Research: Tapping

Timing of Spout and Dropline Deployment Has No Effect on Sap Yield

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Sap yields in tubing systems are strongly influenced by sanitation practices used in collection systems, particularly close to the taphole (Perkins and van den Berg 2012). Taphole "drying", due to microbial plugging of tapholes, is highly related to spout/dropline sanitation (Perkins et al. 2018). Several strategies to reduce microbial contamination of the taphole are useful in improving sap yields and net profits, particularly in vacuum tubing system operations (Perkins et al. 2019). In general, replacement strategies produce higher net profits than cleaning or sanitizing with chemicals. These methods typically involve the use of new standard or new check-valve spouts each year, and periodic replacement of droplines.

However, if conducted during tapping, putting on a new spout or dropline can slow down the process, delaying completion of tapping during a critical time period when there is considerable uncertainty about when sap will begin to flow. Use of the stub spouts and spout adapters can speed up replacement of spouts/adapters during tapping to some degree, but due to a wider range of spout choice, availability, cost and other considerations, some producers prefer entire spout replacement to the use of adapters. To ensure tapping progresses quickly, some producers install new spouts or replace droplines in the late-fall or early-winter while repairing lines at a time when snow depth is typically less. Therefore, when tapping does start at some point later in the winter it can proceed at a faster pace. This approach however does raise the question of whether deploying spouts and droplines well before tapping might lead to reduced levels of sanitation, since if they are placed in the field early they might conceivably get contaminated while in the woods in the timeframe between deployment and tapping. In this case, early spout deployment might not achieve the highest levels of sanitation, and lower yields might be expected compared to if spouts or droplines were deployed during tapping.

This aim of this project was to determine whether early spout and dropline deployment before tapping could be used while maintaining good sanitation levels and high sap yields.

Methods

Research was conducted in the "Red Series" section of woods at the University of Vermont Proctor Maple Research Center in Underhill Center, Vermont, prior to and during the spring sap flow season of 2021. Sixteen mainlines, each serving an average of 80 trees, were used. Each mainline was connected to its own custom Lapierre mini-releaser

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equipped with a counter to record the number of dumps. Releasers were calibrated in place to allow the calculation of total sap production per mainline for the season. The entire system of mainlines was connected to a common Busch 1142 rotary claw vacuum pump on a VFD pulling an average of > 27" Hg throughout the 2021 season.

All mainlines were the same age. All droplines and spouts (polycarbonate, non-CV style) were new. Five mainlines were randomly selected to have new spouts and droplines installed and left dangling (not inserted onto tees) in mid-October 2020. A second set of five mainlines had new spouts and droplines installed in mid December 2020. The final six mainlines had spouts and droplines installed in mid-February 2021 during tapping. Trees with new spouts and droplines deployed in October and December 2020 were tapped at the same time as those installed in mid-February 2021.

Results

In general, the fall and winter in northern Vermont during the study were not unusual in terms of temperature. Mid-late October 2020 into early-November was slightly warmer than normal, but after that through mid December 2020 were slightly colder than the long-term average (Figure 1). The remainder of the winter and spring through late-March 2021 was several degrees warmer than typical, but not extremely so. Average daily temperatures from mid October 2020 through mid-February 2021 tended to be below freezing.

Light sap runs began February 28, 2021 (less than two weeks post-tapping), with more normal, heavier sap flows beginning in mid-March and continuing through April 7, 2021. Overall sap production over the season was slightly below average, but sap sugar content during the 2021 season was almost 0.5°Brix below normal.

Total average sap yields were essentially the same (not significantly different) for all spout deployment dates in mid-October, mid-December, and mid-February (Figure 2). This suggests that the level of microbial contamination of spouts between deployment in mid-October and mid December until sap flows began in late-February was not sufficient to affect the level of taphole drying. This may be because the prevailing cold temperatures during the period sufficiently inhibited microbial, and or that the lack of lack of nutrition (sugar) for microbes on and in spouts doesn't allow microbes to become established.

