"SALTY" SYRUP FROM ROADSIDE SUGAR MAPLES IN DECLINE

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October 1987

FINAL REPORT

We had two objectives in the study of sugar maples which showed signs of decline and stress on a roadside where deicing salt was used in the winter. One goal was to determine If tree stress is related to the levels offsodium and chloride in their sap and in the groundwater and soil around their roots; and, if so, to develop methodology approved by the Association of Official Analytical Chemists (AOAC) that would allow any laboratory to use a standard method to assess maple tree decline due to sodium and chloride effect. The second goal was to evaluate the quality of the syrup processed from sap aseptically collected from maples in decline. We are updating here the later objective of the project that is of interest to the sugar maple producers.

From our study we chose sugar maples from three different groups: 1) healthy In a sugarbush (N = 9); 2) in decline for unknown reasons in sugarbush (N = 3), and 3) in decline along a rural road where deicing salt is used (N =9). We have previously described design and methodology used for the study (1,2,3).

Analyses of maple sap and syrup[1], and groundwater and soil[2] were performed for sodium and chloride by atomic absorption and ion chromatography respectively (2). Saps were aseptically collected (N = 103) during two sap flow seasons and samples with enough sap were boiled to syrup (N =61). However, not all syrup samples had enough syrup for the chemical analysis.

RESULTS

Analysis of variance and Duncan's multiple range test of the data obtained from the study showed that the level of sodium and choride in syrup processed from sap of roadside maples in decline was significantly higher ($p = .05$) than their level in syrup processed from sap of the other two groups of maples (Table 1). The reason is because the level of sodium in sap of roadside maples in decline and in the ground water and soil around their roots was very high. Table 2 shows the levels of sodium in the sap of the three groups of maples, and in groundwater and soil around their roots. We wish to bring to your attention what we have already presented in our progress report (1), mainly that the syrups processed from roadside maple sap were found by 4 testers to have an off-flavor described as "salty", which was correlated with the high sodium levels in those syrups. It is clear that the sodium and chloride levels in sap does further concentrate in the processed syrup (4) .

DISCUSSION

The results clearly indicate absorption of sodium and chloride into sap of road-side trees from deicing salt that leaches in the groundwater and soil around their roots. The high level of these elements in sap seems to affect the health of the trees as well as the flavor grade of the maple syrup. If rural roadside maples are so affected, then maples on roads

where deicing salt is more heavily used are in even greater stress. Also sand, used in many areas, may be heavily mixed with salt.

We recommend that maple syrup producers who collect sap from road-side trees do not mix it with sap from a sugarbush to avoid overall syrup off-flavor. We also suggest that, when possible, sand without salt be used on rural roads to maintain our safety as well as tree health.

[1]Support for this part of the project has been provided by the Vt. Agr. Exp. Sta. Hatch funds (1984-1987); and, in part, by the NAMSC (1985), Florence and Bob Lamb (1985), Chittenden County (VT) Maple Sugarmakers (1985), Rut-land County (VT) Maple Sugarmakers (1985) and the Internat'l Soc. Arboriculture (1984). We gratefully acknowledge their support.

[2]Support for this part of the project has been provided, In part, by the VT Dept. Agr. (1985) and the Chittenden County (VT) Maple Sugarmakers (1986, 1987). We gratefully acknowledge their support.

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Acknowledgements. We thank S. Cutting, W. Clark, G. Audette, H. Marckres and B. Martell for tasting the syrups, and L. McElvany and D. Ross for the chemical analyses and D. B. Howard for the statistical analysis.

Table 1. Sodium and chloride in syrup from aseptically collected sap of three different groups of sugar maples. Reported in parts per million (ppm).

Element	Healthy Sugarbush trees in trees	Roadside trees in decline	Sugarbush trees in decline
Sodium Analyzed by atomic absorption	9.0 (mean)	327.9	45.5
	1.0-44 (range)	35.0-750	1.3-230
	16 (number analyzed)	14	6
Chloride Analyzed by ion chromatography	92.9 (mean)	170.2	78.3
	31.0.-191.0 (range)	65-432.0	18.0-62.0
	16 (number analyzed)	14	6

Table 2. Sodium in sap aseptically collected from three different groups of maples, and in groundwater and soil around their roots. Reported in parts per million (ppm).

Population of sugar maples	Soil 1-3”/10-24”	Groundwater	Xylem sap
In decline roadside	63.1/50.2 (mean) 8/6 (number analyzed)	210 5	26.6 23
Healthy sugarbush	9.6 (mean) 5 (number analyzed)	1.8 10	0.05 15

Citation: M.F. Morselli, and M.L. Whalen. 1987. "Salty" syrup from roadside sugar maples in decline. Maple Syrup Dig. 27(4): 23-24.