Maple Syrup Digest

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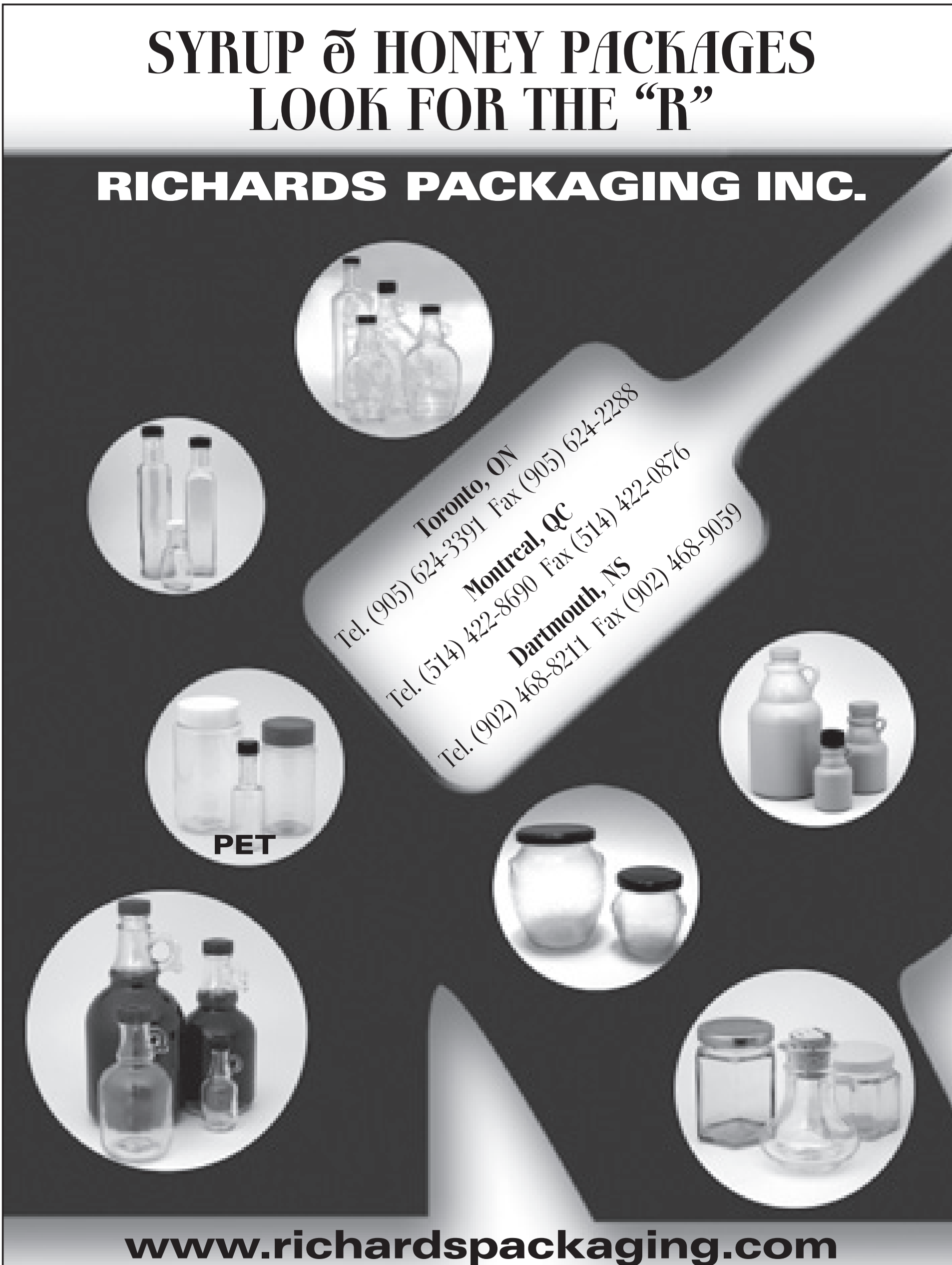
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GREETINGS FROM YOUR PRESIDENT

With this being the 50th Anniversary of the North American Maple Syrup Council it's a good time to take a moment and reflect on where we were back in 1959, the progress we have made over the years and where the Council and industry are going in the years ahead.

When the new "National Maple Syrup Council" first met on October 27, 1959 the leadership defined the purpose of the Council as that of "promoting research in (a) the chemistry and technology of maple sap and products derived from it; (b) in maple bush management and disease control; (c) in markets and marketing of maple products and standardization of the maple products without government regimentation through encouraging development of efficient methods and equipment within the industry".

