



P-ISSN: 2349-8528
E-ISSN: 2321-4902
IJCS 2017; 5(4): 2113-2115
© 2017 IJCS
Received: 10-05-2017
Accepted: 11-06-2017

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Impact of micronutrients spray on growth and yield of *Brassica oleracea* var. Capitata

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Abstract

The experiment was conducted during *rabi*, 2016-2017 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari, Gujarat, India to evaluate the impact of micronutrients spray on growth and yield of *Brassica oleracea* var. capitata. The experiment was arranged over 9 treatments which was laid out in a Randomized Block Design with three replications. The application of 1% General grade-1 + T₁ had shown significant impact on growth parameters viz., plant height (28.54 cm), length of stalk (11.36cm), number of wrapper leaves per plant (42.26), number of non wrapper leaves per plant (21.93) and plant spread (N-S: 55.96 cm & E-W: 54.22 cm) at harvest. Highest yield of head per plot (31.42 kg) marketable head yield per hectare (24.24 t) and other yield attributes viz., polar diameter of head (15.46 cm), equatorial diameter of head (13.35 cm), gross weight of head (1.24 kg/plant) and net weight of head (748.00 g/plant) were recorded significantly highest in T₈ (1% General grade-1 + T₁) treatment. While days of first head initiation, days to first marketable head and head compactness did not show any significant differences.

Keywords: Cabbage, foliar spray, micronutrients, growth parameters, yield

Introduction

Cabbage (*Brassica oleracea* L. var. Capitata) is important among winter vegetables in India belonging to Brassicaceae family and is one of the important cole crops. It is used as salad, cooked, pickling as well as dehydrated vegetable. The word “cabbage” is derived from the French word “coboche” means head. It is mostly employed as culinary and dietary purpose. The particular flavor in cabbage is due to the glycoside ‘sinigrin’ which contains sulphur. The cabbage head is rich source of vitamin A, B, C and minerals. It helps in preventing constipation, increase appetite, speed up digestion and very useful for diabetic patients (Kotecha *et al.* 2016) [5]. Cabbage requires a fairly good amount of nutrients for better growth and yield. Such a heavy demand of nutrients by cabbage cannot be met from soil without supplementing them. The micronutrients though required in small quantities are as important as macronutrients. The role of micronutrients in regulation plant growth and yield is established (Narayanamma *et al.* 2007) [9]. The intensive cultivation and judicious use of only nitrogenous fertilizers, soils becoming deficient in secondary micronutrients. Since, the micronutrients are costly chemicals, amelioration of such deficiencies through soil application may increase the cost of cultivation, whereas, foliar applications might reduce the cost owing to the small quantities required and better absorption through the foliage. Now a days, it is realized that foliar spary of micronutrients are proved beneficial to increase yield, quality and improving shelf life of cabbage (Kotecha *et al.* 2011) [6].

Cabbage requires all the essential micronutrients viz., Ammonium molybdate, B, Zn, Cu, Fe, Mg etc. which are rarely applied to the soils. In foliar feeding of nutrients are better applied to the side of their metabolism and are not subjected to the losses as in case of soil application. Thus, to get higher growth and yield, appropriate foliar feeding of micronutrients are essential (Yadav *et al.* 2009) [11].

Materials and methods

The experiment was carried out with 9 treatments viz., 0.1% Ammonium molybdate (T₁), 0.2% Boric acid (T₂), 0.5% Zinc sulphate (T₃), 0.5% Copper sulphate (T₄), 0.5% Ferrous sulphate (T₅), 0.5% Manganese sulphate (T₆), 1% General grade-1 (T₇), 1% General grade-1+Ammonium molybdate (T₈) and Control (T₉) in a Randomized Block Design (RBD) with three replications.

Recommended dose of FYM 20 t/ha should be incorporated at the time of land preparation. Cabbage seedlings are transplanted to the field and fertigated with recommended dose of N: P: K at the rate of 150: 60: 80 kg/ha at the time of planting.

Micronutrients sprayed twice, firstly at 45 days after transplanting and second at 60 days after transplanting (DAT). Plants in control plots were sprayed with ordinary water. Observations of plant height at harvest (cm), length of stalk (cm), number of wrapper leaves per plant, number of non-wrapper leaves per plant, plant spread (N-S&E-W), days of first head initiation, days to first marketable head, polar diameter (cm), equatorial diameter (cm), gross weight of head (kg/plant), net weight of head (g/plant), head compactness, yield of head per plot (kg) and yield of head per hectare (t). at harvest stage were taken by randomly five selected plant of each plot recorded by standard method.

