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Short Communication

Initial Evaluation for Photosensitivity in Pearl Millet

A.K. JOSHI, J.N. PANDYA, R.K. MATHUKIA AND C.J. DANGARIA
Millet Research Station, Junagadh Agricultural University*, Air Force Road, Jamnagar-361006
e-mail: dr_ak_joshi@yahoo.co.in

Pearl millet is a highly cross-pollinated crop. For commercial hybrid seed production, synchronization in flowering of both the parents is an essential requirement. Knowledge of photoperiodic response of parental lines and identification of photo-insensitive lines would be an asset in commercial hybrid seed production programme in pearl millet. A low degree of photoperiodic sensitivity is also essential for broad adaptation of pearl millet [1].

In a long term experiment spread over nine years from 1990 to 1998 with split plot design and three replications each of single row of 5 m, in all 26 plantings employing recommended package of practices were done at Jamnagar location to create different photoperiodic conditions ranging from 12 hours and 1 minute to 14 hours and 13 minutes, and 39 parental lines were evaluated for their photoperiodic response.

The photoperiodic sensitivity was defined as delay in flowering due to increasing day length by virtue of planting dates. The influence of temperature was nullified by expressing the flowering period in terms of degree-days. These were calculated by summing up the mean daily temperature minus base temperature (12° C in pearl millet) of the flowering period. Flowering was recorded when stigmas on 50% of the main panicles per plot had emerged. The data were subjected to linear correlation and regression analysis between photoperiod and degree-days to flower [2].

In an over all response a significant positive correlation (r) was obtained between degree-days to flower and photoperiod, signifying that with the increase in photoperiod there was a delay in flowering. This indicates that in general pearl millet exhibited a quantitative short day response (Table 1). These results are in agreement with the earlier work [3, 4].

Genotypic differences in response to photoperiods were observed. Non-significant values of r indicated a poor photoperiodic response or photo-insensitive nature of the entry. Accordingly, these parental lines are categorized as low photoperiodic responsive / photo-insensitive lines. Such lines are of particular interest to breeders as a matter of requirement of synchrony in flowering of parental lines for hybrid seed production programme. Out of 39 lines 24 entries were assessed as low photoperiodic-responsive / photo-insensitive lines, which may be useful for breeding purpose. However, some entries with limited plantings (less number of observations-n) require further confirmation and two entries viz. PNMS-3A and 77/29-3 are totally excluded from the discussion. The response of a hybrid to day-length has been shown to be closely related to that of their parents and that the adaptive range of the breeding material can be broadened [1].

The parental lines are also categorized (Table 2) for flowering behavior as early, mid-late and late flowering entries depending on their mean flowering time (Table 1). However, photoperiodic response was not found to be associated with earliness or lateness of the entry. Nevertheless, once we know the temperature regime of a location and degree-days to flower of any entry, the number of days required for flowering can be predicted. This is very helpful in synchronization of flowering time of two parental

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Table 1. Correlation and regression analysis between photoperiods (in hours) and flowering time (in degree days) of different entries

