

Methods of Measuring Quality Losses in Commercial Sugarbeet Storage Piles

Jay B. Law
Utah-Idaho Sugar Co.

Getting accurate and reliable information on pile storage losses requires extensive planning and extremely careful supervision.

The main objective of our storage experiments was to find ways and means of reducing storage losses. Reducing storage losses offered tremendous economical gain in the savings from spoilage and respiration losses. In addition, factories are able to operate more efficiently for a longer period of time.

We have conducted trials with five basic treatments which are (1) check (2) sides covered only, (3) ventilated without side covered, (4) ventilated and sides covered, and (5) ventilated and sides covered plus a canopy over the top.

METHODS

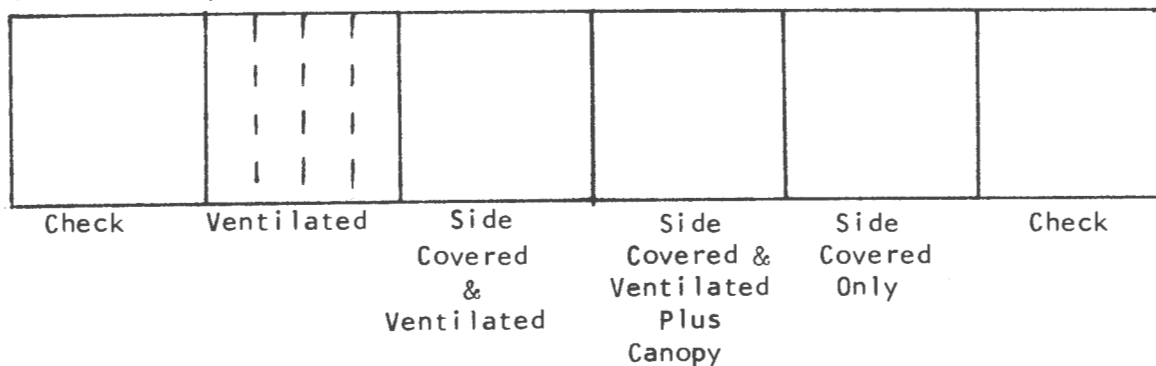
In order to measure storage losses it is necessary to accurately measure any changes in sucrose and weight of the beets. To measure these differences captive samples are buried in selected areas in each treatment. To help eliminate known differences and to make the test as accurate as possible all of the captive samples are taken from one load of beets which in turn is selected for uniformity. Beets are then selected from this one load to make certain that all the beets used in captive samples are fairly well shaped, had average topping and were not excessively bruised or broken.

The average weight of the captive samples have been about twenty pounds. Thirty to fifty such samples are washed, weighed and analyzed for sucrose to determine the sucrose of the captive samples as they were placed in storage. Generally around seventy samples are washed and dried, weighed, tagged and placed in wire baskets which are covered with chicken wire or in nylon net bags and placed in each treatment.

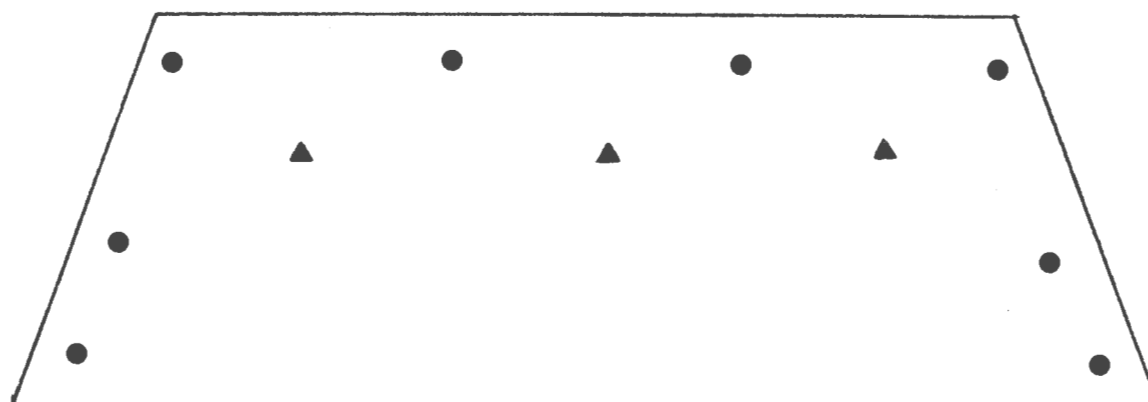
The treated areas are generally about 100 feet long. As one or more of the treatments generally have ventilation, one set of samples is set over each vent and another set halfway between the vents. The vents are 25 feet apart, therefore, each set of samples is 12 1/2 feet apart and each treatment will have seven sets of samples. Some were buried three to four feet to determine the comparative effect of the different depths. (Previous trials had indicated that the greatest differences and therefore the best place to measure differences between treatments is above the four foot level).

