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Nutrient content and their utilization by Barley (*Hordium vulgare* L.) crop as influenced by integrated use of NPK and FYM in alluvial soils of Agra

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Abstract

A field experiment was conducted at Agricultural Research Farm, Department of Agricultural Chemistry and Soil Science R.B.S. College Bichpuri, Agra during *rabi* season 2021-2022. To evaluate the performance of barley crop, with integrated use of NPK and FYM both organic and inorganic sources of nutrients *viz*. T_0 (Control), T_1 (FYM 5t/ha), T_2 (FYM 10 t/ha), T_3 (N40 P30 K20 kg/ha), T4 (N80 P60 K40 kg/ha) and T_5 (N80 P60 K40 kg/ha + FYM 5t/ha). The performances of different nutrient management treatments have beneficial response. Application NPK and FYM showed significant effect of yield both grain and straw and NPK content and uptake by grain and straw. The maximum value recorded under T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) followed by T_4, T_3, T_2, T_1 and minimum under T_0 (control) treatment. The T_5 treatment proves better result interims of yield nutrient content and utilization by barley as comparison to control.

Keyword- Barley, Yield, FYM, NPK content and Uptake

Introduction

Barley (*Hordeum vulgare* L.) comprises a group of grass family Poaceae, it is the fourth most important cereal crop in the world after rice, wheat and maize and it is drought resistance crop widely cultivated along the wheat. Barley is an important cereal crop of India, used as religious purpose and plays a major role not only human food it's also used as animal feed and their industrial value is very high, it is used for malting industry for the preparation of beer. In nutritional point of view the barley is superior to wheat, because comparatively richer in protein and lysine content high digestibility in absence of gluten. The major barley growing states are Rajasthan, Uttar Pradesh, Punjab, Haryana, Bihar, Madhya Pradesh, Gujarat, Himanchal Pradesh, Uttrakhand, Jammu and Kashmir. In India it's grown as secondary crop on marginal poor fertile soil. The fulfillment of demand food grain in our country improves their area and

productivity with the help of improve practices, the present study, the integrated use of NPK and FYM improve the soil fertility status and finally improve the productivity of barley crop.

Materials and methods

The research experiment was conducted at Agricultural Research Farm of Department of Agricultural Chemistry and Soil Science R.B.S. College Bichpuri, Agra during *rabi* season 2021-2022. The climate of Agra falls in semi-arid region and maximum rain fall received the month of 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 nutrient management treatment viz. T_0 (Control), T_1 (FYM 5t/ha), T_2 (FYM 10 t/ha), T_3 (N40 P30 K20 kg/ha), T_4 (N80 P60 K40 kg/ha) and T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) in Randomized Block Design with four replications. The barley seed variety BH-393 was sown in furrow and fertilizer was applied as per treatment below the seed at the time of sowing. The soil sample of the experimental field was collected before sowing and after harvest of crop and all cultural operation done during the experimentation. The data of all character ware also recorded. The physic-chemical property of soil is the pH 8.2, EC 1.5 dS/m at 25^0C, organic carbon 0.03 %, available nitrogen 143.5 kg/ha, available phosphorus 18.0 kg/ha and available potash 182 kg/ha, respectively.

Results and discussion

Grain yield

The data of grain yield of barley crop were recorded at harvest and presented in table.1. The application different integrated nutrient treatment both organic and in organic significantly improve the grain yield of barley crop. The maximum impact on grain yield was recorded under T5 (N80 P60 K40 kg/ha +FYM 5t/ha) treatment as compared to T_4 (N80 P60 K40 kg/ha), T_3 (N40 P30 K20 kg/ha), T_2 (FYM 10 t/ha), T_1 (FYM 5t/ha) treatment, the minimum impact was recorded under T_0 (Control) treatment. Increase grain yield of barley crop due to the mineralization of the nutrient from native sources provide greater availability of nutrients in soil with the application of chemical fertilizer and FYM. Similar results have also been reported by Kumar *et al*. (2010), Kumar *et al*. (2018) and Nagar *et al.* (2020).

Table 1. Effect of different treatments on yield, nitrogen content and uptake by Barley crop

Treatment combination	Grain yield (q/ha)	Straw yield (q/ha)	Nitrogen content (%)		Nitrogen Uptake (kg/ha)	
			Grain	Straw	Grain	Straw
T_0 (Control)	41.25	53.20	1.85	0.49	73.68	36.25
T_1 (FYM 5t/ha)	44.00	57.25	1.87	0.51	79.16	39.79
T_2 (FYM 10 t/ha)	46.33	63.00	1.88	0.53	84.68	43.99
T_3 (N40 P30 K20 kg/ha)	48.40	68.33	1.89	0.54	89.89	48.16
T_4 (N80 P60 K40 kg/ha)	50.25	73.00	1.91	0.55	95.35	51.00
T_5 (N80 P60 K40 kg/ha + FYM 5t/ha)	53.52	77.25	1.93	0.56	11.53	54.46
S.E.m ±	0.54	1.45	0.004	0.002	1.07	0.78
CD (P= 0.05)	1.65	3.46	0.020	0.011	2.90	3.12

