Maple Syrup Digest

Vol. 57, No. 3 October 2018

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Small-Batch Sap Beverages
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Greetings from your President

Summer is quickly coming to an end and soon the fall colours will be in full bloom. As I write these notes, we are preparing and planning our next annual maple conference, to be held this year in Concord, New Hampshire. It was 16 years ago that I attended my first conference in New Hampshire, at the Red Jacket Inn in North Conway, and I have represented New Brunswick as an alternate or delegate ever since. As a child growing up I often remember the many trips to visit with our family here, or up north at their camp. It only seemed fitting that I get to preside over my first meeting as President in this beautiful and wonderful state that holds a special place in my heart.

On October 26-29 we will indulge ourselves full force into many topics of interest regarding the production and marketing of the sweet liquid that mother nature provides us each spring. This conference will provide us with valuable knowledge on the latest technology and equipment. It will offer updates on the most current research, valuable technical sessions, and the opportunity to catch up with old friends and make new ones. I hope you will take this opportunity to participate and take in as much of this year's event as you possibly can. There will be four days of meetings, seminars, trade show, meals, tours and renewed friendships. I do hope you will get some time to relax and enjoy.

The Council this year has embarked on a number of projects and tasks. We are continuing with our efforts to revise or update the North American Maple Producers Manual, revising and changing our meeting structure, and continuing with the informative coloured inserts in the Digest twice a year. The website provides information for and about our members, including archived issues of the Digest. Delegates hold conference calls 2-3 times a year and regularly share and discuss issues regarding our industry among ourselves and our colleagues from the IMSI. Our committees have met and discussed many issues and inform and recommend proposals to the Executive Committee and broader membership on a regular basis.

I was flipping through some of my old issues of the Digest the other day and realized that there are only three of us left remaining as delegates from that first meeting I attended back in 2002, only 16 short years ago. Although our delegates and directors are ever-changing our mandate and purpose stay the same. We continue to provide valuable funds and resources to support many important research projects and we strive to better educate our members on the process and production of great quality pure maple syrup.

As we are ever changing, so is IMSI. It is with mixed emotions that I share the news that a great friend and maple colleague, Dave Chapeskie, will be retiring. Dave has been instru-

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mental as the Executive Director for the International Maple Syrup Institute for quite some time. I am not sure how long, but he has been involved with maple and IMSI ever since I started attending these events. Dave has contributed tremendously to the industry and will be deeply missed when he leaves. I would like to take this opportunity to thank Dave on behalf of myself and the NAMSC. Enjoy your retirement, and best of luck on whatever path lies ahead for you.

Feel free to contact me anytime with any issues or suggestions that you may have. Hope to see you all in Concord NH. Safe travels.

Cheers,
David Briggs, President, NAMSC

Cover photo: Wenzel's Sugarhouse in Hebron, CT.

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Assessing Strategies for Spout and Drop Sanitation in 5/16" Tubing: Sap Yield, Cost, and Net Profit

Timothy D. Perkins, Abby K. van den Berg,
University of Vermont, Proctor Maple Research Center
Stephen L. Childs Cornell Maple Program, Arnot Forest

Over the past decade, a great deal of research has shown the benefits of improved spout and dropline sanitation on sap yields. Proper use of sanitizing chemicals and replacement of various tubing system components (spouts, droplines) have both been shown to retard taphole drying and result in higher sap production from trees. However there has not been a thorough side-by-side comparison of cleaning versus replacement strategies both alone or in combination, and more importantly, most studies have not examined the costs of each approach and the resulting net profit per tap of these methods.

To remedy that situation, the University of Vermont Proctor Maple Research Center and the Cornell Maple Program Arnot Forest conducted a multi-year study examining several common sanitation strategies and assessing the effects on sap yield, attendant costs, and resulting net profits. The following graphs briefly summarize the results of this work. A larger report is available by email request (Timothy.Perkins@uvm.edu) detailing methods, along with an Excel-based Economics of Replacement Strategies Model for maple producers to estimate results for their own operations.

Treatments examined included (for spouts/drop, respectively):

- Used/Used (no sanitation treatment, Control)
- Bleach/Bleach (used spouts/drops cleaned with Ca-based bleach)
- Isopropyl alcohol/isopropyl alcohol (used spouts/drops cleaned with isopropyl alcohol)
- Peroxide/Peroxide (used spouts/drops cleaned with Premium Peroxide II Sanitizer)
- New/Used (new spout on used tubing)
- CV/Used (new Check-valve spout on used tubing)
- New/New (new spout on new dropline)
- New/Bleach (new spout on used drop cleaned with Ca-based bleach)
- New/IPA (new spout on used drop cleaned with Isopropyl Alcohol)
- New/Peroxide (new spout on used drop cleaned with Premium Peroxide II)
- New/Water (new spout on used drop cleaned with water)

Cleaning in the UVM studies was done by pulling a small amount (nominally 15 ml) of sanitizing solution through the spout and/or dropline under vacuum. This resulted in a very short contact time (< 1 sec), but mimicked what many larger producers do. The one exception to this was for Isopropyl Alcohol (IPA), which was left in the dropline for an extended period of time to simulate the way this sanitizer is utilized in Canada (note that IPA is not

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approved for use in maple tubing systems in the USA). Sanitizing in the Cornell studies was done by immersing the spouts/drops in the treatment solution for a period of time followed by rinsing with water prior to being deployed in the woods for the 2014 season, or by flooding the entire tubing system with the treatment solution for a period of time, then a water rinse, while in place prior to the 2015 season. This resulted in a long-contact time of the system with the sanitizer. Wash/rinse water at Arnot was from a municipal source, so contained a small amount of residual chlorine. Water at Proctor was deionized well water (permeate).

For the control treatments (used spouts/used droplines), spouts were pulled under vacuum (termed "dry cleaning" in the maple industry). When drops were replaced, tees were also changed.

Sap collection was accomplished under vacuum for all studies at both sites.

Results

The lowest sap yields were found in the used spout/drop (control) treatment that employed no sanitation strategy (Figure 1). Chemical sanitization of used spout/drops resulted in an average improvement of 32.6% greater sap yield, with bleach showing slightly better results than peroxide or IPA. Replacement strategies to achieve improved sanitation produced better results. Putting a new spout on a used (uncleaned) drop resulted in a 47.8% improvement in sap yield. Using a new Check-valve spout on a used drop showed a 62.2% increase in sap yield.

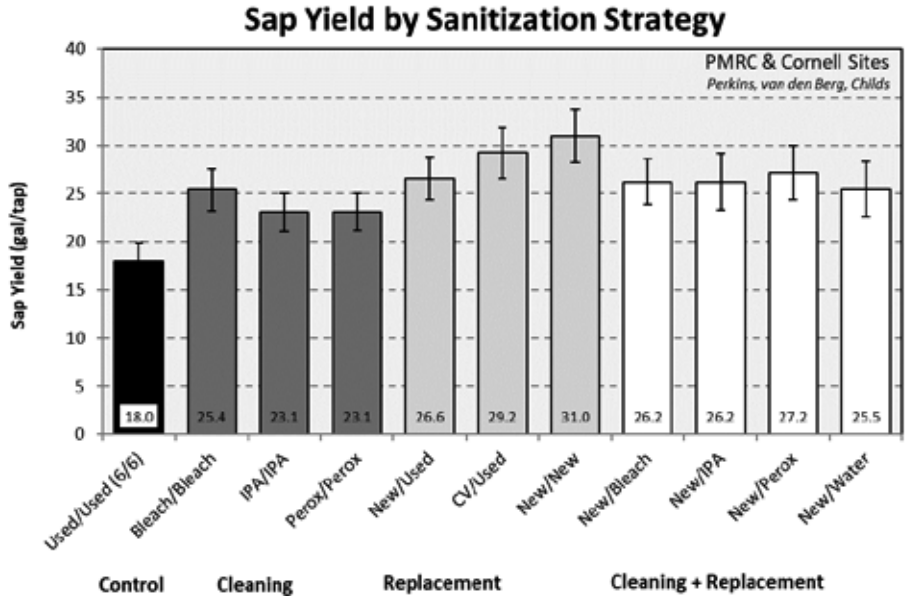

Figure 1. Average sap yield (gal/tap) for all sanitation studies at UVM PMRC (Underhill, VT) and Cornell Maple Program Arnot (Van Etten, NY) sites for 2014 and 2015 sap seasons by sanitation strategy. Controls were used spouts on used droplines. Descriptions for each treatment refer to spout and drop in order. Error bars indicate standard error of the mean.

The maximum increase in sap yield was achieved by using a new spout on a new drop, with a 72.2% increase in sap yield over controls.

Combining chemical sanitation with replacement strategies showed a slight improvement over chemical sanitizers alone, averaging a 46.0% improvement in sap yield, but were not any better than the 47.8% improvement gained from using spout replacement alone on a used, non-sanitized dropline. Interestingly, in the combined treatments, water as a sanitizer appeared to produce as good results as the chemical sanitizers, probably indicating that spout replacement was providing the bulk of the observed results, with the chemical sanitizers providing only a very minor additional effect.

