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Effect of Organic and Conventional Nutrient Management on Post Harvest Status of Broad Leaf Mustard (*Brassica Juncea Var. Rugosa*)

BP. Bhattarai[1*], KP. Shing[2], SM. Shakya[1], Gopal. B. Khatri-Chhetri[1] and YG. Khadka[3]

[1]*Institute of Agriculture and Animal Science, Kritipur, Kathmandu.*

[2]*Institute of Agriculture and Animal Science, Paklihawa Campus, Rupandehi.*

[3]*National Agriculture Research Council, Khumaltar, Lalitpur.*

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***Corresponding author:** BP. Bhattarai, Institute of Agriculture and Animal Science, Kritipur, Kathmandu. E-mail: bishnu.horti@gmail.com*

Abstract

An experiment was conducted to evaluate the effect of organic and conventional nutrient management on post harvest status of Broad Leaf Mustard (*Brassica juncea var. rugosa*) in field at Dakshinkali Municipality-2, Kathmandu, Nepal during the year 2016 - 2018. The experiment was laid out in a Randomized Complete Block Design. There were 13 treatments viz. T_1 (24 t ha^{-1}. farm yard manure (FYM), T_2 (6 t ha^{-1}. vermicompost), T_3 (4 t ha^{-1}. poultry manure), T_4 (12 t ha^{-1} compost), T_5 (½ N: P_2O_5: K_2O + 3 t ha^{-1} vermicompost), T_6 (¾ NPK + 1.5 t ha^{-1} vermicompost), T_7 (½ NPK+12 t ha-1 FYM), T_8 (¾ NPK +6 t ha^{-1} FYM), T_9 (½ N: P_2O_5: K_2O + 2 t ha^{-1}. poultry manure), T_{10} (¾ N: P_2O_5: K_2O +1 t ha-1 poultry manure), T11 (½ N: P_2O_5: K_2O + 6 t ha^{-1} compost), T_{12} (¾ N: P_2O_5: K_2O + 3 t ha^{-1}. compost) and T_{13} (control) with three replications. In the study, maximum shelf life (8.67 days) was recorded in T6 (¾ N: P_2O_5: K_2O + 1.5 t ha^{-1}. vermicompost) and maximum organolaptic test score out of ten (7.72 Score) was detected in T_2 (6 t ha^{-1}. vermicompost) while the maximum vitamin C (75.00 mg/100gm) and vitamin A (13.57 mg/g) were detected in T_5 (½ N: P_2O_5: K_2O + 3 t ha^{-1} vermicompost)in green leaf of Broad Leaf Mustard.

Keywords: Broad Leaf Mustard; Organic; Conventional; Post harvest; Quality;

Introduction

Broad leaf mustard (*Brassica juncea var. rugosa*) is known as Mustard green also in some countries. Broad Leaf Mustard (BLM), comprises under cruciferae family, 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 sources of several vitamins and minerals. Cooler climatic condition is most suitable for its cultivation. It is mainly grown as a winter season crop in Terai, as a summer season crop in the higher hills. In cooler climatic conditions, the quality of the leaves becomes better as compared to warmer climatic conditions. Although it can be grown in wide range of soils, loamy soil, with higher organic content and water holding capacity, is preferred [1].

Generally broad leaf mustard (BLM) has been producing mainly for local consumption and local markets. Specially, it is highly popular in urban and pari urban areas of Nepal. Broad Leaf Mustard is also consumed in the form of fermented product locally known as a "Gundruk" which is most popular and favorite Nepalese 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 [2]. Broad leaf mustard has cultivated in an area of 13,191 ha of land of Nepal with an average national production of 160,761 mt and productivity 12.19 mt ha^{-1}.

Increased cost of chemical fertilizers and awareness on environmental pollution has necessitated the use of organic fertilizers for the development of more efficient fertility management program. Organic farming is an environmentally friendly and low cost input. Organic manuring is the best technology for the better soil and crop productivity. It helps to improve biological, physical and chemical characteristic of soil. . Organic manures are fairly good source of nutrient which has directly influence on post harvest quality of agriculture commodities [3, 4]. Also reported that application of organic manures increased the shelf life and post harvest quality of tomato[5]. Also reported similar result in Banana. However, 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 post harvest quality of Broad Leaf Mustard (*Brassica juncea var. rugosa*).

Materials and Methods

Experimental site and treatments

The present studies on organic and conventional nutrient management on post harvest quality of Broad Leaf Mustard (*Brassica juncea var. rugosa*) were carried out in a field at Dakshinkali Municipality-2, Kathmandu, Nepal during the year

2016 - 2018. There were 13 treatments (Table 1) with three replications. The experiment was laid out in a Randomized Complete Block Design Marpha Broad Leaf Mustard variety was selected as a crop of the experiment. The experimental plots size was 2 x 2.5 m^2 consisting 36 plants per plot.