Sound familiar? Well, it is and it's not only what the Council has been doing since it was established fifty years ago but continues to be the direction of the North American Maple Syrup Council and that of the industry as a whole.

When you think of the challenges the industry faced back in the 1950's versus what we are dealing with today they are somewhat different but still present the same threats. The founders of the Council helped refocus a diminishing industry and point it in a direction that would provide the research and education that would allow it to survive. The resulting innovation and technology improved every aspect of the maple industry and as a result of those initiatives we can still produce a reasonably priced gallon of pure maple syrup today. It's the concern and value we place on our forests that has promoted research to insure the productive future of the maple tree, the desire of producing quality syrup and the creativity and communication that has brought about a viable industry that gives us the opportunity to offer a once very local food product to the rest of the world.

The future of the maple industry from forest management to the production and marketing of product is the responsibility of every syrup producer, packer and industry manufacturer. No one will do it for us. Our continued success requires everyone's support whether it's volunteering at your local maple association, serving at the national level or financially contributing to maple research. Invest your fair share whether maple is your hobby or your career so that in fifty years there will continue to be a sincere appreciation for our continued efforts to maintain a unique industry and to keep a valuable tradition alive.

The annual meeting in Bar Harbor is fast approaching and our hosts, the Maine Maple Syrup Producers Association, promise an enjoyable and educational convention. As your soon to be retiring president I would like to extend my sincere thanks and appreciation to everyone who has volunteered their time and talent contributing to our accomplishments over the past two years. Thank you for the opportunity to serve as President and I look forward to seeing many of you in Maine.

Mike Girard


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IMSI NEWS

The International Maple Syrup Institute (IMSI) continues to provide a very effective forum for sharing information. During the three Board of Directors meetings held so far in 2009, there has been much discussion covering a broad spectrum of issues. There seems to be a growing interest in the Institute, judging in part from a growing number of contacts made to IMSI's Executive office as well as interest in IMSI's current initiatives, including the proposal for standard international maple grades.

A number of new members have joined the Institute in 2009, which is good news as our efforts to interest others to the organization continue. IMSI's Executive Committee and Directors understand that IMSI's service to members and accomplishment are very important both to existing members and potential members. We are working hard to ensure that we are delivering the best service possible and are responding to member needs in setting our priorities and implementing our activities. We hope that membership will grow as awareness increases regarding accomplishments of the Institute,initiatives being worked on and services being provided to members.

On August 18th, 2009, the Board of Directors of IMSI met in Fredericton, New Brunswick at the Fredericton Inn. Yvon Poitras, IMSI Director and General Manager of the Association of New Brunswick Maple Producers, worked with IMSI's Executive Director to arrange the meeting venue. Yvon arranged for a very interesting tour of the Maritime Forest Ranger School after the Board meeting for those who wished to participate. Some highlights from IMSI's Board of Directors Meeting in Fredericton are reported below.

Production, Supply and Demand for Syrup in 2009

It was reported in the last edition of the Maple Digest that the 2009 crop of maple syrup was very good in most regions of United States and Canada. Production statistics for the United States were posted on the internet in June and are available at: http://www.nass.usda.gov/Statistics_by_State/New_England_includes/Publications/0605mpl.pdf. The New England statistics are very easy to find using google's search engine if you cannot access them using this web site information for any reason. Canadian maple and honey production statistics are reported together in the fall of each calendar year, so are not yet available. IMSI's Executive Director is in discussion with Statistics Canada officials to determine if the Annual Canadian Maple Production Statistics could be published earlier in the calendar year.

At the IMSI meeting in Fredericton, it was reported that in 2009 ,109 million pounds of maple syrup were produced in Quebec in 2009. It was also reported that 88 million pounds of Quebec syrup had been graded by mid-August with all grading of syrup to be completed in the fall. Prices for bulk syrup in both Canada and the United States are averaging about $3.00 per pound with some variation for the different grades and in different market places.

Markets are good in North America

and internationally, with a good supply of syrup available. It is too early to project what the syrup supply situation will look like as we approach the 2010 maple production season.

IMSI is arranging for a speaker on the topic of "Using the Internet to Market Maple and other Agricultural Products" at their Annual meeting in Bar Harbor, Maine on Saturday October 24th. Dr. Gregory White, Professor of the School of Economics at The University of Maine, will be a featured speaker.

