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VARIETAL INTERACTION IN REDGRAM-RHIZOBIUM SYMBIOTIC ACTIVITIES IN THE ACID LATERITIC SOILS OF VAMBAN

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ABSTRACT

Poor nitrogen content due to soil reaction is one of the problems in Vamban soil series. Different rhizobial strains were screened for their performance with different cultivars of redgram. Rhizobial seed bacterization enhances the nodulation, plant biomass and grain yield in different cultivars of redgram under acid lateritic soil of Vamban. Among the cultivars, maximum growth, nodulation and yield attributes were recorded with T 21 followed by CO 5 and A 3-1. Due to inoculation with rhizobia redgram seed yield was increased from 16.66 to 58.33% over uninoculated control.

KEY WORDS: Symbiosis, Acid lateritic Soil, Redgram-Rhizobium.

Response to rhizobial inoculation in legume varies with the host varieties. An ideal combination of macro and micro symbionts is required for effective biological nitrogen fixation and grain production. Seed bacterization with rhizobium on legumes has been studied extensively with a view to improve the growth and yield parameters. It is believed that inoculants performed differently on the host legumes (Balasubramanian et al., 1980; Rangarajan and Muthukrishnan, 1980). With the view to understand the varietal and strain interaction in redgram cultivars, the present study was undertaken in acid lateritic soils of Vamban.

MATERIALS AND METHODS

A field trial was laid out at Vamban soil having acidic pH of 5.6 under irrigated condition to study the varietal and strain interaction in redgram cultivars viz., T 21, CO 5 and A 3-1 with five rhizobial strains viz., IHP-195 (ICRISAT), CC-1 (COIMBATORE), IC-3100 (ICRISAT), VPR-1 (VAMBAN) and A-19 (HISSAR). Each treatment was replicated three times under split plot design. The peat based rhizobial inoculum was

Table 1. Interaction between cultivars of redgram and rhizobial strains on the plant growth and nodulation at different growth stages under field condition

Treatments	Plant Dry Weight (g/pl)		Nodule Number/Plant		Nodule Dry Weight (mg/pl)	
DAS	45	60	45	60	45	60
T 21 IHP 195	9.03	11.96	3.0	3.3	13.3	15.3
CC-1	10.10	12.93	2.6	4.0	11.3	18.3
IC-3100	10.20	12.86	3.3	5.0	14.3	21.0
VPR-1	11.90	13.96	3.6	5.3	15.6	24.6
A-19	9.80	11.33	3.0	4.3	12.3	15.6
Control	5.30	9.60	2.3	2.6	9.6	11.3
CO 5 IHP 195	8.90	11.06	4.0	4.6	17.0	21.0
CC-1	9.91	11.36	3.0	5.0	13.0	21.3
IC-3100	9.51	11.10	4.3	6.3	19.6	27.0
VPR-1	10.42	13.06	3.3	7.0	16.0	32.6
A-19	9.30	10.56	1.3	5.0	5.6	21.3
Control	4.91	6.46	1.6	3.0	6.3	14.0
A 3-1 IHP 195	4.50	6.56	3.6	4.0	16.0	17.6
CC-1	5.20	6.90	4.6	3.6	22.0	19.6
IC-3100	4.80	6.83	2.6	5.3	11.6	23.0
VPR-1	6.10	7.93	4.3	5.6	21.0	26.3
A-19	4.70	6.70	3.3	5.0	13.6	21.6
Control	3.00	4.33	1.6	2.6	7.0	12.6
Main plot SED	0.09	0.05	0.4	0.9	1.99	3.44
CD	0.19	0.12	NS	NS	NS	NS
Sub plot SED	0.14	0.17	0.4	0.7	1.98	2.98
CD	0.29	0.35	0.8	1.5	4.04	6.09
Interaction SED	0.25	0.29	0.7	1.2	3.43	5.16
CD	0.51	0.61	NS	NS	NS	NS

NS - not significant.

