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Effect of sowing date and moisture-conservation practice on growth and yield of Indian mustard (*Brassica juncea*) varieties

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ABSTRACT

An experiment was conducted during the winter (*rabi*) season of 2001–02 and 2003–04 at Kanpur, Uttar Pradesh, to evaluate the effect of sowing dates (15 and 30 October) and moisture-conservation practices (control, 1 weeding and hoeing, grass mulch and paddy straw mulch) on growth and yield of 2 varieties of ('Vaibhav' and 'Urwashi') of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] under rainfed conditions. Sowing of variety 'Vaibhav' on 15 October achieved higher seed yield and net monetary return compared to sowing on 30 October and variety 'Urwashi'. Moisture-conservation practices increased the seed yield, yield attributes and net monetary return over the control. Among moisture-conservation practices, paddy straw mulch was found most effective in reducing the weed count and enhancing yield and yield attributes markedly. From economic point of view, paddy straw mulch resulted in the highest net monetary returns of Rs 14,799/ha with a benefit: cost ratio of 2.48.

Key words : Indian mustard, Moisture-use efficiency, Net monetary returns, Weed count, Yield

Rainfed areas constitute about 67% of the cultivated land in India. Indian mustard occupies the largest area in India as well as in Uttar Pradesh. As dryland crop, mustard is raised on residual moisture obtained from monsoon rains. To meet up water demand, it is essential to retain the available soil moisture for long period, so that the production of mustard under dryland condition may be enhanced by reducing the unproductive loss of soil moisture through surface evaporation and weed growth, which may be fetched by application of suitable moisture conservation practices (Bhan and Singh, 1979). Besides, selection of suitable varieties suited to moisture stress condition is equally important. Hence present experiment was undertaken to evaluate the comparative performance of sowing dates and moisture-conservation practices on mustard varieties under moisture-stress condition.

MATERIALS AND METHODS

A field experiment was conducted during the winter (*rabi*) season of 2001–02 and 2003–04 at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The experiment was laid out in split-plot design with 3 replications. The experiment comprised 2 mustard varieties, viz. 'Vaibhav' (V_1) and 'Urwashi' (V_2); 4 moisture conservation practices, viz. M_0, no weed-control measure and moisture conservation practice; M_1, weeding and hoeing at 20 DAS; M_2, layering of grass mulch after 1 weeding and hoeing at 20 DAS @ 3 t/ha; and M_3, layering of paddy straw mulch after 1 weeding and hoeing at 20 DAS @ 3 t/ha; and 2 sowing dates, viz. 15 October (D_1) and 30 October (D_2). The soil was sandy loam having pH 7.6, organic carbon 0.32%, low in N (0.037%), medium in available P (11.70 kg/ha) and rich in available K (164.0 kg/ha). The field capacity of surface layer (0–25 cm) was 18.8% and water-holding capacity 31.10%. Moisture status of the soil at sowing was 20.28 and 20.84 cm during 2001–02 and 2003–04 respectively. The soil moisture was estimated-gravimetrically. Total rainfall was 53.0 mm and 73.4 mm during crop season of 2001–02 and 2003–04, respectively.

The recommended doses of nutrients were applied at the time of sowing uniformly in all the treatments. Water-use efficiency was estimated by employing the equation given by Viets (1962). Soil-moisture-extraction pattern was also determined layer-wise up to 100 cm depth at 30-day interval. Total weed count was done from an area of 0.50 m^2 from 3 places in each plot after harvest. The economics of various treatments were computed based on market price, which was Rs 1,350 and Rs 1,750/q during 2002 and 2004, respectively.

