

Studies on intercropping of mustard varieties with chickpea

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ABSTRACT

A field experiment was conducted during two seasons (*Rabi* 2001-02 and 2003-04) to screen the most suitable variety of mustard grown in association with chickpea and to evaluate the effect of mustard varieties on the yield of chickpea and *vice-versa*. In this study, seven mustard varieties were tested with chickpea in 1:4 row ratio. Results showed that intercropped chickpea produced statistically lower grain yield than sole crop during both the years on area basis. On an average, intercropping of mustard varieties with chickpea reduced the grain yield of chickpea to the extent of 10.15, 9.40, 5.01, 5.50, 9.44, 5.05 and 8.31 per cent with Varuna, Vaibhav, Urvashi, Kanti, Vardan, Basanti and Rohini, respectively. Intercropped mustard gave significantly lower yield than pure cropping during both years on area basis. The positive effects of chickpea on the seed yield of mustard varieties on mean basis were 14.04, 15.49, 22.41, 9.16, 16.55, 14.04 and 12.44 per cent in Varuna, Vaibhav, Urvashi, Kanti, Vardan, Basanti and Rohini, respectively. Intercropping of mustard variety Urvashi proved to be the most suitable for association with chickpea (1:4 row ratio) as it gave maximum seed yield of 11.65 q⁻¹ ha, chickpea equivalent yield of 36.94 q⁻¹ ha, net profit of Rs. 33359⁻¹ ha, LER (1.18) and MAI of Rs. 7321⁻¹ ha followed by Basanti.

Key words: *Brassica juncea*, Chickpea, Chickpea equivalent yield, Economics, Intercropping, Mustard

Chickpea and rapeseeds mustard are important crops in India. There is very limited scope for increasing area under pulses and oilseeds crops and, therefore, intercropping is one of the way for enhancing production of these crops. Intercropping of mustard with chickpea has been tried by various research workers in different agro-climatic conditions of the country. The important agronomic aspects in this system are suitable row ratio of chickpea + mustard, compatible varieties, appropriate sowing time and nutrient management for both the component crops. In the present investigation, an effort was made to identify the most suitable variety of mustard for intercropping with chickpea for higher productivity from the system.

MATERIALS AND METHODS

A field experiment was conducted during *Rabi* seasons of 2001-02 and 2003-04 at Student's Instructional Farm of the C.S. Azad University of Agriculture and Technology, Kanpur. Treatments consisted of sole chickpea, sole mustard, and intercropping of chickpea + mustard with seven genotypes of mustard *viz.*, Varuna, Vaibhav, Urvashi, Kanti, Vardan, Basanti and Rohini. These treatments were laid out in a randomized

block design with four replications. The soil of the experimental site was sandy loam in texture having soil pH (7.0-7.2), organic carbon (0.40-0.43%), available phosphorus (9-10 kg ha⁻¹) and potassium (127.5-100 kg⁻¹ ha). KWR 108 and KPG 59 varieties of chickpea were used during first and second years, respectively both in pure and intercropping systems. Crops were sown on November 7, 2001 and November 12, 2003. Sole chickpea and mustard were sown at a row spacing of 45 cm while in intercropping, 4 chickpea: 1 mustard row ratio followed at 45 cm spacing between rows. Chickpea was fertilized @ 100 kg DAP⁻¹ ha in sole cropping and 80 kg⁻¹ ha in intercropping (80% rows). Mustard crop was fertilized @ 100 kg DAP and 220 kg urea in pure and 20 kg DAP + 44 kg urea in intercropping (20% rows, on row basis). Crops were irrigated only once. Remaining practices were adopted as per recommendation. The yield was used to compute different parameters like land equivalent ration (LER), gross and net income, and monetary advantage index (MAI) as suggested by Willey (8).

RESULTS AND DISCUSSION

Intercropped chickpea produced significantly lower grain yield during the both years on area basis (Table 1). On mean basis, intercropped chickpea produced 18.60 (69.85%), 18.80 (70.60%), 19.97 (74.99%), 19.84 (74.50%), 18.79 (70.56%), 19.96 (74.95%) and 19.89 (71.89%) q⁻¹ ha grain yield with Varuna, Vaibhav, Urvashi, Kanti, Vardan, Basanti and Rohini, respectively as compared to sole cropping of chickpea (26.63 q⁻¹ ha). Thus, smothering effect in grain yield of chickpea resulted in inferior contributing characters in intercropping. It was probably due to shade effect of mustard varieties on chickpea. The reduction on the grain yield of chickpea due to mustard was corroborated with the findings reported by many workers (2, 3, 4, 5, 7).

Seed yield of mustard was significantly higher in sole than intercropping during both the years because of more area (Table 1). On an average, among intercropping, the highest seed yield of mustard was obtained in Urvashi (11.65 q⁻¹ ha) followed by Vardan (10.04 q⁻¹ ha), the sole crop yield being 27.47 q⁻¹ ha. The yield attributes like pod and seed weight plant⁻¹ were superior in intercropped mustard in general and Urvashi in particular. The higher yield and yield attributes might be due to beneficial root interaction of mustard (positive allelopathic effect). The higher seed yield of mustard in intercropping was supported by the findings of Kumar and Singh (4), Dhingra *et al.* (2), Bhatnagar *et al.* (1) and Prasad *et al.* (5). Variation due to varieties was confirmed by Prasad *et al.* (6).

