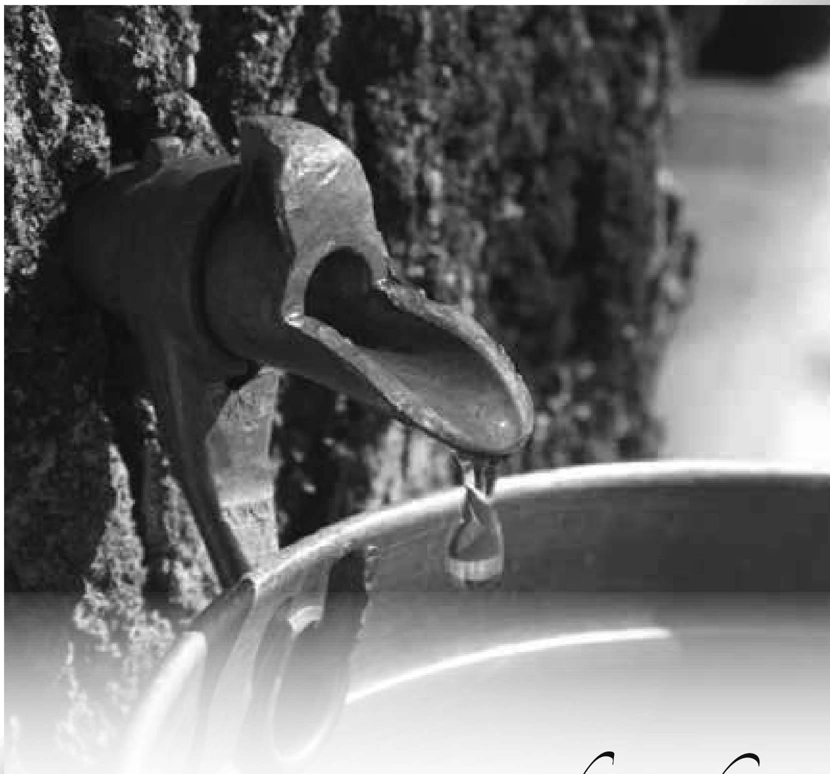
Maple Syrup Digest

Vol. 59, No. 1 January 2020

Organic Defoamer
Silviculture in the Sugarbush

The Newsletter of the North American Maple Syrup Council



MAPLE SYRUP DIGEST

Official publication of the North American Maple Syrup Council
www.northamericanmaple.org
www.maplesyrupdigest.org
Editor: Winton Pitcoff • maplедigest@gmail.com • 413-628-3912
PO Box 6, Plainfield, MA 01070
Published four times a year (Feb., June, Oct., Dec.)
NAMSC Executive Director: Michael A. Girard, CT
860-658-5790 • mgirard@simscroft.com

Advertising rates

Full Page: $276
1/2 Page Vert. or Horz.: $155
Column Inch: $21
Classified: $.50 per word (free for members)

COPY DEADLINE: First of the
month preceding date of issue

Subscription rates

United States: $10.00
Canada: $15.00 (*US funds*)

Back issues

$2.00 per copy, postage included,
supplies are limited.

Greetings from your President

It's hard to believe we are back to another syrup season. I'm hoping everyone was able to get their off-season projects done in the woods. There always seems to be more and more to do. I have heard of many of you who have already tapped and a few making syrup.

There is so much information available between our annual NAMSC/IMSI Conference and the many annual meetings of our member states and provinces. It is at these meetings that we are able to learn from each other and find out everything new in the maple industry. It is so important that we rely on each other to move forward in our industry. In a room full of producers there will be at least one person who has the same question or has the answer for you. And we know everyone has experienced that burned pan.

NAMSC is continuing to offer educational pieces for our members. The *Maple Digest* has plans for more color inserts this year as well as articles full of great info. I appreciate the work Winton Pitcoff puts towards making the *Maple Digest* a great informational publication. If you have anything in particular you would like to see in the *Digest* – drop Winton an email.

Individual chapters are out for the review for the revised edition of The *North American Maple Producers Manual*. We'll let you know when it's ready for print.

We all need to continue educating the public on the taste and benefits of our product. Occasionally I feel that maple syrup is the world's best kept secret. We know what maple can be used for however there are still many that haven't discovered it's many uses. The Michigan Maple Syrup Association's Facebook page posts new recipes weekly, sharing so many ideas with our followers. For most it's not enough to just tell them what maple can be used for – we need to show them with recipes

Along that same line we need to continue being vigilant about the quality of syrup that hits the market. We've all run across the syrup maker who thinks their syrup is so good when in reality it is off-flavored, too thin, or has other defects. Maybe it is something that should only be used for cooking, but maybe instead the best thing to do would be to throw it out. I think we all have a responsibility to do what we can to keep bad syrup from hitting the shelves. It only takes one person to get bad syrup and tell everyone they know to harm all of our businesses.

Maple weekend is a great way to get people into your sugarhouse and learn what it takes to make a quality product. If your state has one, I encourage you to participate – people are anxious to visit you.

I hope everyone has a great syrup season, and that Mother Nature is kind to us.

Debbi Thomas
NAMSC President

In this issue...

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Identifying an Effective Defoamer for Certified Organic Maple Production

Abby K. van den Berg and Timothy D. Perkins
Proctor Maple Research Center, University of Vermont, Underhill, VT

There is currently strong market demand for certified organic maple syrup, and producers are paid a premium of between $0.10 and 0.20 per pound over the price of conventional syrup. While there are incentives and benefits for maple operations to become or remain certified, a significant challenge facing certified organic maple producers, and also discouraging producers from becoming certified, is the lack of an effective certified organic defoamer.

Foam development is inevitable in maple syrup production and requires the use of an agent or mechanism to prevent and control it. Uncontrolled foam can result in foam overflows, loss of product, syrup scorching and the development of off-flavors, as well as risks to personal safety and damage to evaporator pans. Because pure maple syrup is produced from maple sap with nothing added or removed except water, only minute quantities of defoamer should be used during the production process. In addition, too much defoamer can result in off-flavors or textures in syrup, or a greasy sensation on the tongue, lips, or palate.

The commercial conventional defoamers currently used in maple production meet this requirement well, and require only very small quantities to prevent or eliminate foam. Organic maple production requires that certified organic products be used as defoamers, and certified organic cooking oils (safflower, canola, sunflower, etc.) are the most common products currently used. However, because these products aren't specifically engineered to prevent, control, or reduce foam, they have relatively low efficacy (Garrett 2015, Martin 2017*a*,b). This results in increased difficulty in preventing or controlling foam compared to conventional defoamers, and increased incidences of foam overflows and other foam-related adverse events (Martin 2017*a*,b). In addition, their relatively low efficacy often requires that large quantities are used to control foam, which results in more frequent occurrences of defoamer off-flavors compared to syrup made with conventional defoamer.

