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Research Article

EFFECT OF ORGANIC AND CONVENTIONAL NUTRIENT MANAGEMENT ON LEAF NUTRIENT STATUS OF BROAD LEAF MUSTARD *(Brassica juncea var. rugosa)*

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ABSTRACT

An experiment was conducted to evaluate the effect of organic and conventional nutrient management on leaf nutrient status of broad leaf mustard (*Brassica juncea* var. *rugosa*) in the farmer's field, at Dakshinkali Municipality -2, Kathmandu, Nepal during the year 2016 - 2018. The experiment was done using a Randomized Complete Block Design. There were a total of 13 treatments viz. T_1(24 t/ha Farm Yard Manure (FYM)), T_2 (6 t/ha. Vermicompost), T_3 (4 t/ha. Poultry Manure), T_4 (12 t/ ha Compost), T_5 (½ NPK + 3 t/ha. Vermicompost), T_6 (¾ NPK + 1.5 t/ ha. Vermicompost), T_7 (½ NPK+12 t/ha. FYM), T_8 (¾ NPK +6 t/ha. FYM), T_9 (½ NPK + 2 t/ha. Poultry Manure), T_{10} (¾ NPK + 1 t/ha. Poultry Manure), T_{11} (½ NPK + 6 t/ha. compost), T_{12} (¾ NPK + 3 t/ha. compost), and T_{13} (Control), each with three replications. Findings revealed that, maximum leaf nitrogen (4.23%), leaf phosphorus(0.73%), leaf potassium (4.537%), and leaf calcium (2.80%) were observed in T_5 (½ NPK + 3 t/ha. Vermicompost) whereas the maximum leaf magnesium (0.32%) contents was found in T_5 (½ NPK + 3 t/ha. Vermicompost), and T_6 (¾ NPK + 1.5 t/ ha. Vermicompost). But, in the case of leaf iron (802.90 ppm) it was higher in T_2 (6 ton/ha. Vermicompost). Thus, reducing N about ½ of the recommended dose, and adding vermicompost reasonably proved effective practice in improving major nutrient contents of broad leaf mustard.

Key words : Broad leaf mustard**,** organic, conventional, leaf and nutrient

INTRODUCTION

Leafy vegetables are taking on more of the responsibility for feeding the world's population due to high fiber content, high moisture content, and strong flavors (Kennedy, 2011). Leafy vegetables are cheap source of nutrients, and are afforded by all walk of people. When green leaves become food, they have a high moisture and fiber content. Water usually makes up between 80-95 percent of leafy vegetables by weight; of the remaining dry matter, fiber typically accounts for 10-40 percent. Their high water and fiber content seriously curtail to the fact that-how much we use leaves as food (Kennedy, 2011).

Broad Leaf Mustard is known as mustard green, elsewhere. Broad Leaf Mustard (BLM), *Brassica juncea var. rugosa*., belonging to family Cruciferae, is one the most popular, highly commercial, and most widely grown leafy vegetables in Nepal. It can be found in Central to Eastern Asia. It is commonly known as 'Rayo' in Nepal. It is one of the rich source of several vitamins and minerals. Cooler climatic condition is most suitable for its cultivation. It is mainly grown as winter season crop in terai whereas it is mainly grown as summer season crop in the higher hills. In cooler conditions, the quality of the leaves become better as compared to warmer conditions. Although it can be grown in wide range of soil, loamy soil with higher organic content and water holding capacity is preferred (Parajuli, 2015).

In Nepal, *BLM* is mainly produced for local consumption targeting to the local markets. Specially, it is popular in urban and pari urban areas of Nepal. Broad Leaf Mustard is also consumed in the form of fermented product, locally known as *Gundruk* which is most popular and favorite Nepali side dish. Different varieties of Broad Leaf Mustard have been released and registered viz, Marpha Broad Leaf, Khumal Broad Leaf, Khumal Red Leaf, Tangkhuwa, Mike Giant and Red Giant (MoAD, 2016). In Nepal, it is cultivated in an area of 13,191 ha of land with the average national production of 1,60,761 t, and productivity of BLM has recorded 12.19 mt ha^{-1} .

