Indian Journal of Agricultural Sciences **78** (11): 991–3, November 2008

Effect of selfing methods on pod formation in early duration pigeonpea (*Cajanus cajan*)*

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Received: 27 January 2008

Key words: *Cajanus cajan*, Pigeonpea, Selfing method

The floral structure of pigeonpea (*Cajanus cajan* L. Millsp.) was mainly adapted to self-pollination, which changed over time to partial outbreeding. The outcrossing of pigeonpea ranged between 4 and 70% (Bhatia *et al.* 1981). It is impossible to maintain the purity of germplasm lines, elite lines and varieties of pigeonpea due to such a range of outcrossing. To preserve the genetic purity of pigeonpea accessions, breeding lines and varieties, it is essential to multiply the accessions under controlled pollination. When the whole plant is covered with aerable nylon nets, the growth, flowering, podding and ultimately seed setting is badly affected due to scanty sunshine, improper aeration, lesser space between branches and development of fungus on the branches, leaves, flowers and pods after the precipitation. The problem of fungus development is more serious in early pigeonpea than the late-duration pigeonpea. Keeping in view the above facts, present study was undertaken to standardize the selfing methods in early duration pigeonpea.

Twenty accessions, viz 'EC 109873', 'JAM 9–18', 'P 3123', 'EC 109887', 'R 2871', 'P 986', 'DL 74–1', 'AL 15–1', 'EC 109893', 'ICPL 91099', 'EC 109900', 'Pant A 9', 'EC 109914', 'EC 109915', 'DSLR 128', 'P 4689', 'EC 100465', 'ICPL 219', 'AL 1341' and 'P 3497' of early types in pigeonpea were sown in the second fortnight of June during rainy (*kharif*) season of 2002 and 2003 at New Research Farm of Indian Institute of Pulses Research, Kanpur (latitude 20° 27' N, longitude 80° 14' E, normal annual rainfall 800–1000 mm). These accessions were sown in 2 rows of 4 m length with inter- and intra-row spacings of 60 cm and 20 cm respectively. All the recommended package of practices were followed to raise the crop. Six healthy plants of each accession were identified at flowering stage, of which 2 plants were completely covered with aerable nets (100 cm × 80 cm), 2 plants were partially covered (5 branch of each plant) within the same net and 2 plants were taken as control (uncovered). Observations on number of buds and flower drop and number of developed pods of covered, partially covered and uncovered plants of all the accessions were recorded at 7 days interval during the reproductive phase. In case of partially covered plants observations were recorded only for covered portion of both the plants.

The observations recorded in *kharif* 2002 and 2003 on number of bud and flower drop and number of developed pods in uncovered plants, completely selfed single plants and partially selfed plants of all the accessions are depicted in Tables 1, 2 respectively.

In case of uncovered plants, the bud and flower drop ranged from 85.67 to 94.14% in 2002 and from 84.48 to 91.74% in 2003 and pod formation ranged from 5.86 to 14.98% in 2002 and from 8.26 to 15.52% in 2003. The observations recorded on completely selfed single plant revealed that the bud and flower drop ranged from 89.37 to 98.00% in 2002 and from 91.09 to 95.99% in 2003 and pod formation ranged from 2.00 to 10.63% in 2002 and from 4.01 to 8.91% in 2003. When partial-selfing of 2 plants was done, the bud and flower drop ranged from 86.35 to 94.57% in 2002 and from 89.89 to 94.75% in 2003 and pod formation ranged from 5.43 to 12.25% in 2002 and from 5.25 to 10.00% in 2003. Thus, it is clear that the per cent bud and flower drop was maximum in completely selfed single plants, followed by partially selfed plants and uncovered plants and per cent pod formation was maximum in case of uncovered plants, followed by partial-selfing of 2 plants and complete selfing of single plants. Further, the minimum bud and flower drop and maximum pod formation for all the accessions was also observed in uncovered plants, followed by partial-selfing of 2 plants and complete selfing of single plant. In 2002 minimum and maximum temperature was 14.3°C and 39.5°C respectively, relative humidity ranged from 60 to and 80% and maximum rainfall recorded was 9.8 mm during the crop period. Further, in 2003 minimum and maximum temperature was 18.1°C and 41.2°C respectively, relative humidity ranged from 71 to and 90% and maximum rainfall recorded was