RESULTS AND DISCUSSION

Sowing date

Growth characters, yield attributes and yield of mustard

were significantly influenced by 4 different sowing dates (Table 1). Highest values of plant height, length of siliqua, seeds/siliqua, and seed and stover yields were obtained when the crop was sown on 15 October than when it was sown on 30 October. It might be due to more availability of water and its use by crop sown on 15 October compared to sowing on 30 October (Table 2). Sowing on 15 October resulted in the maximum water-use efficiency, indicating more seed and stover production to total water used and lowest under sowing on 30 October. Extraction of moisture was highest in surface layer (0-25 cm depth), followed by sub-surface layer (25–50 cm) and it gradually declined in lower layers up to 1.0 m depth during both the years. Total weed count and weed dry matter were recorded slightly higher when crop was grown on 15 October than on 30 October (Table 1). These results are in conformity with the findings of Singh and Singh (2002).

Varieties

Variety 'Vaibhav' excelled over 'Urwashi' in terms of plant height, number of siliquae, length of siliqua, seeds/siliqua, seed yield and stover yield (Table 1). 'Vaibhav' variety also exhibited maximum water-use efficiency, indicating more seed and stover yield production in proportion to total water used during 2001-02 and 2003-04. Total weed count and dry matter were at par in both the varieties. Moisture-extraction pattern was similar in both the varieties. It was highest in surface layer (0-25 cm) and after that it gradually decreased in both varieties. These results corroborate the findings of Singh and Singh (2002).

Moisture-conservation practices

Application of moisture-conservation practices was found significantly superior to the control in terms of yield and yield attributes (Table 1). Among moisture conservation practices, paddy straw mulch resulted in 10.7% higher seed yield over weeding, hoeing and grass mulch. Higher values of plant height, length of siliqua, number of siliquae, seeds/siliqua and stover yield were also recorded with the application of paddy straw mulch @ 3 tonnes/ha, followed by grass mulch and lowest under control (Table 1). Weed count and dry weight of weed was decreased significantly with use of moisture-conservation practices, as the minimum weed count (53/m^2) was recorded under paddy straw mulch followed by grass mulch. Seed yield was significantly influenced by the application of different moisture-conservation practices. However, maximum weed count (187/m^2), weed dry matter weight (105.0 g/m^2) as well as total water use were recorded in the control plots. Paddy straw mulch resulted in the maximum water use efficiency, followed by grass mulch and lowest being under the control. Mohan Kumar and Sadanandan (1988), Gupta and Awasthi (1997) and Dhal *et al.* (2002) also reported beneficial effects of mulches on crop yield.

Monetary returns

Highest net monetary return (Rs 14,799/ha) was obtained from the application of paddy straw mulch, fol-

Table 1. Effect of sowing dates, varieties and moisture-conservation practices on growth, yield attributes, yield, economics and weed bio-mass in mustard crop (pooled data of 2 seasons)

Treatment	Plant height (cm)	Number of siliquae	Length of siliqua (cm)	Seeds/ siliqua	1,000-seed weight (g)	Seed yield (t/ha)	Stover yield (t/ha)	Weed dry matter (g/m^2)	Total weed count (no./m^2)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	Benefit : cost ratio
Sowing date												
15 October	151.8	356.2	4.4	13.6	4.25	1.43	4.28	64.5	102	9,423	12,660	2.34
30 October	143.8	278.9	3.9	12.2	3.83	1.23	3.89	60.1	93	9,423	9,618	2.02
CD (P=0.05)	6.5	34.0	0.31	0.8	0.15	0.17	0.26	2.40	5			
Moisture-conservation practice												
Control	138.3	275.7	3.5	11.4	3.45	0.98	3.09	105.2	187	8,263	7,090	1.85
Weeding and hoeing at 20 DAS	146.9	312.4	4.1	12.8	4.25	1.33	4.03	63.6	94	9,611	10,508	2.09
Weeding, hoeing and grass mulch at 20 DAS	151.9	332.9	4.4	13.8	4.26	1.44	4.44	41.6	55	9,815	12,526	2.27
Weeding, hoeing and paddy straw mulch 20 DAS	154.9	347.7	4.5	14.6	4.35	1.56	4.78	38.7	53	10,003	14,799	2.48
CD (P=0.05)	4.6	18.4	0.1	1.1	0.14	0.20	0.45	6.5	7			
Variety												
'Vaibhav'	154.3	345.1	4.2	13.4	4.20	1.43	4.32	62.4	99	9,423	12,618	2.33
'Urwashi'	141.7	284.9	4.0	12.8	4.01	1.23	3.85	63.2	95	9,423	9,744	2.03
CD (P=0.05)	6.9	28.5	0.17	0.3	0.92	0.18	0.38	NS	NS			

