# "Effect of Row spacing and Organic manures on Growth and Yield of Barley (*Hordeum vulgare)*"


## ABSTRACT

A field experiment was carried out at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P) in Rabi 2021 to study the "Effect of Row spacing and Organic manures on Growth and Yield of Barley (Hordeum vulgare L.)". It was consisting of three combinations of Row spacing & Organic manures. The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice. The experiment results revealed that the growth parameters and yield parameters such as plant height (79.74 cm), dry weight (19.77 g/m2), number of Tillers/m2 (449.40), number of grains/spike (25.33) and test weight (51.33 g) at harvest, significantly recorded in treatment T8 with the application of 22.5 cm+ Neem cake 0.8 t. Moreover, grain yield (5.22 t/ha), straw yield (7.95 t/ha) and harvest index (45.28%), gross return (107801.2 INR/ha), net return (65851.25 INR/ha) and were also recorded significantly higher in the treatment of T8 which is 22.5 cm + Neem cake 0.8 t/ha among all treatments.



***Keywords:*** *Barley, Row spacing, Organic manures, Grain yield.*


## INTRODUCTION

Barley (*Hordeum vulgare L.)* is the fourth most important cereals of the world after wheat, rice and maize accounting 7% of the total worldwide cereal production **(Pal *et al.,* 2012)**. Barley belongs to family Poaceae; tribe Triticeae and genus Hordeum: comprising nearly 350 species, out of which Hordeum consists of about 32 species including the wild and cultivated one. Barley is a diploid with 2n=14 chromosome. Barley is an annual plant that has been selected from wild grasses and grown in environments ranging from the desert of the Middle East to the high elevation of Himalayas **(Hayes *et al.,* 2003)**. However, native place of cultivated barley is still not clear. **Aberg (1940)** reported that the cultivated barley was brought from Eastern Tibet.

Barley is a major source of food for large population of cool and semi-arid areas of the world, where wheat and other cereals are less adapted. In India, it is an important winter cereal crop popularly known as "Jau". India ranks 7th in the world in respect to total area and production. Annual planting area of the country under barley is 6.9 lakh hectares producing nearly 15.52 lakh tonnes of grains with productivity of 22.45 q/ha. The chief barley-growing regions in the country are Himalayas, Central part of eastern Uttar Pradesh, eastern parts of Rajasthan, Madhya Pradesh, Punjab, Haryana and north western part of north Bihar. Recently Rajasthan has taken up as number one barley producing state replacing Uttar Pradesh, followed by states like Madhya Pradesh, Haryana, Himachal Pradesh, Punjab and Bihar.

Barley is also considered as poor man's crop because of its low input demands and it's more adaptability to adverse conditions such as droughts, salinity and alkalinity **(FAO, 2002)**. The water requirement of this crop is lesser and can be grown economically under adverse soil conditions such as salinity **(Malakooti *et al.,* 2005)**. Under adverse environment conditions barley is more productive than other cereals **(Alazmani, 2014)**. It is a major source of food for large population of cool and semi-arid areas of the world, where wheat and other cereals are less adapted. However, due to tolerance to drought and salinity barley has potential to replace wheat crop dominance. Barley is also used for preparing malt syrup, beer, alcohol, vinegar and portion of it is also used as cattle feed. Its flour is also used to make chapattis, sometimes mixed with wheat or gram for preparing better quality chapatis. Grains are roasted and grinded to use it as Satu. Today, barley account for 15% of coarse grains in use. About 73% of world barley is used for animal feed, 22% for malting and 5% for food use. Barley is also cultivated for malting and brewing purposes to get good grain quality.

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In case of wider row spacing, solar radiation that falls between crop rows remains unutilized; plants become crowded and suffer from mutual shading if the row distance is too narrow. Moreover, yield may be reduced in narrow spacing due to increased competition of plants for nutrient and moisture **(Das and Yaduraju, 2011).**

Organic manuring and nitrogen fertilization are considered among the most important cultural practices for increasing barley productivity and improved quality parameters. In crop production, nutrient availability from manure has been recognized for many centuries (Chavarekar et al., 2013). Modern agriculture, which largely depends on chemical fertilizers, pesticides, herbicides etc., though increased production, has adversely affected the soil productivity and environmental quality. During the era of green revolution, spectacular increase in crop yields resulted ~~in~~ primarily from the introduction of the fertilizers responsive high yielding varieties, use of high quantity of chemical fertilizers and pesticides. The heavy use of chemical fertilizers, pesticides and fungicides caused health hazards and environmental pollution apart from imparting resistance to the causal agents against chemical pesticides and fungicides **(Vasant *et al.*, 2012).**

