

Intercropping in late rainy-season pigeonpea (*Cajanus cajan*) under rainfed condition

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ABSTRACT

A rainfed study was made on intercropping in pigeonpea [*Cajanus cajan* (L.) Millsp.] during late rainy seasons of 1985-86 and 1986-87. A reduction in pigeonpea yield was observed when it was intercropped with cereals, millets and oilseeds. The yield reduction was the highest with Italian millet (*Lolium multiflorum* Lam.) and lowest with castor (*Ricinus communis* L.). However, when total production was considered, the pigeonpea + sorghum [*Sorghum bicolor* (L.) Moench] recorded highest pigeonpea equivalent, followed by pigeonpea + castor and pigeonpea + finger millet [*Eleusine coracana* (L.) Gaertn.]. The highest net return was accrued by pigeonpea + sorghum intercropping system.

In southern Andhra Pradesh pigeonpea [*Cajanus cajan* (L.) Millsp.] is grown as a mixed or intercrop in groundnut (*Arachis hypogaea* L.), sorghum [*Sorghum bicolor* (L.) Moench] and several other crops in drylands. Very often due to unfavourable and erratic south-west monsoon and prolonged dry spells, the yields of rainy-season (*kharif*) groundnut are highly unstable and uneconomical. In several years, the rains received during onset of monsoon are delayed and not well-distributed during normal rainy season (June-August), where usually the groundnut crop is grown in this tract resulting in very poor yields. Due to delayed sowing, usually during August-September, the pod yields of groundnut are very poor and occurrence of severe incidence of pest and disease. However, in late *kharif*, rainfed pigeonpea can be successfully grown. Under these circumstances there is need to have efficient

land use per unit area and time. Intercropping in pigeonpea by growing short-duration crops is one of the ways to achieve this. Therefore, a study was undertaken to identify the best intercrop combination in terms of higher yield and income.

MATERIALS AND METHODS

A field experiment was conducted during late *kharif* seasons of 1985 and 1986 at Tirupati (182.9 m, 13°N, 79°E) of southern agro-climatic zone of Andhra Pradesh. The soil was red sandy loam (Alfisols) with 5.3 pH and 120, 25 and 170 kg/ha available N, P and K respectively. Treatments comprised 11 cropping systems with pigeonpea as base crop. The treatments were replicated 3 times in randomized block design (Table 1). 'Palnadu' pigeonpea was intercropped with 'JL 24' groundnut, 'Aruna castor' (*Ricinus communis* L.), 'CSH 5' sorghum, 'Kalyani'

finger millet [*Eleusine coracana* (L.) Gaertn.] and 'Prasad' Italian millet (*Lolium multiflorum* Lam.) in 1 : 1.

Nitrogen was applied @ 20 kg/ha in single dose basally at the time of sowing. For the crops of castor and Italian millet, an additional top-dressing of 20 kg N/ha was given 30–40 days after sowing. The other crops of sorghum and finger millet require a higher dose of N and hence 40 kg N/ha was top-dressed. A basal application of 40 kg P₂O₅ and 20 kg K₂O/ha was applied uniformly in all treatments.

The rainfall received during the crop-growth period of pigeonpea was 729 and 380 mm during 1985–86 and 1986–87 in 28 and 22 rainy days respectively. All crops were sown on 18 September in 1985–86 and on 16 September in 1986–87. The seeds were placed manually in the furrows at recommended seed rates and spacing for each crop. Thinning was done wherever necessary 20 days after sowing to keep

plants spaced properly. The necessary plant protection was given for the crops. Both the main and intercrops were harvested at maturity and the yields were recorded accordingly.

RESULTS AND DISCUSSION

Yield

Yield of pigeonpea varied significantly in different cropping systems (Table 1). The highest grain yield of pigeonpea was obtained with pigeonpea-sole crop, which was significantly superior to all other systems except its yield with castor intercropping in both the years and with finger millet during 1985–86. The lowest grain yield of pigeonpea was obtained in pigeonpea + Italian millet in both the years, which might be due to their mutual competitive effects compared with the other intercropping systems, as also reported by Dhoble *et al.* (1990).

