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Original Research Article

Ensuing Economic Gains from Fingermillet (*Eleusine coracana* L.) due to Different Dates of Sowing and Varieties

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A B S T R A C T

This study was undertaken at agricultural college farm Bapatla, India which is situated in the Krishna Agro-climatic Zone of Andhra Pradesh at 15^0 91 N latitude and 80^0 47 E longitudes, at an altitude of 4.29 m above mean sea level (MSL) and about 8 km away from the Bay of Bengal during kharif season 2015 to work out effect of different varieties and dates of sowing on fingermillet. The results gained confirm that 2nd fortnight of July sowing date with Chaitanya variety is beneficial to obtain higher net returns from fingermillet crop. The highest gross returns, net returns and B:C ratio were obtained with V_1D_2 followed by V_1D_3 and V_2D_2. The highest net income (Rs. 19433 ha^{-1}) and B:C ratio (2.1) was obtained with Chaitanya variety sown at 2nd fortnight of July due to higher grain yield. The lowest net returns (Rs. 11322 ha^{-1}) and B: C ratio (1.1) were noticed with Bharathi variety sown at 1st fortnight of July. The highest grain yield of 2305 kg ha^{-1} was recorded when the crop was sown on 2nd fortnight of July (D_2) which was significantly superior to 1st fortnight of August sowing (D_3) (1995 kg ha^{-1}) and 1807 kg ha^{-1} with 1st fortnight of July sowing (D_1).

Keywords

Fingermillet, Grass returns, Net returns, Benfit cost ratio

Introduction

India is one of the major producers of millets in world. The predominant millets grown in India are sorghum (*jowar*), pearl millet (*bajra*), finger millet (*ragi*), kodo millet (*kodo*), proso millet (*cheena*), little millet (*kutki*), foxtail millet (*kangni*) and barnyard millet (*sawa*); of which barnyard millet, little millet and kodo millet are endemically domesticated in Indian subcontinent. Millets are warm weather grasses belonging to C_4 group of plants and considered as physiologically efficient. Their cultivation in India extends from sea-level up to 2,000 m above mean sea-level and often grown in diverse soils, climates and harsh environments. Millets have been important food and feed crops producing more reliable harvests than many other crops. Finger millet (*Eleusine coracana* Gaertn), also known as Ragi, is an important millet crop and major source of food in many parts of dry farming region in India. As such, it is grown in dry farming region where annual rainfall ranges between 400 mm to 1000 mm. One of the striking features of fingermillet is its resilience and ability to adjust to diverse agro-ecological conditions which is reflected in having highest productivity among millets (Seetharam, 1997). It is grown under diverse situations of soil and all weather conditions more so varying rainfall situations. Fingermillet is considered as one of the most drought resistant crops among the field

crops with high production potential (Murthy, 2016). Among several agronomic practices, time of planting is an important non-monetary input for realizing higher productivity in any crop. In many farming situations, planting time is highly variable due to economic, agronomic and climatic constraints faced by farmers. The variation in sowing time brings about varied plant environment interaction, which determines the efficiency of inherent physiological processes and ultimately the crop yield (Moorthy and Rao, 1986). Krishnamurthy (1996) and Murthy (2002) reported that, higher growth and yield parameters in fingermillet can be achieved when the crop is sown at optimum date of sowing with recommended cultivation practices.

In *kharif*, farmers are forced to shift cropping season and cultivar selection due to vagaries of monsoon (Murthy, 2016). However, to obtain maximum productivity, sowing time is very important for any crop which is mainly dependent on the agroclimatic conditions of the region. Optimum sowing time and selection of improved cultivars play a remarkable role in exploiting the yield potential of the crop under particular agro-climatic conditions.

