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SHORT COMMUNICATION

Seed inoculation studies in gram (*Cicer arietinum* L.) with different strains of *Rhizobium* sp.

Summary

The pot culture and field experiment with eleven treatments in gram were conducted in order to find out an efficient strain of rhizobia for seed inoculation in future. Results of both the experiments were statistically significant. All isolates of Rhizobium although, were superior over control, did not perform equally in the field. Seed inoculation with different strains of Rhizobium in gram increased the dry weight as well as grain yield significantly.

Introduction

Gram (*Cicer arietinum* L.) is the most important legume, grown on large areas in India for seed purpose. The inoculations of legume seed with an efficient strain of bacteria, have become the most important farm practices in different parts of the world. The average increase in yield of gram due to seed inoculation with an efficient strain of Rhizobium has been reported to the extent of 10–15% by various workers.

Sundara Rao and Sen [3] reported the increase in yield of gram due to seed inoculation with an efficient strain of Rhizobium to the extent of 17–131%. Iswaran [2] observed that inoculation of gram seed with Rhizobium has increased the yield by 28% when lime and phosphatic fertilizers were added. The results of various places varied greatly and hence a study with various isolates of Rhizobium of gram was made in order to find out a more efficient strain. The results of a pot culture and field experiment on some aspects are reported in this paper.

Materials and methods

(a) A pot-culture experiment. The Rhizobium cultures viz. G.N. 31–2, G.N.31–3–1, G.N.31–4–1, G.N.31–3–2 and G.N.31–8 were isolated from gram variety N–31. While G.N.59–4, G.N.59–3, G.N.59–2 and G.N.59–5–2 were isolated from gram variety N–59 and the G.C.3–4 from the variety Chafa.

In order to test their effectiveness in fixing atmospheric free 'N' symbiotically all the cultures were tested in China clay pots filled in with sand previously washed under glasshouse conditions (25–30°C.). Seeds of each variety of gram were inoculated with 10 day old culture grown in yeast mannitol and

three seeds were planted in each pot. The experiment was statistically laid out, with three replications using randomized block design. Uninoculated plants served as a check(control). Plants were supplied with distilled water every day, besides they were saturated twice a week with Brayan's modified Crone's nitrogen-free solution (Erdman [1]).

Plants were carefully uprooted 45 days after planting (at flowering stage), dried in air and weighed to record dry weight. The results of this experiment are presented in Table 1.

(b) A field experiment. The experiment on similar line was also conducted in the field during 1971–72 in order to study the performance of different Rhizobium cultures in respect of yield. Seeds of gram variety N–59 were inoculated with each isolate of Rhizobium separately and were planted in different plots of 7.5 × 3.6 m. each already randomized. Other experimental details were the same that were used for the pot experiment. The crop was completely rainfed and no fertilizers were applied. Results of this experiment are presented in Table 2.

Results

Results given in Table 1 were statistically significant. Dry weights of plants inoculated with all isolates were significantly higher than the check plants. This suggests that inoculated plants were additionally benefitted due to Rhizobium. Control plants did not nodulate and hence their dry weight was less.

Results given in Table 2 were also statistically significant. The isolates viz. G.N.31–2, G.N.59–2 and G.N.59–5–2 gave significantly higher yield than the

TABLE 1

Dry weights of plants in g. grown in sand

Sr. No.	Treatments	Replications			Mean
		I	II	III	
1.	G.N.31–2	1.300*	1.050	1.270	1.206
2.	G.N.59–4	1.160	1.320	1.250	1.243
3.	G.N.31–3–1	1.340	1.200	1.100	1.213
4.	G.N.31–4–1	1.070	1.200	1.170	1.143
5.	G.N.59–3	1.250	1.360	0.920	1.176
6.	G.N.59–2	1.150	1.050	1.100	1.100
7.	G.N.31–3–2	1.295	1.115	0.770	1.060
8.	G.N.59–5–2	0.870	1.070	1.250	1.063
9.	G.C.3–4	1.220	1.040	0.950	1.070
10.	G.N.31–8	1.100	0.735	0.890	0.908
11.	Control	0.900	0.450	0.520	0.623

* Weight of three plants

S.E.:– at 5% – 0.094

C.D.:– at 5% – 0.277

TABLE 2

Yield of gram in kg/ha

Sr. No.	Treatments	Replications			Mean
		I	II	III	
1.	G.N.31-2	353	301	473	376
2.	G.N.59-4	341	466	276	361
3.	G.N.31-3-1	377	222	317	305
4.	G.N.31-4-1	409	294	265	323
5.	G.N.59-3	371	258	430	353
6.	G.N.59-2	360	375	435	390
7.	G.N.31-3-2	287	169	452	305
8.	G.N.59-5-2	348	402	407	386
9.	G.C.3-4	316	294	438	349
10.	G.N.31-8	276	172	452	300
11.	Control	181	288	255	241

S.E.:- at 5% - 42.00/ha
C.D.:- at 5% — 124.14/ha

control. Rest of the isolates, though were, superior over the control, did not give significantly higher yield.

It will be seen from the results of both the experiments that all Rhizobium isolates did not perform equally. Thus it was revealed that there may be a strain variation in Rhizobium. It is therefore, suggested that in order to find out an efficient strain of Rhizobium, a systematic pot culture and field experiments are essential in each legume crop. Sundara Rao and Sen [3] reported an increase in yield of gram due to seed inoculation with different Rhizobium strains varied from 17-131%, while in our experiment with gram an increase in yield was obtained to the extent of 24–62%. It is, therefore, concluded that seed inoculation with different strains of Rhizobium in gram, increased the dry weight of plant as well as grain yield, significantly.

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