Introduction
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Awareness about the impact of application of chemical fertilizers on the environment, especially on the quality of soil and water, and the fast depletion of the non-renewable energy sources in the manufacturing of such fertilizers led to the search for an alternative source for the chemical fertilizers. Research during the fast few decades led to the identification of certain biological organisms and their products that could potentially be used as fertilizer sources. This strategy of fertilizing the soil with biological sources has been widely accepted and recognized as a viable alternative to the application of chemical fertilizers. Among the different groups of plants, certain groups of bacteria, cyanobacteria and fungi are used as effective fertilizer sources for enriching soil with carbon, nitrogen, phosphorus and other minerals. Nitrogen is one of the basic requirements for the growth, productivity and yield of plants. In Angiosperms, Leguminosae include most of the important pulse yielding plants.

Leguminosae is one of the largest families of angiosperms, which include three sub-families, now raised to the rank of families namely Fabaceae, Caesalpinaceae and Mimosaceae. They include about 600 genera and 18,000 species (Hutchinson, 1964; Heywood, 1971; Allen and Allen, 1981). Most of the leguminous plants obtain their nitrogen through symbiotic nitrogen fixation by the bacterium *Rhizobium* found in the root nodules. Because of these characteristics, many leguminous plants have been used as nitrogen source in the traditional agricultural practices such as, crop rotation and green manuring.

It must be remembered that nitrogen is one of the critical factors in determining the growth, productivity and yield of the crop plants which is evident from the fact that one kg of nitrogen is required to produce about 15 kg of pulses. Biological nitrogen fixation through symbiotic process is an important source of nitrogen, especially in the leguminous plants, as it contributes more than 70 per cent of the input of world’s soil and water nitrogen. It has been estimated
that about 100 to 175 million tons of nitrogen is fixed annually by the process of biological nitrogen fixation. About 80 per cent of this are fixed by the bacterium in nodulating leguminous plants.

So, symbiotic nitrogen fixation in the legume-Rhizobium symbiosis is of considerable agricultural importance, as it leads to a significant increase in the combined nitrogen content of the soil. The interaction of the soil bacterium, especially Rhizobium with the roots of leguminous plants, leads to the formation of root nodules. It has been found that not all the nodules contain the bacteria that could effectively fix atmospheric nitrogen. On the basis of the presence of effective nitrogen fixing bacteria in the nodules, they are classified into (i) effective and (ii) ineffective nodules. So, it becomes essential to screen the nodules produced in different leguminous plants and the nitrogen fixing bacterium present in the nodules for the effective nitrogen fixation. This can be achieved by studying the interaction between the Rhizobium and various leguminous host plants. The manifestation of such interaction leads to the production of different types of nodules under different environments. Since, the nodule is the site of nitrogen fixation, it is essential to understand its origin, development, structure, morphology, function and the associated microbial endosymbiont.

Determination of the host range of symbiotically nitrogen fixing bacterium is very essential in order to evolve strategies for the successful exploitation of the organism as biofertilizer for as many crop plants as possible. Most of such studies, during last few decades, were centred around the leguminous crop plants. But the leguminous non-crop plants, which could potentially be the carriers of the effective nitrogen fixing organism, and with potential to be used as green manure crop have often been ignored.

It is well known that some of the leguminous plants produce nodules, not only on the roots but also on the stem. The production of stem nodules has been reported in Aeschynomene, Discolobium, Neptunia and Sesbania...
(Napoli *et al*., 1975; Dreyfus *et al*., 1986; Loureiro *et al*., 1994 and Nodye *et al*., 1994). *Neptunia*, one of the aquatic weeds, produces both stem and root nodules. The potentiality of the use of this plant in agroecosystem, especially in rice fields, has often been emphasised. Nevertheless, this plant has so far been ignored or received little attention.

Keeping these points in view, the present investigation is aimed at understanding the following aspects of *N. natans* - *Rhizobium* symbiosis in greater detail:

- growth of *N. natans* in the natural aquatic habitat with emphasis on its habit
- distribution and types of nodules
- structural and developmental morphology of nodules
- identification of the nodulating endosymbiont, and
- the effect of endosymbiont of *N. natans* as biofertilizer in crop productivity.