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PRODUCTIVITY OF FINGER MILLET AS INFLUENCED BY CROP GEOMETRY AND AGE OF SEEDLINGS

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ABSTRACT

A field experiment was conducted to study the influence of crop geometry and age of seedlings on the productivity of finger millet during *rabi*, 2014- 15 at S.V Agricultural college farm, Tirupati. The experiment was laid out in randomized block design and replicated thrice. The results revealed that the yield attributes *i.e*, number of productive tillers m^{-2}, thousand grain weight, length of the finger, grain yield, straw yield and harvest index were higher with transplanting of 15 days old seedlings at 20 cm × 20 cm with single seedling $hill^{-1}$.The yield increase in finger millet with this treatment was 17.8 per cent higher compared to ANGRAU package.

KEYWORDS: Age of seedlings, crop geometry, finger millet, Yield attributes, Yield

INTRODUCTION

Finger millet or *Mandua* or Bird's foot millet commonly known as *Ragi* (*Eleusine coracana* (L.) Gaertn.) is an important small millet crop ranked third in India with respect to area, production and has the pride of place due to the highest productivity among the millets (Seetharam and Krishne Gowda, 2007). It is a staple food crop in many hilly regions of the country. Finger millet is a small cereal grain with outstanding properties *viz.,* rich in calcium, iron, dietary fibre and polyphenols. Finger millet is the richest source in calcium content and 10 times higher than that of paddy or wheat (Stanly and Shanmugam, 2013).

Over the last three decades, finger millet crop has been declining in area and production due to low price in the market and forced the farmers to shift to cash crop cultivation. However, there is every need to increase the productivity of finger millet for reducing the burden on rice and wheat production to meet the food needs of ever increasing population in India. Major constraint in finger millet production is lack of suitable improved crop management practices. Age of seedling and optimum spacing were the key agronomic practices for realizing higher yield in finger millet. The information related to influence of crop geometry and age of the seedlings on productivity of finger millet is lacking in Andhra Pradesh. In this context, the present work was under taken to study the influence of crop geometry and age of seedlings on the performance of finger millet.

MATERIAL AND METHODS

A field experiment was carried out during *rabi*, 2014 at S.V. Agricultural College Farm, Tirupati. The experimental soil was sandy loam in texture, neutral in reaction (pH 6.9), low in organic carbon (0.43 %) and available nitrogen (213 kg ha^{-1}), high in available phosphorus (24.2 kg ha^{-1}) and medium in potassium (250.2 kg ha^{-1}). The present experiment was laid out in a randomized block design with ten treatments and replicated thrice. The treatments consisted of T_1 - ANGRAU package (Transplanting of 25 days old seedlings at 15 cm × 10 cm @ 2-3 seedlings $hill^{-1}$), T_2 - Transplanting of 12 days old seedlings at 20 cm × 20 cm, T_3 -Transplanting of 12 days old seedlings at 25 cm × 25 cm, T_4 -Transplanting of 12 days old seedlings at 30 cm × 30 cm, T_5-Transplanting of 15 days old seedlings at 20 cm × 20 cm, T_6-Transplanting of 15 days old seedlings at 25 cm × 25 cm, T_7-Transplanting of 15 days old seedlings at 30 cm × 30 cm, T_8-Transplanting of 18 days old seedlings at 20 cm × 20 cm, T_9-Transplanting of 18 days old seedlings at 25 cm × 25 cm, T_{10}-Transplanting of 18 days old seedlings at 30 cm × 30 cm. Transplanting of different aged seedlings in main field was done in staggered fashion as per the spacings. In all the treatments, single seedling $hill^{-1}$ was planted except with ANGRAU

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package, where 2-3 seedlings hill^{-1} were planted. First irrigation was given immediately after transplanting and life saving irrigation on third day after transplanting. Subsequent irrigations were given at an interval of 7-8 days as and when required. The test variety used in the experiment was 'Vakula', a recently released variety from Agricultural Research Station, Perumallapalle, Chittoor district, Acharya N.G. Ranga Agricultural University, Andhra Pradesh.

The recommended dose of fertilizer 60-30-30 kg N, P_2O_5 and K_2O ha^{-1} was applied through urea, single super phosphate and muriate of potash, respectively. Entire dose of phosphorous, potassium and half dose of nitrogen were applied as basal. The remaining half dose of the nitrogen was top dressed at 30 DAT.

The data on yield attributes and yield were subjected to statistical scrutiny by the method of analysis of variance outlined by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The experimental results revealed that yield attributes like productive tillers, number of fingers earhead^{-1}, thousand grain weight, length of finger were significantly higher under transplanting of 15 days old seedlings (DOS) at 20 cm × 20 cm with single seedling hill^{-1} followed by transplanting of 12 DOS planted at 20 cm × 20 cm with single seedling hill^{-1} and it was statistically at par with transplanting of 18 DOS at 20 cm × 20 cm with single seedling hill^{-1}. Optimum plant spacing of 20 cm × 20 cm provides favourable microclimate to crop for effective utilization of available moisture and nutrients leading to better partitioning of photosynthates to reproductive parts might be the reason of getting higher yield attributes. Similar findings were also reported by Umair *et al.* (2014).

