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Use of leaf colour as an efficient tool for need based nitrogen application in rice

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ABSTRACT

A field experiment was conducted to find out the efficiency of Leaf Colour Chart (LCC) in determining the appropriate time of top dressing N fertilizer. In LCC treatment plots N was applied only when LCC reading of more than 50% of selected hills fell below 3. Yield obtained with LCC based nitrogen (N) application was significantly better than farmers practice and control, statistically at par with recommended and soil test based application of N. The results were same when interaction effect was considered. However, Agronomic Efficiency (AE) increased with decreasing level of applied chemical N, except farmers practice. LCC treated plots were better than all other treatment as far agronomic efficiency of applied N is considered.

Key words : Leaf Colour Chart, Agronomic Efficiency.

INTRODUCTION

Nitrogen (N) is the most important nutrient element required by rice plant throughout its growth stages. However, use efficiency of N applied through inorganic fertilizer hardly exceeds 25 - 30%, depending upon soil physical and chemical properties. In highly permeable soil profile with alternating aerobic and anaerobic soil conditions under rice, applied N is readily converted to $NO_{3,}$ which is prone to loss via leaching, de-nitrification or both (Aulakh and Bijay Singh, 1997; Singh *et al.*, 2001). As the resting period of nitrogenous fertilizer in soil increases, proneness to loss by various mechanism increases. Rice seedlings need about 7 days to recover from transplanting shock and so N uptake within two weeks of transplanting is very small (Meelu and Gupta, 1980) resulting into the fact that N applied as basal is subjected to loss or immobilization. When N application is not synchronized with crop demand, N loss from soil – plant system is large, leading to low N use efficiency (Becker *et al*., 1994; Singh *et al*., 2002). It has been documented that synchrony between crop demand and the N supply from all sources throughout the growing season is needed for improving N use efficiency in crop production system (Cassaman *et al*, 1993; Appel, 1994; Compbell *et al*., 1965). Vlek and Fillery (1984) stated that the efficiency could be improved if the time and dosage of fertilizer are adjusted according to the N supplying capacity of the soil and morphological development of the plant or growing degree days. Due to large variability of the N supplying capacity of the native soil from farm to farm and plot to plot, the strategies of N fertilizer management should be responsive to the large variation of crop N requirements and soil N supply (Peng *et al*., 1996). Since the colour of the youngest fully expanded and healthy leaf of a single plant is highly related to N status of the rice plant, application of N based on LCC value could be a useful technology.

The LCC was first developed in Japan by Furuya in 1987. Chinese Researchers at Zheijang Agricultural University developed a much improved LCC and calibrated it for indica, japonica and hybrid rice which then became a model for IRRI-LCC (Doberman and Fairhurst, 2000). Singh *et al*. (2002) reported that chlorophyll meter based application of N produced rice yields similar to those of existing fertilizer recommendations. Chlorophyll meter based N management saved 12.5 to 25% N of existing fertilizer recommendation. Results of N application to rice based on LCC shade 4 were reasonably consistent with those using the Chlorophyll meter. Singh *et al*. (2004) found that application of N with LCC using a critical value of 4 produced rice grain yield which were at par with recommended N applied in three equal splits in three years.

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