



Heterophilly in pigeonpea [*Cajanus cajan* (L.) Millisp.] seedlings

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Pigeonpea [*Cajanus cajan* (L.) Millisp.] belongs to subfamily papilionaceae of family leguminoseae. Considerable variation in the leaf shape and sizes of the primordial leaves developed from emerging plumule immediately after germination and first few leaves there after is observed sporadically in various germplasm lines and cultivated varieties. Their occurrence and perpetuation, generation after generation are not seen in the available literature. If such variants could be fixed, they may be useful seedling markers, which can have special significance in hybrid breeding for identification of parents and hybrids [1]. Present paper describes the variation for few characters related to the seedlings of pigeonpea.

Three derivatives in F₉ generation from different breeding populations (C-11 × *Cajanus cajanifolia*, Akms-8 × *Sesamum* leaf variant and Akms-1 × *Sesamum* leaf variant) were screened to isolate few typical variants for the primordial leaves and first and second leaves appearing there after. The variation in size of the primordial leaves is presented in Table 1. The plants of the standard variety ICPL-87119 were used as check. The primordial leaves of the checks normally measured

52.10 mm in length and 17.70 mm in breadth. The variants however, had bigger or smaller measurements of length and breadth, based on which they change the shape which can be described as broad, narrow, elongated, oval shaped, small or tiny leaves (Fig. 1a to d). They are uniformly simple leaf with entire margin without any lobing and emerge in a pair as an expansion of the terminal axis of plumule pushed above the ground by elongation and straightening of epicotyl during germination. They are normally arranged opposite each other, with growing terminal bud in the centre at the tip. However, the alternate arrangement of the primordial leaves and triplet (Fig. 1e) or quadruplet primordial leaves were seen in the populations as the exceptions. All these variants were tagged and selfed. Seeds of those plants were carried to next generation.

The variants presented in Fig. 1a to 1d, were found to occur in next generation with varying frequencies. Thus their perpetuation indicates the hereditary nature of the size and shape variation. However, the triplet and quadruplet primordial leaves did not perpetuate to next generation.

The leaves appearing immediate after the primordial leaves were normally trifoliolate compound type. However, few variants with abnormally unifoliolate or bifoliolate leaves on first or second nodes above the primordial leaves were located. Such thirty plants were selfed and their thirty progenies were scored for their variant characters (Table 2). Unifoliolate first leaf was scored in 283 plants which account to 63.74 % of total population. Occurrence of bifoliolate first leaf was very low i.e. 4.95 %. In respect of the second leaf the

Table 1. Size variation for the primordial leaves in pigeonpea seedlings

Variants	Range	Mean ± SE
Broad leaf		
Length (mm)	58-65	61.90 ± 0.787
Breadth (mm)	23-28	25.50 ± 0.499
Elongated leaf		
Length (mm)	45-57	51.60 ± 1.107
Breadth (mm)	12-18	15.60 ± 0.581
Oval leaf		
Length (mm)	41-48	44.50 ± 0.085
Breadth (mm)	21-27	23.70 ± 0.538
Tiny leaf		
Length (mm)	42-52	42.52 ± 1.127
Breadth (mm)	12-18	12.18 ± 0.716
Check ICPL-87119 (Normal cultivated type)		
Length (mm)	50-55	52.10 ± 0.547
Breadth (mm)	16-20	17.70 ± 0.396

Table 2. Variants for number of leaflets of first and second leaves of pigeonpea seedlings

Location of leaf on seedling	No. of plants observed*			Total
	Unifoliolate	Bifoliolate	Normal trifoliolate	
First leaf	283 (63.74)	22 (4.95)	139 (31.31)	444
Second leaf	95 (21.40)	14 (3.15)	335 (75.45)	444

*Figures in parenthesis are percentage of total plants observed

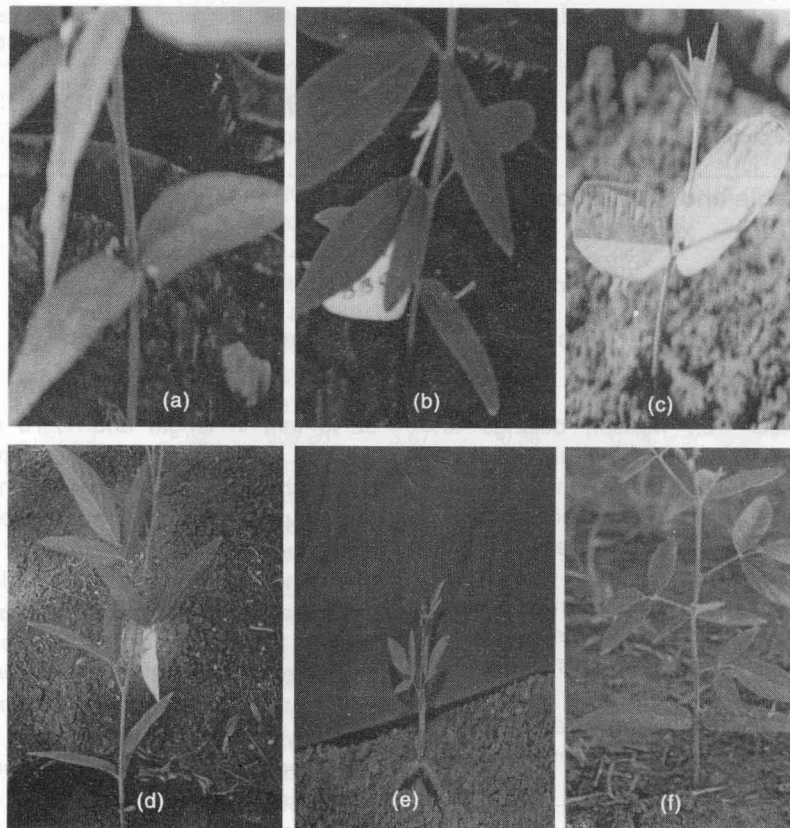


Fig. 1. a to d : Different shapes of primordial leaves in pigeonpea. (a) broad, (b) elongated, (c) oval, (d) tiny, (e) triplet primordial leaves and (f) normal observed in ICPL-87119

percentage of plants with unifoliate and bifoliate was 21.40 and 3.15 % respectively, which were lower than the respective score for first leaf abnormalities.

Some of the progenies bred true for unifoliate first leaf. However, there was not a single progeny to show such nonsegregating behavior in respect of bifoliate first leaf as well as for either type of second leaf. It is expected that the abnormal unifoliate or bifoliate behaviour of first or second leaf is an hereditary trait, however they are influenced by various external factors such as microclimate to which embryo is exposed at the time of germination. Second leaf abnormalities are likely to be more influenced by such nonhereditary factors because by the time of their initiation, plant may develop the root system and have the influence of the different factors influencing development of root

system. Second probability lies in the tendency of the plant to come out of the shock, it succumbed during germination causing the irregular leaf development in early seedling stage.

Such behaviour however, may be governed by some hereditary factors due to which it is expressed in the progeny. Their inheritance needs to be studied in greater details.

Reference

1. Patil A. N., Wanjari K. B., Prema Manapure, Manjaya J. G. and Patel M. C. 1998. Seedling gene markers useful in hybrid seed production. Paper presented in National Symposium, "Biotic and abiotic stress in Pulse Crops". May 1998, IIPR, Kanpur.