Biological Forum – An International Journal **13(4): 107-110(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of Spacing and Phosphorous Levels on Growth and Yield of Finger Millet (*Eleusine coracana* L.)

Baddipadige Prem Sai Reddy[1*], Rajesh Singh[2], Ekta Singh[3] and Punnam Chhetri[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: Baddipadige Prem Sai Reddy)*
(Received 13 August 2021, Accepted 08 October, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A field trial become executed at Crop Research Farm, Department of Agronomy. Naini Agricultural Institute, SHUATS, Prayagraj in *Zaid* 2021 to decide the effect of spacing and phosphorous levels on growth and yield of finger millet. The accommodates of three spacings *viz.*, (30 × 10 cm, 45 × 10 cm, 60 × 10 cm) and three Phosphorous levels (20 kg/ha P, 30kg/ha S and 40 kg/ha S). The experiment was laid out in Randomized Block Design with nine remedies every replicated thrice. The end result confirmed that utility of phosphorous on numerous spacings confirmed vast varient for growth and yield parameters. Among all of the remedies, utility of 40 kg P with 60 cm row spacing recorded maximum Plant height (86.41 cm), No. of tillers/plant (12.54), plant dry-weight (14.68 g), No. of fingers/plant (6.71), Test weight (3.09 g/1000 seeds) while utility of 40 kg P with 30 cm row spacing recorded grain yield of (2.94 t/ha) and straw yield (6.22 t/ha) and Harvest Index (32.11 %). However, the Maximum Gross returns (1,02,900.00 INR/ha), Net returns (70,048.00 /INR/ha) and B:C ratio (2.13) was recorded with spacing of 30 × 40cm + Phosphorous at 40kg/ha as compared to different remedies.

Keywords: Finger Millet, Phosphorus, Spacing, Tillers, Fingers, growth and yield.

INTRODUCTION

Finger millet (*Eleusine coracana* L.) Gaertn is cereal grass grown mostly for its grain. Finger millet is a robust, tufted, tillering annual grass, as much as 170 cm high. The inflorescence is a panicle with 4-19 fingers like spikes that resembles a primary whilst mature, therefore the call of finger millet. The spikes endure as much as 70 alternate spikelets' carrying up to 4 to 7 small seeds (Aparna *et al.,* 2019). The seed pericarp is unbiased from the kernel and may be effortlessly eliminated from the seed coat. Finger millet is a staple food in lots of African and South Asian countries. It is likewise taken into consideration a useful famine crop as its effortlessly saved for lean years.

Finger millet is a primary crop in Karnataka, Tamil Nadu and Gujarat, at the same time as the identical is a minor crop in Telangana. Hence, the spatial distribution of millets both as a number one crop or as allied vegetation in large part relies upon at the developing habitat and the quantity and the of rainfall the vicinity receives. **(**Sundaresh and Basavarajaa, 2017) While sorghum predominates in regions receiving annual rainfall of 350mm. further, the small millets like finger millet, foxtail millet, banyard millet, little millet and proso millet are observed in maximum of the southern and central states in India specially every time annual rainfall is below 350 mm, possibly in which no different cereal crop can grow under such moisture stress (Shinggu and Gani, 2012).

The productiveness of finger millet in the country and as well as state is very low in comparison ability yield of progressed genotypes. The principal for low productiveness is because of an imbalance in vitamins coupled with unfavorable climatic conditions, past due transplanting, defective techniques of cultivation and very little use of fertilizers. The mystery of boosting its in particular lies in appropriate planting approach and nicely fertilizing the crop. Proper sowing approach is one of the crucial nonmonetary inputs in crop production, which impacts the crop growth, yield and quality to first-class to more extent. Method of established order play an important role to make the most all to be had sources for increase because it gives gold standard developing condition. Transplanting is an economically perfect opportunity seeding (Kalaraju *et al.,* 2009).

The improvement of cropping structures inclusive of suitable inter-row spacing will assist crop themselves to compete with weed. Several reviews indicated that crops planted in wider slender row spacing suppress weed boom extra than while planted in wider row spacing. In spite of the crop importance, statistics on weed control practices in finger millet is limited. Hence, this study aimed at determining the separate and interactions on yield and weed destiny of finger millet (Roy *et al.,* 2002).

MATERIALS AND METHODS

The experiment was carried out during Zaid season of 2021 at the CRF (Crop Research Farm) SHUATS, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agricultural, Technology and Sciences, Prayagraj, Uttar Pradesh. The crop Research Farm is located at 25°24′41.27″N latitude, 81°50′56″E longitude and at an altitude of 98m above suggested sea level.

