

STRAUSBAUGH, CARL A.^{1*}, IMAD A. EUJAYL¹, EUGENE REARICK², PAUL FOOTE³ and DAVE ELISON³, ¹USDA-ARS, NWISRL, 3793 North 3600 East, Kimberly, ID 83341, ²Amalgamated Research Inc., 2531 Orchard Drive E., Twin Falls, ID 83301 and ³Amalgamated Sugar Company LLC, 50 South 500 West, Paul, ID 83347. **Sugarbeet cultivar evaluation for storability and rhizomania resistance.**

ABSTRACT

Sugarbeet production worldwide is hindered by sucrose loss in storage and yield loss associated with rhizomania caused by *Beet necrotic yellow vein virus* (BNYVV). To reduce storage losses and improve resistance to rhizomania, studies were initiated to establish a storage cultivar selection program for sugarbeet. In 2006 and 2007, 30 or more commercial sugarbeet cultivars were grown in soil naturally infested with BNYVV. At harvest, two eight-beet root samples from each plot were collected and used to establish percent sugar. Additional samples were placed on top of an indoor pile (set point 1.7°C) and inside an outdoor pile in a randomized complete block design with four replications. After 142 and 159 days in indoor storage, sucrose reduction ranged from 13 to 90% in 2007 and 57 to 100% in 2008. Outdoor storage sucrose reduction ranged from 13 to 32% in 2007 and 28 to 60% in 2008. An average of 31 and 45% of the root surface was covered with fungal growth in 2007 and 2008, respectively. Cultivars that retained the most sucrose had resistance to BNYVV and less fungal growth and weight loss. Indoor storage with BNYVV infested roots allowed for the most consistent cultivar separation and will potentially lead to cultivars being selected for improved storability and rhizomania resistance.

Objectives:

In order to establish a cultivar selection approach for storability and improve on the selection for rhizomania resistance, investigations with rhizomania-infested sugarbeet roots produced and stored under commercial conditions were conducted in indoor and outdoor piles.

Procedures:

Thirty-two commercial sugarbeet cultivars were evaluated in 2006 to establish a screen for storability. The study was repeated in 2007 with 30 commercial sugarbeet cultivars. Twenty of the cultivars were the same in both studies. All cultivars contained at least the *Rz1* gene for resistance to BNYVV, except for the susceptible check, HM070005, and five cultivars in 2006. Rhizomania was uniform and evident throughout the naturally infested commercial fields both years. Other diseases were not evident in the fields and the roots were free of visible root rot at harvest. Plots were arranged in randomized complete block design with four replications as four-row plots. The fields were managed using standard commercial practices. The plants were mechanically topped and the center two rows were harvested. At harvest, three eight-beet samples were collected from each plot. For six cultivars an additional eight-beet sample was pulled at the same time for testing under ambient conditions outdoors. The indoor samples were placed on top of a 9.1 m high commercial indoor pile and the outdoor samples were placed inside (inside corrugated ventilation pipe) a commercial outdoor pile. Temperature was recorded at one hour intervals on a Hobo temperature sensor. In 2006, the samples were placed in the outdoor

pile on 19 Oct and on the indoor pile on 20 Oct. The samples were retrieved on 26 Feb after 142 days in storage. In 2007, the samples were placed in the outdoor pile on 17 Oct and on the indoor pile on Oct 26. The samples were retrieved on 4 Mar after 159 days in storage. On the 1 Feb each year the indoor roots were rated for the percentage of surface area covered by fungal growth (primarily a basidiomycete). When retrieved from storage the roots were evaluated for rhizomania symptoms using a 0-9 disease index (0 = no symptoms, 9 = dead). At the same time surface rot on the roots was visually evaluated as the percentage of root surface area associated with discolored tissue. The roots were weighed prior to storage and again coming out of storage to determine the reduction in root weight. Two samples collected from each plot at harvest time were submitted to the Amalgamated Tare Lab for sugar analysis along with evaluation for conductivity and nitrate. Percent sugar for samples coming out of storage was determined by Amalgamated Research Inc. using gas chromatography. To establish percent sugar reduction only samples from within the same plot were compared.

Conclusions:

Cultivar selection for storability using an indoor storage facility gave more consistent significant differences than outdoor storage. By combining the indoor storage approach with roots from an infested rhizomania field, both storability and rhizomania resistance could be addressed at the same time. Cultivars that retained the most sucrose had resistance to BNYVV and the least fungal growth and weight loss. Based on regression, the basidiomycete fungal growth was correlated with surface root rot and sucrose reduction both years. To perform well in the storage assay, cultivars had to possess both good rhizomania resistance and storability. Thus, indoor storage approach with rhizomania infested roots should allow for reliable cultivar separation and ranking of sugarbeet cultivars for storability and rhizomania resistance.