Table 1. Seed yield and its components of chickpea and mustard as affected by intercropping treatments during 2001-02 and 2003-04

Treatment	Chickpea						Mustard					
	Pod weight Plant ⁻¹ (g)		100-seed weight (g)		Grain yield (q ha ⁻¹)		Silique weight plant ⁻¹ (g)		1000-seed weight (g)		Seed yield (q ha ⁻¹)	
	2001-02	2003-04	Mean	2001-02	2003-04	Mean	2001-02	2003-04	Mean	2001-02	2003-04	Mean
Pure chickpea	24.42	21.92	23.17	18.50	16.00	17.25	25.76	27.50	26.63	-	-	-
Pure mustard	-	-	-	-	-	-	-	-	-	44.55	47.66	46.11
Ch+m (Varuna)	22.32	21.33	21.83	17.12	17.25	17.19	18.30	18.90	18.60	43.25	76.66	59.96
Ch+m (Vibhav)	22.70	18.33	20.52	18.11	15.50	16.81	19.15	18.44	18.80	42.72	81.83	62.28
Ch+m (Urvashi)	22.56	19.50	21.03	17.42	15.08	16.25	18.54	21.40	19.97	51.10	115.75	83.43
Ch+m (Kanti)	24.56	18.66	21.61	19.92	15.25	17.59	20.42	19.25	19.84	41.12	77.58	59.35
Ch+m (Vardan)	22.87	19.08	20.98	17.76	15.16	16.46	18.82	18.75	18.79	44.21	86.58	65.40
Ch+m (Basanti)	24.12	21.16	22.14	19.11	15.83	17.47	19.76	20.15	19.96	48.88	68.08	58.48
Ch+m (Rohini)	24.00	20.58	22.29	18.79	16.08	17.44	19.42	18.75	19.89	41.75	71.33	56.54
C.D. 5%	0.65	N.S.	-	N.S.	N.S.	-	2.12	1.62	-	4.31	19.90	-

Ch = Chickpea, m = Mustard

Table 2. Economics, chickpea equivalent yield, land equivalent ratio (LER) and monetary advantage index (MAI) of different intercropping treatments

Treatment	Gross income (Rs ha ⁻¹)			Net profit (Rs ha ⁻¹)			Chickpea equivalent yield (q ha ⁻¹)			LER	MAI (Rs ha ⁻¹)
	2001-02	2003-04	Mean	2001-02	2003-04	Mean	2001-02	2003-04	Mean		
	Pure chickpea	36320	39295	37808	21920	24545	23232.5	2.576	27.50		
Pure mustard	41742	50800	46271	27700	35800	31750.0	3.025	36.29	33.27	1.00	-
Chickpea+mustard Varuna	39213	45023	42118	24857	30222	27539.0	2.802	31.76	29.89	1.04	1619.92
Chickpea+mustard Vaibhav	40047	45899	42973	25691	31098	28394.5	2.863	32.41	30.52	1.06	2432.43
Chickpea+mustard Urvashi	43572	52302	47937	29216	37502	33359.0	3.119	36.94	34.07	1.18	7312.42
Chickpea+mustard Kanti	39058	43996	41527	24702	29196	26948.5	2.785	31.03	29.44	1.03	1209.52
Chickpea+mustard Vardan	41885	45210	43548	27529	30410	28969.5	2.996	31.33	30.65	1.07	2848.93
Chickpea+mustard Basanti	43528	44792	44160	29172	29941	29556.5	3.111	31.78	31.35	1.10	4014.55
Chickpea+mustard Rohini	38570	45326	41948	24214	30526	27370.0	2.753	32.00	29.77	1.04	1613.38
C.D. 5%	2188	2792	-	2500	2792	-	2.14	1.99	-	-	-

Intercropping system had higher chickpea equivalent yield than sole chickpea (Table 2). Although the yield reduction in chickpea was 5.01% in Urvashi and 5.05% in Basanti but the maximum chickpea equivalent yield was achieved in chickpea + mustard cv. Urvashi (34.07 q⁻¹ ha) followed by Basanti (31.35 q⁻¹ ha) as compared with sole chickpea (26.63 q⁻¹ ha).

The highest gross return (Rs. 47937 ha⁻¹) and net return (Rs. 33359 ha⁻¹) was recorded with chickpea + mustard (Urvashi) system (Table 2). This was superior to sole mustard (Rs. 4627⁻¹ ha gross return and Rs. 31750/ ha net return) as well as chickpea and other intercropping systems.

On an average, LER was higher in chickpea + mustard Urvashi (1.18) followed by chickpea + mustard Basanti (1:10) (Table 2). It indicated that Urvashi variety of mustard was the best for intercropping with chickpea. Monetary advantage index was also maximum (Rs. 7321.42 ha⁻¹) in chickpea + mustard Urvashi intercropping system.

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