Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5904

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (2):** 684-687 (2018)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Flowering Behaviour Studies in Parental Lines of Pearl Millet Hybrid BPMH-3

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Received: 16.10.2017 | Revised: 28.11.2017 | Accepted: 5.12.2017

ABSTRACT

A field experiment was carried out during Kharif 2016 at Saidapur farm of University of Agricultural Sciences, Dharwad. The field experiment comprised of fourteen treatments with two replications in Randomised complete block design. The results revealed that second fortnight of December sowing 2016 (T_{14}) recorded the lowest plant height (77.50 cm) and 92.00 cm by female (ICMA 9277) and male (TPRT 111) parental lines respectively. With respect to days to panicle initiation, days to fifty per cent flowering and days to complete flowering more number of days (48.00) days) was taken for panicle initiation by female parent and 56.00 days by male parent when sown on first fortnight of June 2016 (T_1). The female and male parental lines took significantly more number of days 52.00 days and 64.00 days for fifty percent flowering respectively. While, for complete flowering more number of days to complete flowering was (66.00 days) in female parent and 74.50 days in male parent when sown during first fortnight of June 2016. The lowest number of days in male parental line and in female parental line for panicle initiation, fifty per cent flowering and complete flowering (days) was noticed in Second fortnight of December 2016 sowing (T_{14}). The variation in the plant height at different sowing dates might be attributed by the prevailing environmental conditions at their growth phase besides genetic factor. In the sowings, taken during the month of June, July, August and September months delayed the flowering due to rainy days, non-availability of better sun shine hours and due to prevailing photo period nature, as flowering requires particular day length and temperature and also pearl millet is photosensitive and short day plant. Short day length induces early flowering. During the month of December, the day length is short this period favours early flowering. This was true with both the parents.

Key words: *Dates of sowing, Flowering behaviour, Synchronization*

INTRODUCTION

Pearl millet (*Pennisetum glaucum*) in India is known by several names in different languages, commonly called as pearl millet, cumbu, sajje etc and it is also called as cat tail millet, bulrush millet or candle millet. It belongs to family gramineae (poaceae). The genus Pennisetum has two closely related species*; Pennisetum glaucum* (which is a diploid with A genome (2n = 14) and *Pennisetum purpureum* (which is a tetraploid with B genome (2n = 28).

Cite this article: Priyanka, M. and Gurumurthy, R., Flowering Behaviour Studies in Parental Lines of Pearl Millet Hybrid BPMH-3, *Int. J. Pure App. Biosci.* **6(2):** 684-687 (2018). doi:

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It is considered to be the poor man's staple nourishment and suitable to cultivate in dry lands[2].

Pearl millet being a C_4 species is endowed with a very high photosynthetic efficiency and ability for dry matter production. It is an important coarse grain cereal and forage crop of the arid and semi-arid tropics of the subcontinent. It can be grown on wide range of soils including sandy, light textured soils and may sustain growth on acidic and vary in fertile soils.

Pearl millet is mainly a rainfed crop. Pearl millet producing states in India are Rajasthan, Maharashtra, Haryana, Uttar Pradesh, Gujarat, Karnataka and Tamil Nadu. Area under pearl millet cultivation in Karnataka is 0.29 million hectare, production of 0.31 million tonnes and productivity of 1,080 kg ha^{-1},[1].

Pearl millet inflorescence is a compound terminal spike called panicle and its length generally varies between 20-25 centimeter with a circumference of seven-nine centimeter. The shape of panicle varies considerably, but the common shapes are either cylindrical or conical. Inflorescence consists of a central rachis covered with soft, short hairs and bears fascicles on rachillae. The density of fascicles and length of rachillae determine the degree of compaction of the panicle. Each fascicle contains spikelets surrounded by a wall of bristles (involucre). The prolongation of the fascicle axis determines the length of bristles. A spikelet may contain two-four flowers or florets, but generally two. The lower floret is staminate and the upper floret is bisexual or hermaphrodite. Maximum flowering takes place at 10 a.m. and mid night in Indian condition[5]. Spike takes six days to emerge from sheath with maximum emergence on fourth or fifth day. Most heads shed pollen for four-six days. Stigma receptivity remains for two-three days after emergence, depending upon the variety and weather conditions.

Differential flowering period causes a poor seed set due to non-availability of pollen at the time of stigma receptivity in female parent. Pearl millet being a nitro positive crop, additional dose of nitrogen is applied to enhance the flowering. To achieve proper synchronization of flowering of male and female parents methods like staggered sowing and application of additional dose of nitrogen may be followed.

Mainly pearl millet is grown on marginal lands under harsh condition with limited use of chemicals and fertilizers. Besides this, the quality seed of improved genotypes is another major constraint to enhance production, productivity, seed replacement rate and also loss of crop due to downy mildew disease. Therefore to overcome synchronization problem, flowering behaviour studies are essential.

MATERIAL AND METHODS

The field experiment was laid out under Randomized Block Design (RBD) with two replications and fourteen treatments at Saidapur farm, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *Kharif* 2016. Dharwad situated at $15^0$12' N latitude and $76^0$34'E longitude with an altitude of 678m above mean sea level. The experimental site consisted of medium deep black soil.

Fourteen treatments involves, T_1: First fortnight sowing of June, T_2: Second fortnight sowing of June, T_3: First fortnight sowing of July, 2016 T_4: Second fortnight sowing of July, T_5: First fortnight sowing of August, T_6: Second fortnight sowing of August, T_7: First fortnight of sowing September, T_8: Second fortnight sowing of September, T_9: First fortnight sowing of October, T_{10}: Second fortnight sowing of October, T_{11}: First fortnight sowing of November, T_{12}: Second fortnight sowing of November, T_{13}: First fortnight sowing of December, T_{14}: Second fortnight sowing of December, 2016.