## 2. MATERIALS AND METHODS

The present examination was carried out during *Rabi* 2021-2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, UP, which is located at 25.28°N latitude, 81.54°E longitude and 98 m altitude above the mean sea level. The experiment laid out in Randomized Block Design which consist~~ing~~ of nine treatments with 18 cm+ FYM 5 tons/ ha,18 cm + Neem cake 0.8 t, 18 cm + Vermicompost 2 t, 20 cm + FYM 5 tons ha, 20 cm + Neem cake 0.8 t., 20 cm + Vermicompost 2 t,22.5 cm+ FYM 5 tons /ha , 22.5 cm+ Neem cake 0.8 t 22.5 cm + Vermicompost 2 t.The observations recorded on different growth parameters at harvest viz, plant height (cm), number of tillers per $m^2$ , Plant dry weight , number of tillers per $m^2$, Effective tillers, test weight, grain yield and stover yield and harvest index were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez and Gomez 1984).

### RESULT AND DISCUSSION

**Effect on the growth of Barley.** ~~As can be seen in Table.2,~~ Growth parameters are summarized statistically as shown in Table 2. At 100 DAS, significantly taller plant height (79.44 cm) was recorded with 22.5 cm + Neem cake 0.8 t/ha. However, 22.5 cm + Vermicompost 2 t/ ha, 20 cm + Neem cake 0,8 t/ ha was statistically at par with 22.5 cm+ Neem cake 0.8 t/ ha. The minimum plant height was recorded in the treatment combination of 18 cm + FYM 5 t/ha which is 67.83 cm. Significantly maximum number of tillers/$m^2$ (447,00) was recorded with application of *22.5 cm* + Neem cake 0.8 t/ ha. However, 22.5 cm + Vermicompost 2 t/ ha was statistically at par with *22.5 cm* + Neem cake 0.8 t/ ha. The minimum number of tillers/$m^2$ was recorded in the treatment combination of 18 cm + ~~Fym~~ 5 t/ha which is 374.80 cm. Significantly maximum plant dry weight (19.77 g) was recorded with application of 22.5 cm + Neem cake 0.8 t/ ha. However, 22.5 cm + Vermicompost 2 t/ ha was statistically at par with *22.5 cm* + *Neem cake 0.8 t/ ha*. The minimum plant dry weight was recorded in the treatment combination of 18 cm + ~~Fym~~ 5 t/ha which is 14.15 g. **Ofosu-Anim and Leitch (2009)** reported that spring barley seeds were sown in 120 pots containing a mixture of peat and 180g dry weight of poultry manure, cow dung, chicken manure pellet, sheep manure and horse manure. In this study, organic manures significantly increased plant height and chlorophyll content of leaves over the control plants. The application of inorganic fertilizer increased plant height over ~~chicken~~ manure and compost. In addition, chlorophyll content was higher with inorganic fertilizer than cow dung at six weeks after germination.

**Effect on the yield of barley.** ~~As can be seen in~~ Table 3 showed that yield parameters are summarized statistically. At the time of harvest, significantly Effective tillers/$m^2$ (362.60) was recorded with 22.5 cm + Neem cake 0.8 t /ha. However, 22.5 cm + vermicompost 2 t/ha, 20 cm +Neem cake 0.8 t was statistically at par with 22.5 cm + Neem cake 0.8 t /ha. The minimum Effective tillers/$m^2$, was recorded in the treatment combination of 18 cm + Fym 5 ton / ha which is (289.20). Significantly maximum Number of grains per spike (25.33) was recorded with 22.5 cm + Neem cake 0.8 t /ha application of ?. However, 22.5 cm + vermicompost 2 t/ha, 20 cm +Neem cake 0.8 t / ha was statistically at par with 22.5 cm + Neem cake 0.8 t /ha. The minimum number of grains per spike was recorded in the treatment combination of 18 cm + ~~Fym~~ 5 ton / ha which is (18.67). Significantly maximum test weight (51.33 g) was recorded in the treatment combination 22.5 cm + Neem cake 0.8 t /ha. However, 22.5 cm + vermicompost 2 t/ha, 20 cm +Neem cake 0.8 t / ha statistically at par with 2.5 cm + Neem cake 0.8 t /ha. The minimum test weight was recorded in the treatment combination

