CONCLUDING REMARKS

Under N-deficient condition used in this experiment, it is concluded that, inoculation of rice seedlings with *Klebsiella* R15 has specific effect on root lectin content as evident by a 2-3 fold increase in all 3 rice cultivars. This increasing amount of root lectin is specific and not observed in total root proteins. The biosynthesis of root lectin induced by bacterial inoculation were demonstrate by Western blot analysis showing the significant increase in the 23-kDa, lectin precursor polypeptide, and the 18-kDa lectin mature subunit. Distribution of lectin in the root tissues shown by immunogold-protein A technique, has confirmed the translation site of root lectin on the rough endoplasmic reticulum and packaging into vacuolar lectins for transport to the surface of epidermal cells.

Localization of lectins on both the bacteria attached to epidermal cells of root and invaded bacteria seem to correspond the increasing amount of root lectin in the inoculated rice seedlings. Moreover, distribution of lectin on the bacterial glycocalyx, attached to the epidermal cells, has confirmed the role of root lectin as associative factor. But in the case of invasion of this nitrogen fixing bacteria, an interest is focused on the lectin stained over the bacteria cells. Although the invasion of nitrogen fixing bacteria into plants'root have been reported in other associative symbiotic systems, i.e *Rhizobium* and cereal plants (Davey and Cocking, 1972; Cocking et al., 1990). Rice - *A. faecalis* A15 (You and Qiu, 1982; You et al, 1984). Wheat - *A. brasilense* and Kallar grass - *Azoarcus* strain BH72 (Hurek et al, 1990), little is known about the mechanism of invasion as

well as the advantages of invasion of these bacteria into plants' root. However results of this present study revealed that lectins are involved in the invasion of *Klebsiella* R15 into epidermal cells of root. But at this point of view, questions remained unclear whether lectins are directly involved as carrier in the translocation of *Klebsiella* R15 or they just bind to the bacteria as the receptor of signal molecule that enhance bacterial penetration into the intercellular spaces. Or in another aspect, according to the molecular property of lectin that they can agglutinate cells, aggregation of lectins around the bacterial cells may result in blocking invaded bacteria from further movement into the inner part of rice root. All these suggestions required further investigation.

Since lectins distribution are not confined only in the small Golgi related vacuolar form, but cluster of lectins have been dominantly localized in the cell wall of xylem and phloem of leaf and root tissues as well as in the middle lamella among these cells, and being transported across the cell membrane and cell wall. This pattern of distribution may indicate another role of lectins, that is lectins may be involved in the translocation of nutrients or metabolites, since it has been known that the function of xylem is to transport water and solutes from root to leaf.

Under limited time and nitrogen-deficient environment, associative N_2-fixing bacteria which are majorly colonized outside the root, should retain fixed-N_2 by assimilation via GS-GOGAT pathway within the bacterial cells, so that the total nitrogen content of the rice seedlings did not increase to the significantly detectable level. However an increase in root total proteins have been observed in the later part of the experiment especially in c.v. NMS4.

Finally, studies of the metabolic aspects of rice-*Klebsiella* association have been very limited, particularly an integrative view of the carbon and nitrogen flows in this symbiotic system are needed for further progress.