

PRACTICAL PROBLEMS OF A SUGAR MAPLE SELECTION PROGRAM

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In the spring of 1962, the Northeastern Forest Experiment Station at Burlington, Vermont, initiated a program to select sugar maples for high sugar content in sap. The more important problems that were encountered, and the way they were overcome are reported in this paper.

The first and most obvious need for the program was to develop a method for making initial field selections that would minimize environmental influences. We also needed some form of a survey to locate the areas in which it would be most profitable to concentrate selection efforts. Also, it was apparent that the genetics staff at Burlington was too small to carry out the magnitude of field work needed to make a selection program effective.

After 2 years of exploratory study, a satisfactory procedure for making field selections was developed; the details of this procedure were reported earlier in the 11th Proceedings of the Northeastern Forest Tree Improvement Conference.² Essentially, we used a system of progressive sampling to survey sugarbushes and to locate potentially plus trees. The performances of surrounding standard trees were used to determine the future value of selected trees.

The problem of formulating a set of criteria for making initial field selections was considered in conjunction with the development of the selection technique. The criteria could not be set too high because this might result in too few trees being located. By the same token, if the criteria were set too low, too much time might be used documenting trees that would have little value for the program. The selection criteria finally adopted required that the selected tree exceed the average sweetness of four or five surrounding standard trees by a minimum of 30 percent and that it be at least 1/2-percent sweeter in absolute sugar value than the sweetest of the standards. We were quite fortunate in our choice of criteria, because we ended our program last year with about the maximum number of trees that we could handle adequately.

As mentioned earlier, we could not cover an area large enough to make the selection program a realistic one with our small staff. We were able to solve this problem by enlisting the cooperative aid of state forestry and extension service organizations, educational institutions, and sugar producers in six of the more prominent sugar-producing states in the Northeast. These were Maine, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont. Selection committees were set up in cooperating states to act as liaison groups between the genetics staff of the Experiment Station and the men in the field. These committees helped disseminate information and served as clearing houses for collected data.

A program for training the more than 70 fieldmen, who were primarily service foresters and extension agents, was set up in strategic locations throughout each of the six cooperating states. Without the wholehearted cooperation of these men, our program could not have been carried out successfully.

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² Gabriel, W. J. Selection of sugar maples for high sugar content in sap, development of procedures. NE. Forest Tree Impr. Conf. Proc. 11: 8-11, 1963.

Field screening of selected trees posed the problem of how to rate selections according to their possible genetic worth. An index system of scoring was developed that evaluated similarities between the standard trees and the corresponding selected trees for certain gross morphological and environmental characters (table 1). The index values obtained for diameter, height, and distribution were based on actual measurement crown, insect and disease damage, and topography were scored according to estimates made by the screening geneticist. The score obtained, together with the degree of superiority for sugar production shown by the selected tree over its standards, was used to determine whether or not a selection candidate would be placed in our plus tree catalogue.

Table 1.--Scoring of standards for similarity to selected tree

Character or factor	Index number	Limits
Diameter	0	± 0-10 percent of selected tree diameter.
	1	± 11-20 percent of selected tree diameter.
	2	± 21-30 percent of selected tree diameter.
	3	± 31 percent and over of selected tree diameter.
Height	0	± 0-10 percent of selected tree height.
	1	± 11-15 percent of selected tree height.
	2	± 16-20 percent of selected tree height.
	3	± 21 percent and over of selected tree height.
Distribution	0	Within 0-25 feet of selected tree.
	1	Within 26-40 feet of selected tree.
	2	Within 41-60 feet of selected tree.
	3	Beyond 60 feet of selected tree.
Crown, Insect damage, Disease damage, and Topography ^{1/}	0	Completely comparable to selected tree.
	1*	Some variation but still considered comparable.
	2*	Considerable variation, comparability questionable.
	3*	Not comparable to selected tree.

^{1/} Separate scorings for each of these factors.

* Indicate under remarks on Final Field Screening Form how standard differs from selected tree.

Figure 1 is an actual record of a screening made in 1966; the cover picture shows the standards and the selected tree described in fig. 1. We have found that photos taken of these selection units have helped us decide which trees were to be retained as plus trees in our program.

Using the procedures described here, we conducted surveys in 279 sugarbushes in six states. Out of more than 21,000 trees that were tested, we accepted 237 trees as selection candidates. After screening each of these selections, we finally selected 27 trees to be used as parental stock and as sources of clonal material in our improvement program.

Figure 1.--Final Field Screening Form

NY (11-65): 1 (76-65)
Survey Number

1
Catalogue Number

FINAL FIELD SCREENING FORM

Name of Tree Owner: Harris Lester
Last Name Initial First Name

Address: RD #1 Wellsville, New York

COMPARATIVE PERFORMANCE: SELECTED TREES VS. STANDARDS

1. Sap Sugar Concentration

Date of Test	Selected Tree	Percent Sugar Standards					Standard Average	% Gain
		1	2	3	4	5		
4/ 9/65	3.2	2.2	1.8	2.1			2.0	60.0
4/15/65	3.2	2.0	2.1	1.8			1.9	68.0
4/16/65	3.4	2.2	2.1	1.6			1.9	78.0
4/ 4/66	2.9	1.5	2.1	1.6	2.1		1.8	52.0

2. Environment and Morphology Comparison of Standards and Selected Tree

							Total
(1) DBH	Inches	12.3	11.2	12.8	10.4	10.9	
	Index		0	0	1	1	2
(2) Height	Feet	72	65	70	60	68	
	Index		0	0	1	0	1
(3) Crown			0	1	1	0	2
(4) Insect Damage			0	0	0	0	0
(5) Disease Damage			0	0	0	0	0
(6) Topography			0	0	0	0	0
(7) Distribution			0	1	0	1	2
Total Index							7

(3)-(7) Only the index number is entered.

Sketch map of tree locations. O₃ O₄ O₈

Remarks: Hebblethwaite & Arnold Allegheny County
#3 standard has more crown than selected tree. O₂ O₁
#2 standard has more crown than selected tree.
Photo #14 GOOD PROSPECT!
Graves tree photo #13 4/4/66 screened by WJG alone.