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Study of Pearl millet under Different Spacings and Staggered Sowing in Coastal Agro-Ecosystem of Bapatla

B Swathi, V R K Murthy, M SreeRekha and K Jayalalitha
Department of Agronomy, Agricultural College, Bapatla, A.P.

ABSTRACT

A field experiment was conducted during *kharif,* 2018 on sandy loam soil of Agricultural College Farm, Bapatla. twelve treatment combinations were formed considering four spacingsin combination with three sowing dates. The results revealed that, among the four spacings tested 45 cm × 15 cm and among the dates of sowing 2nd fortnight of July sown crop recorded the highest drymatter accumulation at maturity, yield attributes (number of earheads m^{-2}, earhead weight (g), test weight (g), grain and straw yield.

Keywords: *Dates of sowing, Drymatter accumulation, Grain yield and straw yield, Pearl millet, Spacings, Yield attributes.*

Pearl millet *(Pennisetum glaucum),* which belongs to the family poaceae, is one of the most important among the major millets which are generally referred as nutritious coarse grain cereals. It is one of the oldest food crops known to man and possibly first cereal grain to be used for domestic purposes (Railey, 2006). It is popularly known as bajra or cattle millet or bulrush millet and was considered to be originated from tropical Western Africa.Pearl millet is the most drought and heat tolerant among the cereals and can yield grains even under rainfall as low as 200 mm to 250 mm (Bidinger and Hash, 2003). In Andhra Pradesh the area under pearl millet is 0.042 million ha, production 0.072 million tonnes with an average productivity of 1718 kg ha^{-1} (www.indiastat.com, 2016-17).

Besides climatic factors like temperature and rainfall, inadequate plant population also attributes to the lower yields of pearl millet.Establishment of optimum plant population in the most suitable arrangement pattern is the foundation to a successful crop production system and is essential to get maximum yield.

Sowing window is the most important non - monetary input which influence crop yield even in photo and thermo- insensitive crops.Optimum sowing time improves crop productivity as it makes the synchronization of crop growth stages with suitable environment. Timely planting determines the size of root system, which in turn determines how much stored water that the plant can utilize, vegetative growth for optimum utilization of available soil nutrients and radiant energy (Soler *et al.,* 2008).

MATERIAL AND METHODS

A field experiment was conducted on sandy loam soils of Agricultural College Farm, Bapatla during *kharif,* 2018. The soil was slightly acidic(pH 6.8) in reaction, low in organic carbon (0.21 %), available nitrogen (240 kg ha^{-1}), available phosphorus (12.8 kg ha^{-1}) and available potassium (188.1 $kgha^{-1}$).

Twelve treatment combinations were laid out in factorial randomized block design (FRBD) with three replications. The treatments consisted off our spacings 45 cm × 15 cm (S_1), 45 cm × 30 cm (S_2), 60 cm × 15 cm (S_3) and 60 cm × 30 cm (S_4) and three dates of sowing *viz.,* 2nd fortnight of July (D_1), 1st fortnight of August (D_2) and 2nd fortnight of August (D_3).Entire dose of 40 kg ha^{-1} P_2O_5 and 30 kg K_2O ha^{-1} were uniformly applied basally to all the plots. The recommended dose of Nitrogen 80 kg ha^{-1} was applied in two equal splits *i.e.,* 40 kg ha^{-1} at basal and remaining 40 kg ha^{-1}at 40 days after sowing.

The data on drymatter production, yield attributes and yield were recorded as per standard statistical procedures and analyzed by following the analysis of variance (ANOVA) for randomized block design with factorial concept as suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Drymatter accumulation at maturity (kg ha^{-1})

At maturity, the highest drymatter of 9664 kg ha^{-1} was produced with 45 cm × 15 cmand was on par with 60 cm × 15 cm with 9185 kg ha^{-1} and was significantly superior to 45 cm × 30 cm with 7542 kg ha^{-1}. However, the minimum drymatter production was recorded with 60 cm× 30 cm (6733 kg ha^{-1}).

Table 1. Variation in Growth Parameters, yield attributes and yield of pearl millet as influenced by spacings and dates of sowing

