

Cornell Maple Program



2019 – 2020 ANNUAL REPORT

**Cornell University Department of Natural
Resources**

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Program Overview

Supporting the Maple Products Industry

The Cornell Maple Program conducts research and extension with the goal of improving the production and use of maple products. Work toward this objective takes place in three parts: 1) infrastructure upgrades that create and enhance capacity in our two maple facilities 2) applied research on a broad array of topics related to maple production and profitability and, 3) extension programming to share knowledge across the industry.

The Cornell Maple Program consists of maple specialists and technical support staff located at two facilities who work with a network of industry allies to deliver educational content. The Arnot Research Sugarbush near Ithaca, NY and the Uihlein Maple Research Forest in Lake Placid, NY include a combined capacity of over 14,000 taps in 350 acres of sugarbush, as well as modern processing equipment and research kitchen space. These two research and production facilities provide opportunities for experiments that account for region-wide variability in sugarbush conditions.



Research sugarhouses at Arnot Forest in Van Etten, NY (left) and Uihelin Forest in Lake Placid, NY (right).

Program Highlights



Sugarbush Management

Super Sweet Trees

Continuing the legacy of the “super sweet” maple tree project at the Uihlein Research Forest, we are in the middle of a three year project funded by McIntire Stennis federal capacity funds to re-analyze the potential sap sweetness and volume from our “super sweet” maple plantations. The project dates back to the 1960’s when the US Forest Service attempted to create trees with higher sap sugar content by grafting cuttings from sweet trees onto generic root stock. Seed collected from these trees was then planted and grown. In this project we are measuring the syrup production potential of both the grafted trees and the maples grown from their seed.

The grafted trees, although large and beautiful, have had unremarkably low sugar not any better than the average sugar maple. It is believed that this is a result of the generic root stock they were grafted to. However, the trees grown from their seed, inherited the sweet sap genetics and all tend to be sweeter trees. Our highest season average sap sweetness tree was 8.3% (single day high of 12%) sugar with a handful of trees averaging 6-7% sugar. Not all were sweet though as there was a number of trees with an average 2% sap sweetness. As the trees are starting to produce seeds, it is time to remove the lower sugar trees before they cross-pollinate with the high sugar trees.

Sugarbush Thinning

With funding support from USDA NIFA and NYS Department of Agriculture and Markets, a long-term study is underway to measure the impact of thinning trees from a sugarbush on tree health and syrup production in the remaining stand. Data has been collected for two seasons pre-thinning, and 1 season after the thinning. Preliminary results indicate a positive growth response in the residual stand. The production of sugar, sap and syrup was showing a trend towards response to increased release of the crown, but the relationship is weak. The strength of response may require additional

time for trees to allocate energy reserves into starch (sugar) storage rather than growth following release.

Sap Collection

An effective sap collection system must effectively deliver vacuum to trees, keep tapholes productive, quickly move sap to the sugarhouse, and stay as clean as possible to protect product quality. Numerous projects are underway to improve collection systems.

Line Cleaning

For the second year, most mainlines in the Arnot Forest sap collection system were treated with a food grade washing and sanitation at the end of the sugaring season. The purpose was to develop an efficient washing system and evaluate cleaners. Washing solutions were mixed in a tractor mounted tank and sucked into the far end of mainlines with vacuum. In places where the end of the line was not accessible by tractor, a connector line was installed to reach the nearest roadway. For lines located more than 20 ft uphill from the road, a PTO powered roller pump was used to pump wash fluid to the line.

Each line was treated with the following:

<i>Treatment</i>	<i>Volume (gal)</i>	<i>Chemistry</i>	<i>Concentration</i>
<i>Rinse</i>	<i>50</i>	<i>water</i>	<i>NA</i>
<i>Wash</i>	<i>50</i>	<i>sodium hydroxide (RO soap)</i>	<i>12.0 pH</i>
<i>Rinse</i>	<i>50</i>	<i>water</i>	<i>NA</i>
<i>Sanitize</i>	<i>50</i>	<i>sodium hypochlorite</i>	<i>200 ppm (1 TBSP per gallon)</i>
<i>Rinse</i>	<i>100</i>	<i>water</i>	<i>NA</i>

Sap Flow Boosting

Sap flow rate can have a significant impact on syrup quality. The speed of travel from tree to storage tank influences sap temperature and dissolved oxygen levels.

