Modeling of Urea Release from Coated Urea for Prediction of Coating Material Diffusivity
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Abstract
This study investigates the diffusion of urea from the surface of solid urea to environment through multilayer using finite element method (FEM). A multi-diffusion model was established to simulate the diffusion of urea through coating layer and to environment. Firstly, a comparison between analytical and numerical model was conducted to obtain accurate numerical model for the diffusion of urea. Secondly, model was applied to study the effect of diffusivity coefficient on urea releasing time. Modeling results indicated that releasing time increases as effective diffusivity coefficient decreases. Releasing time was 8.34 days with a diffusivity coefficient of 1.60 \times 10^{-13} \text{m}^2/\text{s} and 132.96 days with diffusivity coefficient of 10^{-14} \text{m}^2/\text{s}. It demonstrated that material chosen for urea coating would have a diffusion coefficient of 1.49 \times 10^{-14} \text{m}^2/\text{s} to obtain a suitable releasing time for effective fertilization.

Keywords: Urea Release; Urea Diffusion; Finite Element Method; multi-diffusion modeling.

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