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Effect of Organic Manures and Biofertilizers on Growth, Yield, Quality of Cabbage (*Brassica oleracea* var *capitata*) under Foot Hill Condition of Nagaland

KEDINO ZANGO, S. P. KANAUJIA, V. B. SINGH AND P. K. SINGH[1]

Department of Horticulture [1]Department of Soil Science & Agricultural chemistry
Nagaland University, SASRD, Medziphema 797106, India

Abstract

A field experiment was carrried out in 2006-07 to study the effect of organic manures and biofertilizers on growth, yield and quality of cabbage. Nine treatments (control, FYM at 60 t/ha, pig manure at 30 t/ha, vermicompost at 10 t/ha, poultry manure at 20 t/ha, 50% FYM + biofertilizers, 50% pig manure + biofertilizers, 50% vermicompost + biofertilizers and 50% poultry manure + biofertilizers) were included in the experiment. Results revealed that application of FYM at 60 t/ha recorded significantly higher plant height (29.45 cm), stalk length (7.77 cm), head diameter (12.91cm), head size (237.39 cm^2), head compactness (135.65), net head weight (1,263 g), net head yield (467.62 q/ha^{-1}) and vitamin C content (143.19 mg/100 mg). FYM at 60 t/ha also gave the highest net return (Rs 159,810/ha).

Key words : Cabbage, Organic manures, Biofertilizers, Growth, Yield.

Cabbage belongs to family cruciferaeis and the most important member of cole crops. It is grown for thickened main bud called head. It occupies 990 hectares of land with a production of 14,755 tonnes in Nagaland. Cabbage hybrids have tremendous advantage due to its high yielding quality and resistance to biotic and abiotic stress. Cabbage is the rich source of vitamin A, B_1, B_2, C and minerals. Besides being used as nutritious vegetable. It also possesses medicinal importance. It prevents constipation and indigestion. It is also helpful in gastric ulcer, cancer and diabetes. Agro-climatic conditions of Nagaland are favorable for its cultivation. Cabbage responds well to application of manure and biofertilizers. Considering the soil health, environmental and ecological problems and present energy crises organic farming is the only best option for vegetable production. Organic farming is ecologically sound, economically viable and socially acceptable. But no information is available on this aspect in Nagaland. Therefore, the present investigation was undertaken to study the effect of organic manures and biofertilizers on growth, yield and quality of cabbage under foothill condition of Nagaland.

Methods

Afield experiment was conducted at experimental farm of School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema during 2006-2007. It is situated at an altitude of 304.8 m above mean sea level. The soil of experimental site was sandy loam having acidic in reaction (pH 4.8), high in organic carbon (0.87%) and medium in available nitrogen (286.2 kg/ha) and low in available phosphorus (8.7 kg/ha) and in available potassium (92.5 kg/ha). The experiment was conducted in randomized block design with three replications. Nine treatments (control, FYM at 60 t/ha, pig manure at 30 t/ha, vermicompost at 10 t/ha poultry manure at 20 t/ha, 50% FYM + biofertilizers, 50% pig manure + biofertilizers, 50% vermicompost + biofertilizers and 50% poultry manure + biofertilizers) were included in the experiment. Full dose of different manures were incorporated in each plot 15 days before planting. Whereas Azotobactor and Phosphotica biofertilizers were incorporated before transplanting as seedling dip method at 2 kg/ha. The hybrid Green Glod was used in the experiment. Thirty-day old seedlings were planted at spacing of 45 × 45 cm in a plot having 1.8 m length and 1.8 m breadth. Observations were recorded on plant height, stalk length, number of non-wrapper leaves/plant, head diameter, head size, head compactness, net head weight, net head yield and vitamin C content. Vitamin C content was determined by 2, 6-dichlorophenol indophenyl dye method as suggested by Rangama (1). Economics of the

Table 1. Effect of organic manures and biofertilizers on growth, yield and quality of cabbage.

Treatments (t/ha)	Plant height (cm)	Stalk length (cm)	Number of non wrapper leaves plant	Head diameters (cm)	Head size (cm^2)	Head compact ness	Net head weight (g)	Net head yield (q/ha)	Vitamin C (mg/100 g)
T_1 (Control)	21.75	4.60	12.60	8.07	9.76	62.69	729.00	269.81	134.45
T_2 (FYM 60)	29.45	7.77	7.10	12.91	72.39	135.65	1263.00	467.62	143.19
T_3 (Pig manure 30)	26.13	6.45	9.10	11.01	64.9	88.96	983.00	363.93	140.29
T_4 (Vermicompost 10)	28.30	6.97	8.00	11.15	94.05	113.64	1130.00	418.35	142.38
T_5 (Poultry manure 20)	24.42	5.60	8.60	9.62	41.68	76.97	898.75	332.77	14.70
T_6 (50% FYM + biofertilizers)	26.87	6.71	8.30	10.70	61.05	96.74	1024.25	378.13	140.50
T_7 (50% Pig manure + biofertilizers)	24.50	5.60	9.20	8.65	71.32	66.47	765.50	283.29	139.06
T_8 (50% Vermicompost + biofertilizers)	25.50	6.60	9.50	9.13	21.15	74.96	812.00	300.57	139.87
T_9 (50% Poultry manure + biofertilizers)	22.60	4.80	9.60	8.45	17.41	62.98	740.62	274.13	138.50
CD (P = 0.05)	2.65	1.08	1.42	3.73	15.02	24.79	233.42	86.38	2.32