Some excellent printed materials designed to aid promotional and marketing efforts for pure maple syrup have been published by the Federation of Quebec Maple Producers,the New Brunswick Maple Producers Association and the New York State Maple Producers Association and have been brought to the attention of IMSI's Board of Directors. A summary of how this material can be accessed will be forwarded to IMSI members in the fall and published in the next issue of the Maple Digest. In the meantime, you may contact Dave Chapeskie, IMSI's Executive Director for further information.

Adulteration of Maple Syrup

At the IMSI Board meeting in Fredericton in August, there was strong concern expressed alleging that adulteration of maple syrup is currently very significant in both North American and international marketplaces. The Board directed that IMSI step up its efforts to raise awareness regarding suspected adulteration in the international marketplace and test suspected samples for adulteration. Members of IMSI are strongly encouraged to obtain and submit suspect samples through the IMSI sponsored program for testing. Information on the test and instructions for submitting samples were e-mailed to IMSI members in August 2009. A Press Release regarding suspected adulteration will be distributed to IMSI members in September. It is very important that all maple syrup industry stakeholders be vigilant and do what they can to protect the industry from adulteration. If significant in the international market place, adulteration could lower the price of pure maple syrup and give some consumers the wrong impression regarding its attributes. Those submitting samples for adulteration testing must purchase them, but IMSI will pay for the testing. Dave Chapeskie, Executive Director of IMSI should be contacted if there are any questions regarding the adulteration-testing program sponsored by IMSI.

IMSI is also monitoring follow-up regarding reported cases of alleged adulteration of maple products in Canada and the United States. With fiscal constraints in some regulatory departments, it is very important that the industry encourage governments to take appropriate regulatory action where required.

International Standard Maple Grades and Classification System

A very important topic of discussion at IMSI's Board meeting in August was the proposal for a standard grades and classification system for the international maple syrup industry. Discussion focused on the classification system to be proposed for syrup suitable for sale in retail markets. Several options were considered and a proposal for three classes of grade A syrup (suitable for sale in retail markets) and Grade B syrup (for food processing and nonfood use) was unanimously accepted as the preferred classification system by IMSI's Board of Directors at their meeting in Frederiction, New Brunswick on August 18th. This proposal involved combining the two lightest colour classes of syrup in current grading classification systems into a single class leaving the darker classes of syrup with only minor adjustment. The final proposal for the standard grades and classification system will be distributed to IMSI members for review and comment in early September. The proposal will be tabled for discussion and a vote by the Directors at IMSI's Directors meeting in late October, in Bar Harbor, Maine.

IMSI Strategic Plan Review

IMSI initiated a Strategic Plan Review in the summer of 2009. The Strategic Review committee has representation from Canada and the United States and is chaired by Richard Norman, Vice President of IMSI. This work includes a review of the mission, objectives and bylaws of the organization and will be completed in 2009/2010. You may contact Dave Chapeskie or Richard Norman if you have questions regarding the review.

Maple Extension and Regulatory Staff Support

A number of concerns have been expressed to IMSI regarding actual as well as potential future reductions in maple extension and regulatory support both in Canada and the United States. Services offered by extension and regulatory staff over the years have been invaluable in helping the maple industry to modernize, remain economically viable, and grow. It is essential that this extension and regulatory support be available to the maple industry in the future. It is up to IMSI members to advise governments that they value and need this support in the future. At their recent meeting in Fredericton, IMSI's Board of Directors agreed that IMSI would provide a letter of support, if it is requested and seen as warrented in particular circumstances. If maple extension services are lost or eroded, it may take a generation or more for their recovery.

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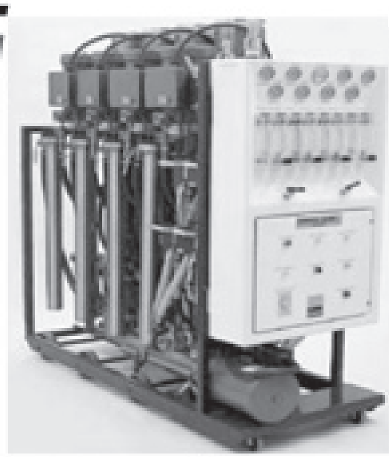

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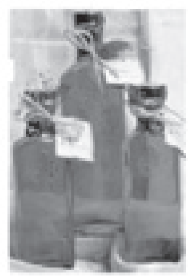

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METABOLISM OFF-FLAVOR IN MAPLE SYRUP

Part II: Remediation of metabolism off-flavor in maple syrup

Abby K. van den Berg[1], Timothy D. Perkins[1], Mark L. Isselhardt[1], Mary An Godshall[2] and Steven W. Lloyd[3]

INTRODUCTION

'Metabolism' is an off-flavor described as 'earthy to bitter' which significantly reduces the economic value of maple syrup (Perkins et al. 2006). It periodically occurs in syrup simultaneously over a wide geographic range, and in some years can affect up to 25% of the total annual maple syrup crop (Perkins and van den Berg in press). Research on metabolism at the University of Vermont Proctor Maple Research Center (PMRC) had two main objectives: 1) to identify the primary compound or compounds responsible for metabolism off-flavor in maple syrup, and 2) to develop a technique maple producers and packers could use to effectively remediate the flavor of metabolized maple syrup.

