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Effect of date of sowing and spacing on growth and yield of *rabi* pigeon pea (*Cajanus cajan* (L.) Millsp.)

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ABSTRACT

A field experiment was conducted on pigeon pea (cv – Rabi 20/105) during 2004 to 2005 at "C' Block farm, B.C.K.V., Kalyani, Nadia, west Bengal in split plot design in replicate on sandy clay loam soil with eight dates of sowing (17th, 25th October, 2nd, 9th, 16th, 23rd, 30th November & 7th December)and two spacing (15 cm ′ 30 cm and 45 cm ′ 30 cm), to study their effect on the yield and yield attributes of Pigeon Pea. The date of sowing and spacing significantly influenced the yield attributes i.e. number of pods per plant, test weight, bio-mass production, harvest index and seed yield. Interaction effects on yield attributes were not significant but that on seed yield, bio-mass yield and harvest index was found significant. Maximum seed yield (14.66 q/ha) was obtained when the crop sown on 17.10.2004 (treatment D_1) which was significantly superior to other dates of sowing. Closer spacing gave significantly higher seed yield than wider spacing. Middle of October sown crop under close spacing (D_1C_1) recorded the highest seed yield 17.42 q/ha) which was significantly superior to other treatments. This may be due to higher number of pods per plant, higher test weight (1000 grains weight in g). High seed yield was associated with short vegetative period and longer reproductive phase. From the economic point of view the highest net return (Rs. 24340.73/ha) as well as net return per rupee investment (Rs. 2.22/-) was recorded on closed spaced early sown crop.

Key Words: Pigeon pea, date of sowing, spacing, growth, yield.

It is estimated that to meet the demand of increasing population and to make the nation pulse sufficient the pulse production has to increase substantially upto 25.88 million tonnes by 2015 AD. Pigeonpea has the special morphological characters with respect to deep rooting and drought tolerance have made this crop adaptable in wide range of unfavourable growing conditions with uncertain rainfall and varied soil depth. One of the most significant achievement in the field of grain legume cultivation in India is that pigeon pea can be grown as Rabi crop (Sengupta & Roy, 1982) particularly in the areas where winter is mild and short like Bihar, West Bengal and Andhrapradesh. Hence, more emphasis has to be given on growth behavior and yield attributes under dry land situation on post rainy season pigeon pea for increasing production with simultaneous reduction of area of high water exhaustive crops.

Keeping this in view, an attempt was made to study the performance of Pigeon Pea during post rainy season as influence by date of sowing and spacing on growth and yield of Rabi Pigeon Pea.

MATERIALS AND METHODS

A field experiment was conducted during 2004 to 2005 at "C' Block farm, B.C.K.V., Kalyani, Nadia, West Bengal. The soil was sandy clay loam soil having organic carbon 0.562% ,.total N 0.052%, available P_2O_5 35 Kg/ha and available K_2O 20.65 Kg/ha with pH 7.3 .The experiment was laid out in split plot design with 3 replication .The treatments comprised eight (8) dates of sowing 17th (D_1), 25th October (D_2), 2nd (D_3), 9th (D_4), 16th (D_5), 23rd (D_6), 30th November (D_7) & 7th December (D_8) allotted randomly in the main plots and two (2) spacing in the subplots 15 cm ′ 30 cm (C_1) and 45 cm ′ 30 cm (C_2). The cost involved fertilizer and plant protection management practice is analysed with respect to return obtained from that particular management practice (treatment).

RESULTS AND DISCUSSION

Phenophasic duration of pigeonpea

The number of days for emergence (Table 1) was found to be more or less same for all the sowing dates (3 – 4 days). The late sown crop took more time to attain 50% flowering but the active reproductive phase in those treatments (i.e. pod initiation to maturity) was very much shortened. In case of D_6, D_7 and D_8 it was 41, 36 and 37 days respectively as against 64, 76, 54 and 49 days in case of D_1, D_2 and D_3, D_4 respectively. As a whole the earlier sowing required more time to achieve harvest maturity, which progressively decreased with delay in sowing

Table 1. Effect of date of sowing and spacing on Phenophasic duration of pigeonpea

Date of sowing	Days				
	Sowing to Emerg.	Emerg. to 50% flowering	Emerg. to pod initiation	Pod initiation to maturity	Emerg. to harvest maturity
D_1	3	119	111	64	175
D_2	4	117	97	76	173
D_3	3	112	112	54	166
D_4	4	116	116	49	165
D_5	4	116	109	51	160
D_6	3	112	112	41	153
D_7	3	110	110	36	146
D_8	3	109	102	37	139

