

Productivity and economics of Indian mustard (*Brassica juncea*)-based cropping systems under brackish water resource

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ABSTRACT

A field experiment was conducted during 1997–98 and 1998–99 on sandy loam soil at the National Research Centre on Rapeseed–Mustard, Bharatpur (Rajasthan), to study the production potential, and economics of 5 important Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] based cropping systems under rainfed conditions. Among all the cropping systems, pearl millet [*Pennisetium glaucum* (L.) R. Br. emend. Stuntz] + clusterbean [*Cyamopsis tetragonoloba* (L.) Taubert] grown for fodder followed by Indian mustard gave the highest productivity per unit area per unit time. This system gave 411.6 q/ha fodder yield of pearl millet + clusterbean, followed by 10.15 q/ha. Though Indian mustard yield was higher after clusterbean, Indian mustard-equivalent yield (15.80 q/ha) was the highest in pearl millet + clusterbean–Indian mustard cropping system. The highest net return was also received from this system (Rs 11,989/ha), followed by clusterbean–Indian mustard cropping system (Rs 10,687/ha). Fallow–Indian mustard cropping system mostly followed by the farmers of Rajasthan gave the lowest Indian mustard-equivalent yield (10.15 q/ha) and net return (Rs 6,000/ha).

Key words : Indian mustard-based cropping systems, Productivity, Economics

In India Indian mustard is mostly grown in the marginal soils where either irrigation facilities are not available or irrigation water is of poor quality (brackish water), due to which in most of the areas the crop is grown keeping land fallow in rainy season, resulting low production per unit area compared to China, Canada, and France. Hence this investigation was

under-taken during 1997–98 and 1998–99 to maximize and sustain the production per unit area under rainfed conditions of semiarid tract of Rajasthan, at Bharatpur, where irrigation water is brackish and Indian mustard is grown as rainfed on conserved rainwater with supplemental irrigation of brackish water.

MATERIALS AND METHODS

The investigation was carried out during 1997–98 and 1998–99 at Research Farm of National Research Centre on Rapeseed–Mustard, Bharatpur, in split-plot design with 4 replications. The soil was sandy loam with pH 8.0, medium in available nitrogen (0.6%), phosphorus (23.5 kg P₂O₅/ha) and potash (230 kg K₂O/ha). Five Indian mustard-based crop sequences, viz. pearl millet + clusterbean (fodder)–Indian mustard, clusterbean (fodder)–Indian mustard, green-manuring–Indian mustard, Indian mustard straw @ 5 tonnes/ha–mustard and fallow–Indian mustard (farmers practice), were taken in main pots and 4 levels of nitrogen (0, 30, 60 and 90 kg N/ha) were taken in subplots. The ‘RH 30’ Indian mustard (suitable for rainfed situations) was sown at a distance of 30 cm on 16 October 1997 and 13 October 1998 after taking preceding the rainy-season crops. The rainy-season crops were grown with recommended package of practices (Table 1). *Sesbania* crop was turned down in the field for green-manuring at 50–55 days after sowing (DAS), whereas pearl millet + clusterbean and clusterbean fodder were harvested at 50 DAS. The full dose of

phosphorus and half dose of nitrogen (as per treatment) were applied basal in Indian mustard crop and the remaining nitrogen was applied 45 DAS after first irrigation. Only 1 irrigation 35 DAS was given to Indian mustard with brackish water. The oil content in seeds was determined by NMR technique. The data were statistically analysed after regular transformations.

RESULTS AND DISCUSSION

Seed yield and Indian mustard-seed equivalent yield

During 1997–98, the yield of the Indian mustard was very low because during this year there was continuous foggy weather for more than 1 months during early growth stage which resulted severe infection of white-rust disease. This year proved to be the bad year for whole country due to which country's mustard production and productivity came down. Among different cropping systems, the maximum seed yield of Indian mustard was recorded in the plots preceded by green-manuring, followed by Indian mustard grown after clusterbean (F) (11.85 q/ha). The higher yield of Indian mustard grown after green-manuring and clusterbean was owing to residual effect of

Table 1. Varieties, seed rate, spacing and fertilizer doses applied to different crops

Crop	Variety	Seed rate (kg/ha)	Row spacing (cm)	N (kg/ha)	P ₂ O ₅ (kg/ha)	K ₂ O (kg/ha)
Pearlmillet + clusterbean	‘Wcc. 75’	5.00	30	60	30	
	‘FS 277’	12.50	30			
Clusterbean	‘FS 277’	25.00	30	20	40	
<i>Sesbania aculeata</i>		30.00	30			
Crop residue	Indian mustard straw 5 tonnes/ha					
Indian mustard	‘RH 30’	5.0	30	0, 30, 60, 90 kg/ha	40	