The primary compound associated with metabolism off-flavor was identified as 2,5-dimethylpyrazine (2,5-DMP) (van den Berg et al. 2009a). 2,5-dimethylpyrazine is a naturally-occurring volatile flavor compound found in a variety of heat-processed foods, including roasted beef, cocoa, bacon, and coffee (Maga 1992), as well as maple syrup (Alli et al. 1992, Akochi-K. et al. 1997). In maple syrup with metabolism off-flavor, however, 2,5-DMP occurs in much greater concentrations (up to 40 times greater) than in syrup without the off-flavor (van den Berg et al. 2009a).

In practice, producers and packers attempt to blend out the off-flavor by mixing metabolized syrup in with good-tasting syrup. Unfortunately, it takes a large quantity of non-metabolized syrup to remove or reduce the metabolism off-flavor to a point where the taste is acceptable. This limits the effectiveness of blending as a strategy to reduce the off-flavor.

With the responsible compound identified, the objective of the current study was to examine several possible remediation techniques to determine which, if any, was most effective in reducing or removing metabolism off-flavor from maple syrup.

Materials and Methods

Remediation Treatment Selection and Rationales

An ideal metabolism remediation treatment should maximize the reduction in undesirable metabolism off-flavor while minimizing other negative impacts on syrup quality, such as reductions in color grade or formation of other undesirable off-flavors. In addition, any remediation treatment developed must not violate federal, state or provincial maple purity laws and regulations. Finally, the technique should be relatively easy to employ by maple producers and/or packers. The treatments examined in this study were chosen based on those criteria.

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In general, four remediation treatments were investigated: heating syrup in an open pan (H), applying air injection to syrup while heating in an open pan (AH), applying air injection to room temperature syrup (ANH), and heating syrup while vacuum was applied (VH).

The predominant compound responsible for metabolism off-flavor, 2,5-dimethylpyrazine, is a volatile compound with a boiling point of 311°F. Akochi-K. et al. (1997) found that the quantity of 2,5-DMP decreased in syrup after reheating a small quantity for 30 min at 211°F. We hypothesized that heating metabolized syrup sufficiently could cause the 2,5-DMP in syrup to either volatilize (to evaporate out of the syrup) or react to form other compounds to a degree great enough to achieve a reduction in the metabolism off-flavor of the syrup. However, while heating syrup in this way could achieve the desired reduction in off-flavor, it would also likely cause syrup to darken substantially. Thus, alternative remediation treatments in which syrup heating could be accomplished with less impact on syrup color were also investigated.

In general, the amount of syrup darkening is proportional to the amount and duration of heat applied to the syrup. Thus, we examined two remediation treatment methods which would potentially allow heating of syrup to occur at lower temperatures than with heating only. First, previous work at the UVM PMRC has shown that air injection systems substantially reduce the temperature of the liquid boiling in the evaporator (an average of 13.5°F lower) (van den Berg et al. 2009b). We hypothesized that applying air injection while heating metabolized syrup could reduce the extent of syrup darkening by maintaining lower temperatures than those obtained when applying heat only, while still promoting the reduction of 2,5-DMP and thus the remediation of metabolism off-flavor.

Second, the temperature at which liquids boil is affected by atmospheric pressure; liquids boil at lower temperatures at reduced pressures (under partial vacuum). We hypothesized that applying vacuum while heating syrup to reduce pressure and thus the temperature at which the syrup boiled could be another way to minimize the extent of syrup darkening, while still achieving clearing of 2,5-DMP and, consequently, reductions in metabolism off-flavor.

Finally, experiments with beet sugar have shown that some off-flavors can be reduced by circulating air through the material at ambient temperature (Duffaut et al. 2004). We hypothesized that applying air injection to syrup without heat application could be an effective way to reduce metabolism off-flavor with very minimal impact on syrup color.

Remediation Eeperiment and Treatment Details

All experiments were conducted at the University of Vermont Proctor Maple Research Center in Underhill Center, Vermont. Pure maple syrup with a pronounced metabolism off-flavor was acquired in 2005 and used for all metabolism remediation experiments.

