

EFFECT OF IRRIGATION, NITROGEN AND STAGE OF HARVESTING ON YIELD, YIELD ATTRIBUTES AND QUALITY OF *BRASSICA CAMPESTRIS* VAR. *TORIA*

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ABSTRACT

The experiment was carried out during 1992-93 and 1993-94 in a split plot design. Six combinations of three irrigation levels (No irrigation, one irrigation at flowering and two irrigation at flowering and pod formation) and two stages of harvesting (Physiological maturity and full maturity) formed the main plot treatments and three nitrogen levels (control, 40 kg N ha⁻¹ and 80 kg N ha⁻¹) were kept in sub-plots. Compared with the no irrigation, irrigation at flowering significantly increased the siliquae plant⁻¹, seeds siliqua⁻¹, 1000 seed weight, oil content, seed yield, stalk yield and harvest index. The crop responded up to the highest level of nitrogen (80 kg ha⁻¹). There was significant increase in siliquae plant⁻¹, seed yield, stalk yield and harvest index over control. However, no significant effect of nitrogen on seeds siliqua⁻¹, 1000 seed weight and oil content was observed. Harvesting at full maturity found to increase oil content, 1000 seed weight, seed yield and harvest index.

INTRODUCTION

Rapeseed and mustard are important oilseed crops of the country. *Brassica campestris* var. *toria*. is an early ecotype of this group. In the multiple cropping systems in vogue in north India it is mostly succeeded by either wheat, onion or sunflower. The crop is getting more popularity with the farmers of the region as the number of short duration and high yielding varieties are now available. The yield of this crop is generally low for various reasons. Being a catch crop farmers do not fully adopt the production package. The use of low level of nitrogen, irrigation without due regard to critical stages and premature harvesting are important causes of low yield of this crop. In the view of above given facts, it was considered worthwhile to study the effect of these factors on the yield, yield attributes and quality of toria.

MATERIAL AND METHODS

The experiment was carried out at the Agronomy Research Farm of Indian Agricultural Research Institute, New Delhi during 1992-93 and 1993-94 in a split plot

design. The main plot treatments consisted of 6 combinations of 3 irrigation levels (No irrigation, one irrigation at flowering and two irrigation at flowering and pod formation) and two stages of harvesting (physiological maturity and full maturity) and 3 nitrogen levels (control, 40 kg N ha⁻¹ and 80 kg N ha⁻¹) were kept in sub-plots replicated thrice. The soil of the experimental field was sandy loam in texture, low in organic carbon, medium in phosphorus and high in potassium. The soil reaction was slightly alkaline (pH-7.6). The variety used was T-9. Date of sowing in the two years of the study was 24 Sept. 1992 and 20 Sept. 1993, respectively. Observations on yield attributes were recorded at harvest from tagged plants. Seed yield and stalk yield/plot was recorded and then converted in q/ha. The oil content in the seed was determined by NMR method. Crop received 38 mm and 5 mm rainfall during 1992-93 and 1993-94, respectively. 60 kg P₂O₅ ha⁻¹ was applied through SSP. There was no need of potash application as the soil was rich in potash.

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RESULTS AND DISCUSSION

Effect of irrigation: When compared with no irrigation, irrigation at flowering significantly increased the siliquae plant⁻¹, seeds siliquae⁻¹ and 1000 seed weight (Table 1). The effect was more particular on siliquae plant⁻¹. The gain of 27 and 22 per cent over no irrigation was recorded during 1992-93 and 1993-94, respectively. The significant improvement in siliquae plant⁻¹ with additional irrigation at pod formation was recorded only in second year. Similar result were also reported by Uppal *et al.* (1990) and Tomar *et al.* (1991).

There was significant increase in the seed yield by irrigating the crop at flowering stage. The gain was 43 and 31 per cent during 1992-93 and 1993-94, respectively. Similarly there was significant improvement in stalk yield as well as harvest index. Significant increase in seed yield, stalk yield and harvest index due to additional irrigation at pod formation over one irrigation at flowering was observed only in the second year. Increase in harvest index

indicates that under favorable moisture regime there is better realization of sink size and sink strength. The results are in line with the results obtained by Roy and Tripathi (1985) and Padmani *et al.* (1992) (Table 2).

Irrigation at flowering significantly increased the oil content in seed over the control. Two irrigation (at flowering and at pod formation) and one irrigation (at flowering) were at par with respect to oil content. Similar result was obtained by Bhan *et al.* (1980).

Lack of response of additional irrigation at pod formation in first year (1992-93) could be attributed to some good showers received during 52-55 DAS.

