Indian J. Agron. **40** (3) : 525–527 (September 1995)

Effect of starch polymer and *N*-triacontanol on Indian mustard (*Brassica juncea*)

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Received: April 1994

Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] is mostly grown on conserved soil moisture received from monsoon rains. Limited water supply restricts the growth and development of crops at various physiological processes (Turner and Kramer, 1980). Starch polymer (*jalshakti*) is capable of absorbing water and releasing it slowly (Bandyopadhyay and Ray, 1988). Similarly, plant-growth regulators minimize the morpho-physiological defects, viz. excessive vegetative growth, unsynchronized flower initiation, flower shedding, immature pods and seed-shattering, and thereby results higher yield of oilseeds (Prasad, 1991). These materials are commercially available.

Therefore present experiment was conducted to study effect of *jalshakti* and *N*-triacontanol on growth and yield characters of Indian mustard.

The field experiment was conducted at Tikamgarh and Sagar during winter season of 1986–87 and 1990–91 on a medium black soil. Seven treatments including seed-coating one, soil application, seed-coating + soil application with starch polymer (*jalshakti*), foliar application of *N*-triacontanol, water spray, control (with no irrigation) and control with 3 irrigations only were tested in randomized block design with 4 replications.

'Varuna' Indian mustard was sown on 20 and 24 October at a row spacing of 30 cm. The crop was fertilized with a basal dose of $N_{40}P_{20}K_{20}$. *Jalshakti* was used @ 20 g/kg of seed through seed-coating as a dry powder, and 10 kg/ha through soil application in furrows. *N*-triacontanol (5 ml in 500 litres water) was sprayed at 40 and 60 days after sowing. Water alone was sprayed @ 500 litres/ha at 40 and 60 days. The crop was provided with adequate protection against insects, pests and diseases.

The plant height, main branches/plant, leaves/plant, siliquae/plant and 1,000-seed weight were significantly higher in seed + soil treatment of *jalshakti*, but remained on on a par with the treatment having 3 irrigations only (Table 1). Foliar application of *N*-triacontanol @ 5 ml/ha; however, proved inferior to both these above treatments, but proved superior to the treatment involving seed-coating or soil application of *jalshakti*.

Seed-coating or soil application of *jalshakti*, however, proved superior to control with respect to plant height, number of leaves and siliquae/plant. Even water spray alone proved significantly superior to

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the control in augmenting all these growth and yield-attributing characters except 1,000-seed weight.

The seed yield differed significantly in different treatments (Table 1). It increased significantly (up to 80%) on application of *jalshakti* @ 10 kg/ha in furrows along with seed-coating treatment (@ 20 g/kg seed) compared with the control. The beneficial effect of *jalshakti* on yield of Indian mustard was also reported by Kumar *et al.* (1991). The increase in yield of Indian mustard was also found significant up to 55.6% due to foliar application of *N*-triacontanol (5 ml/ha) over the control. The stalk yield was also increased significantly up to 51.03 and 24.33% due to seed-coating + soil application of *jalshakti* and *N*-triacontanol respectively over the control. Singh *et al.* (1988) and Prasad (1991) also reported increase in yield of Indian mustard owing to triacontanol and other plant-growth regulators.

The highest net income was obtained when *jalshakti* was applied through seed-coating treatment as well as soil application, owing to highest seed yield and stalk yield under this treatment. The other treatments gave higher monetary gain were 3 irrigations only and *N*-triacontanol.

Thus starch polymer (*jalshakti*) applied through seed-coating treatment + soil application gave the highest yield and net income. The second best treatments was foliar application of *N*-triacontanol. Hence both these materials can be a better substitute of irrigation under rainfed farming conditions.

Table 1 Yield and yield-attributes of Indian mustard as influenced by different treatments (mean data of 2 seasons)

Treatment	Plant height (cm)	Main branches/ plant	Leaves/ plant	Siliquae/ plant	1,000-seed weight (g)	Seed-yield (q/ha)	Stalk yield (q/ha)	Net income (Rs/ha)
Seed treatment with *jalshakti* @ 20 g/kg seed	168.34	7.73	30.91	237.87	3.39	15.40	35.70	10,790
Soil application of *jalshakti* @ 10 kg/ha	164.37	7.84	30.68	249.75	3.35	15.77	33.45	10,975
Seed + soil treatment of *jalshakti*	190.27	11.24	34.67	288.87	3.76	22.31	45.43	16,403
Foliar application of *N*-triacontanol @ 5 ml/ha at 20 and 40 DAS	177.26	10.59	31.03	272.75	3.50	19.28	37.40	14,068
Water spray at 20 and 40 DAS	162.14	8.23	23.92	244.87	3.42	16.56	35.72	11,896
Control with no irrigation	154.58	7.26	20.00	191.25	3.30	12.39	30.08	8,361
Control with 3 irrigations (at branching, flower initiation, grain-filling stage)	188.78	10.45	32.25	287.87	3.63	20.17	44.25	14,524
CD (P = 0.05)	4.96	0.76	2.59	10.10	0.31	2.20	1.38	

DAS, Days after sowing

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Indian J. Agron. **40** (3) : 527–529 (September 1995)

Effect of planting geometry on *toria* (*Brassica campestris* subsp. *oleifera* var. toria)

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Received: April 1994

Inadequate plant population often leads to poor productivity of *toria* [*Brassica campestris* L. ssp. *oleifera* (Metzger) Sinsk. var. toria] at farmers fields, because they usually adopt broadcast method of sowing (Gangwar and Kumar, 1986). Therefore the present investigation was undertaken to study the effect of planting geometry on yield attributes and seed yield of *toria* and work out the optimum plant-population level for higher productivity.

The experiment was conducted during the winter season of 1989–90 and 1990–91 on a silty clay-loam soil (pH 7.2, total N 0.087%, available P_2O_5 56 kg/ha and K_2O 234 kg/ha) at Pantnagar. The experiment was laid out in randomized block design with 3 replications on 5 October 1989 and 8 October 1990 with 'PT 303' variety of *toria*. Treatments comprised 12 planting geometry levels (Table 1). Plant-to-plant spacing was maintained by dibbling the seeds at requisite distance, using wooden dibbler. In no thinning and broadcast-sown treatments, seed rate was kept @ 4 kg/ha. A basal application of 45 kg N/ha and 40 kg P_2O_5/ha was done and remaining 45 kg N/ha was top-dressed after first irrigation. The other cultural practices were followed as per the recommendations.

Significantly higher number of primary and secondary branches were recorded at plant density of 0.16 million/ha but both the planting geometry levels (30 cm x 20 cm and