Increased chemical fertilizer cost and awareness of environmental pollution have necessitated the use of organic fertilizers for the development of more efficient fertility management program. Organic fertilizers are apparently environment and farmer friendly; renewable source of non-bulky, low cost organic agricultural

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inputs for improving soil fertility status in sloppy and denuded areas. Organic manures are fairly good source of nutrient which has directly influenced on plant growth like other commercial fertilizers. Mukherjee et al (1991).Prasad and Singhania (1989) also reported that application of organic manures with NPK increased the leaf nutrient status of Khasi Mandarin. Jambhekar (1992) and Shivputra et al (2004) reported about similar result. However, very few information are available in this area; therefore this study was designed and conducted to indentify the effect of organic and conventional nutrient management on leaf nutrient status of Broad Leaf Mustard *(Brassica juncea* var. *rugosa).*

MATERIALS AND METHODS

This research, conducted on organic and conventional nutrient management on leaf Nutrient Status of Broad Leaf Mustard *(Brassica juncea* var. *rugosa)* was carried out in the farmer's field at Dakshinkali municipality-2, Kathmandu, Nepal during the year 2016 - 2018. There was a total f 13 treatments combination (Table 1). The experiment was laid out by using a Randomized Complete Block Design, each treatment with three replications. Marpha Broad Leaf Mustard variety was used for this research. Area of each experimental plot was measured 2×2.5 $m^{2.}$ Total number of plants per plot was maintained as 36.

Table 1. Treatments detail of the experiment

Treatments	Sources of Nutrients	
T_1	Farm Yard Manure	24 t/ha. Farm Yard Manure (FYM)
T_2	Vermicompost	6 t/ha. Vermicompost
T_3	Poultry Manure	4 t/ha. Poultry Manure
T_4	Compost	12 t/hac
T_5	½ NPK + Vermicompost	½ NPK + 3 t/ha. Vermicompost
T_6	¾ NPK + Vermicompost	¾ NPK + 1.5 t/ ha. Vermicompost
T_7	½ NPK + FYM	½ NPK + 12 t/ha. FYM
T_8	¾ NPK + FYM	¾ NPK +6 t/ha. FYM
T_9	½ NPK + Poultry Manure	½ NPK + 2 t/ha. Poultry Manure.
T_{10}	¾ NPK + Poultry Manure	¾ NPK + 1 t/ha. Poultry Manure
T_{11}	½ NPK + Compost	½ NPK + 6 t/ha. Compost
T_{12}	¾ NPK + Compost	¾ NPK + 3 t/ha. Compost
T_{13}	Control	Control

Use t for ton for all cases

Determination of leaf nutrient status

Collection and preparation of leaf sample from Broad Leaf Mustard *(Brassica juncea* var. *rugosa)* plants were done and were analyzed by using slandered sampling method. The samples were washed first under tap water followed by 0.1N HCl, distilled water and finally with double distilled water . They were then dried by spreading on clean blotting papers and final drying was accomplished in the oven at 68 ^{O}C (Chapman 1964).The samples were sequentially ground by electrical grinder for further analysis.

Digestion of leaf samples

The digestion of the samples for the estimation of nitrogen was carried out in concentrated sulphuric acid (AR grade) by adding digestion mixture. For the estimation of leaf P, K, Ca, Mg and Fe, digestion was done in diacid mixture prepared by mixing nitric acid and perchloric acid (AR grade) in the ration of 4:1 (AOAC.,2000).

Determination of Nutrient elements

a. Total Nitrogen present in leaves was determined by kjeldahl's method (Jackson, 1975). The result was expressed in percentage on dry weight basis.
b. Total Phosphorous of Leaf content was determined by using Vanadomolybdophosphoric yellow

colour method (Jackson 1975), and the results were expressed in percentage on dry weight basis.

c. Total Potassium of Leaf content was determined by flame photometer (Toshniwal, TMF 45), and the result was expressed in percentage on dry weight basis.
d. The estimation of Ca and Mg was done by atomic absorption spectrophotometer. The result was expressed in percentage on dry weight basis.
e. The Fe was determined with the help of atomic absorption spectrometer, and the result was expressed in parts per million (ppm) on dry weight basis.

RESULTS AND DISCUSSION

Leaf Nitrogen

The highest leaf Nitrogen content (4.23 %) was recorded in T_5 (½ N: P_2O_5: K_2O + 3 t/ha. Vermicompost) and lowest (2.38%) were recorded in T_{13} (control, no fertilizer) (Table2). This might be due to the fact that application of 3 t vermicompost along with NPK must have enhanced mineralization of organic nitrogen thus making more nitrogen available to the plant. These results are in conformity with the findings of Prasad and Singhania (1989) and Mukherjee et al (1991) as the authors reported similar results in Khasi mandarin. Similar results were also reported by Reddy et al (2001) in coconut seedling and Shivputra et al (2004) in Papaya.