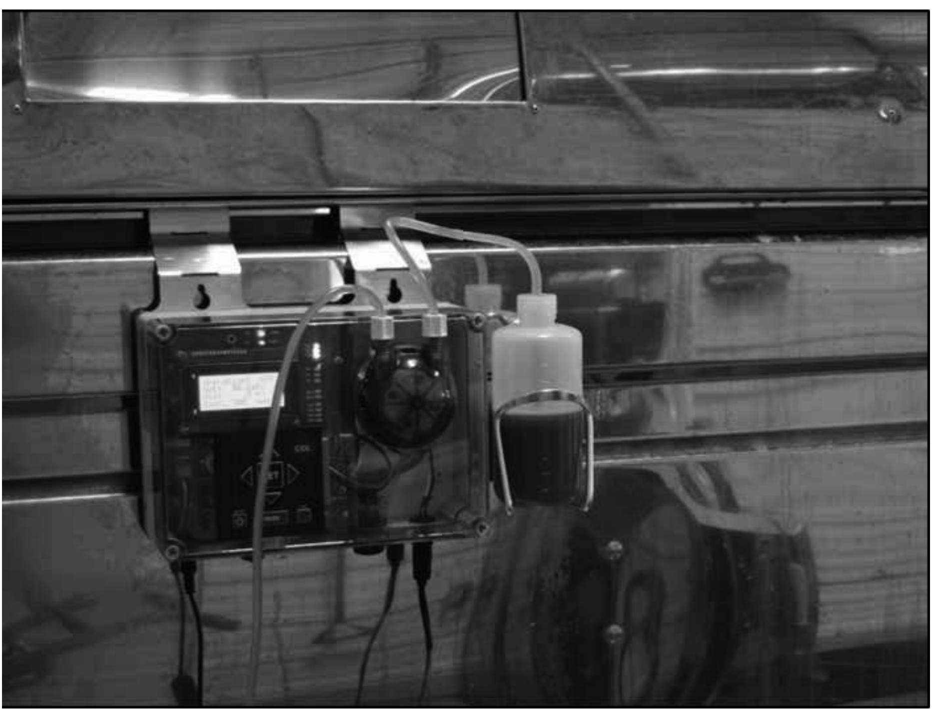
The combination of potential crop losses from foam-related incidents, reductions in crop value due to off-flavors, and ultimately the many adverse effects of such a large proportion of organic syrup with off-flavors potentially being sold to consumers, underscore the need to identify or develop a certified organic defoamer for maple production that is both more effective at controlling foam than the culinary oils that are currently used, and which results in no off-flavors when used in the quantities necessary to adequately control foam. Thus, the overall objective of this project was to identify a certified organic defoamer that met these criteria.

Materials and Methods

To accomplish the overall objective a series of laboratory-level experiments with 35 °Brix concentrate were conducted to test the efficacy of 10 commercially-available certified organic defoaming agents and physical techniques to identify any products or mechanisms that were more effective at controlling foam than organic cooking oils, without perceptible or adverse impacts on flavor. In these experiments, one certified organic defoamer (Trans-O 580, Applied Material Solutions, WI, USA) exhibited substantially better efficacy than the control organic defoamer (organic sunflower oil, Emile Noël, Pont-Saint-Esprit, France), similar efficacy to that of the control conventional defoamer (Atmos 300K, Caravan Ingredients, KS, USA), and had no perceptible impacts on flavor (no defoamer or other flavor defects were noted). This product was selected for producer pilot-testing, and controlled experiments with commercial maple equipment.

To confirm whether the candidate defoamer was significantly more effective than current standard organic defoamers and produced no adverse impacts on flavor, controlled experiments with commercial-scale maple equipment were conducted in which syrup was produced simultaneously with the same batch of concentrate in two identical evaporators using the candidate and control organic defoamers, respectively. Specifically, two identical 3×10 evaporators (Model Deluxe, Les équipements d'érablière CDL, QC, Canada) in the University of Vermont Proctor Maple Research Center (UVM PMRC) Maple Processing Research Facility were set up identically, with the same burner and draft settings, liquid depth in pans, and draw-off temperatures. Evaporator settings were optimized for minimum foam develop-

Defoamer: continued on page 10



Automatic defoamer dispenser (probe not shown).

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ment. One evaporator was assigned to the Candidate defoamer (Trans-O-580), and the other to the Control defoamer (certified organic canola oil, Jedwards International, MA, USA) treatments.

During each trial of the experiment, 400-650 gallons of 22% sap concentrate was acquired from a nearby maple operation (Runamok Maple, Cambridge, VT) and divided equally into two stainless steel tanks which each supplied one of the evaporators. The evaporators were started simultaneously and run until the concentrate supply was fully consumed. Evaporator settings (draft, sap levels, draw-off temperature, etc.) were continuously monitored and adjusted as needed to ensure they operated as similarly to each other as possible. The syrup produced by each evaporator was collected in separate containers. Except for the first trial when the pans were sweetened, the collection of syrup for subsequent analyses began one hour after the start of processing, to ensure that the syrup represented the concentrate being processed that day and help minimize any carryover effects from material remaining in the evaporator. At the end of each trial, the syrup from each evaporator was filtered separately with a plate filter press and placed in a freezer until subsequent sensory analyses. The experiment was repeated four times during the 2019 production season: March 22, 27, 29, and April 3. Evaporators were drained, then cleaned with phosphoric acid following industry standard procedures between each experiment trial to further minimize potential carryover effects from defoamer residue on pans. The treatments were switched between the evaporators after the first two trials to further ensure any effects observed were due to the defoamer treatments, rather than any minute differences between the evaporators themselves.

