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Performance of Barley (*Hordium vulgare* L.) crop through Integrated nutrient feeding in alluvial soils of Agra

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Abstract

The field experiment was conducted during Rabi season 2022-2023 at the Research Farm of Deptt. Of Agricultural Chemistry and Soil Science R.B.S. College Bichpuri, Agra. To evaluate the performance of barley crop with integration of organic and inorganic sources of nutrient viz T_0 (Control), T_1 FYM 5t/ha, T_2 (Vermicompost 5t/ha), T_3 (N100 P60 K40 kg/ha), T_4 (N50 P30 K20 kg/ha+ FYM 5t/ha) and T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha). The result indicated that the different integrated nutrient management treatment have positive response. Application different treatment showed significant effect of plant height, number of tillers per plant, spike length, grains per spike, 1000 grain weight, yield both grain and straw, protein content in grain and NPK content and uptake in grain and straw. The maximum value recorded under T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) followed by T_4, T_3, T_2, T_1 and minimum under T_0 (control) treatment. The T_5 treatment have produces 52.5 q/ha grain and 97.25 q/ha straw yield as comparison to control.

***Key word**: Barley ,growth, Yield ,Uptake of nutrient and INM*

Introduction

Barley (*Hordium vulgare* L.) crop is a member of grass family is an oldest and major cereal grain crop cultivated globally. In India barley is an important cereal crop in winter after wheat both area and production. Barley crop also known as poor man crop, grown in poor fertile soil, very hard in nature. Nutritional point of view the barley is superior to wheat because it has higher protein and lysine content and higher digestibility and also used for malting purpose. Malted barley is mostly used in beer industry. Barley crop generally grown in residual soil because their productivity is very low. The integrated use of nutrient both organic and inorganic sources improve the productivity of barley crop in comparison to traditional cultivation. The nutrient management practices are important factor for enhancing the crop productivity of our country and states.

Materials and Methods

The research experiment was conducted at the research farm of Deptt. Of Agricultural Chemistry and Soil Science R.B.S. College Bichpuri, Agra during Rabi season 2022-2023. The climate of this region was semi-arid and rain fall received manly July to September, the mean annual rainfall of Agra is 650 mm. The soil of experimental field was sandy loam in texture. The experiment was tested with six integrated nutrient management viz. T_0 (Control), T_1 FYM 5t/ha, T_2 (Vermicompost 5t/ha), T_3 (N100 P60 K40 kg/ha), T_4 (N50 P30 K20 kg/ha+ FYM 5t/ha) and T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) in randomized Block Design with four replication. The seed variety R.D.-2035 was sown in furrow and fertilizer was applied as per treatment below the seed at the time of sowing. The soil sample of the field collected before sowing and after harvest of crop and cultural operation done during crop period, all parameter ware also recorded during experimentation. The physic-chemical property of soil the pH 8.4, EC 1.6 dS/m at 25^{0C}, organic carbon 0.04 %, available nitrogen 145.5 kg/ha, available phosphorus 17.0 kg/ha, available potash 185 kg/ha.

Result and discussion

Growth character

The data of plant height and number of tillers per plants of barley crop are summarized in (Table 1). The result indicated that the plant height and number of tillers per plant significantly increased as comparison to control. The tallest plant and number of tillers were observed under T_5 treatment followed by T_4, T_3, T_2, T_1 and minimum under T_0 (control). Similar result was also observed by **Ravanker *et al.* (2005) and kumpawat *et al*. (2009) and Kumar *et al*. (2010).**

Yield attributes

The data related to yield attributing character i.e. spike length, number of grans/spike, and 1000 grain weight as influenced by nutrient management practices are summarized in (Table 1). The result revels that the application of nutrient management treatment significant affected yield attributing character of barley crop in comparison to control. The yield attributing character progracevily increased with the application of nutrients. The highest value under T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) treatment as comparison to T_4 (N50 P30 K20 kg/ha+ FYM 5t/ha), T_3 (N100 P60 K40 kg/ha), T_2 (Vermicompost 5t/ha), T_1 FYM 5t/ha and lowest under T_0 (Control), respectively. The combined application of organic and inorganic sources of nutrient improve the fertility status of soil and improve the availability of nutrient and enhancing the yield attributing character of barley crop. Similar result were also reported by **Ravanker *et al*. (2005, Yadav and Chhipa (2007) and Kumar *et al*. (2010**)

Table-1 Effect of different treatments on growth and yield of Brley crop

Treatments	Plant height (cm)	No of tiller per plant	Spike length (cm)	No of grains per spike	1000 Grin weight	Grain yield (q/ha)	Straw yield (q/h)	Protein content in grain (%)
T_0 control	72.25	4.75	8.25	50.75	34.75	41.50	73.20	11.09
T_1 FYM 5t/ha	76.25	5.50	8.80	52.50	35.87	44.00	77.25	11.32
T_2 Vermicompost 5t/ha	81.0	6.00	9.27	55.50	36.75	46.00	83.00	11.49
T_3 N100 P60 K40 kg/ha	84.0	6.50	9.87	60.00	37.75	48.00	88.25	11.69
T_4 N50 P30 K20 kg/ha+ FYM 5t/ha	87.0	7.00	10.20	62.50	38.37	50.25	93.00	11.85
T_5 N50 P30 K20 kg/ha + Vermicompost 5t/ha	91.25	7.50	10.65	65.25	39.75	52.50	97.25	11.95
SE m±	1.61	0.199	0.34	0.74	0.412	0.94	2.03	0.012
CD at 5%	3.31	0.41	0.66	1.52	0.85	1.95	4.21	0.025