Costs of each strategy ranged greatly, from $0.55/tap for the control treatment (representing labor associated with tapping) to $1.95/tap for a new spout with a new drop (materials, labor to construct and deploy the new drop, tapping). Chemical sanitization costs an average of $1.42/tap, with slight differences among treatment due primarily to the cost of the actual sanitizer used. Both chemical sanitization, whether used alone or in combination with replacement strategies REQUIRES producers to either rinse the system or to allow the first run of sap to flow on the ground. This represents an expense (labor to rinse, or lost revenue of sap) and was included in the calculations. Use of a new spout alone was relatively inexpensive at $0.76/tap (cost of spout plus labor of installing new spout and tapping). Using a Check-valve spout

Tubing sanitation: continued on page 12

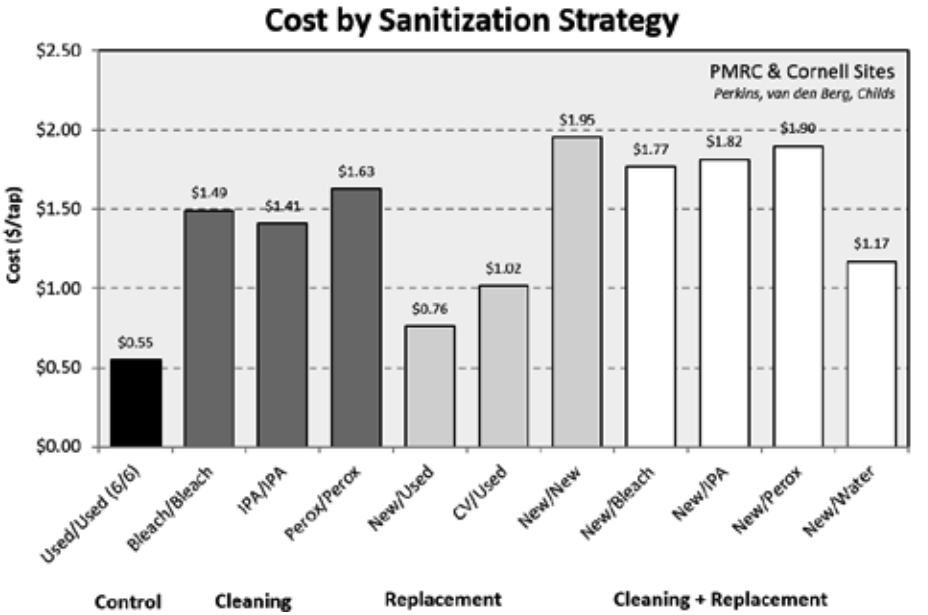

Figure 2. Average cost ($/tap) for all sanitation studies at UVM PMRC (Underhill, VT) and Cornell Maple Program Arnot (Van Etten, NY) sites for 2014 and 2015 sap seasons by sanitation strategy. Costs represent both materials and labor annually for implementing sanitation strategies alone, and do not include other necessary costs of installing or maintaining a vacuum pipeline system.

Tubing sanitation: continued from page 11

was slightly more expensive at $1.02/tap due to the higher cost of this type of spout. An entirely new dropline was $1.95/tap (again, including labor). Combining chemical and replacement strategies was the most expensive approach other than entire spout and dropline replacement, averaging $1.67/tap. Water sanitization was less expensive than the other combined approaches due to lack of rinsing required.

Net profit calculations utilized a sap value of $0.25/gallon. Since changes in sap value vary greatly, and have a large effect on the results, these numbers should only be used as a rough guide. To better understand the net profits in each operation, producers should get a copy of the Excel spreadsheet Economics of Replacement Strategies Model to estimate the best approaches for their own sugaring operations.

In general, ANY sanitation strategy was better than none (Figure 3), however, the highest net profits of the sanitation approaches studied were achieved by utilizing spout/drop replacement strategies. With no sanitation (continuing to employ used spouts and used drops without cleaning or replacement), a net profit of $3.96/tap was realized. Cleaning with chemical sanitizers increased profits by an average of $0.50/tap after costs are factored in, resulting in an average net profit of $4.46/tap. Cleaning drops with chemical sanitizers and adding a new spout increased net profits to an average of $4.90/tap, or $0.94/tap above doing nothing. Interestingly, in the combined chemical/replacement approach, cleaning with water and adding a new spout resulted in the highest net profit in the category, with an average net profit $5.19/tap.

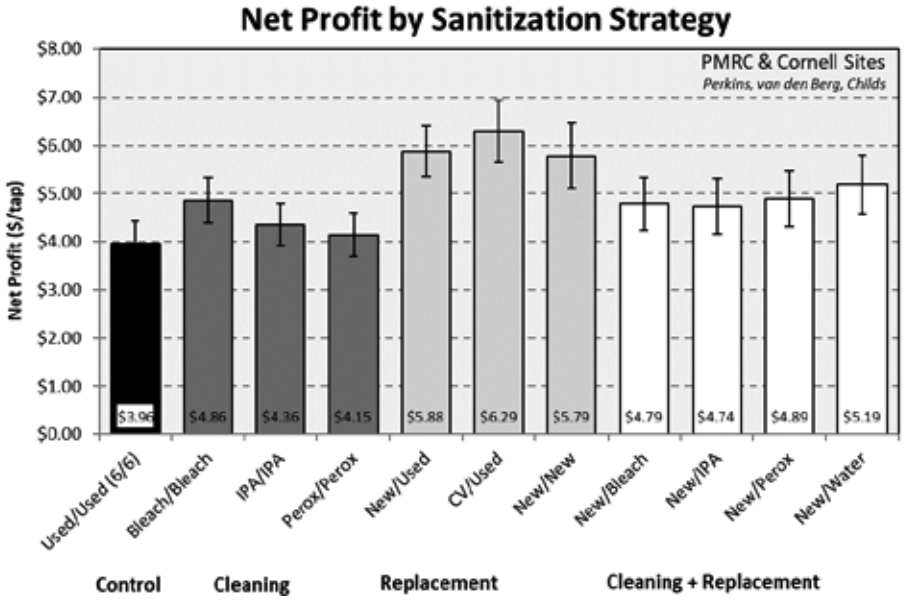

Figure 3. Net profit ($/tap) for all sanitation studies at UVM PMRC (Underhill, VT) and Cornell Maple Program Arnot (Van Etten, NY) sites for 2014 and 2015 sap seasons by sanitation strategy. Values represent value of sap collected minus the cost of implementing sanitation each strategy individually. Error bars indicate standard error of the mean.

Quite clearly however, the highest net profits came from using replacement strategies, with an average net profit of $5.99/tap. Net profit for all three of the replacement strategies tended to be consistently higher than strategies using chemical sanitizers. While complete spout and drop replacement resulted in the highest sap yields, the associated higher cost of that approach tends to reduce net profits slightly. Similarly, while using a new spout on a used dropline results in a modest improvement in sap yield, the low cost of this approach can boost net profits. Using a Check-valve spout on a used drop results in slightly higher sap yields than a new spout alone, and while the increase is less than that found with complete spout and drop replacement, the lower cost of the Check-valve compared to spout-drop replacement typically results in a slight advantage in net profits over both spout replacement or spout-drop replacement.

We note that the long contact time sanitizer treatments provided a higher degree of benefit in terms of sap yield than the short contact time treatments employed, however in some cases the costs are considerably higher as well, so the effects on net profit are variable. Such details require considerably more discussion to parse out, and beyond this brief summary.

Summary

1. Spout and drop sanitation of all types improves sap yields and net profits in 5/16" vacuum tubing systems.

2. Sap yield and net profit is lowest in used tubing systems with no sanitation employed, is better in systems using chemical sanitizers, higher still in combined (sanitizer with spout replacement), and highest with any type of replacement strategies.

3. Within chemical sanitization approaches, long-contact time methods provide better results in terms of sap yield, but the specific approach can alter the costs, and net profits achieved.

4. If using a new spout, use of chemical sanitizers in addition does not increase net profits due to associated higher costs.

5. Within replacement strategies, periodic spout/drop replacement, use of new spouts annually on used tubing, and use of Check-valve spouts on used tubing systems, respectively, tend to provide increasing net profit levels.

6. While replacement of droplines and spouts produces the highest sap yields, the higher cost of implementing this strategy reduces net profits below other approaches (new spouts or use of Check-valve spouts), except where sap yields or sap value are very high.

7. Chemical sanitizer treatments produce some positive benefit, but the net profits tend to be lower and the approach more labor intensive, thus are perhaps more suitable to small-moderate sized maple operations.

