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Kaluram Dangi
Department of Agronomy, A.K.S. University, Satna, Madhya Pradesh, India

PK Bagri
Assistant Professor, Department of Agronomy, A.K.S. University, Satna, Madhya Pradesh, India

T Singh
Professor and Head, Department of Agronomy, A.K.S. University, Satna, Madhya Pradesh, India

Corresponding Author:
PK Bagri
Assistant Professor, Department of Agronomy, A.K.S. University, Satna, Madhya Pradesh, India

Effect of different organic sources of nutrients on growth, yield and economics of barley (*Hordeum vulgare* L.)

Kaluram Dangi, PK Bagri and T Singh

Abstract
A field experiment was conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23^0 58' N and longitude of 80 ^{0} 81' East in kymore plateau of M.P. The experiment consisted of 12 treatments in randomized block design with 3 replications *viz*; T_1. Control, T_2. Beejamrutha 1000 ml/hac + FYM 100%, T_3. Beejamrutha 1000 ml/hac + Vermicompost 100%, T_4. Beejamrutha 1000 ml/hac + FYM 100% + Vermicompost 100%, T_5. Beejamrutha 1000 ml/hac + FYM 50%, t_6. Beejamrutha 1000 ml/hac + Vermicompost 50%, t_7. Beejamrutha 1000 ml/ha + FYM 50% + Vermicompost 50%, T_8. Beejamrutha 1000 ml/ha + FYM 75% + Vermicompost 100%, T_9. Beejamrutha 1000 ml/ha + FYM 100% + Vermicompost 75%, T_{10}. Beejamrutha 1000 ml/ha + FYM 75% + Vermicompost 25%, T_{11}. Beejamrutha 1000 ml/ha + FYM 25% + Vermicompost 75%, T_{12}. Beejamrutha 1000 ml/ha + FYM 75% + Vermicompost 75%. Beejamrutha 1000 ml/ha + FYM 10 t + vermicompost 5 t/ha (T_4) resulted in significantly higher plant height as well as number of leaves per plant over other treatments at every stage of observations. Thus, at 90 days stage, the maximum height was 88.20 cm and 7.78 leaves/plant under T_4. The second-best treatment was Beejamrutha + FYM 10 t + VC 3.75 t/ha. Application of Beejamrutha 1000 ml/ha + vermicompost 5 t/ha + FYM 10 t/ha (T_4) resulted in significant enhancement in all the yield attributing parameters over all other fertility treatments. The maximum effective tillers were 85.8/m length, 4.84 spikes/plant, 9.83 cm length of spike, 64.28 grains/spike, 43.46 g test weight and 11.20 g seed weight /plant.

Keywords: utilization, nutrients, productivity and wheat organic nutrients

Introduction
Barley (*Hordeum vulgare* L) is an important rabi cereal crop in India. It has low cost of production and input requirement, so it is preferred by resource poor farmers in the country. Barley is a nutritious and easily digestible cereal with 8-10% protein, 69.6% carbohydrate, 1.3% fat, 3.9% crude fiber, 1.5% ash, 26 mg calcium, 215mg phosphorus, 1.2% minerals and 336 calorific values. In India, during 2019-20, Barley occupied nearly 7.72 lakh hectare area producing nearly 17.26 lakh tons grain, with a productivity of 2522 kg/ha Anonymous (2021) [1].
The crop needs less water and is more tolerant to salinity and alkalinity condition than other winter cereals. The crop possessed very high tolerance to drought and salt. The application of FYM in the soil helps in increasing the fertility of the soils as well as physical condition including water holding capacity (Singh et al. 2015) [7]. Plant nutrition plays an important role in growth and productivity of a crop. As barley crop is highly responsive to applied nutrient through various sources, a proper fertility management is an important parameter for optimizing the productivity of this crop.

Materials and Methods
field studies were conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23^0 58' N and longitude of 80 ^{0} 81' East in kymore plateau of M.P. state of India The soil of the experimental unit was sandy loam in texture, neutral in reaction (7.4) having medium in organic carbon (0.43) and available N (176.60 kg/ ha) and medium in phosphorus (12.50 Kg /ha) whereas it was high in available k (200 Kg/ha). The experimental farm lies in humid subtropical zone with an average rainfall from 1077 mm. The mean temperature ranges from 21 °C to 31 °C during summer and rarely goes below 5 °C in winter due to high atmospheric humidity. The experiment consisted of 12 treatments in randomized block design with 3 replications. Wheat was sown in row 22.5 cm apart, using 100 kg/ha seeds.

Results and Discussion

Growth characters

The combined application of Beejamrutha 1000 ml/ha + FYM 10 t + vermicompost 5 t/ha (T_4) resulted in significantly higher plant height as well as number of leaves per plant over other treatments at every stage of observations. Table no 1, at 90 days stage, the maximum height was 88.20 cm and 7.78 leaves/plant under T_4. The second-best treatment was Beejamrutha + FYM 10 t + VC 3.75 t/ha (T_9) and then Beejamrutha + FYM 7.5 t + VC 3.75 t/ha (T_{12}). This increase may be owing to increased supply of multi-nutrients and beneficial microflora from Beejamrutha, vermicompost and FYM (Bagri et al. 2022 and Sunag, 2021) [4, 5].

Yield-attributing

Table No 1 & 2 combined application of Beejamrutha 1000 ml/ha + vermicompost 5 t/ha + FYM 10 t/ha (T_4) resulted in significant enhancement in all the yield attributing parameters over all other fertility treatments. The maximum effective tillers were 85.8/m length, 4.84 spikes/plant, 9.83 cm length of spike, 64.28 grains/spike, 43.46 g test weight and 11.20 g seed weight /plant. These results are in close conformity with observations made by (Yogananda, 2019 Singh, D. and Anil Kumar (2015) [6, 7].

