

## Accepted Manuscript

A Review of Mathematical Modeling and Simulation of Controlled-Release Fertilizers

Sayed Ameenuddin Irfan, Radzuan Razali, KuZilati KuShaari, Nurlidia Mansor, Babar Azeem, Ashlee N. Ford Versypt

PII: S0168-3659(17)31084-2  
DOI: doi:[10.1016/j.jconrel.2017.12.017](https://doi.org/10.1016/j.jconrel.2017.12.017)  
Reference: COREL 9097

To appear in: *Journal of Controlled Release*

Received date: 14 September 2017  
Revised date: 12 December 2017  
Accepted date: 17 December 2017



Please cite this article as: Sayed Ameenuddin Irfan, Radzuan Razali, KuZilati KuShaari, Nurlidia Mansor, Babar Azeem, Ashlee N. Ford Versypt, A Review of Mathematical Modeling and Simulation of Controlled-Release Fertilizers, *Journal of Controlled Release* (2017), doi:[10.1016/j.jconrel.2017.12.017](https://doi.org/10.1016/j.jconrel.2017.12.017)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## A Review of Mathematical Modeling and Simulation of Controlled-Release Fertilizers

Sayed Ameenuddin Irfan<sup>a</sup>, Radzuan Razali<sup>a,\*\*</sup>, KuZilati KuShaari<sup>b</sup>, Nurlidia Mansor<sup>b</sup>, Babar Azeem<sup>b</sup>, Ashlee N. Ford Versypt<sup>c,\*</sup>

<sup>a</sup>*Department of Fundamental and Applied Sciences, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak Darul Ridzuan, Malaysia.*

<sup>b</sup>*Department of Chemical Engineering, Universiti Teknologi PETRONAS 32610 Seri Iskandar, Perak Darul Ridzuan, Malaysia.*

<sup>c</sup>*School of Chemical Engineering, Oklahoma State University 420 Engineering North, Stillwater, OK, United States.*

---

### Abstract

Nutrients released into soils from uncoated fertilizer granules are lost continuously due to volatilization, leaching, denitrification, and surface run off. These issues have caused economic loss due to low nutrient absorption efficiency and environmental pollution due to hazardous emissions and water eutrophication. Controlled-release fertilizers (CRFs) can change the release kinetics of the fertilizer nutrients through an abatement strategy to offset these issues by providing the fertilizer content in synchrony with the metabolic needs of the plants. Parametric analysis of release characteristics of CRFs is of paramount importance for the design and development of new CRFs. However, the experimental approaches are not only time consuming, but they are cumbersome and expensive. Scientists have introduced mathematical modeling techniques to predict the release of nutrients from the CRFs to elucidate fundamental understanding of the dynamics of the release processes and to design new CRFs in a shorter time and with relatively lower cost. This paper reviews and critically analyzes the latest developments in the mathematical modeling and simulation techniques that have been reported for the characteristics and mechanisms of nutrient release from CRFs. The scope of this review includes the modeling and simulations

---

\*Corresponding author email address: ashleefv@okstate.edu

\*\*Corresponding author email address: radzuan\_razali@petronas.com.my

Download English Version:

<https://daneshyari.com/en/article/7860314>

Download Persian Version:

<https://daneshyari.com/article/7860314>

[Daneshyari.com](https://daneshyari.com)