Acknowledgements

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Determining Shelf Life and Consumer Acceptability of Processed Maple Sap Beverages for Small Businesses

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Abstract

Consumer interest in local products and functional beverages has increased markedly in recent years. Several beverages composed primarily of maple sap are currently available in the marketplace. These products are sold at ambient temperature, and are considered shelf stable. Prior investigation has demonstrated the need for specialized processing equipment in order to achieve shelf stability of maple sap beverages. The current study investigated the feasibility of producing a refrigerated beverage without the use of commercial processing equipment for small businesses. Acidification with either citric acid or lemon juice did not increase shelf life in heat treated samples and was associated with changes in the visual properties of the beverages. Although boiling was sufficient to produce a beverage with greater than thirty days of refrigerated shelf life, samples were highly susceptible to recontamination, which resulted in spoilage in under one week. All processing methods investigated led to formation of a cloudy precipitate. Several filtration methods were unsuccessful in efficiently removing this precipitate. Consumer acceptability of the visual characteristics of the beverages was also tested, and revealed that the acidified samples were significantly less acceptable than the unacidified control sample. This study suggests that production of a refrigerated sap beverage is possible at small scale, but cannot be recommended due to the difficulty of maintaining a suitably sanitary environment and product. Ongoing experimentation will focus on the feasibility of sap as a substrate for fermented beverage products, which may overcome some of the limitations highlighted in the current report.

Introduction

The market for functional beverages in the U.S. has experienced immense growth in recent years, currently comprising an estimated 59% of the complete functional foods market (Corbo and others 2014). Maple sap is known to be a rich source of minerals and other health-promoting compounds, including antioxidants (Yuan and others 2013), and has potential for use in functional beverage applications, which would allow maple syrup producers to generate additional revenue from their raw material. A number of maple sap beverages are currently available nationally, including Maple Water and

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Sap! maple soda water. These products are aseptically packaged, allowing them to be sold without refrigeration. While this method offers a safe and stable product, it also requires use of very costly processing lines.

Before processing, maple sap is expected to contain a number of different microorganisms originating in the environment, collection system and/or storage vessels. Prior work by researchers in this group showed over one million bacteria per milliliter of unprocessed sap (Calder and others 2016). The types of microorganisms present can change depending on time of season, how sap is collected, how long it is stored and the temperature of storage, but often includes bacteria such as Pseudomonas spp., which can grow even during refrigeration (Filteau and others 2011). In order to produce a commercially viable product, most, if not all of these microorganisms, need to be inactivated by processing. Common methods for accomplishing this goal include heat, addition of salt or acid, and exclusion of air. Even with the correct use of these strategies, many microorganisms are still capable of survival, and their growth during storage leads to microbial spoilage.

A shelf life of greater than thirty days is needed to allow adequate time for processing, transport, merchandising, purchasing and consumption of a typical food product. This project investigated the feasibility of producing a perishable maple beverage using processing methods and equipment available to very small producers. The study also sought to clarify the effects that individual treatments, including heating time and acidification have on microbial populations, as well as the acceptability of the product's visual appearance to consumers.

Research Objectives:

1) Study 1: To determine if boiling at 212°F for different time intervals would extend the shelf life of sap.

2) Study 2: To determine the combined effects of boiling time and acidulant on the microbial shelf life of refrigerated maple sap beverages.

3) Study 2: To identify the primary types of microorganisms responsible for sap beverage spoilage.

4) Study 3: To gain insight into precipitate formation and removal in processed maple sap.

5) Study 4: To assess consumer acceptance of the appearance of sap beverages.

6) To help establish guidance for small maple producers interested in producing sap beverages.

Materials and Methods:

Sap was collected in Somerset County, Maine and transported in clean and sanitized (100ppm bleach) food-grade, plastic buckets to the University of Maine () School of Food & Agriculture's Matthew E. Highlands Pilot Plant. Sap was frozen and held at -10 to -12°C for several months. Prior to the studies, sap was thawed under refrigeration at 3-4°C and then immediately used.

STUDY 1: Heating study

The sap treatments were selected based on an initial study that found higher pasteurization temperatures were more adequate in lowering the microbial load of sap (Calder and others 2016). Boiling temperature (212°F) was selected based on the processing/ visual ease for producers inherent in

the fact that 212°F can be observed as a rolling boil. Treated sap was immediately poured into sanitized glass containers, capped, inverted for 5 minutes and allowed to cool for 30 minutes at room temperature. The containers were then held at refrigerated temperatures (3-4°C) until further analyses. Sap was tested for pH, Brix and also aerobic plate counts (bacteria), yeast and molds using 3M™ Petrifilms™. Analyses occurred on days 0, 3, 7, 14, 21, and 28. The pH and Brix values were analyzed in triplicate replications, while microbial testing was conducted in duplicate reps.

Sap Treatments:

1) Control fresh sap, no treatment

Boiled sap time:

2) 2 minutes
3) 5 minutes
4) 10 minutes
5) 15 minutes

STUDY 2: Heat and acidification study

In order to investigate the interaction of boiling and acid addition to sap, two extended boiling times (10 and 15 minutes), and two commercially available acid sources (citric acid and lemon juice) were combined. Sap was tested for pH, Brix and also for initial microbial population counts including aerobic mesophiles, lactic acid bacteria, fungi and coliforms. All microbial tests were conducted on cultural media, (tryptic soy agar; deMann, Rogosa, Sharpe agar; acidified potato dextrose agar; lauryl sulfate tryptose broth, respectively). Sap was treated as outlined below, stored at 4°C and analyzed periodically during storage for 42 days.

Sap Treatments:

1) Control; unacidified, not heated (C0), boiled for ten (C10) or 15 minutes (C15)
2) Acidifed to pH 4.0 with lemon juice, not heated (LJ0), boiled for ten (LJ10) or 15 minutes (LJ15)
3) Acidified to pH 4.0 with citric acid, not heated (CA0), boiled for ten (CA10) or 15 minutes (CA15)

Heating temperature was selected due to ease of measurement, acidulants were selected according to availability and consumer familiarity. Processing was carried out in UMaine's Food Microbiology Laboratory, a BSL (biosafety level) II facility. Sap was boiled in stainless steel pots, samples were immediately transferred into separate, sterile, disposable 15ml conical tubes, such that each sampling was conducted from a previously unopened tube. Tubes were allowed to come to room temperature and were refrigerated for the duration of the study. Three full, independent study replicates were conducted.

STUDY 3: Precipitate Formation

In a separate set of experiments, the effects of acidification, heating and cooling methods on precipitate formation (previously observed to be associated with processing) were assessed. Samples were heated by boiling for 10 or 15 minutes and were acidified to pH 4.0 by addition of citric acid.

Sap Treatments:

1) Control; unacidified, not heated (UN)
2) Unacidified, heated and cooled at room temperature (UHRT), refrigerator (UHF), or on ice (UHI)
3) Acidified, not heated (AN)
4) Acidified, heated and cooled at room temperature (AHRT), refrigerator (AHF), or on ice (AHI)

Sap beverages: continued on page 18

Sap beverages: continued from page 17

Various filtration methods including the use of cone filters, cheesecloth, centrifugation, and vacuum filtration were assessed. Sample clarity was measured in a spectrophotometer at 580nm.

STUDY 4: Consumer sensory testing

In order to gauge consumer acceptability of the appearance of processed sap products, a consumer test was conducted at the University of Maine Sensory Testing Center. Approval was obtained from the Institutional Review Board for the Protection of Human Subjects. Panelists were recruited by email or through use of flyers posted near the sensory testing center. Random three digit codes were generated for each sample, samples were presented simultaneously in randomized order to each panelist on a white background. Beverages were presented in clear or blue glass bottles (4oz each), panelists were instructed not to open bottles. All samples were boiled for 15 minutes. Treatments assessed were:

1) Unacidified (clear bottle)
2) Acidified to pH 4.0 with citric acid (clear bottle)
3) Acidified to pH 4.0 with lemon juice (clear bottle)
4) Acidified to pH 4.0 with lemon juice (blue bottle)

A blue bottle was used to obscure presence of precipitate, lemon juice-acidified sap was filled into this container because it appeared the cloudiest of treatments assessed. Panelists were asked to rank liking on a scale of 1-9 where 1 corresponded with "dislike extremely" and 9 corresponded with "like extremely". Attributes assessed included clarity, thickness, color and

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overall appearance. Testing was conducted using SIMS software, version 6. Results were analyzed in the same program, compared using analysis of variance followed by Tukey's Honest HSD.

Color was measured instrumentally using a LabScan XE colorimeter (Hunter Associate Laboratory, Inc., Reston, VA). Sap was tested at room temperature in a glass sample cup topped with a white disk. An opaque cover prevented ambient light interference. Reflectance was measured with the white disk backing, an illuminant of D65, 10° standard observer angle, and a 1.75-inch-diameter viewing area. The CIELAB L◎a◎b values were collected. Individual samples were measured in triplicate and sap treatments were analyzed in triplicate to obtain the averages.

Results and Discussion

STUDY 1: Heating study

The untreated sap had a high bacterial load, which ranged from 5.66 log CFU/ml on Day 0 to the highest level detected on Day 21, which was 6.74 log CFU/ml (estimated over 1,000,000 bacterial cells per ml of sap). These counts were similar to bacterial results from our initial study (Calder and others 2016). However, heat treatments were quite effective in lowering bacteria to non-detectable levels, even after only two minutes of boiling (Table 1). During refrigerated storage, untreated sap samples maintained consistent bacterial counts, while the heat-treated sap samples showed slight increases in bacterial growth on Day 21 and 28. By Day 28, the 2 minute sap treatments had TNTC (Too Numerous To Count) levels. Yeast and mold counts were quite similar and ranged from 3.02 to 3.77 log CFU/ml in the untreated sap samples (results not shown). Similar to the bacteria results, the heat treatments were effective in lowering the yeast and mold to non-detectable levels. However, heat treatments were even more effective as yeast and molds were not detected in any of the heat-treated samples during the entire 28 days storage time.

