

Effect of Different Planting Systems on Dry Matter Production in Pearl millet + Legume Parallel Cropping Under Arid Rainfed Condition

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Abstract The experiment conducted on a sandy loam soil during 1990 and 1992 revealed that parallel cropping of moth bean and cluster bean with pearl millet gave significantly higher total produce and total biological yield than their sole cropping during 1992. Among different planting systems parallel cropping of two rows of legumes with paired planted pearl millet (P + C 2:2) gave highest total biological yield than their sole cropping during both the years. Planting system, P + C (1:1) and P + C (2:2) gave highest total biological yield than their sole cropping during both the years. Planting system, P + C (1:1) and P + C (2:2) gave an yield advantage of 137 and 126%, LER of 2.37 and 2.26 during 1990 and 1992, respectively.

Key words Parallel cropping, Planting systems, Arid legumes, Pearl millet

Mixed cropping is a common practice in arid zone of Rajasthan on account of spreading risk of crop failure due to failure of monsoon and fulfillment of multiple requirements of farmers. In these areas intercropping of legumes e.g. green gram, moth bean and cluster bean with grasses (*Cenchrus ciliaris*, *Lasiurus indicus*) and castor has been proved more beneficial in terms of money and maximum productivity per unit area without affecting the yield of main crop (Singh 1980). Adoption of parallel cropping system and its advantages is well defined (Saxena 1972). Keeping these factors into consideration the present investigation was undertaken to find out the suitable planting system and crops combination in parallel cropping of legumes

with pearl millet for maximum production per unit area under rainfed condition of arid zone.

Materials and Methods

The experiment consisting ten treatments were tested in a randomized block design with four replications. Two legume crops (moth bean and cluster bean) were parallel cropped with pearl millet (normal sown at 40 cm and paried sown at 30/60 cm) under three planting systems (1:1, 2:1 & 2:2) at CAZRI, Regional Research Station, Bikaner, during 1990 and 1992. The soil was sandy loam in texture. The sole crops of main crop (pearl millet) in both the systems, (normal and paried) and parallel crop (legumes) were sown, separately. All the

Table 1 Climatic condition during crop season (July-November)

Months	Rainfall (mm)		Temperature (°C)				Humidity (%)				wind speed (km hr ⁻¹)	
	(a)	(b)	Max		Mini		I		II		(a)	(b)
			(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)		
July	78.8	76.3	37.1	37.6	27.5	27.1	71.0	70.0	42.0	20.0	17.1	14.0
August	132.3	64.8	36.4	34.3	26.8	26.3	75.0	76.0	47.0	51.0	10.2	11.0
September	13.3	118.7	36.1	33.8	25.5	22.2	73.0	75.0	39.0	44.0	10.6	9.7
October	Nil	20.9	35.4	34.4	17.6	18.7	46.0	57.0	15.0	28.0	5.1	6.1
November	Nil	Nil	30.9	29.9	11.8	11.0	56.0	52.0	18.0	22.0	4.8	3.2
Total	224.4	390.7	-	-	-	-	-	-	-	-	-	-

(a) = 1990; (b) = 1992

Table 2 Total produce ($t\ ha^{-1}$) as affected by different planting systems and parallel crops

Planting systems	Cluster bean		Moth bean		Mean	
	(a)	(b)	(a)	(b)	(a)	(b)
Main crop (Pearl millet)						
P + C (1:1)	0.83	1.60	1.09	1.98	0.96	1.80
P + C (2:1)	1.37	2.07	0.73	2.83	1.05	2.50
P + C (2:2)	0.99	2.37	0.73	2.20	0.86	2.28
Sole (Pn)	—	—	—	—	0.99	3.27
Sole (PP)	—	—	—	—	0.50	2.93
Mean	1.06	2.01				
	System (S)		Crop (C)		S X C	
SEm \pm	0.04	0.11	0.03	0.08	0.06	0.16
CD 5%	0.13	0.34	0.10	0.24	0.18	0.49
Parallel crop (legume)						
P + C (1:1)	0.82	1.33	0.27	0.51	0.60	0.92
P + C (2:1)	0.35	1.30	0.28	1.20	0.35	1.25
P + C (2:2)	0.33	2.40	0.37	2.73	0.35	2.57
Mean	0.50	1.68	0.31	1.49	—	—
Sole (C)	1.35	1.70	0.95	1.07	—	—
	System		Crop		S X C	
SEm \pm	0.19	0.03	0.15	0.02	0.26	0.05
CD 5%	0.60	0.10	0.48	0.07	0.83	0.14

Pn = Pearl millet normal (40 cm) Sown; PP = Pearl millet paired sown (30/60)

C = Parallel crops (legume); (a) = 1990; (b) = 1992

interculture operations e.g. weeding and fertilizer application were done as recommended for individual crop. During 1991 due to severe drought the crop failed. The crop was grown as rainfed. During crop season (July-November) of 1990, a total of 224.4 mm and in 1992 a total of 390.7 mm rainfall was received. In first year (1990) the rainfall was very erratic (having more than 15 days of long dry spell in month of September and October) but in 1992 the rainfall distribution pattern was normal (Table 1). The main crop of pearl millet was badly damaged by birds, therefore, only dry matter yield was recorded in all the crops.

