

A PRELIMINARY STUDY ON NODULATION IN COWPEA IN ACID SOIL

Use of *Rhizobium* culture has now become an established practice in legume cultivation. However, infection and nodule formation by *Rhizobium* sp. is reduced to a great extent in acid soils. In the present study an attempt has been made to isolate and select efficient strains of *Rhizobium* tolerant to low pH and suitable for cowpea cultivated in different acid soils of Kerala.

Twenty nine isolate of *Rhizobium* belonging to cowpea miscellany group were used. Out of these, 5 were exotic strains obtained from Tamil Nadu Agricultural University, Coimbatore (isolate No. CBE) and Indian Agricultural Research, Institute, New Delhi (isolate Nos. 6055, Ma-7, D9 and BGI). All these isolates were screened for their nodulation efficiency in cowpea var. Kanakamani using sterilized soil of pH 5.5 taken in 9" diameter earthen pots. *Rhizobium* culture was applied at the time of sowing by seed inoculation technique. Observations on the average number of nodules formed per plant, nodule dry weight and plant dry weight were recorded on the 40th day of plant growth.

Fifteen isolates of *Rhizobium* were randomly selected for testing their ability to grow in yeast extract mannitol broth at different levels of pH, 2.5, 3.5, 4.5, 5.5, 7.0, 8.5, 9.5, 10.5 and 11.5. The presence or absence of growth at different levels of pH was recorded after incubation for 4 days at 28 ± 1°C in a B.O. D. incubator.

Out of the 29 isolates of *Rhizobium* tested for nodulation in cowpea, isolate No- 11 was found to be the most efficient one in terms of average number of nodules formed, nodule dry weight and gain in dry matter content in the plant (Table 1). Vincent (1970) and John (1974) have shown that an increase in dry matter content of the plant by the application of suitable *Rhizobium* culture is a reliable estimate of symbiotic efficiency. In the case of isolate nos. 13, 14 and 6050 the number of nodules formed was significantly higher than that of isolate no. 11. However, a corresponding significant increase in nodule dry weight and plant dry weight was not observed in these cases (Table 1).

In vitro study on the effect of different pH on the growth of rhizobia showed that the native isolates were more tolerant to lower pH in comparison to exotic isolates of rhizobia (Table 2). Growth in different cultures was uniform at pH 5.5, 7.0 and 8.5 and moderate at pH 9.5. No growth was recorded at the extremes of pH such as 2.5, 10.5 and 11.5. These observations are in accordance with that reported earlier by Pandher and Khalon (1978) regarding growth of rhizobia at different levels of pH. At pH 4.5 all the native isolate no. 1 were able to grow. However, none of the exotic isolates was capable of growing at pH 4.5.

Thus the present study indicates the need for the selection of efficient strains of native rhizobia suitable for growing legumes in acid soils.

Table 1

Effect of application of different isolates of *Rhizobium* on nodulation, nodule and plant dry weight in cowpea var. Kanakamani.*

Isolate number	Nodule number	Nodule dry weight (mg)	Plant dry weight (g)
1	42.0	200.0	3.05
2	36.0	213.0	2.95
3	42.0	222.0	3.37
4	40.0	161.0	2.37
5	45.0	187.0	3.10
6	80.0	250.5	2.95
7	74.0	167.5	2.53
8	35.5	221.0	3.10
9	73.0	156.5	2.68
10	52.5	213.5	3.60
11	121.5	301.3	4.18
12	65.6	134.0	2.41
13	189.5	100.0	2.27
14	162.0	140.5	2.95
15	35.5	129.0	2.20
16	47.0	201.0	2.97
17	93.0	82.5	1.95
18	63.5	220.0	3.05
19	61.0	228.0	3.20
20	43.0	233.0	3.00
21	44.0	151.5	2.64
22	66.5	196.0	2.78
23	46.5	158.0	3.11
24	73.0	120.0	2.62
CBE	31.0	240.6	2.95
6050	165.5	215.0	2.97
Ma-7	39.5	87.5	2.18
19	73.5	139.5	2.05
BGI	45.0	85.0	1.85
C. D. at 5%	12.66	30.63	0.61

* (Mean of two replications)

Table 2
Effect of different levels of pH on the growth of rhizobia.

Isolate number	PH								
	2.5	3.5	4.5	5.5	7.0	8.5	9.5	10.5	11.5
1	—	—	—	+	+	±	±	—	—
2	—	—	+	+	+	+	±	—	—
3	—	—	+	+	+	+	±	—	—
4	—	—	+	+	+	+	±	—	—
10	—	—	+	+	+	+	±	—	—
11	—	—	+	+	+	+	±	—	—
16	—	±	+	+	+	+	±	—	—
17	—	±	+	+	+	+	±	—	—
19	—	±	+	+	+	+	±	—	—
20	—	—	±	+	+	+	±	—	—
21	—	±	+	+	+	+	±	—	—
CBE	—	—	—	+	+	+	±	—	—
6050	—	—	—	+	+	+	±	—	—
Ma-7	—	—	—	+	+	+	±	—	—
D-9	—	—	—	+	+	+	±	—	—

സംഗ്രഹം

റൈസോബിയം കൾച്ചറുകൾക്ക് പയറുചെടികളുടെ വേരുകളിൽ നോഡ്യൂളുകൾ ഉണ്ടാക്കാനുള്ള കഴിവിനെപ്പറ്റി ഒരു താരതമ്യ പഠനം നടത്തുകയുണ്ടായി. ആകെ 29 കൾച്ചറുകൾ ഉപയോഗിക്കുകയും അവയ്ക്ക് കനകമണി എന്ന ഇനം പയറിൽ ഏത്രത്തോളം നോഡ്യൂളുകൾ ഉണ്ടാക്കാൻ സാധിക്കും എന്നു പരിശോധിക്കുകയും ചെയ്തു. ഈ പരീക്ഷണത്തിൽ നിന്നും 11-ാം നമ്പർ കൾച്ചർ ആണ് ചെടിക്ക് ഏറ്റവുമധികം അനുയോജ്യമായതെന്ന് കാണുകയുണ്ടായി. കാർഷികകോളേജു ഫാമിന്റെ പല ഭാഗത്തു നിന്നും വേർതിരിച്ചെടുത്ത കൾച്ചറുകൾക്ക് മറ്റു സ്മലത്തു നിന്നും ലഭിച്ച കൾച്ചറുകളേക്കാൾ അമ്ളതം കൂടിയ മണ്ണിൽ കാര്യക്ഷമമായി പ്രവർത്തിക്കുവാൻ സാധിക്കുമെന്നും കാണുവാൻ സാധിച്ചു.

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