Slow moving sap is more prone to warming on sunny days which promotes microbial activity, leading to off-flavors, yeast laden sap and darker syrup. One possible remedy is utilizing vacuum to accelerate sap flow. Using vacuum eliminates the need for pumps powered by electricity or fuel which reduces maintenance requirements and allows systems to be placed in remote locations.

Several configurations of vacuum pumps and specialized releasers have been tested for their ability to consolidate sap from several slow moving lines and accelerate it down a single conductor line. The most promising setup is a vertical releaser modified with a small air inlet on the discharge line. In our test system, sap reached the sugarhouse 2x faster without vacuum loss to the trees upstream from the releaser. More tests are scheduled for the 2021 sugaring season.

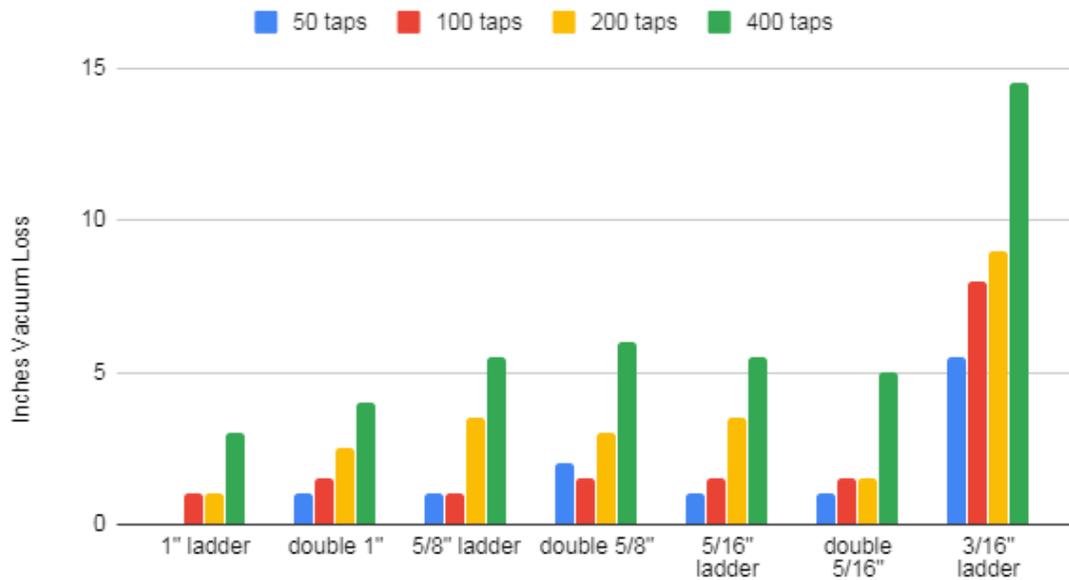


Sap Ladders

Moving sap uphill and across flat sections of sugarbush can be challenging. Sap ladders are one way to address this issue. To be effective a ladder must lift sap up the ladder and also conduct vacuum to the woods below the ladder. Traditional 5/16" ladders can waterlog and stop moving sap. They may also lose vacuum to the woods. We installed a demonstration ladder system with several alternative configurations side by side to compare performance. This system demonstrates the value of adding a 1" line to conduct vacuum and the limited usefulness of 3/16" tubing for ladders. Our

demonstration also showed the importance of a small, controlled air inlet at the bottom of the ladder for improving the flow rate up and preventing waterlogging.

Vacuum Loss with Added Air



Flatland System

Lack of slope is a challenge in some sugarbushes. In these flat systems, it is difficult to move sap without trucking or using pumping stations. The CMP installed and tested an alternative system that lifts sap uphill using a series of simplified ladders. In these ladders the mainline was bent into an S-shape instead of being cut.



As a result, the mainline is a continuous, unbroken line with 4 foot lifts every 60 to 100 feet. The system was tested with positive results during the 2020 season. Initial results indicate that the system was able to effectively move sap and also maintain vacuum.

