

Delayed Sucrose Analysis of Pulped Beet Samples

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The deep freezing of pulped sugar beet samples for later sucrose analysis appears promising for field plot work. Preliminary tests in 1947 and 1948 indicated that very little change in sucrose content took place in samples frozen shortly after pulping. Delayed analysis, provided it does not change the relative ranking of varieties, certainly may be desirable in plot harvesting in cases in which equipment and qualified manpower are limited and the harvest season short.

Methods

A practical test involving the statistical analysis of sucrose contents of a variety test was conducted in 1949. This consisted of 25 varieties replicated

Table 1.—Sucrose Analysis on Pulped Beet Samples After Various Periods in Frozen Storage.

| Variety No. | Sucrose Analysis In Percentage | | | | | | | | | |
|---------------|--------------------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | Original Analysis | After 3 wks. storage | Change over last test | After 6 wks. storage | Change over last test | After 9 wks. storage | Change over last test | After 12 wks. storage | Change over last test | Total Increase |
| 1 | 16.38 | 16.52 | .14 | 16.74 | .22 | 16.68 | -.06 | 16.85 | -.03 | .27 |
| 2 | 16.74 | 16.94 | .20 | 17.03 | .09 | 17.08 | .05 | 17.07 | -.01 | .33 |
| 3 | 16.76 | 16.87 | .11 | 17.09 | .22 | 17.12 | .03 | 17.10 | -.02 | .34 |
| 4 | 17.81 | 18.01 | .20 | 18.14 | .13 | 18.16 | .02 | 18.19 | .03 | .38 |
| 5 | 17.48 | 17.72 | .24 | 17.83 | .11 | 17.90 | .07 | 17.88 | -.02 | .40 |
| 6 | 16.62 | 16.83 | .21 | 16.96 | .13 | 16.98 | .02 | 16.95 | -.03 | .33 |
| 7 | 16.95 | 17.21 | .26 | 17.24 | .03 | 17.21 | -.03 | 17.27 | .06 | .32 |
| 8 | 16.34 | 16.70 | .36 | 16.79 | .09 | 16.76 | -.03 | 16.80 | .04 | .46 |
| 9 | 16.65 | 16.89 | .24 | 17.02 | .13 | 17.01 | -.01 | 17.01 | | .36 |
| 10 | 16.91 | 17.08 | .17 | 17.18 | .10 | 17.23 | .05 | 17.24 | .01 | .33 |
| 11 | 16.08 | 16.23 | .15 | 16.46 | .23 | 16.37 | -.09 | 16.40 | .03 | .32 |
| 12 | 16.27 | 16.45 | .18 | 16.62 | .17 | 16.49 | -.13 | 16.67 | .18 | .40 |
| 13 | 16.64 | 16.91 | .27 | 17.03 | .12 | 17.05 | .02 | 16.92 | -.13 | .28 |
| 14 | 17.26 | 17.50 | .24 | 17.56 | .06 | 17.65 | .09 | 17.51 | -.14 | .25 |
| 15 | 17.41 | 17.60 | .16 | 17.65 | .05 | 17.68 | .03 | 17.76 | .08 | .32 |
| 16 | 16.51 | 16.74 | .23 | 16.82 | .08 | 16.88 | .06 | 16.95 | .07 | .44 |
| 17 | 16.58 | 16.91 | .33 | 16.92 | .01 | 16.89 | -.03 | 16.95 | .06 | .37 |
| 18 | 17.18 | 17.36 | .18 | 17.41 | .05 | 17.45 | .04 | 17.42 | -.03 | .24 |
| 19 | 16.64 | 16.83 | .19 | 16.96 | .13 | 16.94 | -.02 | 17.00 | .06 | .36 |
| 20 | 15.82 | 15.98 | .16 | 16.07 | .09 | 16.06 | -.01 | 16.18 | .12 | .36 |
| 21 | 16.72 | 16.95 | .23 | 17.08 | .13 | 17.01 | -.07 | 17.08 | .07 | .30 |
| 22 | 18.40 | 18.58 | .18 | 18.60 | .02 | 18.60 | | 18.70 | .12 | .30 |
| 23 | 16.98 | 16.72 | -.24 | 16.76 | .04 | 16.75 | -.01 | 16.72 | -.03 | .34 |
| 24 | 16.33 | 16.56 | .23 | 16.66 | .10 | 16.70 | .04 | 16.72 | .02 | .39 |
| 25 | 16.28 | 16.48 | .20 | 16.63 | .15 | 16.59 | -.04 | 16.68 | .09 | .40 |
| Gen. Mean | 16.77 | 16.98 | .21 | 17.08 | .11 | 17.09 | | 17.11 | .02 | .34 |
| LSD (19:1) | .39 | .39 | | .41 | | .41 | | .40 | | |
| Calc. F Value | 19.4755 ¹ | 20.5673 ¹ | | 16.8133 ¹ | | 17.5908 ¹ | | 18.9726 ¹ | | |