The observations on plant height (cm), days to panicle initiation, days to 50 % flowering and days to complete flowering were recorded at respective stages.

RESULTS AND DISCUSSION

The experimental results indicated that, delay in days to 50 % flowering in T_{14} treatment. Among the different dates of sowings, T_{14} recorded less number of days for panicle initiation, days to 50 per cent flowering and days to complete flowering. Whereas more number of days to panicle initiation, days to 50 per cent flowering and days to complete flowering was noticed in T_1 treatment. Highest plant height was recorded in T_1 treatment (139.37 and 185.00cm in female and male parent respectively) and lowest in T_{14} (77.50 and 92.00cm in female and male parent respectively) an indicated in table 1. The difference in number of days to fifty per cent flowering between the male and female parental lines were more (12days) in T_1 and the difference was narrow down (5days) in second fortnight December sowing (T_{14}) as depicted in table 2.

Table 1: Influence of date of sowing on plant height at harvest and days to panicle initiation in A-line (ICMA 9277) and R-line (TPRT 111)

Treatments	Plant height (cm)		Days to panicle initiation (Days)		
	A line	R line	A line	R line	Difference (days)
T_1 : First fortnight of June, 2016	139.37	185.00	48	56	8
T_2 : Second fortnight of June, 2016	131.35	170.50	47.85	55.5	7.65
T_3 : First fortnight of July, 2016	125.75	161.50	47.5	55	7.5
T_4 : Second fortnight of July, 2016	117.43	154.50	47.3	54.8	7.5
T_5 : First fortnight of August, 2016	109.52	148.37	46.13	53	6.87
T_6 : Second fortnight of August, 2016	107.52	145.28	45.25	51.8	6.55
T_7 : First fortnight of September, 2016	101.45	142.87	44.38	50.8	6.42
T_8 : Second fortnight of September, 2016	99.24	133.50	43.13	49	5.87
T_9 : First fortnight of October, 2016	97.70	121.98	42.75	48.5	5.75
T_{10} : Second fortnight of October, 2016	95.73	119.52	41.5	47	5.5
T_{11} : First fortnight of November, 2016	92.00	112.60	40.5	45.5	5
T_{12} : Second fortnight of November, 2016	89.00	100.00	40.2	45	4.8
T_{13} : First fortnight of December, 2016	78.56	94.50	40	44.7	4.7
T_{14} : Second fortnight of December, 2016	77.50	92.00	39	43.5	4.5
Mean	**104.43**	**134.43**	**43.82**	**50.00**	-
S.Em. ±	12.77	13.04	3.19	3.04	-
C.D. (P = 0.05)	54.42	39.85	9.76	9.28	-

The variation in the plant height at different sowing dates might be attributed by the prevailing environmental conditions at their growth phase besides genetic factor. These finding are analogues with the reports Hipparagi *et al.*[4], in maize hybrid and Ganachari[3], in fodder sorghum hybrid seed production.

In the sowings, taken during the month of June, July, August and September months delayed the flowering due to rainy days, non-availability of better sun shine hours and due to prevailing photo period nature, as flowering requires particular day length and temperature and also pearl millet is photosensitive and short day plant. Short day length induces early flowering. During the month of December, the day length is short this period favours early flowering. This was true with both the parents. The present results are in conformity with the findings of Quinby and Shertz[6], in sorghum hybrid seed production. The early flowering in December second sowing might be due to low temperature and good sunshine hours during that period[7,3].

From the above data it can be concluded that at all the dates of sowing, both the male and female parents found to be non synchronous in their flowering behaviour. Hence, none of the dates of sowing found suitable for synchronous flowering of male and female parental lines of pearl millet hybrid BPMH-3 seed production at Dharwad location.

Table 2: Influence of date of sowing on days to fifty per cent flowering and days to complete flowering in A-line (ICMA 9277) and R-line (TPRT 111)

Treatments	Days to fifty per cent flowering			Days to complete flowering		
	A-line	R-line	Difference (days)	A-line	R-line	Difference (days)
T_1: First fortnight of June, 2016	52	64	12	66.00	74.50	8.5
T_2: Second fortnight of June, 2016	51	62.5	11.5	63.50	71.00	7.5
T_3: First fortnight of July, 2016	50.5	62	11.5	63.50	71.00	7.5
T_4: Second fortnight of July, 2016	50	61	11	63.00	70.00	7
T_5: First fortnight of August, 2016	49.5	60	10.5	63.00	70.00	7
T_6: Second fortnight of August, 2016	48.5	58.5	10	62.50	68.50	6
T_7: First fortnight of September, 2016	49.5	59	9.5	62.00	67.00	6
T_8: Second fortnight of September, 2016	48	57	9	61.00	66.50	5.5
T_9: First fortnight of October, 2016	48	56.5	8.5	60.50	65.00	4.5
T_{10}: Second fortnight of October, 2016	47.5	55	7.5	60	64.50	4.5
T_{11}: First fortnight of November, 2016	47	54	7	58.50	63.00	4.5
T_{12}: Second fortnight of November, 2016	46.5	53	6.5	58.00	62.50	4.5
T_{13}: First fortnight of December, 2016	46.5	52	5.5	57.00	61.00	4
T_{14}: Second fortnight of December, 2016	46	51	5	56.00	60.00	4
Mean	**48.60**	**57.53**	-	**61.03**	**66.75**	-
S.Em. ±	1.93	2.93	-	0.499	2.045	-
C.D. (P = 0.05)	5.92	8.95	-	1.523	6.248	-

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