The diagrams below may help locate the location of the samples.

Side View 7 Sections



End View



● Shallow sample (1-2 feet deep)

▲ Deep sample (3-4 feet deep)

Thus in each treatment there are seven sets of samples with each set consisting of ten to eleven samples (eight shallow and two or three deep samples).

A rope tied to each basket extends to the surface where it is tied to a stake to facilitate locating the samples when they are to be removed.

In addition to the captive samples, grab samples are generally taken to more fully evaluate the change in sucrose between the time the beets were put into storage and when they are processed. These 20-25 pound test samples are taken at random from every four to five loads of beets that are delivered. An equal number of samples are taken at random at the end of the storage period.

In all of these tests it is necessary to keep accurate temperature records. Where ventilation is one of the treatments it is desirable to have some of the temperature tubes down through the beets to an area very near the barrels or ventilating ducts to help determine when to blow or perhaps more accurately when not to blow. These thermometers are used to determine the limits for blowing in cold weather to prevent freezing of beets near the tubes.

Most of the temperature tubes are located in the upper three to five feet since this is the area where both hot areas and frost cones develop.

In all ventilated treatments three rows of temperature tubes are placed in the pile on 25 foot centers over the barrel row of the storage pile. The tubes on the fan side are placed within one foot of the barrel row. The center and off fan side are placed four to five feet deep.

In all other tests the temperature tubes are placed on 50 foot centers running lengthwise in three rows. One row on each side of the pile set in about five feet from the shoulder and one row in the center of the pile. Temperatures are read and recorded every three days.

When reloading of the test pile begins all captive samples are carefully recovered as fast as possible in one to two days. Samples are then taken to the tare and sugar lab for analysis for weight and sucrose.

Results of Pile Storage Tests Average 100 days of storage

The combined results of sugar loss from the captive samples indicates losses were less than losses incurred in the check.

The ventilated fully covered canopy indicated a very substantial reduction in sugar loss for the 100 day storage period.

The combined results of weight loss indicated there is not much difference between the check and ventilated, side covered and ventilated and side covered treatments. This was to be expected including an increase in weight loss for the ventilated only treatment. The ventilated full canopy indicated the smallest loss of weight for all treatments.

Grab samples The grab samples data shows there were small differences in the loss between the various treatments varying from a low of .288 to a high of .396 lbs/T/day; however, without weight losses this information is difficult to interpret. It is the total loss of sugar that is important and this data was collected to see if there were large significant differences in the sucrose changes in the beets of the various treatments.

The data obtained definitely indicates that captive samples have given far better information than have the grab samples, and that future work should depend on the captive samples rather than on grab samples. The weight loss plus the sucrose loss is important and as the grab samples only provide information on sucrose it does not give an accurate or complete picture of the losses that occur.

Summary of Pile Storage Experiments

1. The canopy (side and top covered plus ventilation) was the most successful treatment.
2. Captive samples are more reliable than grab samples in measuring pile storage losses.
3. Temperature records must be kept to properly evaluate causes of storage loss.
4. Temperature records show it is very important to drop the pile temperature early in the season. If temperature permits, beets should be ventilated within twenty four hours of storage.
5. These experiments show that pile management is a science and is a major responsibility of the agricultural staff.