Materials and Methods

The field experiment was conducted at Agricultural College Farm, Bapatla, which is situated in the Krishna Agro-climatic Zone of Andhra Pradesh at 15^0 91 N latitude and 80^0 47 E longitudes, at an altitude of 4.29 m above mean sea level (MSL) and about 8 km away from the Bay of Bengal. During the crop growth period, the weekly mean maximum temperatures ranged from 29.3^0C to 39.1^0C with an average of 33.7^0C and the weekly mean minimum temperatures ranged from 19.1^0C to 26.8^0C with an average of 23.9 ^{0}C. The weekly mean average relative humidity at 8.30 was hrs was 80.3 per cent and at 17.30 hrs was 71.3 per cent. A total rainfall of 669.2 mm was received in 32 rainy days during the crop growth period. The mean weekly sunshine hours ranged from 1 to 8 hours day^{-1} with an average of 5 hours day^{-1}. The mean weekly day length ranged from 11 to 13 hours day^{-1} with an average of 12 hours day^{-1}.

Based on soil analysis, using standard methods from Jackson (1967) the soil of the experimental site was classified as sandy loam in texture, slightly acidic in reaction and low in organic carbon and available nitrogen, medium in phosphorus and high in available potassium. The treatments consisted of three varieties of fingermillet *viz.* Chaitanya (V_1), Bharathi (V_2) and Hima (V_3) as first factor and three dates of sowing *viz.*1st fortnight of July (D_1), 2nd fortnight of July (D_2) and 1st fortnight of August (D_3) as the second factor. The design adopted was Randomized Block Design with factorial concept replicated thrice. A uniform dose of 60:30:30 kg NPK per hectare was applied to the experimental plots. Entire quantity of phosphorus and potash and 1/3 of nitrogen was applied as basal. The remaining nitrogen was applied in two equal splits at 30 DAS and 60 DAS. The data collection for growth and yield attributes was done from randomly selected five plants and then by calculating the average value for each plot. After maturity of crop, harvesting was followed by removing the earheads from plant and subsequently the plants were harvested by sickle from each plot. The yield observations were calculated from whole net plot plant population and then converted to hectare basis. All the data recorded in the study were subjected to statistical analysis using Fisher's method of analysis of variance suggested by Panse and Sukhatme (1978) as outlined for the design

adopted in this study, significance of differences was tested by the 'F' test at 5% level. The critical differences were calculated when the differences among treatments were found significant by 'F' test. Summary tables of treatment means have been prepared and presented with standard error of mean (S.Em ±) and coefficient of variation (C.V. %).

The gross returns from each treatment were worked out with the prevailing prices. The net returns from each treatment were calculated by deducting the cost of cultivation from gross returns. Returns per rupee investment for all the treatments were worked out on the basis of net returns and cost of cultivation.

Gross returns = Value of the product (Grain + Straw)

Net returns = Gross returns - Total cost of cultivation

$$\text{Returns per rupee investment} = \frac{\text{Net returns}}{\text{Cost of cultivation}}$$

Results and Discussion

Effect of dates of sowing and varieties on yield attributes and yield of fingermillet

The highest number of productive tillers m^{-2} and no. of fingers per ear head was observed with 2nd fortnight of July sowing which was significantly superior to 1st fortnight of July and 1st fortnight of August sowing dates. However, D_1 and D_3 sowing dates were on par with each other with respect to productive tillers m^{-2}. Thousand grain weight did not significantly differ either with dates of sowing, varieties or by their interaction. However, numerically test weight ranged between 2.7 g and 2.8 g for different varieties and also with different dates of sowing.

Grain yield was significantly influenced by dates of sowing and varieties. The highest grain yield of 2305 kg ha^{-1} was recorded when the crop was sown on 2nd fortnight of July (D_2) followed by 1st fortnight of August sowing (D_3) and 1st fortnight of July sowing (D_1).

The highest straw yield was recorded with the crop sown on 2nd fortnight of July (D_2) which was significantly superior to 1st fortnight of July (D_1) and 1st fortnight of August (D_3).Interaction between dates of sowing and varieties revealed that the highest straw yield was obtained with fingermillet variety Chaitanya sown on 1st fortnight of July (D_1) which was significantly superior to V_2D_1, V_3D_1, V_1D_3 and V_3D_3 and statistically on par with V_1D_2, V_2D_2, V_3D_2 and V_2D_3 (Table 1).

