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Effect of Integrated Nutrient Management on Yield Attributes, Yield and Economics of Cabbage var Golden Acre under Medziphema Condition

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ABSTRACT

A field experiment was conducted to investigate the effect of integrated nutrient management on growth, yield and quality of cabbage (*Brassica oleracea* var. *capitata*) under foothill of Nagaland during *rabi* season of 2021-2022 at the Experimental Farm of Horticulture, School of Agricultural Sciences, Nagaland University. During the study, 14 treatments and three replications were assessed in RBD. Results revealed that integration of organic manures in combination with inorganic fertilizers or either alone significantly increased the yield, yield attributes and economics of cabbage over control. Among the various treatments, application of 25% NPK + 75% FYM + Biofertilizers (T_8) showed maximum head diameter (13.18 cm), head size (147.11 cm^2), gross head weight (1410.00 g), net head weight (694.67 g), head compactness (43.27 cm), yield per plot (11.10 kg) and yield per hectare (256.85 q). The highest net return of Rs 6,53,495/- and the highest cost benefit ratio of 5.58 was obtained from treatment T_8 (25% NPK + 75% FYM + Biofertilizers). Thus, T_8 can be suggested as an effective INM for getting higher yield and net return of cabbage var Golden Acre under foothill of Nagaland.

Keywords Integrated nutrient management, Cabbage, Yield, Economics.

INTRODUCTION

In this modern era where most people are concerned with health and hygiene for day to day living, vegetables play an essential role in maintaining health of human as well as food and nutritional security. It contains all essential nutrients especially minerals and vitamins which are required for normal functioning of human metabolic activity. It is also considered as the cheapest natural protective food as their consumption prevents several diseases. Vegetables being a short duration crop also fit in any cropping system very well and thus three to four crops can be grown in the same field in a year. Vegetable farming is an important source of income leading to improved livelihood and it also gives more opportunity to rural and urban development. Cabbage (*Brassica oleracea* var. *capitata*) is a cole crop which belongs to the family Cruciferae and is the origin of Mediterranean region. Cabbage is widely cultivated in the world.

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In India it is mainly grown in states of Maharashtra, West Bengal, Karnataka, Bihar, Gujarat, Assam and Orissa. In India the cultivated area under cabbage is around 3.98 million ha with the production of 90.37 Mt annually and productivity of 22.68 t ha^{-1} (NHB 2018). With regard to nutritional importance, cabbage is a good source of Vitamin A (2000 I.U./100 g) and Vitamin C (124 mg/100 g) and it has a property of anti-carcinogenic which helps in preventing cancer (Birt 1988). Cabbage is rich in thiamine, riboflavin, moisture (91.9%), protein (1.8%), fat (0.1%), minerals (0.6%). The basic concept of integrated nutrient management (INM) is to maintain soil fertility and crop productivity without compromising with the soil health. It secures the regular supply of nutrients to the desirable amount for better crop productivity. The integration of different organic and inorganic fertilizers with respect to soil and climatic conditions, ecological and socio-economic conditions results in better crop yield and growth. Prolong use of chemical fertilizers alone deteriorate soil health and quality. Thus, integrated use of chemical fertilizers along with other organics nutrients and bio-fertilizers gives a promising result for better productivity of crop without harming soil health and environment. The combined use of organic and inorganic sources of nutrients effectively improve soil health and helps in increasing production as it involves the use of available local resources and hence, turned to be more applicable, realistic and economically viable way of supplying nutrients to crop. As appropriate management practices and nutrients plays a vital role in achieving the optimum yield of cabbage. The poor growth and yield of cabbage in terms of quality and quantity may be due to underutilization or excess use of fertilizers and also, there is sparse information about the combined use of different inorganic and organic sources of nutrients in cabbage under agro-climatic condition of Nagaland. Hence, the present experiment was conducted to study on the effect of integrated nutrient management on yield attributes, yield and economics of cabbage under Medziphema condition.

