

Performance of greengram (*Phaseolus radiatus*) varieties under different dates of sowing during winter season

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ABSTRACT

A field experiment was conducted during winter season (pre-rabi sowing) of 1996 and 1997 at Orissa University of Agriculture and Technology, Regional Research Station, Chipilima, to study the response of greengram (*Phaseolus radiatus* L.) varieties to date of sowing. Variety 'Nayagarh Local' gave the maximum seed yield (978 kg/ha), followed by 'Sujata' (937 kg/ha) and 'PDM 54' (878 kg/ha). Sowing on 10 September was the best date with seed yield of 969 kg/ha. A delay of 10 and 20 days in sowing reduced the seed yield by 14.2 and 30.0% respectively. Most yield components varied significantly due to varieties but not due to dates of sowing. Incidence of yellow mosaic virus, cercospora leaf-spot and powdery mildew was the minimum in 'PDM 54' and in the crop sown on 10 September.

Key words : Greengram, Variety, Date of sowing

Greengram is the principal pulse crop of Orissa, occupying 8% of the gross cropped area. The crop is grown largely during rainy season (*kharif*) in rainfed upland in the inland districts, and during winter (*rabi*) season in rice fallow in the coastal districts. Its cultivation during *kharif* is safe because the rain often falling at the maturity stage causes great crop loss besides interfering in harvesting operation. Low temperature, on the contrary, restricts

greengram cultivation during winter season in the inland districts. The best alternative is therefore to grow greengram as a pre-rabi crop. The present study was undertaken to identify a suitable variety and find out the optimum date for pre-rabi sowing.

MATERIALS AND METHODS

The experiment was conducted at the Regional Research Station, Orissa University of Agriculture and Technology,

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Chiplima, in Sambalpur district during winter season (pre-rabi sowing) of 1996 and 1997 under upland condition. The soil of the experimental plot was sandy loam, with pH 6.4. Available N, P, and K contents were 220, 16.8 and 172 kg/ha, respectively. The treatments comprising eight varieties ('Banpur Local', 'Nayagarh Local', 'Rairakhhol Local', 'Badelia Local', 'Dhauli', 'Sujata', 'PDM 54' and 'K 851') and three dates of sowing (10, 20 and 30 September) were evaluated in a randomised block design having three replications. The crop was sown in line with spacing of 25 cm x 5 cm, using seed rate of 25 kg/ha with a fertilizer dose of 20 kg N and 40 kg P_2O_5 /ha. Full dose of fertilizer in the form of urea and single superphosphate was applied in furrows before sowing. One hoeing and weeding was done at 25 days after sowing to keep the crop plants free of weeds. The crop was kept free from major insect pests by taking suitable plant-protection measures. Rainfalls of 64.4, 36.0 and 16.4 mm during 1996 and of 57.9, 117.8 and 123.6 mm during 1997 were received during the growing period of the crops sown on 10, 20 and 30 September respectively. Mean monthly maximum and minimum temperatures decreased from 32.5 and 25.7°C in September to 27.3 and 14.5°C in December respectively. Mean monthly relative humidity during the cropping period varied between 92.2 and 87.5% in the forenoon and 71.0 and 42.5% in the afternoon. Besides, one pre-sowing irrigation for ensuring germination, two light irrigations were provided at the pre-flowering and pod-development stages of the crop.

RESULTS AND DISCUSSION

Growth duration

Varieties did not vary significantly in respect of days taken to 50 flowering, though 'Rairakhhol Local' and 'Badelia Local' took 3-4 days more than the rest of the varieties (39.8-40.340.3 days) to attain this stage (Table 1). However, significant variation among the varieties was observed in respect of the total duration. 'PDM 54' took the longest duration (84.3 days) and 'K 851' the shortest (73.9 days) to attain maturity. Dates of sowing had no significant effect on days to 50% flowering and maturity. The interaction of variety and date of sowing on growth duration was not significant.