Lifting Sap with 3/16" Laterals

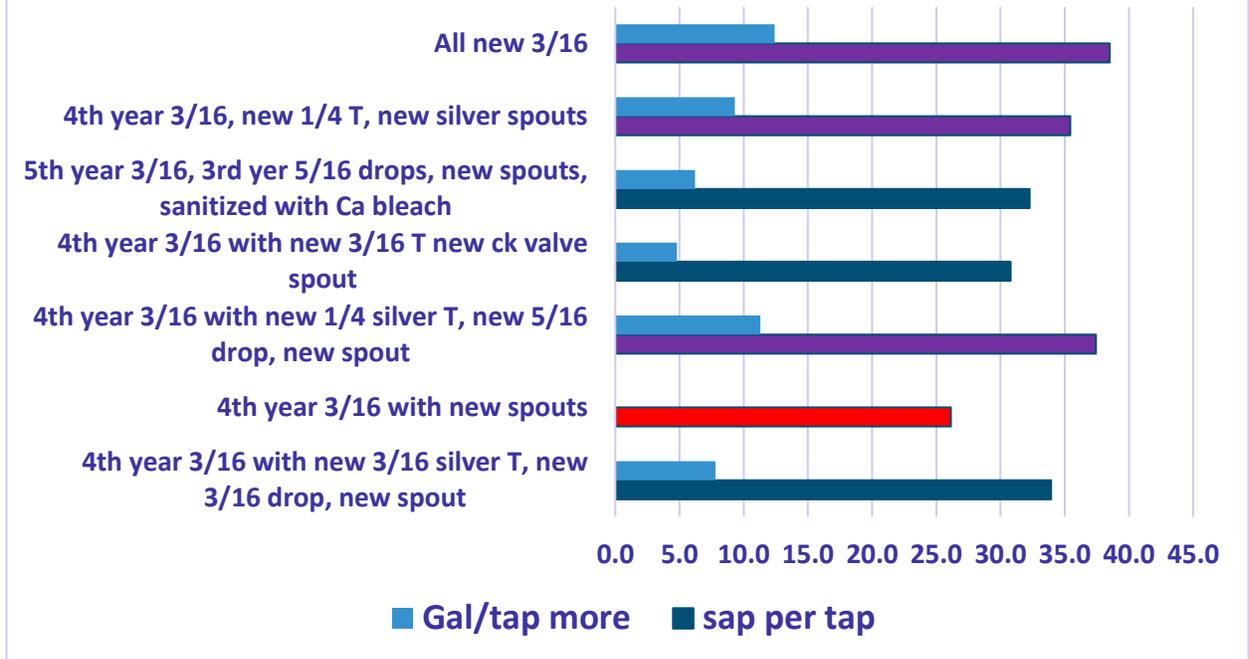
We initiated a small study in 2019 to test the ability to pull sap uphill within a tubing system by using natural gravity vacuum created in 3/16" tubing on the downhill side. With a pocket of maples on the other side of the hill from our sugarhouse, we wanted to pull the sap up and over the hill to our sugarhouse without adding a vacuum pump. Trees on top of the hill with downhill sap flow created vacuum within the line that pulled the sap from the trees on the back side of the slope. The natural vacuum was enough to pull uphill from trees that were less than 20feet below the top of the hill. Any trees below this did not have enough vacuum to pull the sap uphill. Even at 15 feet below the top of the hill we still had 7.5inhg vacuum. With only the cost of a couple rolls of tubing and fittings we were able to make an additional 21 gallons of syrup from ~60 trees that we would not have access to otherwise.

Tap Hole Sanitation

Treatments to improve sanitation for the spout and drop line in tubing systems can increase sap yields by upwards of 100%. Check valve spouts, bac zap spouts with imbedded silver, spout and drop line sanitation, and spout and dropline replacement have all proven highly effective in boosting sap production. However, 3/16" lines do not maintain productivity with these practices. Evidence indicates productivity drops in these lines due to clogged fittings. If you look at a 3/16" fitting you will see that the opening is very small. Even a little yeast and mold can block this opening.

Several treatments were studied to improve 3/16" performance during the 2020 sugaring season. These treatments included replacing fittings with new fittings, replacing fittings with 1/4" fittings and cleaning tubing with calcium bleach. The 1/4" fittings proved effective but were very difficult to install. Calcium bleach showed some promise but may need to be applied in a concentration higher than 200 ppm to bring performance back to the level of new tubing.

2020 3/16" Replicated Tubing Trials



Re-tapping

Past studies of re-tapping have shown potentially large gains depending on the timing of the retap and sugaring weather. Recent tests have adopted the practice of tapping the second hole directly above the original hole to avoid creating a new column of partitioned wood.

In 2020, the importance of spacing out the two tap holes was studied. Trees were re-tapped with either 2 inches or 7 inches between the tap holes. Trees tapped 2 inches apart did not show increased production. However, trees with the re-tap 7 inches above the original hole produced 7.5 more gallons of sap than trees that were not re-tapped.

