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Integrated Nutrient Management in Toria (*Brassica campestris* Var Toria)

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Abstract

A field experiment was conducted during *rabi* season of 2005-06 and 2006-07 to study the integrated nutrient management in toria var Parbati in sandy loam soil at recommended and 75% recommended fertility level. The yield attributes and seed yield increased with each additional input both at recommended and 75% recommended fertility level. Application of FYM at 5 t/ha along with sulfur at 40 kg/ha + Zn 5 kg/ha + boron 1 kg/ha + Azotobacter seed treatment recorded the highest seed yield (856 kg/ha) as compared to other treatments. Application of FYM at 5 t/ha along with sulfur at 40 kg/ha increased the seed yield of toria significantly (810 kg/ha) as compared to recommended fertility level (617 kg/ha) alone. Thereafter improvement in seed yield due to addition of inputs like Zn, B and *Azotobacter* was found non-significant. Similar trends were also observed at 75% recommended fertility level.

Key words : Integrated nutrient management, *Brassica campestris.*

In Orissa, rapeseed and mustard are promising oilseed crops next to groundnut and sesame and mostly grown in rice fallows both under rainfed and irrigated condition. The area under rapeseed and mustard is only 110.31 thousand hectare with a productivity of 369 kg/ha which is much below the national average of 1, 063 kg/ha. The main reason of low productivity is inadequate use of both inorganic fertilizers and organic manures and the imbalance in soil fertility arising out of it. (Jain and Sharma 2000). Due to the escalating prices and high demand supply gap of chemical fertilizer, there is a strong need to adopt integrated nutrient supply system by judicious combination of organic manure, inorganic fertilizers, secondary and micro-nutrients and biofertilizers for restoration of soil fertility and improvement in rapeseed and mustard productivity. Therefore the present study was undertaken to assess the effect of integrated nutrient management practices on the productivity of toria.

Methods

The trials were conducted during the *rabi* seasons of 2005-06 and 2006-07 at Central Research Station on sandy loam soil with pH 5.6, OC 0.37%, available N 220.0 kg/ha, available phosphorus 21.5 kg/ha, available potassium 201.0 kg/ha and available sulfur of 21.0 kg/ha. Twelve treatments, T_1—Recommended fertility level 40 : 20 : 20 kg NPK/ha, T_2–T_1 + FYM 5 t/ha, T_3–T_2 + 40 kg S/ha, T_4–T_3 + 5 kg Zn/ha, T_5 – T_4 + 1 kg boron/ha, T_6 – T_5 + Azotobacter seed treatment, T_7 – 75% Recommended fertilizer, T_8 – T_7+FYM 5 t/ha, T_9 – T_8 + 40 kg S/ha, T_{10} – T_9 + 5 kg Zn/ha, T_{11} – T_{10} + 1 kg boron/ha, T_{12} – T_{11} + Azotobacter seed treatment were tested in randomized block design with three replications. Toria variety Parbati was sown on 26 November 2005 (2005-06) and 11 November 2006 (2006-07) and harvested respectively on 12 February 2006 and 3 February 2007. A row spacing of 30 cm and plant spacing of 10 cm were maintained in both the seasons. N was applied through urea and DAP, P_2O_5 through DAP, K_2O through MOP, sulfur through elemental S, zinc as zinc sulfate, boron as borax and Azotobacter as seed treatment. Fully decomposed FYM was applied in the field 3 weeks before sowing and properly mixed with the soil. Full dose of P_2O_5 and K_2O and half dose of N were applied as basal at the time of sowing while rest amount of nitrogen was applied at first irrigation as top dressing. Zn, B were applied just before sowing and elemental S was applied 3 weeks before sowing.

Results and Discussion

Plant height increased significantly with the

Table 1. Effect of integrated nutrient management on growth, yield attributes and yield of toria.

