Vegetable Section

—Scientific Note—

Planting Hole Application of Controlled-release Fertilizer Can Reduce Nitrogen Use without Yield Loss in Strawberry Grown in Sandy Soil in a Subtropical Climate

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High temperatures and poor water retention in sandy soils in subtropical climates can lead to quick losses of water-soluble nitrogen (N) fertilizer to the environment before it can be taken up by plant roots (Shukla et al., 2010). This is especially true for bare-root strawberry (*Fragaria xananassa* Duch.) transplants during establishment, because their fine roots are desiccated at the time of transplanting and can only absorb small amounts of water. Florida growers often apply high concentrations of soluble N (41–47 kg·ha⁻¹) during establishment to maximize N absorbed by the plant (Agehara, 2021). Controlled-release fertilizer (CRF) can be comparable to soluble N fertilizer in supplying the N necessary for vegetable cropping systems, while using less fertilizer due to fewer environmental losses (Incrocci et al., 2020; Wilson et al., 2010). The objective of this experiment was to examine the efficacy of planting hole application of CRF as a new fertilization strategy to replace conventional fertigation for bare-root strawberry transplants during establishment.

‘Brilliance’ strawberry was grown on sandy soil (97% sand) in West Central Florida during the 2020–21 winter production season. There were 11 treatments arranged in a complete block design: four N rates (0, 11.8, 23.5, and 47.0 kg·ha⁻¹, respectively) by fertigation with urea ammonium nitrate (UAN) over 3 weeks during establishment and seven N rates (0, 2.4, 4.7, 11.8, 23.5, 35.3, and 47.0 kg·ha⁻¹, respectively) using planting hole application of polymer-coated urea (PCU) at planting. Data were analyzed using analysis of variance followed by the Tukey-Kramer test for multiple comparison. For PCU treatments, curve fitting was used to characterize the dose responses as a dependent variable to N rates. Five models, including linear, quadratic, exponential plateau, exponential decay, and sigmoidal models, were fit to each data set, and the best-fit model was selected based on the smallest corrected Akaike information criterion.

Model fitting analysis revealed positive dose-responses to PCU rate in many growth and yield variables. Both canopy projected area during establishment and shoot (leaves + stems) N uptake at the end of the season showed linear increases. Monthly marketable yields recorded from November through February also showed linear increases, except for December. Total season marketable yield increased linearly by up to 32%. Interestingly, the proportion of misshapen fruit showed a linear reduction.

Some PCU treatments had better results compared to the UAN treatment at 47 kg·ha⁻¹ N (the common practice for strawberry production in Florida). During establishment, canopy projected area was 40% greater for the PCU treatment at 11.8 kg·ha⁻¹ N. November marketable yields for the PCU treatments at 11.8 and 47 kg·ha⁻¹ N were 108% and 106% greater, respectively. February marketable yield for the PCU treatment at 47 kg·ha⁻¹ N was 24% greater.

These results suggest that small amounts of CRF in planting holes can achieve high early yields while maintaining total yields and fruit quality and saving up to 35 kg·ha⁻¹ N. This new fertilization method can replace conventional fertigation during establishment in the winter strawberry production system.

This study will be repeated in the 2021–22 strawberry winter production season, with an emphasis on spatial and temporal variations in soil electrical conductivity in the rhizosphere.

Literature Cited


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