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Influence of spacing and organic manures on growth and yield of pearl millet (*Pennisetum glaucoma* L.)

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Abstract
A field experiment was conducted during *Kharif* season (2021) at SMOF (SHIATS Modal Organic Farm), Department of Agronomy, SHUATS, Allahabad (U.P.). The soil of the experimental field is sandy loam in texture, nearly neutral in soil reaction (pH 7.5), the available N, P, K fertilizer is applied through organic fertilizers i.e., Cow manure, Sheep manure, Poultry manure and Vermicompost. The Treatments consisted of 3 different spacing 20 x 15 cm, 30 x 10 cm, 40 x 10 cm and 3 different organic manures FYM 5 t/ha, vermicompost 2 t/ha and Neem cake 0.5 t/ha. The experiment was laid out in Randomized Block Design with 9 treatments and replicated thrice. The results revealed that the application of 30 x 10 cm + Vermicompost 2 t/ha recorded maximum plant height (173.50 cm), Number of leaves/plant (13.30), plant dry weight (47.90 g/plant), number of seeds/ ear head (1579.80), test weight (9.54 g), grain yield t/ha), stover yield (8.19 t/ha) and harvest index was found to be non-significant. Maximum Gross retunes (158437 INR/ha), Net retunes (111361.7 INR/ha) and B:C ratio (2.36) Where also recorded with the treatment with the application of 30 x 10 cm + Vermicompost 2 t/ha.

Keywords: FYM, growth, yield, kharif, vermicompost, neem cake

Introduction
Bajra (*Pearl millet*) the world's hardiest warm season cereal crop is an indispensable arid and semi - arid crop of India cultivated as dual purpose (fodder and grain) crop in over 8.69 m ha ranking fourth among total cereals. Further, the nutritional value of bajra offers much scope to development of value-added products in new health-conscious consumer segments as it contains more fibre and is good for diabetic and heart patients. It is the richest sources of nutrition, especially iron, calcium and zinc among cereals and hence can provide all the nutrients at least cost compared to wheat and rice. Pearl millet (*Pennisetum glaucum* L.) is multipurpose cereal crop belongs to the Poaceae family. It is commonly called as Bajra, Bajri, Sajje, Kambu, Kamban, Sajjaluetc in various Indian local languages. It is commonly used for food, feed, and forage's purpose (Arora *et al*., 2003) [1]. This millet cultivated mostly in semi-arid part of Africa and Asia. In India, pearl millet is a third most important crop grown after riceand wheat. Pearl millet is an important coarse grain cereal generally grown as rainfed crop on marginal lands under low input management conditions. It is adapted to drought and poor soil fertility, but respond well to good management and higher fertility levels. It is generally cultivated in area with rainfall ranging from 150 to 600 mm. It is a dual-purpose crop; its grain is used for human consumption and its fodder as cattle feed. Pearl millet is a small seeded caryopsis. The development of cropping systems such as appropriate inter-row spacing will help crop themselves to compete with weed. Several reports indicated that crops planted in narrow row spacing suppress weed growth more than when planted in wider row spacing. In spite of the crop importance, information on weed management practices in finger millet is limited. Hence, this study aimed at determining the separate and interaction influences of control practices, inter-row spacing and their interactions on yield and weed density of pearl millet.

Material and Methods
The experiment was conducted during *Kharif* season of 2021. The experiment was conducted in Randomized Block Design consisting of nine treatment combinations with three replications and was laid out with the different treatments allocated randomly in each replication. The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.5) with low level of organic carbon (0.28%), available N (225 Kg/ha), P (19.50 kg/ha) and higher level of K (92.00 kg/ha).

The treatment combinations are T1 - 20 x 15 cm + FYM 5 t/ha, T2 - 20 x 15 cm + Vermicompost 2 t/ha, T3 - 20 x 15 cm + Neem cake 0.5 t/ha, T4- 30 x 10 cm + FYM 5 t/ha, T5 - 30 x 10 cm + Vermicompost 2 t/ha, T6 - 30 x 10 cm + Neem cake 0.5 t/ha, T7 - 40 x 10 cm + FYM 5 t/ha, T8 - 40 x 10 cm + Vermicompost 2 t/ha, T9 - 40 x 10 cm + Neem cake 0.5 t/ha. The observations were recorded on different growth parameters at harvest *viz*. plant height(cm), number of nodules per plant, plant dry weight, Number of pods per plant, number of seeds per pod, test weight, grain yield and stover yield.

A. Growth Attributes

At 80DAS, maximum plant height (173.50 cm) was recorded with application of spacing 30 x 10 cm + Vermicompost 2 t/ha which was significantly superior over all other treatments and treatment with application of 30 x 10 cm + FYM 5 t/ha (171.10 cm is statistically at par with treatment of spacing 30 x 10 cm + Vermicompost 2 t/ha. At 80 DAS, maximum number of leaves per plant (13.30) was recorded with application of 30 x 10 cm + Vermicompost 2 t/ha and treatment with application of 30 x 10 cm + FYM 5 t/ha (13.20) and 40 x 10 cm + FYM 5 t/ha (13.10) which were statistically at par with treatment of application of spacing 30 x 10 cm + Vermicompost 2 t/ha. At 80 DAS, maximum plant dry weight (45.90 g/plant) was recorded with application of 30 x 10 cm + Vermicompost 2 t/ha and treatment with application of 30 x 10 cm + FYM 5 t/ha (45.20 g/plant) which were statistically at par with treatment of application of spacing 30 x 10 cm + Vermicompost 2 t/ha.