All experiments began with approximately 8.5 gallons of the original metabolized syrup. All treatments except the vacuum treatment were conducted in a 12" × 20" stainless steel canning unit with a propane burner (Leader Evaporator, St. Albans, VT). Each treatment was applied to syrup for 180 minutes and each of the four treatments was run in duplicate. The specific details of each of the four treatments are described below.

Heating Only

For this treatment, syrup was heated continuously and maintained at boiling throughout the duration of the experiment.

Air Injection with Heating

For this treatment, an air injection system modified to fit the dimensions of the canning unit (D&G USA, Fairfax, VT) was operated while syrup was heated continuously throughout the duration of the experiment.

Air Injection without Heating

For this treatment the air injection system was run continuously with syrup at room temperature throughout the duration of the treatment.

Heating Under Vacuum

Syrup was placed in a large stainless steel container fitted with a hard plastic cover. Vacuum was applied to the inside of the container with a vacuum pump (Model E2M-1, Edwards High Vacuum Pump Co., Crawley, Sussex, England) through tubing connected to a fitting in the plastic cover. Vacuum was maintained at approximately 15"Hg. Vacuum was applied while syrup was heated continuously and maintained at boiling on a propane stove throughout the duration of the experiment. Vacuum was interrupted to collect intermediate syrup samples.

Syrup temperature was monitored and recorded throughout the duration of each experiment with a Type-K thermocouple and Cole-Parmer Digi-sense Model 92801-10 Thermocouple Scanner. Syrup samples were collected at the beginning of each experiment and at 30-minute intervals until its conclusion. At the conclusion of each experiment, each syrup sample collected was adjusted, if necessary, to syrup density (66.9°

Brix minimum) with deionized water. The color of each sample was determined as the percent light transmittance at 560 nm with a Spectronic Genesys 8 spectrophotometer (Thermo Electron Corp., Waltham, MA) using glycerol as a 100% transmittance standard. The quantity of 2,5-dimethylpyrazine and other volatile flavor compounds in each syrup sample was determined by solid-phase microextraction (SPME) and gas chromatography time-of-flight mass spectrometry (GC-TOF-MS) at the Sugar Processing Research Institute, Inc. (New Orleans, LA). The relative quantities of each compound were expressed as peak area counts. The mean and standard error of the color, temperature and 2,5-DMP composition of syrup at each time-point of each treatment were calculated.

Results and Discussion

Figure 1 shows the average temperature of syrup during the three treatments in which heat was applied, and indicates that both air injection during heating and heating under vacuum were effective in maintaining lower temperatures over the course of treatment than applying heat only.

Heating syrup under vacuum resulted in the lowest temperatures. Applying vacuum allowed boiling to occur at approximately 160-170°F throughout the course of treatment, approximately 40-50°F lower than with heating only (Figure 1). Air injection during heating was also effective in maintaining lower temperatures than with heating only. The temperature of syrup heated with air injection was consistently about 20°F lower than syrup that was heated only (Figure 1). A gradual increase in temperature similar to that observed in syrup treated with heating only was observed in this treatment, consistent with the increase in boiling point associated with increasing syrup density.

Figure 2 shows the average quantity of 2,5-DMP present in syrup samples collected over the course of each treatment. All experiments began with the same metabolized syrup, so all syrup contained very similar amounts of 2,5-DMP at the beginning of each experiment. The amount of 2,5-DMP remained essentially unchanged in syrup treated with air injection only (Figure 2), indicating this is not an effective method for remediating metabolism off-flavor. However, the quantity of 2,5-DMP did decrease progres-

