

Original Research Article

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Effect of Organic and Inorganic Manure on the Growth, Yield and Quality of Cabbage (*Brassica oleracea* L. Var. *capitata* L.)

Gaurav Singh, Krishna Kumar Mishra*, Adarsh Pandey and Abhishek Tiwari

Department of Agricultural Sciences and Allied Industries, Rama University,
Kanpur (U. P.), India

*Corresponding author

ABSTRACT

The present investigation entitled “Effect of Integrated Nutrient Management on Growth, Yield and Quality of Cabbage (*Brassica oleracea* L. var. *capitata* L.)” was conducted at the experimental farm of the faculty of Agricultural Sciences and Allied Industries, Rama University, Mandhana, Kanpur (U.P.) during 2018-19. The experiment was laid out in randomized block design (RBD) with three replications comprising of 8 treatment combinations. The treatments were T₁: Control, T₂: Nitrogen + Vermicompost, T₃: Nitrogen+ F.Y.M, T₄: Zn + Nitrogen, T₅: Phosphorus + F.Y.M, T₆ : Potash + Boron, T₇: Nitrogen + Phosphorus + Boron, T₈ : F.Y.M + Vermicompost. Seeds of cabbage cv. ‘NS-183’ were sown in the nursery on 25th Sep., 2018 and transplanting was done on 27th Oct., 2018. Maximum plant height was recorded (27.25 cm) in T₇ (Nitrogen + Phosphorus + Boron) while minimum (26.15 cm) was observed in T₅ (Phosphorus + F.Y.M). Plant spread was maximum (67.70 cm) through recommended package of fertilization (T₇) (Nitrogen + Phosphorus + Boron) followed by in T₅ (Phosphorus + F.Y.M) 64.97 cm. Maximum stalk length were observed in T₇ (4.80 cm) and minimum T₅ (4.60 cm). Number of days taken to 50 % head maturity did not differ significantly and at least 50 % heads were harvested from 80th to 90th days from date of transplanting of seedlings. Polar (11.88 cm) and equatorial diameter (14.35 cm) as well as head shape index (0.87) were observed to be the maximum in T₇ (Nitrogen + Phosphorus + Boron). The significantly highest yield (25.85 kg/plot) from a plot area (3.0 m²) was obtained in T₇ (Nitrogen + Phosphorus + Boron) were found to minimum yield (20.65kg/plot) T₁ control.

Keywords

INM, Cabbage,
F.Y.M, Vermicompost
and Growth

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Introduction

Cabbage (*Brassica oleracea* L. var. *capitata* L.) belongs to the cole group of vegetables. It is the most popular vegetable around the world in respect of area, production and availability almost round the year and occupies the pride place among cole crops due to its delicious taste, flavor and nutritive value.

It is grown for heads which are used as vegetable, eaten raw and frequently preserved as sauerkraut or pickle. Cabbage is an excellent source of vitamin C, some B vitamins, potassium and calcium (Hasan and Solaiman, 2012).

India is the second largest producer of cabbage in the world, next to China, accounting for 17.55 per cent of the world area and 13.79 per cent of the world production (NHB, 2019). Crop yields were the primary focus in the past, awareness of increasing population growth and limited potential to bring more land into production led to the notion of cropping sustainability or sustainable intensification, i.e. consistently achieving high crop yields without damaging the soil's capacity to produce such yields.

Thus, the current focus in soil and crop management is on maintenance of soil quality or soil health. Low or unbalanced fertilization leads to depletion of soil nutrients and degradation due to lower soil organic matter (SOM) contents from lower root biomass associated with reduced crop yields.

Maintenance and/or improvement in soil health in terms of SOM content and supply of various micronutrients is possible when farmers apply organic nutrient sources such as manures and crop residues available on the farm and supplement them with mineral fertilizers to achieve the yield goal. Therefore

the objective of this study is to determine the best fertilizer type for the maximum growth and yield of cabbage varieties in gird region of Kanpur Uttar Pradesh.

Materials and Methods

The field experiment was carried out in lomy sand soil, alluvial in origin, light brown in colour, well drained, fairly retentive of moisture, low in organic mater (0.48%) and medium in available phosphorus (30.2Kg ha⁻¹) and available potassium (315Kg ha⁻¹). Experiment was laid out in randomized block design with 8 treatments.

Cultural practices such as adequate application of fertilizers have to be adhered to in order to obtain good yields in cabbage production.

Experimental site

The present investigation was conducted in Agricultural Research Farm, Agriculture and Allied Industries at Rama University, Kanpur (U.P.) during *rabi* season of 2018-19. The experimental farm falls under the Indo-gangetic alluvial tract of Central Uttar Pradesh. The farm was well laid out and irrigated by tube well.

