concentration trees have been identified, they are, from year to year, the same individuals. A positive correlation between sugar concentration and volume for individual trees would identify the superior ones. Sugar concentrations can be easily measured in the field with hand refractometers. Volume measurements are much more time-consuming determinations.

Differences in the volume yield from individual sugar maples have been recognized from the beginning of the industry. Clark (1874) was one of the first to record differences in volumes from individual trees and correlate these with temperature. Jones (1903) was apparently the first to measure sugar concentration and volume yields simultaneously from each of several tapholes in the same tree and in different trees. The data on volume yields from groups of trees are extensive, but there are very few data comparing volume yields and sugar concentrations on individual trees.

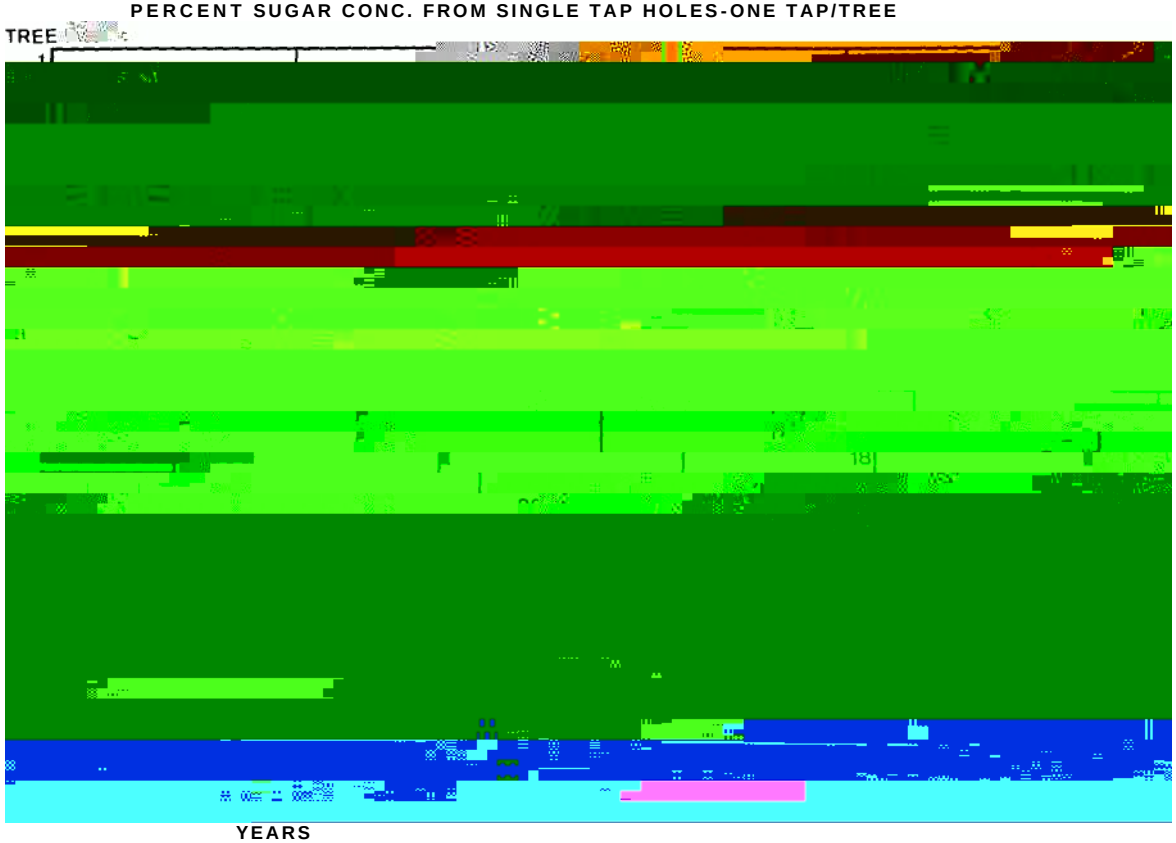
Moore *et al.* (1951), in Ohio, observed in a group of trees over a four-year period

Tressler and Zimmerman (1942) reported on observations in a New York sugarbush over a three-year period. They measured the sugar concentration and volume yields from individual tapholes, but unfortunately did not publish their data in this form. They did find a positive correlation between sap volume and sugar content (weight of sugar) from similar tapholes—that is, trees with one, two or three taps. Morrow (1952), commenting on Tressler's work, observed that the data did not show a correlation between sugar concentration and volume yield in the same taphole (tree).

