

## INTRA-CORTICAL OCCURRENCE OF *BEIJERINCKIA INDICA* IN SOME RICE (*ORYZA SATIVA* L.) VARIETIES

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MANY reports have shown dinitrogen-fixing capacity associated with the rhizosphere of non-leguminous plants such as tropical grasses, rice, cereals, etc. Habte and Alexander<sup>1</sup> have shown that the rates of dinitrogen fixation varied significantly in 16 rice varieties, which could be due to the effect of host plant genotype influencing this association. Similarly, Hirota *et al*<sup>2</sup> found significant variations in the nitrogenase activity of different rice varieties. It has also been shown<sup>3</sup> that the root cortex of rice could be invaded by *B. indica*, a dinitrogen-fixing bacterium frequently occurring in the rhizosphere of rice. Therefore, to determine whether this invasion process in the rice root cortex by *B. indica* is also influenced by plant variety, the following experiment was conducted.

Seeds of 12 commonly grown varieties of rice (IR8, Jaya, K-7-3-A, K-14-7, K-35-3, K-184, Pankaj, Ratna, R-P-14-4, T-N-1, K-7-3-11-2, Ratnagiri-24) were surface-sterilized with 0.2% mercuric chloride solution and then thoroughly washed several times with sterile water. Twenty five seeds of each variety were sown in earthen pots in duplicate containing steamed soil. The seeds were inoculated with liquid culture growth of *B. indica* isolated from the rice rhizosphere soil. Uninoculated controls were maintained. Knop's solution, without nitrogen, was applied every 4 days and the pots were irrigated daily.

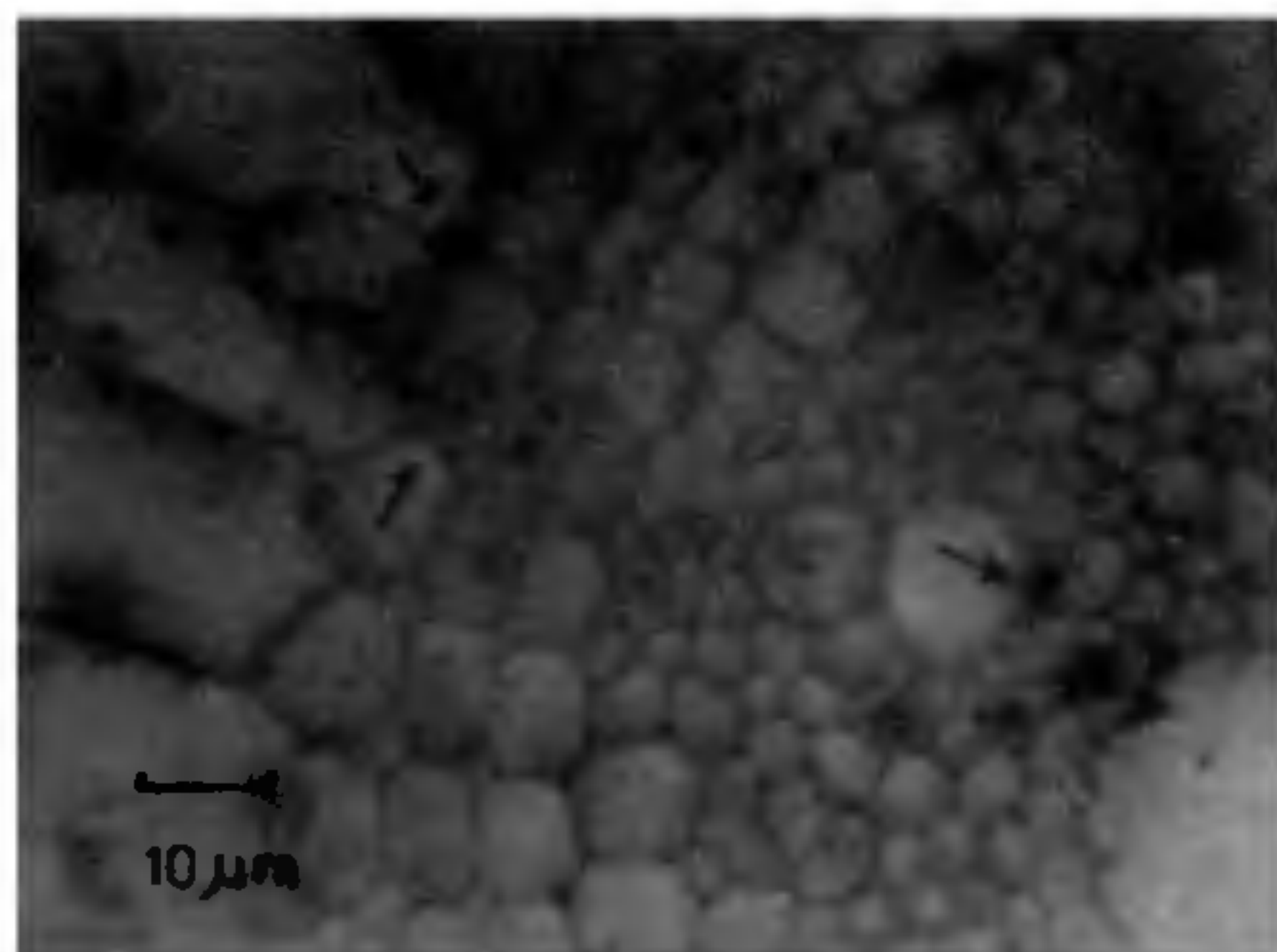


Figure 1. T.S. of the rice root Var (IR8) showing cells of *Beijerinckia* in the cortical and vascular cells.

After one month the plants were carefully removed with intact roots. They were thoroughly washed and surface-sterilized and subjected to the tetrazolium test as described by Bhide and Purandare<sup>4</sup>. After incubation of 48 hr, sites showing high metabolic activity of the tetrazolium reducing bacteria were seen as evidenced by the reddening of such sites. Transverse sections through such areas when observed under the microscope showed that the bacteria were profusely distributed in the epidermal cells, outer and inner cortical cells and sometimes even in the vascular bundles (figure 1).

Intra-cortical occurrence of bacteria was further confirmed by carrying out re-isolation of bacteria from the cell sap of cut root pieces, on Derx's medium. After incubation of 21 days at 30° C typical colonies of *B. indica* were seen on the plates.

The different characters of these re-isolated bacteria were selected since they are the most common high inoculation and both were *B. indica*, as per Bergey's Manual, 8th edition, 1974. A similar experiment was conducted using unsterilized soil, and identical results were observed.

The 12 rice varieties used in the above experiment were selected since they are the most common high yielding varieties recommended for rice cultivation.

The results of the above experiment showed that *Beijerinckia* sp. invaded the roots of all the 12 varieties of rice tested. There was also no significant variation in the degree of invasion of roots of different varieties. This was evidenced by studying root sections which showed abundant distribution of bacteria in all the root tissues. This is seen in the photomicrograph of the T.S. of rice root of a plant of variety IR-8 (figure 1).

The possibilities of intra-cortical occurrence of *Beijerinckia* in more rice varieties cannot be ruled out, and these intra-cortical bacteria may show variation in the degree of occurrence, inside the root tissues.

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1. Habte, M. and Alexander, M., *Appl. Environ. Microbiol.*, 1980, 40, 507.
2. Hirota, Y., Fusii, T., Sano, Y. and Iyama, S., *Nature (London)* 1978, 276, 416.
3. Karkhanis, R. and Tikhe, P. R., *Curr. Sci.*, 1980, 49, 949.
4. Bhide, V. P. and Purandare, A. G., *Curr. Sci.* 1979, 48, 913.