These results indicate that placing the second tap only 2 inches away from the first tap is not enough to prevent contamination from moving into the new tap hole from the old one.

A separate re-tapping study was initiated at the Uihlein Forest with funding from the Northern NY Agriculture Development Program. Re-tapping included two methods of either drilling a new tap hole 8 inches above the original tap hole and adding a

second spout or pulling the original spout and moving it to a new tap hole 8 inches above the initial tap hole near the end of the season before tap holes started to plug.

Results from 2019 showed that there was not a benefit to re-tapping. We repeated the study in 2020 which had a sap season that was twice as long as 2019. In 2020, trees that were tapped on March 2nd produced just as much syrup per tap as trees that were tapped on January 22 then re-tapped on March 30th. These results show that the success of re-tapping is highly dependent on the length of the sap season and end-of-season weather.



Syrup Processing

Making syrup with good flavor and proper grade standards is paramount in a sugaring operation. We continue to investigate methods to improve quality and processing efficiency.

Ultrafiltration

Preliminary trials were conducted to measure the quality impact of ultrafiltration on concentrated sap. In the experiment, concentrate at 18 brix was filtered to 0.45 microns. Samples were then left at room temperature for varying periods before being frozen. Control samples of unfiltered sap were subjected to the same treatment. An analysis of invert sugars showed the ultra-filtered samples developed invert at a slower rate than the control. Covid-19 restrictions precluded any further testing during the 2020 season. New facilities and equipment for the 2021 season, including 2 chilled bulk storage tanks and a heated sugarhouse will allow for more rigorous tests next season.

Grade Blending Calculator

In order to blend syrups of different grades to the grade requested by a customer, properties governing light transmittance must be understood. We collected

data on changes in light transmittance when darker syrups are added to Golden syrups at different ratios. The data was then manipulated into a logarithmic function of best fit. This function was used to create a user friendly “calculator” in an excel spreadsheet, where maple syrup producers can enter two syrups of different transmittance, and find out how much they need of each syrup to blend into their desired transmittance or grade. This tool has been uploaded to the Cornell Maple Program website for free use.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Transmittance Blending Calculator					<i>Instructions</i>						
2						Enter your data into the YELLOW highlighted squares like this: your data						
3						Enter numbers only, no special characters or unit labels. Ex: 25.2 Th						
4	Lighter	Darker										
5	69.1	20.5	Enter the initial transmittance % you get for both of your starting syrups.									
6			The higher number (greater light transmittance) should go into the "Lighter" column, while the lower numl									
7		34	Enter the transmittance % of a 50/50 blended sample of your 2 syrups.									
8			Be sure they are mixed thoroughly. Allow bubbles to settle completely out before measuring Tc. <i>Bubbles in</i>									
9		35.6	Enter the Tc% you hope to achieve (desired transmittance)									
10												
11		24.3	Variable A									
12		34	Variable B									
13		35.6	x									
14		0.859323	Ratio of Darker : Lighter syrup required									
15		50	Enter the total Gallons of Lighter syrup you have here.									
16												
17	100	85.93229	If you were using 100 gallons of lighter syrup...									
18		0.5	Correction									
19	50	42.96614	The maximum # of gallons you could use for blending, based on the total amount of Lighter syrup you have									
20		92.96614	The max gallons you would end up with after blending									
21		40	The number of gallons you want to make at your desired Tc%									
22	21.51321	18.48679	The # of gallons you should use to blend of each syrup.									
23												

Brix Equalizer Demonstration

This season Uihlein Forest had the opportunity to demo a Brix Equalizer by Dominion and Grimm. The innovative unit has a digital in-line brix meter that measures the finished brix of syrup after being drawn-off and filtered, but before being packed into a barrel. A digital touch panel screen allows the user to set the desired brix level and if the unit reads a brix higher than the set point, it will inject a little permeate water from a small tank on the machine. Syrup is re-circulated through the unit from an insulated mixing tank that has a rotating paddle specially designed to homogenize the syrup to ensure a consistent brix through the



entire batch. Once the desired brix level is reached the unit allows a user to pump directly from the unit into a barrel. After demoing the balancing unit, the crew at the Uihlein Forest found that using the equalizer as part of our production made sugaring easier.

