



# Effect of Organic Manure on Nutrient Content of Cabbage Head (*Brassica oleracea* var. *capitata*)

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

Experiment was carried out at Horticulture Farm, Rajasthan College of Agriculture, Udaipur during winter season of 2020-21 to evaluate the effect of organic manure on nutrient content of cabbage head. Ten treatments comprising of various combinations of organic manures was used in a randomized block design (RBD) with three replications. Recommended dose of nitrogen (RDN) 150 kg ha<sup>-1</sup> was used. Results showed that the application of 100% RDN through enriched compost + fortified *Panchagavya* spray @ 4% at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + fortified *Jeevamrut* @ 500 L ha<sup>-1</sup> twice at 15-days interval recorded the highest protein and nutrient content i.e., Ca, P, K, Fe and S in cabbage head which are significantly different from other treatments. Lowest values for these parameters were recorded under control, in which no manure has been applied.

Keywords: Cabbage; enriched compost; neem cake; FYM; panchgavya; jeevamrut.

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## 1. INTRODUCTION

“Cabbage (*Brassica oleracea* var. *capitata*) with chromosome number of 18 ( $2n = 18$ ) is a member of the Brassicaceae family. Its origin is in the Mediterranean region. Cabbage (mostly white cabbage) occupies about 4% of the total area under vegetables in the country. Cabbage heads are low in calories, fat and carbohydrates, while rich in protein content, calcium (Ca), iron (Fe), magnesium (Mg), sodium (Na), potassium (P) and phosphorus (P) and ascorbic acid. Cabbage is primarily used as a vegetable, but it may also be used to make a delicious pickle (sauerkraut) as well as salads. It has a long history of medicinal use and is commonly prescribed to treat coughs, fevers, peptic ulcers, and skin conditions. In comparison to conventional farming, these are viewed to be more profitable and environment-friendly, delivering equally or more nutritious goods with less (or no) pesticide residues. Various organic materials that may be used as organic fertilizer are derived from animal waste and plant leftovers that can be used efficiently after composting” (Hartatik et al., 2023). “Compost and farmyard manure (FYM) play an important role in plant nutrition because these directly increase crop yields by accelerating the respiratory process, growing cell permeability and hormonal growth action or by a combination of all these processes. Neemcake is a concentrated organic manure of plant origin (as a residue). Along with a significant amount of K, neem cake also contains N and P” (Lokanadhan et al., 2012). “*Panchagavya* is a five-component fertilizer made up of cow dung, urine, milk, curd and ghee that is used extensively in agriculture, especially for horticultural crops. *Jeevamrut* stimulates a lot of biological soil activity and produces nutrients available to the crop. The filtered extract is applied to soil and is thought to enrich soil microbiologically by introducing a variety of beneficial microorganisms. A large population of nitrogen fixers, phosphate solubilizers and siderophore producers reportedly is present in the *jeevamrut*” (Pathak and Ram, 2013).

## 2. MATERIALS AND METHODS

Effect of organic manure on the nutrient content of cabbage head cv. Kranti, was carried out at Horticulture Farm, Department of Horticulture, Rajasthan College of Agriculture, Udaipur from October 2020 to February 2021. At the transplanting time, 100% of recommended dose of nitrogen (RDN) ( $150 \text{ kg ha}^{-1}$ ) was applied

through FYM, enriched compost (EC) and neem cake (NC) as described in the treatments. *Panchagavya* @ 4% at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval, were applied as per the treatments. The treatments were as follows: T<sub>1</sub>: EC equivalent to 100% RDN, T<sub>2</sub>: EC (1/2) + NC (1/2) equivalent to 75% RDN; T<sub>3</sub>: EC (1/2) + NC (1/2) equivalent to 50 % RDN; T<sub>4</sub>: T<sub>1</sub> + Fortified *Panchagavya* spray @ 4% at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval, T<sub>5</sub>: T<sub>2</sub> + Fortified *Panchagavya* spray @ 4 % at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval; T<sub>6</sub>: T<sub>3</sub> + Fortified *Panchagavya* @ 4 % at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval; T<sub>7</sub>: 20 t FYM  $\text{ha}^{-1}$ ; T<sub>8</sub>: 20 t FYM  $\text{ha}^{-1}$  + Fortified *Panchagavya* @ 4 % at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval, T<sub>9</sub>: Fortified *Panchagavya* @ 4% at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut* @  $500 \text{ L ha}^{-1}$  twice at 15 days interval and T<sub>10</sub>: Control (No manure). Randomized Block Design (RBD) will be used to analyse the individual data of the numerous characters evaluated in the experiment, as suggested by Panse and Sukhatme (1985).