Poor yield of pigeonpea during 1986–87

Table 1. Yield of different crops as influenced by pigeonpea intercropping systems

Cropping system	Grain yield (q/ha)				Straw yield (q/ha)			
	Main crop		Intercrop		Main crop		Intercrop	
	1985–86	1986–87	1985–86	1986–87	1985–86	1986–87	1985–86	1986–87
Pigeonpea alone (PP)	18.16	13.12			42.56	36.48		
PP + groundnut	13.50	8.06	3.36	3.56	37.73	30.05	9.64	10.20
PP + castor	15.42	10.13	2.50	2.16	40.60	31.40	17.50	14.50
PP + sorghum	13.50	7.50	19.68	20.80	38.32	27.92	26.50	33.50
PP + finger millet	15.22	7.98	3.36	10.30	45.20	34.80	26.80	38.32
PP + Italian millet	13.33	6.82	4.26	6.88	40.80	28.64	16.50	23.50
Groundnut sole	6.12	5.60			19.20	14.88		
Castor sole	8.56	8.78			12.86	14.98		
Sorghum sole	26.67	31.81			29.96	36.30		
Finger millet sole	11.28	13.22			24.32	29.60		
Italian millet sole	8.26	14.80			16.58	26.62		
CD (P = 0.05)	4.28	3.64			6.24	5.38		

Table 2. Pigeonpea equivalent and economics of pigeonpea-intercropping systems

Cropping system	Pigeonpea equivalent (q/ha)			Mean gross income (Rs/ha)		Mean total gross income (Rs/ha)	Mean expenditure (Rs/ha)	Mean net return (Rs/ha)
	1985-86	1986-87	Mean	Grain	Fodder or Firewood*			
Pigeonpea alone (PP)	18.16	13.12	15.64	12,512	988*	13,500	2,500	11,000
PP + groundnut	16.86	11.62	14.24	11,392	1,343	12,735	5,500	7,235
PP + castor	17.92	12.29	15.11	12,084	1,326	13,210	3,500	9,910
PP + sorghum	20.88	15.30	18.09	14,472	3,828	18,300	3,750	14,550
PP + finger millet	16.48	11.84	14.16	11,328	2,532	13,860	3,250	10,610
PP + Italian millet	14.93	9.40	12.17	9,732	1,468	11,200	3,000	8,200
Groundnut sole	6.12	5.60	5.86	4,688	852	5,540	4,000	1,540
Castor sole	8.56	8.78	8.67	6,936	348	7,284	2,000	5,284
Sorghum sole	10.00	11.93	10.97	8,772	3,313	12,085	2,750	9,335
Finger millet sole	4.23	4.96	4.60	3,676	1,348	6,524	2,250	3,274
Italian millet sole	3.10	5.55	4.33	3,460	540	4,000	2,000	2,000
CD (P = 0.05)	3.40	4.20	3.88					

Market rates for grain (Rs/q): Pigeonpea, 800; groundnut, 800; castor, 800; sorghum, 265; finger millet, 265; Italian millet 265; and for fodder or firewood, (Rs/ha): 25, 50, 25, 100, 50, 25 respectively

was mainly due to the less amount of rainfall (380 mm) received in 22 rainy days, which was not well distributed throughout the crop-growth period. The crop also suffered terminal drought during its peak flowering and pod-maturity phases of crop.

In terms of pigeonpea equivalents, pigeonpea + sorghum intercropping system had significantly higher equivalent in both the years (Table 2), giving on an average of 1,809 kg/ha, whereas sole pigeonpea gave 1,564 kg/ha. Sorghum had less adverse effect on pigeonpea yield compared with the other intercrops, as also reported by Rao and Willey (1980), Umarani (1981) and Lomte and Dabhadre (1990). The other intercropping systems of pigeonpea + castor and pigeonpea + finger millet in terms of pigeonpea equivalents were better than other intercropping systems.

Economics

All the intercropping systems gave higher return than the respective sole crops but only pigeonpea + sorghum had higher net return

than sole crop of pigeonpea. The highest net return of Rs. 14,550/ha was obtained with pigeonpea + sorghum combination, which was Rs 3,550 more income than sole pigeonpea. This combination provided cereal, pulse and fodder too in a single cropping system. It was concluded that sorghum intercropping system was beneficial and remunerative in late kharif under rainfed Alfisols in Southern zone of Andhra Pradesh.

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