Birch Syrup

Uihlein Forest continues to tap birch trees and research syrup production. The season for birch sap starts as soon as maple end sand runs for a few weeks until buds start to open. Birch sap flows due to pressure in the roots and runs when the weather warms in late spring. The best production is when the trees are tapped right as maple season is ending. Average sap sweetness is only 0.8-1.0% but birch trees may produce over 20 gallons of sap per tap within a short period. It is still unknown whether vacuum increases birch sap production. The consensus is vacuum does not increase production but does help to evacuate sap from the lines quicker.

In 2020 we have been experimenting with the flavor of birch syrup. Although a strong flavor, it is enjoyable in marinades, salad dressings, dressing on sandwiches, or as a glaze. To reduce the bitter flavor we have been testing different cooking methods. So far we have found that faster cooking results in more delicate the flavor. Instead of cooking down larger batches of syrup we have found that cooking down 5 or 10 gallon batches of concentrated sap at a time yields the best fruity flavor. Boiling too quickly will result in not enough time to caramelize the sugars and provide a unique flavor.

Beech Syrup

American beech are being tapped at the Uihlein Maple Research Forest in Lake Placid, NY. Due to the spread of beech bark disease (BBD), beech have lost much of their timber value. By tapping the trees for sap collection, it may be possible to create value from beech where there was none.

Because beech tend to produce sprouts as they succumb to BBD, they are quickly increasing in numbers in northern forests. And for a variety of reasons, they outcompete maple seedlings. Tapping these small clonal saplings could help control beech while also diversifying maple producers' product offerings. However, beech sap is only possible to collect under vacuum, and both sap volume and sap sugar are relatively low.

Beech Syrup flavor is similar to maple syrup, but with hints of dried fruit. One physical distinction of the syrup is that pectin forms when the sap is boiled, creating difficulty filtering. If not filtered, the syrup may turn into a beech jelly.

Though the sap volume and sugar content are so low, tapping beech makes value from what would otherwise be a nuisance tree. Additionally, the rarity of beech syrup can add significant value, and combining with maple syrup can raise the price-point per volume.

Value Added Products

Product diversification becomes ever more important as the maple industry grows and increases syrup output. Work continues to improve classic maple confections and also develop novel maple products to access profitable new markets.

Alternative Sugar Production Methods



High temperature cooking

We were able to boil syrup at a higher invert sugar level than is traditional by increasing the finish temperature. For example, we boiled a dark syrup with 3.5% invert at 300°F resulting in a crystalline sugar with intensified maple flavor.

This strong maple sugar is useful for combining with ingredients that can overwhelm the delicate maple flavor, such as in artisan chocolate recipes.

Sucrose crystal growth

Pure sucrose from maple syrup may be useful especially for crystal coating

Amorphous Sugar

By taking high-invert syrup to 305°F and allowing it to cool in a shallow mold for several hours, we created a sugar glass, similar to an enlarged lollipop, formally known as an “amorphous solid”. This solid could be broken up and ground to particle sizes similar to crystalline sugar, however, the resultant amorphous particles have very different properties than sugar crystals.

Vacuum Boiling high-invert syrup

Boiling to high temperatures introduces a risk of scorching the sugar.

maple candies. These crystals can be extracted from syrup by supersaturating a syrup at higher finish temperature, then allowing the liquid to slowly cool and sit undisturbed for an extended period of time.

Syrup cooked to higher temperatures formed more sucrose crystals, but required rinsing for purity

Using vacuum while cooking reduced the temperature at which the syrup boils, removing water without the risk of scorch.

We applied 24 inches of vacuum using a pump from our tubing system. We were using a high-invert Very Dark syrup to make amorphous glass sugar, so our target temperature was 305°F. With vacuum, the finish temperature was reduced to about 233°F.

Multi-Ingredient Confections



Maple Chocolate

Novel maple chocolate recipes were taken through the research and development process all the way from initial experimentation, to cooperation with an industry collaborator.

Samples were publicly shared providing useful feedback during several

Maple Mints

A traditional butter mint recipe was adapted for use with intense maple sugar. This was an experiment to find if maple and mint were compatible flavors. Samples and the recipe were shared at the 2020 maple conference, and met with great approval.

development phases. Furthermore, we worked with students in the Food Science program at Cornell to research how the properties of amorphous sugar interact in a chocolate sugar-fat matrix. We now have an agreement for future collaboration with an industry partner to take our simple recipe and create an artisanal version, whilst sharing her chocolate science expertise.

