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Struvite as a Sustainable Fertilizer for Planting Chili Pepper Under Different Soil Conditions

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A B S T R A C T

Struvite ($MgNH_4PO_4.6H_2O$) is a sustainable, slow-release fertilizer that offers a promising solution for nutrient recovery and environmentally friendly agriculture. This study evaluates its effectiveness in chili pepper cultivation across alkaline and acidic soils, addressing a critical gap in research on sustainable fertilization strategies. A pot trial experiment compared struvite with conventional NPK fertilizer, analyzing phosphate (PO_4) and nitrate (NO_3) release rates under varying soil pH conditions. Twelve pots with different soil pH levels were treated with three fertilizer types at two doses, alongside a control group. The experiment was conducted outdoors under shade for 60 days. Results indicate that struvite, when applied at a higher dosage in alkaline soil, significantly enhanced plant growth compared to NPK fertilizer. While NPK treatments performed better in alkaline soils than in acidic soils, struvite exhibited a more controlled nutrient release, with acidic conditions accelerating dissolution. These findings underscore the potential of struvite as a sustainable alternative to conventional fertilizers, reducing nutrient runoff, promoting circular economy practices, and enhancing soil health. The study highlights the importance of integrating resource-efficient fertilizers like struvite into sustainable agricultural systems, particularly in alkaline soil environments.

Keywords: *Struvite; Nitrate; NPK Fertilizer; Chili Pepper*