

FINAL REPORT FOR SARE GRANT PROJECT #FNE97-188
SWEET SORGHUM SYRUP PRODUCTION IN VERMONT

The first goal of our project was to determine the best sweet sorghum varieties to grow here in Vermont that will produce the most desirable sorghum syrup. Second was to do further research and development of a mechanical harvester for sorghum stalks. Third was to build a sorghum evaporator pan that would be interchangeable with maple syrup evaporator pans.

SWEET SORGHUM VARIETY TRIAL REPORT

The sweet sorghum variety trial for 1997 included 30 varieties. Some varieties have been grown now for three years and eight were new this year. Many of the varieties were grown from seed saved from last year's plot. Others were acquired from an extension agent in Kentucky and some from Midwestern growers. The majority were chosen once again due to their early maturation ~~of~~ for outstanding syrup qualities.

This year the varieties were grown at three locations; the third site was added to get more information on sorghum grown under different conditions. This site was at Bennington College, on a silty-loam soil, located about six miles from the Williamson farm. Sod was turned under in the spring and 50, 40, and 30 pounds of nitrogen, phosphorus and potassium per acre were added respectively. The same plot was used at Clear Brook Farm as in 1996, located about 10 miles away. The sandy loam was amended with the same fertilizer as above. A new plot was used at the Williamson farm, where sod was turned under and manure spread on the field. The soil here is ledgey-clay. The plots at Bennington College and the Williamson farm were cultivated several times and the Clear Brook Farm Plots were hand weeded one time. No herbicides were used. The varieties were once again planted in two-row plots, 36 inches apart, and 25 feet long.

When the earliest varieties started to flower, all plots were evaluated for developmental stages at each site. At the Williamson farm, brix readings, a measure of sugar concentration in the plant sap, were taken at the end of the season. At this time a taste test was also done on the plant sap and mature seed heads were cut to be saved for the next year. This is an important practice because sweet sorghum seed sources are scarce.

A cool, wet spring lead to very poor germination in some varieties. These were replanted with some success. The extended dry periods in the 1997 season had a negative effect on the maturation of most varieties. Usually sweet sorghum can withstand drought conditions with little loss in yield, but this year the development and hence the sweetness of the stalks was slowed substantially. Plant growth

was particularly depressed at Clear Brook Farm. This was due to weed pressure and to low fertility, despite the application of fertilizer. Weed pressure was also fairly high at Bennington College, but the varieties did better probably due to a soil with more organic matter. The varieties did the best at the Williamson farm, most likely due to the newly turned sod and fewer weeds. The plants were the tallest and thickest in these plots. It is generally agreed that sweet sorghum grown for syrup does the best on soils higher in clay; the Williamson plots had the highest clay content. This would also be critical in a drought year, such as 1997. In these conditions, producers are careful not to apply too much nitrogen, as it affects the quality of the syrup. Apparently, in sandy soils such as Clear Brook Farm, more fertilizer could be safely applied and not affect the sap quality.

As in 1996, the rate of maturation for most varieties differed at each site. This could be due primarily to soil fertility, moisture, and total solar radiation differences or to other micro climatic conditions. Sweet sorghum is apparently sensitive to small differences in solar radiation. As stated above, weeds were also a problem at some sites. Usually sweet sorghum grows so quickly in its grand stage of growth as to reach canopy closure over weed growth, but this did not happen due to the drought conditions. Overall, there was a small core group of six varieties that matured evenly at all sites. Others would be nearing maturity at one site and just beginning to flower at another. This shows the importance of using multiple sites in order to understand how sweet sorghum will perform in southern Vermont. After this year, Blackstrap, Early Orange, Early Orange 2, Waconia Orange, Simon, and Umbrella can be recommended for reliable production in this area. This is helpful especially because Umbrella and Simon were new this year and are used for good quality syrup by other producers.

Only six varieties produced mature seed by the first killing frost, as compared with ten varieties last year. This was again due to the dry summer. Sweet sorghum production was down in other parts of the country as well. We expect that more of the thirty varieties will produce mature seed when grown in this area, and so many of these varieties should be tested again. Often a variety produces good syrup even if it has not reached the soft dough stage (used as an indication of peak sap sweetness). In early October, Moes Miller, Smith, Della, Orange, Simon, Ames Amber and Waconia Orange were above 13% in brix readings of the plant sap. This is the level at which it becomes profitable to harvest the plant and make syrup. However, on the taste test done on the plant sap, these varieties did not always have good tasting sap. Della, Ames Amber, and Waconia Orange all had good tasting sap. Some old-timers stress the importance of tasting the sap before you make syrup to distinguish qualities other than sweetness that will contribute to the final product.

REPORT ON DEVELOPMENT OF MECHANICAL HARVESTER

In the process of making sweet sorghum syrup there is a large amount of labor involved; hand cutting and milling of the sorghum stalks to extract the juice. There are no mechanical harvesters available.

We worked on a corn harvester this past summer and tested it during harvest. The modifications we made to the harvester were fairly simple to accomplish. By speeding up the rate of material feed and removing six of the eight knives from the cutter head we were able to cut sorghum stalks into three inch long billets without losing any of the juice. By fanning the chopped sorghum all the leaves could be removed before milling. This method of harvesting would enable us to utilize the continuous flow fruit press we experimented with last year. This system would reduce the hand labor to equipment operation and would increase our production.

The next step in mechanical harvesting development is to find the best method to remove the leaves from the chopped sorghum. This should be fairly easy to do by using a small fanning mill or a shaker tray to accomplish this. Once the leaves are removed the sorghum billets can be moved by augers from the wagon through a grinder into the continuous flow fruit press to extract the juice.

REPORT ON SORGHUM EVAPORATOR PAN DEVELOPMENT

In collaboration with G.H. Grimm CO. we redesigned and built a new sorghum evaporating pan that will interchange with a maple syrup evaporating pan. We were quite pleased with the performance of our new pan. It is much easier to use and produces better syrup than our first design. G.H. Grimm CO will use this design with its special features to make pans for other farmers who make both maple and sorghum syrup.

OUTREACH

In March I travelled to Kentucky with the managers from Sugarhill Container CO. to attend the National Sweet Sorghum Producers meeting. I was on the meeting agenda to give a lecture about our seed trials and experimentation with the continuous flow fruit press.

Maplerama, Vermont's annual maple tour, was held in Benn. County August 1st and 2nd. Our sugar house was one of the tour stops for this event. I described the process of making sorghum syrup and gave samples of sorghum to the people who attended. In October Emily and I talked about sorghum at the annual State Grange Meeting. I have had several people inquire about making sorghum and have supplied them with seed and information to get them started. Enclosed are the publications that mention sorghum syrup production in Vermont.

There are a few other things I am working on that are related to sorghum. We have found that sorghum stalks after juice extraction makes good silage for cattle feed. We have tried using a filter press to clean the finished syrup, but found we need a special filter paper and are working with a company in Missouri to come up with the right paper to use. I have saved a good supply of seeds from the different varieties we have grown in our test plots. While attending the NSSPPA meeting, I met a fellow from North Carolina that is growing seventy different varieties of sorghum and plan to trade seeds with him this spring. I am also working with the Vermont Department of Agriculture to get the Seal of Quality established for sorghum syrup.