¹ Exceeds the 1% Point : 2.06

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six times each, or a total of 150 plots. Two pulped samples were taken for each plot and placed into containers when making the original sucrose analysis at harvest. No preservatives of any kind were added. These were taken to deep freeze within one and one-half hours after pulping. Samples were stored at -15° F. At intervals of three, six, nine and twelve weeks 300 samples were removed and thawed in a dry heating chamber with a temperature of 110° F. Thawing required from thirty to fifty minutes. Duplicate samples were weighed from each container as soon as the lid was removed. Analysis followed.

Results

A slight increase in sucrose readings was evident at the end of the third and sixth week. Subsequent readings remained practically the same as the six weeks level. The largest average raise, .21 percent, occurred at the three-week period. To this was added .11 percent increase for the six-weeks period, none for the nine-week period, and .02 percent for the twelve-week period. The total average raise was .34 percent. The least average raise of any variety at the end of the twelve-week period was .24 percent, the largest .46 percent (See Table 1). Statistically, the data for each date are very similar. Rankings for 8 of the plots were identical for all dates. Sixteen rankings were identical at the three- and six-weeks periods, fifteen at the nine-week period and thirteen at the twelve-week period.

No differences in the final product were noted in 1947 in comparing tin and paper containers.

In the 1949 tests both tin and paper containers were compared for additional data. Two complete replications were stored in metal containers and four complete replications in waxed paper ice cream cups. The metal containers were much more satisfactory in every respect. A metal container with a tight fitting lid should be used. The final results showed a much greater change in sucrose content in the paper cups (See Table 2).

Table 2.—Effect of Type of Container on Final Sucrose Content of Stored Pulped Beet Samples.

| Type of | Replication | Sucrose Analysis in Percent | | | | | |
|----------------------|-------------|-----------------------------|----------|-------|-------|-------|--------|
| | | No. | Original | 3 Wk. | 6Wk. | 9 Wk. | 12 Wk. |
| Metal | I | | 16.37 | 16.49 | 16.37 | 16.51 | 16.53 |
| Metal | IV | | 16.78 | 16.93 | 17.02 | 16.99 | 16.90 |
| Ave. of Metal | | | 16.58 | 16.71 | 16.80 | 16.75 | 16.71 |
| Paper | II | | 16.71 | 17.02 | 17.06 | 17.08 | 17.12 |
| Paper | III | | 16.86 | 17.05 | 17.22 | 17.24 | 17.24 |
| Paper | V | | 16.90 | 17.18 | 17.32 | 17.38 | 17.47 |
| Paper | VI | | 17.00 | 17.22 | 17.35 | 17.35 | 17.41 |
| Ave. of Paper | | | 16.87 | 17.12 | 17.24 | 17.26 | 17.31 |

Summary

The deep freezing of pulped beet samples for later sucrose analyses appears promising for field plot work. It may also have other applications. Data analyzed statistically covering 25 varieties of sugar beets, with six replications each, showed practically identical results for pulp stored three, six, nine and twelve weeks. A slight increase in the sucrose content was noted in the stored samples but the variation in L.S.D. (19:1) increased only slightly from .39 to .41 percent, indicating that the sucrose data after deep freeze storage is quite reliable. Metal containers gave much better results than waxed paper and were more satisfactory in handling.