Table1: Treatments Combination

Treatments	Sources of Nutrients	
T_1	Farm Yard Manure	24 t. ha^{-1} FYM
T_2	Vermicompost	6 t. ha^{-1} vermicompost
T_3	Poultry manure	4 t. ha^{-1}. poultry manure
T_4	Compost	12 t. ha^{-1}
T_5	½ N: P_2O_5: K_2O + vermi.	½ N: P_2O_5: K_2O + 3 t. ha^{-1}. vermi.
T_6	¾ N: P_2O_5: K_2O + vermi.	¾ N: P_2O_5: K_2O + 1.5 t. ha^{-1}. vermi.
T_7	½ N: P_2O_5: K_2O + FYM	½ N: P_2O_5: K_2O + 12 t. ha^{-1}. FYM
T_8	¾ N: P_2O_5: K_2O + FYM	¾ N: P_2O_5: K_2O +6 t. ha^{-1}. FYM
T_9	½ N: P_2O_5: K_2O + poultry manure	½ N: P_2O_5: K_2O + 2 t. ha^{-1}.poultry manure
T_{10}	¾ N: P_2O_5: K_2O + poultry manure	¾ N: P_2O_5: K_2O + 1 t. ha^{-1}. poultry manure
T_{11}	½ N: P_2O_5: K_2O + compost	½ N: P_2O5: K_2O + 6 t. ha^{-1}. compost
T_{12}	¾ N: P_2O_5: K_2O + compost	¾ N: P_2O_5: K_2O + 3 t. ha^{-1}. compost
T_{13}	Control (No nutrient application)	Control (No nutrient application)

Note: Recommended dose of Broad Leaf Mustard: 120: 80: 60 N: P_2O_5: K_2O kg ha^{-1}

Shelf life of green leaf

The harvested leaves of each treatment were brought and kept at room temperature (21° C) on a table. The leaves were visually monitored day by day until the leave turned yellow and have shrinks. Number of days taken by the leaves to turns yellow and collapses were recorded and mean shelf-life in days computed. The study was done in HICAST laboratory.

Organolaptic test of green leaves

The harvested marketable green leaves of each replication were taken and organolaptic test was done. All total 10 consumers were selected for the smell and taste. Selected consumers were cooked as a vegetable and asked to rate in a 0 to 10 scale. And treatment mean was calculated.

Vitamin A and C Analysis

The vitamins in the green leaf of BLM were determined as prescribed by Association of Official Analytical Chemists [6]. The study was done in Biotechnology laboratory, T.U and HICAST laboratory.

Determination of Vitamin A

Place 500 mg of small cut pieces of fresh leaf material into a clean and sterilized mortar .Add 20 ml of 80% acetone and grind the tissue for about 5 min. carefully transfers the resulting green liquid to a Buchner funnel containing a layer of what man no 1 filter paper. Filter the extract using suction. Repeat grinding of the pulp with 15 ml of 80 % acetone. After 5 min filter the second extract as before into the flask containing the first extract. After the second extraction the tissue was devoid for chlorophyll. Then filter the slurry into the flask containing other filtrates. Whit 5 ml of 80% acetone rinses the mortar and sides of the funnel to insure that all chlorophyll is collected. For convenience of calculating the amount of chlorophyll present, adjust the final volume of the filtrate to 50 ml by adding sufficient 80 % acetone. Add determined the absorbance at 663 nm by spectrophotometer and calculated amount of vitamin A in mg/g.

Determination of Vitamin C (Ascorbic acid)

Fresh leaves marketable of Broad leaf mustard were harvested of each treatment and their replications. They were collected and taken to the lab. Each replications were bundled and identified correctly and they were been put to the oven and 80 Degree Celsius temperature was maintained. They were put in the oven for dried and grinded.

5ml of standard ascorbic acid solution was taken and 5 ml of HPO_3 was added. A micro burette was filled with the dye. It was titrated with the dye solution to a pink colour which should persist for 15 sec. Then the dye factor was determined.

10 gram of powdered form of leaf sample was taken, blended with 3% HPO_3 and make up to 100 ml with HPO_3. After that it was filtered.

An aliquot (5 ml) of the HPO_3 extract of the sample was taken and titrated with the standard dye to a pink end point which should persist for at least 15 sec. Then it was titrated rapidly and made a preliminary determination of the titre. In the next determination, most of the dye required was added and titrated accurately.

Vitamin C was determined by 2, 6-Dichlorophenol- Indo phenol Visual Titration Method.

Result And Discussion

Shelf life of green leaves

Shelf life at room temperature could be markedly influenced by the various combinations of nutrients which are presented below (Table 2). The maximum shelf life (about 9 days) was recorded in T6 (¾ NPK + 1.5 t. ha^{-1}. Vermicompost) and minimum shelf life (about 6 days) was recorded in T_{13} (Control). This might be due to the fact that application of vermicompost along with N: P_2O_5: K_2O must have due to mineralization of organic nitrogen thus enhancing shelf life to the broad leafs mustard plant. Similar types of results were found by in tomato and Banana [2, 5].

Table 2: Effect of organic and conventional nutrient management in Shelf life and Organolaptic Test of Broad Leaf Mustard (Please follow the treatment combination pattern as mentioned in table1.)

