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# Effect of Different Varieties and Row Spacing on Growth and Yield of Pearl Millet (*Pennisetum glaucum* L.)

***Sudheer Ghuraiya[1*], Rajesh Singh[2] and Ekta Singh[3]***

*[1]M.Sc. Scholar, Department of Agronomy, NAI, SHUATS, Prayagraj, (Uttar Pradesh), India.*
*[2]Assistant Professor, Department of Agronomy, NAI, SHUATS, Prayagraj, (Uttar Pradesh), India.*
*[3]Ph.D. Scholar, Department of Agronomy, NAI, SHUATS, Prayagraj, (Uttar Pradesh), India.*

*(Corresponding author: Sudheer Ghuraiya*)*
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**ABSTRACT: A field experiment was conducted during Zaid (2021) at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.). The soil was sandy loam in texture, nearly neutral in soil reaction (pH 6.7). Medium in organic carbon (0.72%), available nitrogen (114.8 kg ha$^{-1}$), available phosphorus (17.14 kg ha$^{-1}$), available potassium (156.2 kg ha$^{-1}$). The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice. The treatments which are with $T_1$: 30 cm × 15 cm + JBV-2, $T_2$: 45 cm × 15 cm + JBV-3, $T_3$: 60 cm × 15 cm + JBV-4, $T_4$: 30 cm × 15 cm + JBV-3, $T_5$: 45 cm ×15 cm + JBV-4, $T_6$: 60 cm × 15 cm + JBV-2, $T_7$: 30 cm × 15 cm + JBV-4, $T_8$: 45 cm × 15 cm + JBV-2, $T_9$: 60 cm × 15 cm + JBV-3. The results showed that plant height (192.1 cm), dry weight (1.17 g/plant), crop growth rate (22.52 g$^{-1}$ (m$^2$)$^{-1}$ plant), Relative growth rate (0.027) leaf area index (4.41) and Ear head length (29.72/plant) were found significantly higher with 45cm × 15 cm+ JBV-4. Maximum seed yield (2.51 t ha$^{-1}$) and Stover yield (6.30 t ha$^{-1}$) were significantly recorded with the application of 45cm × 15 cm + JBV-4 compared to all other treatments.**

**Keywords:** Varieties, Spacing, Nitrogen, Phosphorus, Potassium, Pearl millet.

## INTRODUCTION

Bajra (pearl millet), the most resilient warm-season cereal crop in the world, is an indispensable arid and semi-arid crop of India, cultivated as a dual-purpose crop (forage and grain) over 8.69 million hectares, ranking fourth among total grains. In addition, the nutritional value of bajra offers a lot of room for the development of value-added products in new segments of health-conscious consumers, as it contains more fibre and is good for diabetic and heart patients. It is the richest source of nutrition, especially iron, calcium and zinc among grains and therefore can provide all nutrients at minimal cost compared to wheat and rice. Millet (*Pennisetum glaucum* L.) is the most important crop in parts drier than the semi-arid tropics and accounts for almost half of the global production of millet species among the different cultivated millet species (Singh *et al*., 2017; Vinoth and Ravindhran, 2017).

Pearl Millet has been reported to have many nutritional and medical functions (Yang *et al*., 2012). Pearl Millet (*Pennisetum glaucum* L.) is a versatile cereal belonging to the Poaceae family. It is commonly referred to as Bajra, Bajri, Sajje, Kambu, Kamban, Sajjaluetc in various local Indian languages. It is commonly used for food, feed and fodder (Arora *et al*., 2003).

Due to its excellent nutritional properties and resilience to climate change, pearl millet, along with other millets, is renamed Nutri-cereal (Gazette of India, No. 133 of April 13, 2018) for production, consumption and trade and included in the public distribution system. Weather recommendations for pearl millet are generally made based on calendar day or soil temperature (Andrews *et al.*, 1998). Timely sowing of crops generally ensures sufficient time for root development and vegetative growth for optimum harvest of available soil nutrients and radiant energy (Soler *et al*., 2008).

Delayed sowing decrease in values of all parameters (Iping, 1997). Pearl millet has differentiated into many ecotypes due to different types of environmental isolation or different cropping systems (Kurauchi *et al*., 2000). Yield can be increased by identifying more varied yields and appropriate planting times (Khan *et al*. 2009); (Arif *et al*., 2001).