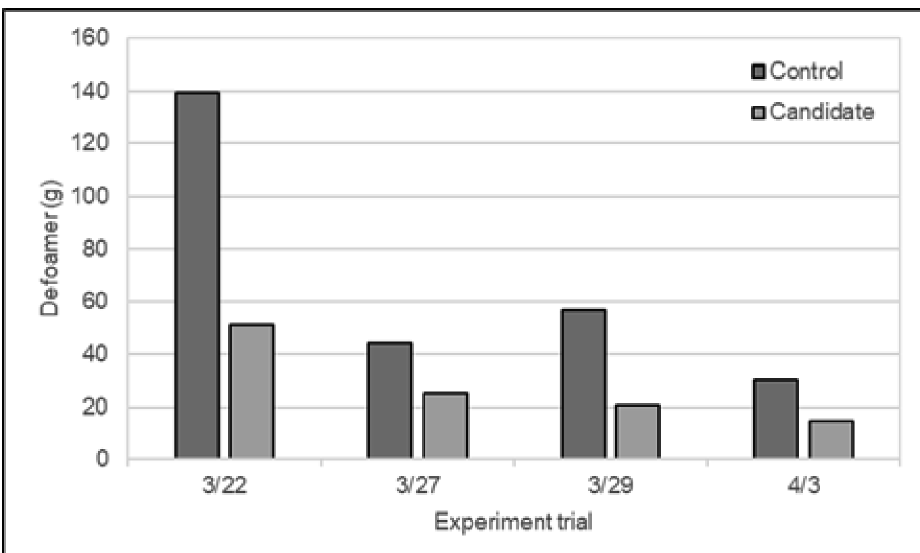

Figure 1. Quantity of Control and Candidate defoamer used (total for back and front pans) in evaporators processing the same pool of sap concentrate during four experiment trials in 2019.

Foam control and defoamer treatments

Each evaporator was equipped with a peristaltic pump-type automatic defoamer dispenser in identical locations and heights above the liquid in the back pan. These devices add a precise amount of defoamer at regular intervals through the unit's probe. In addition, if foam rises to the point where it touches the probe, the unit will add defoamer continuously until the foam subsides. During each experiment trial, the units were started with the same settings (rate and amount of defoamer added) in both evaporators, and then adjusted independently (higher or lower) as needed to control foam over the course of the trial. In the front pans, defoamer was added manually whenever foam reached a predetermined, marked height (7″ above the bottom of the pan). Three drops of defoamer were added initially; if foam was not controlled after one minute, three additional drops were added. If it was evident that it was possible to control the foam with fewer than three drops, fewer drops were used. The time, number, and location of each manual addition was noted. The defoamer containers for each treatment were weighed before and after each experiment trial to determine the total quantity of defoamer used in each evaporator. A paired, two-sided Student's *t*-test was used to determine whether significant differences existed in the quantity of defoamer used between the two treatments.

Flavor evaluation

Potential impacts of the Candidate defoamer on flavor were evaluated first with a standard sensory evaluation experiment to assess the frequency at which defoamer off-flavor or texture occurred in syrup produced with the

Defoamer: continued on page 12

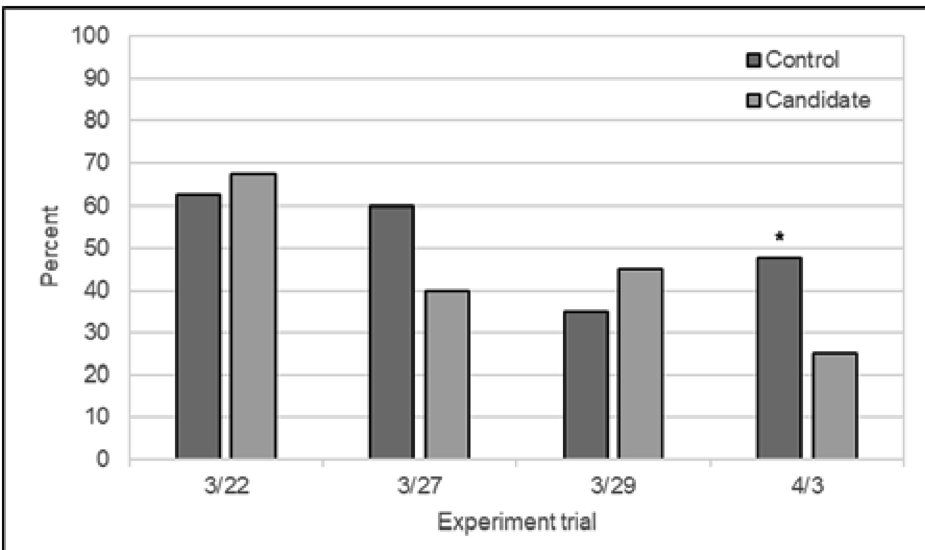

Figure 2. Percentage of "Yes" responses of sensory panelists to the question "Does this syrup have organic defoamer off-flavor (or texture)?" for each syrup produced simultaneously with the Control and Candidate defoamers in four experiment trials ($n = 40$ for each syrup). * indicates a statistically significant difference in the frequency of "Yes" responses between the syrups in the pair (McNemar's test, $p < 0.0389$).

Defoamer: continued from page 11
Candidate defoamer, and determine whether it was similar or less than the frequency in syrup produced simultaneously with the Control defoamer. (The general terms "defoamer off-flavor" or "defect" will be used henceforth to encompass both the flavor and textural aspects of this off-flavor).

An attribute difference test following standard sensory evaluation protocols and procedures (Meilgaard *et al.* 2006) was conducted with 40 healthy, adult panelists who were trained to identify defoamer off-flavor in maple syrup (either having completed the IMSI Grading School, or significant work training and experience assessing this attribute in maple syrup). Each pair of syrups produced simultaneously with the Control and Candidate defoamers during each trial was de-identified, given a random, 3-digit code, and presented to panelists in a balanced, randomized order to reduce presentation order bias and carryover effects.

Panelists were asked to taste each syrup in each pair and evaluate whether defoamer off-flavor was present (Yes or No), and then to indicate its level of defoamer off-flavor intensity using a verbally-anchored scale of defoamer off-flavor intensity, from "none" to "very strong." Results were compiled and McNemar's tests used to determine if significant differences existed in the frequency of "Yes" responses to the question of whether defoamer off-flavor was present between the pairs of syrup produced simultaneously with the Control and Candidate defoamers during each of the four trials.

To further investigate potential impacts of the Candidate defoamer on flavor, including the occurrence of defoamer off-flavor as well as defects of any other nature, the flavor of the syrup samples produced during the experiment trials was also assessed through sensory evaluation conducted by certified inspectors at ACER Division Inspection Inc. using the standard classification protocols and criteria used in the maple industry in Québec (http://ppaq.ca/en/producer/useful-information/classification/). Three certified inspectors evaluated each de-identified syrup sample and provided both individual and consensus assessments of each.

Results and Discussion

Foam control efficacy

Differences in the performance of the Control and Candidate defoamers were evident through several anecdotal observations made during the experiment trials. During the first experiment trial, foam overflowed from the back pan of the Control defoamer evaporator as the boiling point was initially reached; this did not occur in the Candidate defoamer evaporator (which reached the boiling point at the same time). The overflow in the Control defoamer evaporator was not controlled by the "emergency" addition of canola oil by the automatic defoamer dispenser, and only stopped when the evaporator was turned off.

