

Effect of organic and inorganic sources of nutrients on growth attributes of barley crop in Inceptisols of Agra

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Abstract

A field experiment was conducted at the Agricultural Research Farm, R.B.S. College, Bichpuri, Agra, during the rabi seasons of 2023-24 and 2024-25 to evaluate the effect of integrated application of organic and inorganic nutrient sources on growth attributes of barley crop in Inceptisols of Agra. The experiment was laid out in a randomized block design with eight treatments and three replications. The results revealed that the application of @ (75% NPK + 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹) was recorded significantly maximum higher plant height, no. of tillers, ear length, no. of spikelet spike⁻¹, no. of grain ear⁻¹ and test weight of barley crop (83.2, 66.2, 8.04, 42.2, 43.3, 47.9) compared to control (59.1, 50.2, 5.99, 26.5, 30.7, 37.9) respectively.

Keywords: Integrated nutrient management, growth, barley

Introduction

Barley (*Hordeum vulgare* L.), one of the cereal crops, is grown in temperate and subtropical areas of the world. It is the world's fourth important cereal crop after wheat, rice and maize. In India, it accounts for less than one percent area and production of total cereals. It is consumed by poor people as chapati or as sattu and used as cattle feed. Barley is used in malt industry for manufacturing fermented drinks. Barley is an important cereal crop of the world with an annual production of 132 M t from around 528 M ha with an average productivity of 2.5 t ha⁻¹. As indicate above, it is grown in all the countries where wheat can be successfully grown either for food, beverage or animal feed. In India, barley is grown in all the states where wheat crop is grown.

Integrated use of organic manures (FYM, vermicompost, poultry manure, etc.) along with inorganic fertilizers not only reduces environmental pollution but also sustains soil fertility by improving physical, chemical, and biological properties.

Farmyard manure (FYM) is a valuable source of both macro- and micronutrients and helps maintain soil productivity for a longer period compared to sole inorganic fertilizers. The organic matter in FYM enhances chelation of micronutrients, thereby increasing their availability in soil.

Materials and Methods

The field experiment was conducted during the kharif seasons of 2023–24 and 2024–25 at the Agricultural Research Farm, R.B.S. College, Bichpuri, Agra (Uttar Pradesh), India. The experimental soil was sandy loam (Typic Ustochrept) with initial available Zn, Mn, Fe and Cu of 0.82, 9.86, 8.75 and 064 mg kg⁻¹, respectively. The experiment was laid out in a randomized block design with three replications and eight treatments viz. T₁ (control), T₂ (100% NPK), T₃ (75% NPK), T₄ (50% NPK), T₅ (50% NPK + 20 kg ZnSO₄ ha⁻¹), T₆ (50% NPK + 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹), T₇ (75% NPK + 20 kg ZnSO₄ ha⁻¹), and T₈ (75% NPK + 5 t FYM ha⁻¹).

¹ + 20 kg ZnSO₄ ha⁻¹). Combined data of two years revealed that treatment T₈ (75% NPK + 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹). Nitrogen, phosphorus, potassium and zinc were applied through urea, diammonium phosphate, muriate of potash and zinc sulphate accordance with treatments at the time of sowing and barley crop was sown in third week of November respectively. The crop was harvested at physiological maturity and yield data were recorded. The yield attributes of barley crop were recorded at harvest. The data were statistically analyzed using standard procedures of ANOVA at 5% level of significance.

Results and Discussion

Plant height

It could be inferred from (Table 1) that the maximum plant height of barley crop significantly higher the application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ (83.2 cm) compared to (T₁) control (59.1cm) respectively. The percent increase in plant height of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources of nutrients management treatments over control were 7.7, 13.2, 17.8, 23.5, 29.3, 36.7 and 40.8% respectively. These results are in conducted by Singh (2017), Meena *et al.* (2017) and Kumari *et al.* (2024)

Number of tillers

Data presenting in (Table 1) that the application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ recorded significantly higher

number of tillers of barley crop (66.2) compared to (T₁) control (50.2) respectively. The percent increase in number of tillers of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources of nutrients management treatments over control were 9.0, 12.0, 15.9, 19.6, 23.9, 28.2 and 31.9% respectively. Similar results were observed by Singh (2017), Meena *et al.* (2017) and Lal *et al.* (2016).