The sap pH levels ranged from 6.0 to 8.0 for all treatments. The untreated sap appeared more acidic than the heat treated samples, demonstrating a pH level decrease during storage from an

Sap beverages: continued on page 20

Table. 1: Average Aerobic Plate Counts (Bacteria, Log CFU/ml) in Maple Sap During Refrigerated Storage

Treatment	*Day 0*	*Day 3*	*Day 7*	*Day 14*	*Day 21*	*Day 28*
Control	5.66±0.07	6.03±0.06	5.99±0.01	6.58±0.02	6.74±0.02	6.48±0.02
2 Min	ND	ND	ND	ND	2.37±0.41	TNTC
5 Min	ND	ND	ND	ND	<1.0	ND*
10 Min	ND	ND	ND	ND	ND	1.22±0.77
15 Min	ND	ND	ND	ND	<1.0	1.12±0.71

Heat treatment was 212° F at the following treatment times:
2 Min = 2 minutes; 5 Min = 5 minutes; 10 Min = 10 minutes; 15 Min = 15 minutes
These sap treatments were not acidified.
After capping, heat treated containers were inverted for 5 min, cooled to room temp and stored at 3-4 deg C.
ND = Not detectable (≤10 CFU/ml); TNTC = Too Numerous to Count
Averages n=6; *Day 28, n=4 for the 5 min treatment

Sap beverages: continued from page 19

initial value of 6.34 to 5.28 on Day 28. The decreasing pH values over time could be due to the microbial activity in the sample jars, which increased during storage. Heating seemed to have an unexpected effect on sample pH levels. The higher the treatment time, the higher the pH levels, and this trend stayed consistent over storage time. The 2 and 5 minute heat treated samples had pH levels > 7.40, while the 10 and 15 minute heat treated samples had pH levels >7.70.

The Brix levels in the untreated sap samples were found to be 2 Degrees Brix (an estimated 2% sugar level), which would be expected in maple sap. However, Brix levels slightly decreased in the 2 and 5 minute treated samples, which was unexpected. For the 10 and 15 minute treated samples, the Brix levels increased, which would be expected since the longer the boiling time, the more water is evaporated from the sap to concentrate the sample sugars. The 15 minute heat-treated sap samples had Brix values >2.50.

During the course of the study, we experienced cloudy sap samples along with a white precipitate across all treatments. These observations were also noted in our initial study (Calder and others 2016). The precipitate could be from denatured amino acids or a mineral precipitate bound to amino acids. Although the Control samples were not heated, the components in sap may be susceptible to cold and/or heat shock which could cause the precipitate to form. These aspects were investigated further in Studies 2 and 3.

STUDY 2: Heat and acidification study

Study 2 took a more in-depth look at the microbial populations present in

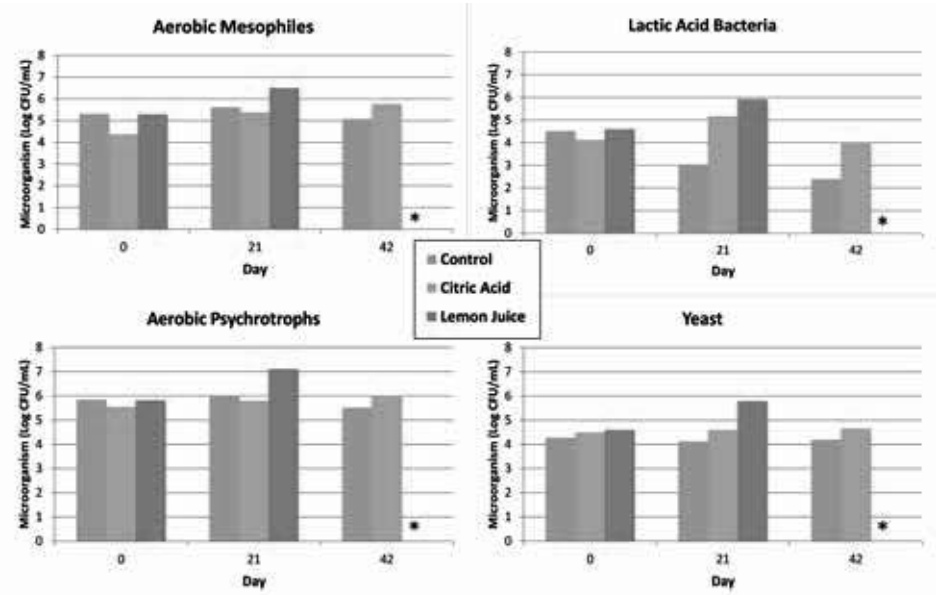

Figure 2: Predominant Microbial Populations in Unheated Maple Sap During Refrigerated Storage. n = 3, citric acid and lemon juice samples acidified to pH 4.0. * This sample was only evaluated for 21 days due to extremely high counts

sap during storage. Coliforms, an indicator of potential fecal contamination and/or poor sanitation, are commonly enumerated in agricultural commodities. Using a standard Most Probable Number (MPN) method, we were unable to detect any coliforms during this study (< 3 MPN/ml). Consistent with the results of Study 1, boiling, whether for 10 or 15 minutes, regardless of the presence or type of acidulant, was sufficient to reduce microbial populations by greater than 5 log CFU/ml. No significant increases in population were observed in any of the heat treated samples (data not shown).

Notably, the addition of acid was not associated with a significant decrease in any microbial populations on Day 0 (Figure 2). In unheated samples, unacidified sap maintained lower counts for yeast and lactic acid bacteria throughout 42 days of storage when compared to sap containing either citric acid or lemon juice. Samples acidified with lemon juice also demonstrated the highest levels of aerobic mesophiles (total bacteria growing at body temperature) and psychrotrophs (total bacteria growing at refrigeration temperature) by Day 21 of storage. Levels of psychrotrophic bacteria were higher in unprocessed sap than any of the other populations tested, and were highest in samples acidified with lemon juice.

STUDY 3: Precipitate Formation

In all experiments conducted to this point, we have observed the presence of haze or snowy precipitate in sap samples during storage. Study 3 was undertaken to assess the factors that contribute to the lack of clarity, and to see whether practical methods for clarification could be employed. Regardless of filtration method, precipitate removal was unsuccessful. While no clear clarity

Sap beverages: continued on page 23

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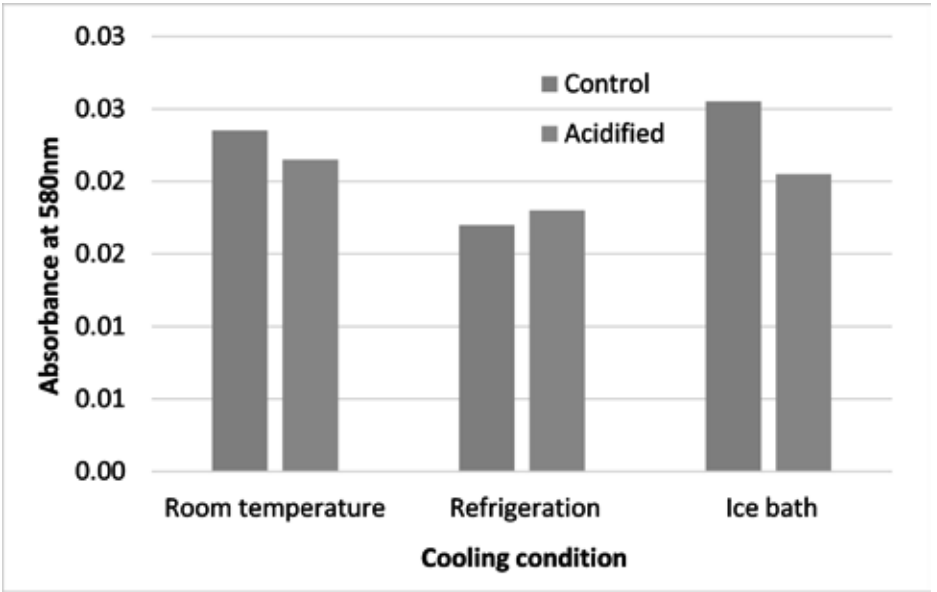

Figure 3. Clarity of Boiled Maple Sap Cooled at Various Temperatures. n = 4. Boiling for 10 minutes. Acidification to pH 4.0 with citric acid.

Sap beverages: continued from page 21

trend was observed according to cooling methodology used, samples cooled under refrigeration demonstrated the least cloudiness (lowest absorbance, Figure 3), but values were highly variable. While investigators suspect that more costly methods, such as membrane filtration, would be successful in clarifying sap, the expense associated with such processing places those methods out of scope for this study. Since it is unlikely that small producers will be able to successfully clarify sap beverages, the effect of appearance on consumer acceptance was investigated (Study 4). Mineral composition analysis of this precipitate is ongoing.