Maple Orange Soft Drinks

The two sodas that had been developed and approved with scheduled processes have been produced on a commercial scale. These sodas were Maple Orange Crush and Maple Orange Cream which includes vanilla. These sodas are now being bottled alongside the popular Maple Lemon Ginger Soda by cooperators at Roxbury Mountain Maple.

The new Orange sodas have been sampled out at several events including the 2020 Maple Conference. Additionally, a new Soda Guidelines Fact Sheet has been added to the CMP Website.

The proven feasibility of combining maple and mint flavors opens the door to many confections, deserts, and other products, including but not limited to: maple mint jelly to be served with lamb, maple peppermint patties, maple mint candy canes, maple mint protein bars/sports supplements, and a new flavor of the “hot maple beverage” described below.

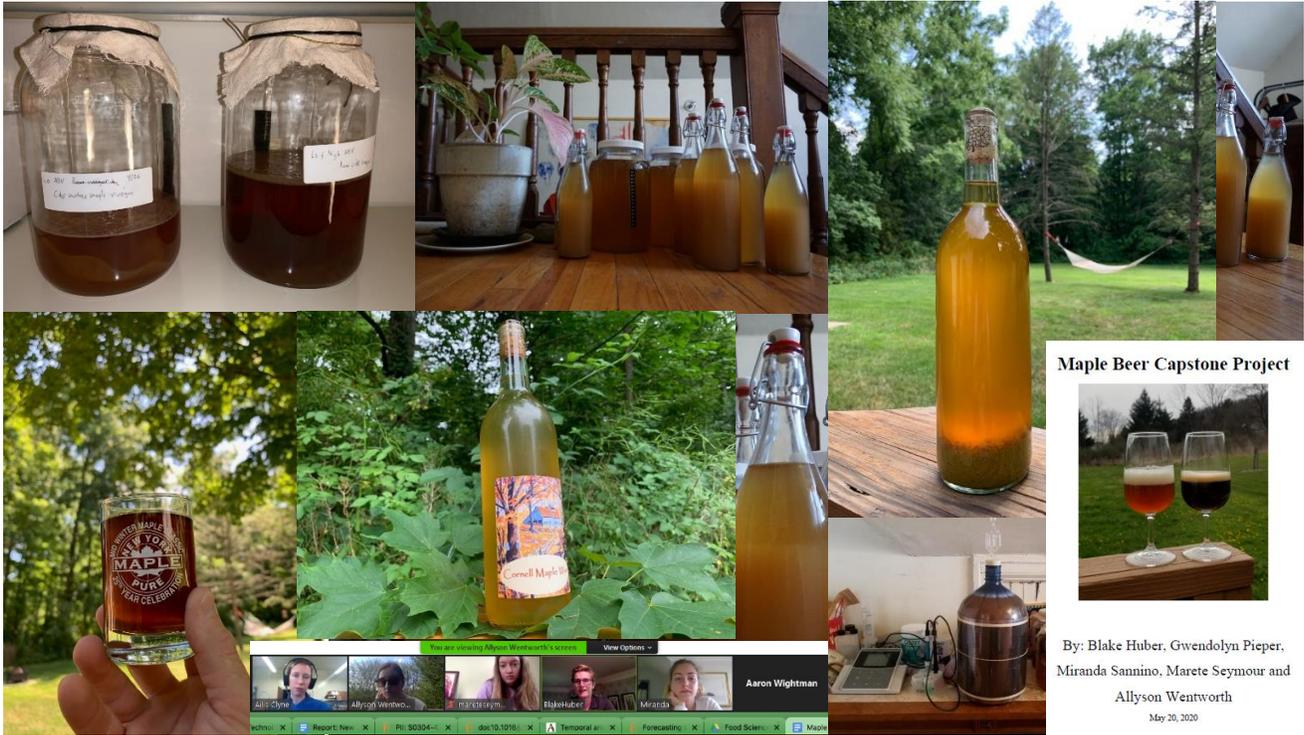
Hot Maple Beverage

Amorphous glass sugar readily dissolves into hot water or milk. Development of this new product began in 2020 after processes for amorphous sugar production were having success.

This drink is reminiscent of hot cocoa. While the product still needs a good name, the flavor is phenomenal. We aim to complete development of two recipes to share with maple producers: one that can be stored in a canister for use with hot milk, and a “just-add-water” version that can be packaged into single serve pouches. The latter has more obstacles.

Additionally, while updating the Confections Notebook, maple marshmallow recipes were explored for product improvement. Issues with product stability, texture, and flavor were identified for future research.