For the remainder of the experiment trials, the Control defoamer evaporator had to be started on low fire until the boiling point was reached in order to avoid this type of overflow. This was not required with the Candidate defoamer evaporator; it could be started on high fire and reach the boiling point without any foam overflow. In addition, during all trials the automatic defoamer dispenser in the Candidate defoamer evaporator was able to be set at a lower rate to control foam in the back pan than that in the Control defoamer evaporator. And, although manual ad-

Defoamer: continued on page 14

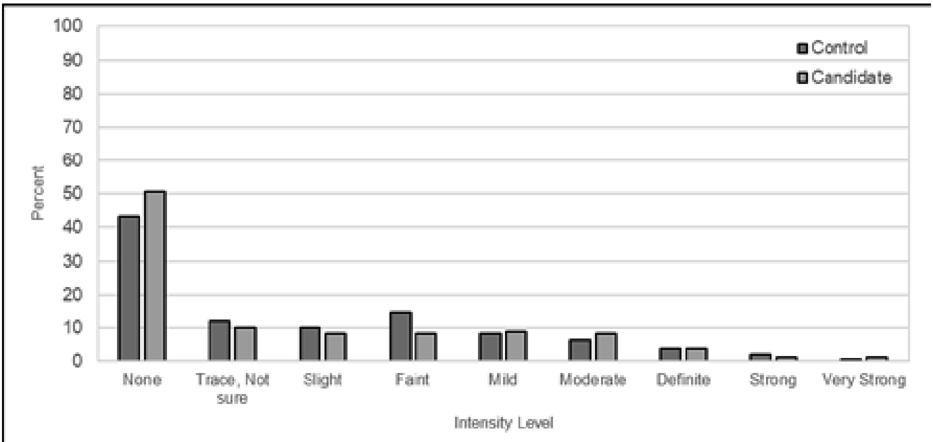

Figure 3. Overall average percentage of responses of sensory panelists for each level of the intensity scale to the question "Please indicate the intensity of organic defoamer off-flavor (or texture) of this maple syrup" for syrup produced simultaneously with the Control and Candidate defoamers in four experiment trials (n = 40).

Defoamer: continued from page 13

ditions of defoamer to the front pans were of similar frequency in the two evaporators, foam could be eliminated or controlled with fewer drops of the Candidate defoamer than of the Control defoamer.

The total quantity of defoamer used (back and front pans) in the two evaporators during each experiment trial is presented in Figure 1. An average of 45% less of the Candidate defoamer was used, although this difference was only marginally statistically significant ($p < 0.0992$). It should be noted that, in general, the usage rate for both defoamers was relatively high compared to that of conventional defoamers.

Flavor

The frequency of "Yes" responses of panelists to the question "Does this syrup have organic defoamer off-flavor?" for each syrup pair produced during the four experiment trials is presented in Figure 2. There were no significant differences in the frequency of "Yes" responses between pairs of syrup produced simultaneously with the Candidate and Control defoamers during any of the experiment trials except for that on April 3. For the pair produced during this trial, the syrup produced with the Candidate defoamer received significantly fewer "Yes" responses than the syrup produced with the Control defoamer (Figure 2). The results indicate that the Candidate defoamer does not result in a more frequent occurrence of defoamer off-flavor than the Control defoamer, and suggest that it could sometimes result in less frequent occurrences of this defect.

One notable aspect of the results of the sensory evaluation experiment is the relatively high frequency of "Yes" responses for both types of syrup for some of the samples tested – for example, about 60% of the panelists indicated there was defoamer off-flavor present in the syrups produced with both the Control and Candidate defoamers during the trial on March 22 (Figure 2). This can be put into some context with the results of the second question asked in the sensory experiment, "Indicate the intensity level of organic defoamer off-flavor in this syrup." Figure 3 shows the average percentage of panelists' responses to this question in each category (None to Very strong) for the syrups produced with the Control and Candidate defoamers in the four experiment trials. The majority of responses for syrup produced with both treatments were low intensity, with averages of 88 and 86% of all responses being from None to Mild for syrup produced with the Control and Candidate defoamers, respectively (Figure 3).

The results of the sensory experiment likely reflect two limitations in its design. First, asking panelists to indicate if a specific off-flavor is present introduces a suggestion ("expectation error", Meilgaard *et al.* 2006), potentially introducing a bias toward detecting that defect and unconsciously predisposing panelists to perceive the flavor or respond "Yes." Second, providing panelists the means to subsequently indicate the intensity of the off-flavor they perceived could have increased the occurrence of panelists choosing "Yes" as the response to the first question when they were uncertain if the defect was present, because it allowed them to indicate subsequently that the flavor was present at a very low intensity (e.g. "Trace, Not sure", "Faint").

Despite these potentially mitigating factors, however, the results remain noteworthy and could still reflect a high frequency of defoamer off-flavor in syrup produced with organic defoamers in general. The limitations of this experimental approach to assess the potential impacts of the Candidate defoamer on syrup flavor were addressed with the second approach used to assess flavor, standard classification.

Table 1 presents the classification results for each syrup sample from the individual inspectors, as well as their consensus assessment. This method of assessing the flavor of the syrup samples produced in the experiment not only provides a means to mitigate the limitations of the sensory evaluation experiment, but also to address the question of whether there are any other potential impacts of the Candidate defoamer on syrup flavor besides characteristic defoamer off-flavor, as a defect in flavor of any type would be identified by the inspectors. A significant defoamer flavor defect would be indicated by a classification of "√R4." None of the syrup samples produced with either of the defoamers during the experiment trials was classified as √R4 (Table 1). Slight defects in flavor are indicated by a √, followed by a verbal description of the nature of the defect. For the syrup samples for which inspectors indicated the presence of a slight flavor defect with a √, defoamer was not the defect noted (Table 1). Thus, these results indicate that defoamer off-flavor was not present at any level, from slight to significant, in any syrup produced with either the Candidate or Control defoamers.

Conclusions

Taken together, the results of this study indicate that the Candidate de-

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Defoamer: continued from page 15

foamer can be more effective at controlling foam with lower quantities than the organic cooking oils currently used as defoamers for certified organic maple production, and results in a similar or lower frequency of defoamer off-flavor, and no other apparent significant general impacts on flavor. Although it still presents many of the same issues as other organic defoamers (high usage quantities and increased risks of flavor defects), because of its effectiveness at controlling foam, particularly in the back pan, this product could provide an alternative option for foam control in some organic maple operations.

