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Effect of organic, inorganic & biofertilizers on growth attributes of cabbage (*Brassica oleracea* var. *Capitata*). Under C.G. Plain zone

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Abstract

The field experiment was conducted during *Rabi* season of 2016-17 at the Horticulture Research cum Instructional farm, BTC CARS, Bilaspur (C.G.). The treatments consisted of eleven combination of different agro input management practices viz., treatments 100 % RDF (Control) (T₁), 75 % RDF + 25 % N through FYM (T₂), 75 % RDF + 25 % N through VC (T₃), 50 % RDF + 50 % N through FYM (T₄), 50 % RDF + 50 % N through VC (T₅), 125% RDF (T₆), 100 % RDF + 25% N through FYM (T₇), 100 % RDF + 25% N through VC (T₈), 100 % RDF + 25% N through FYM + *Azotobacter* @ 2 kg ha⁻¹+PSB @ 2 kg ha⁻¹ (T₉), 100 % RDF + 25% N through VC+ *Azotobacter* @ 2 kg ha⁻¹+PSB @ 2 kg ha⁻¹ (T₁₀), 100 % from organic FYM+VC+AZ+PSB (T₁₁). The significantly maximum and minimum head Formation was recorded 95.01(%) T₂ and 78.41 (%) T₁₁ at harvest. Maximum head height was recorded 60 DAT and time of harvest are 16.91cm and 20.79 cm under treatment T₂ minimum head height was recorded 12.43 cm and 14.71cm under treatment T₃ and T₇. Maximum head diameter was recorded 60 DAT and time of harvest are 42.65 cm and 46.37 cm under treatment T₂ minimum head diameter was recorded 24.90 cm and 32.69 cm under treatment T₈ and T₄.

Keywords: Organic, Inorganic, Biofertilizer Combination, *Azotobacter* and Cabbage

Introduction

Cabbage (*Brassica oleracea* var. *capitata* L.) is an important winter vegetable crop. From the nutritional point of view, it is a rich source of vitamin A, B & C, mineral, minor in fibers and carbohydrates. The major cabbage producing states are U.P., Odisha, Bihar, Assam, West Bengal, Maharashtra and Karnataka. In India annual production of the cabbage is 9039.2 Mt (5.5% of total vegetables production) from an area of about 0.400ha (4.3% of total vegetable area) with the productivity of 22.6 Mt/ha. (Anon. 2014) [1].

In Chhattisgarh, 403.4 '000 hectare area is under the vegetable cultivation with production of 5565.9'000 MT with productivity of 13.5 Mt/ha out of which cabbage is cultivated in an area of 18.6 '000 hectare producing 338.6 '000 Mt with productivity of 18.2 Mt/ha (Anon. 2014) [1]. It is cultivated in almost all districts of Chhattisgarh viz., Gariabandh, Baloda Bazar, Mahasamund, Dhamtari, Raipur, Durg, Balod, Bemetara, Jagdalpur, Kondagoan, Kanker, Bilaspur, Janjgir-Champa, Korba, Raigarh, Surguja, Surajpur, Koriya and Balrampur.

Cabbage is a heavy feeder and removes the N, P and K from soil to a larger extent. In modern agriculture, continuous and indiscriminate use of chemical fertilizers, pesticides, herbicides etc. affect`s the biodiversity, quality of the produce and human health. There are also evidences that the intensive agriculture has resulted in decline in vitamin and mineral content of fresh fruits and vegetables over last six decades. Use of organic manures along with bio-fertilizers is not only helpful in improving soil health, growth, yield and quality but also avoids chemical based farming (Bahadur *et al.*, 2003) [2]. Use of organic, inorganic & biofertilizers help in mitigating multiple nutrient deficiencies. Application of organic manures to acidic soil reduces the soluble and exchangeable Al temporarily by forming complex and provides better environment for growth and development by improving physical, chemical and biological properties of soil.

Material and methods

The head height was measured by meter scale in centimeter from the base to the top head. Diameter of head was measured by in meter scale of head spreading from randomly selected five plants when it was harvested and then mean was recorded and expressed in centimeter (cm). Development of head per plot was counted at harvest by the number of plants which were developed head, and percent head formation per plot was calculated by using the following formula:

$$\% \text{ Head formation plot}^{-1} = \frac{\text{Number of head developed plant} \times 100}{\text{Total number of plants}}$$

Results and discussion

Head Formation (%)

The observation on head formation in cabbage was recorded on at harvest and presented in Table 1 The data indicated significant influence of integrated nutrient management on head formation of cabbage.

The head formation (%) ranged from 78.41 % to 95.01 %, where recorded maximum head formation (95.01 %) under treatment T₂ with the application of 75 % RDF + 25 % N through FYM and it was found similar but significantly

superior with T₆:125% RDF (94.44 %), whereas significantly minimum head formation (78.41 %) was recorded with treatment T₁₁:100 % from organic FYM+VC+AZ+PSB.

The results of present study it is indicated that different combination of micronutrients with NPK fertilizers combined supplied adequate available plant nutrients and provide better growing conditions which increase the number of plants forming head. The results are in close agreement with the findings of Parmar *et al.* (2009) [4].

