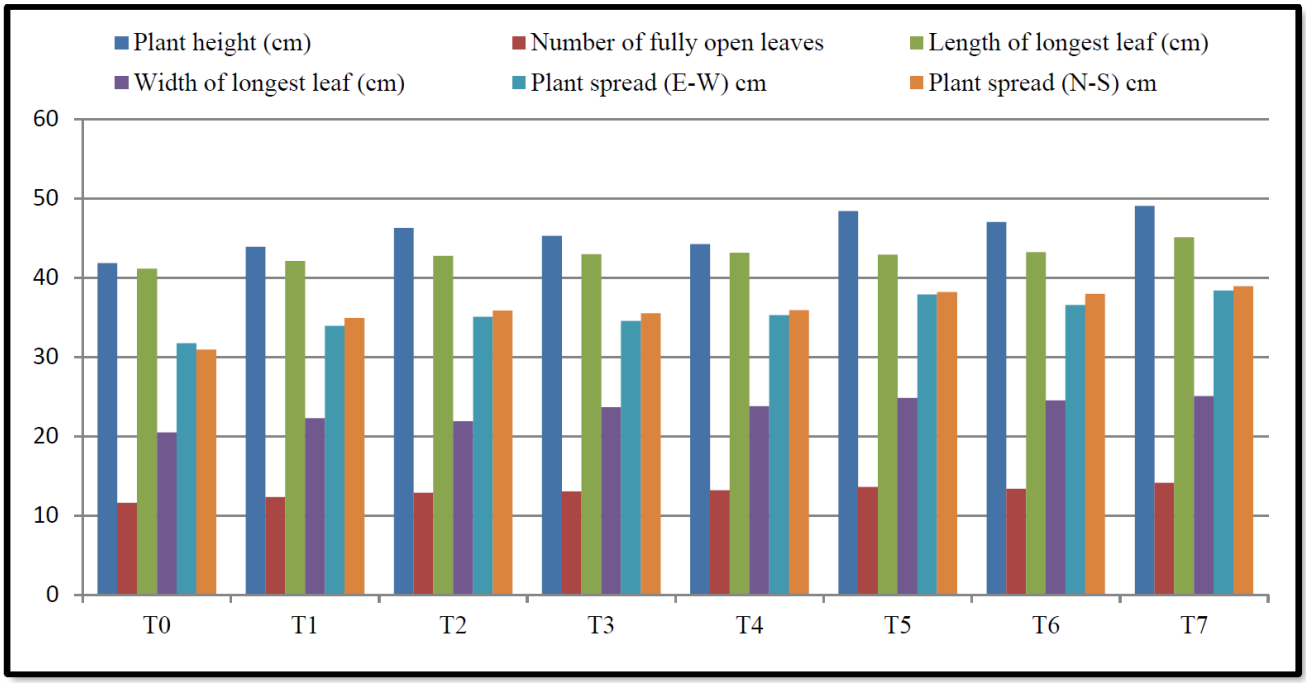

Fig. 1: Growth parameters were influenced by foliar spray of micronutrients on cauliflower.

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