

## INFLUENCE OF NITROGEN IN CONJUNCTION WITH RHIZOBIUM ON GROWTH AND YIELD OF GRAM (*Cicer arietinum* L.)

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Gram (*Cicer arietinum* L.) commonly known as "Bengal gram" or Chickpea is one of the most important pulse crops of the country. Among the various factors contributing to the growth and yield of gram, nitrogen is considered important. Again, as a leguminous crop, the process of symbiotic nitrogen fixation does not occur efficiently if large nitrogenous fertilizers are applied. Therefore, an attempt was made to evaluate the effect of nitrogen in conjunction with Rhizobium inoculation on the growth and yield of gram under acid soil of Manipur.

The field experiment was conducted at experimental farm of College of Agriculture, Central Agricultural University, Imphal during 1997-98. The soil was clay with pH (5.5), organic carbon (2.25%), available nitrogen (533.12 kg/ha), available  $P_2O_5$  (43.20 kg/ha) and available  $K_2O$  (336.00 kg/ha). Gram variety C-235 was tested in combination with nitrogen doses @ 0, 10, 15, 20, 30, 35 kg N/ha and nitrogen plus Rhizobium (10 kg N/ha + Rhizobium, 15 kg N/ha + Rhizobium, 20 kg N/ha + Rhizobium, 25 kg N/ha + Rhizobium, 30 kg N/ha + Rhizobium) arranged in randomized block design with three replications. Full doses of nitrogen, phosphorus (40 kg  $P_2O_5$ /ha) and potassium (30 kg  $K_2O$ /ha) were applied at the time of sowing. Gram was sown on 14th November, 1997 in the furrow 30 x 10cm apart and seeds were covered with soil. At harvesting growth and yield data were recorded and analysed according to analysis of variance techniques.

The results indicated (Table 1) that the plant height was affected significantly at different doses of nitrogen and Rhizobium inoculation. The plant height was gradually increased by increasing levels of nitrogen upto 25 Kg N/ha. The highest plant (39.37 cm) was recorded with the application of 20 kg N/ha plus Rhizobium inoculation which was significantly higher than the other treatments. All the treatment combinations were significantly superior the number of branches/plant, number of field pods/plant and 100 seed weight to the control with respect to the highest seed weight was recorded with an application of 25 Kg N/ha (14.9 g) which was at par with 30 kg N/ha (14.0 g), 15 kg N/ha plus Rhizobium inoculation (14.5 g) and 20 kg N/ha plus Rhizobium inoculation (14.6 g). Similar results were obtained by Singh and Khangarot (1987) and Roy et al (1995).

Seed yield of gram was gradually increased upto 25 kg N/ha and nitrogen in combination with Rhizobium inoculation, seed yield increased upto 20 kg N/ha plus Rhizobium inoculation (Table 2). The highest seed yield (12.0 q/ha) was recorded with treatment of 20 kg N/ha plus Rhizobium inoculation with was significantly superior to remaining treatments. This is in conformity with the findings of Vadavia et al. (1991) and Patel & Patel (1991).

The application of 20 kg N/ha plus Rhizobium inoculation produced maximum straw yield. The increase in straw yield may be attributed to the increased level of plant attributes viz. plant height, number of branches and total dry matter production of the crop. This is supported by the findings of Singh, et. Al. (1998) and Rathore and Patel (1991).

The treatment which recorded maximum grain and straw yields also produced the highest biological yield i.e. an application of 20 kg N/ha plus Rhizobium inoculation which was highly significant over the other treatments except 30 kg N/ha and 15 kg N/ha plus Rhizobium inoculation. The different treatments of

nitrogen and Rhizobium inoculation significantly affected the harvest index of gram. Significant increase in harvest index due to significant increase in grain yield, total dry matter yield, number of pods/plant and 100 seed weight with applied nitrogen was also reported by Singh and Khangarot (1997). There was insignificant different on seed to husk ratio due to the different treatment combinations.

#### REFERENCES

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Table 1. Effect of nitrogen in conjunction with Rhizobium inoculation on growth and yield attributes of gram

Treatment	Plant height (cm)	No. of nodules/ plant (120days)	No. of branches/ plant	No. of field pods/ plant	No. of seeds/ pod	100 seed weight (g)
Control	30.45	23.33	2.93	6.60	1.06	12.10
15 kg N/ha	32.82	3.45	3.03	11.20	1.08	13.40
20 kg N/ha	33.12	37.33	3.37	11.60	1.09	13.90
25 kg N/ha	36.37	36.33	3.33	16.30	1.28	14.90
30 kg N/ha	34.20	34.0	3.30	12.80	1.26	14.00
35 kg N/ha	33.33	24.78	3.23	12.60	1.23	13.30
Rhizobium (Rh)	36.57	29.44	3.20	14.90	1.23	12.50
10kg N/ha + Rh	37.67	33.00	3.37	16.70	1.21	13.20
15 kg N/ha + Rh	33.08	53.89	3.80	18.70	1.21	14.50
20 kg N/ha + Rh	39.37	42.00	4.00	24.50	1.60	14.60
25 kg N/ha + Rh	36.25	30.33	3.67	16.20	1.37	13.10
30 kg N/ha + Rh	35.68	25.67	3.43	13.40	1.17	12.90
S.Ed ±	1.08	2.18	0.26	0.72	0.27	0.55
CD 0.05	2.24	4.53	0.54	1.50	NS	1.15

NS = Non significant.

Table 2. Effect of nitrogen in conjunction with Rhizobium inoculation on yield, harvest index and seed to husk ratio of gram

Treatment	Seed yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)	Harvest index (%)	Seed:husk ratio
Control	6.55	17.78	24.33	27.33	3.6;1
15 kg N/ha	7.10	20.41	27.51	26.04	3.7;1
20 kg N/ha	8.95	23.92	32.87	27.27	4.2;1
25 kg N/ha	10.15	24.30	34.45	29.69	4.5;1
30 kg N/ha	9.70	26.36	36.06	26.90	4.1;1
35 kg N/ha	8.55	23.04	31.60	27.09	4.0;1
Rhizobium (Rh)	7.85	21.85	29.70	26.40	3.7;
10kg N/ha + Rh	8.35	23.92	32.27	25.93	14.0;1
15 kg N/ha + Rh	9.80	25.85	35.65	27.58	4.1;1
20 kg N/ha + Rh	12.00	26.42	38.42	31.27	4.6;1
25 kg N/ha + Rh	8.10	24.56	32.66	24.87	3.9;1
30 kg N/ha + Rh	8.00	23.77	31.77	25.18	3.7;1
S.Ed ±	0.66	2.16	1.88	1.05	0.54
CD 0.05	1.37	4.47	3.89	2.18	NS

NS=Non significant