Treatments	Drymatter accumulation (Kg ha^{-1})	No. of earheads m^{-2}	Earhead weight (g)	Test weight (g)	Grain (kg ha^{-1})	Straw (kg ha^{-1})
SPACINGS (S)						
S_1 (45 × 15 cm)	9664	25.1	45.2	10.2	2817	6796
S_2 (45 × 30 cm)	7542	17.7	49.8	10.3	1614	5877
S_3 (60 × 15 cm)	9184	21.3	47.2	10.8	2577	6557
S_4 (60 × 30 cm)	6733	15.5	51.7	10.9	1335	5347
SEm±	343.76	0.49	1.14	0.47	60.5	58.1
CD (P=0.05)	1008.1	1.4	3.3	NS	177.6	170.5
DATES OF SOWING (D)						
D_1 (2nd fortnight of July)	9059	21.7	53.4	11.4	2263	6746
D_2 (1st fortnight of August)	8314	19.8	51.2	10.5	2100	6164
D_3 (2nd fortnight of August)	7468	18.2	40.8	9.8	1895	5523
SEm±	297.7	0.42	0.98	0.4	52.4	50.3
CD (P=0.05)	873	1.2	2.8	1.1	153.8	147.7
INTERACTION (S × D)						
SEm±	595.41	0.85	1.97	0.81	307.7	100.7
CD (P=0.05)	NS	NS	NS	NS	NS	NS
CV%	10.76	7.45	7.05	12.17	9.64	8.06

Among different dates of sowing at maturity, the highest drymatter was recorded during 2nd fortnight of July sowing (9060 kg ha^{-1}) which was significantly superior over 1st fortnight of August sown crop(8314 kg ha^{-1}). The lowest drymatter was obtained with the crop sown during 2nd fortnight of August (7468 kg ha^{-1}).

Drymatter production is the expression of growth and development of different morphological parameters. Among different spacings, accumulation of maximum drymatter was recorded at closer spacing 45 cm × 15 cm which is due to more biomass accumulation with more number of plants per unit area. Among different dates of sowing, higher drymatter accumulation was recorded with 2nd fortnight of Julysown crop which was due to cumulative effect of more plant height and optimum weather conditions like availability of more bright sunshine hours coupled with optimum day length which inturnmight have increased the photosynthesis and in turn drymatter production. Similar results were reported by Chouhan *et al.* (2015) and Deshmukh *et al.* (2013).

Yield Attributes

Significantly more number of ear heads m^{-2} were recorded in closer spacing of 45 cm × 15 cm, while minimum number of ear heads m^{-2}were observed with 60 cm × 30 cm.Among the different dates of sowings tested maximum number of earheads m^{-2} were observed with crop sown on 2nd fortnight of July and was superior to 1st fortnight of August sowing. Minimum number of earheads m^{-2} were recorded with the crop sown during 2nd fortnight of August.

Among the different spacings, the maximum earhead weight (g) was recorded with 60 cm × 30 cm and lowest earhead weight (g) was reported with spacing 45 cm × 15 cm. Maximum earhead weight (53.4g) was obtained when pearl millet was sown during 2nd fortnight of July sown crop, which was significantly superior to 1st fortnight of August sown crop. However, the lowest earhead weight was recorded with crop sown during 2nd fortnight of August sown crop.

The spacings tested had no significant effect on test weight**.** Among the dates of sowing, the maximum test weight was recorded with 2nd fortnight of July sowing (11.4g) which was superior to 1st fortnight of August sowing and lower test weight was recorded with the crop sown during 2nd fortnight of August (9.8g).

Yield (kg ha^{-1})

With regard to spacings, maximum grain yield was recorded with 45 cm × 15 cm which was

significantly superior over spacing 45 cm × 30 cm and 60 cm × 15 cm. Minimum grain yield was obtained with wider spacing 60 × 30 cm. Significantly, higher grain yield of 2263 kg ha^{-1} was recorded with 2nd fortnight of July sown crop and was superior to 1st fortnight of August sown crop (2100 kg ha^{-1}). However, the lowest grain yield was recorded when the crop was sown during 2nd fortnight of August (1895 kg ha^{-1}).

Among different spacings, maximum stover yield was obtained with narrow spacing 45 × 15 cm (S_1).Higher stover yield of 6746 kg ha^{-1} was recorded with 2nd fortnight of July sowing and was significantly superior to 1st fortnight of August sown crop(6164 kg ha^{-1}). However, lower Stover yield was recorded when pearl millet was sown during 2nd fortnight of August. Among different dates of sowing higher grain yield and straw yield was recorded with 2nd fortnight of July sowing due to combined effect of higher values recorded for growth parameters and yield attributing characters as wells as congenial weather conditions that prevailed during grain filling and physiological maturity stages of crop growth. The results are in corroboration with the finding of Arslan *et al.* (2018), Bhuva and Detroja (2018) and Andhale *et al.* (2005).

There was no interaction between spacings and dates of sowing for all parameters studied.

CONCLUSION

It can be concluded that among the four different spacings, narrow spacing *i.e.,*45 × 15 cm (S_1) recorded higher values of growth parameters, yield attributes and yield of pearl millet. Among the three dates of sowings, 2nd fortnight of July sown crop recorded higher values of drymatter accumulation, earhead weight, 1000 grain weight, grain yield and straw yield of pearl millet followed by 1st fortnight of August sowing.

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