## MATERIALS AND METHODS

A field experiment was conducted during Zaid season 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.) which is located at 25°39′42″N latitude, 81°67′56″E longitude and 98 m altitude above the mean sea level, during Zaid season 2021. The soil was sandy loam in texture, medium in organic carbon and medium in available nitrogen,

phosphorous and low in potassium. Nutrient sources were Urea, MOP, SSP to fulfill the requirement of Nitrogen, phosphorous and potassium. Nitrogen applied as split dose half as basal dose remaining as top dressing. The treatment consisted 3 type of Spacing and 3 type of variety $T_1$:30 cm × 15 cm + JBV-2, $T_2$:45 cm × 15 cm + JBV-3, $T_3$:60 cm × 15 cm + JBV-4, $T_4$:30 cm × 15 cm + JBV-3, $T_5$:45 cm × 15 cm + JBV-4, $T_6$:60 cm × 15 cm + JBV-2, $T_7$:30 cm × 15 cm + JBV-4, $T_8$: 45 cm × 15 cm + JBV-2, $T_9$:60 cm × 15 cm + JBV-3 used. The Experiment was laid out in Randomized Block Design, with nine treatments which are replicated thrice. Date of sowing was on 11nd April 2021 with the seed rate of 6-8 kg/ha. In the period from germination to harvest several plant growth parameters were recorded at frequent intervals along with it after harvest several yield parameters were recorded those parameters are growth parameters, plant height, leave area index and plant dry weight are recorded. The yield parameters like Grains per ear-head, grain yield, test weight (1000 seeds), 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).

## RESULTS AND DISCUSSION

*A. Effect of Different Variety and Spacing on plant height of pearl millet*

The plant height was recorded at 20, 40, 60 and 80 DAS, and presented in Table 1. Effect of different variety and spacing on plant height at 20, 40, 60 and 80 DAS was significant. At 20 DAS, maximum plant height (14.33 cm) was recorded with the variety and spacing. 45cm × 15cm + V3 and 30cm × 15cm + V1, 45cm × 15cm + V2, 60cm × 15cm + V3, 30cm × 15cm + V2, 45cm × 15cm + V3, 60cm × 15cm + V1, 30cm × 15cm + V3, and 60cm × 15cm + V2. variety and spacing was statistically at par with Variety and spacing 45cm × 15cm + V3. At 40 DAS highest plant height (40.1) 45cm × 15cm + V3 Variety and spacing was recorded and it is the significantly highest. At 60 DAS highest plant height (100.17) 45cm × 15cm + V3 was recorded and 60cm × 15cm + V1 and 30cm × 15cm + V3 was statistically at par with 45cm × 15cm + V3. At 80 DAS highest plant height (192.1 cm) 45cm × 15cm + V3 was recorded and 30cm × 15cm + V3 statistically at par with 45cm × 15cm + V3. At 80 DAS highest plant height (192.1 cm) 45cm × 15cm + V3 was recorded and 30cm × 15cm + V3 statistically at par with 45cm × 15cm + V3. Plant height increase with the local variety (Saba *et al*., 2015) noticed that Local variety (Zango) had significantly higher plant height (191.7 cm) and panicle length (47.1 cm) then the improved variety SOSAT C-88 and the SOSAT C-88 have been the plant height (183.23 cm).

*B. Effect of Different Variety and Spacing on dry weight (g) in Pearl Millet*

The dry weight was recorded at 20, 40, 60, and 80 DAS, and presented in Table 1. At 20 and 40 DAS was non-significant and at 60 DAS the Maximum Dry matter (29.3 g) recorded with 60cm × 15cm + V2 and 45cm × 15cm + V2, 60cm × 15cm + V3, 60cm × 15cm + V1 was statistically at par with 60cm × 15cm + V2. At 80 DAS the also highest dry matter (65.37 g) 60cm × 15cm + V2 and 45cm × 15cm + V2, 60cm × 15cm + V3, 45cm × 15cm + V3, 60cm × 15cm + V1 was statistically at par with 60cm × 15cm + V2. The Maximum dry matter at 80 DAS (65.37 g) 60cm × 15cm + V2 and 45cm × 15cm + V2, 60cm × 15cm + V3, 45cm × 15cm + V3, 60cm × 15cm + V1 was statistically at par with 60cm × 15cm + V2. With recommended dose of fertilizer (RDF). NPK (Wijitphan *et al.*, 2009) also noticed that the highest total dry matter yield of 70.84 t ha was obtained from a 50 × 40 planting -1 configuration and this was significantly higher than that from other planting configurations. The 50 × 100 space, total dry matter yield was significantly lower than other spaces of planting and the yield was 55.8 t ha.

