

BIOLOGICAL NITROGEN FIXATION IN ACID RICE GROWING SOILS

S.A. KULASOORIYA

University of Peradeniya and
Institute of Fundamental Studies, Kandy, Sri Lanka

ABSTRACT

Most dinitrogen fixing organisms and systems operate optimally under near neutral to slightly alkaline conditions. Nitrogen fixing cyanobacteria and eubacteria both free-living and associative, are few and their activities generally low in acid sulphate soils. Nonetheless, certain cyanobacteria have been found to form free floating macro-colonies in humic bog soils of Sri Lanka under continuous submergence, which make the floodwater pH more favourable for their growth. Photodependent nitrogen fixation which predominates under these conditions, has been shown to contribute 30 to 35 kgN/ha.

The Azolla-Anabaena system which is relatively more tolerant than cyanobacteria to low pH conditions, grows better in acid soils and could contribute significantly to soil fertility, provided other factors are favourable for its growth and nitrogen fixation.

Deepwater rices which are widely distributed in acid sulphate soils of Thailand harbour epiphytic cyanobacteria whose nitrogen fixation contributes significantly to this ecosystem. Nitrogen fixed by these organisms, intimately associated with the submerged parts of the plants, is readily available to the host plant.

Reports on nitrogen fixation in the rhizosphere of rice grown in acid soils are sparse, but preliminary studies have yielded nitrogen fixing bacteria from the rhizosphere of long duration, traditional varieties of rice grown without fertilizer additions, in bog soils of Sri Lanka.

The importance of a continued search for nitrogen fixing organisms from adverse rice soils is emphasized, in view of the recent discovery of a new bacterium isolated from sugar cane, which grow and fix nitrogen optimally under acid conditions.