Although based upon a single year at a single location representing only one set of weather conditions, it appears that deployment of new spouts onto droplines up to several months prior to tapping, as long as temperatures are expected to remain cold, might be a useful strategy to utilize labor during a slower period of time and that an adequate degree of spout sanitation is maintained to not negatively affect sap yield during the subsequent spring flow period. A follow up study will examine the

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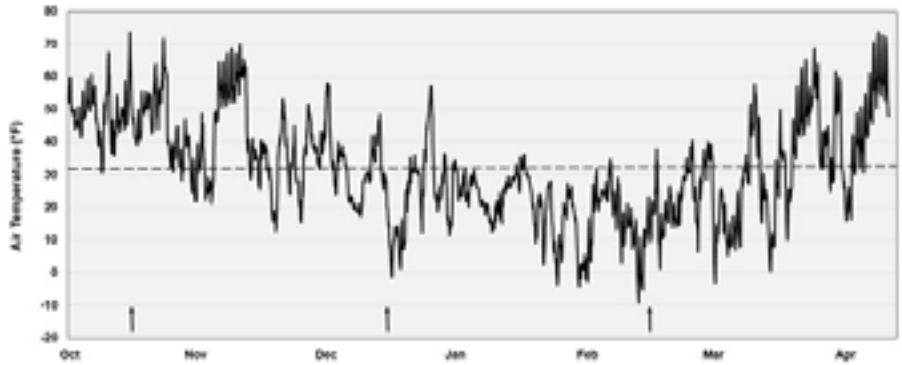

Figure 1. Air temperature at UVM PMRC in Underhill, Vermont, during the study period from October 2020 through April 2021. The dashed line represents the freezing point (32°F). Arrows along the bottom of the graph indicate the approximate time periods of spout and drop deployment in mid-October and mid December 2020, and mid-February 2021. Tapping was conducted during the spout and drop deployment in mid February. Raw data available are at: https://www.uvm.edu/femc/data/archive/project/forest-environmental-monitoring-canopy-tower/dataset/raw-forest-canopy-meteorological-tower-data Duncan J., and C. Waite. Forest Canopy Meteorological Tower Data. University of Vermont. FEMC.

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timing of spout deployment on used droplines on sanitation and sap yield.

Acknowledgements

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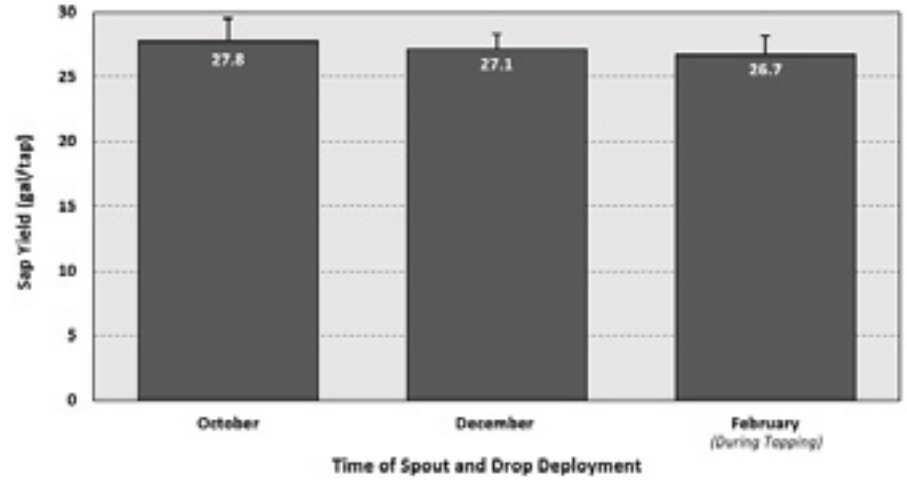

Figure 2. Effect of timing of spout and drop deployment on average sap yield (+ SE) during the subsequent flow season. All treatments were tapped in mid-February. Differences in sap yield are not statistically significant. N = 5, 5, and 6 mainlines averaging 80 trees each respectively.