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Research Article

Relative performance of neem coated urea *viz-a-viz* ordinary urea applied to rice-wheat cropping in sub-tropical soils

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Summary

On-farm trials (OFTs) at eighteen different farmer field locations varying in soil fertility were conducted (2006–08) to assess the relative performance of different nitrogen sources *viz.*, neem coated urea (NCU) and ordinary urea (OU). The treatments thus compared consisted of 96 and 120 kg N ha^{-1} through NCU and OU, thus, constituting T_1= 80% NCU, T_2= 80% OU, T_3= 100% NCU and T_4= 100%OU. The grain yield for wheat and rice in T_3/T_4 was significant ($p<0.05$) (6.9% and 13.8%, respectively) higher than T_1/T_2, however, the grain yield among equivalently applied N treatments was statistically at par. The results revealed no significant differences in agronomic efficiency of N (AE_N) applied through different sources at equal applied level. However, there was significantly higher AE_N for T_1/T_2 than T_3/T_4 in both wheat and rice. The total energy productivity for wheat in T_3/T_4 was 6.87 per cent higher, with a decrease in energy productivity by 0.11 MJ ha^{-1} than T_1/T_2. However, in rice the total energy productivity was 14.9 per cent higher in T_3/T_4 with 0.16 MJ ha^{-1} over T_1/T_2. Thus, it can be concluded that the two N sources are equally effective for rice-wheat cropping in sub-tropical soils.

Key words : Agronomic efficiency, Crop yield, Energy productivity, Neem coated urea, Sub-tropical soils

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Introduction

Rice (*Oryza sativa* L.) and wheat (*Triticum aestivum* L.) are grown sequentially in an annual rotation constituting a rice-wheat (RW) cropping system and is a dominating system being practiced an ~85 per cent of the cultivated area in Punjab. The nitrogen (N) requirement of these crops in the region is being met through urea (46% N) and through an extensive research it has been substantiated that of the total quantity of applied N through urea, ~50–70 per cent is subjected leaching, ammonia volatilization and denitrification losses. According to Singh and Singh (2003) N use/recovery efficiency in RW cropping system rarely exceeds 30-40 per cent. The improvement in the N efficiency is, therefore, of prime importance, not only for achieving and sustaining high crop grain yield but also to protect the natural resources from degradation. The use of slow release N-fertilizers such as sulphur coated urea (SCU) in rice has been reported to be a better option than ordinary urea (OU) in almost all types of soils (Meelu *et al.*, 1983; Singh and Katyal, 1987). In India, the blended use of OU with neem cake was the traditional practice with the belief that when they are applied together nitrogen use efficiency (NUE) in rice is enhanced (Agarwal *et al.*, 1980; Singh and Singh, 1986). Devakumar and Goswami (1992) reported that oil derived from neem seeds contain melicians of which epinimbin, deacetyl, salanin and azadirachtin showed dose dependent inhibition of nitrification. According to Singh and Singh (2003) oil forms a fine coating and protects the N due to denitrification losses and thereby ensuring regulated and continuous availability of N over a long period of time, as required by crops. Although it had been established long ago that neem products, when applied along with urea, can enhance NUE in crops (Singh and Singh, 1986), the practice