

INFLUENCE OF RHIZOMANIA ON SUGARBEET STORABILITY

Carl Strausbaugh and Imad Eujayl

USDA-ARS NWISRL
3793 North 3600 East, Kimberly, ID 83341
E-mail: carl.strausbaugh@ars.usda.gov

In southern Idaho much of the sugarbeet crop is stored from mid-October to mid-March. Approximately 1/3 of the crop is directly processed, 1/3 is held in short-term storage and 1/3 is held in long-term (> 90 days) storage. To do well in storage, cultivars need resistance to storage rot pathogens and a low respiration rate. In the past, germplasm lines with storage rot resistance and low respiration were developed and released, but this research area was phased out because of the industry's decision to place emphasis on physical methods, such as ventilation and freezing to reduce storage losses. However, recent research conducted by our group at Kimberly and others has shown that losses due to disease problems initiated in the field may lead to sugar loss in storage that can rival or surpass that caused by respiration even when using the physical methods to reduce losses.

Our initial studies have focused on the influence of rhizomania on sugarbeet storability. In these studies we utilized 5 leading rhizomania resistant commercial cultivars and a susceptible check cultivar grown in infested and non-infested fields. Samples from these plots were placed in the Twin Falls super pile from mid-October (in both 2005 and 2006) to the end of February and sampled on 40 day intervals. After 144 days in storage in 2005 and 142 days in storage in 2006, sugar reduction across cultivars was assessed. Roots from the non-infested fields lost an average of 20% and 13% of their sugar in 2005 and 2006, respectively. However, roots from the same cultivars in rhizomania infested fields lost 68% and 21% of their sugar in 2005 and 2006, respectively. During the 2006 storage season, the sugar loss would likely have been much higher had the weather not led to continuously below freezing temperatures for most of December 2006 and January 2007. In December samplings, frozen root surface area

across cultivars was 1% and 2% for roots from noninfested fields and 25% and 41% for roots from rhizomania infested fields in 2005 and 2006, respectively. Root rot was always worse with stored roots from rhizomania infested fields than from disease free fields in December, January, and February samplings both years.

In another study, beets were placed on top of the commercial roots in the indoor storage facility at Paul, ID to reduce the influence of environmental factors. By utilizing a more uniform environment, we hoped to develop a reliable assay to screen cultivars for resistance to rhizomania and reduce storage losses. Preliminary data from the 2006 storage season with all commercial cultivars grown in a rhizomania infested field suggested the storage study provided a reliable screen for both rhizomania and storability. If the differences prove repeatable, we should be able to establish a reliable cultivar selection technique based on this research. To do well in this storage screen, cultivars must possess both good storability and resistance to rhizomania. Preliminary evidence from indoor storage research with roots produced in rhizomania infested fields indicates that cultivars without good rhizomania resistance will suffer greatly (sugar loss up to 80% - 90%) in storage regardless of their level of storability. Therefore, cultivars that perform well in storage must possess both rhizomania resistance and good storability. This data may also lead to a more sensitive screen for rhizomania resistance than the current approach of root assessment in the field. We anticipate continuing our research on screening and selecting new germplasm for storability of sugarbeet roots for the foreseeable future. This storage work will impact not only roots in long-term storage but also roots in short-term storage since significant sugar loss could be documented in 2005 by early December.



Figure 1. Conventional and transgenic sugarbeet samples in onion bags evaluated for fungal growth in the Paul Storage Facility on Feb 1, 2008.



Figure 2. Fungal growth of an undescribed Basidiomycete (correlates with sugar loss in storage) extending through onion bags. Hobo sensor used to record temperature also evident in photo.



Figure 3. Fungal growth of an undescribed Basidiomycete on roots in commercial sugar beet pile at the Paul Indoor Storage facility.



Figure 4. Fungal growth (undescribed Basidiomycete, Penicillium, and Botrytis) on commercial sugarbeet pile at the Paul Indoor Storage facility on March 16, 2007.