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RHIZOSPHERIC NITROGEN FIXATION ASSOCIATED WITH WETLAND RICE

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ABSTRACT :

The rhizosphere of rice is known to have nitrogen fixing activity, although it is quantitatively less pronounced than the activity attributed to cyanobacteria. This nitrogen fixing activity is attributed to rhizospheric diazotrophs.

Of the techniques so far reported for the detection and estimation of rhizosphere nitrogen fixation and isolation of diazotrophic bacteria from wetland rice, the most promising one involved an initial assay for nitrogenase activity by the cut plant soil method (Barraquio et, al., 1986) followed by a more specific method of isolation using a spermosphere model (Thomas-Bouson et.al., 1982).

In this investigation, field grown plants of a new improved short-age variety of rice, namely Bg 400-1 grown in two different localities under similar agronomic practices was used. The cut plant soil technique was employed to estimate the rates of biological nitrogen fixation at early flowering. Samples with the highest total rhizospheric nitrogen fixing activity were used for the isolation and characterization of the most prevalent diazotrophs in the rice rhizosphere. Several different aerobic media were used for isolation of these organisms. The most dominant population was recognized to be a single celled, coccoid organism forming transparent, slightly yellowish round colonies on Watanabe medium (Watanabe & Barraquio, 1979). This organism was tentatively identified as an enterobacteriaceae and will be used for further evaluation of rhizospheric nitrogen fixing activity.

It is known that the nitrogen fixing activity of the rhizosphere of wetland rice differs with the stage of maturity of the rice plant (Watanabe et.al., 1979). This was further examined with a short-age variety of rice, Bg 450, grown in the same locality with similar agronomic practices. The cut plant soil technique was used for the estimation of rhizospheric nitrogen fixing activity at selected growth stages of the rice plant. The highest nitrogen fixing activity was obtained at the nursery stage. There was a decline in activity at the stages of maximum tillering and an increase at the stage of maturity. The high activity in the nursery stage may be due to factors other than Soil nitrogen depletion such as high root biomass per unit area, root secretion favourable for N_2 fixing bacteria etc. High activity at maturity is most likely to be due to soil nitrogen depletion, in addition to root secretions.