This location is located at the proper aspect of the river Yamuna and through country aspect prayagraj City. All the centers required for crop cultivation had been available. Treatment comprised T_1 30cm + 20 kg/ha Phosphorous, T_2 30 cm + 30 kg/ha phosphorous, T_3 30cm + 40 kg/ha Phosphorus, T_4 45 cm + 20 kg/ha Phosphorous, T_5 45 cm + 30 kg/ha Phosphorous, T_6 45cm + 40 kg/ha phosphorous, T_7 60 cm + 20 kg/ha Phosphorous, T_8 60cm + 30kg/ha Phosphorous, T_9 60 cm + 40 kg/ha Phosphorous of These were replicated thrice on Randomized Block Design recommended dose of fertilizers was applied at the sowing time in Urea, SSP, MOP form.

Statistical analysis. Test information accumulated turned into subjected to statical evaluation via way of means of adopting fishers' approach of evaluation variance (ANOVA) as described by Gomez and Gomez, (2010). Critical Difference (CD) values have been calculated the 'F' test significant at 5% level.

Plant sampling

Growth attributes. Plant height was recorded at 20, 40, 60, 80 and at harvest stage five plants were selected randomly from every single plot which was tagged for observation the height was measured in cm. Number of leaves per plant were counted on the five tagged plants in each plot at 20, 40, 60, 80 and at harvest stages and the mean was determined for each treatment for all growth stages. Dry weight according to plant became recorded with roots at an interval of 20, 40, 60, 80, and at harvest stages by uprooting 5 plants randomly from each plot. These plants were first air dried then wrapped with paper and stored in oven drying at 70°C for 24 to 48 hours. The dry weight of sample was recorded, common and expressed as g/plant.

Yield attributes. Number of ears/hills was recorded from five tagged hills in each plot at 90 DAS. Thereafter, the mean as calculated treatment-wise. Number of grains/ear grains from five ears were counted separately which were obtained randomly from the tagged hills and their average were recorded. Test weight one thousand grains were randomly counted from each ear obtained from each plot and weighted and recorded as test weight (g) at appropriate 14% moisture. Grain yield grains from harvest area (1.0 m^2) were dried in sun, wiped clean and weighted one by one from every plot for calculating the grain yield in t/ha

RESULTS AND DISCUSSION

Effect of Spacing and Phosphorus levels on growth and yield of Finger millet (*Eleusine coracana* L.)

Plant height (cm). At harvest, the very best plant height was observed in the treatment 9 with spacing of 60x40 cm+ phosphorous at 40 kg/ha (86.14 cm) which was significantly higher over rest of the treatments expect treatment 5 with spacing of 40 × 30cm + Phosphorous at 30 kg/ha, Treatment 6 with spacing of 45x40 cm+ phosphorous 40kg/ha, treatment 7 with spacing of 60 × 20 cm + Phosphorous at 20kg/ha and treatment 8 with spacing of 60 × 30 cm + Phosphorous at 30 kg/ha which were statistically at par with spacing of 60 × 40cm + Phosphorous at 40 kg/ha.Increased plant height and wide variety of leaves is probably because of wider spacing with better fertilizer levels resulted in less competition between plants for solar radiation, space and increased supply of nutrients and efficient utilization helps in higher increase in comparison to UAS bunch` of practices.

Number of tillers/plants. At harvest, the highest No. of tillers per plant was observed in the treatment 9 with spacing of 60 × 40 cm + Phosphorous at 40 kg/ha (12.54) which was significantly higher over rest of the treatments expect treatment 6 with spacing of 45 × 40cm+ phosphorous at 40 kg/ha and treatment 8 with spacing of 60 × 30 cm + Phosphorous at 30 kg/ha which were statistically at par with spacing of 60 × 40 cm + Phosphorous at 40 kg/ha.The higher number of tillers at wider spacing intercepted more of solar radiation, water and increased nutrient availability helped to produce significantly higher number of tillers. Again, less competition between plants due to wider space allowed the individual plants to develop massive root system. Better aeration at wider spacing resulted in healthy plant growth with more tillers (Narasimhamurthy and Hedge, 1981).

Dry weight. At harvest, the highest Plant dry weight (g/plant) was observed in the treatment 9 with spacing of 60 × 40 cm + Phosphorus at 40 kg/ha (14.68 g) which was significantly higher over rest of the treatments except treatment 5 with spacing of 40 × 30 cm + Phosphorus at 30 kg/ha, treatment 6 with spacing of 45 × 40 cm + Phosphorus at 40 kg/ha and treatment 8 with spacing of 60 × 30 cm+ Phosphorus at 30 kg/ha which were statistically at par with spacing of 60 × 40 cm + phosphorous at 40 kg/ha. There are reports that, P uptake increased with progressive increase in supply of P_2O_5 to crops because of more availability of these nutrients and their by higher biomass production (Arulmozhi *et al.*, 2013).