Table 1: Effect of organic, inorganic and biofertilizers on head formation (%), Head height and head diameter of cabbage.

Treatments	Treatments details	Head formation %	Head height (cm)		Head diameter (cm)	
			60 DAT	At harvest	60 DAT	At harvest
T ₁	100 % RDF (Control)	86.56	14.41	17.91	42.42	43.91
T ₂	75 % RDF + 25 % N through FYM	95.01	16.98	20.79	42.65	46.37
T ₃	75 % RDF + 25 % N through VC	91.97	12.43	20.35	29.41	37.12
T ₄	50 % RDF + 50 % N through FYM	94.19	15.48	19.99	29.39	32.69
T ₅	50 % RDF + 50 % N through VC	86.4	15.33	19.16	30.51	35.16
T ₆	125% RDF	94.44	14.49	19.24	29.49	33.76
T ₇	100 % RDF + 25% N through FYM	90.91	13.04	14.71	31.85	35.75
T ₈	100 % RDF + 25% N through VC	90.79	11.86	16.29	24.90	36.94
T ₉	100 % RDF + 25% N through FYM + <i>Azotobacter</i> @ 2 kg ha ⁻¹ + PSB @ 2 kg ha ⁻¹	90.96	15.00	19.33	37.95	40.35
T ₁₀	100 % RDF + 25% N through VC + <i>Azotobacter</i> @ 2 kg ha ⁻¹ +PSB @ 2 kg ha ⁻¹	87.3	14.56	17.97	32.11	38.11
T ₁₁	100 % from organic FYM+VC+AZ+PSB	78.41	15.51	20.32	34.55	38.14
SEm±		2.56	0.97	0.74	0.61	0.77
CD(P=0.05)		7.36	2.80	2.14	1.75	2.21

Head height (cm)

The observation on head height in cabbage was recorded on 60 DAT and at harvest and are presented in Table 1 and depicted through. The data indicated significant influence of integrated nutrient management on head height

It is vivid from table that at 60 DAT the head height was recorded with the ranges from (T₈) 11.86 cm to 16.98 cm (T₂) Significantly maximum head height (16.98 cm) was recorded with the application of 75 % RDF + 25 % N through FYM (T₂) which was at par with T₁₁ (15.51 cm) and T₄ (15.48 cm), whereas under treatment T₈:100 % RDF + 25% N through VC recorded minimum head height (11.86 cm).

At harvest the head height of cabbage from ranges 20.79 cm (T₂) to 14.71 cm (T₇) and shows significantly difference between the treatments. Application of 75 % RDF + 25 % N through FYM (T₂) obtained maximum head height (20.79 cm) which was at par with T₃ (20.35 cm) and T₁₁ (20.32 cm) but significantly differed with T₁₀:100 % RDF + 25% N through VC+ *Azotobacter* @ 2 kg ha⁻¹+ PSB @ 2 kg ha⁻¹ (17.91cm) whereas was minimum head height (14.71 cm) obtained under T₇:100 % RDF + 25% N through FYM.

The perusal of data presented in table 1 revealed that maximum head height was observed with the application of 75 % RDF + 25 % N through FYM. It may be due to nutrients like nitrogen are an important factor for the activity of plant organs. It can increase other nutrient uptake and subsequently its concentration in the leaves. An increased N content stimulates the photosynthetic activity by the elevation of the content of stromal and thylakoid proteins in leaves. Positive effect of nitrogen supply is in the form of increased, head height and leaf expansion. Additionally nitrogen promotes rapid growth, increases leaf size and quality, hastens crop

maturity, and promotes head development. Similar finding has been also reported earlier reza *et al.* (2016) [5].

Head Diameter (cm)

The observation on head diameter in cabbage was recorded on 60 DAT and at harvest and presented in Table 1 and depicted through. The data indicated significant influence of integrated nutrient management on head diameter.

It is vivid from table that at 60 DAT the head diameter was recorded with the ranges from 24.90 cm (T₈) to 42.65 cm (T₂). Significantly maximum head diameter (42.65 cm) was recorded with the application of 75 % RDF + 25 % N through FYM (T₂), which was at par with T₁ (42.42 cm) and T₁₁ (37.95 cm), whereas under treatment T₈:100 % RDF + 25% N through VC recorded minimum head height (24.90 cm). At harvest the head diameter of cabbage from ranges 32.69 cm (T₄) to 46.37 cm (T₂) and shows significantly difference between the treatments. Application of 50 % RDF + 50 % N through FYM (T₄) obtained maximum head height (46.37 cm) which was at par with T₁ (43.91 cm) and T₉ (40.35 cm) but significantly differed with T₁₁: 100% from organic FYM+VC+AZ+PSB (38.14 cm). Whereas minimum head diameter (32.69 cm). Obtained under treatment T₄:50 % RDF + 50 % N through FYM.

The positive effects of nitrogen fertilizers and organic nutrients on head diameter of cabbage might be due to the better availability of soil nutrients that produced healthy plants with large vegetative growth, which reflected in the height and head diameter and improvement of soil chemical and physical properties by using farmyard manure. This result similar finding has been reported earlier Chaudhary, *et al* (2015) [3].

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