The higher grain yield recorded with 2nd fortnight of July could be attributed to the cumulative effect of more tiller production and crop had an opportunity of longer growth period with sufficient light, temperature, relative humidity bright sunshine hours coupled with optimum day length which might have increased photosynthesis, in turn, drymatter production and yield.

On the other hand delay in sowing during 1st fortnight of August resulted in vegetative phase coinciding with short day periods resulting in lower biomass accumulation and in turn low yield. Under late sown conditions, lack of soil moisture due to cessation of rains also affects grain yield potential. Similar findings were observed by Ravi kumar *et al.*, (1992), Murthy (1999) and Nagaraju and Mohan kumar (2006).

Table.1 Yield attributes and yield of fingermillet varieties as influenced by dates of sowing

Treatments	No. of productive tillers m^{-2}	No. of fingers per ear head	Test weight (g/1000 grains)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)
Varieties(V)						
(V_1)Chaitanya	105.4	7.0	2.8	2173	2927	42.6
(V_2)Bharathi	100.8	6.1	2.7	1970	2678	42.6
(V_3)Hima	96.2	6.0	2.7	1934	2578	43.7
SEm±	2.14	0.16	0.04	55.31	61.0	0.9
CD (0.05)	6.4	0.4	NS	165	183	NS
Dates of sowing(D)						
(D_1)1 st fortnight of July	98.0	6.0	2.7	1807	2468	42.5
(D_2)2nd fortnight of July	106.8	6.7	2.8	2305	2962	44.3
(D_3)1 st fortnight of August	99.2	6.3	2.8	1995	2740	42.3
SEm±	2.14	0.16	0.04	55.31	61.0	0.9
CD (0.05)	6.4	0.4	NS	165	183	NS
Interactions(V x D)						
SEm±	3.17	0.27	0.06	95.79	105.7	1.63
CD (0.05)	NS	NS	NS	NS	317	NS
CV (%)	6.4	7.37	3.9	8.19	6.7	6.6

Table.2 Economics of fingermillet varieties at different dates of sowing

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Gross returns (Rs ha^{-1})	Cost of cultivation (Rs ha^{-1})	Net returns (Rs ha^{-1})	B : C Ratio
V_1D_1	2064	3100	26322	10144	16178	1.6
V_1D_2	2313	3039	29277	9844	19433	2.1
V_1D_3	2141	2642	27018	8456	17174	2.0
V_2D_1	1672	2196	21166	10144	11322	1.1
V_2D_2	2303	2825	29049	9844	19205	2.0
V_2D_3	1934	3014	24713	8456	14869	1.8
V_3D_1	1684	2108	21259	10144	11415	1.1
V_3D_2	2300	3023	29110	9844	19266	2.0
V_3D_3	1819	2602	23126	8456	13282	1.6

V_1=Chitanya, V_2=Bharathi, V_3=Hima. D_1= 1st fortnight of July, D_2= 2nd fortnight of July, D_1= 1st fortnight of August

Effect of dates of sowings and varieties on economics of fingermillet

The data pertaining to economics (Table 2) the highest gross returns, net returns and B:C ratio were obtained with V_1D_2 followed by V_1D_3 and V_2D_2. The highest net income (Rs. 19433 ha^{-1}) and B:C ratio (2.1) was obtained with Chaitanya variety sown at 2nd fortnight of July due to higher grain yield. The lowest net returns (Rs. 11322 ha^{-1}) and B:C ratio (1.1) were noticed with Bharathi variety sown at 1st fortnight of July which might be because of lesser grain yield and stover yield. The cost of cultivation was varied for three varieties with different dates of sowing might be due to the cost of inputs change from time to time.These results are in agreement with the findings of Parusuraman (2002), Giribabu (2006), Poorna teja (2014) and Tejeswara Rao *et al*. (2015).

From the results of the experimentation, it can be concluded that 2nd fortnight of July (D_2) recorded higher values of yield attributes, yield, gross returns, net returns and B: C ratio for getting higher profitable production of fingermillet should be sown on 2nd fortnight of July.

References

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