Straw yield

The results related to straw yield of barley crop are given in table 1. The straw yield was significant increase in barley straw yield over control with the application of NPK and FYM treatment. This could might be attributed to increase availability of more nutrients in soil. The highest value of straw yield was recorded under T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) treatment in comparison to T_4 (N80 P60 K40 kg/ha), T_3 (N40 P30 K20 kg/ha), T_2 (FYM 10 t/ha), T_1 (FYM 5t/ha) treatment and lowest value were T_0 (Control) treatment. Thus, the result reveals a higher productivity due to combined application of organic and inorganic sources of nutrient. This could be attributed to a sustained availability of major as well as micro nutrient accumulation in soil boost the yield of crop. Similar result reported by Ravanker *et al*. (2009), Kumar *et al*. (2010), Kumar *et al.* (2018) and Nagar *et al*. (2020).

Nitrogen content and uptake

Effect of different nutrient management treatment on nitrogen content and uptake by grain and straw of barley crop (Table1). The nitrogen content and uptake by barley crop was affected by different nutrient management treatment in comparison to unfertilized control. The T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) treatment gave maximum nitrogen content and uptake followed by T_4 (N80 P60 K40 kg/ha), T_3 (N40 P30 K20 kg/ha), T_2 (FYM 10 t/ha), T_1 (FYM 5t/ha) and lowest value recorded under T_0 (Control) treatment. This may be due to the fact that the application of nutrient with combination of organic manure increase the soil fertility and availability of nutrient to plant and accumulate more nitrogen in plant ultimately increase the nitrogen content and uptake in grain and straw. The uptake is directly related to content of nitrogen in grain. The similar results have been given by Kumpawat *et al*. (2009), Kumar *et al*. (2010), Kumar *et al.* (2018) and Singh and Singh (2017).

Table 2. Effect of different treatments on Phosphorus and Potassium content and uptake by Barley crop

Treatment combination	Phosphorus content (%)		Phosphorus uptake (kg/ha)		Potassium content (%)		Potassium uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_0 (Control)	0.19	0.07	7.45	5.6	0.45	1.58	18.8	115.7
T_1 (FYM 5t/ha)	0.20	0.09	8.51	7.5	0.46	1.59	20.2	123.2
T_2 (FYM 10 t/ha)	0.21	0.11	9.4	8.6	0.47	1.61	21.9	134.0
T_3 (N40 P30 K20 kg/ha)	0.22	0.13	10.2	9.3	0.49	1.62	23.5	143.3
T_4 (N80 P60 K40 kg/ha)	0.23	0.14	10.6	10.2	0.50	1.63	25.1	152.2
T_5 (N80 P60 K40 kg/ha + FYM 5t/ha)	0.23	0.16	11.3	11.4	0.51	1.64	26.7	159.9
S.E.m ±	0.005	0.004	0.023	0.031	0.004	0.003	0.42	2.06
CD(P= 0.05)	0.023	0.021	0.041	0.072	0.009	0.008	1.12	5.23

Phosphorus content and uptake

The value of phosphorus content and uptake by grain and straw are summarized in table 2. The various organic and inorganic sources of nutrient treatment significantly enhanced the phosphorus content and uptake in both grain and straw of barley crop in compared to control. The maximum value of phosphorus

content and uptake was recorded under T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) treatment followed by T_4 (N80 P60 K40 kg/ha), T_3 (N40 P30 K20 kg/ha), T_2 (FYM 10 t/ha), T_1 (FYM 5t/ha) and lowest value recorded under T_0 (Control) treatment. The T_5 treatment maintained their superiority over rest of the treatment in case of phosphorus utilization by barley crop. It may be due to the application of organic with inorganic fertilizer improve additional plant nutrient in soil and improve physical and biological environment of soil and produce more available nutrient finally crop consume more nutrient. Similar result has been reported by Ravankar *et al*. (2005), Kumpawat *et al*. (2009), Kumar *et al*. (2010), Kumar *et al.* (2018) and Singh and Singh (2017).

Potassium content and uptake

The result related to potassium content and uptakes by barley crop are summarized in (Table2). The potassium consumption by barley grain and straw was affected by different NPK and FYM treatment. It is quite clear that the nutrient management treatment progressively improved the potassium content and uptake. The highest value recorded under the treatment T_5 (N80 P60 K40 kg/ha + FYM 5t/ha) treatment followed by T_4 (N80 P60 K40 kg/ha), T_3 (N40 P30 K20 kg/ha), T_2 (FYM 10 t/ha), T_1 (FYM 5t/ha) and lowest value recorded under T_0 (Control) treatment the similar findings were also given by Bindia *et al.* (2005), Kumpawat *et al*. (2009, Kumar *et al.* (2018), Singh and Nagar *et al*. (2020).

Conclusion

The combined use of nutrient by different sources both organic and inorganic sources have appeared better utilization to improve crop productivity and consumptions of nutrient by barley. Integrated use of chemical fertilizers with considerable amount of FYM showed increased in yield and uptake as compared application of FYM and chemical fertilizers alone.

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