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Influence of different organic and inorganic fertilizer combinations on growth of cabbage (*Brassica oleracea* var. *capitata* L.) under Gorakhpur condition

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Abstract

An experiment was conducted during 2020-21 at research farm, National P.G. College, Barahalganj, Gorakhpur. The main objective of experiment was to assess the influence of different organic and inorganic fertilizer combinations on growth of cabbage (*Brassica oleracea* var. *capitata*) under Gorakhpur condition. The plant height and number of leaves were proliferate under the influence of organic and inorganic fertilizer combination. The maximum plant height and number of leaves were recorded under T₆ showed 37.21 cm and 15 cm, respectively. Number of days taken for head initiation was positively influenced by organic and inorganic fertilizers. Number of days taken for head maturity and days of harvesting showed similar effect at vermicompost (50%)+NPK (50%). The head of diameter is also influenced by the application of organic and inorganic fertilizers. The maximum head diameter was recorded under T₆ showed 16.79 cm followed by T₉ (Sheep manure -50%+NPK-50%) and minimum head diameter was recorded showed 12.70 cm under control.

Keywords: Organic, inorganic, fertilizer and growth

Introduction

Cabbage is a popular leafy vegetable. The botanical name and family of cabbage is *Brassica oleracea* var. *capitata* L, family Brassicaceae, respectively. It is a member of cole crops and it is an important fresh and processing vegetable in most of the countries of the world. In India, it ranks second next to the cauliflower in area and production. China is the largest producer of cabbage in the world. The major cabbage producer states are Uttar Pradesh, Orissa, Bihar, Assam, West Bengal, Maharashtra and Karnataka. Cabbage has an anti-cancer property. Prior to cultivation and use as food, cabbage was mainly used for medicinal purpose (Silva, 1986)^[12]. Cabbage is an important and nutritious winter leafy vegetables in our country. It contains a range of essential vitamins and minerals as well as small amount of protein and good calories. In recent years vegetable consumption has increased. However, the productivity of cabbage per unit area is quite low as compare to the developed countries of the world.

The different cultivated type of cabbage showed great variation in size, shape and colour of leaves as well as texture of the head (Singh *et al.*, 2006)^[13]. Cabbage is consumed either raw or processed in different ways e.g. boiled or fermented or used in salad, due to its anti-oxidant, anti-inflammatory and anti-bacterial properties. Fresh cabbage juice, prepared either separately or mixed with other vegetable such as celery, is often include in commercial weight loss diet (Samec, 2011)^[11].

Soil management practices have recently changed dramatically including an increased use in synthetic fertilizers and pesticides to help crop yield. However, some studies have suggested that the excess use of these agro-chemicals may actually increase pest problems in the long run (Altieri and Nicholls, 2003)^[1]. The cultivation of cabbage is required proper supply of nutrients. The requirement of these plant nutrients can be provided by applying organic manure or inorganic fertilizer or both. However, farmer are now showing interest in organic farming because they are more aware about the residual effect of chemical substances. Besides the excess application of inorganic fertilizers application causes hazard to public health and environment, but both organic and inorganic fertilizer application combined, can increase the yield as well as keep the environment sound.

The application of higher amount of organic manure along with reduced levels of inorganic nitrogen fertilizers can improve the nutritional and keeping quality of cabbage head (Londhe, 2002 and Yadav *et al.*, 2001)^[9, 15].

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The limited information of the benefits of organic fertilizers with crop still need further investigation. It is with this idea, the present investigation was conducted to study the influence of different organic and inorganic fertilizer combinations on growth of cabbage (*Brassica oleracea var. capitata* L.).

Materials and Methods

The experiment was conducted at research farm, National P.G. College, Barhalganj, Gorakhpur affiliated to DDU Gorakhpur University, Gorakhpur during 2020-21. The soil was sandy loam pH7.1, Electrical Conductivity (EC) 0.35 dsm⁻¹, organic carbon 0.52% and available nitrogen 117.50 kg ha⁻¹, available phosphorus 18 kg ha⁻¹ and available potassium 202.8 kg ha⁻¹. The various treatment combinations were T₁ – Control (Recommended dose of NPK 120:80:80 kg/ha.), T₂- Neem cake (75%)+NPK (25%), T₃-Neem cake (50%) +NPK (50%), T₄-Neem cake(25%)+NPK(75%), T₅-Vermicompost (75%)+NPK (25%), T₆-Vermicompost (50%)+NPK (50%), T₇-Vermicompost (25%)+NPK (75%), T₈-Sheep Manure (75%)+NPK(25%), T₉-Sheep Manure (50%)+NPK (50%), T₁₀- Sheep Manure (25%)+NPK(75%).

In total there were ten treatments with three replication. The experiment was laid out in Randomized Block Design (RBD) with ten treatment, each replicated three times and thirty plots. The unit plot size was 2.4 m x 1 m. The plant was spaced at 60 cm between the row and 45 cm between the plants in each pot. Data obtained for plant height and number of leaves per plant were taken at 30, 60 and 90 days after transplanting.