MATERIALS AND METHODS

The research work entitled "Effect of integrated nutrient management on growth, yield and quality of cabbage (*Brassica oleracea* var. *capitata*) under foothill of Nagaland was conducted at the horticulture experimental farm, Nagaland University, School of Agricultural Sciences, Medziphema campus, Nagaland, during November 2021-March 2022.The experimental site was located in the Horticulture farm of SAS NU Medziphema campus, at an altitude of 304.8 m above the mean sea level and is positioned geographically at Latitude of 20° 45' 43" and a Longitude of 93° 53' 04" E.The climatic condition of this region is sub-tropical with high humid and medium to high rainfall. The temperature in summer ranges from 25-35°C and winter temperature varies between 22-25°C. The initial status of the soil was acidic with a soil pH of 5.6, 1.38% organic carbon and available NPK of 301.1 kg ha^{-1}, 47.07 kg ha^{-1} and 89.6 kgha^{-1} respectively. The experiment comprises of 14 treatments viz. T_1 (Recommended NPK 120: 60: 60 kg ha^{-1}), T_2 (FYM 30 t ha^{-1}), T_3 (Neem cake 5 q ha^{-1}), T_4 (Vermicompost 10 t ha^{-1}), T_5 (50% NPK + 50% FYM + Biofertilizers), T_6 (50% NPK + 50% Neem cake + Biofertilizers), T_7 (50% NPK + 50% Vermicompost + Biofertilizers), T_8 (25% NPK + 75% FYM + Biofertilizers), T_9 (25% NPK+ 75% Neem cake + Biofertilizers), T_{10} (25% NPK + 75% Vermicompost + Biofertilizers), T_{11} (50% NPK + 25% FYM + 25% Neem cake), T_{12} (50% NPK + 25% Neem cake + 25% Vermicompost), T_{13} (50% NPK + 25% FYM + 25% Vermicompost), T_{14} (Control) which were assessed in Randomized Block Design with three replications. The variety golden acre was used as a test crop in a plot size of 2.4 m × 2.4 m maintaining a spacing of 60 cm × 45 cm. Recommended dose of NPK were applied through urea, SSP and MOP in the ratio of 120: 60: 60 kg ha^{-1}. The treatments were evaluated on the basis of growth, yield and yield attributes, quality, soil nutrients and economics. After the harvest of crop soil samples were collected from each plot and analyzed for pH, organic carbon, available nitrogen, phosphorus and potassium. The statistical analysis was carried out as per procedure given by Panse and Sukhatme (1989). Economics of the treatments were carried out by calculating the cost of cultivation based on prevailing rates of input and output.

RESULTS AND DISCUSSION

Yield and yield attributes

The findings of the experiment indicated beneficial

Table 1. Effect of INM in yield and yield attributes of cabbage.

Treatments	Head diameter (cm)	Head size (cm^2)	Gross head weight (g)	Net head weight (g)	Yield $plot^{-1}$ (kg)	Yield ha^{-1} (q)	Head compactness (cm)
T_1 Recommended NPK (120: 60: 60 kg ha^{-1})	12.05	123.81	1089.00	562.33	8.97	207.48	35.21
T_2 FYM (30 t ha^{-1})	10.68	120.15	1045.00	485.67	7.77	179.72	34.15
T_3 Neem cake (5 q ha^{-1})	10.46	113.30	970.00	440.00	7.03	162.75	33.33
T_4 Vermicompost (10 t ha^{-1})	10.90	119.06	1020.67	464.00	7.43	172.00	34.73
T_5 50% NPK + 50% FYM + Biofertilizers	12.72	143.17	1343.33	652.33	10.47	242.19	39.01
T_6 50% NPK + 50% Neem cake + Biofertilizers	11.19	122.42	1064.67	505.33	8.07	186.66	34.80
T_7 50% NPK + 50% Vermicompost + Biofertilizers	12.65	139.09	1326.67	646.33	10.33	239.11	38.90
T_8 25% NPK + 75% FYM + Biofertilizers	13.18	147.11	1410.00	694.67	11.10	256.85	43.27
T_9 25% NPK + 75% Neem cake + Biofertilizers	11.23	122.31	1065.33	554.00	8.80	203.63	35.10
T_{10} 25% NPK + 75% Vermicompost + Biofertilizers	12.35	128.39	1188.33	601.67	9.60	222.14	37.57
T_{11} 50% NPK + 25% FYM + 25% Neem cake	12.95	146.19	1383.33	673.33	10.77	249.13	41.17
T_{12} 50% NPK + 25% Neem cake + 25% Vermicompost	12.61	129.38	1191.67	607.33	9.70	224.45	38.17
T_{13} 50% NPK + 25% FYM + 25% Vermicompost	12.82	145.79	1360.00	653.33	10.43	241.43	40.67
T_{14} Control	9.37	101.83	769.00	373.33	6.03	139.61	30.00
SEm ±	0.36	1.88	4.74	5.03	0.08	1.90	1.07
CD (p=0.05)	1.05	5.47	13.79	14.61	0.24	5.51	3.10

effect of integrating NPK fertilizers with different organic manures as well as biofertilizers on yield and yield attributing characters of cabbage i.e., head diameter, head size, gross head weight and net head weight. The results of the findings revealed that T_8 (25% NPK + 75% FYM + Biofertilizers) recorded