Sr. No.	Name of entry	n	r	r2	t	F	Regression equation	period [h]	time [deg.day]
1	81 -A	27	0.45*	0.2	2.54*	6.45*	y=47.55x+192.57	13.32	826.07
2	841 -A	48	0.16	0.02	1.1	1.21	y=28.63x-384.71	13.33	766.73
3	ICMR-88088	6	0.92*	0.84	4.62**	21.39*	y=85.05x-370.98	13.14	746.67
4	214-2	6	0.48	0.34	1.43	2.04	y=29.31x+372.36	13.14	757.5
5	PPMI-301	42	-0.39*	0.15	-2.66*	7.07*	y=-84.42x+2002.55	13.21	886.98
6	77-273-3-2	6	0.57	0.32	1.37	1.88	y=121.26x-778.58	13.14	814.83
7	AIB-23	12	0.54	0.29	2	4.02	y=45.92x+145.84	12.73	730.42
8	PN-2A	24	0.15	0.02	0.71	0.5	y=22.80x+476.34	13.24	778.46
9	PPNBV-8	24	0.14	0.02	0.65	0.42	y=21.23x+368.36	13.43	653.58
10	RIB-20K-86	21	0.61*	0.37	3.35**	11.22**	y=67.75x-219.49	13.4	688.38
11	AER-49	12	0.06	0.003	0.19	0.04	y=2.97x+698.94	13.31	738.5
12	J-108	12	-0.08	0.006	-0.25	0.06	y=-6.99x+786.13	13.31	693.08
13	RP-3414	12	0.26	0.068	-0.86	0.73	y=-21.59x+928.07	13.31	640.67
14	843-A	39	0.61*	0.37	4.74**	22.47*	y=82.96x-429.82	13.39	681.56
15	1009	12	-0.15	0.02	-0.48	0.23	y=-31.42x+1213.18	13.31	794.92
16	2059	12	0.04	0.001	0.12	0.01	y=4.73x+752.13	13.31	815.08
17	J-2289	12	-0.25	0.06	-0.8	0.64	y=13.31x+663.42	13.31	663.42
18	J-2296	21	0.42	0.18	2.04	4.19	y=49.25x+58.77	13.4	718.76
19	5054-A	12	-0.44	0.19	-1.55	2.41	y=-79.03x+1771.47	13.31	719.33
20	ICMR-87003	33	-0.22	0.05	-1.28	1.64	y=-52.92x+1514.91	13.34	808.69
21	ICMR-88088	57	0.69*	0.45	7.20**	51.83**	y=166.49x-1446.59	13.37	779.69
22	ICMR-89951	12	-0.13	0.016	-0.41	0.17	y=-9.97x+775.64	13.31	642.92
23	Pb-111-A	33	0.17	0.03	0.98	0.96	y=45.59x+274.49	13.4	885.73
24	J-2290	36	0.28	0.07	1.67	2.78	y=65.07x-34.69	13.35	834.36
25	D-23	39	-0.02	0.005	-0.14	0.02	y=-4.19x+886.52	13.42	830.2
26	ICMP-85410-E1E1	12	0.94*	0.89	9.06**	81.99**	y=200.39x-1680.42	13.38	1001.33
27	ICMP-85410-e1e1	12	0.71*	0.51	3.23**	10.42**	y-188.21x-1829.36	13.38	689.42
28	BSECTCP-2/C2	15	0.64*	0.4	3*	9**	y=80.57x-291.49	13.35	783.93
29	PNMS-3A	3	-	-	-	-	-	12.5	638.33
30	PNBM-90001	15	0.05	0.002	0.18	0.03	y=5.61x+873.13	13.35	888.06
31	PNMS-8A	12	-0.38	0.15	-1.32	1.74	y=-48.17x+1597.31	13.48	947.92
32	PNBM-89053	15	0.66*	0.44	3.19**	10.19**	y=162.01x-1319.54	13.35	843.07
33	886-A	12	0.55	0.3	2.09	4.35	y=93.08x-436	13.19	791.25
34	89-111 -A	9	0.94*	0.89	7.55**	57.04**	y=105.29x-601.12	13.45	815.56
35	ICMP-451	9	0.62	0.39	2.11	4.43	y=45.63x+130.22	13.45	744.22
36	RIB-335/74	18	0.56*	0.32	2.73*	7.4*	y=55.96x-32.61	13.49	722.06
37	G-73-107	9	0.78*	0.6	3.27*	10.69*	y=103.63x-570.48	13.45	823.89
38	77/29-3	3	-	-	-	-	-	14.16	791
39	H-77/833-2	9	-0.73	0.54	-2.84	8.09	y=-220.76x+3765.87	13.33	822.44
OVER-ALL RESPONSE		732	0.17*	0.03	4.7**	22.09**	y=38.45x+271.27	13.34	784.32

* significant at 5% level
** significant at 1% level

Table 2. Categorization of different parental lines for flowering time [degree days]

Sr. No.	Early flowering entries [<700 degree days]	Mid-late entries [700-800 degree days]	Late entries [>800 degrees days]
1	PNBV-8	841 -A	81-A
2	RIB-20K-86	ICMR-88088	PPMI-301
3	J-108	214-2	77/273/3-2
4	RP-3414	AIB-23	2059
5	843-A	PN-2A	ICMR-87003
6	J-2289	AER-49	Pb-111-A
7	ICMR-89951	1009	J-2290
8	ICMP-85410 e1e1	J-2296	D-23
9	PNMS-3A	5054-A	ICMP-85410 E1E1
10	-	ICMR-58004	PNBM-90001
11	-	BSECTCP-/C2	PNMS-8A
12	-	886-A	PNBM-89053
13	-	ICMP-451	89-111 -A
14	-	RIB-335/74	G-73-107
15	-	77/29-3	-
16	-	H 77/833-2	_

lines by staggered sowing in commercial hybrid seed production programme.

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