Effect of Spacing and Phosphorus levels on yield attributes and yield of Finger millet

From the observations fingers/plant (6.71) was more and significant in treatment with treatment 9 with spacing of 60 × 40 cm + Phosphorus at 40 kg/ ha which was significantly higher over other treatments except treatment 5 with spacing of 40 × 30 cm + Phosphorous at 30 kg/ha and treatment 8 with spacing of 60 × 30 cm + Phosphorus at 30 kg/ha which have been statistically at par with spacing of 60 × 40 cm + Phosphorus at 40 kg/ha.

From the observations Test weight (g/1000 seeds) (1.99) was observed non-significant difference between treatment, were heights test weight (3.09 g/1000 seeds) observed in treatment 9 with spacing 60 × 40 cm +

Phosphorus at 40 kg/ha and lowest Test weight (2.65 g/1000 seeds) observed in treatment 1 with spacing of 30 × 20 cm + Phosphorus at 20 kg/ha. This can be because of decrease quantity of plants that produced significantly bold grains because of much less competition and greater availability of light, nutrient and feeding area per plant in comparison to better plant population **(**Zarafi and Emechebe, 2006).

Table 1: Effect of Spacing and Phosphorus levels on growth and yield of Finger millet.

Treatments	Plant height (cm)	No. of tillers /Plant	Dry weight (g)
1. 30 cm + 20 + kg/ha Phosphorous	82.33	11.52	13.16
2. 30 cm + 30 + kg/ha Phosphorous	83.16	11.57	13.41
3. 30 cm + 40 + kg/ha Phosphorous	84.06	11.75	13.69
4. 45 cm + 20 + kg/ha Phosphorous	83.56	11.67	13.55
5. 45 cm + 30 + kg/ha Phosphorous	85.29	12.07	14.23
6. 45 cm + 40 + kg/ha Phosphorous	85.67	12.32	14.42
7. 60 cm + 20 + kg/ha Phosphorous	84.69	11.85	13.96
8. 60 cm + 30 + kg/ha Phosphorous	86.12	12.48	14.55
9. 60 cm + 40 + kg/ha Phosphorous	86.41	12.54	14.68
F-Test	S	S	S
SEm (±)	0.85	0.10	0.16
CD (P = 0.05)	2.55	0.31	0.49

From the observations seed yield or grain t/ha (2.94) was more and significant in treatment with treatment 3 with spacing of 30 × 40 cm + Sulphur at 40 kg/ha which was significantly higher over all other treatments except treatment 2 with spacing of 30 × 30 cm + Phosphorus at 30 kg/ha and treatment 6 with spacing 40 × 40 cm + Phosphorous at 40 kg/ ha which have been statistically at par with spacing of 30 × 10 cm (S_2) + Sulphur at 30 kg/ha. Optimum planting pattern is the pre-considered necessary for proper usage of growth resources and in the end to make the most the potential productiveness of any crop. This is in agreement with the findings of (Suresh, 2013).

From the observations straw yield t/ha (6.22) was more and significant in treatment with treatment 3 with spacing of 30 × 40 cm + Sulphur at 40 kg/ha which was significantly higher over all other treatments except treatment 2 with spacing of 30 × 30 cm + Phosphorus at 30 kg/ ha and treatment 6 with spacing 40 × 40 cm + Phosphorous at 40 kg/ha which were statistically on par with spacing of 30 × 10 cm (S_2) + Sulphur at 30 kg /ha.

It might be maximum plant population owing to closer spacing at 20 × 10cm might have been contributed to the maximum accumulation of dry matter and number of leaves which ultimately enhanced straw yield. Similar findings were described earlier by (Kalaraju *et al.*, 2009) phosphorus plays a crucial role in millet production. The significant improve in grain and stover yield of pearl millet turned into large function of improved growth and the consequent increase in the different yield attributes as mentioned above. This favorable effect might be owing to the fact that P is well acknowledged for its role as 'Energy currency' and performs a key role in the development and energy transformation in different vitally important metabolic processes in the plant (Singh *et al.*, 2017).

From the observations Harvest Index (23.2 %) was more and non-significant in treatments, were heights value observed (32.11) with treatment 3 with spacing of 30 × 40 cm+ Phosphorus at 40 kg/ha and lowest value (31.13) observed in treatment 9 with spacing of 60 × 40 cm + Phosphorus at 40 kg/ha.

Table 2: Effect of Spacing and Phosphorous levels on yield attributes and yield of Finger millet.