Table 2. Effect of date of sowing and spacing on yield components of pigeonpea

Date of sowing	Pods/plant	Effective pods/plant	Seeds /pod	1000 grains weight (g)	Grain yield (q ha^{-1})
D_1	139.83	74.67	2.53	113.00	14.66
D_2	136.00	65.17	2.59	107.00	10.98
D_3	123.83	61.33	2.63	102.33	6.30
D_4	97.67	55.17	2.70	96.17	5.68
D_5	75.83	41.83	2.55	83.50	4.10
D_6	73.50	35.00	2.74	83.17	3.38
D_7	72.83	28.33	2.67	81.67	2.24
D_8	71.50	15.50	2.26	81.67	0.76
SEm(±)	**2.463**	**1.083**	**0.185**	**0.977**	**0.15**
CD (P=0.05)	**7.489**	**3.293**	**NS**	**2.970**	**0.45**
Spacing					
C_1	99.21	47.29	2.43	93.79	7.33
C_2	98.54	46.96	2.74	93.33	4.69
SEm(±)	**1.614**	**0.717**	**0.035**	**0.685**	**0.21**
CD (P=0.05)	**NS**	**NS**	**0.105**	**NS**	**0.66**

Effect of date of sowing and spacing on yield and yield components

Number of pods per plant

The number of pods per plant at harvest was the highest in case of earlier sown crop i.e. D_1 closely followed by that of D_2. The late sown treatment (D_3 to d_8) recorded lower number of pods per plant. D_1 and D_2 were statistically at par. On the other hand, delayed sown treatments D_5 to D_8 recorded lower number of pods per plant, all being statistically at par with each other. Similarly, number of effective pods per plant was maximum in early sown crop (D_1) which progressively decreased with delay in sowing. The late season dry spell might be the limiting factor for pod filling in case of late sown crop. Jayanna (2001) also reported the similar result. Both the number of pods per plant and number of effective pods per plant were least affected by deferential spacing. This is supported by the earlier works of Singh and Srivastava (2002) that row spacing had no significant effect on the number of pods per plant.

Number of seeds per pod

The number of seeds per pod, varied from 2.26 to 2.74 the highest being 2.74 in D_6. However, the effect was statistically non significant. The lowest number of seeds per pod was noticed in D_8 i.e. later date of sowing (2.26). Laxminarayana (2003) also reported that similar results. The number of seeds per pod was significantly influenced by row spacing. The wide spacing resulted in significantly higher number of seeds per pod. Laxminarayana (2003) also reported the similar result.

Test weight (1000 grains weight in g)

The data presented in table 2 it revealed that the test weight decreased with delay in sowing. The test weight was highest (113g) in case of earlier sown crop i.e. D_1 (17th October). However, the difference among the late sown treatments i.e. D_5 to D_8 were not significant. Singh and Srivastava (2002) also reported the similar result. On the other hand the effect of row spacing on test weight was found statistically non significant.

Table 3. Effect of date of sowing and spacing on yield (q/ha)

Cropping geometry	Date of sowing								
	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	Mean
C_1	17.42	11.89	8.62	7.64	4.94	4.13	2.9	1.11	7.33
C_2	11.89	10.07	3.98	3.72	3.26	2.64	1.59	0.41	4.69
Mean	14.66	10.98	6.30	5.68	4.10	3.38	2.24	0.76	

	Main effect		Interaction effect	
	C	D	C x D	D x C
SEm (±)	0.21	0.15	0.42	0.37
CD (P=0.05)	0.66	0.45	1.29	1.12

Table 4. Net return per rupee investment

Cropping geometry	Date of sowing							
	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8
C_1	2.22	1.21	0.60	0.42	-0.08	-0.23	-0.45	-0.78
C_2	1.32	0.96	-0.22	-0.27	-0.36	-0.48	-0.68	-0.91

Grain yield

Seed yield of pigeon pea was the highest (14.66 q ha^{-1}) in case of earlier sown crop i.e. D_1 (17th October) which progressively decreased with delay in sowing from D_2 to D_8. The difference among D_4, D_5 and D_6 was statistically non significant. There was a sudden decrease in grain yield when the crop was sown after the end of November (D_7 & D_8). A very low grain yield was recorded from 7th December sown crop. Patel *et al.* (2000) also recorded the same result that the earlier sown (30th June) of determinant cultivar (GT – 100) produced higher grain yield. The grain yield production was significantly influenced by row spacing, close spacing recorded about 55.95 % more grain yield than the wider spacing treatment. Laxminarayana (2003) also reported the similar result. The interaction of date of sowing & spacing was found significant with respect to grain yield production. The highest grain yield was recorded from D_1C_1 treatment combination followed by that of D_1C_2 and D_2C_1. The lowest seed yield was recorded from D_8C_2

Economics of Pigeon pea

Among all the treatments combination, D_1C_1 level showed the highest (2.22) net return per rupee investment which provided the economic viability of the *rabi* pigeon pea followed by that of D_1C_2 and D_2C_1.Sowing beyond D_3 (2nd Nov) at wider spacing recorded negative net return (Table-4). This implies that delay in sowing beyond end of October was not economically viable.

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