Leaf Phosphorus and Potassium Content

Leaf P content was affected significantly by different treatments. Maximum leaf P content (0.73%) and K content (4.537 %) were recorded in T_5 (½ N: P_2O_5: K_2O + 3 t/ha. Vermicompost) and lowest p content (0.40%) and K content (2.987%) were recorded in T_{13} (control, no fertilizer) (Table 2). Highest leaf P and K content in T5 may be attributed to the fact that vermicompost is a rich source of soil micro- organisms which must have helped in the solubilization of fixed P and K to soluble form, thus making it easily available to the plant. These result are in agreement with the findings of Jambhekar et al (1992).

Table 2. Effect of organic and conventional nutrient management in leaf nutrient status of broad leaf mustard

	Treatments	Leaf Nitrogen (%)	Leaf Phosphorus (%)	Leaf Potassium (%)
T_1	24 ton/ha. Farm Yard Manure (FYM)	3.28	0.67	4.027
T_2	6 ton/ha. Vermicompost	3.27	0.63	4.003
T_3	4 ton/ha. Poultry Manure	3.97	0.66	4.053
T_4	12 ton/ha Compost	3.64	0.67	4.060
T_5	½ N: P_2O_5: K_2O + 3 ton/ha. Vermicompost	4.23	0.73	4.537
T_6	¾ NPK + 1.5 ton/ ha. Vermicompost	3.56	0.70	4.233
T_7	½ NPK + 12 ton/ha. FYM	3.08	0.61	3.997
T_8	¾ NPK +6 ton/ha. FYM	3.03	0.67	3.810
T_9	½ NPK + 2 ton/ha. Poultry Manure.	2.91	0.63	4.290
T_{10}	¾ NPK + 1 ton/ha. Poultry Manure	2.72	0.64	3.983
T_{11}	½ NPK + 6 ton/ha. Compost	2.61	0.68	4.137
T_{12}	¾ NPK + 3 ton/ha. Compost	2.94	0.65	4.007
T_{13}	Control	2.38	0.40	2.987
	LSD (0.05)	0.6339	0.1166	0.6519
	P-Value	<.001	0.002	0.026
	CV% (between treatments)	11.7	10.8	9.6

Leaf calcium content

The highest leaf Ca content (2.80%) was recorded in T_5 (½ N: P_2O_5: K_2O+ 3 t/ha. Vermicompost) and lowest (1.59 %) were recorded in T_{13} (control, no fertilizer) (Table3). This response could have been produced due to the fact that vermicompost is a rich source of Ca and with the application of higher quality of it, availability of Ca would have increased, hence occurred as more leaf Ca content. These result are in confirmation with the findings of Anitha and Prema (2003) as the authors reported more Ca in vermicompost.

Leaf magnesium content

The highest leaf Mg content (0.32 %) was recorded in T_5 (½ N: P_2O_5: K_2O + 3 t/ha. Vermicompost) and T_6 (¾ NPK + 1.5 t/ ha. Vermicompost) whereas the lowest (0.23%) content was recorded in T_{13} (control, no fertilizer) (Table3). This may be attributed to the fact that vermicompost is a rich source of Mg and with the application of higher quality of it, availability of Mg would have increased, hence more leaf Mg content in the result. These results are in confirmation with the findings of Anitha and Prema (2003) as the authors reported about more Mg in vermicompost. Similar result was also reported by Rodrignez et al (2000) in Gerbera.

Leaf iron content

Leaf Fe content was affected significantly ($p<0.05$) by different treatments. The Highest leaf Fe content (802.90 ppm) was recorded in T_2 (6 t/ha. Vermicompost) and lowest (319.03 ppm) was recorded in T_{13} (control, no fertilizer) (Table3). Highest Fe content while using 6 t/ha. vermicompost might be due to the positive effect of vermicompost on soil properties thus releasing Fe to the plant. Addition of vermicompost in the soil increased the availability of micronutrient to plant (Sainz et al., 1998, Vasanthi and Kumaraswamy, 1999) Similar result was also reported in grape by Venkatesh et al. (1997).

