



## Cultivation of Pearl Millet (*Pennisetum typhoides*, S & H) under Organic Farming for Nutritional Grain Production in Uttar Pradesh

R.A. Singh<sup>1</sup>, P.V. Singh<sup>1</sup>, I.P. Singh<sup>1</sup>, V.R. Chaudhary<sup>1</sup> and R.K. Singh<sup>2</sup>

<sup>1</sup>C.S. Azad University of Agriculture and Technology, Kanpur (U.P.), India

<sup>2</sup>K.V.K. Jalaun (U.P.), India

### Abstract

Field study was undertaken during two consecutive years in rainy season of 2005-2006 to 2006-2007 on denuded soils of village *Baghauri* of district Mainpuri, Uttar Pradesh under “National Agricultural Technology Project” funded by Indian Council of Agricultural Research, New Delhi. The main objective was to utilize organic manure for production of nutritive grains of coarse millet crop of Bajra. The operational area was sandy loam having poor nutritive status. Three treatments i.e., compost 150 qt + mustard cake 100 kg/ha, compost 150 qt + neem cake 100 kg/ha and compost 150 qt + castor cake 100 kg/ha were tested. Bajra cultivar WCC-75 was planted at spacing of 50 cm in rows and 20 cm distance maintained between plants to plant. Application of compost 150 qt + mustard cake 100 kg/ha registered highest grain yield (21.25 q/ha), dry fodder yield (91.00 q/ha) and biomass yield (112.25 q/ha). The lowest grain yield (20.70 q/ha), dry fodder yield (90.00 q/ha) and biological yield (110.70 q/ha) were noted under compost 150 qt + castor cake 100 kg /ha. Compost 150 qt + neem cake 100 kg/ha yielded grains, dry fodder and biological yield between these two limits. Almost similar harvest index (%) was found under all the tested treatments. Therefore, the natural/organic cultivation system of Bajra may be done with the use of compost 150 qt + mustard cake 100 kg/ha.

**Keywords:** *Biomass yield, Cakes, Coarse grain, Compost manure, Natural farming.*

### Introduction

Pearl millet also called in Hindi Bajra, is an important coarse millet crop of India and is second to sorghum in area and production. It is grown practically all over the country and more particularly in dry and semi-dry zones of northern and peninsular India in soils of poorer fertility. It ranks fourth in order of cereals crops and has been considered as the staple food of the common man in the country. Since it is grown, mostly under marginal conditions of moisture and fertility of soil, which coupled with low yielding potentiality of varieties, often results in to very poor per hectare yield. Varieties of Bajra available for cultivation before the introduction of hybrids and improved were tall in nature and poorly responsive towards

improved managements and as such yielding ability was very low. Therefore, the farmers are not followed its cultivation on large scale and they shifted their holding under rice-wheat cropping system. The introduction of dwarf high yielding new plant type of hybrids has opened a new era in Bajra cultivation and increased the yield 10 to 15 time over local improved varieties. Owing to increase in productivity of hybrid Bajra, the farmers also adopted its cultivation during summer season, but not follow the proper agronomical practices especially in organic base system of production. Some efforts have been made by the scientists and reported better results under organic farming.

**\*Corresponding Author:**

**R.A. Singh;**

DOI: <http://dx.doi.org/10.21746/aps.2023.12.2.3>

Page | 5737

In the long term study conducted at Jodhpur, it was found that application of 40 tonnes of farm yard manure/ha once in two years gave the highest moisture use efficiency and grains yield in comparison to 20 t FYM/ha once in year (Singh, et al., 1981). Similarly it makes little difference in yield, whether 20 tones of FYM is applied once in two years and 10 tones of FYM + 10 kg N/ha is supplemented with 10 kg N/ha (inorganic ) every years.