Ear length

Among the organic and inorganic sources of nutrients management treatments, application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ recorded significantly higher ear length of barley crop (8.04 cm) compared to (T₁) control (5.99 cm) respectively. The percent increase in ear length of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources of nutrients management treatments over control were 11.8, 17.7, 22.6, 26.4, 29.3, 31.7 and 34.2% respectively (Table 1). These results are in consistent with those of Singh and Pandey (2018) and Patel *et al.* (2025b).

Number of spikelet spike⁻¹

Among the organic and inorganic sources of nutrients management treatments, application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ recorded significantly higher No. of spikelet spike⁻¹ of barley crop (42.2) compared to (T₁) control (26.5) respectively. The percent increase in no. of spikelet spike⁻¹ of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources

Table 1: Effect of organic and inorganic sources of nutrients on plant height, no. of tillers, ear length, no. of spikelet spike⁻¹, no. of grain ear⁻¹ and test weight of barley crop

Treatments	Plant height (cm)	No. of tillers (M ⁻¹)	Ear length (cm)	No. of spikelet spike ⁻¹	No. of grain ear ⁻¹	Test weight (gm)
T1	59.1	50.2	5.99	26.5	30.7	37.9
T2	80.8	64.3	7.89	40.3	41.7	46.2
T3	69.6	58.2	7.35	34.2	37.2	42.7
T4	63.7	54.7	6.70	30.7	33.5	41.0
T5	66.9	56.2	7.05	32.2	35.5	41.8
T6	76.4	62.2	7.75	38.2	40.0	44.9
T7	73.0	60.0	7.58	36.0	39.0	43.8
T8	83.2	66.2	8.04	42.2	43.3	47.9
SEm ±	1.05	1.18	0.05	1.16	0.72	1.19
CD @ 5%	2.24	2.53	0.11	2.48	1.55	2.55

of nutrients management treatments over control were 15.7, 21.4, 28.9, 35.8, 44.0, 52.2 and 59.1% respectively (Table 1). Similar findings were observed by Reddy et. al., (2021), Sunag et. al., (2021) and Singh et al. (2024).

Number of grain ear⁻¹

Among the organic and inorganic nutrients management treatments, application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ recorded significantly higher number of grain ear⁻¹ of barley crop (43.3) compared to (T₁) control (30.7) respectively. The percent increase in number of grain ear⁻¹ of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources of nutrients management treatments over control were 9.2, 15.8, 21.2, 27.2, 30.4, 35.9 and 41.3% respectively (Table 1). Similar findings were observed by Reddy et. al., (2021)

Test weight

Application of (T₈) @ 75% NPK + 5t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ recorded significantly higher test weight of barley crop (47.9 gm) compared to (T₁) control (37.9 gm) respectively. The percent increase in test weight of barley crop with: (T₄), (T₅), (T₃), (T₇), (T₆), (T₂) and (T₈) levels of organic and inorganic sources of nutrients management treatments over control were 8.2, 10.3, 12.5, 15.6, 18.5, 21.8 and 26.3% respectively (Table-1). The results obtained in this study with reported by Reddy et. al., (2021), Sunag et. al., (2021).

Conclusion

The study clearly that the integrated application of 75% recommended NPK in combination with 5 t FYM ha⁻¹ and 20 kg ZnSO₄ ha⁻¹ significantly improved the all growth parameters of barley compared to the control. The results suggest that partial substitution of chemical fertilizers with farmyard manure, supplemented by zinc, not only sustains soil fertility but also optimizes nutrient use efficiency. Therefore, this strategy can be considered a viable and sustainable option for improving barley productivity.

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