Treatment	Plant height (cm) 2005-06	2006-07	Number of branches/plant 2005-06	2006-07	Number of siliquae/plant 2005-06	2006-07
T_1 – Recommended fertility level 40 : 20 : 20 kg NPK/ha	95.83	96.10	6.10	7.20	74.20	94.10
T_2 – T_1 + FYM 5 t/ha	99.72	99.4	7.40	7.50	80.80	98.90
T_3 – T_2 + 40 kg S/ha	101.90	101.40	7.90	8.80	88.30	105.40
T_4 – T_3 + 5 kg Zn/ha	103.60	102.10	7.80	8.70	92.40	106.73
T_5 – T_4 + 1 kg boron/ha	104.53	103.80	8.0	9.00	94.93	108.10
T_6 – T_5 + Azotobacter seed treatment	105.03	105.10	8.20	9.20	100.03	110.43
T_7 – 75% Recommended fertilizer	93.33	95.00	5.70	6.10	70.10	80.23
T_8 – T_7 + FYM 5 t/ha	98.70	99.32	6.90	6.50	75.33	87.70
T_9 – T_8 + 40 kg S/ha	99.53	101.35	7.30	7.37	86.10	9.70
T_{10} – T_9 + 5 kg Zn/ha	100.67	102.60	7.40	7.60	89.20	100.00
T_{11} – T_{10} + 1 kg boron/ha	101.30	102.80	7.47	8.10	90.40	101.03
T_{12} – T_{11} + Azotobacter seed treatment	101.72	103.20	7.70	8.50	94.60	102.13
SE +	1.46	1.47	0.44	0.53	4.42	2.19
CD (0.05)	4.28	4.32	1.28	1.56	12.97	6.41

Table 1. Continued.

Treatment	Number of seeds/siliquae 2005-06	2006-07	Seed yield (kg/ha) 2005-06	2006-07	Mean
T_1 – Recommended fertility level 40 : 20 : 20 kg NPK/ha	11.48	11.53	538	696	617
T_2 – T_1 + FYM 5 t/ha	12.11	12.40	600	766	683
T_3 – T_2 + 40 kg S/ha	13.07	13.87	755	865	810
T_4 – T_3 + 5 kg Zn/ha	13.98	14.13	775	881	828
T_5 – T_4 + 1 kg boron/ha	14.10	14.30	783	889	836
T_6 – T_5 + Azotobacter seed treatment	14.20	14.50	801	910	856
T_7 – 75% Recommended fertilizer	10.20	11.13	463	608	536
T_8 – T_7 + FYM 5 t/ha	11.00	11.10	498	662	580
T_9 – T_8 + 40 kg S/ha	11.25	11.67	573	738	656
T_{10} – T_9 + 5 kg Zn/ha	12.10	12.47	593	757	675
T_{11} – T_{10} + 1 kg boron/ha	12.88	13.37	607	770	689
T_{12} – T_{11} + Azotobacter seed treatment	13.24	13.77	612	777	695
SE +	0.26	0.29	14.24	16.10	
CD (0.05)	0.74	0.84	41.77	47.23	

application of FYM at 5 t/ha + 40 kg S/ha along with recommended dose of fertilizer in the both seasons as compared to the recommended fertilizer dose alone. Thereafter increase in plant height due to each additional input was however found to be non-significant. The tallest plant of 105 cm was observed in the treatment T_6 i.e. FYM at 5 t/ha + S 40 kg/ha + B 1 kg/ha + Zn 5 kg/ ha + Azotobacter seed treatment (Table 1). Similar trend was also observed at 75% recommended fertility level.

Yield attributing characters like number of branches / plant, number of siliquae/plant and number of seeds/siliqua increased significantly with application of FYM 5 t/ha + 40 kg S/ha along with recommended dose fertilizer as compared to recommended fertilizer alone. Each successive addition of inputs thereafter like Zn, B and Azotobacter seed inoculation increased the yield attributing characters but were not significant. The highest no. of branches/plant, number of siliquae/plant and seeds/siliqua were recorded in T_6. Similar trends were also observed at 75% recommended fertility level. The improvement in yield attributing characters under FYM application might be due to better nutrient

availability, production of photosynthates and their translocation from vegetative parts to economic product. These results corroborate with the findings of Jat et al. (2005).

Mean data revealed that application of FYM at 5 t/ha + 40 kg S/ha along with recommended dose of fertilizer recorded significantly higher yield (810 kg/ha) as compared to recommended dose of fertilizer (617 kg/ha). Application of FYM at 5 t/ha and FYM 5 t/ha + 40 kg S/ha recorded 11 and 31% higher yield as compared to the recommended dose. Highest seed yield of 856 kg/ha was recorded in the treatment T_6. Similar trend was also observed at lower level of fertility i.e. 75% of recommended dose. Incorporation of FYM improves the physical, chemical and bio-logical environment of the soil and results in better crop growth (Jain and Sharma 2000). Sulfur helps in better assimilation of photosynthates (Sharma 1994) hence higher yield. Combined applications of organic manures along with inorganic fertilizers also increase the efficiency of fertilizers. The increase in yield due to application of FYM and sulfur might be due to their positive influence on maintaining balanced source-sink relationship by improving the yield attributes which ultimately increased the seed yield of toria.

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