Table 2. Interaction between cultivars of redgram and rhizobial strains on the yield attributes at harvest

Treatments		Dry Matter Yield (kg/ha)	Seed Yield (kg/ha)	% Increase over Control
T 21	IHP 195	10689	916	17.43
	CC-1	9663	970	24.35
	IC-3100	9938	980	25.65
	VPR-1	11412	1080	38.46
	A-19	9785	960	23.07
	Control	7558	780	-
CO 5	IHP 195	9995	940	25.33
	CC-1	9801	875	16.60
	IC-3100	9549	920	22.66
	VPR-1	11856	1026	36.80
	A-19	9607	880	17.33
	Control	7913	750	-
A 3-1	IHP 195	5934	510	41.66
	CC-1	5358	480	33.33
	IC-3100	6455	520	41.44
	VPR-1	7199	570	58.33
	A-19	5341	425	18.05
	Control	4853	360	
Main Plot	SED	352	18.6	
	CD	718	38.1	
Sub Plot	SED	503	21.2	
	CD	1028	43.3	
Interaction	SED	872	9.6	
	CD	NS	NS	

NS - not significant

Table 3. Correlation regression between nodule numbers and plant dry weight, nodule dry weight and seed yield in the three cultivars of redgram as influenced by rhizobial inoculation

Red gram varieties	Independent variables	Dependent variable	Coefficient of correlation 'r'	Coefficient of Regression 'b'	Level of significance Y
T-21	Plant dry weight	Nodule number	0.869**	1.908	1.605 + 1.908
	Nodule dry weight	" "	0.932**	4.349	0.151 + 4.349
	Seed yield	" "	0.867**	2.434	0.189 + 2.434
CO-5	Plant dry weight	" "	0.781*	1.020	3.725 + 1.020
	Nodule dry weight	" "	0.942**	3.909	3.354 + 3.090
	Seed yield	" "	0.862**	0.516	6.411 + 0.516
A 3-1	Plant dry weight	" "	0.779*	0.692	1.675 + 0.692
	Nodule dry weight	" "	0.955**	3.949	2.793 + 3.949
	Seed yield	" "	0.735*	0.480	2.669 + 0.480

* Significant at 5 % ** Significant at 1 %

used with a binding material (rice kanji). An approximate population of 10^6 cells/redgram seed was maintained for each treatment. During the plant growth various biometric observations viz., plant dry weight (g/pl), nodule number and nodule dry weight (mg/pl) were recorded at 45 and 60 DAS (days after sowing). At harvest yield attributes viz., dry matter production (DMP), pod yield and seed yield were recorded. Statistical analysis in the split plot design and the correlation and regression were worked out.

RESULTS AND DISCUSSION

Due to inoculation of rhizobial strain on different redgram varieties a significant increase in plant growth and nodulation was observed at 45 and 60 DAS, over uninoculated control (Table 1). However, interaction effect was found to be significant with plant dry weight only. Among the cultivars tested, better nodulation was recorded with CO 5 followed by T 21 and A 3-1. However, more plant dry weight was recorded in T 21 followed by the other two cultivars. Among the rhizobial strains inoculated, maximum nodulation and plant dry weight was recorded with VPR-1 strain followed by CC-1 at two different growth stages of the plant. The nodulation peak was recorded at 60 DAS.

As compared to uninoculated control, inoculation with rhizobial strains on different culti-

vars of redgram have recorded significant results in DMP, pod and seed yields (Table 2). Interaction was found to be non-significant with yield attributes at harvest. Yield increase due to rhizobial inoculation in T 21 ranged from 17.43 to 38.46% while in CO 5 cultivar it was from 16.66 to 36.80 % and in A 3-1 from 18.05 to 58.33% over control.

The present investigation is in agreement with the findings of Raut **et al.** (1980) in which they observed that both single and composite rhizobial cultures significantly increased the nodulation, DMP and grain yield per plant in soybean. Similar to the result of Rasal **et al.** (1986) on french bean, the present investigation revealed that inoculation of various rhizobial strains increased plant growth, nodulation, DMP and grain yield over control. However, these isolates did not perform equally under similar conditions with different cultivars to redgram under acid lateritic soil.

Correlation studies revealed that plant dry weight, nodule dry weight and seed yield had significant correlation with nodule number (Table 3).

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