INTEGRATED USE OF ORGANIC AND INORGANIC N FERTILIZERS IN RICE-WHEAT CROPPING SYSTEM

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ABSTRACT

Nitrogen, a major and vitally important plant nutrient, is subjected to a variety of losses which affect its efficiency. Various sources viz prilled urea (PU), urea supergranules (USG), green manures (GM) and barnyard manure (BM) were employed in rice to work out the efficient and economical N source. N-rate for either treatment was maintained at 87 kg N ha^{-1}. Maximum gain in terms of rice growth, yield and N-uptake was induced by USG and GM *(S. rostrata)* + PU. Incorporation of GM resulted in a saving of 60 kg N ha^{-1}. On the succeeding wheat crop, GM *(S. aculeata)* + PU and BM+PU gave more residual effect than all other sources for tiller number m^{-2}, straw and grain yields and N-uptake, whereas plant height difference remained non significant among the sources. In areas where USG is costly or unavailable and BM is also in short supply, the small scale farmers can find the green manures a cheaper N source to get sustainable yields in rice-wheat rotation. A simple and cheep equipment for the purpose of rotavation of green manures has been proposed.

INTRODUCTION

The yield of wetland rice is usually limited by the low supply of soil N (De Datta, 1981). As the majority of soils in arid/semi-arid regions are low in organic matter and nitrogen, so the soil N is supplemented with chemical fertilizers to meet the crop requirement. But it is prone to various types of losses in soil and usual farmer's practices in Asia result only in 30-40% N recovery (De Datta, 1981). Greater fertilizer N efficiency may be achieved by the timely application of slow/controlled release N-fertilizers. The placement of USG at a and Morris, 1987 and Kolar and Greval, 1988).

Green/organic manures may preferably be incorporated into the soil 24 hours before rice transplanting to get maximum benefit from decomposition of the stuff. Because under anaerobic soil conditions, the rate of decomposition is slow and the anaerobes operate at a much lower energy level and synthesize much less cell material (low N factor). However, inspite of the lower nitrogen factor in flooded soils, materials with wide C:N ratio such as straw and weeds, instead of supplying nitrogen may depress its availability to rice especially in soils low in organic matter, while green manures like sesbania release the greater part of their nitrogen within 2-3 weeks of incorporation in flooded soils. Burrying of green manure one day before transplanting rice gave higher yield than burrying it 15 days earlier (Beri and Meelu, 1981). Sesbania, an annual cultivated legume and widely used GM plant for rice, has been reported to contain 3% N on the average, which can accumulate about 80-120 kg N ha^{-1} per crop (Mamaril et al, 1986). Therefore, the present research was envisaged to evaluate integrated effect of organic and inorganic N fertilizers on growth and yield of rice and wheat. This will provide valuable information to make the labour and investment of farmers more profitable as well as to reduce the dependence on chemical fertilizers.