

SHOULD LATERAL LINES BE VENTED?

B. Stowe, T.D. Perkins, and T.R. Wilmot
The University of Vermont
Proctor Maple Research Center
Underhill Ctr., VT 05490

Maple producers with gravity tubing installations are sometimes concerned that their 5/16" lateral lines are full of sap that doesn't appear to be moving, or appears to be moving very slowly. This phenomenon is often observed in areas without appreciable slope, but can also be found on installations on sloping ground. When a spout is pulled out of a tree near the end of such a line, the sap in the lateral line suddenly begins to rapidly flow towards the mainline as though it were locked up and then suddenly released. This appears at first glance to be a strong argument for venting sap lines on gravity tubing systems. While early on in maple tubing research and application, the use of venting was sometimes thought to be advantageous, a substantial amount of prior research has demonstrated that closed systems almost always yield more sap (Blum 1967, 1968, Morrow 1972), with the consequence that the long-standing recommendation is to NOT vent lateral lines. A great deal has changed since the 1960s and 1970s in terms of maple production and recommended practices, especially given the introduction of the new polyethylene tubing formulations and new types of spouts. Consequently, we are occasionally asked whether lateral lines in gravity tubing installations should be vented. As a result of these questions, we compared sap yield from standard non vented (closed) 5/16" lateral lines alongside a vented 5/16" installation under gravity conditions.

Two treatments were installed in the sugarbush at The University of Vermont Proctor Maple Research Center in Underhill Center, Vermont, in the spring of 1999. The trees used in this study were of similar diameter and the site was relatively homogenous. All treatments utilized 5/16" rigid polyethylene line (Leader 30P) with 12 drop lines of equal length. The first treatment was a standard, non-vented (closed) tubing installation. The second installation was identical except for the addition of a vent tube extending up from the last spout at the upper end of the 5/16" line. All spouts used in this study standard non-vented lines produced 47.0% and 7.8% more sap respectively than did vented lines (Figure 1). Over the two seasons, un-vented lines produced an average of 27.4% more sap than vented lines. While it is possible that in some years the difference in yield between an unvented system and a vented system might be due to taphole drying at the end of the season, we did not observe this, as all sets of tapholes were still running (although slowly) until the seasons ended due to buddy sap. In our experiments, there was a slight difference in sap volume production on each collection day (Figure 2), indicating that the important factor (for at least the two seasons during which the study occurred) was a difference between the two treatments which occurred on a daily basis. This difference was most likely the result of vacuum created in the closed system.

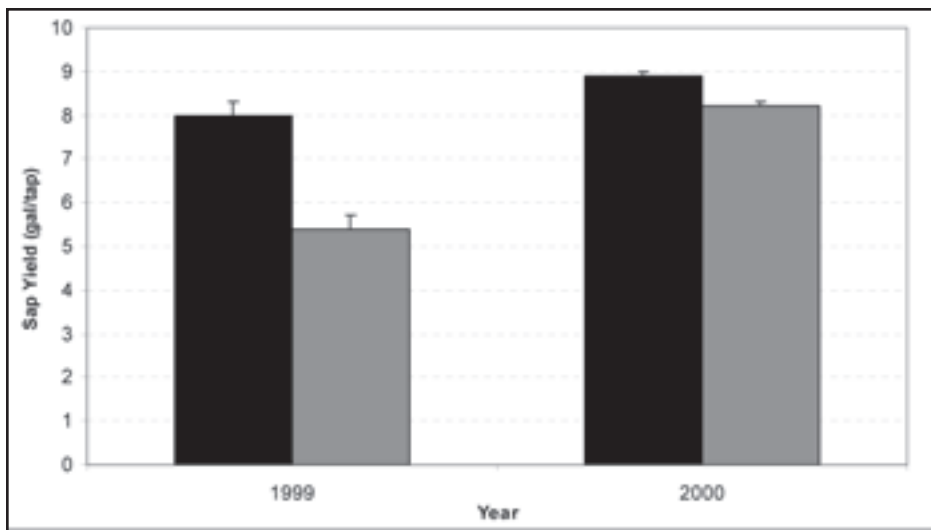


Figure 1. Total seasonal sap yield (average gallons of sap produced per tap) from closed/unvented (black bars) and vented/open (gray bars) lateral tubing systems during the 1999 and 2000 sugaring seasons in Underhill Ctr., Vermont.

When sap is flowing, the weight of the sap in the lateral line creates a suction (vacuum) on the tapholes in that line. This vacuum can be considerable when flow is rapid. For example, 12 feet of sap in the line can create a suction up to 10.5" of Hg. According to Morrow (1972) sap production in a closed system can occasionally be twice that of vented system.

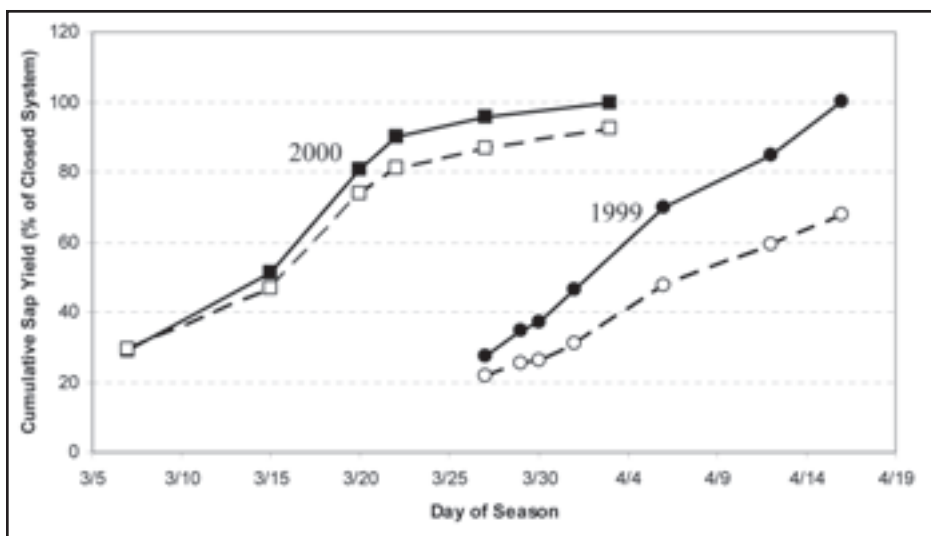


Figure 2. Cumulative sap yield (% of control "closed" system) for the 1999 and 2000 sugaring seasons in Underhill Ctr., Vermont. Solid (filled) symbols represent closed systems. Open symbols represent vented systems.

Venting of tubing systems was originally devised as a way to overcome air locks created when lateral lines were laid on the ground. Because these ground lines invariably had places where the sap needed to run uphill for a short distance, venting kept the sap from stalling on these humps. Modern tubing practice (since the early 1960's) dictates that lateral lines should be tight, straight, and consistently downhill (and suspended in the air, not laid on the ground). This is especially important in gravity systems where vacuum cannot overcome an occasional uphill grade. If the whole system can drain itself, then it is pitched correctly. While sugarmakers may be concerned about the seeming visual lack of movement of sap through a non-vented system, sap is in fact moving through the lines, although it is not readily apparent.

LITERATURE CITED:

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