Grain and straw yield

The yield of both grain and straw of barley crop are summarized in (Table 1) Result indicated that the nutrient management treatments significantly increased the grain and straw yield of barley crop as compared to control. Over all, the treatment T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) gave better performance for enhancing the grain and straw yield as comparison to rest of the treatment. The superiority of the treatment may be arranged T_5> T_4 >T_3> T_2,>T_1 >T_0 in case of yield of barley crop. The combined use of NPK and organic sources of nutrient improve more humus on colloidal complex and gradual release nutrient and improve soil biological environment and improve metabolic activity resulted the availability of more nutrient to plant and improve the grain and straw yield of barley crop. Similar findings were also reported by **Ravanker *et al*. (2005), Yadav and Chhipa (2007), Kumar *et al.* (2010) and Singh and Singh (2017).**

Protein content

The quality parameter i.e. protein content in barley grain (Table 2) are affected by different nutrient management treatments in comparison to unfertilized control. The T_5 treatment gave maximum protein content in comparison to T_4, T_3, T_2, T_1 and lowest under T_0 (control). The nutrient management practice progracevily improve protein content but at par to each other. Similar results were also reported **by Das and Ram (2005) and Singh and Singh (2017).**

Table-2 Effect of different treatments on nutrient content and uptake by Brley crop

Treatments	Nitrogen content (%)		Phosphorus content (%)		Potassium content (%)		Nitrogen uptake (Kg/ha)		Phosphorus Uptake (Kg/ha)		Potassium uptake (Kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_0 control	1.85	0.49	0.19	0.07	0.45	1.58	73.68	36.25	7.93	5.67	18.89	115.75
T_1 FYM 5t/ha	1.87	0.51	0.20	0.09	0.46	1.59	79.16	39.79	8.90	7.54	20.21	123.22
T_2 Vermicompost 5t/ha	1.88	0.53	0.21	0.11	0.47	1.61	84.68	43.99	9.77	9.35	21.97	134.04
T_3 N100 P60 K40 kg/ha	1.89	0.54	0.22	0.13	0.49	1.62	89.89	48.16	10.67	11.71	23.52	143.39
T_4 N50 P30 K20 kg/ha+ FYM 5t/ha	1.91	0.55	0.23	0.14	0.50	1.63	95.35	51.00	11.68	13.50	25.13	152.20
T_5 N50 P30 K20 kg/ha + Vermicompost 5t/ha	1.93	0.56	0.24	0.16	0.51	1.64	100.53	54.46	12.32	13.57	26.78	159.97
SE m±	0.099	0.005	0.011	0.009	0.008	0.007	1.69	1.53	0.22	0.73	0.82	2.54
CD at 5%	0.020	0.011	0.023	0.020	0.018	0.015	3.50	3.17	0.45	1.51	1.70	5.26

Nutrient content

The result of NPK content in grain and straw of barley crop are given in (Table2). It is quite clear that the integrated use of organic and inorganic sources of nutrient improve NPK content in grain and straw significantly over control. The treatment T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) gave better result as comparison to T_4 (N50 P30 K20 kg/ha+ FYM 5t/ha), T_3 (N100 P60 K40 kg/ha), T_2 (Vermicompost 5t/ha), T_1 FYM 5t/ha and lowest value recorded under T_0 (Control). Confirming the findings with those of **Das and Ram (2005), Kumpawat *et al*. (2009), Kumar *et al*.(2010) and Kumar et al.(2018). .**

Nutrient uptake

The various INM treatment significantly enhanced the NPK utilization by barley crop (Table 2).The data further reveled that nutrient management treatment recorded significant higher NPK utilization in comparison to control treatment during the experimentation. The nutrient management treatment T_5 (N50 P30 K20kg/ha + Vermicompost 5t/ha) showed significant better result compared to rest of treatment. The superiority of the various treatment may be arranged as $T_{5>}$ T_4> T_3> T_2> $T_{1>}$ T_0. Integrated nutrient management treatment improve soil fertility and availability of nutrient and increase the growth and yield and finally improve the uptake of more amount of nutrient by barley crop. Similar result reported by **Das and Ram (2005), Kumpawat *et al*. (2009), Kumar *et al*. (2010) and Kumar et al.(2018).**

Conclusion

The deep analysis and evaluation of results of the present study may be concluded that the integrated nutrient management treatment gave better result of growth, yield and uptake of nutrient by barley crop in alluvial soils of Agra.

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