BECKER, MARTIN A.[1], CHRIST, DANIELA S.[1] and MARK VARRELMANN[1]*, [1]Institute of Sugar Beet Research, Holtenser Landstrasse 77, 37079 Goettingen, Germany. **Impact of selfpropelled harvesters with different defoliation and microtopping techniques on sugar beet storage stability.**

ABSTRACT

In Europe, sugar beets are stored in unprotected field piles for up to 80 days. Storage of sugar beets is accompanied by sucrose losses and accumulation of invert sugars (Jaggard et al., 1997). Previous studies have shown a correlation between the occurrence of storage rot, sucrose losses as well as invert sugar content (Liebe and Varrelmann, 2013). In addition, storage rot and invert sugar content were observed to increase following mechanical damage (unpublished results). Injury severity mainly depends on harvesting technique. Sugar beets are injured during defoliation or topping. Further injuries or bruising are i.a. due to tap root breakage, root contact and transport. These wounds represent entry sites for microorganisms (wound pathogens and saprophytic colonizers). Objective of this study was to determine the influence of different self-propelled harvesters on injuries, storage rot development and white sugar yield loss.

Sugar beets of a commercial hybrid were sampled from a harvester demonstration field trial in Dobieszów (Poland). The eight harvesters participating in the demonstration worked with different topping and cleaning technologies. One harvester was equipped with cleaning rollers, the other seven harvesters with turbines. Sugar beets were harvested in non-randomized strips; therefore, results have to be interpreted with care. An amount of 100 sugar beets per harvester and storage duration were sampled and transported to Göttingen (Germany). Before storage, 20 sugar beets in five replicates per harvester were rated visually for injuries at the tap root, root-neck, crown and tail. Storage was conducted at 8°C and 80% relative humidity in a climate container for five and 12 weeks. Each variant included 20 sugar beets in five replicates. Stored beets were rated visually for number of beets displaying rot symptoms on the surface. Freshly harvested and stored sugar beets were washed and processed to brei. Beet brei filtrates were analyzed for sucrose, invert sugar and melassogenic substances in an automatic beet laboratory system (Venema, Groningen, The Netherlands) according to standard protocols (Burba and Georgi, 1975, 1976; ICUMSA, 2003).

Visual rating for injuries of the freshly harvested beets did not result in significant differences between harvesters. After five weeks, slight differences in the sugar content between the different treatments were observed. After 12 weeks of storage, significant differences in sugar as well as invert sugar content were detected. The sugar content ranged from 14.4 to 16.3%. Invert sugar content ranged from 3 to 61 mmol/kg. Based on these results, the harvesters could be divided into two groups: one group with low white sugar losses and low invert sugar contents as well as one group with high sugar losses and high invert sugar in the harvested sugar beets after long-term storage. It might be possible to attribute these differences to differences in cleaning and scalping technologies. One of the harvesters with the lowest white sugar losses and invert sugar contents was equipped with cleaning rollers, while the majority of the other harvesters with worse results were equipped with turbines. This could be explained by the fact that cleaning rollers cause less injuries and entry sites for microorganisms than turbine cleaning. However, as also a harvester with turbine technology displayed comparable low white sugar losses after storage, the trial must be repeated in a completely randomized design. Another possible explanation is that the visual injury rating was unable to detect all injuries that contributed to storage rot development. However, an experimental error cannot be excluded, due to the non-randomized strip plot design.

References:

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