Results and discussion

Growth parameters

The Performance of cabbage cv. Golden Acre in response foliar application of different micronutrients is presented as mean values with statistical notation in the different tables. The results of various growth parameters namely plant height, length of stalk (cm), number of wrapper leaves per plant, number of non wrapper leaves per plant, plant spread (N-S & E-W), days of first head initiation and first marketable head as influenced by foliar spray of micronutrients in cabbage are presented in Table 1. The micronutrients influenced plant height, number of wrapper leaves, number of non wrapper leaves per plant, plant spread (N-S&E-W) significantly throughout the growing season of cabbage to the highest level of 28.54 cm, 42.26, 21.93 and 55.96 cm & 54.22 cm respectively at harvest stage, in which plant height was at par with treatment T₁, T₂, T₅, T₆ and T₇ and number of wrapper leaves, number of non wrapper leaves per plant and plant spread (N-S&E-W) were at par with treatment T₂, T₃ and T₇. The significantly lowest length of stalk (11.36 cm) is desirable growth character for cabbage crop. This increase in plant growth parameter is due to the role of zinc in chlorophyll formation, which is also influenced cell division, meristemic activity of plant tissue and expansion of cells and formation of cell wall by active synthesis of aromatic amino acid *i.e.* tryptophane, which is the primary precursor of auxin and stimulate the growth of plant tissues by cell elongation

and cell division. Bsavrajeshwari *et al.* (2008)^[1] in tomato, Chaudhary and Mukherjee (1999)^[2], Sharma *et al.* (2005)^[10] in cauliflower, Kanujia *et al.* (2006)^[4] and Devi *et al.* (2012)^[3], Yadav *et al.* (2009)^[11] observed in cabbage and also substantiated similar trends of increase in plant growth during their period of study. And the data found that none of the sources were found to be significant for days of first head initiation and first marketable head.

Yield and attributes

The results on effect of foliar application of micronutrients on various yield and attributes *viz.*, polar diameter of head, equatorial diameter of head, gross weight of head, head compactness, net weight of head, yield of head per plot and yield of head per hectare in cabbage as influenced by foliar spray of micronutrients are presented in Table 2. The maximum polar and equatorial diameter of head (15.46 cm and 13.35 cm) was recorded in T₈ (1% General grade-1+T₁) which was statistically at par with T₇ treatment. The occurrence of higher polar and equatorial diameter upon T₈ treatment was combination of Fe, Mn, Zn, Cu and B which is the best for production of highest diameter of head. This could be due to the application of micronutrient induced the synthesis of chlorophyll which in turn resulted in higher vegetative growth. This is in accordance with Narayanamma *et al.* (2007)^[9], Yadav *et al.* (2009)^[11], Kotecha *et al.* (2011)^[6] in cabbage. The treatment T₈ produced significantly maximum gross weight of head per plant (1.24 kg) which was statistically at par with T₂ (1.16 kg/plant), T₃ (1.15 kg/plant) and T₇ (1.21 kg/plant) and net weight of head per plant (748.00 g), which was at par with T₂ (668.66 g/plant), T₃ (651.66 g/plant) and T₇ (719.33 g/plant). Among various treatments, T₈ (1% General grade-1+T₁) recorded maximum yield of head per plot (31.42 kg) and yield of head per hectare (24.24 t), which was statistically at par with T₂ (28.11 kg), T₃ (27.39 kg) and T₇ (30.22 kg) and T₂ (21.68 t), T₃ (21.13 t) and T₇ (23.32 t), respectively. This is attributed to the presence of higher polar and equatorial diameter (cm), gross weight of head (kg), net weight of head (g), highest yield of head per plot and highest yield of head per hectare (t). These results are in close agreement with the findings of earlier researchers like Narayanamma *et al.* (2007)^[9], Yadav *et al.* (2009)^[11], Kotecha *et al.* (2011)^[6], Nandi and Nayak (2008)^[8] in cabbage and Naga *et al.* (2013)^[7] in tomato. And none of the sources of micronutrients were found significant for head compactness.

Table 1: Effect of foliar application of Micronutrients on growth parameters of cabbage

Treatments	Plant height (cm)	Length of Stalk (cm)	No. of wrapper leaves per plant	No. of non-wrapper leaves per plant	Plant spread (cm)		Days of first head initiation	Days to first marketable head
					N-S	E-W		
T ₁ : Ammonium molybdate (0.1%)	25.02	13.84	34.80	17.60	48.96	47.90	50.66	72.86
T ₂ : Boric acid (0.2%)	28.37	13.23	40.80	18.26	50.11	50.79	49.70	71.86
T ₃ : Zinc sulphate (0.5%)	25.50	12.28	38.73	17.20	49.02	49.78	50.86	72.60
T ₄ : Copper sulphate (0.5%)	24.38	11.98	34.33	17.66	45.83	45.92	51.66	73.60
T ₅ : Ferrous sulphate (0.5%)	25.17	12.52	34.60	15.66	46.38	46.55	50.63	72.13
T ₆ : Manganese sulphate (0.5%)	25.25	13.28	33.73	17.60	47.22	47.70	50.20	73.53
T ₇ : General grade-1 (1%)	27.72	14.01	41.40	19.00	52.96	50.67	49.00	71.33
T ₈ : 1% General grade-1+T ₁	28.54	14.26	42.26	21.93	55.96	54.22	49.26	70.93
T ₉ : Control	24.04	11.36	31.93	16.33	43.72	45.82	52.13	74.93
S.E.m. ±	1.071	0.610	2.175	0.947	2.329	1.726	0.925	1.973
C.D. _{0.05}	3.21	1.83	6.52	2.84	6.98	5.17	NS	NS
C.V. %	7.13	8.14	10.19	9.15	8.25	6.12	3.18	4.70