*Short note

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Table 1 Mean and per cent of flower drop and pod formation following different methods of selfing in early-duration pigeonpea in *kharif* 2002

Genotype	Reproductive phase duration (days)	Normal (uncovered)				Complete-selfing				Partial-selfing			
		Bud and flower drop		Pod formation		Bud and flower drop		Pod formation		Bud and flower drop		Pod formation	
		Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%
'EC 109873'	39	850	92.38	202	7.62	1133	94.20	122.5	5.80	1004.5	93.50	166.5	6.50
'JAM 9–18	34	878	85.67	165.5	14.33	1234	93.40	105	6.60	1057.5	91.33	122.5	8.67
'P 3123'	42	747.5	88.09	225	11.91	1165	94.66	153	5.34	995	90.53	187.5	9.47
'EC 109887'	36	937.5	93.31	141	6.69	1323.5	95.00	107.5	5.00	1114	93.45	125	6.55
'R 2871'	38	669	90.52	146	9.48	1205	96.45	104	3.55	980.5	91.15	126.5	8.85
'P986'	44	811	86.05	229.5	13.95	1060.5	92.96	161.5	7.04	982.5	91.62	199.5	8.38
'DL 74–1'	37	867.5	86.37	143.5	13.63	1245	89.37	94.5	10.63	1117.5	87.75	120	12.25
'AL 15–1'	39	967.5	88.02	237.5	14.98	1273.5	91.32	168	8.68	1197	89.23	188	10.17
'EC 109893'	35	870	89.53	154	10.47	1144	92.49	116	7.51	991.5	91.67	132	8.33
'ICPL 91099'	40	877.5	86.09	154	13.91	1277	90.59	115	9.41	1050	88.05	144	11.95
'EC 109900'	37	735	88.83	143	11.12	1092	90.87	108	9.13	946.5	89.40	126	10.60
'Pant A 9'	39	1015	89.52	169	10.48	1316.5	93.49	130	6.51	1221.5	92.00	150	8.00
'EC 109914'	34	858	94.14	207.5	5.86	1179.5	98.00	154.5	2.00	1117	94.57	174.5	5.43
'EC 109915'	43	778.5	87.09	182	12.01	1112.5	93.48	131	6.52	1012	89.05	156.5	10.95
'DSLR 128'	35	875.5	91.00	209	9.00	1276	95.53	150	4.41	1130	91.35	177.5	8.65
'P4689'	40	738	87.21	254	12.79	1166	90.65	173.5	9.35	935.5	86.35	206.5	10.65
'EC 100465'	38	894.5	90.74	217	9.26	1395.5	93.85	141.5	6.15	1145.5	90.80	185	9.20
'ICPL 219'	43	839	93.56	179.5	6.44	1300	97.93	128.5	2.07	1112	94.56	156	5.44
'AL 1341'	37	933.5	90.12	251.5	9.88	1428.5	92.48	201.5	7.52	1198	91.12	230	8.88
'P 3497'	43	934.5	90.71	230.5	9.29	1179	95.16	184.5	4.84	1069.5	89.90	210	9.10
Mean	38.65	854	89.45	192	10.66	1225	93.59	137.5	6.4	1069	90.87	165	8.9

Table 2 Mean and per cent of flower drop and pod formation following different methods of selfing in early duration pigeonpea in *kharif* 2003