Fermentations



Maple Beer Capstone Project

By: Blake Huber, Gwendolyn Pieper,
Miranda Sannino, Marete Seymour and
Allyson Wentworth
May 20, 2020

Maple Vinegar

Last year, attempts were made to convert late-season, buddy sap into vinegar, in the hopes that the low-value sap could be made highly valuable and marketable. Attempts were unsuccessful. These experiments were conducted before a suitable recipe for maple wine had been developed.

With quality maple wine as a starting point, vinegar fermentations have been far more successful. We tested several different types of initial inoculant: red wine mother of vinegar (MOV), white wine MOV, cider MOV, and raw unpasteurized apple cider vinegar (raw ACV). The cider MOV was most the successful. Batches subsequently inoculated with unpasteurized maple vinegar were successful as well.

Maple Kombucha

Since the article, “Maple Kombucha could be the next big thing” appeared in the Maple News, many interested businesses have reached out for more information. To meet these requests, the Cornell Maple Program has provided free online documents: a basic recipe guide for experimenting with fermentation at home, and the Kombucha Chapter excerpted from the upcoming Fermentation Notebook.

The Kombucha Chapter was distributed to a few maple producers and interested colleagues for feedback prior to publishing on the Cornell Maple Website.

Collaboration has begun with a pair of small business owners looking to start an all-local-ingredient maple-based

Furthermore, we tested adding charred oak to flavor imperfect wine. This wine had excess tartaric acid which seemed to aid the fermentation. The oak added a smoky character that gave this product a uniquely delicious quality that would raise its value.

Maple Wine

Efforts to refine maple winemaking techniques continue with the goal of expanding the maple beverage market. Guidelines for basic maple wine production are available on the CMP website.

Additional research was conducted this year to improve product quality to produce a wine on par with commercial grape wine standards. This included reduction of the fermentation temperature, adjustments in acid and oaking recommendations and experiments with infusions such as hops and herbs.

Details on maple wine production will be included in the forthcoming Maple Fermentation Notebook, expected this fall.

kombucha brewery in the finger lakes region. Maple is to be featured as the key ingredient and marketing standpoint of their products.

Moving forward, the Cornell Maple Program is available for informational support to those wishing to start a Maple-based Kombucha business.

Maple Beer

The Cornell Maple Program is working with brewing experts to create guidance for the best use of maple in making high quality beers. Work to date has included experiments to determine the best use of maple in the beer making process. Studies with nut brown ale and amber ale indicate that maple flavor is lost during primary fermentation. Therefore, it is best to add maple syrup or sugar after the primary fermentation. Maple can also be used as a priming sugar to carbonate the beer. Although maple flavor is somewhat overpowered by other beer flavors, taste tests show that it improves the overall appeal of the taste and aroma.

Experiments have been conducted on using maple in IPA and Oktoberfest beers with future studies scheduled with saison and sour beer style. Guidance for maple beer production will also be featured in the upcoming Maple Fermentation Notebook.

Find out more about any of these topics in the *Value-Added Product Development* section of the Long-Form Final Report available on the Cornell Maple Program website.

Extension

The Cornell Maple Program conducts applied research with an end goal of developing pragmatic educational materials that result in real world improvements on farms. These materials are communicated through a network of outreach programs in the northeast including conferences, workshops, articles, videos and online resources.

Maple Cream Pricing

Maple Cream
Enter in values for the cells highlighted in yellow; the cells highlighted in blue will update automatically

# hours spent making and packaging cream	3
gallons of maple syrup used	2
\$/lb for maple syrup	2.75
price of cream machine	1,600.00
lbs of cream made over the lifetime of machine	1,000
percent of cream given out as samples	5%

number of jars filled	1/2 lbs of cream produced	cost of jars		price of jars		# of jars sold		total revenue
		retail	wholesale	retail	wholesale	retail	wholesale	
16	8	\$ 1.00	\$ 8.00	\$ 6.00	16	-	\$ 128.00	
8	4	\$ 1.15	\$ 14.00	\$ 30.00	8	-	\$ 128.00	

value of syrup used to make cream \$ 61.05
cost of jars \$ 26.35
cost of machine/batch \$ 37.30
total revenue \$ 241.30
total profits \$ 126.70
profit/hour \$ 42.83
profit/lb of syrup converted to cream \$ 63.35

note that this does not include the labor cost of marketing or electricity and vendor fees

shrinkage from syrup to cream 77%

From The Sugar-maker's Companion by Michael Farrell • Copyright © by Michael Farrell. • All rights reserved.

