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***Short Communication***

# YIELD AND QUALITY OF CHICKPEA AS AFFECTED BY RHIZOBIUM INOCULATION

**SHIVENDRA KUMAR VISHWAKARMA, PRATIBHA SINGH, R.P. SINGH AND R.N. KEWAT**
Department of Biochemistry, N.D. University of Agriculture and Technology, Faizabad, U.P. 224 229
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In India, chickpea is the premier pulse crop occupying 7.10 million hectares area and contributing 5.75 million tonnes to the national pulse basket. Pulse or legume grains, being an important source of vegetable proteins, are easily digestable under normal condition, possess good cooking quality and also helps in decreasing the blood cholesterol level as compared to animal proteins, the consumption of which causes atherosclerosis (Khanna and Gupta, 1988). Pulses containing high protein content (20-30%) are enormously utilized in covering widespread protein-calorie-malnutrition problem of the underdeveloped and developing countries including India also. Rhizobium is a soil bacteria, which has a close association with the roots of higher plants. Rhizobium culture is low cost technology for increasing the yield. In India, the cost of fertilizers is very high and they are not easily available at the time of sowing and other cultural practices of the crop. Due to the importance of rhizobium bacterium in nitrogen fixation process, the present investigation has been conduced to observe the influence of this bacteria on quality parameters of chickpea.

The field experiment was conducted at Students Instructional Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad during the *Rabi* season, 2007-08. Eight treatment combinations (Table 1) were replicated four times in randomized block design. Four prominent tested varieties were sown on 29 October, 2007. The row to row and plant to plant spacing were kept 30 cm and 10 cm respectively. The seeds were sown at the rate of 70 kg $ha^{-1}$. Fertilizers NPK were applied @ 20:50:25 kg $ha^{-1}$. *Rhizobium* was applied @ 200 g/10 kg seeds. After harvesting, the produce of each plot was collected and weighed separately. For the determination of dal-husk ratio, the hundred seeds were collected randomly from each plot and their weight was recorded on balance. The husk of each seed was removed manually and weighed on same balance. Lastly the weight of dal and husk were noted and calculated their ratio. Protein content in chickpea was estimated by Lowery *et al.* (1951) using folinciocalteau's reagent. Methionine content was analysed by the method as described by the Horn *et al.* (1946). Tryptophan content was estimated by the method given by Spice and Chamber (1949). The seed yield ranged from 18.29 to 22.26 q/ha. Maximum seed yield (22.60 q $ha^{-1}$) was recorded in Udai variety and the lowest seed yield (18.29 q/ha) in Avarodhi variety after the Rhizobium inoculation. Rhizobium increased the capacity of nitrogen fixation by the crop. The result shows a very close relationship between nitrogen metabolism and increasing nitrogen levels. A relationship between enzyme and nitrogen, there is a general agreement that increase in nitrate level enhanced the nitrate reductase activity. This is the reason to increase the rate of photosynthesis by increasing the enzyme activity of carbonic anhydrase which is an important enzyme governing the role of photosynthesis in plants.

The test weight as influenced by Rhizobium inoculation was in the range of 140.92 to 333.90 g. The highest test weight

Table 1: Seed yield, test weight and dal husk ratio of chickpea seeds is affected by *Rhizobium* inoculation

| Varieties | Seed yield (q/ha) | | Test weight (g) | | Dal husk ratio | |
|---|---|---|---|---|---|---|
| | Control | *Rhizobium* | Control | *Rhizobium* | Control | *Rhizobium* |
| Radhey | 16.43 | 21.41 | 300.10 | 312.80 | 76.30 | 101.80 |
| Avarodhi | 14.60 | 18.29 | 130.81 | 140.92 | 87.80 | 90.80 |
| Udai | 17.34 | 22.26 | 216.92 | 226.40 | 104.90 | 117.80 |
| K-850 | 17.75 | 21.55 | 317.30 | 333.90 | 150.40 | 171.40 |
| CD at 5% | V = 0.494, R = 0.403, V x R = 0.698 | | V = 0.569, R = 0.465, V x R = 0.805 | | V = 0.013, R = 0.011, V x R = 0.019 | |

(333.90 g) was recorded in K-850 variety and lowest (140.92 g) in Avarodhi variety. The magnitude of increase was being proportional to level of Rhizobium treatment. Rhizobium treatment increased the quality of carbohydrate that is assimilated by different plant parts and translocating to the developing grains in plants (Mishra and Dixit, 1988). It may be a possible reason for higher value of test weight of chickpea. The results are well supported with the finding of Singh (1985) in chickpea. Rhizobium treatment enhanced the dal-husk ratio. Maximum dal-husk ratio (171:40) was recorded in K-850 variety and minimum (90:80) in Avarodhi variety. Protein content in inoculated seed ranged between 23.31 and 24.50 per cent. Highest protein content (24.50%) was noticed in K-850 variety followed by the Avarodhi (24.48%) and Udai (23.89%) Rhizobium inoculation favours the nitrogen pool of the soil which are converted into organic nitrogenous compounds viz., amino acids, protein and nucleic acids.

Table 2: Protein, methionine and tryptophan content of chickpea seeds after the *Rhizobium* inoculation

| Varieties | Protein (%) | | Methionine (g/100g protein) | | Tryptophan (g/100g protein) | |
|---|---|---|---|---|---|---|
| | Control | *Rhizobium* | Control | *Rhizobium* | Control | *Rhizobium* |
| Radhey | 21.51 | 23.31 | 0.077 | 0.073 | 0.16 | 0.15 |
| Avarodhi | 22.06 | 24.48 | 0.086 | 0.082 | 0.15 | 0.15 |
| Udai | 21.12 | 23.89 | 0.084 | 0.071 | 0.15 | 0.15 |
| K-850 | 22.86 | 24.50 | 0.082 | 0.079 | 0.16 | 0.16 |
| CD at 5% | V = 0.38, R = 0.31, V x R = 0.53 | | V = NS, R = NS, V x R = NS | | V = NS, R = NS, V x R = NS | |

Rhizobium treatment influenced the methionine content and highest amount of methionine (0.082 g/100 g protein) was present in Avarodhi variety and lowest (0.071 g/100 g protein) in Udai variety. Highest amount of (0.16 g/100 g protein) was recorded in Avarodhi variety whereas, lowest tryptophan content (0.15 g/100 g protein) in variety Radhey. After Rhizobium inoculation, amino acid variation is reported due to higher peroxidase enzyme activity, which favours low methionine and tryptophan by synthesis (Kushwaha and Srivastava, 1978). The percentage of protein increased while methionine and tryptophan content tended to decrease. There was a negative correlation between methionine and protein content. The results showed that seed yield, test weight and dal husk ratio of chickpea seeds were significantly increased with *Rhizobium* treatments. Highest seed yield was noticed in Udai variety (22.26 q/ha) and lowest in Awarodhi (18.29 q/ha) variety with *Rhizobium* inoculation. Highest test weight (333.90 g) and dal : husk ratio (171:40) was recorded in K-850 variety. Significant improvement in protein content in chickpea seed was recorded but the essential amino acids tryptophan and methionine were slightly decreased. Protein (24.48%) and methionine (0.082 g/100g protein) contents were noticed maximum in Avarodhi variety while, tryptophan content (0.16 g/100g protein) was found highest in K-850 variety. Hence it may be concluded that *Rhizobium* inoculation improved the quality and quantity of chickpea.

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