Result and Discussion

The data pertaining to cabbage (Table-1) reveals that maximum plant height at 90 days after transplanting was observed under T₆: Vermicompost (50%) +NPK (50%) showed 37.21 cm followed by T₉-Sheep Manure (50%) +NPK (50%) showed 35.51 cm and minimum height under T₁(control). The higher plant height might be due to abundant supply of nitrogen and phosphorus, and organic and inorganic fertilizer combinations, which help the plants in better photosynthesis to attain vigor. The results of the study are in agreement with the findings of Hossain (1998)^[6], Kacjan Marric and Osvald (2004)^[7] and Pramanik (2007)^[10] obtained the maximum plant height of cabbage with increased nitrogen rates.

Table-1 also reveals that the significant effect of different organic and inorganic fertilizer on number of leaves per plant recorded at 30,60 and 90 days after transplanting was found to be maximum in T₆:Vermicompost(50%)+NPK(50%) followed by T₉:Sheep Manure(50%)+NPK(50%) and the minimum under T₁(control). Generally treatments with high

rates of nitrogen in the study resulted relatively high number of cabbage leaves which is in agreement with the findings of Moniruzzaman *et al.*, (2006) who reported that the maximum number of leaves in cabbage(14.30) was obtained by application of 200 kg ha⁻¹ of nitrogen and the minimum number of leaves (12.70) was recorded from treatments where nitrogen was not applied.

The data regarding days to flowering (Table-1) showed that the minimum number of days for head initiation (36 days) was recorded under T₆: Vermicompost (50%) +NPK (50%) followed by T₇: Vermicompost (25%) +NPK (75%). The plant under T₁ (control) maximum delayed head initiation during 2020-21. Generally plant supply with high quantity of nitrogen, phosphorus and sulphure started to initiate relatively in short period of time. The results are in agreement with the findings of Hossain *et al.*, (2011) who reported that the earliest head initiation (55 days) time in cabbage plants which received organic and inorganic fertilizers.

The maximum number of days taken for head maturity of cabbage was 88.89 days under control followed by 86.18 days in T₂: Neem Cake (75%) +NPK (25%). The minimum number of days (75.69 days) taken for head maturity of cabbage were found in T₆:Vermicompost (50%)+NPK(50%). These results are in close conformity with the findings of Fatewa (2012) who observed a significant effect of fertilizers on maturity of cabbage heads where fertilizers application reduced the date of maturity compared to without fertilization.

The data regarding two days of harvest of cabbage has shown that the maximum days of harvest of cabbage (90 days) was recorded in T₁ (control) followed by T₂ (88.37days): Neem Cake (75%) +NPK (25%) and minimum days of harvest of cabbage was found (78.33 days) in T₆: Vermicompost (50%) +NPK (50%). Similar findings were reported by Dubey *et al.*, (2012)^[3] and Kumar *et al.*, (2013)^[8].

It is clear from the Table-1 that the head diameter of cabbage was maximum (16.79 cm) under T₆: Vermicompost (50%) +NPK (50%) followed T₉ (14.67 cm): Sheep Manure (50%) +NPK (50%) and lowest head diameter (12.70 cm) was recorded under T₁ (control). Nutrients are play an important role in improving productivity and quality of cabbage. Added doses of nitrogen, phosphorus and other essential nutrients increased the vigour of plants, size of fruits, thereby resulting into higher head diameter per plant. These findings corroborate reports of Din *et al.*, (2007) that significant high head diameter was obtained from NPK fertilizer with organic and inorganic fertilizer combinations. Similarly, Thapa and Prasad (2011)^[14] obtained the maximum head diameter (48.98 cm) by the application of 100 kg nitrogen and 100 kg phosphorus ha⁻¹.

Table 1: Influence of different organic and inorganic fertilizer combinations on growth of cabbage (*Brassica oleracea var. capitata* L.) under Gorakhpur conditions

Treatments	Plant Height(cm)	No. of leaves/plant	No. of days taken for head initiation	No. of days taken for head maturity	Days of harvest	Head Diameter(cm)
T ₁ :Control	33.32	9.33	45.00	88.89	90.00	12.70
T ₂ : Neem cake (75%) +NPK (25%)	34.63	11.33	44.00	86.18	88.37	14.26
T ₃ : Neem cake (50%) + NPK (50%)	35.44	9.67	42.00	83.92	84.67	13.79
T ₄ : Neem cake (25%) + NPK (75%)	33.52	10.67	41.50	81.55	82.67	13.99
T ₅ : Vermicompost (75%) +NPK (25%)	34.05	9.00	44.60	80.74	85.33	12.74
T ₆ : Vermicompost (50%) +NPK (50%)	37.21	15.00	36.00	75.69	78.33	16.79
T ₇ : Vermicompost (25%) +NPK (75%)	34.86	11.00	38.00	86.67	87.67	13.27
T ₈ : Sheep Manure (75) +NPK (25%)	34.11	10.67	39.33	87.82	88.00	13.96
T ₉ : Sheep manure (50%) +NPK (50%)	35.51	13.67	42.00	76.65	80.77	14.67
T ₁₀ : SheepManure (25%) +NPK (75%)	33.44	11.33	43.00	83.22	86.89	13.60
SE±	0.92	1.40	1.70	1.70	2.30	0.82
CD 5%	2.75	4.17	5.04	2.04	3.84	2.44

Conclusion

Based on the results findings in this experiment it is concluded that the treatment T₆:Vermicompost(50%) + NPK(50%) was found best over the treatments in terms of plant height, number of leaves, number of days taken for head initiation and maturity, days of harvest and head diameter followed by T₉ and lowest observations was recorded under T₁(control).

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