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Response of toria (*Brassica campestris* subsp. *oleifera* var. *toria*) seed crop to nitrogen and phosphorus

R.K. Kataria, H.L. Sharma* and G.D. Sharma*
Seed Production Unit
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur – 176 062.

Abstract

A field experiment was conducted during *Rabi*, 1999 and 2000 at the research farm of Seed Production Unit, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur to work out nitrogen and phosphorus requirement of toria (*Brassica campestris* subsp. *oleifera* var. *toria*). Crop responded significantly to N up to 80 kg/ha with significant increase in plant height, primary and secondary branches, siliquae/plant, 1000-seed weight, seed yield, seedling length and vigour index. However, increase in siliqua length and seeds/siliqua was significant up to 60 kg N/ha. Germination of seeds was not influenced by increase in nitrogen levels. P application also resulted significant increase in plant height, secondary branches, number of siliqua/plant, 1000-seed weight and seed quality parameters viz. seedling length and vigour index up to 80 kg P_2O_5/ha. Influence of P on primary branches, siliqua length and seed germination was observed only up to 60 kg P_2O_5/ha, while increase in P did not increase seeds/siliqua.

Key words: Nitrogen, phosphorus, seed quality, toria.

Introduction

In Himachal Pradesh amongst different oilseed crops, rapeseed-mustard group of crops rank first in acreage (9.1 thousand hectares) though its productivity is quite low (5.22 q/ha). Toria is grown as a catch crop under intensive crop systems (rice-toria-wheat and maize-toria-wheat) under irrigated conditions in low and mid hills of the State. Under such systems it requires liberal application of nitrogen and phosphorus during the initial stages for the development of early vigour and higher seed yield. New high yielding varieties are replacing the old one very fast and their nutritional requirements are likely to be different. Information on nitrogen and phosphorus requirement of these varieties is very meager. It was pertinent to study nutrient need of the high yielding varieties, the present experiment was, therefore, planned to find out optimum level of nitrogen and phosphorus for seed production of high yielding variety of toria.

Material and Methods

A field experiment was conducted during *Rabi* seasons of 1999 and 2000 at the research farm of Seed Production Unit, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur representing a Typic Hapludalf soil, situated 32.6° N and 76.3° E at an elevation of 1291.0 m above mean sea level. The silty clay loam soil was medium in available nitrogen (296.0 kg/ha) and phosphorus (17.4 kg/ha) and high in available potash (312.0 kg/ha). The pH and organic carbon percentage of surface soil were 5.9 and 0.98 respectively. The experiment with twelve treatment combinations comprising three nitrogen levels (40, 60 and 80 kg N/ha) and four phosphorus levels (20, 40, 60 and 80 kg P_2O_5/ha) was laid out in randomized block design with three replications. Toria variety Bhawani was sown on September, 19 and 15 during 1999 and 2000, respectively immediately after harvest of maize. The crop was sown in lines 30 cm apart and a uniform seed rate of 15 kg/ha was used. One hoeing and thinning was done after 20 days of sowing. Entire dose of nitrogen and phosphorus as per treatments along with potash @ 40 kg K_2O/ha was applied at the time of sowing. One irrigation at flowering was applied during both the years. All other recommended package of practices for toria was followed. Plant height and yield attributes were recorded at maturity. The produce was graded using Agrosaw (junior) seed

*Department of Agronomy, CSK HPKV, Palampur.

grader. Seed yield and other quality parameters were recorded. The seedling length was measured on 7th day after soaking as per standard procedure. Seed vigour index was worked out by multiplying seed germination percentage by the seedling length.

Results and Discussion

Effect of nitrogen

Significant increase in plant height, primary and secondary branches, siliqua/plant, 1000-seed weight, seedling length and vigour index (Table 1) was recorded with each successive increase in nitrogen up to 80 kg/ha. Siliqua length and seeds/siliqua increased significantly only up to 60 kg N/ha. Significantly higher seed yield (1228 kg/ha) was recorded with the application of 80 kg N/ha over 60 kg and 40 kg N/ha. Influence of graded doses of nitrogen was not observed on germination percentage of the seed. These results are in conformity with the findings of Singh and Meena (2004), Dixit *et al.* (1997), Das and Das (1995) and Mahal *et al.* (1995).

Effect of phosphorus

Crop responded to the application of P with consistent and significant increase in seed yield with each successive increase up to 80 kg P_2O_5/ha (Table 1). Significantly higher seed yield (1155 kg/ha) to the tune of 41% over 20 kg P_2O_5/ha was recorded with the application of 80 kg P_2O_5/ha. Similarly plant height, number of secondary branches, number of siliquae/plant, seedling length and vigour index increased significantly up to 80 kg P_2O_5/ha. Increase in these parameters was observed to the tune of 19, 41, 19, 34 and 37 % over 20 kg P_2O_5/ha. Siliqua length and seed germination percentage increased significantly with P application up to 60 kg P_2O_5/ha only. Seeds/siliqua remained uninfluenced by the increase of P levels.

Higher number of primary branches were recorded with P application @ 80 kg P_2O_5/ha, but the difference in between successive doses was not significant Similar effects of P on growth, yield attributes and yield of toria and mustard have also been reported by Arthamwar *et al.* (1995), Narang *et al.* (1993) and Tyagi and Rana (1992).

Table 1. Effect of nitrogen and phosphorus on growth, yield attributes, seed yield and seed quality parameters of *toria* (Pooled data of 2 years)

Treatments	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Siliquae/ plant	Siliqua length (cm)	Seeds/ siliqua	1000-seed weight (g)	Seed yield (kg/ha)	Germination (%)	Seedling length (cm)	Vigour index
N (kg/ha)											
40	77.9	4.5	9.8	167.5	5.3	8.0	2.06	816.8	93.2	9.0	836
60	89.2	6.6	12.3	179.1	7.2	9.6	2.22	955.6	93.5	10.1	947
80	104.3	8.7	15.7	201.0	7.2	9.6	2.40	1227.6	93.4	11.0	1028
CD (P=0.05)	2.8	0.6	0.8	1.4	0.1	0.9	0.01	16.7	NS	0.1	7.3
P_2O_5(kg/ha)											
20	82.7	6.0	10.6	166.8	6.2	8.5	2.10	819.4	92.2	8.5	783
40	87.8	6.4	11.8	180.0	6.5	8.9	2.19	967.0	93.1	9.5	887
60	92.6	6.8	13.1	189.3	6.8	9.2	2.31	1058.3	93.7	10.6	996
80	98.7.	7.2	14.9	198.0	6.9	9.4	2.40	1155.3	93.9	11.4	1076
CD (P=0.05)	3.2	0.7	0.9	1.6	0.1	NS	0.02	19.3	0.2	0.1	8.5

Interaction effects

A significant positive interaction between N and P levels on seed yield was recorded (Table 2). Consistent and significant response to P was recorded up to 80 kg/ha at 40 and 60 kg N/ha, whereas it was significant up to 60 kg P_2O_5/ha at 80 kg N/ha.

Therefore, it can be concluded that nitrogen to toria should be increased from the existing recommendation of 60 to 80 kg/ha and P from 40 to 60 kg P_2O_5/ha for higher yields i.e. a combination of 80 kg N and 60 kg P_2O_5/ha.

Table 2. Interaction effect of nitrogen and phosphorus on seed yield of toria (kg/ha)

Treatments	P_2O_5 (kg/ha)			
	20	40	60	80
N (kg/ha)				
40	566.8	795.3	884.6	1020.6
60	768.4	896.5	1009.1	1148.6
80	1123.0	1209.1	1281.3	1296.9
CD (P=0.05)		33.5		

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