Table 2. Effect of INM on economics of cabbage

Treatments	Yield ha^{-1} (q)	Soil pH	Net income (Rs)	B:C
T_1 = Recommended NPK (120:60:60 kg ha^{-1})	207.48	5.73	516220	4.86
T_2 = FYM (30 t ha^{-1})	179.72	6.13	419160	3.49
T_3 = Neem cake (5 q ha^{-1})	162.75	5.83	358250	2.76
T_4 = Vermicompost (10 t ha^{-1})	172.00	6.03	226000	0.78
T_5 = 50% NPK + 50% FYM + Biofertilizers	242.19	5.83	612960	5.40
T_6 = 50% NPK + 50% Neem cake + Biofertilizers	186.66	5.53	441370	3.72
T_7 = 50% NPK + 50% Vermicompost + Biofertilizers	239.11	5.83	518720	2.61
T_8 = 25% NPK + 75% FYM + Biofertilizers	256.85	5.93	653495	**5.58**
T_9 = 25% NPK + 75% Neem cake + Biofertilizers	203.63	5.53	486335	3.90
T_{10} = 25% NPK + 75% Vermicompost + Biofertilizers	222.14	5.93	421865	1.73
T_{11} = 50% NPK + 25% FYM + 25% Neem cake	249.13	5.63	631780	5.46
T_{12} = 50% NPK + 25% Neem cake + Vermicompost	224.45	5.53	515240	3.26
T_{13} = 50% NPK + 25% FYM + 25% Vermicompost	241.43	5.63	568680	3.65
T_{14} = Control	139.61	5.63	328830	3.65
SEm ±	1.90	0.03	-	-
CD (p=0.05)	5.51	0.10	-	-

maximum result in all yield attributing characters such as head diameter (13.18 cm), head size (147.11 cm^2), gross head weight (1410.00 g) and net head weight (694.67 g) (Table 1). Based on the experimental results, it was found that yield and yield attributing characters improved significantly with the application of 25% NPK + 75% FYM + Biofertilizers. Maximum yield per plot (11.10 kg) and yield per hectare (256.85 q) were recorded in treatment combination of 25% NPK + 75% FYM + Biofertilizers (Table 1).These findings were in close conformity with Changkiri *et al*. (2022), Merentola *et al.* (2012) and Gupta and Samnotra (2004).

Economics

The data depicted in the Table 2 clearly shows that the most profitable was treatment T_8 (25% NPK + 75% FYM + Biofertilizers). The highest net return of Rs 6, 53,495 was obtained from treatment T_8 (25% NPK + 75% FYM + Biofertilizers) with highest benefit cost ratio of 5.58. Similar findings were reported by Zango *et al.* (2009), Tekasangla *et al.* (2015), Moakala *et al.* (2015) and Walling *et al.* (2021).

CONCLUSION

Based on experimental results it can be concluded that the effect of different treatments and their combinations was found to be significantly superior over control treatment. Treatment combinations of 25% NPK + 75% FYM + Biofertilizers were found significantly superior with respect to yield attributes, yield and economics as compared to other treatments. However treatments T_{11} (50% NPK + 25% FYM + 25% Neem cake and T_5 (50% NPK + 50% FYM + Biofertilizers) also equally gave better B:C. Thus, depending upon the availability of organic manures in particular area, the treatment combinations of either 25% NPK + 75% FYM + biofertilizers (*Azospirillum*+ *Azotobacter*), 50% NPK + 25% FYM + 25% Neem cake and 50% NPK + 50% FYM + Biofertilizers (*Azospirillum* + *Azotobacter*) can be suggested as effective nutrient combinations for getting higher yield and net return of cabbage var golden acre under Medziphema condition.

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