Other Beginner Documents

- SWOT Analysis - Beginner's Marketing Worksheet
- Maple Summary of Accounts
- Should you buy sap? Economic Analysis by Michael Farrell

Welcome Beginner Sugarmakers

- Running a Maple Business
- Product Development
- Maple Recipes
- Maple Confections
- Sugarbush Management
- Uihlein Forest
- About Birch Syrup
- Arnot Forest
- Syrup Sales
- Maple Program Calendar
- NYS Grown & Certified Maple

BF 152: Intro to Maple Syrup Production
Sugaring for Profit

The Cornell Small Farms Program is pleased to offer an introductory course in maple syrup production as part of a new suite of online courses. This online course covers all the basics of maple syrup production.

Cornell Maple Program
3 subscribers

Analytics | Edit Video

This instructional video on how to test invert sugar in maple syrup is a part of our Beginner's Video Series.
Music: Vienna Beat by Blue Dot Sessions (www.sessions.blue)
SHOW MORE

2020 Annual Maple Conference

The annual New York winter maple conference was held January 3rd and 4th at the NY State Fairgrounds in Syracuse. This year included a new event – a maple alcohol tasting session with opportunity to meet the producers of these products. The event was attended by 281 participants. Copies of the Cornell guidebook *Maple Wine Methods and Materials for NY State Maple Syrup Producers* were distributed. Maple Conference Session Descriptions are attached at the end of long-form annual report available on the CMP website.

Cornell Small Farms Course: Intro to Maple Syrup Production

The Cornell maple program again delivered a beginner maple course as part of the non-credit bearing Cornell Small Farms online course series. A total of 23 participants representing 5 states engaged in the six-week course that included one live presentation a week with available resources and dialogue that accompanied each week.

New Instructional Videos

Due to restrictions on in-person instructional sessions caused by the COVID-19 pandemic, personnel of the Cornell Maple Program could not conduct regularly scheduled workshops and talks. Anticipating a significant period of time before normal in-person sessions could resume, we produced new instructional videos to engage maple producers in remote learning.

Two new playlists were added to the Cornell Maple Program YouTube Channel: “Beginner Maple Producers” and “Advanced Topics in Maple”. The new videos produced are, “Intro to Invert Sugar Testing” for beginners, and “Making Maple Sugar from High Invert Syrup: Amorphous Sugar” for advanced producers looking to experiment with their value-added products.

Cornell Maple Program Website Updates

This year, the Cornell Maple Program website underwent major changes. It became more interactive, user friendly, and mobile friendly. With the vast increase in mobile users, this was a highly necessary improvement. Additionally, content has been organized topically to make resources easier to find. A site search engine has been added, along with a whole suite of new documents, links, videos, and tools.

New Sections:

- Updated Recipes
- Calculators and Tools
- Sugarbush Management
- Running a Maple Business
- Beginner Producers
- Archival Research

Website updates are ongoing. We expect website use to increase over the course of the pandemic, and have plans to add new features and content to accompany alternative remote learning programs that are currently in the design phase.

Summary of workshops and training sessions

Maple program staff held 107 workshop sessions this year in NY and other maple producing states. Most sessions were workshops for maple producers. Cornell’s maple team also gave presentations at national and international maple meetings, trainings for natural resource professionals, classes for students, talks to the general public, and informational sessions for policy makers. A list of all talks administered by Cornell Maple Program personnel can be found in the long-form Final Report available on the CMP website.

Publications

This year, the Cornell Maple Program contributed 10 pieces to the *Maple News*. These articles are archived online on the Maple News Website. Two pieces were contributed to the *Pipeline*. One to *Grassroots: The Voice of New York Agriculture*. Links to publications in maple-related news outlets are regularly added to the “In the News” section of the CMP website.

Two books were added to the Cornell Maple Program Notebook Series: *Maple Syrup Production Beginner’s Notebook* (2019), *Sugarbush Management Notebook* (2020). These can be viewed and downloaded for free on the CMP Website :



Additionally, the Kombucha Chapter of the *Fermentation Notebook* has been pushed out ahead of the book itself due to increasing interest. This can be found on the “Product Development” page of the CMP website, alongside two new fact sheets, “Maple Soda Guidelines” and “Maple Kombucha Recipe Instructions”.

For more information visit www.cornellmaple.com