

Effect of sowing dates and irrigation schedules on yield and water-use efficiency of Indian mustard (*Brassica juncea*)

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ABSTRACT

A field experiment was conducted during the winter season of 1988–89 and 1989–90 at Morena to study the effect of sowing dates and irrigation schedules on growth parameters and water-use efficiency of Indian mustard [*Brassica juncea* (L.) Czernj & Cosson]. Timely sown crop (17 and 27 October) significantly increased the growth parameters, viz. leaf-area index, leaf-area ratio, and seed yield, consumptive use and water-use efficiency. Two irrigations at pre-flowering and siliqua-development stage, followed by 1 irrigation at pre-flowering stage increased growth characters and seed yield significantly than other irrigation treatments. Consumptive use was also improved due to irrigation, whereas the water-use efficiency decreased with irrigation.

Key words : Indian mustard, Sowing date, Irrigation

Yield is the net resultant outcome of the effect of various growth factors on the growth and yield parameters and their integrated influence on yield expression. Since such information is meagre in Indian mustard, an experiment was conducted to assess the effect of sowing dates and irrigation schedules on physiological growth characters for realising the higher seed yield of this crop.

MATERIALS AND METHODS

A field experiment was conducted during the winter season of 1988–89 and 1989–90 at Morena. The soil was sandy loam with pH 7.3, organic carbon 0.18% and had available N, P₂O₅ and K₂O status of 227, 7.3 and

399 kg/ha respectively. The moisture content at field capacity and bulk density were 20.7% and 1.37 g/cm³ respectively. The experiment was laid out in split-plot design with 4 replications. The treatments comprised 4 sowing dates (17 October, 27 October, 6 November and 16 November) as main plots and 4 irrigation schedules [no irrigation, 1 irrigation at pre-flowering (PF), 1 irrigation at siliqua development (SD) and 2 irrigations at PF and SD stages] as subplot treatments. After a pre-sowing irrigation of 100 mm depth, the crop ('Pusa Bold') was sown as per treatment at 30 cm x 10 cm spacing with a fertilizer dose of 80, 40 and 20 kg/ha of N, P₂O₅ and K₂O respectively. The post-sowing irrigations were

Table 1. Effect of sowing date and irrigation on growth parameters, seed yield, consumptive use of water and water-use efficiency in Indian mustard

Treatment	Leaf-area ratio		Leaf-area index		Seed yield (kg/ha)			Consumptive use (mm)		Water-use efficiency (kg/ha-cm)	
	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Pooled	Y ₁	Y ₂	Y ₁	Y ₂
<i>Sowing date</i>											
17 October	10.94	10.07 (10.50)	1.31	0.66 (0.98)	2,663	1,826	2,245	174.5	165.7	15.26	11.03
27 October	10.77	9.85 (10.31)	1.17	0.60 (0.88)	2,556	1,765	2,160	166.7	144.7	15.33	12.20
6 November	10.14	8.90 (9.52)	0.87	0.37 (0.62)	2,408	1,367	1,887	164.4	139.2	14.65	9.82
16 November	9.88	8.61 (9.24)	0.68	0.29 (0.48)	2,184	1,107	1,645	147.6	126.2	14.80	8.77
CD (P = 0.05)	NS	0.31 (0.24)	0.02	0.07 (0.12)	229	176	168				
<i>Irrigation schedule</i>											
No irrigation	9.76	8.77 (9.26)	0.78	0.36 (0.57)	2,253	1,070	1,661	93.9	88.8	23.99	12.05
1 irrigation at PF	11.11	9.81 (10.46)	1.13	0.58 (0.85)	2,532	1,708	2,121	162.0	146.3	15.63	11.67
1 irrigation at SD	10.06	8.93 (9.49)	0.91	0.39 (0.65)	2,460	1,534	1,997	171.5	142.1	14.34	10.79
2 irrigations at P F + SD	10.80	9.91 (10.35)	1.20	0.59 (0.89)	2,569	1,755	2,160	225.8	198.7	11.37	8.83
CD (P = 0.05)	0.81	0.33 (0.21)	0.01	0.13 (0.07)	149	149	103				

Values given in the parentheses are mean of 2 years
Y₁, 1988-89; Y₂, 1989-90

of 75 mm, each measured with the help of Parshall flume.

The climate of the area was sub-tropical with extreme hot and cold during summer and winter respectively. The total precipitation during crop period in 1988-89 and 1989-90 was 6.5 and 18.2 mm in 1 and 7 rainy days respectively and the temperature ranged from 35.0 to 2.9°C and 33.9 to 3.6°C during 2 successive seasons.

RESULTS AND DISCUSSION

Growth parameters and seed yield were higher in the first season than in the second season due to favourable temperature, longer growth period and less infection of pest and diseases.

Sowing date

Date of sowing markedly influenced the growth parameters, viz. leaf-area index (LAI) and leaf area ratio (LAR).

Delay in sowing caused a significant reduction in growth characters. The highest value were recorded in early sowing. However, the yield differences were not significant in respect of 17 and 27 October sowing (Table 1). This may be due to the prevalence of favourable temperature at sowing time and longer optimum period for crop growth. The late-planted crop is subjected to relatively lesser time span available for plant growth and development. Consumptive use and water-use efficiency were more in timely (17-27 October) sown than late (6-16 November) - sown crop due to efficient utilization of available soil moisture at each stage of crop growth. Thus, sowing of Indian mustard beyond its optimum period (27 October) causes reduction in yield, water use, and growth param-

eters. The present findings are in close conformity with those of Jadhav and Singh (1992).

Irrigation

The differences in LAI and LAR, as well as seed yield between 2 irrigations at PF and SD stages and 1 irrigation at PF stage were not significant. Single irrigation applied at pre-flowering stage showed significantly higher growth characters and yield than irrigation at SD stage. This may be due to better growth and development of plant as consequence of timely water availability. The results corroborate the findings of Rana *et al.* (1991) and Singh *et al.* (1994). The consumptive use of water increased with increasing frequency of irrigation. The effect was, however, more conspicuous at 2 irrigation levels than no irrigation because of more evapo-transpiration. However, water-use efficiency declined due to more utilization of water without proportionate increase in seed yield. Singh *et al.* (1985) also reported similar results.

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