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How does simulated hail damage timing affect sugar beet root yield and quality?

Hail damage can cause significant root yield and quality reductions to a sugar beet crop. In southern Alberta, damaging hailstorms usually occur in July and August and can sometimes result in 100% defoliation, depending on storm intensity and duration. The objective of this study was to determine how simulated hail damage treatments affected sugar beet root yield and quality at harvest time. This test was conducted for 4 years during the 2019-2022 growing seasons. Simulated hail damage treatments of 100% defoliation were applied on four dates in July and four dates in August and were compared to an untreated check to measure reductions. Treatments were applied using a 4-row single drum defoliator starting on July 7 and were continued every 7 days until the end of August. At harvest, the center 2 rows of each test plot were lifted and weighed in the field. A subsample of 10-12 sugar beets per plot were bagged and analyzed for sugar content and impurity levels. It was determined that July hail simulation timings reduced root yield by 36.3% on average compared to a 21.2% reduction for August hail simulation timings. Visual observations following hail simulation treatments indicated that July defoliation timings had quicker, and fuller regrowth compared to August timings. August hail simulation timings reduced extractable sugar per ton (EST) by 19.6% compared to only an 8.2% reduction for July timings. Treatment effect on percent sugar was very similar to EST response. Reductions in extractable sugar per acre (ESA) increased gradually from the first hail simulation treatment and reached a maximum reduction of 46% on July 28 before reductions started to decrease until the final treatment date in late August. Late July to early August treatment timings affected loss to molasses more than treatments outside of that date range. It was concluded that the latest hail simulation timing in July caused the most significant damage overall, as indicated by losses in ESA, and resulted in the worst possible outcome for producers.