Effect of nitrogen: There was no significant increase in seeds siliqua⁻¹ and 1000 seed weight where higher doses of nitrogen were used. The effect was more pronounced on siliquae plant⁻¹. The application of 40 kg N ha⁻¹ and 80 kg N ha⁻¹ increased the number of siliquae plant⁻¹ by 15 and 25 per cent in 1992-93. The corresponding figures for 1993-94

Table 1. Effect of Irrigation, Nitrogen and Stage of Harvesting on siliquae plant⁻¹, seeds siliquae⁻¹ and 1000 seed weight and oil content (%)

Treatment	1992-93				1993-94			
	Siliquae plant ⁻¹	Seeds siliqua ⁻¹	1000 seed weight	Oil content (%)	Siliquae plant ⁻¹	Seeds siliqua ⁻¹	1000 seed weight	Oil content (%)
Irrigation Levels								
No irrigation	132.24	12.34	2.36	41.28	131.51	12.32	2.35	41.32
One at flowering	167.99	13.12	2.52	42.48	160.33	13.14	2.51	42.40
Two at flowering + pod formation	170.43	13.21	2.53	42.81	175.42	13.16	2.52	42.85
SEm (±)	1.505	0.105	0.027	0.22	0.388	0.085	0.021	0.24
CD at 5%	4.743	0.325	0.085	0.68	1.223	0.260	0.066	0.74
N kg/ha								
0	137.32	12.71	2.44	42.04	137.69	12.62	2.43	42.04
40	158.77	12.98	2.46	42.23	156.91	12.92	2.46	42.27
80	174.57	12.99	2.50	42.29	174.67	13.06	2.50	42.27
SEm (±)	1.412	0.255	0.015	0.24	1.117	0.270	0.016	0.23
CD at 5%	4.122	NS	NS	NS	3.259	NS	NS	NS
Stage of harvesting								
Physiological maturity	156.34	12.90	2.39	41.01	156.35	12.85	2.38	40.98
Full maturity	157.44	12.88	2.55	43.37	156.49	12.89	2.55	43.40
SEm (±)	1.229	0.070	0.021	0.18	0.317	0.070	0.018	0.18
CD at 5%	NS	NS	0.066	0.56	NS	NS	0.058	0.57

Table 2. Effect of irrigation, nitrogen and stage of harvesting on seed yield, stalk yield and harvest index (%)

Treatment	Seed yield (q/ha)		Stalk yield (q/ha)		Harvest index (%)	
	1992-93	1993-94	1992-93	1993-94	1992-93	1993-94
Irrigation levels						
No irrigation	8.53	8.57	33.50	33.64	20.29	20.30
One at flowering	12.23	11.19	39.15	37.58	23.68	22.86
Two at flowering + pod formation	12.42	12.38	39.52	39.38	23.86	23.92
SEm (\pm)	0.076	0.021	0.126	0.147	0.065	0.071
CD at 5%	0.236	0.067	0.396	0.462	0.205	0.224
N kg/ha						
0	9.04	8.89	34.87	34.28	20.57	20.57
40	11.52	11.17	35.87	35.70	24.10	23.64
80	12.61	12.09	41.43	40.62	23.09	22.72
SEm (\pm)	0.022	0.026	0.218	0.223	0.092	0.092
CD at 5%	0.065	0.076	0.635	0.651	0.269	0.269
Stage of harvesting						
Physiological maturity	10.77	10.46	37.36	36.81	22.17	21.94
Full maturity	11.35	10.97	37.42	36.92	23.00	22.80
SEm (\pm)	0.060	0.017	0.103	0.120	0.051	0.058
CD at 5%	0.192	0.055	NS	NS	0.162	0.183

were 14 and 26 per cent, respectively. Similar findings of Padmani *et al.* (1992) corroborate the results of this experiment.

Similar trend was observed for seed yield and stalk yield. The application of 40 and 80 kg N ha⁻¹ enhanced the seed yield over the control by 27 and 40 per cent in 1992-93 and 26 and 36 per cent in 1993-94, respectively. The highest harvest index was obtained with 40 kg N ha⁻¹. The application of 80 kg N ha⁻¹ though improved the harvest index over the control but it was less by 1 per cent than 40 kg N/ha. (Table 2). This indicates that the higher doses of nitrogen contributes more to stalk yield than seed yield. Similar results were obtained by Azad and Gupta (1990) and Uppal *et al.* (1990).

Nitrogen levels could not influence the

oil content up to significant level. Such finding are in line with the results of Singh (1989).

Effect of Stage of Harvesting:

Waiting for full maturity had no significant effect on siliquae plant⁻¹, seeds siliquae⁻¹ and stalk yield but there was significant increase in 1000 seed weight, oil content, seed yield and Harvest Index (Table 1 and 2). This indicates that plant retains enough photosynthetic area in the form of green pods and stem even at physiological maturity. The current assimilates accruing this photosynthetic area primarily diverted to seed and thereby increasing the 1000 seed weight, seed yield and harvest Index. This also explain the increase in oil content Similar results were obtained by Bhan *et al.* (1980).

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