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Adjusting fertilizer strategies to address new challenges in sugarbeet production including early harvest, varietal differences, and sugar quality.

Climate variability including extended wet and dry periods during the growing season or increased freeze-thaw cycling during processing operations can adversely impact sugar quality. To complete sugar processing prior to warmer spring temperatures, the Michigan sugarbeet harvest season now extends from early harvest (i.e., mid-late August) through conventional harvest (beginning mid-late October). A recent initiative that emphasizes improved beet quality as compared to yield has practitioners questioning which fertilizer management strategies to target across a more variable climate, early harvest intervals, updated varietal characteristics, and when managing an N-responsive cropping system. Although management has mostly evolved to being site- or field-specific, little work has been done investigating how nutrient management may change based on sugarbeet varietal characteristics. More defensive varieties with greater disease tolerance may respond differently compared to more aggressive varieties with greater tonnage. Multi-year field studies were established to evaluate sugarbeet varietal response (defensive vs. aggressive) to specific fertilizer management strategies in combination with early and conventional harvest intervals. The study was blocked by two harvest timings (early and conventional) and two varieties. All treatments (other than the check) received 67 kg N ha^{-1} applied 5 cm x 5 cm at planting. Five fertilizer strategies consisted of 1) non-treated control (NTC), 2) 67 kg N ha^{-1} applied 5x5 at planting (5x5 N only), 3) 67 kg N ha^{-1} applied 5x5 followed by 112 kg N ha^{-1} subsurface banded at 2-4 leaf growth stage for total N rate of 179 kg N ha^{-1} (5x5 + Sidedress N), 4)) 67 kg N ha^{-1} applied 5x5 followed by 112 kg K_2O ha^{-1} surface banded at 20-leaf growth stage (5x5 + liquid K), and 5) 67 kg N ha^{-1} applied 5x5 followed by 112 kg N ha^{-1} subsurface banded at 2-4 leaf growth stage plus 112 kg K_2O ha^{-1} surface banded at 20-leaf growth stage for a total of 179 kg N ha^{-1} and 112 kg K_2O ha^{-1} (All). Across early and conventional harvest timings, 179 kg N ha^{-1} produced optimal root yields and recoverable sucrose per hectare but peak recoverable sucrose per Mg was produced by starter N only in both years of early harvest timing and one of two years for conventional harvest timing. Liquid K_2O application to either starter N only or split-applied N did not increase root yield or quality from similar treatments receiving only N fertilizer suggesting K management may be part of a broader soil management strategy for areas with below critical K concentrations rather than specifically targeted to enhance sugar production.