STUDY 4: Consumer sensory testing

In a visual sensory test conducted at the UMaine Sensory Testing Center, 63 panelists rated their liking of the appearance of various sap beverage prototypes. Panelist demographics are displayed in Table 2.

Of the panelists who participated, 64% said they would be interested in trying a maple sap beverage and 83% would consider purchasing the control sample. The maple beverages that were acidified with either acid were liked significantly ($p<0.05$) less than the control (Table 3). Panelists liked the color of the control and citric acid samples significantly more than the samples acidified with lemon juice.

As shown in Figure 4, the lemon juice sample had the highest yellow value of the three samples and most likely the color disliked most by consumers. The primary feedback was the precipitate in the sap was unappealing. The feedback on using a colored bottle to mask the texture of the beverage was mixed, which is likely a result of presenting both clear and opaque bottles in the same test. As previously

Sap beverages: continued on page 26

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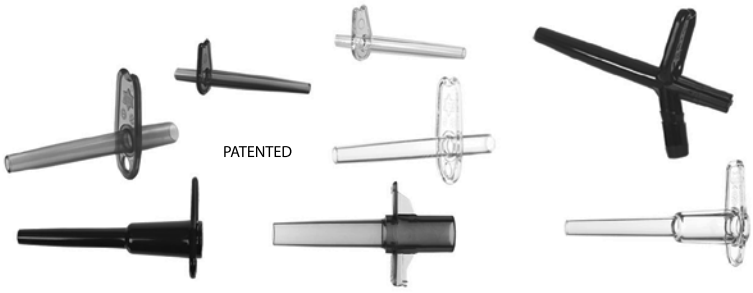

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Table 2. Sensory Evaluation Panelist Characteristics

Attribute	*Response*	*Percentage*
Gender	Male	41.3
	Female	57.1
	Other/Prefer not to say	1.6
Age	18-30	66.7
	31-40	9.5
	41-50	3.2
	51-60	11.1
	61-70	9.5
Functional beverage consumption	At least weekly	25.4
	At least monthly	57.1

Sap beverages: continued from page 23

mentioned, instrumental analysis revealed that the primary color difference among samples was a higher b* value for the sap acidified with lemon juice, which corresponds to a more yellow, less blue appearance (Figure 4).

Appendix: Fermented beverage feasibility

During the course of this project, a limited study was conducted to assess the potential for utilizing mixed cultures of yeast and bacteria to produce a fermented beverage from maple products. Several different kombucha culture systems were utilized for this testing. While the sugar concentration in sap alone is not sufficient to drive successful fermentation, kombucha was successfully prepared from a number of combinations of maple sap and syrup. Traditionally, kombucha is made from black tea sweetened with sugar. We compared beverages with the same total sugar, replacing water with sap, sugar with syrup, or both. During fermentation, pH serves as the primary measurement of progress, with typical product fermentation taking 7 days and producing a product with a final pH of 3.5 – 2.5. Results for this experiment are displayed in Figure 5.

Experimental treatments were successfully fermented, as the substitution of syrup for sugar almost indistinguishable, with both entering the finished product pH range on day 7. The combination of maple sap and sugar fermented fastest, reaching a finished pH after only four days, while the sap and syrup samples fermented the slowest, finishing after 10 days.

Conclusions

Sap is highly perishable and contains a high bacteria and yeast load that could be a potential food safety issue for consumer health. While extended heating of sap appears to be effective in lowering the microbial levels for a shelf life of at least 42 days under refrigera-

Sap beverages: continued on page 28

Table 3. Average Hedonic Scores for Visual Attributes of Maple Sap Beverage Prototypes

Treatment	*Color*	*Thickness*	*Clarity*	*Overall liking*
Control	6.7	6.4	6.6	6.6
Citric acid	6.3	6.2	5.4	5.6
Lemon juice (clear bottle)	5.6	5.9	4.6	5.0
Lemon juice (blue bottle)	5.5	6.0	5.3	5.5

Ranked on 1-9 scale where 1 = Dislike extremely and 9 = Like extremely

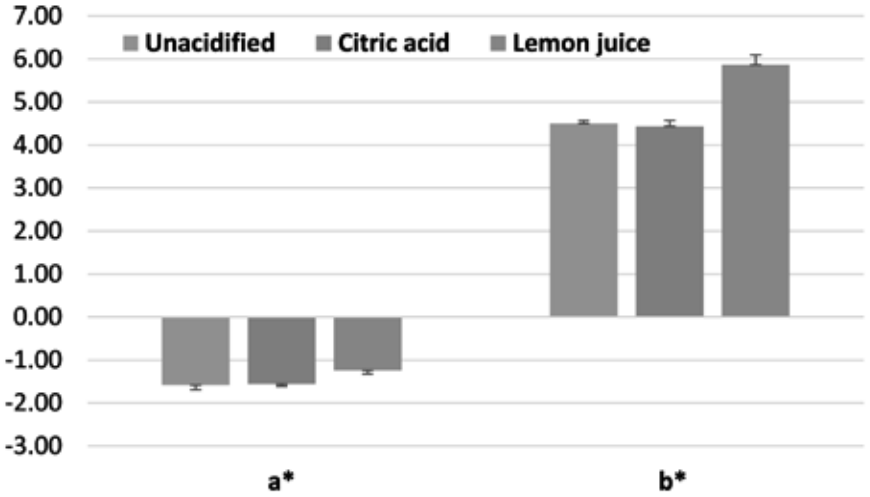

Figure 4. Color Values for Processed Sap Beverages. Error bars represent standard deviation, n = 9. a* ranges from red (positive) to green (negative). b* ranges from yellow (positive) to blue (negative).

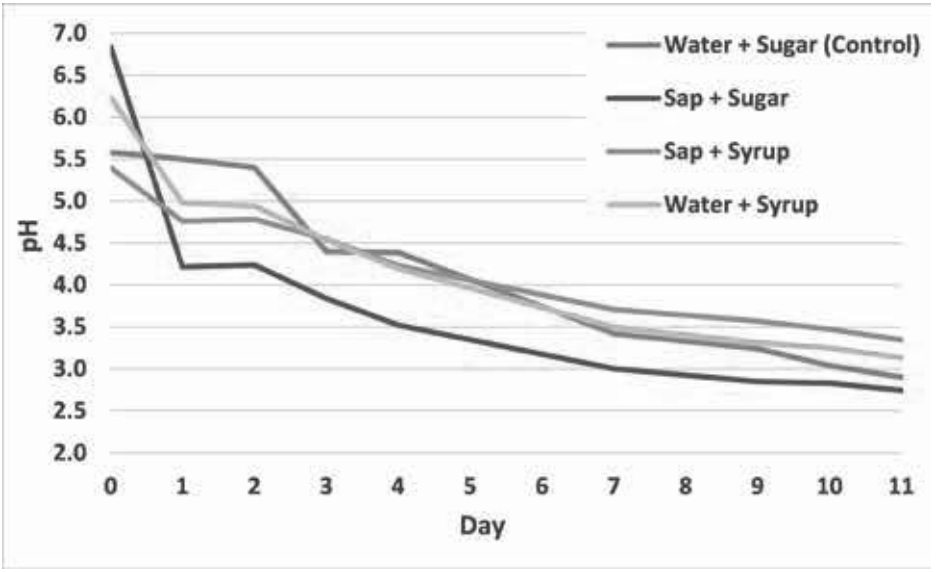

Figure 5. pH of Experimental Maple Kombucha Beverages During Fermentation. n = 3. Initial sugar concentration 10% in all treatments, fermentation carried out at ambient temperature.

Sap beverages: continued from page 26

tion, any sanitation failure resulting in introduction of bacteria from air or packaging is likely to result in rapid spoilage, even when the product is promptly refrigerated. Initial consumer data suggests that people are willing to try maple sap beverages and would consider buying them at retail locations. The acidification of the sap led to a significant decrease in consumer acceptability of the beverages' overall appearance, as lemon juice significantly decreased consumer acceptability of the beverage color.

The production of a refrigerated maple-based beverage at very small scale cannot be recommended due to lack of microbial stability and unresolved issues of product clarity. Initial investigations into the fermentation of sap show promising results, and would likely overcome the main hurdles associated with producing a heat treated, acidified product. More research is warranted to explore options for value-added production from maple sap at this scale, particularly with regard to fermented beverage concepts.

Acknowledgments

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Ask Proctor

Timothy Perkins, Ph.D.
University of Vermont Proctor Maple Research Center

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Will the dry weather affect syrup production next spring?

In many of the maple sap production areas it has been quite dry this summer, some for a second year in a row. We frequently are asked by producers how this might affect the sap run or sap sweetness next year. The real answer is, we can't really be sure. There are several things, however, that we do know.

First off, maple trees are fairly resistant to stress. While some amount of stress is almost always present (and may actually enhance function), it takes a good deal to push the tree systems beyond their ability to cope. When this does happen, it usually is due to what is referred to as "multiple, interacting stresses," which push trees into a "decline spiral." Like a spin in an aircraft, once the tree is headed downhill, it can take some doing for the tree to recover.

