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Increase in growth, productivity and nutritional status of wheat (*Triticum aestivum* L. cv. WH-711) and enrichment in soil fertility applied with organic matrix entrapped urea

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Abstract

Field experiments were conducted during two consequent years in semi-arid, subtropical climate of Rohtak district situated in North-West Indian state Haryana to evaluate the effects of eco-friendly organic matrix entrapped urea (OMEU) on wheat (*Triticum aestivum* L. cv. WH-711). The OMEU prepared in granular form contained cow dung, rice bran (grain cover of *Oryza sativa*), neem (*Azadirachta indica*) leaves and clay soil (diameter of particles <0.002mm) in 1:1:1:1 ratios and saresh (plant gum of *Acacia* sp.) as binder entrapping half of the recommended dose of urea. A basal application of organic matrix entrapped urea showed increase in plant growth in terms of fresh and dry weights, root length, root number, leaf number, tillers, plant height, earlet number, earlet length and productivity in terms of grain yield and straw yield over free form of urea (FU) and no fertilizer (NF) application. The OMEU increased total soluble proteins, organic N and free ammonium content in the leaves at 45 and 60 days. The nutritional status of wheat grains in OMEU applied plants was almost similar to that observed for FU applied plants. An increase in organic carbon and available phosphorus (P) was observed in OMEU applied plots on harvest, whereas pH was slightly decreased over FU applied plots. The microbial population and activity in terms of fungal and bacterial colony count and activities soil dehydrogenase and alkaline phosphatase were significantly higher in OMEU applied plots as compared to the FU applied plots. Our data indicate that OMEU which are low cost, biodegradable and non-toxic can be used to replace the expensive chemical fertilizers for wheat cultivation in semi-arid, subtropical climate.

Key words

Cowdung, Organic matrix entrapped urea, Plant growth, Saresh (plant gum of *Acacia* sp.), Yield

Introduction

Wheat and rice are the major cereal crops in India, covering a large area of cultivable land in India and other countries and consume maximum amount of N fertilizers (Sharma *et al.*, 2008). Industrial fixation of nitrogen for the use as fertilizer represent the largest human contribution of new reactive nitrogen to the N-cycle, which is evident from the fertilizer use in India during 1995-2005 (FAI, 2005). From 1960, hybrid rice and wheat varieties developed during green revolution phase in India are highly responsive to fertilizer pesticides and water and though have added very significantly to food grain production in the country, it has caused many environmental concerns e.g. loss of organic matter and micronutrients in the soil, loss of biodiversity, depletion of water table, increase in salinity and contamination of water and air with reactive nitrogen species (FAI, 2005; Singh and Singh, 2008). Due to decrease in organic matter and micronutrients in intensive cultivation areas a decline or stagnation in the productivity of wheat has been documented which persuade farmers for further loading of nitrogenous chemical fertilizers (Quyen *et al.*, 2002; Satyanarayana *et al.*, 2002; Singh *et al.*, 2006; Liew *et al.*, 2010).