Table 2. Green fodder and dry-matter yields of rainy-season crops

Crop	Green fodder yield (q/ha)			Dry-matter yield (q/ha)		
	1997-98	1998-99	Average	1997-98	1998-99	Average
Pearlmillet + clusterbean	496.2	327.0	411.6	80.6	62.7	71.65
Clusterbean	295.8	75.8	185.8	70.9	19.6	45.25

Table 3. Indian mustard seed yield and Indian mustard-equivalent seed yield in Indian mustard-based cropping systems

Cropping system	Seed yield of Indian mustard (q/ha)			Indian mustard seed equivalent yield (q/ha)		
	1997-98	1998-99	Average	1997-98	1998-99	Average
Pearlmillet + clusterbean-Indian mustard	7.40	13.90	10.65	13.60	17.98	15.79
Clusterbean-Indian mustard	7.80	15.90	11.85	12.71	17.61	15.16
Crop residue-Indian mustard	7.40	13.90	10.65	7.40	13.90	10.65
Green-manuring-Indian mustard	8.30	16.10	12.20	8.30	16.10	12.20
Fallow-Indian mustard	7.10	13.20	10.15	7.10	13.20	10.15
CD (P=0.05)	NS	1.90		0.28	0.87	

nitrogen fixation from the atmosphere (40 kg N/ha) by these leguminous crops in the rainy season. Our findings support those of Sharma and Mitra (1988), who reported beneficial effect of green-manuring. However, maximum Indian mustard-seed equivalent yield was recorded in pearl-millet + clusterbean-Indian mustard-crop sequence, followed by clusterbean-Indian mustard crop sequence. The higher Indian mustard seed equivalent yield in 2 treatments was because of rainy-season fodder production, while in other treatments there was no preceding crop production. The lowest seed-equivalent yield of Indian

mustard was recorded in fallow-Indian mustard crop sequence, followed by crop residue-Indian mustard sequence. Farmers of this tract usually grow Indian mustard keeping land fallow in rainy-season due to brackish water. But as per this study it is not useful to keep the land fallow. In the rainy season fodder crops pearl millet + clusterbean or clusterbean can be safely grown, which gives additional fodder yield without affecting the seed yield of Indian mustard.

Cost of cultivation and net return

The cost of cultivation (Table 3) was the

Table 4. Indian mustard seed-equivalent yield, cost of cultivation, net return and benefit : cost ratio of various cropping systems

Cropping system	Indian mustard equivalent yield (q/ha)	Returns/year (Rs)	Cost of cultivation (Rs)	Net return (Rs)	Benefit : cost ratio
Pearlmillet + clusterbean-Indian mustard	15.79	18,762	6,973	11,789	1.69
Cluster bean-Indian mustard	14.94	17,902	7,215	10,687	1.48
Crop residue-Indian mustard	10.65	12,744	6,492	6,252	0.96
Green-manuring-Indian mustard	12.20	14,640	6,282	8,358	1.33
Fallow-Indian mustard	10.15	12,192	6,192	6,000	0.97

Price (Rs/q) : Indian mustard grain, pearl millet + clusterbean (fodder) and clusterbean fodder Rs 1,200.00, 15.00 and 20.00 respectively

maximum in clusterbean-Indian mustard sequence, followed by pearlmillet + clusterbean-Indian mustard, which was because of the cost of seed and fertilizer use in season. The lowest cost was in crop sequence, as no cost of seed or fertilizer etc. was involved for rainy-season crops, but difference was not much, as in fallow fields number of ploughings increased in the rainy season for controlling heavy seed infestation in the fields. The net return was also highest in pearlmillet + clusterbean (F)-Indian mustard cropping sequence, which was owing to higher production of fodder in the rainy season without much affecting succeeding Indian mustard crop. This was closely followed by clusterbean (F)-Indian mustard cropping sequence. Though fodder yield of clusterbean was

low, being a leguminous crop it fixes nitrogen (approximately 40 kg N/ha) from atmosphere, which increased succeeding Indian mustard yield. The lowest net return was obtained in fallow-Indian mustard cropping system. It can be concluded from the present study that among the cropping sequences tried, pearlmillet + clusterbean-Indian mustard cropping system is most profitable than fallow-Indian mustard cropping system (commonly followed by the farmers due to brackish water).

REFERENCE

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