Producer Pilot-testing and General Notes

Four operations pilot-tested the Candidate defoamer during the 2019 maple production season, two with dripper-style defoamer dispensers, and two with peristaltic pump-type automatic dispensers. The operations with automatic dispensers indicated the Candidate defoamer was very effective and reported they were very to extremely likely to use the product in forthcoming seasons. Both indicated there was a significant (or complete) reduction in foam overflows upon initial boiling. The two operations with dripper-style dispensers reported difficulty adjusting the dispensing rate to the appropriate level with the Candidate defoamer (it was either too fast or too slow). One of these operations reverted to using organic safflower oil because of this, even though they felt that the Candidate defoamer seemed to be more effective at controlling foam. All three of the remaining operations reported using less of the Candidate defoamer than the typical product used in their operations (from ~25-50% less). Of note, however, with sap of very poor quality all operations reported similar difficulty controlling foam with the Candidate defoamer as compared to organic canola or safflower oil.

This defoamer has some specific storage and handling instructions, including that it should not be exposed to freezing temperatures, and needs to be mixed well before each use. More information can be found in the technical bulletin for Trans-O-580, which can be obtained from the manufacturer (www.appliedmaterialsolutions.com), or from maple equipment dealers who sell the product. The product is currently certified organic only in the United States.

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		Inspector 1		Inspector 2		Inspector 3		Concensus	
Defoamer Treatment	Experiment Trial	Grading	Comments	Grading	Comments	Grading	Comments	Grading	Comments
Control	3/22	OK		√	Lightly wood	√		√	Lightly wood
Candidate	3/22	√	Sap. Caramelized	OK		√	Wood	√	
Control	3/27	√	Caramelized	OK		OK		OK	
Candidate	3/27	OK		OK		√	Wood	OK	
Control	3/29	OK		OK		OK		OK	
Candidate	3/29	OK		OK		OK		OK	
Control	4/3	√		OK		OK		OK	
Candidate	4/3	OK		OK		√		OK	

Table 1. Consensual and individual sensory quality grading by three certified inspectors at ACER Division Inspection Inc. of each syrup sample produced simultaneously with the Control and Candidate defoamers in four experiment trials. "√" indicates a slight trace of a flavor defect, and "OK" indicates a syrup free of flavor defects. ("Wood" flavor is often referred to as "metabolism" in English).

Defoamer: continued from page 17

Like any product used in organic maple production, the certifying agent for an operation must be notified and approve of its use. Likewise, it is also advisable for bulk producers to notify buyers of the type of defoamer used.

Best Practices

Most engineered organic defoamers like the one tested in this study are also based on organic cooking oils, and as such are sensitive to degradation like their culinary counterparts. In addition, they are unquestionably not as effective at controlling foam as conventional defoamers. Thus, it is particularly important for certified organic maple operations to follow best practices for defoamer use and care, and for controlling and minimizing foam development during processing. The following apply to all defoamers, both organic and conventional.

Heat, oxygen, and light all degrade defoamers and cause rancidity that can impart rancid off-flavor to syrup (Martin 2011, 2016). All defoamers should be stored away from heat, and material in dispensers replaced frequently, as the heat from the evaporator rapidly degrades the defoamer within them. Use new defoamer each season (do not store and reuse last year's supply). Dispensers should be thoroughly cleaned periodically (or replaced when necessary) to remove residues, which can impart a rancid flavor to fresh defoamer.

The amount of foam generated typically increases with the amount of heat, the accumulation of niter on pans, and reductions in sap quality. Any practices to mitigate these factors will help minimize foam development and the amount of defoamer required to control excessive foaming. Maintaining heat settings of the evaporator at levels as low as possible to balance desired production rates, and rigorous attention to managing niter formation (e.g. reversing flow or changing pans frequently) are primary means to achieve this. If using organic cooking oil, starting on low fire until the initial boiling point is reached can be an approach to reduce the foam overflows that occur frequently at this stage of processing.

The overall goal is to use the minimum amount of defoamer possible. A variety of devices are available to dispense defoamer at a constant rate, or as needed when foam reaches a certain level, including cups, dripper-style dispensers, and automatic peristaltic pump-based dispensers. Any of these will add more defoamer than necessary if not used and monitored closely. Ensuring that as little defoamer as possible is being added at all times, whichever device or method of addition is used, requires regular and rigorous attention. Peristaltic pump-type automatic defoamers work particularly well with organic defoamers (which are liquid at room temperature) and can reduce the amount of defoamer used if operated properly. For manual additions of defoamer, note that spray bottles add significantly more defoamer than dropper bottles. Note also that additions of defoamer to the front pan are generally more likely to result in defoamer flavor defects than additions to the back pan, with the likelihood increasing with proximity of the addition to the draw-off (Martin 2016, 2017c).

Acknowledgements

This research was supported by a grant from the North American Maple Syrup Council Research Fund, and by

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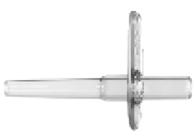

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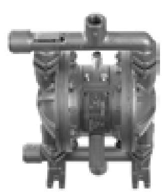

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Organic Transitions Program grant no. 2016-51106-25717 from the USDA National Institute of Food and Agriculture.

We thank Nathalie Martin, Yves Bois, and Centre ACER, Inc. for their collaboration with this work and providing the sensory classification of the syrup samples. We thank Brendan Haynes and Wade Bosley (UVM Proctor Maple Research Center) for their invaluable assistance in completing the experiments, Joël Boutin (CETAA/CFA) for technical advice, Alan Howard (UVM) for assistance with statistical analyses, Steve Savastano (Access Technologies), and the team at Runamok Maple for their assistance and collaboration acquiring the sap concentrate for the experiments. We also thank the producers who participated in the pilot tests (Ben and Dick Wilcox, Amber Ridge Maple; Richard Carr and family, Backwoods Alchemy Maple; David Gavett, Scrag Mountain Sugarhouse; and Wade Bosley and Tim Perkins, UVM PMRC), and the sensory panelists and their employers (Butternut Mountain Farm, Maple Grove Farms of Vermont, Runamok Maple, and Sugarman of Vermont), for their assistance and contributions to this work.

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Silviculture, and Why it Belongs in a Sugarbush

Joseph Orefice, PhD, Yale School of Forestry & Environmental Studies

I sat down to write this article at Yale-Myers Forest in a 1700's farmhouse, flanked by two sugar maples from a similar era. Today is frozen and typical of a January day in New England, but the weekend will bring 60 degrees F here in Connecticut, along with heavy rain. No doubt the house and the maples have seen their share of changes in the land and climate

We are seeing new challenges for our maples and their offspring. Invasive species, climate change, poor forest management, and other factors are all serious threats to the productivity of harvesting maple sugar in the decades to come. However, there are things we can do to protect the tradition of maple sugaring in our regions. Silviculture is our primary tool.

First off, let's tackle the climate change question. The question is not whether climate change is occurring or not – it is, and I expect the maple producers reading this have already realized this through changes in their tapping season. The question is – what will climate change mean for the future of sugar maples? News articles and scientific papers have used the threat of sugar maple loss due to climate change as a scare tactic to get people to care about climate change. NO MORE MAPLE SYRUP! they say.