Results and Discussion

Total produce : Among different system highest total produce of 1.37 and 2.83 $t\ ha^{-1}$ of pearl millet was recorded during 1990 and 1992, respectively when two rows of legumes were parallel cropped with paired planted (P + C 2:1) pearl millet which

was significantly higher than rest of the systems (Table 2). Ramakrishna *et al.* (1977) have also reported the better performance of paired system. Cluster bean during 1990 and moth bean during 1992 proved to be less competitive, resulting in highest total produce of main crop. The better growth of cluster bean during 1992, exhibited poor growth of main crop (Pearl millet) and with paired planted, pearl millet produced highest total produce (2.83 $t\ ha^{-1}$), during 1992 whereas in 1990 it was with parallel cropping of cluster bean in same planting system.

The data given in Table 2 showed that total produce of parallel crops was also significantly affected by different planting systems in both years. The highest total produce of 2.56 $t\ ha^{-1}$ of parallel crops as recorded with planting system P + C (2:2) during 1992, whereas it was highest in system P + C (1:1) during 1990. The cluster bean proved highest yielding parallel crop during both the years than

Table 3 Total biological yield ($t\ ha^{-1}$) as affected by different planting systems and crops

Planting systems	Cluster bean		Moth bean		Mean	
	(a)	(b)	(a)	(b)	(a)	(b)
Sole (C)	1.34	2.37	1.35	2.40	1.35	2.38
P + C (1:1)	1.65	3.30	1.34	3.38	1.49	3.34
P + C (2:1)	1.33	3.40	1.01	3.33	1.17	3.37
P + C (2:2)	0.49	3.67	1.12	3.40	0.81	3.53
Sole (Pn)	—	—	—	—	0.75	3.27
Sole (PP)	—	—	—	—	0.67	2.83
Mean	1.16	3.18	1.16	3.13	—	—
	Systems		Crops		S X C	
SEm \pm	0.07	0.16	0.06	0.11	0.09	0.22
CD 5%	0.22	0.46	0.18	0.33	0.30	0.066

C = Paralle crop ; Pn = Pearl millet normal (40 cm) sown;

PP = Pearl millet paired (30/60cm) sown ; (a) = 1990; (b) = 1992

moth bean. The planting system P + C (1:1) proved to be the lowest yielder during both the years.

Total biological yield: the data given in Table 3 showed that biological yield was significantly affected by different planting systems during both the years. In 1990 highest total biological yield ($1.49\ t\ ha^{-1}$) was recorded in system P + C (2:1), whereas during 1992 the highest total biological yield of $3.53\ t\ ha^{-1}$ was recorded in planting system P + C (2:2) which was at par with system P + C (2:1). Ramakrishna *et al.* (1977) have also reported that paried row planting system is more productive than uniform system. The sole cropping of normal and paried planted pearl millet gave 50 and 55% lower yield in 1990 than the system P + C (1:1), but in 1992 it was 7 and 19% lower than system P + C (2:2), respectively. Total biological yields in moth bean and cluster bean parallel cropping were at par in both the years. The similar findings were also reported by Singh and Joshi (1980).

Land equivalent ratio (LER): It is evident from the data given in Table 4 that planting systems P + C (1:1) and P + C (2:2) gave highest land equivalent ratio of 2.37 and 2.26 during 1990 and 1992, respectively. This was due to highest total biological yield in the respective planting systems. The lowest LER was recorded in planting system P + C (2:1) and P + C (1:1) in 1990 and 1992, respectively. The parallel cropping of one row of moth bean with normal planted pearl millet gave a yield advantage of 148% in 1990, but during 1992, parallel cropping of two rows of moth bean with pearl millet gave 131% yield advantage over their sole cropping. Rao and Willey (1980) have also observed 57% yield advantage in pearl millet + pigeon pea intercropping.

Acknowledgement

I am thankful to Director, CAZRI, Jodhpur for providing necessary facilities during the period of investigation.

Table 4 Land equivalent ratio (LER) as affected by different planting systems and crops

Planting Systems	Cluster bean		Moth bean		Mean	
	(a)	(b)	(a)	(b)	(a)	(b)
P + C (1:1)	2.27	1.26	2.48	1.07	2.37	1.16
P + C (2:1)	1.62	1.46	2.48	2.08	1.31	1.77
P + C (2:2)	1.33	2.21	1.12	2.31	1.22	2.26
Mean	1.72	1.64	1.53	1.82	—	—

P = Main crop ; C = Parallel crop ; (a) = 1990 ; (b) = 1992

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(Received April 1993 Accepted March 1994)