Bajra grains also called "*Balvardhak*" because it contains fiber which helps to the better digestion and reduces indigestion, gasses and acidity. The low amount of carbohydrates in grain, control to the cholesterol and reduce heart diseases. It is also saving from the danger of high blood pressure. The use of Bajra grains control to the blood sugar. The grains use of Bajra strengthened to the bones due to high amount of calcium. Such studies have also been recommended by Pundir (2023). The northern tract of alluvial soil and Bundelkhand region of Uttar Pradesh, having loamy sand, sandy loam, sandy clay loam and light loam of riverine tract and *raker*, *parwa*, *kawar* and mixed *kawar* of Bundelkhand zone of Uttar Pradesh are famous for Bajra cultivation. In early, 1980's Bajra was grown in U.P. on 1 million ha with total production of 0.70 million tones. Since then both area and production have shown a steady decline due to various reasons. In 2019-2020 the Bajra area was reduced to 0.91 million ha with total production of 1.93 million mt. (Anonymous, 2021). Efforts to arrest this decline in area and production did not succeed due to various factors including expansion of rice-wheat cropping system. Mostly farm families are cultivate the Bajra without any use of fertilizers. Few growers use only in scientific made compost, which has poor availability of plant nutrients. Therefore, with the aforementioned points a flexible plan was made on nutritive grains, production through application of organic manure and carried out on degraded land, is the subject matter of this manuscript.

## Materials and Methods

The field study was undertaken during two consecutive years in rainy season of 2005-2006 to 2006-2007 on denuded soils of village *Baghauli* of district Mainpuri, Uttar Pradesh under "**National Agricultural Technology Project**" funded by Indian Council of Agricultural Research, New Delhi. The main objective was to utilize organic manure for production of nutritive grains of *coarse millet* crop of Bajra. The pilot area was sandy loam having pH 7.9, organic carbon 0.20, total nitrogen 0.02%, available P<sub>2</sub>O<sub>5</sub> 7.96 kg/ha and available K<sub>2</sub>O 165 kg/ha. The pH was determined by Electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta, et al., 1962). Total nitrogen was analyzed by Kjendahl's method as discussed by Piper (1950). The available P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were determined by Olsen's method (Olsen, et al., 1954) and Flame photometric method (Singh, 1971), respectively. Three treatment i.e. compost 150 qt + mustard cake 100 kg/ha, compost 150 qt + neem cake 100 kg/ha and compost 150 qt + castor cake 100 kg/ha were tested under natural farming. The Bajra was planted at spacing of 50 cm in rows and 20 cm distance maintained plant to plants in rows. The Bajra was planted in the end of second fortnight of July and harvested after 90 DAP on end of October during both experimental years. Since, the improved cultivar WCC-75 was planted, required 50 kg N + 25 kg P<sub>2</sub>O<sub>5</sub> + 25 kg K<sub>2</sub>O/ha for grain production, which was given by compost 150 q/ha. The mustard, neem and castor cakes were also used in combination of compost to fulfill the plant nutrients and protection from the seasonal insects. The recommended agronomical practices were followed in raising of Bajra. The protective irrigations were given as and when required. The yield data of grain and stover was recorded and summarized.

## Results and Discussion

The pooled data of plant height, grain yield, fodder yield, biological yield and harvest index are presented in Table-1 and discussed here under appropriate heads.



Bajra at compost 150 qt. + mustard cake 100 kg/ha



Bajra at compost 150 qt. + castor cake 100 kg/ha

**(A) Plant Height (cm):** The data noted on plant height have been given in Table-1. It is clear from the results that planting of Bajra crop with compost 150 qt. + mustard cake 100 kg/ha brought out maximum height under pooled results of two years (168.00 cm). Application of compost 150 qt. + castor cake 100 kg/ha displayed minimum height by 167.00 cm. The application of compost 150 qt. + neem cake @ 100 kg/ha showed plant height by 167.80 cm. The variability in plant height was due to variation in available percentage of nitrogen in the cakes. Similar results have also been reported by Singh, *et al.*, (2023) in sorghum.

**(B) Grain Yield (q/ha):** It is clear from the pooled results given in Table-1 that the application of compost 150 qt. + mustard cake 100 kg/ha gave highest yield by 21.25 q/ha, closely followed by compost 150 qt. + neem cake 100 kg/ha (20.85 q/ha). Compost 150 qt. + castor cake 100 kg/ha yielded lowest yield of Bajra by 20.70 q/ha. The variation in nitrogen percentage, which was available in cakes responsible for highest and lower productivity of Bajra grain. Similar observations

have also been reported by Singh, *et al.*, (2023) in sorghum.