However, the science behind these claims is more nuanced than simply predicting the presence or absence of sugar maple in its current range. Climate predictions showing range shifts for tree species are at a broad scale and should not be interpreted as 100% movements of ecosystems north. The intent of these models was to look at landscape level changes and habitat suitability, not the presence or absence of a species.

Regional changes in climate are happening now, but the effects of these changes on the long-term presence of sugar maple will be very site-specific. Species will be lost from some sites within a region, but may persist or even expand on other sites in that same region. Sugar maple is expected to be lost from some sites in its current range, but to persist on others. Red maple is predicted to persist and expand on more sites than it is lost from. What will actually happen is unpredictable but these trends give us some direction.

A key to understanding forest ecology is to understand that the species that exist on a site are there for two reasons: 1) they found an opportunity to establish, and 2) they out-competed other species for that space. Species regularly exist on sites that are not optimal for their growth. White pine is an excellent example. It grows best on well-drained fertile sites, but it can also be found on a hummock in a bog because it was able to find a competitive edge to establish on that hummock.

What this mean for sugar maple in a time of climate change is that we have an opportunity now to manage our sugarwoods and provide them the opportunity to establish new maples and the ability to outcompete other species, even if climate is pushing the stand in a new direction. Silviculture is the means for which we find the tools to make this happen. Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests to meet the diverse needs and values of landowners and society. Simply put, it is applied forest ecology. Silviculture is best understood by breaking it down into tending operations and regeneration systems.

Tending operations focus on growing trees that already exist in the woods, such as thinning out trees for the benefit of others to have more space. Regeneration systems are methods by which trees are removed in order to provide a desired amount of light to allow new trees to be established. The timing and amount of light allowed in, as it relates to site quality and seed sources, will determine which species are able to regenerate.


An estimated 300 year old maple on the author's farm in Union, CT. The overstory of this former sugarbush is dying out while the understory is dominated by barberry and heavy deer browse. It'll take some work, but this site is overdue for some regeneration treatments.

Most sugarmakers will thin out their woods to favor maples prior to setting up tubing systems. However, this is often a one-time treatment when it should be seen as a process to repeat. If we think about trees as a barn full of dairy cows with a limited amount of hay that can fit in that barn, then we can understand how trees need space to thrive. Barn = sugarbush, cows = trees, hay = fixed amount of sunlight. If the barn is full of calves, then we can feed about 10x the number of calves off that hay than we would mature cows. However, as those calves grow older they get bigger and need more hay. If we do not remove some of those calves, then all of the calves in the barn will be underfed. However, we can increase the growth of our best calves by removing those that are underperforming. We need to do this multiple times until the calves become mature cows and at their production maximum. At that time we might think about getting some more calves.

Although this is a simplified analogy, the same is true for trees in our sugarwoods. We need to give room to the best trees by removing the underperforming ones. The added benefit of tending our woods is that the trees we leave behind will be healthier and better able to withstand stresses that may result from climate, disease, and harvesting sugar. These trees will also develop larger crowns and produce more sap with higher sugar contents – it's a win-win. The caveat is that we ensure any harvesting which occurs in our woods does not cause damage to the trees we're leaving behind – especially by driving all over their roots. What is not effective is leaving underperforming

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maples in a sugarbush simply because they provide another tap. This low productivity "tap" is detracting from your production because it is likely reducing the productivity and growth of your better trees. Don't tap the small stuff – either give it room to grow or remove it to give its neighbor room to grow.

Diversity in your woods is important for ecosystem function and preventing insect outbreaks. One winner in the models of forest change with climate is red (soft, swamp) maple. Red maple has a native range from Florida to New Brunswick and is a steady winner in changing forests. It is very flexible in its ability to adapt to different sites but rarely dominates a site long-term. It's no secret that red maple makes great syrup and it is something we should pay more mind to as we manage sugarbushes for the future.

Regenerating our sugarbushes is critical for ensuring their longevity in a time of change. But not all forests need to have regeneration present all of the time. Healthy, young stands of maple should be tended and allowed to grow, as it may be 100 years or more before they're in need of regenerating. However, older woods where the mature trees are starting to fade out or suffering from heavy damage should have steps taken to regenerate them. This will become even more important as droughts and storms resulting from

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climate change start to erode our overmature stands of trees.

This is where the work comes in, as forest regeneration faces many challenges. Invasive plants such as Japanese barberry out-compete maple regeneration and might need to be removed prior to providing an understory more light. American beech acts in a similar way, but recent studies indicate that the relationship between beech and sugar maple might also be strongly tied to calcium content (and/or pH) of the forest soils, so sometimes we're fighting to get rid of beech to favor sugar maple on a site where beech competes best. White-tailed deer complicate all of these dynamics in that they favor invasive shrubs and beech by preferentially browsing on maples. Hunting deer is fun but rarely effective enough to lower a deer population to a level in which regenerating maples becomes easy. Deer protection of seedlings or large-scale regeneration treatments that overwhelm a local deer population are needed to effectively deal with browse pressure. In spite of these challenges, sugarmakers need to think about regenerating portions of their woods today so their children's children have something to tap.

Key points to keep in mind

1. Climate change should not be ignored and poses a significant challenge to the maple industry.

2. We can influence the future of our sugarwoods through proactive management.

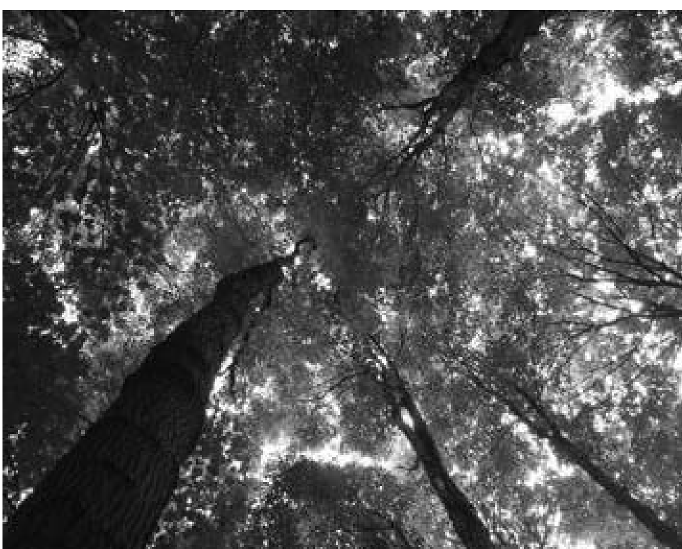
3. Silviculture is a means by which sugarmakers can provide maples with competitive advantages and opportunities in a changing climate.