Treatments	Number of fingers/ear head	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
1. 30 cm + 20 + kg/ha Phosphorous	5.80	2.65	2.62	5.74	31.35
2. 30 cm + 30 + kg/ha Phosphorous	5.85	2.72	2.86	6.10	31.92
3. 30 cm + 40 + kg/ha Phosphorous	6.08	2.82	2.94	6.22	32.11
4. 45 cm + 20 + kg/ha Phosphorous	5.93	2.75	2.58	5.58	31.23
5. 45 cm + 30 + kg/ha Phosphorous	6.32	2.89	2.68	5.85	31.37
6. 45 cm + 40 + kg/ha Phosphorous	6.49	2.96	2.78	5.98	31.75
7. 60 cm + 20 + kg/ha Phosphorous	6.23	2.87	2.43	5.32	31.33
8. 60 cm + 30 + kg/ha Phosphorous	6.60	3.03	2.48	5.41	31.41
9. 60 cm + 40 + kg/ha Phosphorous	6.71	3.09	2.54	5.63	31.13
F-Test	S	NS	S	S	NS
SEm (±)	0.08	0.10	0.08	0.11	0.87
CD (P=0.05)	0.24	—	0.23	0.32	—

CONCLUSION

On the basis of one season of experimentation with spacing 30 × 40 cm+ Phosphorus at 40 kg/ha were found more productive (2.94 t/ha) as well as economic (102900.00 INR/ha). The conclusions drawn are based on one year data only which requires further confirmation for recommend.

Acknowledgment. The authors are thankful to Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University Technology and Sciences, Prayagraj, (U.P.) India for providing field, facilities and assistance in conducting this research.

Conflict of Interest. None.

REFERENCES

Aparna, K., Rekha, K. B., Vani, K. P., & Prakash, T. R. (2019). Growth and yield of finger millet as influenced by crop residue composting. *Journal of Pharmacognosy and Phytochemistry*, *8*(4): 1108-1111.

Arulmozhiselvan, K., Elayarajan, M., & Sathya, S. (2013). Effect of Long Term Fertilization and Manuring on Soil Fertility, Yield and Uptake by Finger Millet on Inceptisol. *Madras Agricultural Journal*, *100*(4-6): 490-494.

Gomez, K. A., & Gomez, A. A. (2010). Statistical Procedures for Agricultural Research.

Kalaraju, K., Kumar, N.S., Nagaraja, N., & Ningappa, K. B. (2009). Effect of methods of plantingon growth and yield of finger millet genotypes under organic farming. *Research on Crops*, (10): 20-24.

Narasimhamurthy & Hegde, B. R. (1981) Tillering in relation to intra-row competition in ragi under rainfed conditions. *Indian J. Agron., 26*(3): 337-338.

Roy, D. K., Chakraborty, T., Sounda, G., & Maitra, S. (2002). Effect of fertility levels and plantpopulation on yield and uptake of nitrogen, phosphorus and potassium in finger millet (*Eleusine coracana* L.) in lateritic soil of West Bengal. *Indian Journal of Agronomy*, *46*(4): 707-711.

Shinggu, C. P., & Gani, M. (2012). Effects of planting methods, sowing dates and spacing on weed and the productivity of finger millet (*Eleusine corocana* L. Gaertn) in the northern guinea savanna of nigeria. *Global Journal of Bio-Science and Biotechnology*, *1*, 160-162.

Singh, L., Sharma, P. K., Jajoria, M., Deewan, P., & Verma, R. (2017). Effect of phosphorus and zinc application on growth and yield attributes of pearl millet (*Pennisetum glaucum* L.) under rainfed condition. *Journal of Pharmacognosy and Phytochemistry*, *6*(1): 388-391.

Sundaresh, R., & Basavaraja P. K. (2017). Influence of Different Levels of Phosphorus and Potassium on Growth, Yield Attributes and Economics of Finger Millet in Low Phosphorus and Potassium Soils of Eastern Dry Zone of Karnataka, India. *International Journal of Current Microbiology and Applied Sciences*, *6*(11): 3559-3566.

Suresh, A. P. (2013). Integrated nitrogen management under different crop establishment methods in summer pearl millet (*Pennisetum glaucum* L.) under Gujarat condition. M.Sc. (Ag.) Thesis, Anand Agricultural University, Anand, Gujarat.

Zarafi, A. B., & Emechebe, A. M. (2006). Effect of intra-row spacing on incidence and severity of pearl millet downy mildew on grain yield. *Archives of Phytopathology and Plant Protection*, *39*(1): 9-14.

How to cite this article: Reddy, B.P.S.; Singh, R.; Singh, E. and Chhetri, P. (2021). Effect of Spacing and Phosphorous Levels on Growth and Yield of Finger Millet (*Eleusine coracana* L.). *Biological Forum – An International Journal*, *13*(4): 107-110.