The highest grain yield of finger millet was obtained with transplanting of 15 days old seedlings at 20 cm × 20 cm with single seedling hill^{-1}, which was statistically significant than other treatments. Transplanting of 12 days old seedlings at 20 cm × 20 cm with single seedling hill^{-1} recorded significantly higher grain yield which was however, comparable with transplanting of 18 days old seedlings at 20 cm × 20 cm with single seedling hill^{-1}. Higher grain yield with transplanting of 15 days old seedlings at 20 cm × 20 cm with single seedling hill^{-1} might be due to enhanced stature of yield attributes, forming larger sink size coupled with efficient translocation of photosynthates to the sink was noticed under optimum planting pattern with transplanting of young seedlings. These results are in line with the findings of Jogi Naidu *et al*. (2013).

Among all the treatments, ANGRAU package *i.e*, transplanting of 25 days old seedlings at 15 cm × 10 cm @ 2-3 seedlings hill^{-1} resulted in significantly the highest straw yield due to maintenance of more plant population owing to closer spacing 15 cm × 10 cm and maintenance of two seedlings hill^{-1} might have contributed to maximum LAI and DMP which ultimately enhanced the straw yield. Similar findings were also reported by Kalaraju *et al.* (2011).

Higher harvest index is indicative of high efficiency of partitioning of photosynthates into grain than other plant parts. The highest harvest index of finger millet was registered with transplanting of 15 days old seedlings at 20 cm × 20 cm spacing with single seedling hill^{-1} which was comparable with transplanting of 12 days old seedlings at same spacing with single seedling hill^{-1}. The lowest harvest index of finger millet was recorded with ANGRAU package *i.e*, transplanting of 25 days old seedlings at 15 cm × 10 cm @ 2-3 seedlings hill^{-1} due to the less conversion of total number of tillers into productive tillers and it causes less increase in grain yield corresponding to increase in biological yield whereas greater the conversion of total number of tillers into productive tillers in case of transplanting of 15 days old seedlings at 20 cm × 20 cm with single seedling hill^{-1}. Similar finding was also reported by Hardev Ram *et al*. (2014).

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Table 1. Yield attributes of finger millet as influenced by crop geometry and age of seedlings

Treatments	Productive tillers (m^{-2})	No. of finger earhead^{-1}	Length of finger (cm)	No. of grains earhead^{-1}	Test weight (g)
T_1 : ANGRAU package (Transplanting of 25 days old seedlings at 15 cm × 10 cm @ 2-3 seedlings hill^{-1})	82.9	7.0	8.3	2069	2.74
T_2 : Transplanting of 12 days old seedlings at 20cm × 20 cm	84.9	9.1	8.7	2274	2.89
T_3 : Transplanting of 12 days old seedlings at 25 cm × 25 cm	50.5	9.0	8.3	2128	2.82
T_4 : Transplanting of 12 days old seedlings at 30 cm × 30 cm	48.5	8.6	8.2	2110	2.79
T_5 : Transplanting of 15 days old seedlings at 20 cm × 20 cm	90.9	10.2	8.6	2323	2.91
T_6 : Transplanting of 15 days old seedlings at 25 cm × 25 cm	53.3	8.5	8.4	2140	2.85
T_7 : Transplanting of 15 days old seedlings at 30 cm × 30 cm	50.0	8.0	8.3	2116	2.80
T_8 : Transplanting of 18 days old seedlings at 20 cm × 20 cm	84.7	9.0	8.8	2229	2.87
T_9 : Transplanting of 18 days old seedlings at 25 cm × 25 cm	45.5	9.0	8.5	2184	2.76
T_{10} : Transplanting of 18 days old seedlings at 30 cm × 30 cm	43.1	8.6	8.1	2106	2.86
SEm±	2.9	0.6	0.11	12.30	0.05
CD (P=0.05)	8.7	NS	0.32	36.56	0.14

Table 2. Grain yield and straw yield including harvest index of finger millet as influenced by crop geometry and age of seedlings

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index
T_1 : ANGRAU package (Transplanting of 25 days old seedlings at 15 cm × 10 cm @ 2-3 seedlings hill^{-1})	2361	6856	0.33
T_2 : Transplanting of 12 days old seedlings at 20cm × 20 cm	2426	5041	0.43
T_3 : Transplanting of 12 days old seedlings at 25 cm × 25 cm	2147	4610	0.35
T_4 : Transplanting of 12 days old seedlings at 30 cm × 30 cm	2031	4165	0.34
T_5 : Transplanting of 15 days old seedlings at 20 cm × 20 cm	2876	5752	0.44
T_6 : Transplanting of 15 days old seedlings at 25 cm × 25 cm	2299	4858	0.40
T_7 : Transplanting of 15 days old seedlings at 30 cm × 30 cm	2112	4100	0.41
T_8 : Transplanting of 18 days old seedlings at 20 cm × 20 cm	2413	5306	0.42
T_9 : Transplanting of 18 days old seedlings at 25 cm × 25 cm	1976	4550	0.39
T_{10} : Transplanting of 18 days old seedlings at 30 cm × 30 cm	1966	4010	0.37
SEm±	110	217	0.04
CD (P=0.05)	324	642	0.12

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