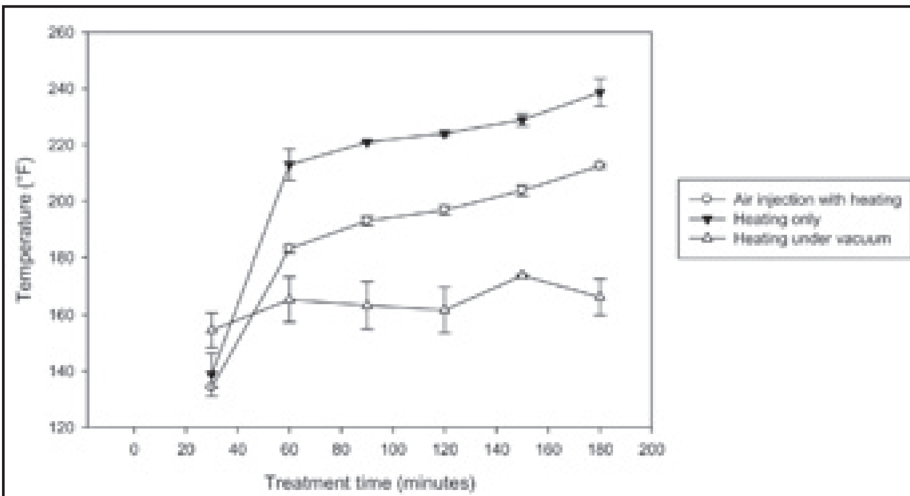

Figure 1. Mean temperature (± standard error) of maple syrup at 30-minute intervals during the application of three treatments investigated for efficacy in remediating metabolism off-flavor: air injection of syrup during syrup heating, heating syrup in an open pan, and heating syrup while vacuum was applied. n=2 at each timepoint.

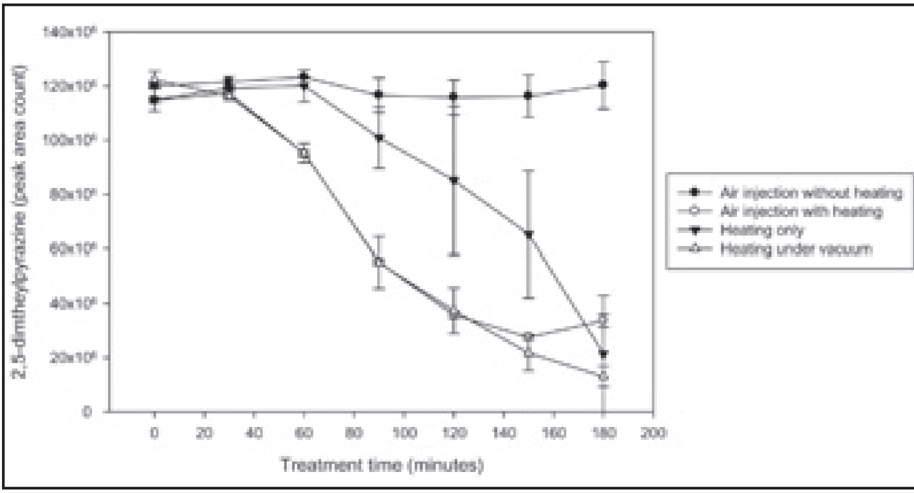

Figure 2. Mean (± standard error) quantity of 2,5-dimethylpyrazine (2,5-DMP) in maple syrup collected at 30-minute intervals during the application of four treatments investigated for efficacy in remediating metabolism off-flavor: air injection of syrup at ambient temperature, air injection of syrup during syrup heating, heating syrup in an open pan, and heating syrup while vacuum was applied. n=2 at each timepoint.

sively over the course of treatment in syrup treated with the other three remediation treatments examined. Syrup treated with air injection during heating and heating under vacuum initially showed the largest reductions in the quantity of 2,5-DMP (Figure 2). Reductions began after 60 min of treatment and continued at similar rates in the two treatments until the conclusion of treatment (except in syrup treated with AH, which showed a slight increase in 2,5-DMP at the very end of treatment). Syrup treated with heating only also showed progressive reductions in the quantity of 2,5-DMP over the course of treatment (Figure 2). Although the initial reductions in 2,5-DMP were smaller than those observed in syrup treated with AH or VH, reductions in the quantity of 2,5-DMP began after 90 min of treatment and continued progressively throughout the duration of treatment. Interestingly, although the initial rates of 2,5-DMP reduction differed between the treatments, by the end of treatment syrup treated with all three treatments contained similar amounts of 2,5-DMP (Figure 2). Thus, after 180 minutes, all three treatments were equally effective in reducing the quantity of 2,5-DMP present in metabolized syrup.

Though the three different heating treatments were equally effective in clearing 2,5-DMP from metabolized syrup, the optimum remediation treatment should result in the least syrup darkening. Figure 3 shows the average color (as % light transmittance) of syrup samples collected over the course of each treatment. Syrup treated with air injection at room temperature darkened slightly over the course of treatment. The greatest darkening by the end of treatment was observed in syrup treated with air injection during heating (Figure 3), which is surprising given the lower syrup temperatures maintained during application of this treatment. Syrup treated with heating under vacuum showed the least amount of darkening, while syrup treated with heating only darkened to levels intermediate of the other two heating treatments (Figure 3). Thus, although air injection with heating yielded large reductions in the quantity of 2,5-DMP in syrup, it also resulted in extensive syrup darkening and is thus not an ideal method for remediating

