Chapter XI

SUMMARY

The cultivation of pulse crops enriches the soil fertility through symbiotic nitrogen fixation, and supplements chemical fertilizers for plant growth. Nitrogen fixation of the legumes depend upon root nodules being formed by effective strains of Rhizobia, on the host plant under favourable environmental conditions. The present investigation entitled "The role of root nodule bacteria in bio-nitrogen fixation and yield of certain pulse crops" has revealed the following aspects.

1. The legume crops like Pisum sativum, Lens esculenta, Cicer arietinum, Glycine max, Phaseolus radiatus and Vigna sinensis possess root nodules, where atmospheric nitrogen is fixed through the symbiotic bacteria for the increase of yield and can supplement chemical nitrogen fertilizer.

2. Isolation of strains of Rhizobium for six different legume crops were made from the fields located in various places of Assam and from these, six different rhizobial strains were identified, namely A, B, C, D, E and F.

3. Culturing of these six strains of Rhizobium in artificial media showed variation in their growth characteristics. The growth was faster in strains A, B, D; medium in C and
E, F were found to be slow growers. Powdered wood charcoal was used as carrier for seed inoculation of the six leguminous crops and for performing efficiency test for the confirmation of these identified strains of *Rhizobia*.

4. The application of *Rhizobium* strains as seed inoculation to the six different legume crops revealed that the optimum growth, nodulation, dry matter content, pod number and nitrogen content were obtained through the efficient strains— BN2b in *L. esculenta*; CG3e in *C. arietinum*; AG1d in *P. sativum*; EN5b in *G. max*; DNG4d in *P. radiatus* and FT6a in *V. sinensis*, besides increasing grain yield as compared to the uninoculated control.

5. A significant correlation was found between the phosphorous application along with the *Rhizobia* for overall performance of the six different legume crops.

6. Treatment of nutrients such as—nitrogen, potassium, calcium, molybdenum etc. together with effective strains of *Rhizobia* also cause greater growth, nodulation and nitrogen fixation in various leguminous crops like *C. arietinum*, *L. esculenta* and *P. radiatus*. However, some variation were observed in respect to effectiveness of the different nutrients and legume plants on the extent of growth, number of leaflets, fresh weight of shoot and root, number of nodules and nitrogen content etc. at 45 days of growth.
7. Vitro studies revealed the effect of soil factors such as—temperature, moisture and pH, on the growth of L. esculenta, C. arietinum and P. radiatus as well as the Rhizobia. The growth, nodulation, fresh weight of the plant and nitrogen content was optimum at soil temperature of 30°C, soil moisture content of 70 percent and the soil pH in the range of 6.9 to 7.5.

8. The growth and development of L. esculenta, C. arietinum and P. radiatus plants depend upon the availability of suitable soil types in combination with the application of appropriate Rhizobium strains. Among various soil types, such as clay, alluvial, loamy, laterite and humus; humus soil caused optimum growth, nodulation, number of leaflets, fresh weight of the plant and the nitrogen content at 45 days of growth of the legume host, treated with appropriate Rhizobia.

9. Considerable variation in the number and species diversity of soil micro-organisms occurred in different season and in different soil types. Population of fungus, bacteria and actinomycetes were greater during the month of December and January and declined on either sides. The highest fungal count was made in the rhizosphere of Cicer arietinum grown in humus and loamy soils, whereas in laterite soil, the fungal population was lowest with the Aspergillus, Penicillium, Trichoderma and
Fusarium forming the dominant forms. It was revealed that, Aspergillus, Trichoderma and Fusarium inhibited the growth of Rhizobium on plate culture, whereas Penicillium was found to have growth stimulatory effect on Rhizobium.