Table 2: Effect of foliar application of micronutrients on yield and attributes of cabbage

Treatments	Polar diameter (cm)	Equatorial diameter (cm)	Head compactness	Gross weight of head (kg/plant)	Net weight of head (g/plant)	Yield of head per plot (kg)	Yield of head per hectare (t)
T ₁ : Ammonium molybdate (0.1%)	13.20	12.85	26.02	1.07	577.00	24.24	18.70
T ₂ : Boric acid (0.2%)	13.45	13.07	28.64	1.16	668.66	28.11	21.68
T ₃ : Zinc sulphate (0.5%)	13.17	12.76	29.90	1.15	651.66	27.39	21.13
T ₄ : Copper sulphate (0.5%)	13.55	13.00	24.79	1.08	582.66	24.47	18.88
T ₅ : Ferrous sulphate (0.5%)	12.84	12.34	30.29	1.08	584.00	24.53	18.93
T ₆ : Manganese sulphate (0.5%)	12.84	12.19	31.08	1.11	609.66	25.62	19.76
T ₇ : General grade-1 (1%)	14.24	13.19	27.93	1.21	719.33	30.22	23.32
T ₈ : 1% General grade-1+T ₁	15.46	13.35	24.98	1.24	748.00	31.42	24.24
T ₉ : Control	12.11	12.05	29.97	1.02	526.33	22.10	17.05
S.E.m. ±	0.588	0.285	2.455	0.045	41.078	1.722	1.329
C.D. _{0.05}	1.76	0.86	NS	0.14	123.13	5.16	3.98
C.V. %	7.58	3.87	15.09	6.92	11.30	11.27	11.27

Conclusion

The result inferred that the foliar spray of micronutrients of 1% General grade-1 (Fe-2.0, Mn-0.5, Zn-4.0, Cu-0.3 and B-0.5) +T₁ (Ammonium molybdate) is favorably influenced plant growth and yield attributes. Results clearly emphasized the importance of foliar spray of micronutrients for higher yield produce hence, gave a remunerative return. Based on the trend of head yield and economical aspect of cabbage observed in the present study; it is concluded that for getting higher yield of cabbage head treatment (T₈) *i.e.* 1% General grade-1 + T₁ two spray of micronutrients at 45 days after transplanting and 60 days after transplanting was found better.

References

- Basavarajeswari CP, Hosamni RM, Ajjappalavara PS, Naik BH, Smitha RP *et al.* Effect of foliar application of micronutrients on growth and yield components of Tomato (*Lycopersicon esculentum* Mill.). Karnataka J. Agri. Sci. 2008; 21(3):428-430.
- Choudhary D, Mukharjee S. Effect of boron and zinc concentration on growth and yield of cauliflower cv. Snow Ball-16. Haryana. J. Hort. Sci. 1999; 28(1-2):119-120.
- Devi M, Bhanishana Devi RK, Ranjan Das. Enhancement of physiological efficiency of cabbage (*Brassica oleracea* L. var. Capitata) using foliar nutrition of boron. Crop Res, 2012; 43(1-2-3):76-80.
- Kanujia SP, Ahmed N, Chattoo MA, Jabeen N, Naryan S. Effect of micronutrients on growth and yield of cabbage (*Brassica oleracea* var. Capitata L.). Applied Bio. Res, 2006; 8:15-18.
- Kotecha AV, Dhruve JJ, Patel NJ, Vihol NJ. Influence of micronutrients and growth regulators on the performance of cabbage quality. Adv. Res. J. Crop Improv. 2016; 7(1):46-51.
- Kotecha AV, Dhruve JJ, Vihol NJ. Effect of foliar application of micronutrients and growth regulators on growth and yield of cabbage (*Brassica oleracea* L. var. Capitata) cv. Golden Acre. Asian J. Hort. 2011; 6(2):381-384.
- Naga SK, Swain SK, Varma SV, Raju B. Effect of foliar application of micronutrients on growth parameters in Tomato (*Lycopersicon esculentum* Mill.). J. of Agric. and Food Sci. 2013; 1(10):146-151.
- Nandi A, Nayak SC. Performance of hybrid cabbage (*Brassica oleracea* L. var. Capitata) as influenced by foliar micronutrient spray. Veg. Sci. 2008; 35(1):45-48.
- Narayanamma M, Chiranjeevi, Ahmed SR. Effect of foliar application of micronutrients on the growth, yield and nutrient content of cabbage (*Brassica oleracea* L. var. Capitata) in Andhra Pradesh. Veg. Sci. 2007; 34(2):213-214.
- Sharma P, Goswami RK, Deka BC. Effect of foliar application of micronutrients on shelf life of cabbage. Indian J. Hort. 2005; 62(2):160-62.
- Yadav BD, Khandelwal RB, Sharma YK. Response of cabbage to foliar application of micronutrients. Veg. Sci. 2009; 36.