Experimental materials

Planting Materials

Cabbage cultivar 'N.S-183' was used in the present study. It is an early variety ready within 100-115 days with medium sized, compact round heads, light green in colour and resistant to black rot. Average head yield is 300 q/ha. It is suitable for growing in Zone I, II and III of Uttar Pradesh. For this experiment, the seeds of 'NS-183' were procured from the IARI, Regional Research Station, Kanpur Mandhana, Uttar Pradesh.

Details of treatments used for the study

Sr. no	symbol	Treatments
1.	T ₀	Control
2	T ₁	Nitrogen + Vermicompost
3	T ₂	Nitrogen + F.Y.M
4	T ₃	Zn + Nitrogen
5	T ₄	Phosphorus + F.Y.M
6	T ₅	Potash + Boron
7	T ₆	Nitrogen + Phosphorus + Boron
8	T ₇	F.Y.M + Vermicompost

Nursery sowing and raising of seedlings

The seeds of cultivar ‘N.S-183’ were sown at the experimental farm in 3 x 1 x 0.15 m seedbeds. The soil of seedbed was prepared to obtain good tilth to provide a feasible condition for vigorous growth of young seedlings. Weeds, stubbles and dried roots of previous crops were removed. Well decomposed FYM was applied to the prepared seed bed at the rate of 5 kg/m². The seeds were sown in two separate nursery beds on September 25, 2018; in one it was untreated seed while in other seeds inoculated with bacterium (*Bacillus pumilus*) were sown as per treatments.

Experimental Layout

The field was divided into Twenty four plot and the allocation of the treatment was done randomly using random number table. The details of the experimental layout are given below

Sr. No	Cultural operation	Date
1	Sown in nursery	25-09-2018
2	Ploughing and harrowing	24-10-2018
3	Layout	26-10-2018

4	Fertilizers application	27-10-2018
5	Transplant	27-10-2018
6	First Irrigation	07-11-2018
7	Fruit maturity	03-02-2019
8	Harvest	05-03-2018

Field preparation

The field was ploughed thoroughly by tractor followed by planking, 15 days prior to actual date of transplanting. Stones, pebbles and residues of previous crop were removed manually. The experimental plot was partitioned into the unit plots (2.7 x 1.8 m) in 29 accordance with the experimental design and organic and inorganic fertilizers were applied as per treatments of each unit plot.

Observations Recorded

Growth and Yield Parameters

Plant height (cm)

The height of the plant was measured from the ground level to the top of the head surface with the help of measuring scale.

Plant spread (cm)

The spread of the plant was recorded as the distance between two outer most leaves of the plants and their average was taken.

Stalk length (cm)

Length of stalk was measured from ground level to the first non wrapper leaf.

Number of days to 50 % head maturity

It was recorded as number of days taken from date of transplanting to the date when marketable size heads of 50 % plant in a plot/treatment were harvested.

Polar diameter (cm)

Polar diameter in centimeter was measured after cutting the head into 2 halves longitudinally.

Equatorial diameter (cm)

Equatorial diameter in centimeter was measured after cutting the head into 2 halves transversally.

Gross head weight (g)

Weight of the heads along with non wrapper leaves and stalk was recorded at harvest in grams.

Net head weight (g)

Weight of the same heads without non wrapper leaves and stalks was recorded in grams.

Yield per plot (kg)

Yield per plot was calculated by pooling the net head weight of all the heads in a plot.

Results and Discussion

The results of present investigation based on the periodical observations taken at different time interval during crop growth were presented here for quick grasp of the experiment.

It is evident from the results table-1 indicate that the various treatments significantly influence the plant height (T₇) Nitrogen + phosphorus + boron was observed significantly highest plant height as compared to rest treatments. But the (T₁) control was recorded significantly lowest plant height as compared to rest INM treatment for maturity of cabbage crop. The same finding also

reported by Kumar and Dhar (2010), Meena and paliwal (2003), Patil *et al.*, (2003) Bhardwaj *et. al* (2007) and Sharma *et al.*, (2009). It is evident from the results table-1 indicate that the various INM methods significantly influence the plant spread with (T₇) Nitrogen + phosphorus + boron was observed significantly highest fallowed by (T₅) phosphorus + F.Y.M. The same finding also reported by Malik *et al.*, (2005), Bhagavantagoudra and rokhed (2002), Sharma and Chandra (2002) and Choudhary and Choudhary (2005).

