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Studies on Response of Pigeonpea to Canopy Modification and Plant Geometry

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Abstract: A field experiment was conducted at Agricultural Research Station, Gulbarga on *vertisols* during kharif seasons of 1996, 1998 and 1999 to study the effect of nipping on seed yield of pigeonpea (Cv.TS-3). The results revealed that nipping of the terminal bud at 50 days after sowing significantly reduced the height of the plant and increased the number of primary and secondary branches and pods per plant. Pigeonpea recorded a seed yield of 1466 Kg /ha and 1560 kg/ha when the terminal shoot was nipped at 50 DAS, at 90 x 20 cm and 90 x 10 cm planting geometry respectively. The highest gross income (Rs.24180), net income (Rs.16068) and benefit cost ratio (1.98) was obtained when nipping was done at 50 DAS at 90 x 10 cm spacing regime.

Introduction

Pulses occupy an indispensable place in our daily diet as a source of protein. Pulse crops also have the unique potentiality to associate symbiotically with *Rhizobium* Sp. and fix atmospheric nitrogen, thereby enriching the soil. The production of pulses has remained almost stagnant at around 13-14 million tonnes for the last many years. As a result of ever increasing population, the per capita availability of pulses has shown a sharp decline in recent years and it has come to less than 40 g/day at present, against a normal rquirement of 69 g/day.

Pigeonpea is an important pulse crop and 91 per cent of the world's pigeonpea is produced in India. The crop is largely grown under rainfed situation, its agronomic practices are required to be standardized for realizing yield potential. Among them optimum plant population and the number of reproductive sink/plant are the key factors determining the yield. Reddy and Narayanan (1987) reported that nipping of terminal bud in sesamum activated the dormant lateral buds to produce more branches which finally resulted in yield increase. Since limited data are available on these aspects in pigeonpea, an experiment was planned to study the effect of nipping on growth and yield.

Plant population plays an important role in pigeonpea production. Pigeonpea responds to varied population levels due to its elastic nature in adjusting to different spacings. It greatly varies with dates of sowing, varieties, soil fertility and soil types. Deeper soils with high fertility demands wider row space while in the soils with lower depth and fertility narrow row space is required.

Material and Methods

A field experiment was conducted at Agricultural Research Station, Gulbarga on *vertisols* during kharif seasons of 1996, 1998 and 1999 to study the effect of nipping on seed yield of Pigeonpea (Cv. TS-3). The experiment was laid out in randomized block design with three replications. The soil was clay loam with PH of 8.0. The available N, P_2O_5 and K_2O contents were 180, 25 and 350 kg/ha, respectively. The organic carbon content was 0.55 per cent. The sowing was undertaken soon after the receipt of normal rainfall during the month of June in 1996-97 and in the month of July during 1998-99 and 1999-2000. Nipping of apical or terminal shoot was done by hand clipping at 50,50 and 70 and 50,70 and 90 DAS was compared with control plot (no nipping). Two planting geometries viz.,90 x 20

cm and 90 x 10 cm were tested. The crop was raised following the other recommended package of practices. The growth and yield attributes viz., plant height, number of primary branches, secondary branches, number of pods per plant and test weight were recorded at harvest. The crop was harvested at its full maturity stage and the yield data was recorded.

Results and Discussion

During 1996-97, A total rainfall of 776.10 mm was received out of which 719.30 mm of rainfall was received during the crop growth period between June to November with good distribution which has helped for the growth and development of pigeonpea, so the yield levels are high. In the year 1999-2000, A total rainfall of 709.80 mm was received out of which 588.60 mm was received between June to November, the rainfall received was less and the yield levels are less compared to 1996-97.

During 1999-2000, though the rainfall received during the crop growth period and total rainfall was high compared to 1996-97 and 1998-99, but in the month of October 260.2 mm of rainfall was received and the crop suffered due to excess soil moisture and the leaves turned yellow for nearly 20-25 days which inturn aftected the yield.

Nipping of terminal bud at 50 DAS significantly reduced the plant height and increased the number of primary and secondary branches, pods per plant and test weight. Similar results were reported by Mishra and Nayak (1997) in Jute crop. The increased yield components may be attributed to activation of lateral dormant buds by arresting the terminal growth through nipping of terminal bud ehich might have facilitated the significant increase in the yield attributes. Similar findings were reported by Ramanathan and Chandrashekharan (1998) in sesamum crop. Nipping twice (50 and 70 DAS) and thrice (50,70 and 90 DAS) reduced the growth and yield attributes significantly.