Table 1: Growth parameters and yield-attributes of barley as influenced by organic sources of nutrients

Tr. No.	Treatments	Plant height (cm)			No. of leaves/plant			Effective tillers/m length	Spikes/plant
		30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS		
T_1	Control	25.16	33.14	65.25	2.05	4.38	5.40	58.4	3.02
T_2	Beejamrutha+ FYM (10 t/ha)	27.12	35.17	71.28	2.50	4.57	5.62	63.8	3.28
T_3	Beejamrutha + VC (5 t/ha)	27.50	36.78	71.96	2.55	4.70	5.85	65.7	3.48
T_4	Beejamrutha + FYM 10 t + VC 5 t/ha	30.54	44.76	88.20	4.17	6.90	7.78	85.8	4.84
T_5	Beejamrutha + FYM 5 t/ha	26.00	34.28	69.98	2.13	4.42	5.40	60.3	3.10
T_6	Beejamrutha + VC 2.5 t/ha	26.18	34.95	71.28	2.25	4.48	5.46	62.0	3.18
T_7	Beejamrutha + FYM 5 t + VC 2.5 t/ha	28.12	38.83	74.15	3.15	5.10	6.13	71.6	3.79
T_8	Beejamrutha + FYM 7.5 t + VC 5 t/ha	28.48	40.36	77.35	3.19	5.20	6.24	75.8	3.98
T_9	Beejamrutha + FYM 10 t + VC 3.75 t/ha	29.52	43.52	86.16	3.82	5.95	6.93	82.5	4.53
T_{10}	Beejamrutha + FYM 7.5 t + VC 1.25 t/ha	27.91	38.50	73.21	2.78	4.78	5.82	68.7	3.70
T_{11}	Beejamrutha + FYM 2.5 t + VC 3.75 t/ha	28.20	40.22	76.55	3.10	5.11	6.24	73.2	3.88
T_{12}	Beejamrutha + FYM 7.5 t + VC 3.75 t/ha	29.43	41.26	77.50	3.55	5.56	6.60	78.9	4.25
	SEm +	0.38	0.70	0.79	0.12	0.22	0.25	0.72	0.16
	C.D. (P=0.05)	1.11	2.02	2.28	0.34	0.63	0.72	2.07	0.46

Table 2: Yield-attributes, yield, economics and quality of barley as influenced by organic sources of nutrients

Tr. No.	Treatments	Length of spike (cm)	Grains/ spike	Seed weight/ plant (g)	Test weight (1000-grains) (g)	Harvest index (%)	Grain yield (q/ha)	Straw yield (q/ha)	Grain protein (%)	Net income (Rs./ha)	B:C ratio
T_1	Control	6.10	49.89	8.12	40.05	31.05	20.65	45.85	9.76	40860	2.59
T_2	Beejamrutha+ FYM (10 t/ha)	7.13	52.93	8.36	40.73	33.87	28.96	56.54	11.13	55859	2.52
T_3	Beejamrutha + VC (5 t/ha)	7.69	53.50	8.72	40.82	33.28	29.51	59.15	11.40	57770	2.58
T_4	Beejamrutha + FYM 10 t + VC 5 t/ha	9.83	64.28	11.20	43.46	35.48	33.78	61.43	13.22	60808	2.30
T_5	Beejamrutha + FYM 5 t/ha	6.58	50.93	8.17	40.17	34.13	27.90	53.85	10.80	57410	2.81
T_6	Beejamrutha + VC 2.5 t/ha	6.96	51.37	8.26	40.52	34.38	28.36	54.12	10.94	58817	2.86
T_7	Beejamrutha + FYM 5 t + VC 2.5 t/ha	8.37	55.92	9.10	41.54	33.93	30.15	58.70	12.06	59645	2.63
T_8	Beejamrutha + FYM 7.5 t + VC 5 t/ha	9.05	58.53	9.55	42.12	34.26	30.72	58.90	12.47	53881	2.22
T_9	Beejamrutha + FYM 10 t + VC 3.75 t/ha	9.45	64.00	10.92	42.92	35.70	32.45	58.45	13.10	59020	2.34
T_{10}	Beejamrutha + FYM 7.5 t + VC 1.25 t/ha	7.98	54.87	8.94	41.48	34.44	30.10	57.30	11.83	59355	2.62
T_{11}	Beejamrutha + FYM 2.5 t + VC 3.75 t/ha	8.79	57.95	9.18	41.95	34.39	30.26	57.72	12.24	59877	2.63
T_{12}	Beejamrutha + FYM 7.5 t + VC 3.75 t/ha	9.22	60.10	10.27	42.55	34.59	32.10	60.70	12.85	60695	2.46
	SEm +	0.29	0.97	0.31	0.68	0.52	0.60	1.28	0.09	--	--
	C.D. (P=0.05)	0.83	2.80	0.90	1.98	1.50	1.74	3.70	0.26	--	--

Economical

Treatments, T_4 having Beejamrutha + FYM 10 t + VC 5 t/ha resulted in maximum net income up to Rs.60808/ha with B:C ratio 2.30. This was closely followed by T_{12} (Rs.60695/ha with 2.46 B:C ratio) and then T_{11} (Rs.60695/ha with 2.63 B:C ratio).

Conclusion

Based on one year field experimental data, it is concluded that amongst the applied organic sources of nutrients, Beejamrutha 1000 ml/ha + FYM 10 t/ha + vermicompost 5 t/ha (T_4) proved the best treatment for growing barley var. JB-1 for Kymore plateau (Satna region) of Madhya Pradesh.

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