The carbohydrate and protein in cabbage head were determined following the procedures as described by anthropic method of Hedge and Hofreiter (1962), Lowry et al. (1951), AOAC's official titrimetric method (AOAC 1990) and oxidative hydrolytic degradation method of Maynard (1970), respectively. “Phosphorus and potassium content were estimated by using tri-acid digestion” (Jackson, 1973) in the ratio of 10: 4: 1 ( $\text{HNO}_3$ :  $\text{HClO}_4$ :  $\text{H}_2\text{SO}_4$ ). The individual minerals viz., Ca, S and Fe, were estimated with AAS (Atomic Absorption spectrophotometers Chemito, AA 203 P, Double Beam)” as used by L'vov (2005). It is based on the principle of volatilization of atoms, which absorb by light at specific wave length. The mixture is prepared and digested with diacid (9:4, mixture of  $\text{HNO}_3$  and  $\text{HClO}_4$ ) digest on mixture.

## 3. RESULTS AND DISCUSSION

Organic manure addition significantly affected the nutrient content of cabbage head.

**Table 1. Effect of organic manure on nutrient content of cabbage head**

Treatment	Protein content (%)	Carbohydrate (%)	Calcium (%)	Phosphorus (%)	Iron (ppm)	Potassium (%)	Sulphur (%)
T <sub>1</sub>	1.53	5.38	0.75	0.41	207.52	2.74	1.17
T <sub>2</sub>	1.47	5.32	0.70	0.36	203.22	2.68	1.13
T <sub>3</sub>	1.42	5.29	0.66	0.35	201.74	2.65	1.09
T <sub>4</sub>	1.57	5.42	0.77	0.44	210.22	2.78	1.20
T <sub>5</sub>	1.49	5.33	0.71	0.37	205.07	2.70	1.14
T <sub>6</sub>	1.45	5.31	0.68	0.35	202.71	2.67	1.11
T <sub>7</sub>	1.51	5.35	0.72	0.38	205.29	2.72	1.15
T <sub>8</sub>	1.53	5.37	0.73	0.39	206.10	2.73	1.16
T <sub>9</sub>	1.40	5.26	0.65	0.33	200.47	2.63	1.08
T <sub>10</sub>	1.37	5.21	0.62	0.31	198.90	2.61	1.05
SEm±	0.03	0.01	0.02	0.02	2.40	0.03	0.03
C.D. @ 5%	0.08	0.04	0.05	0.06	7.13	0.09	0.09

Significantly higher value protein (1.57 %), carbohydrate (5.42 %), calcium (0.77 %), phosphorus (0.44 %), potassium (2.78 %), iron (210.22 PPM) and Sulphur (1.20 %) was observed, with T<sub>4</sub> (EC equivalent to 100% RDN+ Fortified *Panchagavya* spray @ 4 % at 10 to 20 days after transplanting + 15 days after 1<sup>st</sup> spray + Fortified *Jeevamrut*@ 500 liter /ha at twice 15 days interval). However, the minimum protein (1.37%), carbohydrate (5.21 %), calcium (0.62 %), phosphorus (0.31 %), potassium (2.61 %), iron (198.90 PPM) and sulphur (1.05 %) was observed with T<sub>10</sub> (Table 1). “The increase in protein content with dose of nitrogen might be due to the fact that nitrogen is a major contributor of protein and amino acids, the synthesis of which is accelerated by its supply in the soil. If, nitrogen is adequate and other conditions found favorable for growth, proteins are formed from the manufactured carbohydrates. Similarly, higher level of protein with increasing nitrogen rate has been clearly demonstrated in potato” (Kumpulainen, 2001), brinjal (Shelke et al., 2001) and cabbage Upadhyay et al. (2012). “Application of organic nutrient sources increased the quality of parameters measured because soil has been managed organically and has congenial environment for microorganisms, which produce compounds that influence the plant to absorb more micronutrients from soil. It is also reported that substances such as citrate and lactate, when combined with soil minerals, enhanced their availability to the plant roots. This is especially important for iron as many soils contains adequate iron but in unavailable form. Moreover, application of biofertilizers in the treatment along with the manures may result in increased uptake of all macro and micronutrients,

it might be one of the reasons for increase in mineral content in cabbage. Similarly, the increased mineral content of vegetables due to addition of manures and biofertilizers over conventionally grown vegetables were reported by several researchers” (Woese et al., 1997; Shelke et al., 2001; Worthington, 2001; Magkos et al., 2003; Shankar et al., 2009).

#### 4. CONCLUSION

It is concluded that conjoined application of 100% RDN through EC + fortified *Panchagavya* spray @ 4 % at 10 to 20 days after transplanting and 15 days after 1<sup>st</sup> spray + fortified *Jeevamrut* @ 500 L ha<sup>-1</sup> twice at 15 days interval, is the best in improving and increasing the nutrient content and also increase protein and carbohydrate of cabbage head.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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