Treatments		Shelf life (days)	Organolaptic test (0 to 10 scale)
T_1	24 t. ha^{-1} Farm Yard Manure (FYM)	6.83	6.5
T_2	6 ton/ha. Vermicompost	8.5	7.72
T_3	4 t. ha^{-1}. Poultry Manure	7.17	6.5
T_4	12 t. ha^{-1}	7.5	6.2
T_5	½ N: P_2O_5: K_2O + 3 t. ha^{-1}. Vermi.	8	6.47
T_6	¾ N: P_2O_5: K_2O + 1.5 t. ha^{-1}. Vermi.	8.67	6.5
T_7	½ N: P_2O_5: K_2O + 12 t. ha^{-1}. FYM	6.83	6.38
T_8	¾ N: P_2O_5: K_2O +6 t. ha^{-1}. FYM	6	6.54
T_9	½ N: P_2O_5: K_2O + 2 t. ha^{-1}. Poultry Manure.	7.5	6.27
T_{10}	¾ N: P_2O5: K_2O + 1 t. ha^{-1}. Poultry Manure	7	6.67
T_{11}	½ N: P_2O_5: K_2O + 6 t. ha^{-1}. Compost	6.17	6.38
T_{12}	¾ N: P_2O_5: K_2O + 3 t. ha^{-1}. Compost	7.67	6.87
T_{13}	Control	5.5	5.83
LSD (0.05)		1.482	0.4252
P-Value		0.005	<.001
CV% (between treatments)		12.3	3.9
SEM		0.508	0.1457

Organolaptic test of green leaves

Perusal of data given in (Table 2) further revealed that the maximum preference and the rating (average of 10) of taste of BLM were recorded (7.72) in T_2 (6 t.ha^{-1}. Vermicompost) and minimum preference and the rating of taste (5.83) of BLM were recorded in T_{13} (control). This might be due to the fact that application of vermicompost along with NPK must have combination effect to make more testy of green leafs of BLM. Similar experimental finding were obtained by in cabbage and strawberry [4, 7].

Determination of Vitamin C and content in BLM

The maximum vitamin C content (75 mg/100g.) and vitamin A content (13.57 mg/g.) were analyzed in T5(½ N: P_2O_5: K_2O + 3 t. ha^{-1}. Vermicompost) However, the minimum vitamin C content (36 mg/100g.) and vitamin A content (11.42mg/g.) were detected with T_{10} (¾ N: P_2O_5: K_2O + 1 t. ha^{-1}. Poultry Manure) (Table 3).This may be attributed to the fact that vermicompost is a rich source of plant nutrients which could be help to increase vitamin A and C content in BLM. Similar type of experimental findings was obtained by in okra (*Abelmoschus esculentus*) [8, 9].

Conclusions

It is concluded that the treatment T_6 (¾ N: P_2O_5: K_2O + 1.5 t. ha^{-1}. Vermicompost) was found to be effective which has increased the shelf life leaf (about 9 days) however the organolaptic test score out of ten (7.72 Score) was recorded in T2 (6 ton/ha. Vermicompost).Whereas the maximum vitamin C (75.00 mg/100 g) and vitamin A (13.57 mg/g) were determined in T5 (½ N: P_2O_5: K_2O + 3 t.ha^{-1} Vermicompost) in the Broad Leaf Mustard (*Brassica juncea var. rugosa*). Please try to search the function of organic matter substances to improve in the quality by humic acid and fulvic acid. Which organic substances might be supported to improve the shelf life of leaf, vitamins content and organolaptic test.

Table 3: Effect of organic and conventional nutrient management on Vitamin C and Vitamin A of Broad Leaf Mustard

Treatments		Vitamin C (mg/100gm)	Vitamin A (mg/g)
T_1	24 t. ha^{-1} Farm Yard Manure (FYM)	41	13.18
T_2	6 ton/ha. Vermicompost	71.83	11.86
T_3	4 t. ha^{-1}. Poultry Manure	43.83	12.41
T_4	12 t. ha^{-1}	44.33	12.54
T_5	½ N: P_2O_5: K_2O + 3 t. ha^{-1}. Vermi.	75	13.57
T_6	¾ N: P_2O_5: K_2O + 1.5 t. ha^{-1}. Vermi.	67.5	12.89
T_7	½ N: P_2O5: K_2O + 12 t. ha^{-1}. FYM	51.5	12.47
T_8	¾ N: P_2O_5: K_2O +6 t. ha^{-1}. FYM	59.83	13.05
T_9	½ N: P_2O_5: K_2O + 2 t. ha^{-1}. Poultry Manure.	60.67	11.68
T_{10}	¾ N: P_2O_5: K_2O + 1 t. ha^{-1}. Poultry Manure	53.33	11.42
T_{11}	½ N: P_2O5: K2O + 6 t. ha^{-1}. Compost	64.83	13.12
T_{12}	¾ N: P_2O_5: K_2O + 3 t. ha^{-1}. Compost	55.83	12.71
T_{13}	Control	36	12.17
LSD (0.05)		2.127	0.06764
P-Value		<.001	<.001
CV% (between treatments)		2.3	0.3
SEM		0.729	0.02317

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