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Integrated nutrient management in rice (*Oryza sativa*)-toria (*Brassica campestris* subsp. *oleifera* var toria)-rice cropping sequence for coastal Orissa

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Nutrient supply is a key factor for crop production and must be managed rationally. The present steep rise in the prices of phosphatic and potassic fertilizer enforced to economize their use. In coastal Orissa, fertilizer recommendation in available for individual crops without considering the crop in sequence or the residual effect of bio-fertilizer or green-manuring. The present study was therefore undertaken in the most promising rice (*Oryza sativa* L.)-based cropping sequence, rice–toria [*Brassica campestris* L. subsp. *oleifera* (Metzger) Sinsk. var toria]–rice to find out the requirement of organic and chemical manures in a year taking into account the residual effects for higher yields.

The field experiment was conducted during rainy seasons 1989–90, 1990–91 and 1991–92, winter and summer seasons at Ranital, in a sandy-loam soil. The soil had with pH 6.4, organic carbon 0.52%, available phosphorus, potassium, and zinc 10.8 and 178 kg/ha and 0.45 ppm respectively. Ten treatments (Table 1) were laid out in randomized block design with 3 replications. Rice varieties 'Parijat' during the rainy season and 'Banaprabha' during the summer season were transplanted as per recommended fertilizer application on 15 July and 31 January each year with 2–3 seedlings/hill at 15 cm × 15 cm spacing and harvested in middle of October, and first week of May respectively. Short-duration toria 'TS 29' was sown at 30 cm spacing on 5 November with all P and K and 50% N at sowing. The remaining N was top-dressed 21 days after sowing at the first irrigation and was harvested on 20 January. Prickly sesban [*Sesbania cannabina* (Retz.) Pers.; syn. *S. aculeata* Pers.] was sown in the third week of May and ploughed under the soil at 45-day stage. Phosphorus recommended for rice was applied to prickly sesban. Blue-green algae @ 10 kg/ha was applied in 5–7 cm standing water 7 days after transplanting. *Azolla* @ 2 tonnes/ha was applied with P requirement of rice crop 1 month before transplanting. Phosphorus through sulphur-free phosphatic fertilizer diammonium phosphate was applied in toria and in rice through Mussoorie rockphosphate and single superphosphate 50% each.

Supplementing 60 kg N/ha through

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Table 1. Yield of rice–toria–rice cropping sequence as influenced by different treatments

Fertilizer (kg NPK/ha)			Yield (q/ha)		
Rainy-season rice	Winter toria	Summer rice	Rainy-season rice	Winter toria	Summer rice
0,30,30	0,30,30	0,40,40	22	1.7	28
Prickly sesban + 20,30,30	60,30,30	80,40,40	39	6.7	42
BGA + 40,30,30	60,30,30	BGA + 60,40,40	38	6.6	43
Prickly sesban + BGA + 30,30	60,30,30	80,40,40	41	7.1	42
60,30,30	60,30,30	80,40,40	36	6.4	40
60,60,60	60,0,30	80,40,40	35	6.3	40
60,30,30	60,30,30	80,40,40	35	7.3	40
60,30,30 + ZnO (4%) seedling dip	60,30,30	80,40,40 + ZnO (4%) seedling dip	36	6.4	42
Azolla + 40,30,30	60,30,30	*Azolla* + 60,40,40	38	6.5	43
Prickly sesban + 0,30,30	60,30,30	80,40,40	32	6.4	42
CD (P = 0.05)			2.0	0.25	01.3

BGA, Blue green aglae

prickly sesban and blue green algae with 30 kg each of P_2O_5 and K_2O/ha outyielded all other treatment combinations during the rainy season. Substituting a part of the chemical N either through prickly sesban or blue green algae or *Azolla* with remaining N and 30 kg each of P_2O_5 and K_2O/ha could not attain the same yield level as that of prickly sesban + blue green algae + 30 kg each of P_2O_5 and K_2O/ha.

Application of 60, 30 and 30 kg, N, P and K/ha + 20 kg S through gypsum in toria recorded higher seed yield than application of NPK alone. But when toria was preceded by rice crop with prickly sesban + blue green algae application during the rainy season, it gave almost equal seed yield with application of 60, 30 and 30 kg N, P and K/ha. This suggests the residual effect of prickly sesban + blue green algae in increasing the solubility and availability of S present in the soil, thereby effecting more S uptake and higher seed yield. Similar results were reported by Mohanty and Mandal (1989).

In summer rice, application of 80, 40 and 40 kg N, P and K/ha + Zn_0 (4%) recorded almost identical yield as that blue green algae or azolla + 60, 40 and 40 kg N, P and K/ha and proved superior to the package dose of 80, 40 and 40 of N, P and K kg/ha. Residual effects of either prickly sesban + blue green algae or azolla applied to rainy-season rice was not marked during summer season.

REFERENCE

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