4. Stop tapping the small trees. Either give them room to grow or remove them in favor of their neighbor.

5. Trees with room to grow yield more sugar and can better withstand the stresses posed by climate change.

6. Red (soft, swamp) maple is a survivor and we should pay it more mind.

7. Today's regeneration will be tomorrow's forest.



The dense crowns and heavy competition in this sugarbush in New York indicate that it's in need of a thinning. Favoring the best trees will keep the stand productive and able to withstand future stresses.

2019 USDA ACER Funded Projects

The 2019 Acer Access and Development Program's grants were announced late last year, with the USDA funding 8 projects to help advance the maple industry. Following are summaries of the funded projects.

Development of a Spatial Visualization Tool for Identification and Quantification of Market Opportunities for Maple Syrup and Value-Added Products

The University of Maine System acting through University of Southern Maine will conduct research to identify and quantify local and regional market opportunities for U.S. maple syrup and value-added products ("maple syrup"). Intensive business and economic research will address three key objectives: 1) Consumer Survey: assess consumer attitudes and preferences about U.S. maple syrup by state and regional market; 2) Business and Economic Modeling: quantification of potential relative value of U.S. market opportunities for domestic maple syrup; and 3) Market Feasibility: development of an interactive, online spatial visualization tool for assessing the value of regional market opportunities for maple syrup.

Developing a Sustainable Maple Syrup Industry in New Jersey through Research and Targeted Outreach

Stockton University, in Galloway, NJ will lead research and outreach programs to increase maple syrup production in New Jersey and the larger Mid-Atlantic region by using of novel technology, landowner engagement, and sustainable best management practices. The research efforts will focus on best management practices (BMPs) for sustainable maple syrup production, maximizing economic returns, and encouraging environmental stewardship. Outreach efforts will define BMPs for sustainable maple syrup production in New Jersey and the Mid-Atlantic at large, especially on the issues of sap volume, syrup quality, and ecological forest management with the goal of ascertaining the economic viability of maple syrup production regarding climate and seasonal variability. Outreach efforts will address land and technology access for current and potential producers delivered via workshops, demonstrations, and online content. The study results will be shared through maple conferences, agriculture and forestry conferences and meetings, peer-reviewed journal articles, and trade publications.

Expanding Knowledge for the Efficient and Profitable Production of Quality Maple Syrup and Value-Added Products

Cornell University will expand current research and education efforts to improve the efficiency of syrup production and quality of syrup. Areas of focus will include: 1) Sap collection system design and maintenance enhancements 2) Syrup processing efficiency and quality improvements 3) Value-added production process innovations. The result of this research will be disseminated through a three-part educational outreach effort in collaboration with maple programs in Ohio and Pennsylvania. Project staff will increase producer knowledge and normalize adoption of improved technologies and processes. Producers will also gain access to new production methodologies for the large-scale, efficient production of value- added products, including granulated sugar, refined sugar, cotton candy, and maple candy.

Leveraging Education and Research to Promote Maple Syrup Production in Ohio, Pennsylvania, and West Virginia

The Ohio State University will lead education and research programs to contribute the development of effective outreach strategies and policy instruments for enhancement of maple syrup production in Ohio, Pennsylvania, and West Virginia. The research team will conduct a survey to analyze syrup production and production practices in the tri-state region and evaluate stakeholder perceptions and motivations for engaging in maple syrup production by communicating with key stakeholders. A three-pronged strategy will be implemented to develop outreach and education materials, such as a varied array of fact sheets, presentations, best management resources, trainings, and introductory and in-depth workshops, to current producers, private woodland owners (potential as future producers or through lease tapping), and management professionals.

Maple Financial Education

The University of Vermont and State Agricultural College will expand maple financial benchmark programs and consolidate new maple business management education curricula that can be disseminated nationally, with an emphasis on enhancing producer and landowner sustainability through cost of production analysis and viable business planning. The target audience for this project will be current maple producers, prospective maple producers, landowners and business advisers seeking to expand producer and landowner education nationally. The curricula content is suitable for delivery in conventional educational settings and new distance learning business modules will be developed to expand accessibility to maple operators and forest land owners. This multi-state project will establish long-term maple business education capacity by developing a new network of coordinated business advisers in several states. By 2022 at least eight maple states representing over 90% of national maple production will participate in the education network develop a plan to offer programs in their respective regions.

Increasing production and income of U.S. maple producers through the increased use of red maple as a crop tree

The University of Vermont and State Agricultural College will conduct the research and education necessary to increase producer knowledge, awareness and understanding of the best practices

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and benefits of including red maple as a crop tree to increase production and income. Red maple is a resource with the potential to significantly increase U.S. syrup production and the production and income of individual producers. Maple producers throughout the U.S. will benefit from this knowledge to increase their total annual syrup production and income by increasing the number of red maple trees tapped for sap collection in their operations. Ultimately by increasing the number of red maple trees would increase the total production of the U.S. maple industry, helping to improve the sustainability of domestic maple production, and increase competitiveness of domestically produced syrup in the global marketplace.

Maple Syrup Production from Big Leaf Maple Trees in the Riparian Zones of Washington's Forests

University of Washington will conduct a three-year research project to determine the best practices to facilitate the development of a commercial maple syrup industry in the Pacific Northwest (PNW), specifically in Washington State. The project objectives involve determining the volume of sap and syrup that can be produced according to the following variables: (1) Different elevations, latitude, and climatic zones; (2) Collection methods using traditional bucket collection versus high vacuum tubing systems; (3) Size and health of bigleaf maple trees; and (4) Timing of tapping and strategies such as reaming of existing tap holes or re-tapping trees throughout the season (December-March). The research will also provide educational opportunities on how to develop the most successful and cost-effective sugaring enterprises with bigleaf maple in the PNW to bring additional income and diversity to the region's farming and forestry operations.

Sustaining the Central Appalachian Maple Syrup Industry through Integrated Forest Management Education Programming

West Virginia University Research Corporation will assemble a team of experts in forest management, forest operations, forest pathology, landowner assistance, and maple syrup operations to create a program that will provide an integrated program designed to promote maple syrup production by educating forest landowners, foresters, and loggers on the nuances of southern sugarbush management. The program expects to increase maple syrup production by increasing the number of maple trees tapped and the operations will become more sustainable as landowners, foresters and loggers are educated on proper management of the maple resource.

Maple Syrup Geography and Uses Expanding

Some recent news articles highlight the spread of maple syrup production beyond the northeast U.S. and southeast Canada.