Table 2. Water use, water-use efficiency and moisture-extraction pattern as influenced by sowing dates, moisture-conservation practices and varieties

Treatment	Water use (mm)		Water-use efficiency (kg grain/mm water)		Moisture-extraction pattern (%)							
					0–25 cm		25–50 cm		50–75 cm		75–100 cm	
	2001–02	2003–04	2001–02	2003–04	2001–02	2003–04	2001–02	2003–04	2001–02	2003–04	2001–02	2003–04
Sowing date												
15 October	185.4	187.3	7.6	7.8	46.4	46.3	25.1	26.8	17.0	16.4	11.5	11.0
30 October	176.8	179.1	6.7	7.2	43.2	44.3	27.2	27.0	17.3	17.1	12.3	11.6
Moisture-conservation practice												
Control	183.8	185.6	5.1	5.5	46.0	46.6	25.6	26.4	17.1	16.5	11.3	10.5
Weeding and hoeing at 20 DAS	181.7	183.5	7.0	7.2	45.2	45.4	26.3	26.7	17.4	16.9	11.1	11.0
Weeding, hoeing and grass mulch, at 20 DAS	179.6	182.6	7.8	8.2	44.2	44.5	26.0	27.4	17.0	16.8	12.8	11.3
Weeding, hoeing and paddy straw mulch, at 20 DAS	179.2	181.2	8.8	8.9	44.0	44.5	26.1	27.5	17.6	16.5	12.3	11.5
Variety												
'Vaibhav'	184.0	186.1	7.6	7.9	45.4	46.0	25.5	27.1	17.3	17.0	11.8	9.9
'Urwashi'	178.2	180.2	6.7	7.1	44.2	44.4	26.8	26.4	17.0	16.5	12.0	12.7

lowed by grass mulch as the moisture-conservation practice. The paddy straw mulch as the fetched about 2.48 times benefit over investment of rupee 1, while the lowest returns were observed in the control. The crop sown on 15 October provided the maximum net return (Rs 12,660/ha) and it was 31.6% higher than from that sown on 30 October. 'Vaibhav' variety proved its superiority with 29.5% higher net monetary return than 'Urwashi'.

REFERENCES

Bhan, Suraj and Singh, S.R. 1979. Water harvesting and moisture conservation practices for dry farming of maize and mustard in Uttar Pradesh. *Annals of Arid Zone* **18**(1 and 2): 107–107.

Dhal, J.K., Mahanama, T., Sandhu, A.S. and Shov, C.R. 2002. Effect of polythene mulch on yield of groundnut (*Arachis hypogaea*). *Journal of Research, Orissa University of Agriculture and Technology* **20** (2): 80–81.

Gupta, C.R. and Awasthi, O.P. 1997. Effect of mulch material on growth and yield of ginger (*Zinziber officinalis* Rosco.). *Journal of Vegetable Science* **24** (1): 13–15.

Mohankumar, C.R. and Sadanandan, N. 1988. Effect of sources of planting material and mulching on the growth and yield of taro. *Journal of Root Crops* **14** (2): 55–77.

Singh, S.K., and Singh, G. 2002. Response of Indian mustard (*Brassica juncea*) varieties to nitrogen under varying sowing dates in eastern Uttar Pradesh. *Indian Journal of Agronomy* **42**(2): 242–248.

Viets, F.G. 1962. Fertilizers and efficient use of water. *Advances in Agronomy* **14**: 223–261.