different treatments were also worked out according to prevailing market prices of inputs and outputs. The cost of cultivation was calculated item-wise and treatment-wise cost incurred in each treatment. Gross income was calculated by yield multiplied by sale rate of cabbage at Rs 800/q. Net income was estimated by deducting the total cost of cultivation (fixed cost + treatment cost) from gross income of the particular treatment.

Results and Discussion

Table 1 reveals that different types of organic manures and biofertilizers and their combinations has significant effect on growth attributes of cabbage (Table 1). Maximum plant height (29.45 cm) and stalk length (7.77 cm) were recorded in T_2 (FYM at 60 t/ha), which was closely followed by treatment T_4 (vermicompost at 10 t/ha). The treatment difference between T_2 (FYM at 60 t/ha) and T_4 (vermicompost at 10 t/ha) were at par. On the other hand, minimum number of non-wrapper leaves/plant (7.10) which is desirable character was also recorded in T_2 (FYM at 60 t/ha). Whereas maximum number of non-wrapper leaves/plant (12.60) was found in control (T_2). This may be due to the reason that FYM increased the growth of plant by increasing chlorophyll production and rate of photosynthesis. Similar results were also reported by Anant et al. (2), Mahendran and Kumar (3). Table 1 shows that different types of organic manures and biofertilizers and their combinations have also significantly beneficial effect on yield and yield attributing characters of cabbage. Results indicate that T_2 (FYM at 60 t/ha) recorded maximum

Table 2. Effect of organic manures and biofertilizers on economics in cabbage.

Treatments	Fruit yield (q/ha)	Cost of cultivation (Rs/ha) Fixed cost	Treatment cost	Total	Net income (Rs/ha)	Gross income (Rs/ha)
T_1 (Control)	269.81	44000	–	44000	90905	134905
T_2 (FYM 60 t/ha)	467.62	44000	30000	74000	159810	233810
T_3 (Pig manure 30 t/ha)	363.93	44000	30000	74000	107965	181965
T_4 (Vermicompost 10 t/ha)	418.35	44000	100000	144000	65175	209175
T_5 (Poultrymanure 20 t/ha)	332.77	44000	25000	69000	97385	166385
T_6 (50% FYM + biofertilizers)	378.13	44000	15200	59200	129865	189065
T_7 (50% Pig manure + biofertilizers)	283.29	44000	15200	59200	82445	141645
T_8 (50% Vermicompost + biofertilizers)	300.57	44000	50200	94200	56085	150285
T_9 (50% Poultry manure + biofertilizers)	274.13	44000	12700	56700	80365	137065

head diameter (12.91 cm), head size (237.39 cm^2), head compactness (135.65), net head weight (1263 g) which further led to the enhancement of the net head yield. The highest net head yield (467.62 q/ha) was recorded with the treatment T_2 (FYM at 60 t/ha) which was significantly higher over all the treatments except T_4 (vermicompost at 10 t/ha) where yield value was 418.35 q/ha. This may be due to favorable effect of FYM in supplying essential nutrients in balanced ratio and physical, chemical and biological property of soil, which enhance absorption and utilization of essential nutrients to the plants. The results were also in conformity with the findings of Subhan (4), Vimala et al. (5) who reported that sole application of FYM gave the highest yield of cabbage. Treatment T_2 (FYM at 60 t/ha) also exerted significantly higher vitamin C content as compared to other treatments except T_4 (vermicompost at 10 t/ha). Maximum vitamin C content (143.19 mg/100 mg) in cabbage was noted with sole applications of FYM (T_2) followed by (T_4). Similar results were also noted by Anant et al. (2).

Table 2 indicated that the most profitable treatment was T_2(FYM at 60 t/ha), which gave the highest net return of Rs 159,810 followed by T_6 (50% FYM + biofertilizers), which gave the net return of Rs 1,28,065. This is due to lower cost of input and higher head yield. Thus it is concluded that sole application of FYM at 60 t/ha is considered as the best treatment in term of yield, quality and economics of cabbage under foot hill condition of Nagaland.

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