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GREEN MANURING FOR RICE WITH RHIZOBIUM INOCULATED *Sesbania grandiflora*

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ABSTRACT

The *Rhizobium* isolates were obtained from root nodules of *Sesbania grandiflora* (L.) grown in different soil samples. In Leonard jar experiment, the plants inoculated with the isolate SG-5 gave maximum dry weight (1 g/plant), nodule number (47 per plant) and total nitrogen content (51.80 mg/plant). Similarly pot culture experiment also revealed that plant inoculated with SG-5 isolate gave maximum dry weight (1.51 g/plant) and total nitrogen content (43.34 mg/plant). The response of rice crop to the incorporation of inoculated green manure was encouraging, with respect to nitrogen content, phosphorus content and grain yield.

KEY WORDS : Rice, Green Manuring, *Rhizobium, Sesbania grandiflora*

The nitrogen fertilizers produced by industries consume large amount of energy obtained from the fossil fuels. The price of fuel will keep rising due to its scarce resources. In these circumstance, alternative sources of nitrogen fertilizers especially biologically fixed nitrogen plays an important role. The nitrogen fixed by legume - *Rhizobium* interaction is made available to the cereals and other non-legumes through green matter incorporation. This process is called green manuring.

The biological nitrogen is one of the most effective alternative sources of nitrogen for agricultural crops, both pulses and cereals. *Agati (Sesbania grandiflora)* is an important nitrogen fixing leguminous green manure crop in rice cultivation. However, at present, recommendation of *agati* green manuring does not contain rhizobial inoculation. Therefore, the present study was taken up to develop a rhizobial inoculant for *agati* and to evaluate for its green manuring efficiency in rice production.

MATERIALS AND METHODS

Soil sample were collected from different *agati* growing areas of Karnataka. The rhizobial strains were isolated in pure cultures from the nodules of *agati* grown in different soil samples, and were authenticated (Vincent, 1970). These strains were screened in Leonard jars (Somesgaran and Hoben, 1985) for dry matter and nitrogen fixation by *agati* crop. The best strains were used in pot culture experiment with earthen pots each containing 6 kg of unsterilised soil. The pots were sown with incoulated *agati* seeds and each with six replications. These pots were fertilized at the rate of 60 kg of N, 30 kg of P and 30 kg. of muriate of potash per hectare. Three plants were maintained in each pot. After 45 days of sowing, shoot biomass was recorded. In three replications the plant tops were incorporated into respective pots and later transplanted with 21 days old rice seedlings. The plants from the other three replication were used to record dry weight, nitrogen content and nodule characters. The rice crop was harvested after 105 days and grain and straw yield, grain and straw nitrogen content, grain and straw phosphorus were analysed. Randomised complete block design (RCBD) was used and analysed statistically.

Table 1. Effect of rhizobial inoculation on *Sesbania grandiflora*

Rhizobial isolate	Plant dry weight (g)	Nodules / plant	Total plant nitrogen (mg)
Control	0.25	7.00	5.75
SG-1	0.90	26.00	31.95
SG-2	0.85	18.00	31.31
SG-3	0.70	30.50	34.86
SG-4	0.45	33.50	12.30
SG-5	1.00	47.00	51.80
CD (0.05)	0.38*	1.93*	3.01*

Table 2. Influence of *S. grandiflora* green manuring on rice crop

Treatments	Plant dry weight (g)	Grain dry weight (g)	Total nitrogen per plant		Total phosphorus per plant	
			Grain (mg)	Straw (mg)	Grain (mg)	Straw (mg)
No. Gm. No. Nitrogen	2.36	0.30	2.41	6.24	0.61	1.29
Uninoculated GM+P+K	3.44	1.06	7.21	13.63	0.86	1.62
GM (SG-2) + P + K	5.68	1.17	12.80	10.22	1.16	2.10
GM (SG-3) + P + K	5.23	2.19	30.61	24.79	2.06	5.58
GM (SG-5) + P + K	9.24	2.38	35.25	29.34	2.44	3.31
No GM + Recommended N + P + K	10.36	0.94	32.51	21.72	2.11	3.57
No GM + 50% Recommended N + P + K	8.14	2.03	20.10	13.02	1.47	3.10
CD (0.05)	NS	NS	4.3*	4.01*	1.96*	1.78*

Note : GM - Greem manure P - Phosphorus K - Potassium

RESULTS AND DISCUSSION

Inoculation response to *agati* crop

In Leonard Jar experiment, the inoculation of *agati* plants with respective rhizobial culture showed that SG-5 rhizobial isolate produced higher dry matter (1 g/plant), nodule number (47 per plant) and total nitrogen content (51.80) mg/plant) of plant over the control (Table 1). In general, all the inoculated plants performed better compared to uninoculated control plants. Similar differences in the efficiency of strains with respect to plant dry weight and nitrogen content in other legumes has been reported (Dipankersen and Weavers, 1981; Ahamed *et al.*, 1984).

Transfer of nitrogen and phosphorus to rice crop

Results of the study on transfer of nitrogen and phosphorus from the incorporated *agati* to rice crop was encouraging with respect to grain yield (2.38 g/plant), its nitrogen (35.25 mg/plant) and phosphorus content (2.44 mg/plant) (Table 2).

The increase in nitrogen, phosphorus and yield of rice plant with green manure crop and no fertilizer nitrogen indicates the efficiency of *agati* as a green manure for rice and results were in confirmity with report of Khind *et al.*, (1982), Rinaudo *et al.*, (1983) and Nagarajah, (1988).

The green manure inoculated with respective efficient specific, bacterial symbionts increased the green manure biomass, rice grain yield, nitrogen and phosphorus content of rice crops. These results need to be studied under field conditions. However, the result indicated SG-5 rhizobial isolate as a rhizobial inoculant for *Sesbania grandiflora* green manuring in rice farming.

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