



Effect of Integrated Nutrient Management on Cabbage Production in Dry Temperate Region of Himachal Pradesh

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ABSTRACT

Cabbage (*Brassica oleracea* var. *capitata* L.) is one of the most important winter vegetable crops in India. It is grown in almost every household in Kinnaur district- a dry temperate region of Himachal Pradesh. It is grown as an off-season vegetable during summer in the district. Farmers get good price of their produce due to off-seasonality. To study the effect of integrated nutrient management on cabbage production, experiment was conducted during the year 2017-18. Total five trials were laid out at farmer's field to compare three treatments, T1 was farmers' practice consisting of use of FYM only and T2, use of FYM and recommended fertilizer dose whereas T3 was use of FYM and recommended doses of fertilizers + seedling treatment with *Azotobacter*. It was found that use of FYM and recommended doses of fertilizers + seedling treatment with *Azotobacter* recorded maximum yield of 22.45 t/ha. T3 also recorded the highest net return (Rs.3,59,819/ha) and benefit cost ratio (4.03) in comparison to recommended and farmers' practice.

Key Words: Cabbage, Dry temperate region, Integrated nutrient, Management.

INTRODUCTION

Cabbage (*Brassica oleracea* var. *capitata*) is one of the most economically and nutritionally important crop of Brassica family. In dry temperate region of Himachal Pradesh, cabbage (*B. oleracea* var. *capitata*) is grown during summer as an off-season vegetable and farmers fetch good remunerative price of their produce. It is also a vital part of fast food in Indian cuisine due to wider adaptability, economical and all year availability. Besides, being rich in vitamins, it also contains sulphoraphane which reduces the risk of prostate cancer in human beings (Khatkar *et al*, 2018). Cabbage is a heavy feeder crop, it removes various important nutrients from the soil. The indiscriminate use of fertilizers will not affect the yield but also adversely affect the soil quality. Bindu (2019) reported that cabbage variety Green Voyager performed better under rain shelters and was the best variety for off season cultivation in Kerala. The variety Green Voyager recorded highest plant height and leaf number at all

stages of growth. Moreover, the sole use of farm yard manure will not meet the nutrient requirement of cabbage. On the other hand integrated use of organic, chemical and biofertilizers will not only improve the yield but also improve the physical and chemical property of soil. Further, the use of organic manure along with integrated use of biofertilizers and chemical fertilizers is known to increase biological and physiological condition of crop. The experiment was laid out to study the effect of integrated nutrient management on the growth and yield parameters of cabbage var Pusa Mukta.

MATERIALS AND METHODS

The experiment was conducted during summer season of year 2017 at farmer's field in district Kinnaur. Total five trials were conducted in two different villages. It was grown as an intercrop in the apple orchard. Treatments included T1: farmer's practice of using FYM only, T2: recommended dose of FYM @ 20t/ha, T3: recommended dose of FYM

Table 1. Effect of integrated nutrient management on Cabbage production.

Treatment	After transplant mortality	Number of non-wrapper leaves	Plant height (cm)	Head weight (g)	Yield per plot (kg)	Yield (t/ha)	Net Returns (Rs.)	B:C Ratio
T1	15.67	10.56	11.67	550.90	24.24	20.20	3,21,849/-	3.92
T2	12.23	11.89	11.87	610.90	26.88	22.40	3,58,219/-	3.99
T3	08.37	12.78	11.93	612.97	26.94	22.45	3,59,819/-	4.03

T1: Farmers Practice (Use of FYM only), T2: Recommended dose of Fertilizer, T3: Recommended dose of fertilizers + seedling treatment with *Azotobacter*.

@ 20 t/ha + seedling treatment of *Azotobacter* @ 30×10^7 cfu/ml. Variety used was Pusa Mukta. Nursery was grown on 20th of March, 2017 and seedlings were transplanted on 24th April at spacing of 60 X 45 cm. Recommended doses of fertilizers 20 t/ha FYM and 125:100: 50 kg/ha N:P:K were supplied through IFFCO 12:32:16, urea and muriate of Potash. Full dose of IFFCO 12:32:16 and muriate of potash were applied at the time of field preparation as a basal dose. Urea was applied in two split doses first at earthing up and second twenty days after at second weeding. Plot size for the on farm testing was 3 X 4 m. In T3 treatment seedlings were dipped in solution containing *Azotobacter* for 20 min. thereafter transferred in field. Parameters recorded were number of after transplant mortality, non-wrapper leaves, plant height, head weight, yield per plot (kg) and yield per ha as per the standard procedure.

Cabbage was harvested when its head reached desired size and firm after 90 to 95 days. Each head was cut with the sharp knife at the base. Then outer leaves and roots were removed. Data collection was carried out 90 days after transplanting and harvesting of cabbage heads was done at maturity.

RESULTS AND DISCUSSION

Data (Table 1) reveal that minimum after transplant mortality was recorded in integrated nutrient treatment which was 8.37 and maximum after transplant mortality of 15.67 was observed in farmer's treatment. The minimum after transplant

mortality in *Azotobacter* treated seedlings may be due to synergistic effect of biofertilizer for quick establishment of seedlings. The highest values for number of non-wrapper leaves (12.78), plant height (11.93 cm), Head weight (612.97 g), Yield per plot (26.94 kg) and Yield per ha (22.45 t/ha) was recorded in T3 treatment. The lesser head weight of variety Pusa Mukta' than its varietal potential may be due to growing under established apple orchard. The control treatment or farmer's practice T1 recorded the lowest values for all the parameters. The higher growth and yield attributes in T3 may be due to increased chlorophyll contents in leaves as a result of increased supply of all the essential plant nutrients as well as increased physico-chemical and biological properties of the soil. All these favourable situations might have resulted in greater accumulation of carbohydrates, protein and their translocation towards the reproductive organs (yield-attributes). These results were in close agreement with those of Supe and Marbhal (2008), Wani *et al* (2010) and Verma and Maurya (2013).

It has been also observed that productivity of cabbage was closely associated with other parameters like number of non-wrapper leaves, plant height and head weight. The results corroborate with those of Pandey *et al* (2007), Choudhary *et al* (2012) and Kumar and Khare (2015).

Maximum net returns of Rs 3,59,819/- and benefit cost ratio of 4.03 was recorded from integrated nutrient management treatment T3.

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CONCLUSION

Based on the present study it can be concluded that integrated nutrient management has significant role in increasing yield per plot (kg) and per ha (t/ha). Net return and B:C ratio were also highest in T3 treatment. Though the yield difference in T2 and integrated nutrient management treatment (T3) was not much but it recorded other advantages of lesser after transplant mortality, more number of non-wrapper leaves, plant height and head weight which resulted in higher yield, net returns and B:C ratio.

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