So then, what does that have to do with drought? Well, perhaps the tree is already stressed to some degree by overcrowding, or the nutrient levels could be a bit deficient, and maybe there was some insect activity over the past few years that drew down the

Ask: continued on page 30

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Ask: continued from page 29

tree's carbohydrate reserves. When those low-moderate level stresses occur alone, the tree can struggle through without too much trouble, but when you add another stress such as drought to the mix, the decline can begin. If the stress is lengthy, the tree may not have enough reserves to make it through the tough patch. This may occur more often in young (crowded) trees, or in over-mature trees that have naturally slow growth rates. Decline may first be observed as crown thinning (fewer or smaller leaves), foliar discoloration, or dieback at the branch tips. When continued, larger branches in the crown may die, and over a period of time the entire tree may succumb. With drought, this often manifests itself first on the upper shoulder of slopes where soils tend to be a thinner and stonier. Even then, decline from drought often takes a few years to show up.

More often however, what you'll end up with due to a low-moderate drought is reduced radial and branch growth and perhaps a lower amount of carbohydrate stored in that ring (less available soil moisture means the tree has less photosynthesis to produce sugar). This isn't a real big problem, and because sap flow is dictated by the weather conditions during the spring season, and because the sugar collected in any one season is actually a mix of sugars formed over many years (a taphole may cut through 20 or more years of tree rings, with each ring contributing a variable amount of sap and sugar due to the hydraulic conductivity of each ring and the amount of carbohydrate stored in each ring), one smaller tree ring will result in only a muted effect.

So in summary, except in rare situations, drought during the previous growing season probably won't have much detectible effect on sap yield or sap sugar content. If the drought was severe in your area, and you're concerned you might have some decline issues, the most conservative action would be to not tap in those areas, or to tap more lightly for a few years and see if any signs of decline show up.

Photo: Mark Isselhardt

Adding Profits Through Value-Added Products

Olga Peters

Farmers around the country are learning that producing value-added products can be the difference between a sustainable operation and a failing farm. Dairy farms are making cheese, corn growers are making specialty popcorns, and vegetable growers are processing their crops into sauces and other prepared foods. Sugarmakers are leaving money on the table if they don't consider doing the same, say experts.

The tried-and-true value-added maple products include candy and cream, and many producers have taken advantage of these products already. Some have gone further, adding maple products like ice cream, maple cotton candy, and maple-coated popcorn or nuts. More adventurous sugarmakers have begun making additional items, like salad dressings, hot sauces, and dog biscuits.

Helen Thomas, executive director of the New York Maple Producers Association, said adding new products helps a sugarmaker's bottom line. A product line with variety attracts the modern consumer to all of a farm's products, she said.

"If the line is so limited [to syrup] you're missing the interests of probably 90 percent of customers out there," she said.

And missing out on potential profits, she adds. Value-added products have a higher return on investment than a gallon of syrup. A $55 gallon of syrup can be turned into molded candy worth $120 to $150.

There are some challenges, she cautions. Navigating state regulations, maintaining a quality product, remaining efficient, and building a customer base takes time, practice, and resources.

Thomas recommends first understanding your state's regulations, which may determine the easiest value-added products to make. Pure maple products, like cream or candy have the lowest threshold for regulations, financial investments, and special equipment. Move into the realm of adding other ingredients such as popcorn, vinegar, or nuts, and stricter regulations kick in depending on the state's rules.

"Do pure maple," she said. "Do it well and package it attractively."

Another consideration is the additional labor, warns Cornell Maple Specialist Steve Childs. Making value-added products can be inefficient, he said. This cuts into a business' time and profits.

But his biggest concern is product quality. Not all the products he sees on store shelves are good. To make high quality products, be prepared to innovate and brush up on chemistry, he said. Quality products create return customers. Better products also tend to remain shelf-stable for longer which is important, especially if selling to a food distributor with markets outside the sugarmaker's local area.

To help ensure quality, Childs says, master the culinary science of sugars and how they respond to heating and

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cooling. Be sure to cool your syrup to make the smoothest possible candy and cream, he says, and understand how to use a diabetic meter to test for invert sugar levels. Cornell produces charts on invert sugar levels and how they pertain to different products. Childs' authored the New York State Confections Notebook which includes more information on these topics and more.

Childs collaborates with sugarmakers and fellow researchers to develop equipment and techniques to ensure efficiency. For example, Childs and Sunrise Metal, an equipment maker in Indiana, developed a "mold popper," a simple set of stainless steel rails and a rolling pin. This tool helps sugarmakers pop candy from a sheet mold in approximately three seconds, a process that can take 30 to 40 seconds by hand.

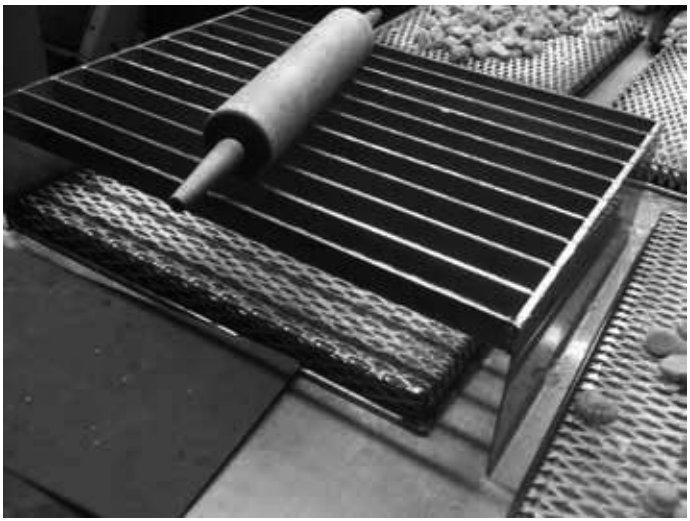
They also also developed a water jacketed candy machine and a vacuum cooling system. Temperature is key to maintain a smooth texture for confections. The vacuum cooling system cools the syrup to the right temperature in under six minutes, compared to the conventional water bath methods that take more than an hour.

Three years ago, Childs tested the then new equipment at the New York State Fair, where volunteers had been spending every day, all day long, making creams, candies, and cotton candy. "It's miserable," hot, and humid work, he said. The popper, water jacket, and vacuum cooling system reduced the volunteers' work time to five hours every other day.

Childs recommends learning from a seasoned sugarmaker to make a new product. Or gain experience by volunteering with your state maple association at events. Childs finds that people who have tried and failed at making value-added products get more from workshops or trainings than complete newbies.

What a sugarmaker must never do is try to wiggle around state regulators, he said. "Don't try to hide from them. You want them to be your best friend," Childs said. If you're sneaky, then you'll give regulators no choice but to mistrust you, he added.

"We are on the edge of some real breakthroughs in maple as an ingredient item," Childs said.



This simple tool, developed by Steve Childs and Sunrise Metal, speeds up the process of removing maple candy from molds.

Tips from Successful Value-Added Producers

1. Research your state's maple and food regulations, which may inform what type of value-added product you make first. You might have a great idea for a maple salad dressing, but if you're new to value-added products, salad dressing may not be the best first product. In many states, pure maple products, such as sugar shapes or cream, are covered by the same rules as syrup. But when products involve other ingredients, like nuts or popcorn, a state may require a commercial kitchen license. Add even more ingredients like vinegar or things that can spoil quickly and even more regulations are likely to kick in, and recipes may require testing or regular inspections. To male these processes easier, be on a first-name basis with your state's inspectors and regulatory officials.

2. Dream big. Then start small. Scale up slowly. Want to sell your maple BBQ sauce all over the world? Do your research on distributors and talk to fellow sugarmakers who have done just that. This will help you start preparing your long-term business plan. Now think small. Practice keeping your new product's expenses low and the quality high. Take your product to your local farmers' market and your local general store. Do taste testings at local craft shows. Build a customer base and a fan base. Whether you sell to the store down the road or to a supermarket in Paris, repeat customers are how you sustain your business.

3. Build a production process that keeps the quality high and the production efficient. Value-added products often bring in more money than a gallon of syrup, but they also take time and effort, and time is money. Build your production process with a combination of technology, an understanding of culinary science, and practice. Fellow sugarmakers and your state's agricultural school are good resources.

4. Synergistic partnerships can make little sugarmakers look big. Is there a coffee roaster in your community? Can you co-brand a maple coffee? The New York Maple Producers Association does just that. A New York coffee roaster makes the coffee with syrup from the association. The association's members then sell the coffee through their own websites. These types of partnerships give sugarmakers access to equipment, infrastructure, and potential markets without needing to make hefty investments. Another option: instead of investing in your own commercial kitchen, how about renting space from a fellow food producer? Also, look for shared commercial kitchens that rent space for startup food businesses, as well as business training.

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Tales from Value-Added Producers

Multiple maple products are a farmstand draw

Chip Hager, Hager's Farm Market

Hager's Market sells a variety of prepared foods and produce from its location on Massachusetts' scenic Mohawk Trail. Chip Hager said his customers appreciate the variety including the family's maple syrup, cream, coated nuts, and popcorn.