Yield-attributing characters

Significant differences among the varieties were observed in respect of the yield-attributing characters, viz. number of pods/plant, number of seeds/pod and 1,000-seed weight (Table 1). 'Sujata' recorded the maximum number of pods/plant, closely followed by 'Nayagarh Local' and 'PDM 54', whereas 'K 851' and 'Rairakhhol Local' gave the minimum number of pods/plant. 'Nayagarh Local' recorded the maximum number of seeds/pod and it was on a par with 'Banpur Local', 'PDM 54', 'Sujata' and 'Rairakhhol Local'. 'Dhauli' and 'K 851' recorded the least number of seeds/pod. Test weight of seeds of 'Sujata' was the maximum, closely followed by that of 'Dhauli'. All the four local varieties being at par recorded significantly lower test weight of seeds than the improved varieties.

Table 1. Effect of dates of sowing and varieties on growth duration, yield-attributing characters and yield of greengram

Treatment	Days to 50% flowering	Days to maturity	No. of pods/ plant	No. of seeds/pod	1,000- seed weight (g)	Yield (kg/ha)		Harvest index (%)
						Seed	Straw	
Variety								
'Banpur Local'	39.8	78.9	18.1	10.9	23.9	782	1,260	38
'Nayagarh Local'	39.8	81.1	21.9	11.1	23.8	978	1,412	41
'Rairakhol Local'	43.3	80.0	16.7	10.4	22.9	815	1,236	40
'Badelia Local'	44.0	81.5	17.2	10.2	22.7	744	1,163	39
'Dhauri'	40.3	79.8	17.4	9.8	29.2	752	1,128	40
'Sujata'	40.3	83.3	22.4	10.6	29.6	937	1,223	43
'PDM 54'	40.1	84.3	20.4	10.9	27.1	878	1,142	43
'K 851'	39.8	73.9	16.7	9.8	27.5	700	988	41
CD (P = 0.05)	NS	5.52	2.5	0.86	1.83	135	217	
Date of sowing								
10 Sep.	40.0	79.3	21.8	10.6	26.0	969	1,431	40
20 Sep.	41.3	79.9	19.2	10.4	25.9	834	1,169	48
30 Sep.	41.5	81.8	15.7	10.3	25.7	669	981	41
CD (P = 0.05)	NS	NS	1.52	NS	NS	83	133	

Table 2. Interaction effect of varieties and dates of sowing on number of pods/plant and seed yield of mungbean

Variety	No. of pods/plant			Seed yield (kg/ha)		
	10 Sep.	20 Sep.	30 Sep.	10 Sep.	20 Sep.	30 Sep.
'Banpur Local'	22.8	18.0	13.6	1,011	756	528
'Nayagarh Local'	26.5	21.2	18.1	1,189	933	811
'Rairakhol Local'	17.3	17.9	15.0	822	945	678
'Bedelia Local'	18.0	16.7	17.0	833	711	689
'Dhauri'	17.5	18.0	16.8	856	800	600
'Sujata'	27.4	24.3	15.5	1,144	1,000	667
'PDM 54'	27.0	18.0	16.0	1,144	745	744
'K 851'	17.6	19.2	13.4	755	756	589
CD (P = 0.05)		4.24			235	

Date of sowing significantly influenced the number of pods/plant. Sowing on 10 September recorded the maximum number of pods/plant, which declined progressively with delay in sowing. A delay of 10 and 20 days in sowing from 10 September reduced the pod number/plant significantly

by 11.9 and 28.0% respectively. Number of seeds/pod and 1,000-seed weight remained unaffected by the dates of sowing.

