

Intercropping of greengram (*Phaseolus radiatus*), blackgram (*Phaseolus mungo*) and sesame (*Sesamum indicum*) in pigeonpea (*Cajanus cajan*) under different seeding methods

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ABSTRACT

A field experiment was conducted during the rainy season of 1991 to 1993 at Diphu to study the feasibility of intercropping greengram (*Phaseolus radiatus* L.), blackgram (*P. mungo* L.) and sesame (*Sesamum indicum* L.) in pigeonpea [*Cajanus cajan* (L.) Millsp.] under different seeding methods in the hills slope (20%). Intercropping did not affect the grain yield of pigeonpea, but it increased the total productivity in terms of pigeonpea equivalent. Pigeonpea alone recorded the lowest pigeonpea equivalent, which was found significantly inferior to the intercropped treatments. Among the seeding methods evaluated, accommodation of 1 or 2 rows for blackgram and greengram proved better than that of sesame. Accommodation of 1 row greengram in normally spaced (75 cm x 30 cm) was found the most remunerative in terms of net return and benefit : cost ratio.

In Assam pigeonpea [*Cajanus cajan* (L.) Millsp.] as a pure crop is not economically viable considering its productivity and duration. However, there is a great scope for intercropping with greengram (*Phaseolus radiatus* L.), blackgram (*P. mungo* L.), sesame (*Sesamum indicum* L.), maize, cowpea and soybean. Intercropping with short-duration grain legumes, oilseeds, cereals and millets in pigeonpea is compatible and remunerative (Singh *et al.*, 1979; AICPIP, Kanpur, 1982; Ahlawat *et al.*, 1985). Pigeonpea is sown at wide inter-row spacing of 75 cm in Assam. The initial growth up to 60–65 days after sowing is slow. During this early growth period, the inter-row spaces can be properly utilized by raising short-duration crop in between pigeonpea rows and the farmers can obtain an additional benefit without affecting the pigeonpea yield.

Therefore the present experiment was undertaken to study the feasibility of intercropping greengram, blackgram and sesame under different seeding methods in rainfed pigeonpea in hill slope.

MATERIALS AND METHODS

A field experiment was conducted at Diphu (25°50' N, 93°30' E) during 1991, 1992 and 1993 in the 20% hill slope under rainfed conditions. The experiment was conducted in randomized block design and replicated thrice. The blocks were designed across the slope. The treatments consisting of pigeonpea alone (T_1), 1 row of greengram in between pigeonpea rows (T_2), 1 row of blackgram in between pigeonpea (T_3), 1 row of sesame in between pigeonpea (T_4), 2 rows of greengram in between pigeonpea (T_5), 2 rows of blackgram in between pigeonpea

Table 1. Grain yield of pigeonpea, intercrops and pigeonpea-equivalent yield as affected by different intercropping treatments

Treatment	Yield of pigeonpea (q/ha)			Yield of intercrops (q/ha)			Pigeonpea-equivalent yield (q/ha)		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Pigeonpea alone (T ₁)	5.28	8.22	10.43				5.28	8.22	10.43
1 row of greengram between pigeonpea rows (T ₂)	5.00	7.22	7.81	4.44	12.49	8.89	10.78	23.30	19.36
1 row of blackgram between pigeonpea rows (T ₃)	8.89	6.50	7.74	4.17	14.00	11.94	13.06	20.50	19.68
1 row of sesame between pigeonpea rows (T ₄)	5.56	7.50	7.37	2.08	3.94	3.61	9.72	15.39	14.59
2 rows of greengram between pigeonpea rows (T ₅)	6.39	6.72	6.28	4.72	13.88	8.47	12.53	23.86	17.31
2 rows of blackgram between pigeonpea rows (T ₆)	5.56	7.30	6.43	5.00	16.89	12.89	10.56	24.19	19.32
2 rows of sesame between pigeonpea rows (T ₇)	5.00	6.55	8.93	2.61	5.05	3.83	10.22	16.66	16.60
Broadcasting greengram between pigeonpea rows (T ₈)	4.45	6.61	5.50	4.17	11.69	12.78	9.86	21.81	22.10
Broadcasting blackgram between pigeonpea rows (T ₉)	7.22	5.00	5.93	4.44	13.59	15.53	11.66	18.59	21.46
Broadcasting sesame between pigeonpea rows (T ₁₀)	4.17	5.61	6.92	2.44	3.05	5.22	9.06	11.72	17.66
CD (P = 0.05)	NS	NS	NS				NS	4.97	4.81

Market prices of grain (Rs/kg): pigeonpea, 5.00; greengram, 6.50; blackgram, 5.00; and sesame, 10.00

