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Effect of Date of Sowing on Potential Source and Sink Realization in Pigeon Pea

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Abstract

Field experiment was conducted under rain fed to study the potential sink size of pigeon pea under early and late sown conditions. Significant decrease in seed yield was noticed with late sown crop and was mainly attributed to reduced flower production and pods per plant. The maintenance of more LAI and dry matter accumulation in early sown crop resulted in more yield. It might be due to higher sink to source ratio. The reduction in the potential sink size i.e. pods per plant, flowers per plant in late sown crop would be due to low precipitation and temperature, especially during reproductive growth phase of the crop. Among the genotypes studied, ICPL-87 recorded significantly and consistently higher seed yield both under late and early sown conditions. Further, it has recorded lower flower and pod drop and higher pod setting.

Key words : LAI, Sink source, Yield potential, Reproductive phase, Pigeon pea.

Pigeon pea (*Cajanus cajan* (L.) Mill sp.) is an important commercial grain legume crop in the northern Karnataka. Gulbarga is one of the important pigeon pea growing area in Karnataka occupying on area of 55.7% and producing 34% of total production in the state. Hence Gulbarga is popularly known as dhal bowl of Karnataka. But the productivity in this region is 344 kg/ha which is much lower than state (485 kg/ha) average. One of the major reason for low productivity is poor pod setting. Though it produces enormous flowers, but only 10—20% pod setting is being realized. In view of this an investigation was carried out to elucidate extent of flower production, pod setting and seed yields of pigeon pea in relation to environmental conditions. The variation in environmental condition was simulated by early and late sowing of the crop.

Methods

The experiment were conducted during *kharif* of 1998-99 at Agriculture Research Station, Gulbarga on

Table 1. Seed yield and yield parameters of pigeon pea genotypes as influenced by date of sowing. Figures indicate percent pod setting over potential sink.

	Seed yield (kg/ha)		Pods per m.sq. area		Harvest index (HI %)		Total dry matter (g/pl)		Leaf area index (LAI)	
Genotypes	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
ICPL-83015	0994	343	1150 (18.5)	0528 (21.0)	25	19	31	22	5.2	3.1
ICPL-84023	0874	393	0957 (17.2)	0495 (19.2)	25	20	29	21	5.9	3.7
AL-15	1011	403	0957 (21.3)	0528 (25.0)	22	18	38	21	7.3	4.8
UPAS-120	1114	386	0990 (20.0)	0528 (23.0)	22	21	39	24	6.9	5.1

Table 1. Continued.

Genotypes	Seed yield (kg/ha) Early	Late	Pods per m.sq. area Early	Late	Harvest index (HI %) Early	Late	Total dry matter (g/pl) Early	Late	Leaf area index (LAI) Early	Late
ICPL-87	1173	488	1188 (27.3)	0627 (30.0)	25	21	34	25	4.8	4.8
T-21	0874	266	0891 (26.0)	0396 (20.0)	23	18	37	21	5.3	5.2
Mean	1007	380	1022 (21)	0517 (23)	24	19	35	22	5.9	4.4
	SE	CD at 5%	SE	CD at 5%	SE	CD at 5%	SE	CD at 5%	SE	CD at 5%
Date of sowing	25	153	40	231	0.5	0.31	1.6	9.40	0.1	0.6
Genotypes	50	146	70	203	1.10	NS	1.50	NS	0.40	1.10
Geno × DOS	35	104	74	217	1.60	1.60	2.10	NS	0.50	NS

medium black clayey soils. The trial was laid in split-plot design with date of sowing as a main plot and six early type pigeon pea genotypes as sub plot with three replications. Early sowing refers to the first fortnight of July and late sowing is second fortnight of August. The crop was raised following recommended practices and was adequately protected against pest and diseases. The uniform plant stand was maintained with 30 × 10 cm spacing in both dates of sowing. The observation on flower production, flower drop and pod drop were computed by counting the number of flowers and pods produced per plant at two days interval by tagging randomly selected five plants in each plot. Further, the flower drop was computed by deducting total number of pods at harvest. The leaf area index (LAI) was calculated at 50% flowering and the total dry matter (TDM) computed at the time of harvest.

Results and Discussion

Early sowing recorded significantly higher seed yield 1,007 kg/ha as compared to late sown crop (Table 1). This might be due better crop growth noticed in terms of higher TDM, LAI pods per plant (Table 2) and harvest index (HI). The poor performance of late sown crop is attributed to the low precipitation and low temperature prevailed particularly during reproductive growth phase of the crop (Table 3). These results are in agreement with Ali (1).

In general early sown crop had more number of flowers and pods production (Table 2). Further, the

Table 2. Total flower production, flower and pod drop per unit area of pigeon pea genotypes as influenced by date of sowing.

Genotypes	Total flower per m^2 area Early	Late	Flower drop per m^2 area Early	Late	Pod per m^2 area Early	Late	Sink to source flowers : LAI Early	Late	Sink : source ratio Pods : LAI Early	Late
ICPL-83015	6204	2508	4614	1832	367	117	1193	809	221	170
ICPL-84023	5664	2580	4341	1957	345	116	960	697	162	134
AL-15	4488	2145	3203	1461	306	156	615	447	131	110
UPAS-120	4983	2310	3691	1623	269	159	722	453	143	103
ICPL-87	4356	2112	2842	1390	226	095	908	440	248	131
T-21	3465	1947	2371	1428	214	118	656	374	168	076
Mean	4858	2267	3527	1618	288	129	823	515	173	118
	SE	CD at 5%	SE	CD at 5%	SE	CD at 5%				
Date of sowing (D)	264	1584	72	431	16	48				
Genotypes (G)	330	957	418	1233	38	111				
G × D	495	1010	388	1146	38	112				

Table 3. Meteorological data during growth period (average for two years).

Crop growth phase	Precipitation (mm)		Rainy days (days)		Temperature (C) Maximum		Minimum		Relative humidity (%) (0830 h)		(0530 h)	
	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
Vegetative	389.5	3815	25	23.5	32.4	32.1	22.8	22.3	79	78	60	58
Reproductive	202.5	064.1	8.5	3.0	31.9	28.8	20.4	16.9	68	62	49	42
Total	591.5	222.8	33.5	26.5								

number of pods retained after the drop was also more. However, pod set percentage did not differ much between the dates of sowing. This indicates that plant have compensatory mechanism of maintaining the rate of pod setting depending upon the source. That is why poor growth in late sown crop resulted in poor production of flowers and pods. Therefore, it is the number of pods than the pod set percentage which determines the seed yield in pigeon pea under given situation. Sink to source ratio in terms of number of flowers and pods to the LAI is more in early sown crop. This indicates that retention of active source would certainly help in production of more number of reproductive parts. In late sown crop there was a drastic reduction in source resulted in poor sink formation. It may be due to low precipitation coupled with low temperature prevailed during reproductive growth phase of the crop (Table 3). Similar observation are made by Fukuzawa and Zhenga (2) and who reported heavy vegetative growth followed by more flowers in early sown crop.

The maximum grain yield of 1,173 kg/ha under early sowing was recorded in ICPL-87 followed by UPAS-120 (1114 kg/ha) and AL-15 (1011 kg/ha). Further, ICPL-87 recorded higher seed yield under late sown condition also as compared to other genotypes. It is because of its ability to retain more pods and higher source to sink ratio under situation rather than flower produced per plant and percent pod setting. The results are in agreement with Srivastava (3) and Singh (4) who reported that seed yield depends on source and sink relation which in tern depends on environment.

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