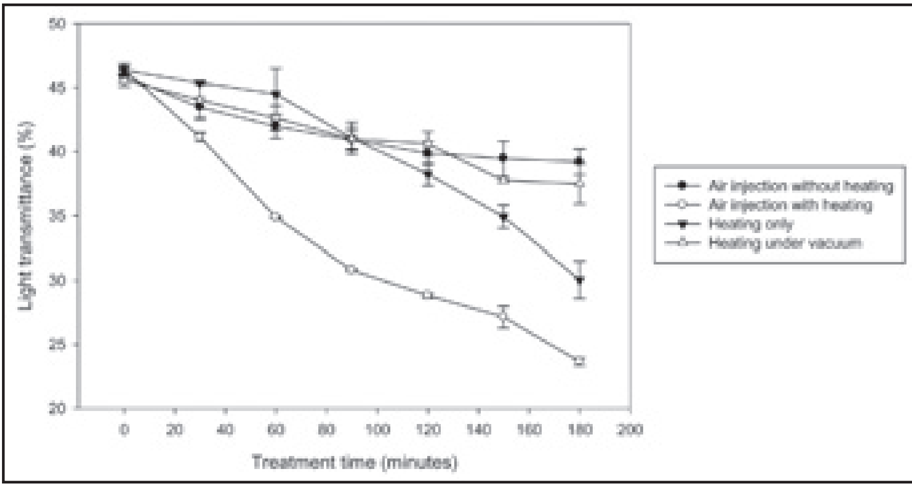

Figure 3. Mean (± standard error) percent light transmittance at 560nm of maple syrup collected at 30-minute intervals during the application of four treatments investigated for efficacy in remediating metabolism off-flavor: air injection of syrup at ambient temperature, air injection of syrup during syrup heating, heating syrup in an open pan, and heating syrup while vacuum was applied. n=2 at each timepoint.

metabolized syrup. The treatment which produced the greatest reductions in 2,5-DMP with the least impact on syrup color was heating syrup under partial vacuum.

As a final step, informal sensory evaluations were conducted to confirm reductions in 2,5-DMP quantity corresponded to reductions in the metabolism off-flavor of syrup. In blind tasting of syrup treated with the four remediation treatments tested, syrup treated with heating only was identified as having the best overall flavor and also the least detectable metabolism off-flavor. This clear preference for the flavor of syrup treated with heating only may be at least partly explained by examining the composition of a class of flavor compounds often associated with maple flavor, the cyclopentenones (CPs), in the treated syrup. Figure 4 shows the average quantity of total CPs in syrup samples collected over the course of each treatment. As with 2,5-DMP, there was no apparent change in the quantity of cyclopentenones over the course of treatment in syrup treated with air injection only. The quantity of CPs decreased progressively in syrup treated with heating under vacuum (Figure 4). Likewise, in syrup treated with air injection during heating, the quantity of CPs decreased during the initial treatment period, though it increased slightly toward the end of treatment. In contrast, the quantity of CPs increased progressively over the course of treatment in syrup treated with heating only (Figure 4). In addition, this syrup contained much greater quantities of CPs at the later stages of treatment than syrup treated with either AH or VH. Thus, in syrup treated with heating only, the quantity of off-flavor compounds (2,5-DMP) was reduced, while the quantity of compounds with more positive flavor attributes (CPs) simultaneously increased.

In conclusion, the results of this study suggest that of the treatments tested, heating syrup in an open pan was the most effective treatment for the remediation of syrup with metabolism off-flavor. This treatment yielded similar reductions in the quantity of 2,5-DMP in syrup as heating syrup under vacuum and applying air injection during heating. Though it resulted in greater syrup darkening than heating syrup under vacuum, heating syrup in an open pan yielded the clearest overall improvements in syrup fla-