Among the plant geometries, 90 x 10 cm although enhanced thy plant height as compared to 90 x 20 cm the differences were not significant (Table 1). Higher plant population leading to competition for space and nutrients might have resulted in increased plant height. The wider spacing of 90 x 20 cm enhanced the growth characters, viz., primary branches/plant, secondary branches/plant and capsules/plant being significantly superior than 90 x 10 cm spacing. This is due to lower individual plant

Table 1. Effect of nipping and plant geometry on growth, yield and yield attributes of pigeonpea Cv.TS-3

Sl. No.	Treatments	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Pods/plant	Seed weight (g)	Seedyield (Kg/ha)
1.	90x20 cm No-nipping	185.8	9.2	6.3	87.7	12.65	1287
2.	90x20 cm Nipping at 50 DAS	176.3	12.2	8.8	111.8	12.67	1466
3.	90x20 cm Nipping at 50 and 70DAS	168.2	10.7	6.9	81.7	12.64	1158
4.	90x20 cm Nipping at 50, 70 and 90 DAS	166.3	9.8	5.5	68.2	12.63	1062
5.	90x10 cm No-nipping	189.3	7.7	5.3	79.1	12.49	1433
6.	90x10 cm Nipping at 50 DAS	177.9	10.5	7.9	92.7	12.58	1560
7.	90x10 cm Nipping at 50 and 70DAS	172.0	8.7	5.3	66.0	12.55	1341
8.	90x10 cm Nipping at 50, 70 and 90 DAS	169.3	7.9	4.1	55.1	12.57	1233
	S.Em.±	1.64	0.42	0.36	4.42	0.047	38.42
	C.D. at 5%	4.98	1.29	1.09	13.43	NS	116.54

(Pooled data of 3 years, 1996-2000)

competition under wider spacing. Siag *et al*.(1993) reported that the ancillary characters were not influenced significantly due to different row spacings , although plant height increased at closer spacings in comparison to wider spacings.

The spacing of 90 x 20 cm registered maximum number of pods/plant (111.80) when nipping was done at 50 DAS. The fact that wider spacing has registered more number of primary and secondary branches/plant which enhanced the more number of pods/plant. Similarly 100 seed weight was also more in 90 x 20 cm spacing regime than 90 x 10 cm.

Pigeonpea recorded a seed yield of 1466 kg/ha and 1560 kg/ha when the terminal shoot was nipped at 50 DAS, at 90 x20 cm and 90 x 10 cm planting geometry, respectively. Nipping had significant influence on the seed yield. Narayanan and Narayanan (1987) also reported favourable effect of nipping on seed yield in sesame. The increase in seed yield due to nipping was 13.90 per cent over the control (Table 1). The reduced yield in other treatments may be attributed to reduction in growth and yield components.

The highest gross income (Rs.24180), net income (Rs.16068) and benefit cost ratio (1.98) was realised when nipping was done at 50 DAS at 90 x 10 cm spacing regime. Roy and Singh (1992) also reported higher seed yield and net returns in chickpea when plants were nipped at 30 or 40 days after sowing.

Table 2. Gross income, Cost of cultivation, net income and benefit cost ratio of Pigeonpea as influenced by plant population and nipping

Sl. No.	Treatments	Gross income (Rs/ha)	Cost of cultivation (Rs/ha)	Net income (Rs/ha)	Benefit cost ratio
1.	90 x 20 cm No-nipping	19948	8062	11886	1.48
2.	90 x 20 cm Nipping at 50 DAS	22723	8112	14611	1.80
3.	90 x 20 cm Nipping at 50 and 70 DAS	17949	8162	9787	1.19
4.	90 x 20 cm Nipping at 50,70 and 90DAS	16461	8212	8249	1.01
5.	90 x 10 cm No-nipping	22211	8062	14149	1.75
6.	90 x 10 cm Nipping at 50 DAS	24180	8112	16068	1.98
7.	90 x 10 cm Nippingat 50 and 70 DAS	20785	8162	12623	1.54
8.	90 x 10 cm Nipping at 50,70 and 90DAS	19111	8212	10899	1.32

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