(T₆), 2 rows of sesame in between pigeonpea (T₇), broadcasting greengram in between pigeonpea (T₈), broadcasting blackgram in between pigeonpea (T₉), and broadcasting sesame in between pigeonpea (T₁₀). The crop was uniformly fertilized @ 15 kg N/ha and 40 kg P₂O₅/ha. Both pigeonpea and intercrops were sown on same day as per treatment. The crop was sown on 1 and 9 August and 28 July in respective crop seasons. On an average greengram, blackgram, sesame and pigeonpea took 71, 78, 91 and 185 days to mature respectively. The soil of the experimental site contained 1.72% organic matter, available N 357.5 kg/ha, available P₂O₅ 13.44 kg/ha and available K₂O 280 kg/ha, with soil pH 5.82. Pigeonpea was sown at 75 cm x 30 cm spacing. Irrespective of intercrop a uniform spacing of 37.5 cm and 25 cm between alternate rows for accommodating 1 row and 2 rows respectively was maintained. 'ML 56', 'T 9', 'ST 1683' and 'T 21' were the varieties used for greengram, blackgram, sesame and pigeonpea respectively. The rainfall received during the period of experimentation was 574.1, 611.2 and 484.2 mm in 1991, 1992 and 1993 respectively.

RESULTS AND DISCUSSION

The grain yield of pigeonpea did not differ significantly in different years (Table 1), indicating the intercropping feasibility of greengram, blackgram and sesame with pigeonpea. Ali (1985) reported that greengram, blackgram and sesame were compatible and remunerative intercrops in rainfed pigeonpea. However, reduction in grain yield of pigeonpea due to intercropping was recorded. The minimum yield reduction (3.2%) was obtained when 1 row of blackgram was accommodated between pigeonpea rows. The results confirm the

findings of Hati and Ray (1982). The reduction in grain yield of pigeonpea due to intercropping was mainly due to competition for nutrient, moisture and solar energy. Among the intercrops, blackgram gave the highest grain yield, followed by greengram and sesame.

The pigeonpea-equivalent yield showed significant differences in 1992 and 1993 and also when the data were pooled. The total productivity in terms of pigeonpea equivalent increased by intercropping greengram, blackgram and sesame. The data revealed that pigeonpea alone gave significantly lowest pigeonpea-equivalent yield and found inferior to all the intercropped treatments (Table 1). This is in conformity with the findings of Roy *et al.* (1981). The highest pigeonpea-equivalent yield accounting for 226% increase in yield over the sole pigeonpea was obtained when 2 rows of blackgram were accommodated. Among the seeding methods, accommodation of 1 row of greengram or blackgram was significantly better than 1 row of sesame. Broadcasting of both greengram and blackgram between pigeonpea rows proved better than sesame for pigeonpea-equivalent yield. However, accommodation of 2 rows was found equally good for greengram, blackgram and sesame.

Net return showed significant differences in all the crop seasons and also in pooled analysis (Table 2). Among the treatments tested, accommodation of 1 row of greengram recorded the highest net return, followed by 2 rows of blackgram. Pigeonpea alone gave significantly lowest net return. The results revealed that seeding methods did not influence the net return within the respective intercrop. The higher values of benefit : cost ratio were shown by the intercropped treatments (2.41–3.62) compared

Table 2. Pigeonpea-equivalent yield, cost of cultivation, net return and benefit : cost ratio as affected by different intercropping treatments

Treatment	Pooled pigeonpea-equivalent yield (q/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)				Benefit : cost ratio
			1991	1992	1993	Pooled	
T ₁	7.92	2,119	519	1,992	3,097	1,869	1.88
T ₂	17.81	2,459	2,929	9,191	7,223	6,448	3.62
T ₃	17.75	2,508	4,021	7,741	7,331	6,364	3.54
T ₄	13.23	2,461	2,400	5,231	4,836	4,156	2.69
T ₅	17.90	2,587	3,676	9,341	6,066	6,361	3.46
T ₆	18.02	2,599	2,679	9,497	7,057	6,411	3.47
T ₇	14.50	2,504	2,606	5,826	5,796	4,742	2.90
T ₈	17.92	2,682	2,241	8,216	8,361	6,273	3.34
T ₉	17.23	2,769	3,062	6,524	7,962	5,849	3.13
T ₁₀	12.71	2,639	1,841	3,169	5,992	3,667	2.41
CD (P = 0.05)	4.17		2,975	2,464	2,436	2,088	

Details of treatments are given in text

with sole pigeonpea (1.88).

It was concluded that intercropping of greengram, blackgram and sesame under accommodation of single or double rows or broadcasting between pigeonpea rows may be followed for general cultivation in the hill slope under rainfed condition.

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