Environment & Ecology 35 (4C) : 3383—3385, October—December 2017
Website : environmentandecology.com ISSN 0970-0420

Photoinsensitivity Studies in Early Maturing Pigeonpea (*Cajanus cajan* (L.) Millsp.) Genotypes

Muralidhara B., Muniswamy S., Lokesha R.

Received 31 March 2017; Accepted 2 May 2017; Published online 22 May 2017

Abstract The experiment was carried out during *kharif* 2014, with 21 pigeonpea genotypes of different maturity group with four dates of sowing. Based on the mean photoperiod sensitivity (%) across four dates of sowing, the early maturing genotypes ICPL-2011252 (6%) and ICPL-20340 (7%) displayed lower magnitude of photoperiod sensitivity (%) along with other early maturing genotypes. Where, Maruti (25%) and GC-11-39 (23%) genotypes displayed the higher magnitude of photoperiod sensitivity (%).

Keywords *Kharif,* Pigeonpea, Photoperiod sensitivity.

Introduction

Pigeonpea is an important grain legume of Asia, Latin America and Africa. Globally, it is grown on ~ 5 million hectares in about 82 countries of the world. India accounts for about 90% of the global production and it is grown in rainfed areas where day length varies from 11 to 14 h and large differences in temperature are experienced. The traditional varieties grown are extremely sensitive to photoperiod and temperature, which has limited the expansion of pigeonpea to higher latitudes and altitudes and also limited its use in alternative cropping systems. Therefore, the development of short duration lines which are less photoperid and temperature sensitive could be a break through for pigeonpea expansion to wider latitudes and altitudes and to provide alternative cropping system options (including shorter rotations, i.e., wheat-pigeonpea, paddy fallows and summer crop) and would also play a key role to move towards market based agriculture.

Materials and Methods

The present investigation was carried out at Agricultural Research Station (ARS), Kalaburagi during *kharif* 2014, with four dates of sowing (15th June, 15th July, 15th August and 15th September). A total of 21 pigeonpea genotypes were evaluated, among them 16 were of early maturing genotypes (<50 days for days to 50% flowering, ICRISAT) and 5genotypes were check varieties.

Photoperiod sensitivity

The photoperiod sensitivity was computed as per cent

Muralidhara B*., Muniswamy S., Lokesha R.
Dept of Genetics and Plant Breeding,
UAS, Raichur 584104, India
e-mail : muralib5002@gmail.com
*Correspondence

Table 1. Photoperiod sensitivity (%) of early maturing pigeonpea genotypes over staggered dates of sowing **.** DFF-Days to 50% flowering, PS (%) - Photoperiod sensitivity in per cent.

Sl.No.	Genotypes	15th Jun DFF	15th Jul DFF	15th Jul PS (%)	15th Aug DFF	15th Aug PS (%)	15th Sep DFF	15th Sep PS(%)
1	ICPL-2011252	48	47	2	45	6	44	9
2	ICPL-20340	46	45	2	43	7	41	11
3	ICPL-2011251	48	46	5	43	12	41	15
4	ICPL-2011249	46	43	6	41	11	38	17
5	ICPL-2011255	48	46	5	42	13	41	16
6	ICPL-2011254	48	45	6	43	11	41	14
7	ICPL-2011250	48	46	4	43	10	38	20
8	ICPL-2011253	50	47	6	45	11	42	17
9	ICPL-20339	48	45	7	44	10	41	15
10	ICPL-20330	57	52	10	49	15	43	25
11	ICPL-20341	50	46	8	44	13	41	19
12	ICPL-20328	56	53	6	50	11	48	15
13	ICPL-20338	49	45	7	43	12	41	17
14	ICPL-20337	54	50	8	46	15	44	19
15	MN-5	52	47	11	46	13	43	19
16	PAU-881	54	50	8	47	14	41	24
	Sub mean 1	50 ± 3.4	47 ± 2.7	6 ± 2.2	44 ± 2.4	11 ± 2.6	42 ± 2.3	17 ± 4.1
17	ICPL-88039 (ch)	69	62	11	59	15	55	21
18	GC-11-39 (ch)	82	71	13	61	26	58	30
19	ICPL-87 (ch)	88	82	8	65	26	61	31
20	TS-3R (ch)	91	84	9	69	22	64	27
21	Maruti (ch)	111	103	7	76	32	73	35
	Sub mean 2	88 ± 15.3	80 ± 15.5	9 ± 2.5	66 ± 6.7	24 ± 6.3	62 ± 6.9	29 ± 5.1
	Mean	59	55	7	49	14	46	20
	SEm±	1.01	0.74	1.06	0.84	2.29	0.46	1.89
	CD @ 5%	2.99	2.21	3.13	2.40	6.78	1.36	5.58

early /delay in flowering under specific environment compared to the time of flowering in the normal environment with the help of formula suggested by Talukdar et al. [1].

$$\text{Photoperiod sensitivity (\%)} = \frac{\text{DFF in specific environment} - \text{DFF in normal environment}}{\text{DFF in normal environment}} \times 100$$

Where, DFF : days to 50% flowering

a. Genotypes that differed by lower magnitude of photoperiod sensitivity percentage were considered as insensitive. b. Genotypes that differed by higher magnitude of photoperiod sensitivity percentage were considered as sensitive.