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of 18 cm + ~~Fym~~ 5 ton / ha. Significantly maximum grain yield (5.20) was recorded with 22.5 cm + Neem cake 0.8 t /ha application of . However, 22.5 cm + vermicompost 2 t/ha, 20 cm +Neem cake 0.8 t / ha was statistically at par with 22.5 cm + Neem cake 0.8 t /ha. The minimum grain yield was recorded in the treatment combination of 18 cm + FYM 5 ton / ha which is (3.24 t/ha). Significantly maximum Straw yield (7.81 t/ha) was recorded with 22.5 cm + Neem cake 0.8 t /ha application of . However, 22.5 cm + vermicompost 2 t/ha, 20 cm +Neem cake 0.8 t / ha was statistically at par with 22.5 cm + Neem cake 0.8 t /ha. The minimum number of grains per spike was recorded in the treatment combination of 18 cm + FYM 5 ton / ha which is (5.84). Significantly maximum Harvest index % (45.28) was recorded with application of 22.5 cm + Vermicompost 2 t/ha. However, 22.5 cm + Neem cake 0.8 t / ha was statistically at par with 22.5 cm + Vermicompost 2 t/ha. The minimum number of harvest index was recorded in the treatment combination of 18 cm + FYM 5 ton / ha which is (35.72 %). **Chand *et al.* (2018)** reported that application of FYM increased plant height, dry matter accumulation, total number of tillers, chlorophyll content effective tillers, ear length, grains ear$^{-1}$, test weight, grain, stover and biological yield, protein content over control.

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**Table 1:** Organic matter, N, P, K ~~&~~ moisture composition of the FYM and VC used in the experiment.

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| Parameter | FYM | Vermi compost | Neem cake |
|---|---|---|---|
| Total N (%) | 1.77 | 1.26 | 5.22 |
| Available P (%) | 0.62 | 0.41 | 1.08 |
| Available K (%) | 2.55 | 2.24 | 1.48 |
| Moisture content (%) | 20 | 14 | 10 |

**Table 2**. Effect of Row Spacing and Organic manures on growth attributes of Barley

| Treatment combination | At 100DAS | | |
|---|---|---|---|
| | Plant Height (cm) | Number of Tillers/m$^2$ | Plant dry weight (g/plant) |
| 1- 18 cm + FYM 5 t/ ha | 67.83 | 374.80 | 14.15 |
| 2- 18 cm + Neem cake 0.8 t/ha | 70.16 | 396.40 | 17.28 |
| 3- 18 cm + Vermicompost 2 t/ha | 69.34 | 380.60 | 15.43 |
| 4- 20 cm + Fym 5 t/ ha | 71.42 | 389.00 | 16.66 |
| 5- 20 cm + Neem cake 0.8 t/ha | 75.77 | 420.60 | 18.55 |
| 6- 20 cm + Vermicompost 2 t/ ha | 74.39 | 410.20 | 18.34 |
| 7- 22.5 cm + Fym 5 t/ ha | 72.68 | 391.13 | 17.59 |
| 8- 22.5 cm + Neem cake 0.8 t/ha | 79.44 | 449.40 | 19.77 |
| 9- 22.5 cm + Vermicompost 2 t/ ha | 76.25 | 447.00 | 19.52 |
| F-Test | S | S | S |
| Sem (±) | 2.211 | 4.69 | 0.51 |
| CD (5%) | 6.22 | 14.07 | 1.52 |

**Table 3.** Effect of Row spacing and Organic manures on yield attributes of Yellow Barley.

| Treatment combination | At Harvest | | | | | |
|---|---|---|---|---|---|---|
| | **No. of Effective tillers** | **No. of grains/spike** | **Test weight(g)** | **Grain yield (t/ha)** | **Straw yield (t/ha)** | **Harvest Index (%)** |
| 1 | 289.20 | 18.67 | 43.67 | 3.24 | 5.84 | 35.72 |
| 2 | 315.60 | 20.42 | 46.12 | 3.56 | 6.27 | 37.51 |
| 3 | 293.66 | 18.54 | 44.58 | 3.28 | 5.96 | 35.58 |
| 4 | 281.80 | 19.38 | 45.75 | 3.49 | 6.02 | 37.50 |
| 5 | 342.20 | 23.11 | 49.66 | 5.01 | 7.33 | 47.51 |
| 6 | 333.60 | 22.86 | 48.41 | 4.43 | 6.59 | 44.92 |
| 7 | 321.00 | 21.29 | 47.29 | 4.26 | 6.48 | 43.68 |
| 8 | 362.60 | 25.33 | 51.33 | 5.22 | 7.95 | 44.87 |
| 9 | 350.07 | 24.15 | 50.04 | 5.20 | 7.81 | 45.28 |
| F-Test | S | S | S | S | S | S |
| Sem (±) | 1.63 | 0.57 | 0.62 | 0.16 | 0.32 | 2.50 |
| CD (5%) | 4.89 | 1.71 | 1.87 | 0.47 | 0.96 | 7.48 |

## CONCLUSION

It is concluded that, treatment 9 with 22.5 cm + Neem cake 0.8 t/ha had performed better in growth and yield parameters. As it is was more productive it can be recommended to farmers after further ~~trails~~.

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