INDUSTRY **NEWS**

Drop and spout sanitation review

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UNDERHILL Ctr., Vt.—Considerable research has been conducted by the Cornell Maple Program and University of Vermont Proctor Maple Research Center on the effects of spout and tubing sanitation on improvements in sap yield and economics.

While much of this has been presented previously, most notably in the New York State Maple Tubing and Vacuum System Notebook (Cornell Maple Program, County Cornell Cooperative Extension and the New York State Farm Viability Institute), that resource presents the information on an annual basis, so comparing results over several seasons is difficult.

In practice, many sanitation strategies are carried across multiple seasons.

Therefore, understanding how the choices made to achieve good sanitation affects sap yield and maple producer economic gain across several years is important in the decision-making process.

In this review, we use the studies done at the Cornell Arnot Forest to compare the multi-year production of sap and the financial cost-benefit relationships.

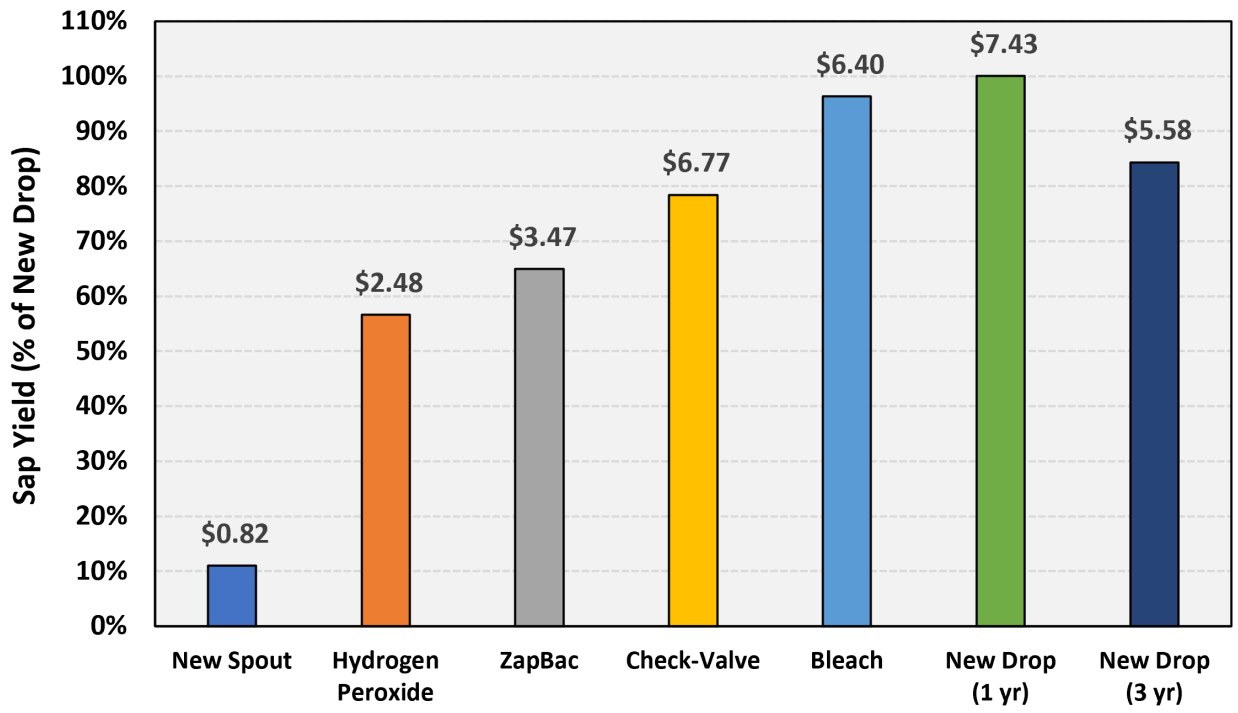

FIGURE 1. Sap yield for several sanitization approaches relative to New Drops and Spout Control treatments (100%) over several years at the Cornell Arnot Forest. Values above each bar represent the estimated net sap value based upon an average syrup yield of 0.35 gal/tap with a sap value of $0.50/gal after material and labor costs are subtracted. Different sap yields, different sap values, and different costs would produce variable, but proportional results.

Field methods used to test sap yield are described within the Notebook and are not repeated here. For comparisons over several seasons, averages were made for sap yield for each treatment and compared to the results from using new drops and spouts across the same time period.

The number of years a sanitation strategy varied, but typically ranged from 4-7 for several of the treatments. Zap Bac® spouts were tested across only a single year.