*C. Effect of Different Variety and Spacing on dry length of Ear-head (cm) in Pearl Millet*

Ear-head length was recorded at 60 and 80 DAS, and presented in (Table 1).

**Table 1: Effect of Different Variety and Spacing on growth attributes of Pearl Millet.**

| Treatments | Plant height (cm) | | | | Length of Ear-head (cm) | | Dry weight (g) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20 DAS | 40 DAS | 60 DAS | 80 DAS | 60 DAS | 80 DAS | 20 DAS | 40 DAS | 60 DAS | 80 DAS |
| 1. 30cm × 15cm + V1 | 13.48 | 36.03 | 97.77 | 163.73 | 6.41 | 27.52 | 0.14 | 2.85 | 24.53 | 60.43 |
| 2. 45cm × 15cm + V2 | 13.80 | 35.57 | 97.40 | 163.90 | 6.37 | 26.49 | 0.16 | 3.28 | 26.87 | 62.17 |
| 3. 60cm × 15cm + V3 | 13.41 | 35.27 | 98.25 | 172.73 | 6.43 | 27.87 | 0.12 | 3.39 | 28.37 | 64.90 |
| 4. 30cm × 15cm + V2 | 13.23 | 36.37 | 98.54 | 169.87 | 6.72 | 27.00 | 0.17 | 2.75 | 23.80 | 55.40 |
| 5. 45cm × 15cm + V3 | 14.33 | 40.10 | 100.17 | 192.10 | 7.06 | 29.72 | 0.12 | 2.77 | 23.43 | 62.33 |
| 6. 60cm × 15cm + V1 | 12.77 | 34.61 | 99.41 | 173.43 | 6.88 | 26.38 | 0.14 | 3.28 | 28.33 | 64.07 |
| 7. 30cm × 15cm + V3 | 14.10 | 38.33 | 99.25 | 187.57 | 6.73 | 29.13 | 0.14 | 2.99 | 21.30 | 60.77 |
| 8. 45cm × 15cm + V1 | 11.85 | 36.13 | 97.40 | 169.61 | 6.67 | 25.63 | 0.14 | 2.87 | 23.23 | 61.13 |
| 9. 60cm × 15cm + V2 | 12.77 | 36.13 | 97.53 | 169.70 | 6.73 | 25.92 | 0.14 | 3.25 | 29.30 | 65.37 |
| F test | S | S | S | S | NS | S | NS | NS | S | S |
| S. ed (±) | 0.41 | 0.75 | 0.52 | 2.30 | 0.25 | 0.64 | 0.01 | 0.34 | 1.51 | 1.98 |
| CD (5%) | 0.87 | 1.59 | 1.11 | 4.89 | - | 1.93 | - | - | 3.20 | 4.21 |

Effect of different variety and spacing on Relative growth rate, at 60 DAS, was non significantly influenced due to different variety and spacing. And 80 DAS, was significantly influenced due to different variety and spacing. However, at 60 DAS, maximum ear-head length (7.06) was recorded non- significant in variety and spacing. (45cm × 15cm + V3) and at 80 DAS maximum ear-head length (29.72) was recorded in variety and spacing. (45cm × 15 cm + V3) and Variety and Spacing. (30cm × 15cm + V3) followed by (45cm × 15cm + V3) respectively. The length of ear head did not increase significantly with the increase in the recommended dose of fertilizer (RDF) fertilizer (NPK) it is depended on the variety and spacing (Hassan *et al*., 2014) noticed that the variety UNGADI was highest recorded plant population (61.33), number of ear head per plant (0.88) and grain yield (360 kg $ha^{-1}$) and variety DEMBI was recorded plant population (58.67), number of ear head per plant (0.80) and grain yield (344kg $ha^{-1}$)

*D. Effect of Different Variety and Spacing on grain weight per Ear-head (g) and test weight (g) in Pearl Millet*

**(i) Grain weight per Ear-head.** Grain weight (Ear head)$^{-1}$ (Panicle) was recorded at 80 DAS, and presented in (Table 2). Effect of different variety and spacing at 80 DAS, was non significantly influenced due to different variety and spacing.