The family started its maple production in 1938, said Hager, and their product line grew out of a combination of what the businesses needed and what it had on hand. Over the years they added other maple products. His mother and grandmother started making maple cream, Hagar said. Maple coated nuts and popcorn came along when the family started attending craft shows.

"We wanted a greater assortment of snacks to offer," Hagar said. Their farm grows corn, so they decided to add it to their snack selections. A lot of trial and error went into creating coating that added crunch without turning the popcorn soggy.

The Hagers have a commercial kitchen at their market. This gives them flexibility in the types of value-added products they offer.

Hagar said the market's maple sales have increased since 2009 when the market opened.

"Value-added is great," he said. Just make sure you have a product that is easy to keep in production. An empty shelf is money lost."

Innovate, and listen to customers

Lyle Merle, Merle Maple

Innovation runs in his family, said Lyle Merle. His father liked to try new techniques and technology, and Merle has continued that tradition.

Today, Merle Maple sells everything from maple syrup to maple-coated dog biscuits. The company's maple spreads are the business' most popular items, with their new bourbon maple spread looking to soon outsell the popular cinnamon spread. Merle spent years developing the maple spreads so they would have a long shelf life and not separate at room temperature. He worked with Cornell's Geneva research center to do so.

Merle and Childs collaborated on multiple projects. At Childs' request, Merle developed a syrup that is denser and therefore microwaveable for making sugar on snow. Heat, then pour over crushed ice or ice cream.

Merle is certified by the state for commercial food production. He often launches new products at craft shows where he can get direct feedback from customers.

"When we have a new product idea, we will try two or three variations of the recipe and sample them to the public to see which one is best received and the general interest in the product," he said. "We had a BBQ sauce and customers asked if we had something hotter, so we developed the hot sauce."

His advice for those new to value-added products? Invest in a cotton candy maker. The investment is pretty low

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and the profit margin is good. At least better than tapping more trees, he said. Granulated sugar is also a good basic product to start with, he said.

"Make something the public wants. Don't make a product for yourself," he said. "Make it for the people who are paying."

Making maple international

Rob Hausslein, Sugar Bob's Finest Kind

Sugar Bob's Finest Kind specializes in smoked maple syrup. Recently, the company acquired Vermont Maple Crafters and its line of Sriracha hot sauces. What started at a farmers' market in is now an award-winning savory maple company.

"We're committed to big flavors with clean ingredient labels," owner Rob Hausslein said.

A chef at their local market asked Hausslein and his wife Ann Ogden to make him a smoked syrup 16 years ago, and they started experimenting. As the smoked syrup gained popularity, Hausslein said he decided to focus on it over regular maple syrup. The speciality product allowed him to continue in the maple industry without competing with other sugarmakers in the local market.

Four years ago, Hausslein quit his day job to take the business full-time. Last year, Finest Kind bought Vermont Maple Crafters in order to expand its production facility, said Hausslein. Since the company uses ingredients other than maple, it needs a commercial kitchen.

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Scaling up is biggest challenge when growing an operation, Hausslein said. The more you scale up, the more infrastructure to finance, which means added pressure to increase profits.

Getting a new product off the ground often takes longer and costs more than expected, he said. Hausslein recommends scaling up slowly. "Know how to use a hammer before you use a nail gun," Hausslein said.

Build partnerships with fellow farmers and associations, he said. Finest Kind buys syrup from neighboring sugarmakers, instead of sourcing syrup from cheaper bulk markets. This partnership allows Hausslein to feel comfortable standing behind the ingredients in his products.

Hausslein also advises to look beyond the local area for markets. He said Finest Kind has few buyers in Los Angeles but it has many customers in Tokyo. Even with customers far and wide, he knows that nothing sells a product like samples, so demonstrations and taste tests remain central to Finest Kind's marketing plan.

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Thinking of Value-Added? Ask Yourself:

• What is your product idea?

• Why do you want to make this product?

• Where do you want to see this product in five years?

• Who is your ideal customer?

• What regulations will you need to meet or infrastructure will you need to invest in?

• What skills do you need to build or hire to make the product?

• How will you ensure an efficient production process and consistent quality?

• What existing products are similar to yours? Where are these existing products sold? How are they marketed? How do you want to sell and market? Online, in stores, at farmers' markets?

• Is this a product you can create yourself? Do you need to hire staff? Are there partners you can collaborate with?

• In the short term, is there a simpler product that you can start with? Would starting simple gain you skills - cooking science, building a customer base, marketing - while also keeping costs down?

The Seventh Annual Lake Erie Maple Expo

The seventh annual Lake Erie Maple Expo will be held on November 9 and 10 in Albion, Pennsylvania at Northwestern High School. The event will begin with workshops on Friday morning, which will include:

- Tubing on Flat Ground, offered by Ohio producers Jason and Chris Grossman.
- Sugarhouse Management, with Vermont maple expert Glenn Goodrich.
- Tour of the Bissell Maple Farm production plant and bottling line in Jefferson, Ohio, with a workshop on marketing maple and value-added products.
- For the beginner, Laura Dengler and Mark Lewis will explore the basics of maple production. This seminar is being held at Triple Creek Maple Products, just north of Albion.
- Maple Confections with Ohio producer and maple products judge James Miller.

All of the workshops will start at 9:00 am and conclude at 2:00 pm. The workshop registration fee is $30.00 and includes lunch. This is a separate fee from the Friday evening/Saturday registration. The workshop registration area will be in the New Albion FFA Sugarhouse on the SE corner of the high school.

The trade show will open Friday at 5:00 pm.

On Friday evening, the featured speaker will be Mark Canella, Agricultural Business Program Director for the University of Vermont Extension, speaking on Maple Economics and Industry Trends. The presentation will include trends for industry growth and a discussion of issues that are currently affecting the maple industry.

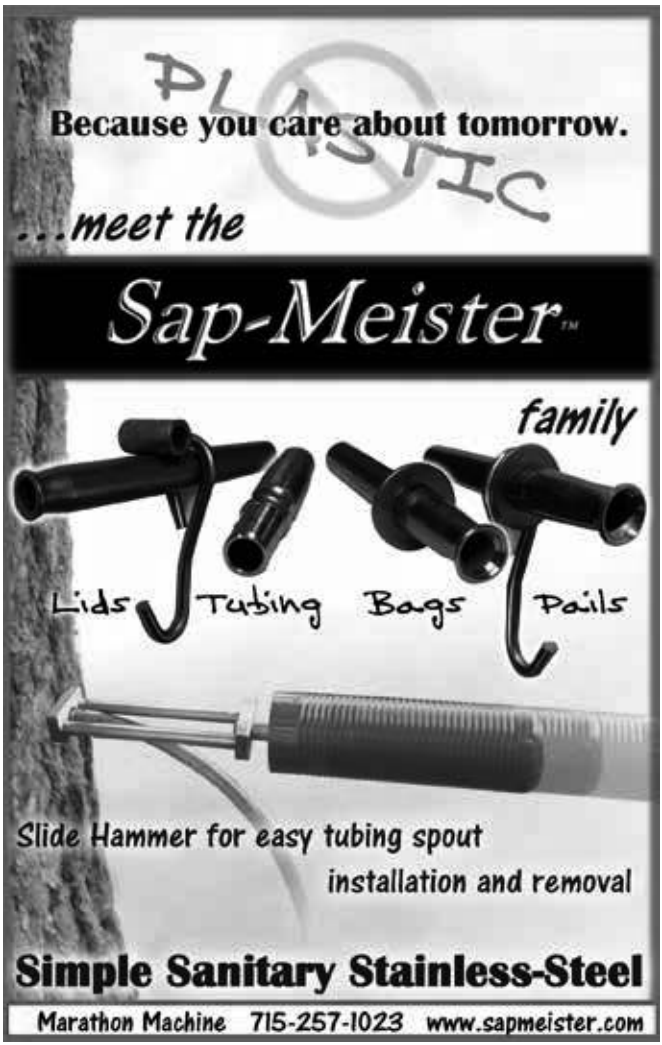
The Saturday program is loaded with topics that are sure to be of interest to everyone. More than 30 concurrent sessions will take place throughout the day. Seminars will start at 9:00 am and include an all-star cast of speakers including Dr. Tim Perkins from the UVM Proctor Research Center; New York State Maple Specialist Stephen Childs from the Cornell Maple Program; and Aaron Wrightman, Extension Maple Specialist. Maple producer expert presenters include Glenn Goodrich of Goodrich Maple, and a host of local and out of state speakers on a variety of topics. There will also be presentations from all of the major maple equipment manufactures highlighting some of the newest technology in the industry, and maple production and marketing seminars and maple product demos for the beginner and small producer.

Registration is $40.00 for both the Saturday and Friday evening programs. Pre-registration deadline is October 15. Registration information is available on line at www.pamaple.org.

FDA Reconsidering Added Sugar Label for Maple

More than 3,000 comments on a proposed rule by the U.S. Food and Drug Administration (FDA) that would require maple syrup to bear an "Added sugar" declaration on nutrition labels are being reviewed by the agency. In a September 6 statement, FDA Commissioner Dr. Scott Gottlieb acknowledged receipt of the comments, and indicated that they would be considered and that a final rule would be issued in early 2019.