Genotype	Reproductive phase duration (days)	Normal (uncovered)				Complete-selfing				Partial-selfing			
		Bud and flower drop		Pod formation		Bud and flower drop		Pod formation		Bud and flower drop		Pod formation	
		Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%
'EC 109873'	39	767.5	89.38	232.5	10.62	1108.5	92.60	139.5	7.30	974	91.50	184	8.50
'JAM 9–18	34	909	87.73	147.5	12.27	1240	93.48	102	6.52	1073	92.22	108	7.78
'P 3123'	42	768.5	89.27	194.5	9.73	1127	92.77	169.5	7.23	1011.5	91.79	163.5	8.21
'EC 109887'	36	879.5	89.43	184.5	9.57	1329	95.71	103.5	4.29	1084	91.18	145	7.82
'R 2871'	38	626.5	89.50	149	9.50	1180	94.87	121.5	5.13	995	92.50	112	7.50
'P986'	44	817.5	86.22	224.5	13.78	1059	93.96	156.5	6.04	955.5	89.89	211	9.11
'DL 74–1'	37	841	84.48	155.5	15.52	1256	91.74	85.5	8.26	1143.5	90.87	90.5	9.13
'AL 15–1'	39	993.5	89.50	210.5	10.50	1294.5	94.67	148	5.33	1222	92.75	158.5	7.25
'EC 109893'	35	839.5	88.27	173	11.73	1155.5	91.09	96.5	8.91	1000	90.51	139	9.49
ICPL 91099'	40	894.5	87.75	133	12.25	1266	92.75	123	7.25	1064.5	90.00	136	10.00
'EC 109900'	37	726	87.09	152.5	12.91	1112	93.62	94	6.38	976	92.72	103	7.28
'Pant A 9'	39	1004.5	88.87	185.5	11.23	1335	94.41	111	5.59	1215	91.79	152.5	8.21
'EC 109914'	34	839	91.74	213.5	8.26	1186	95.23	148.5	4.77	1120	94.75	170.5	5.25
'EC 109915'	43	793	89.61	165.5	10.39	1089	93.63	142.5	6.27	1031.5	92.63	128.5	7.37
'DSLR 128'	35	852.5	88.75	224	11.25	1283	95.99	137	4.01	1137	92.35	171.5	7.65
'P4689'	40	729	86.69	264.5	13.31	1166	92.18	171	7.82	956	91.17	184	8.83
'EC 100465'	38	799.5	90.47	227	9.53	1370	94.64	157.5	5.36	1174.5	93.44	159.5	6.56
'ICPL 219'	43	825	91.15	198	8.85	1305.5	94.47	122.5	5.53	1090.5	93.24	165.5	6.76
'AL 1341'	37	931.5	90.05	248.5	9.95	1425	93.81	197.5	6.19	1219.5	93.00	210.5	7.00
'P 3497'	43	920.5	88.29	245	11.71	1172.5	94.71	192	5.29	1113.5	94.27	149	5.73
Mean	38.65	840	88.71	196	11.14	1223	93.82	136	6.17	1078	92.13	152	7.77

13.6 mm during the crop period. Tables 1, 2 indicated that mean per cent pod formation in uncovered plants (under natural conditions) was 10.66 in 2002 and 11.14 in 2003. Similar results (10% pod set) were also reported by Pathak (1970), Ariyanayagam (1975), Sheldrake and Narayanan (1979), Tayo (1980), Pandey and Singh (1981).

The more bud and flower drop and less pod formation in case of selfed plants than uncovered plants may be due to the scanty sunshine, unbalanced temperature, improper aeration, lesser space between branches and development of fungus on the plant parts within the net.

Further, the more bud and flower drop and less pod formation in case of completely-selfed single plants than partially-selfed plants may be due to the bending of plants causing poor sunlight, overcrowding of branches resulting development of fungus on leaves, flowers and pods, whereas in case of partially-selfed plants bending did not take place because of support of both the plants to each other and overcrowding of branches was also not observed because only few branches of both the plants were selfed.

Although the per cent pod formation observed in case of selfed plants was lesser than uncovered plants even though the selfing of plants is only way to maintain the purity of pigeonpea accessions because of the fare amount of outcrossing observed in this crop.

Since the partial selfing of 2 plants was observed superior over the complete selfing of single plant, therefore, it may be suggested that one should follow the method of partial-selfing of 2 plants in pigeonpea.

SUMMARY

Twenty accessions of early-duration pigeonpea (*Cajanus cajan* L. Millsp.) were grown in rainy (*kharif*) season of 2002 and 2003 and 2 methods of selfing, viz complete covering of single plant with aerable nylon net and partial covering of 2 plants within same aerable nylon net were followed to record the effect of selfing on bud and flower drop and pod formation. The partial selfing of the 2 plants recorded more per cent pod formation as compared to complete selfing of single plant in all the accessions in both the years. Thus partial selfing of 2 plants was observed as superior method for selfing in pigeonpea.

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