Results and Discussion

Pigeonpea being a quantitatively short day plant, exhibits considerable magnitude of photoperiod sensitivity in present day cultivars. Hence identification and development of non-sensitive short duration pigeonpea cultivars, expands pigeonpea cultivation to all seasons and to non traditional niches.

The photoperiod sensitivity of genotypes was calculated based on the per cent early or delay in the days to 50% flowering under specific environment to the normal environment. From the study it was observed that, date of sowing and days to 50% flowering are inversely related, as indicated by the decrease in mean values of days to 50% flowering with

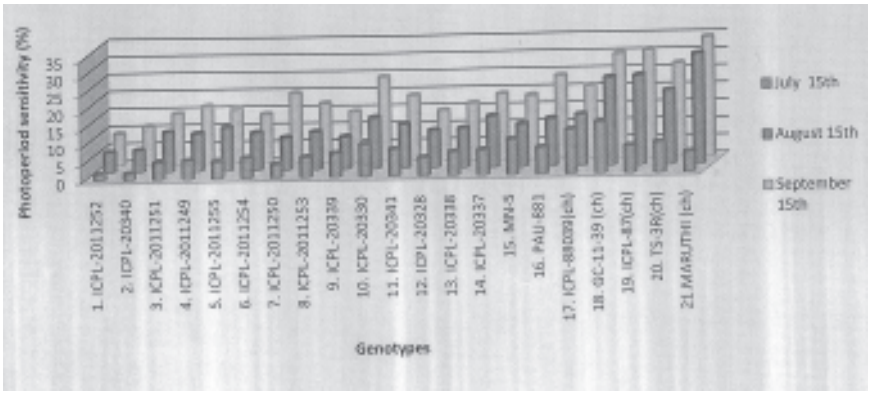

Fig. 1 Photoperiod sensitivity (%) of genotypes in different dates of sowing.

delay date of sowing. i.e. 15th June (59 days), 15th July (55 days), 15th August (49 days) and 15th September (46 days) (Table 1). Earliest flowering was observed in September sown crop, where reproduction period of crop coincides with the low temperature and reduced photoperiod.

The mean values for photoperiod sensitivity (%) (Table 1 and Fig. 1) in different dates of sowing revealed that photoperiod sensitivity (%) increased with corresponding delay in date of sowing, as implicated by increase in mean value for photoperiod sensitivity (%), in July (7%), August (14%) and September (20%) and early maturing genotypes showed less photoperiod sensitivity (%) ranging from 6 (ICPL-2011252) to 16 (ICPL-20330), as compared to checks. It was evident by the mean values for photoperiod sensitivity (%) in checks ranging from 16 (ICPL-88039) to 25 (Maruti). In the present investigation mean temperature during crop growth period was 38°C in June to 29°C in December coupled with gradually decreasing mean photoperiod from 13.08 h in June to 11.06 h in December. However, short duration cultivars are less sensitive variation in photoperiod and temperature. In conformity, Chauhan et al. [2] and Silim et al. [3] reported that, short duration pigeopea cultivars are less sensitive photoperiod and temperature .In contrast to this findings of Dhanasekar and Reddy [4] opined that short duration genotypes need not necessarily be photoinsensitive.

Conclusion

It can be inferred from the studies that, the early maturing pigeonpea genotypes showed less photoperiod sensitivity than checks, as indicated by the lower mean values for photoperiod sensitivity across the different sowing environments. Among early maturing genotypes ICPL-2011252 and ICPL-20340 showed very less sensitivity to photoperiod across the different sowing environments. Hence, these genotypes can be directly used as a photoinsentitive variety or choice of parent in breeding program to improve photoinsensitivity trait.

References

1. Talukdar BS, Babu PPP, Bidinger FR (1993) Combining ability and correlation studies for earliness and photoperiod response in pearl millet. Crop Improve 20 : 31—35.
2. Chauhan YS, Johansen C, Moon JK, Lee YH, Lee SH (2002) Photoperiod responses of extra short duration pigeonpea lines developed at differen latitudes. Crop Sci 42 : 1139—1146.
3. Silim SN, Gwataa ET, Coeb R, Omanga PA (2007) Response of pigeonpea genotypes of different maturity duration to temperature and photoperiod in Kenya. Afr Crop Sci J 15 : 73—81.
4. Dhanasekar P, Reddy KS (2012) Study of compact dwarf pigeonpeas response to photoperiod and exogenous gibberellic acid. J Food Leg 25 : 25—30.