ISOTOPE AND RADIATION TECHNIQUES IN RICE NUTRITION RESEARCH

K.S. KUMARASINGHE, G.D. BOWEN and S.K.A DANSO
Joint FAO/IAEA Division of Nuclear Techniques in Food Agriculture, International Atomic Energy Agency
Wagramerstrasse 5, P.O. Box 100. A-1400 Vienna, Austria

ABSTRACT

The challenge to increase rice production can only be met if reliable, accurate and quantitative information are available. Isotope and radiation techniques have proved to be a powerful tool in the search for this information and this paper reviews some of the work using isotope and radiation techniques in rice nutrition research with special reference to the contribution made by the Joint FAO/IAEA Division of the IAEA.

Of the constraints to rice production, those related to soil are the most significant. Nutrients continuously removed from the soil by crops need to be replenished either through additions of inorganic or organic fertilizers if the productivity of the land is to be sustained. Such fertilizers added to the soil are however, not always efficiently utilized by the plant. For instance, a considerable amount of the N added to the soil is lost through oxidation, leaching, denitrification and volatilization. Using N-15 labelled ammonium sulphate it has been possible to demonstrate that the efficiency of N utilization in most soil types can be greatly increased placing the fertilizer at 5-15 cm depth at transplanting time or by applying it two weeks before primordial initiation on the surface as one single dose. In extremely acidic or alkaline soils, placement at lower depth had no effect possibly because of lack of nitrates for denitrification resulting from a slow rate of nitrification under these conditions. Ammonium sulphate and urea behaved similarly as regards time of application and placement are concerned. Sodium nitrate was found to be inefficient as source of N, but late application produced better results than early application. Several studies have shown that depending on the soil type, the gaseous losses of N may be as high as 70%, a factor which could contribute significantly to the lesser effectiveness of ammonium sulphate placed on the surface as compared to shallow placement. Sterilization of the soil by gamma radiation eliminated the effects of placement of ammonium sulphate possibly illustrating the role of microorganisms in N losses from fertilizers in acid to neutral soils. Attempts to reduce the gaseous losses of N by using inhibitors such as N serve has failed.