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Slow Release Coating Remedy for Nitrogen Loss from Conventional Urea: A Review

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ABSTRACT

Developing countries are consuming major part of the global urea production with an anticipated nitrogen use efficiency of 20 to 35%. The release of excess nitrogen in the soil not only detrimental to the environment but also lessens the efficiency of the conventional urea. The urea performance can be enhanced by encapsulating it with slow release coating materials and synchronizing the nutrients release with the plant up-taking. However, the present cost of most of the coated fertilizers is considerably higher than the conventional fertilizers. The high cost factor prevents their widespread use in mainstream agriculture. This paper documents a review of literature related to the global urea market, issues pertaining to the conventional urea use, natural and synthetic materials for slow release urea and fluidized bed spray coating process. The aim of the current review is to develop technical understanding of the conventional and non-conventional coating materials and associated spray coating mechanism for slow release urea production. The study also investigated the potential of starch as the coating material in relation to the coatings tested previously for controlled release fertilizers.

Keywords: Nitrogen pollution; slow release urea; coating materials; starch; fluidized bed.

1. LIMITATIONS OF CONVENTIONAL UREA

Over the years, product quality and controlled release of nutrients in the soil have remained major challenges of the fertilizer industry. Until today, the main goal of applying the fertilizers to the soil was to provide nutrients to the plants and to increase or sustain an optimal crop yield. Nitrogen fertilizers, due to their mobility in the soil, should be supplied to the plants in a controlled manner to make them as efficient as possible. Otherwise, nitrogen losses due to volatilization and leaching will result in marked inefficiency, less economic cultivation, reduced biomass production and adverse environmental impact. Various types of natural and synthetic fertilizers for agricultural uses are available in the market in bulk quantities [1]. Normally, these fertilizers contain three elements, which are nitrogen, phosphorous and potassium. Among them, urea is an important synthetic fertilizer and is a

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