It is evident from the results table-1 indicate that the various INM methods significantly influence the stalk length with the applied (T₇) Nitrogen + phosphorus + boron was observed significantly highest stalk length (4.80) fallowed by (T₅) phosphorus + F.Y.M (4.60) and (T₄) Zn + nitrogen (4.45) as compared to rest treatments. But the (T₁) control was recorded significantly lowest stalk length as compared to other treatments.

The same finding also reported by Malik *et al.*, (2005), Bhagavantagoudra and rokhed (2002), Sharma and Chandra (2002). It is evident from the results table-1 indicate that the various treatments significantly influence the 50% head maturity were found in (T₇) Nitrogen + phosphorus + boron was observed significantly highest stalk length (86.75) fallowed by (T₅) phosphorus + F.Y.M (85.78) and (T₄) Zn + nitrogen (83.31) and minimum in found (T₁) control was recorded significantly lowest 50% head maturity.

The same finding also reported by Malik *et al.*, (2005), Bhagavantagoudra and Rokhed (2002), Sharma and Chandra (2002). Polar diameter (cm) with the applied (T₇) Nitrogen + phosphorus + boron was observed significantly highest (11.88 cm) fallowed by (T₅) phosphorus + F.Y.M (11.75 cm) and (T₄) Zn + nitrogen (11.36 cm).

Table.1 Effect of different organic and inorganic manure combination on growth and yield attributes in cabbage.

Treatments	Plant height (cm)	Plant spread (cm)	Stalk Length(cm)	50%head maturity	Polar diameter (cm)	Equatorial diameter (cm)	Head shape index	Gross weight (g)	Net head weight(g)	Head yield kg/plot	Head yield q/ha
Control	25.24	60.25	4.25	79.25	10.85	12.75	0.80	1425.65	795.14	20.65	165.17
Nitrogen + vermicompost	25.15	62.49	4.41	82.24	11.26	13.40	0.84	1478.87	925.10	22.50	240.55
Nitrogen + F.Y.M	24.95	61.99	4.34	81.50	11.16	13.75	0.84	1466.85	935.12	23.66	252.53
Zn + Nitrogen	25.75	63.13	4.45	83.31	11.36	13.55	0.83	1490.25	955.05	24.00	281.22
Phosphorus + F.Y.M	26.15	64.97	4.60	85.78	11.75	14.20	0.82	1537.35	985.11	24.50	290.49
Potash + boron	25.00	62.11	4.40	82.05	11.28	12.95	0.87	1469.66	940.17	23.80	269.66
Nitrogen+phosphorus +boron	27.25	67.70	4.80	86.75	11.88	14.35	0.82	1601.95	1026.35	25.85	310.40
F.Y.M + vermin compost	25.15	62.49	4.42	82.42	11.28	13.46	0.83	1478.65	930.40	23.05	244.56
CD at 5 %	1.30	3.45	0.16	3.53	0.34	0.74	0.025	61.49	38.60	2.55	40.57

Transformation value = $\sqrt{x+0.5}$

The same finding also reported by Malik *et al.*, (2005), Bhagavantagoudra and rokhed (2002), Sharma and Chandra (2002) Chaubey *et al.*, (2006).

Maximum equatorial diameter (cm) found in (T₇) Nitrogen + phosphorus + boron was observed significantly highest Equatorial diameter (14.35 cm) followed by (T₅) phosphorus + F.Y.M (14.40) and minimum in found (T₁) control.

The same finding also reported by Malik *et al.*, (2005), Acar and Paksoy, (2006), Cervenski *et al.*, (2011). Maximum head shape index was found with (T₇) Nitrogen + phosphorus + boron was observed significantly highest (14.35) followed by (T₅) phosphorus + F.Y.M (14.40) and minimum in (T₁) control. The same finding also reported by Wu *et al.*, (2005) and Bahudur *et al.*, (2006, 2009).

It is evident from the results table 4.4 indicate that the various INM methods significantly influence the Maximum Gross weight (g) observed in (T₇) Nitrogen + phosphorus + boron significantly (1601.95 g) followed by (T₅) phosphorus + F.Y.M (1537.35) and minimum in found control. The same finding also reported by Wu *et al.*, (2005) and Bahudur *et al.*, (2006, 2009).

Maximum Net head weight (g) observed in (T₇) Nitrogen + phosphorus + boron was observed significantly (1026.35) followed by (T₅) phosphorus + F.Y.M (985.11) and minimum in found (T₁) control.

Head yield kg/plot found in (T₇) Nitrogen + phosphorus + boron was observed significantly highest (25.85 kg/plot) followed by (T₅) phosphorus + F.Y.M (24.50 kg/plot) and (T₄) Zn + nitrogen (24.00 kg/plot) and minimum in found (T₁) control.

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