Replacement with new spouts was tested for several years, however most years included rinsing with water. It was later realized that the rinse water was chlorinated (thus contributing to the sanitizing effect), so only one year of data was used.

While this analytical approach did not directly compare sanitation strategies for the same time periods, the number of seasons involved in most comparisons was likely sufficient to give a reasonable indication of the sanitation response.

Year-to-year variation in the effectiveness of sanitation strategies depended upon the temperatures and length of the season.

The sanitation strategies tested produced a range of average sap yield improvements relative to the New Drop and Spout Control treatment (Figure 1), which was indexed to 100%. Results ranged from a low of 11% for replacement of new spouts alone to a high of 96.3% for Bleach (sodium hypochlorite). Other approaches produced a range of responses in sap yield. Hydrogen Peroxide (H2O2) produced a sap yield only about half as good as New Drops and Spouts.

New ZapBac spouts resulted in a 64.9% increase in sap yield in the one season they were tested. Leader Check-Valve Spouts yielded an average sap yield increase of 78.4%.

While generally producing the highest comparative sap yield, in practice, droplines in the New Drops and Spouts treatment are rarely replaced annually, but most commonly are swapped out on a time-based rotation, with three years being common.

Therefore, sap yield for New Drops and Spouts was calculated over multiple years based upon putting a New Drop and Spout in the system in the first season and replacing with only a New Spout over the subsequent two seasons to get a composite yield over three years.

With this approach, sap yield is estimated to be 84.3% of control based upon research at the University of Vermont.

Although sap yield is important, to get a fuller picture of the financial aspects of spout and tubing sanitation, factoring in the cost of implementing each sanitation strategy is also a prime consideration.

When the estimated cost of materials and labor are factored in, the economic benefit of each approach can be assessed.

The value above each bar in Figure 1 represents the estimated economic gain per tap for each of these sanitation strategies (using a fixed value for sap of $0.50/gallon).

Using New Spouts alone produced a net increase of $0.82/tap and is clearly the least economically advantageous approach to spout/tubing sanitation, but nonetheless results in some benefit if nothing else is done.

Hydrogen Peroxide resulted in a gain of $2.48/tap due to both the relatively low sanitizing efficacy as well as the relatively high cost of the sanitizer itself and the labor cost of implementation (note: none of these assessments include the additional cost of any equipment necessary to apply the sanitizers).

New ZapBac spouts performed better in the single year of testing, with a sap value of $5.75/tap.

Given that kill efficacy drops off over successive seasons, and these spouts are recommended to be used for multiple years, the net profit would drop off if that practice were used. it is probably more advantageous to simply replace ZapBac spouts annually rather than use them for multiple seasons as recommended.

Leader Check-Valve Spouts produced an estimated annual net profit of $6.77/tap.

Results using Check-Valves are typically far less sensitive to dropline or lateral line age than if replacement with regular spouts is used.

Sanitation with Bleach can produce close to the same sap yields as New Drops and Spouts. Although the material itself is inexpensive, the labor costs involved in applying Bleach followed by the rinsing of tubing systems will typically produce marginally less profit ($6.40/tap) than using Check-Valves.

Replacement of Drops and Spouts each year would produce the highest sap yield increase, but is generally impractical for most operations.

Replacing Drops and Spouts on a 3-year rotation (replacing droplines every 3 yrs with annual replacement of spouts) produces a net improvement of sap yield above that of replacing with New Spouts or Check-Valves alone, but the drop-off in sap yield in years 2 and 3 combined with the cost of materials and labor in constructing and deploying new drops as well as removing old drops reduces net profit to $5.58/tap.

If drops are not replaced regularly, sap yield will continue to drop for at least 5-7 years after initial drop replacement, with concomitant reductions in net profit over time.

Although isopropyl alcohol (IPA) as a sanitizer was not directly assessed in this work, other studies have shown it produces sap yields in the 60-70% range, about the same or slightly better than ZapBac spouts and just below Check-valves.

The high cost of the sanitizer, the high labor cost involved in applying the sanitizer, and the need to allow some sap to run on the ground at the beginning of the season reduces net profit somewhat below the top net profit approaches (New Drops and Spouts, Bleach, and Check-Valve Spouts).

It should be noted that the use of IPA for sanitizing maple tubing systems is not permitted in the U.S.

By understanding the relationships between sanitation, sap yield, and net profit, maple producers can use the sanitation strategy that works best for their operation and desires.