**(ii) Test weight (g).** The Test weight (g) recorded at harvest is presented in Table 2. The data shows that there was a significant effect of different variety and spacing on the Test weight (g). However, maximum test weight (10.5 g) was recorded with variety and spacing (45cm × 15cm + V3) and (45cm × 15cm + V2), (60cm × 15cm + V2) was statistically at par with variety and spacing (45cm × 15cm + V3). The results and probable reasons for such results are in conformity with the findings of Kaushik and Gautam (1994); Ali *et al*., (2010).

**Table 2: Effect of Different Variety and Spacing on yield attributes of Pearl Millet.**

| Treatments | Grain weight(g)/Ear-head | Test weight (g) |
|---|---|---|
| 1. 30cm × 15cm + V1 | 19.56 | 8.83 |
| 2. 45cm × 15cm + V2 | 21.75 | 9.27 |
| 3. 60cm × 15cm + V3 | 21.04 | 9.40 |
| 4. 30cm × 15cm + V2 | 20.58 | 8.06 |
| 5. 45cm × 15cm + V3 | 22.88 | 10.5 |
| 6. 60cm × 15cm + V1 | 21.49 | 8.59 |
| 7. 30cm × 15cm + V3 | 22.45 | 9.03 |
| 8. 45cm × 15cm + V1 | 21.33 | 8.13 |
| 9. 60cm × 15cm + V2 | 20.83 | 9.07 |
| **F- test** | NS | S |
| **S. EM** (±) | 0.82 | 0.48 |
| **C. D. (P = 0.05)** | - | 1.45 |

*E. Effect of Different Variety and Spacing on yield and yield attributes in Pearl Millet*

The data shows in Table 3 that there was a significant effect of different variety and spacing on the grain yield (kg/ha). However, maximum grain yield (2516.67 kg/ha) was recorded with different variety and spacing (45cm × 15cm + V3). And Minimum grain yield (1910.00 kg $ha^{-1}$) was recorded with different variety and spacing (60cm × 15cm + V1). Different variety and spacing with NPK Recommended dose of fertilizer (RDF) improved the Grain and Stover yield by improving the source and sink relation due to increased translocation of photosynthates towards reproductive system. This agreement will be finding of Jat and Shaktawat (2001).

**Table 3: Effect of Different and Spacing on yield and yield attributes of Pearl Millet.**

| Treatments | Seed yield (kg/ha) | Stover yield (kg/ha) | Harvest index (%) |
|---|---|---|---|
| 1. 30cm × 15cm + V1 | 1983.33 | 5693.33 | 25.89 |
| 2. 45cm × 15cm + V2 | 2316.67 | 5823.33 | 28.48 |
| 3. 60cm × 15cm + V3 | 2266.67 | 5616.66 | 28.77 |
| 4. 30cm × 15cm + V2 | 2303.33 | 5490.00 | 29.54 |
| 5. 45cm × 15cm + V3 | 2516.67 | 6300.00 | 28.49 |
| 6. 60cm × 15cm + V1 | 1910.00 | 5436.67 | 26.05 |
| 7. 30cm × 15cm + V3 | 2400.00 | 6376.67 | 27.35 |
| 8. 45cm × 15cm + V1 | 1983.33 | 5723.33 | 25.74 |
| 9. 60cm × 15cm + V2 | 2210.00 | 5283.33 | 29.53 |
| **F- test** | S | S | S |
| **S. EM** (±) | 70.63 | 187.21 | 0.71 |
| **C. D. (P = 0.05)** | 211.77 | 561.26 | 2.13 |

However, maximum Stover yield (6376.67 kg/ha) was recorded with variety and spacing (30cm × 15cm + V3) and variety and spacing (45cm × 15cm + V2) was statistically at par with (30cm × 15cm + V3), minimum stover yield (5283.33 kg $ha^{-1}$) was recorded with variety and spacing (60cm × 15cm + V2). However, maximum harvest index (29.54 %) was recorded with variety and spacing (30cm × 15cm + V2) and (45cm × 15cm + V2), (60cm × 15cm + V3), (45cm × 15cm + V3), (60cm × 15cm + V2) variety and spacing was statistically at par with (30cm × 15cm + V2) And the minimum harvest index (25.74 %). With the Variety and Spacing (60cm × 15cm + V2).

## CONCLUSION

On the basis of one Zaid season experimentation, it was concluded that the different variety and spacing. With the recommended dose (RDF), NPK and T5 (45cm × 15 cm+V3) this spacing and this variety was found more productive with B:C ratio of (2.79).

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**Conflict of Interest.** None.

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