"While added sugars declared on the updated Nutrition Facts label include sweeteners added to processed foods, they also include foods that are "packaged as such" including a bag of table sugar, jar of honey or container of maple syrup," wrote Gottlieb. "We recognized that this new labeling information on "packaged as such" products may inadvertently lead consumers to think their pure products, such as a jar of honey or maple syrup, may actually contain added table sugar or corn syrup because there are "added sugars" listed on the label."



Gottleib's statement says that the final rule "will provide a path forward for pure, single-ingredient "packaged as such" products that does not involve the standard "added sugars" declaration on the Nutrition Facts label. We are not considering changes to the required percent daily value for these products, including for products like pure honey and maple syrup. We believe

that such a solution strikes the balance of addressing producer concerns that their products could be perceived as being economically adulterated while still informing consumers on how these products contribute to their daily added sugar intake."

At the same time, an effort is underway to implement a legislative fix. Language is under consideration for inclusion in the 2018 Farm Bill that would prevent the FDA from requiring that maple syrup or other single ingredient sugars include a declaration of added sugars as part of their nutrition facts. Such language would represent a much more permanent solution, critical to the maple industry's ability to assure consumers through consistent, clear messaging, that pure maple products are unadulterated.

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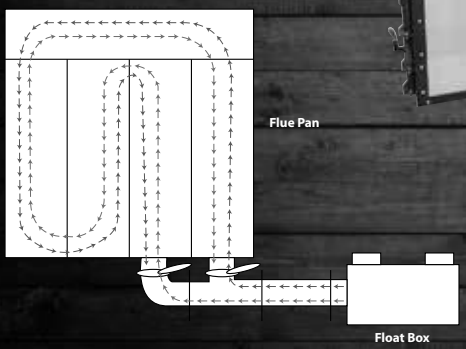

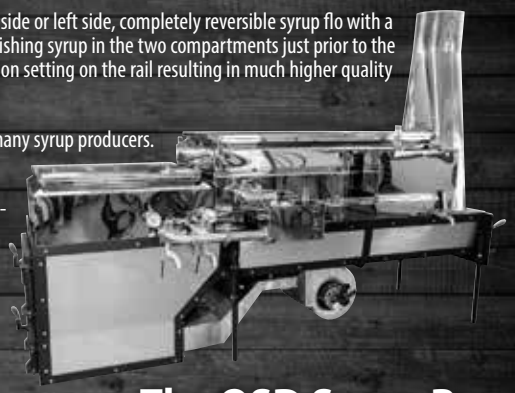

The OSD Syrup Pan

2018 USDA Acer grants awarded

On September 18 the USDA announced six grant awards totaling more than $2.6 million for the Acer Access and Development Program, which supports research for the maple industry.

Moving the Maple Syrup Producers Manual into the Modern World with an Online Module Based Platform of Accessible, Updateable Videos and Trainings that Replaces the Currently Out of Date Manual
Michigan State University

Basing their work on the *North American Maple Syrup Producers Manual*, Michigan State University will develop video content modules that will be informative, professionally edited, and represent regional differences across the U.S. maple states. They will incorporate industry research and development advances, university research findings, as well as nationally identified specialists appropriate for the chapter topics. This will all be done in "sprints" so that the first chapter updates will be available in the first 3-8 months with chapters being rendered and disseminated consistently across the three years. It will enable the work to be reviewed and updated on a continuous basis.

Efficient, Profitable and Sustainable Maple Production through Applied Research, Education and Innovative Technologies
Cornell University

The College of Agriculture and Life Sciences at Cornell University will extend research and education efforts of the Cornell Maple Program to increase maple syrup production per tap, improve sap collection and processing efficiency, and promote productive and sustainable sugarbush management practices through applied research, the development of innovative technologies and educational outreach.

Collaborative to Communicate Maple Benefits to Help Producers Promote Maple Products to Consumers
University of Rhode Island

The newly formed Collaborative to Communicate Maple Benefits (C2MB) at the University of Rhode Island will encourage consumers to switch to maple, the 'smarter sweetener,' by increasing consumer awareness of maple benefits, including its sustainability, versatility, and potential health benefits.

Maple Forest Business Development
The University of Vermont and State Agricultural College

The University of Vermont and State Agricultural College will develop and disseminate new educational materials to landowners, maple operators, and key land management decision-makers to increase informed development of forest parcels into maple production. An interdisciplinary project team and collaborators will investigate and advance knowledge enabling these key stakeholders to integrate current silviculture findings and applied business analysis related to high yield maple production systems into sustainable cost-benefit decision-making.

The *North American Maple Syrup Producers Manual*: A Comprehensive Resource for Maple Sugar Makers
The University of Vermont and State Agricultural College

The University of Vermont and State Agricultural College will update sev-

eral key chapters of the *North American Maple Producers Manual* to include the many technological advances in sap collection practices, maple syrup production equipment and techniques, the internationally-harmonized maple syrup grading system, and economic considerations. New chapters will focus on food safety regulations and practices and tapping guidelines and sustainability. This resource will be available as a free pdf download.

Developing Markets and Increasing Awareness for Vermont and U.S. Produced Maple

Vermont Agency of Agriculture, Food & Markets

The Vermont Agency of Agriculture, Food, and Markets (VAAFM) will address some of the most pressing concerns for maple producers: consumer awareness and consumption domestically and abroad. The objectives outlined take a multi-faceted approach to develop knowledge and interest in maple for two primary consumer groups – the conscious consumer and food service professionals – and include directed marketing campaigns, agritourism, and international market growth. VAAFM will be able to leverage those results to create strong, research-based consumer outreach materials and programs.

For more details about each grant, see https://goo.gl/CZWdzF.

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Are You Coming to New Hampshire?

Don't miss the big event, October 26-29, 2018. The NH Maple Producers Association is hosting this year's annual meetings of the North American Maple Syrup Council & International Maple Syrup Institute in Concord, New Hampshire. Hundreds of maple producers and suppliers from across North America will gather to share ideas and show some of the latest equipment available.

Our planning committee has been working for two years to ensure this convention will be fun and educational. It will be held at the beautiful Grappone Conference Center at the Marriott Hotel. Comfortable hotel rooms are available at the Marriott or other nearby hotels, and should be reserved soon.

The NAMSC & IMSI meetings will update you on the most recent progress of these two organizations that protect and support the maple industry. The technical sessions will inform and motivate you to make your maple operation more productive and efficient. These sessions are still in the planning stages, but will be conducted by some of the world experts on maple production. More information will be available soon.

We will be offering bus tours to fascinating places in the area, such as: Pleasant View Gardens, where they raise "Proven Winners" plants; the Bolduc Farm, where they've been tapping trees since 1779; and Windswept Maples, where high-quality maple syrup is made. Then there's Sanborn Mills Farm, which teaches sustainable agriculture and uses a sawmill, grist mill and blacksmith shop. We may also visit the NH International Speedway and museum. We'll visit the Anheuser-Bush Brewery, Moonlight Meadery and Mac's Apples. Companion tours are being arranged for Shaker Village, NH Telephone Museum and Mt. Kearsarge Indian Museum. Not all of these tours are carved in stone yet, so there may be a change or two in the near future.

Bring your best maple syrup, cream and sugar to enter into the international contest. Who knows, you may win "best of show!" If you enjoy photography, enter your best photo of a sugarbush scene, maple people on the job or creative maple photography. We will also hold a silent auction and have some wonderful raffle items.

To register for the convention or learn more about the tours and contests, go to nhmapleproducers.com and click on "2018 NAMSC & IMSI Conference," event registration, and download the registration form.

New Hampshire's maple producers are proud to host this annual meeting and hope you will come so you can learn about the latest innovations in maple production, check out the new equipment and visit some of the fascinating places that make NH such a memorable place to visit. We're looking forward to seeing you in October!

North American Maple Syrup Council Research Fund

The NAMSC Research Fund funds research that supports and advances the maple industry. In recent years we have given tens of thousands of dollars to projects that have developed innovative practices and technologies, helped deepen our understanding of the science of sugarmaking, and promoted the products we all make.

You can make a difference!

Concerned about the future of the Maple Industry? Make a contribution to support the maple research we fund. One easy way is to pledge to send $.01 per container to the NAMSC Research Fund. Grant recipients are announced at NAMSC Convention each October.

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The NAMSC Research Fund is a non-profit, volunteer committee of the North American Maple Syrup Council, Inc.

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You can give a dollar amount or a percentage or your estate, or you can list NAMSC as the beneficiary of your bank accounts, retirement plan or life insurance. Contact your attorney for information on how to revise your will, or your financial institution, plan administrator, or life insurance agent for the procedures required to revise your beneficiary designations.

The information needed for your legal documents is: North American Maple Syrup Council, PO Box 581, Simsbury, CT 06070.

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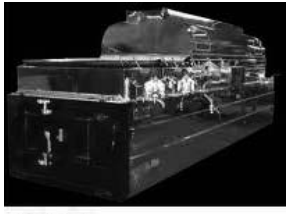

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