Interaction of variety and date of sowing was significant only in respect of number of pods/plant (Table 2). 'Sujata' sown on 10

Table 3. Reaction of varieties to major diseases under different dates of sowing (60 days after sowing)

Variety	Yellow mosaic virus (% plants affected)				Cercospora leaf-spot (% leaves affected)				Powdery mildew			
	10 Sep.	20 Sep.	30 Sep.	Mean	10 Sep.	20 Sep.	30 Sep.	Mean	10 Sep.	20 Sep.	30 Sep.	Mean
'Banpur Local'	16	20	20	18.7	42	60	80	60.7	NA	NA	NA	NA
'Nayagarh Local'	12	20	26	19.3	36	64	80	60.0	NA	NA	NA	NA
'Rairakhol Local'	30	30	32	30.7	40	60	72	57.3	A	A	A	A
'Bedelia Local'	20	24	36	26.7	18	36	60	38.0	NA	NA	NA	NA
'Dhauri'	22	30	32	28.0	16	40	60	38.7	A	AS	AS	AS
'Sujata'	6	8	16	10.0	20	40	50	36.7	A	A	A	A
'PDM 54'	2	0	14	5.3	20	24	25	23.0	A	A	A	A
'K 851'	8	10	20	12.7	20	20	30	23.3	A	A	A	A
Mean	14.5	17.8	24.5	26.5	26.5	43.0	57.1					

NA=Not appeared; A=appeared mildly; AS=appeared severely

and 20 September and 'Nayagarh Local' sown on 30 September recorded the maximum number of pods/ plant. Minimum number of pods/ plant corresponding to the dates of sowing was recorded with 'Rairakhol Local' and 'K 851' respectively.

Yield

Seed yield varied significantly due to variety and date of sowing (Table 1) 'Nayagarh Local' gave the highest seed yield, closely followed by 'Sujata' and 'PDM 54'. The lowest seed yield was recorded with 'K 851'. Assuming the seed yield of 'K 851' to be 100, the varieties could be rated as: 'Nayagarh Local', 140; 'Sujata', 134; 'PDM 54', 125; 'Rairakhol Local', 116; 'Banpur Local', 112; 'Dhauri', 107; and 'Bedelia Local', 106. Earlier sowing on 10 September gave the highest seed yield, which declined progressively with delay in sowing. A delay of 10 and 20 days in sowing from 10 September reduced the seed yield by 14.2 and 31.0% respectively. The results confirmed the finding of Rawson and Craven (1979), Faroda *et al.* (1983) and Jaiswal (1995), who reported significant differences in seed yield of greengram due to variation in dates of sowing.

The interaction of variety and date of sowing influenced the seed yield significantly (Table 2). 'Nayagarh Local' yielded maximum on 10 and 30 September sowing, and it was on a par with 'Sujata' 'PDM 54' and 'Banpur Local' on 10 September sowing and with 'PDM 54' in the later dates of sowing. 'Sujata' was the top yielder when sown on 20 September, closely followed by 'Nayagarh Local' and

'Rairakhhol Local'.

Straw yield followed almost the similar trend as that of grain yield. 'Nayagarh Local' among the varieties and 10 September among the dates of sowing registered maximum straw yield.

Harvest index recorded by 'PDM 54' and 'Sujata' was maximum; minimum being under 'Banpur Local', indicating that the former two varieties are more suitable as pre-rabi crop in partitioning the net assimilates towards reproductive plant parts. The crop sown on 20 September recorded higher harvest index than both earlier and later sowings. Earlier sowing on 10 September, though recorded higher seed and straw yields, increased the biomass comparatively more and thus gave lower harvest index.

Disease incidence

Incidence of yellow mosaic virus was maximum in 'Rairakhhol Local', followed by 'Dhauri' and 'Badelia Local'. The incidence of cercospora leaf-spot was maximum in 'Banpur Local', followed by 'Nayagarh Local' and 'Rairakhhol Local'

(Table 3). Minimum incidence of both the diseases was recorded in 'PDM 54'. Varieties 'Banpur Local', 'Nayagarh Local' and 'Badelia Local' were free from powdery mildew; the incidence was mild in 'Rairakhhol Local', 'PDM 54' and 'K 851' and severe in 'Dhauri' and 'Sujata', especially under late sowing.

Early sowing on 10 September showed the minimum disease incidence, and the severity of disease incidence increased with delay in sowing beyond this date.

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