Table 1: Influence of spacing and organic manure on growth attributes of pearl millet

Treatments	Plant height(cm) 80 DAS	Number of leaves per plant At 80 DAS	Plant dry weight(g/plant) At 80DAS
20 x 15 cm + FYM 5 t/ha	167.30	12.70	42.52
20 x 15 cm + Vermicompost 2 t/ha	168.50	12.80	43.04
20 x 15 cm + Neem cake 0.5 t/ha	163.90	12.30	42.3
30 x 10 cm + FYM 5 t/ha	171.10	13.20	45.20
30 x 10 cm + Vermicompost 2 t/ha	173.50	13.30	45.90
30 x 10 cm + Neem cake 0.5 t/ha	166.20	12.60	42.82
40 x 10 cm + FYM 5 t/ha	170.80	13.10	43.88
40 x 10 cm + Vermicompost 2 t/ha	169.70	13.00	43.50
40 x 10 cm + Neem cake 0.5 t/ha	165.60	12.40	42.60
S.Em(±)	1.04	0.07	0.33
CD (5%)	3.13	0.21	1.00

B. Yield Attributes and Yield

Treatment with application of spacing 30 x 10 cm + Vermicompost 2 t/ha was recorded maximum number of ear head per plant (1.00) and minimum with 20 x 15 cm + FYM 5 t/ha (1.00). There is no significant difference between the treatments. Treatment with application of spacing 30 x 10 cm + Vermicompost 2 t/ha was recorded maximum number of grains per ear head (1579.80) which was significantly superior over all other treatments and treatment with of application of spacing 30 x 10 cm + FYM 5 t/ha (1569.60) which were statistically at par with the treatment with spacing 30 x 10 cm + Vermicompost 2 t/ha. Treatment with application of spacing 30 x 10 cm + Vermicompost 2 t/ha was recorded maximum test weight (9.54 g) which was significantly superior over all other treatments and treatment with of application of spacing 30 x 10 cm + FYM 5 t/ha (9.45 g) and 40 x 10 cm + FYM 5 t/ha (9.15g) which were statistically at par with the treatment with spacing 30 x 10 cm + Vermicompost 2 t/ha. Treatment with application of spacing 30 x 10 cm + Vermicompost 2 t/ha was recorded maximum grain yield (3.72 t/ha) which was significantly superior over all other treatments and treatment with of application of spacing 30 x 10 cm + FYM 5 t/ha (3.31 t/ha), 40 x 10 cm + FYM 5 t/ha (3.16 t/ha), 40 x 10 cm + Vermicompost 2 t/ha (3.10 t/ha) and 20 x 15 cm + Vermicompost 2 t/ha (3.04 t/ha) which were statistically at par with the treatment with spacing 30 x 10 cm + Vermicompost 2 t/ha. Treatment with application of spacing 30 x 10 cm + Vermicompost 2 t/ha was recorded maximum stover yield (8.19 t/ha) which was significantly superior over all other treatments and treatment with of application of spacing 40 x 10 cm + FYM 5 t/ha (7.79 t/ha) and 20 x 15 cm + Vermicompost 2 t/ha (7.42 t/ha) which were statistically at par with the treatment with spacing 30 x 10 cm + Vermicompost 2 t/ha. Among the four spacings, plants grown with 20 cm× 10 cm spacing recorded significantly higher grain yield and straw yield (2,227 and 4,349 kg/ha, respectively) followed by 30 cm × 5 cm (1,953 kg/ha and 3,986 kg/ha, respectively) and low grain and straw yield was observed in 10 cm× 5 cm (1,621 and 3,426 kg/ha, respectively). Nandini *et al.* (2019) [4].

Table 2: Influence of spacing and organic manure on Yield attributes and yield of pearlmillet

Treatments	Number of ear head/plant	Number of grains/ear	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
20 x 15 cm + FYM 5 t/ha	1.0	1441.10	8.52	2.85	6.94	29.05
20 x 15 cm + Vermicompost 2 t/ha	1.0	1453.10	8.60	3.04	7.42	29.02
20 x 15 cm + Neem cake 0.5 t/ha	1.0	1315.80	8.33	2.78	5.86	32.18
30 x 10 cm + FYM 5 t/ha	1.0	1569.60	9.45	3.31	7.09	29.81
30 x 10 cm + Vermicompost 2 t/ha	1.0	1579.80	9.54	3.72	8.19	32.23
30 x 10 cm + Neem cake 0.5 t/ha	1.0	1422.40	8.43	2.74	6.69	29.00
40 x 10 cm + FYM 5 t/ha	1.0	1491.30	9.15	3.16	7.79	28.91
40 x 10 cm + Vermicompost 2 t/ha	1.0	1461.80	8.89	3.10	7.17	29.96
40 x 10 cm + Neem cake 0.5 t/ha	1.0	1411.30	8.71	2.81	5.94	32.10
S.Em (±)	0.00	28.97	0.23	0.20	0.28	1.95
CD (5%)	-	86.85	0.68	0.59	0.85	-

Conclusion

It is concluded that application of 30 ×10 cm + Vermicompost 2 t/ha was recorded significantly higher grain yield (3.72 kg/ha), higher gross returns (INR 158437), net returns (INR 111361.7), B:C ratio (2.36) as compared to other treatments. Therefore it is suggested to farmers in order to increase pearlmillet growth and yield.

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