**Title**

Characteristics of an ideal Controlled Release Urea Fertilizer for field application: A review

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**Abstract**

Nitrates and Ammonium are two of the main elements required by the plants to carry out metabolic functions robustly. The application of nitrogenous fertilizers on the agricultural fields causes the synthesis of these nutrients below the ground level. These nutrients are required by the plants in specific amounts, on particular times. Around the globe the irrational use of nitrogenous fertilizers, mainly Urea has resulted in the loss of more than 70% of the nitrogen in the environment, without it being of any use to the plants. The losses put burden on the environment, as well as an economic strain on the farmers.

So, in order to curb the losses, scientists created Controlled Release Urea (CRU) that releases the nutrients at a steady pace; the release being in-line with the plant’s metabolic uptake of the nutrient. The slow rate of release would ensure that the nitrogen does not get lost to the environment, instead it is used by the plants in an ideal way, giving a better yield.

Over the years many varieties of CRU have been introduced and experimented upon. This review would provide a detailed insight into the various aspects pertaining to CRU. This paper would highlight the ideal characteristics of CRU, which makes it effective for agricultural applications. Research gaps related to CRFs studies have also been discussed within the scope of this paper. The information provided here within this review paper may help the future development of CRFs.

**Outline**

**Introduction**

**Difference between traditional Urea fertilizer and Controlled release Urea**

**Types of CRU**

* Matrix-Based
* Encapsulated

**Use of CRU**

* Advantages of CRU in field application
* Disadvantages of CRU in field application

**Composition of an effective CRU for field application**

* Benefit of using Bio-based coating over fossil-fuel derived coating
* Bio-based coating materials
* Addition of modifiers
* Micro-nutrient coating
* Coating with Microbial inoculum
* Cost-Benefit analysis of various bio-based coating materials
* Nutrient Release Mechanism
* Coating Techniques

**Conclusion and prospects**