Taylor (1956) reported the results of an extensive study of 4,500 trees undertaken over a period of several years. He found that, although the sugar concentration in the sap of individual trees varies during the day, from day to day and from season to season, individual trees maintain their relative position in a population. The sweetest trees are always the same individuals.

Materials and Methods

The trees used in this study are part of a stand of mature maples (Acer saccharum Marsh.) growing at an elevation of 1,400 feet on a site with a gently sloping southwest exposure at the Proctor Maple



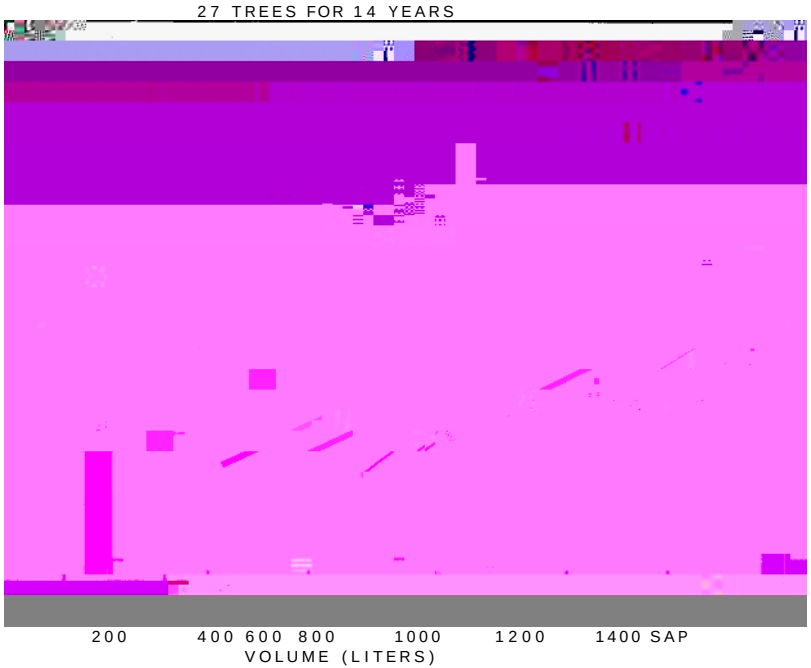


FIGURE 3. ***Average percent sugar concentration and total sap volume from 27 trees for 11 years with the regression line, the regression formula, the correlation coefficient and the 99 percent confidence bands for the mean percent sugar.***

Research Farm in Underhill, Vermont. The trees, widely spaced in a parklike stand, range from 15 to 32 inches dbh and have from one-third to two-thirds of their height in live crown.

Sugar concentrations were determined as total solids with Zeiss hand refractometers from a drop of sap when the spout was dripping. Volumes were measured either from individual buckets or by an automatic volume recorder previously described (Marvin and Erickson 1956). Measurements of sugar concentration and sap volume were taken simultaneously whenever a flow period occurred, frequently although each of the trees was not used every year. Thus 4 of the trees were used every year (trees 1, 3, 4 and 6), 9 trees were used for 17 years, 9 trees for 16 years, 3 trees for 15 years, 3 trees for 14 years, and 1 tree for 13 years (tree 23). In Figures 1 and 2 all the available data were used for 29 trees. In Figure 3 and Table 1 the data are for the 27 trees used each year for 14 years. The volumes compared were the totals for each tree for each year, and the sugar concentrations were the averages for each tree for each year. Over 10,000 observations were recorded during the 18-year period. The data were analyzed both manually and by

and separated into quartiles with the largest volumes and highest sugar concentrations on the ri