Often considered a weed, the bigleaf maple grows up and down the west coast of the US and Canada. Normally cut down to make way for Douglas fir, some farmers are instead tapping them and making syrup. A January article from the Northwest News Network featured an interview with Neil McLeod of Neil's Bigleaf Maple Syrup in Acme, Washington. While the bigleaf maples produce sap with a significantly lower sugar content than sugar or even red maples, McLeod makes several hundred gallons a year and sells it locally at a premium to the relatively untapped (get it?) market.

The University of Washington, funded by a recent USDA grant (see page 32) will spend the next three years studying the possibility of expanding production in the area. At the same time, the article notes, concerns are already arising about noticeable dieback of the bigleaf maples.

On the other side of the globe, Dave DeGray planted 225 maple saplings 33 years ago, and says that his grove in New Zealand is the only one in the southern hemisphere. The trees are growing more rapidly than those in North America, he says, estimating their size to be comparable to a 100+ year old tree in our region. The article, on New Zealand's Newshub website, doesn't indicate whether he has tried tapping the trees or not. Given the much warmer climate, sap flow may

well prove to be a challenge.

Somewhat closer to home, it turns out that there's a Kentucky Maple Syrup Association, with 14 producer members, and they celebrated their first "Maple Syrup Day" in January. Maple production isn't new to the hills of Kentucky, but has been less common in recent years. Great to see that it's making a comeback.

Finally, seeing a new market opportunity with the growth of the cannabis industry, Bruce Hopper of Pure BS Maple Shack in Auburn, Massachusetts teamed up with Cultivate Holdings, a recreational marijuana producer, to create a THC-infused syrup. This isn't to pour over pancakes, though – a four-ounce bottle contains almost 500 mg of THC and costs $70, so you'll want to use it more sparingly. And keep it away from the kids.

New Nutrition Label Guidance Issued

In June 2019, thanks to advocacy from IMSI, NAMSC, and member organizations and sugarmakers, the US Food and Drug Administration (FDA) backed off of its requirement that all nutrition labels include an 'added sugars' line on the panel. Their guidance allows single ingredient products, like maple syrup, to leave off the line, and recommends the inclusion of a footnote explaining the amount of sugars that one serving of the product contributes to the diet as well as the contribution of a serving of the product towards the percent daily value of recommended sugars. The footnote is not required, but FDA encourages manufacturers to use it as a way to provide useful information to consumers.

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Labels must still include a percent daily value line for total sugars. In order to avoid confusion about what this means, particularly as consumers become more familiar with the 'added sugars' lines that will be appearing on all other products, IMSI is encouraging all producers to include a footnote reading "One serving adds 24g of sugar to your diet and represents 48% of the Daily Value for Added Sugars."

As with past labeling issues in the maple industry, IMSI is encouraging all sugarmakers to use the same nutritional information on their products, to help build a consistent understanding about pure maple syrup among consumers in all parts of the world.

For further information, contact IMSI executive director Jean Lamontagne, jeanlamontagneimsi@gmail.com.

Nutrition Facts

_ servings per container

Serving size **2 tbsp (30mL)**

Amount per serving

Calories **110**

	% Daily Value*
Total Fat 0g	**0%**
Sodium 5mg	**0%**
Total Carbohydrate 27g	**10%**
Total Sugars 24g	
	48% †
Protein 0g	

Calcium 30mg 2% · Potassium 90mg 2%

Not a significant source of saturated fat, trans fat, cholesterol, dietary fiber, vitamin D and iron.

† One serving adds 24g of sugar to your diet and represents 48% of the Daily Value for Added Sugars.

IMSI is recommending this footnote language for the new nutrition labels

Online Resources and Programs From UVM Extension

The University of Vermont Extension Maple Business program continues to develop new resources to support business owners. In spring 2019 the program launched a series of online business tools and business planning tools at the website: www.vtmaplebiz.org.

In January 2020 the program has launched an additional website to focus on maple economics and sustainable forestry practices. The new website is www.maplemanager.org

The website currently includes new resources for maple sugarbush leases. Additional legal planning and forestry planning resources will be added over the next 2 years. This website also includes an "Ask the Team" portal for producers and forest owners to ask our specialists question about tree health, forestry practices and business management. Questions and answers will be posted publicly and archived for all to view.

Financial Benchmark Participants Needed!

Since 2013, UVM Extension business educators have worked with maple producers directly to provide financial analysis support and generate Maple Business Benchmark reports that discuss the financial side of maple enterprises.

UVM has received USDA funding to expand the program to work with participants in New York, Maine, New Hampshire, Massachusetts and Vermont. The current phase of the project is seeking more participants with 10,000 taps or more that are willing to commit to two years of financial analysis with an adviser. Contact Mark Cannella (Mark.Cannella@uvm.edu) for more information about the Northeast Maple Benchmark Program.

MAPLE RESEARCH.ORG

NORTH AMERICAN MAPLE SYRUP COUNCIL

NAMSC has launched mapleresearch.org, a new online resource for the maple industry. The site is a curated collection of research papers, articles, videos, and tools, representing the most current and scientifically accurate information for maple production, to help all producers make the best products possible using the most current and most sustainable practices.

From *Maple Syrup Digest* articles, to producers' manuals, to how-to videos, the site includes a collection of the best resources available online about all aspects of maple syrup production, at no cost. The site is searchable, and resources can be downloaded and printed.

The site was built in collaboration with the University of Vermont's Proctor Maple Research Center, and funding was provided by the U.S. Department of Agriculture's (USDA) Agricultural Marketing Service.

Symposium: Making it Work in the Southern Tier

In September 2018 the West Virginia Department of Agriculture hosted the Southern Syrup Research Symposium to focus attention on research and extension needs to expand the tree sap industry in "the southern tier" of syrup producing states. A lot has happened since then. On June 19th and 20th we will be reconvening the Symposium at WVU in Morgantown WV to take stock of where we've come and shine a light on where we need to go. Join us for updates on research and development grants our region has received, to hear from researchers on problems and opportunities specific to our region, and to take part in discussions on the adaptations sap and syrup producers are making to increase yields and maintain quality.

The Symposium will be preceded by a maple syrup quality control and grading workshop on Friday and include Saturday afternoon workshops on innovative maple cooking and value-added processing.

The Symposium is hosted by West Virginia University and co-sponsored by Ohio State University, The Future Generations University Maple Program, and Virginia Tech. Funding provided by a USDA 2017 ACER Access grant.

For more information contact:

Jamie Schuler
WVU Division of Forestry
jamie.schuler@mail.wvu.edu
870-723-9378

Thank you to our Research Alliance Partners

The research published in the *Maple Syrup Digest* is funded in part by the North American Maple Syrup Council Research Fund. The Fund is supported by Alliance Partners and other contributors who make generours donations each year. Please support these businesses and organizations.

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