Table 3. Effect of organic and conventional nutrient management on Ca, Mg and Fe status in green leaf of broad leaf mustard

	Treatments	Leaf Calcium (%)	Leaf Magnesium (%)	Leaf Iron (ppm)
T_1	24 ton/ha. Farm Yard Manure (FYM)	2.45	0.29	528.90
T_2	6 ton/ha. Vermicompost	2.72	0.34	802.90
T_3	4 ton/ha. Poultry Manure	2.38	0.30	605.07
T_4	12 ton/hac Compost	2.09	0.30	429.97
T_5	½ N: P_2O_5: K_2O + 3 ton/ha. Vermicompost	2.80	0.32	545.77
T_6	¾ NPK + 1.5 ton/ ha. Vermicompost	2.73	0.32	721.17
T_7	½ NPK + 12 ton/ha. FYM	2.43	0.29	395.97
T_8	¾ NPK +6 ton/ha. FYM	2.36	0.28	507.20
T_9	½ NPK + 2 ton/ha. Poultry Manure.	2.77	0.31	605.83
T_{10}	¾ NPK + 1 ton/ha. Poultry Manure	2.42	0.31	573.00
T_{11}	½ NPK + 6 ton/ha. Compost	2.44	0.29	618.23
T_{12}	¾ NPK + 3 ton/ha. Compost	2.52	0.29	478.97
T_{13}	Control	1.59	0.23	319.03
	LSD (0.05)	0.3904	0.02120	22.84
	P-Value	<.001	<.001	<.001
	CV% (between treatments)	9.5	4.3	2.5

CONCLUSION

Broad Leaf Mustard (BLM), *(Brassica juncea var. rugosa*) is a most important green leaf vegetable of Nepal. According to this research application of ½N: P_2O_5: K_2O + 3 t/ha. Vermicompost was effectively improving the leaf nitrogen, leaf phosphors, leaf potasim, leaf calcium and leaf magnesium content status of Broad Leaf Mustard (BLM) whereas leaf iron status was better while applying 6 t/ha vermicompost. Thus, reducing N about ½ of the recommended dose, and adding vermicompost reasonably proved effective practice in improving major nutrient contents of Broad Leaf Mustard.

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REFERENCES

Anitha,S. and Prema, A.(2003). Vermicompost boosts crop production. *Indian Farming News* 53(8): 15-18

AOAC.(2000). Official Methods of Analysis. 17th ed. Association of Official Analytical Chemists; Gaithersburg, MD, USA.

Jackson, M L. (1975). Soil chemical analysis. Asia publishing House Bombay, 10-205.

Jambhekar, H.A. (1992). Use of earthworm as potential source of decomposed organic wastes. In : *Proceedings, National Seminar on Organic farming* . Mahatma Phule Krishi Vidyapeeth, Pune, 52-53

Kennedy, D. (2011) *Twenty first Century Greens, Leaf Vegetables in nutrition and Sustainable agriculture*, USA. pp: 19-21

MoAD. (2016). Agriculture Diary, Agriculture Information and Communication Centre, Hariharbhawan, Lalitpur.

Mukherjee, D.S., Mitra and A.C. Das . (1991). Effect of oil cake on change in carbon and microbial population in soil . *Journal of Indian Society of Soil Science* 39: 457-194

Parajuli, A. (2015). Cultivation and Management practices of leafy vegetable in Nepal . www.wordpress.com.

Prasad, R.A. and R.A. Sighania. (1989). Effect of different type of enriched manures and time of incubation on soil properties . *Journal of Indian Society of Soil Science* 37: 329-322

Reddy, D. V.S., S.N. Kumar and S.R. Prabhu. (2001). Evaluation of alternative media to potting mixture for raising coconut seedlings in polybags. *Journal of Plantation Crops*, 29 (1) : 62-65

Sainz, M.J., M.T. Toboada and A. Vilarino. (1998). Growth, mineral nutrient and mycorrhizal colonization of red cover and cucumber plants grown in a soil amended with composted urban wastes. Plant and Soil, 205(1) : 85-92

Shivputra, S.S., C.P. Patil, G.S.K., Swamy and P.B. Patil. (2004). Cumulative effect of VAM fungi and vermicompost on nitrogen, phosphorus and potassium and chlorophyll contant of papaya leaf. *Mycorrhiza News*, 16 (2): 15-16

Vasanthi, D. and K. Kumaraswamy. (1999). Efficiency of vermicompost to Improve Soil Fertility and Rice yield . *Journal of Indian Society of Soil Science* , 47: 268-272

Venkatesh, P.B. Patil, K. S. Kumar, C.V. Patil and R.S. Giraddi. (1997). Influence of in sate vermiculture and vermicompost on availability and plant content of micronutrient. *Advance in agricultural Research in India*, 7:179-183