**(C) Dry Fodder Yield (q/ha):** The highest dry fodder was weighed under treatment of compost 150 qt. + mustard cake 100 q/ha by 91.00 q/ha. Application of compost 150 qt. + neem cake 100 kg/ha produced 90.10 q/ha, which was almost similar to the T<sub>1</sub> treatment. The lowest fodder yield was recorded under compost 150 qt. + castor cake 100 kg/ha. The highest and lowest dry fodder yield was supported by plant height of respective treatments. Similar observations have also been reported by Singh, *et al.*, (2023) in sorghum crop.

**(D) Biological Yield (q/ha):** The similar trend was also recorded in biological yield of Bajra to the yield level of grain (q/ha) and dry fodder yield (q/ha). Therefore, grain yield and dry fodder yield of Bajra were responsible to maximum and minimum yield of dry biomass of Bajra.

**(E) Harvest Index (%):** Almost similar harvest index (%) was calculated under different tested treatments. The similar grain yield ratio in total biomass production under different treatments was responsible for at

par harvest index. It indicates that the different treatments have similar potential for grain production. Singh, *et al.*, (2023) have also been reported similar results in sorghum crop.

### Conclusion and Recommendation

The application of compost 150 qt + mustard cake 100 kg/ha registered highest grains and

dry fodder yields of Bajra, therefore, farm house holds residing in Bajra growing tract may be advocated for combined application of aforementioned doses of compost and mustard cake and harvest the fruits from newly generated technology of natural farming.

**Table 1:** Effect of different treatments on grains, fodder, biological yield and harvest index (Pooled data of two years)

S. No.	Treatment	Plant height (cm)	Grains yield (q/ha)	Dry fodder yield (q/ha)	Biological yield (q/ha)	Harvest index (%)
1.	Compost 150 Qt + mustard cake 100 kg/ha (T <sub>1</sub> )	168.00	21.25	91.00	112.25	18.93
2.	Compost 150 Qt + neem cake 100 kg/ha (T <sub>2</sub> )	167.80	20.85	90.10	110.95	18.79
3.	Compost 150 Qt + castor cake 100 kg/ha (T <sub>3</sub> )	167.00	20.70	90.00	110.70	18.70

### References

- Anonymous. "Kharif Phasloyan Kee Sagan Paddatiyan." *Publication of Directorate of Agriculture, U.P., Lucknow* (2021): 228.
- Datta, N.P., Khera, M.S. and Saini, T.R. "A rapid colorimetric procedure for determination of organic carbon in soil." *Journal of Indian Society of Soil Sciences* 10 (1962): 67-74.
- Olsen, C.R., Cole, C.V, Watanable, F.S. and Dean, L.A. "Estimation of available phosphorus in soils by extraction with sodium bicarbonate." *U.S.D.A. Circ*, 939 (Washington) (1954): 19.
- Piper, C.S. "Soil and Plant Analysis." *Univ. Adelaide, Aust* (1950).
- Pundir, R. "Mota Anaj ke Sevan Say Rahe Sehatmand. Saptrang." *Danic Jagran* (2023): 12.
- Singh, R.A., Singh, I.P., Yadav, C.K., Singh, R.K. and Singh, M.K. "Sorghum (*Sorghum bicolor* L.) cultivation in ravines affected area with organic farming for nutritional grains production in Uttar Pradesh." *Annals of Plant Sciences* 12.1 (2023): 5689-5693.
- Singh, R.P., Singh, H.P., Daulay, H.S. and Singh, K.C. "Effect of periodical application of nitrogen in organic and inorganic form on the yield of rainfed pearl millet." *Indian J. Agrc. Sci.* 51 (1981): 409-416.
- Singh, T.A. "A laboratory manual for soil fertility and fertilizer." *U.P.Agril. Univ. Pantnagar, Nainital* (1971): 71-74.

**Source of support:** Nil;

**Conflict of interest:** The authors declare no conflict of interests.

### Cite this article as:

Singh, R.A., Singh, P.V., Singh, I.P., Chaudhary, V.R. and Singh, R.K. "Cultivation of Pearl Millet (*Pennisetum typhoides*, S & H) under Organic Farming for Nutritional Grain Production in Uttar Pradesh." *Annals of Plant Sciences*.12.02 (2023): pp. 5737-5740.