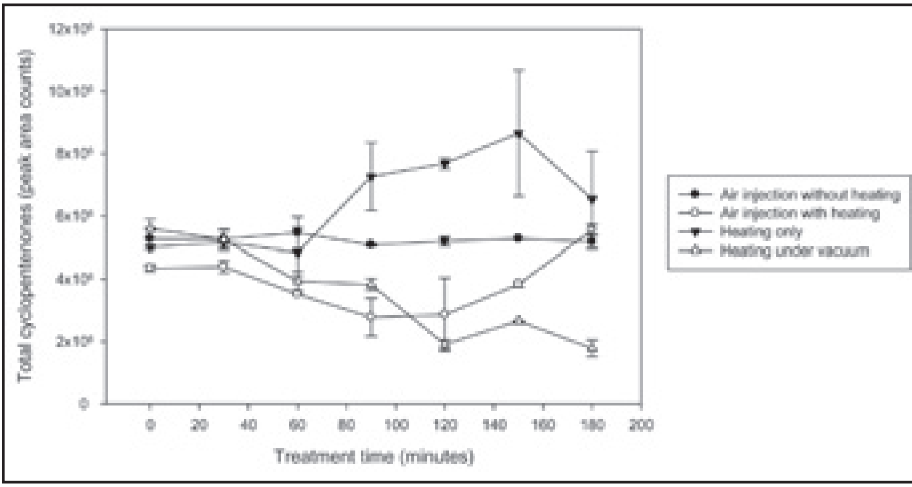

Figure 4. Mean (± standard error) quantity of total cyclopentenones (CPs) in maple syrup collected at 30-minute intervals during the application of four treatments investigated for efficacy in remediating metabolism off-flavor: air injection of syrup at ambient temperature, air injection of syrup during syrup heating, heating syrup in an open pan, and heating syrup while vacuum was applied. n=2 at each timepoint.

vor, both on the basis of improvements in perceived syrup flavor and an increased composition of some more desirable flavor compounds in the syrup. In addition, heating syrup in an open pan is the most practical treatment and could be relatively easily employed by most maple producers. Although not part of this research, this remediation technique might also prove to be useful in removing or reducing other volatile off-flavors in maple syrup. More investigation will be necessary to determine the effectiveness of this approach in remediating other types of off-flavors.

Recommendations for Remediation Treatment Application

The following are basic guidelines for applying the remediation treatment. All equipment should be approved for food use and suitable for the intended purpose. Always use extreme caution and appropriate safety and personal protective equipment when heating syrup to high temperatures. There is an increased danger of burning syrup, scorching pans and personal injury from contact with the hot syrup. Heating syrup to high temperatures results in syrup with very high density, which can behave unpredictably and has an increased propensity to produce large splashes of scalding hot syrup. Syrup treated in this manner may darken appreciably. In severely metabolized syrup, the process can be repeated. Some blending of treated syrup with appropriate (good) tasting syrup may be necessary to achieve the final desired color grade and flavor.

1. Place the syrup to be remediated in equipment designed for heating syrup, such as a finishing pan or canning unit.

2. Heat the syrup until it reaches a temperature between 235 and 240°F. As the syrup boils and concentrates, the likelihood of foaming increases. The syrup batch must be monitored constantly. Small amounts of defoamer should be added when necessary. Excessive stirring of the hot syrup can lead to crystallization and should be avoided.

3. Remove the syrup from the heat and allow it to cool sufficiently enough to allow the safe addition of water. Carefully and slowly add clean, potable water to adjust the

syrup back to standard syrup density. Adding water to the hot syrup can cause the water to boil spontaneously, causing the syrup to splash unpredictably. Therefore extreme caution must be used during this step.

4. Reheating syrup may cause nitre to develop, and filtering with an appropriate filter may be necessary prior to grading and packing.

5. The finished syrup should be graded and packed in accordance with the appropriate federal, state or provincial regulations.

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References

Akochi-K., E., Alli, I. and Kermasha, S. 1997. Characterization of the pyrazines formed during the processing of maple syrup. Journal of Agricultural and Food Chemistry 45: 3368-3373.

Alli, I., Akochi-K., E. and Kermasha, S. 1992. Flavor compounds in maple syrup. Food Science and Human Nutrition (Ed. G. Charalambous). Elsevier Science Publishers, Amsterdam, The Netherlands. pp 131-140.

Duffaut E., Godshall, M.A. and Grimm, C. 2004. The effect of ozone and air on off-odors in beet sugar. Proceedings of the 2004 Conference on Sugar Processing Research, "New Developments in the Sugar Processing", Atlanta, GA, USA, April 4-7, 2004. pp 193-208.

Maga. J.A. 1992. Pyrazine update. Food Reviews International 8(4): 479-558.

Perkins, T.D., Morselli, M., van den Berg, A.K. and Wilmot, T.R. 2006. Maple chemistry and quality. North American Maple Syrup Producers Manual, 2nd ed. (Eds. Heiligmann, R.B., Koelling, M.R. and Perkins, T.D.). The Ohio State University, Ohio, USA. pp 294-300.

Perkins, T.D. and van den Berg, A.K. (in press) Maple syrup - production, composition, chemistry, and sensory characteristics. Advances in Food and Nutrition Research (Ed. S.L. Taylor). Academic Press, San Diego, CA, USA.

van den Berg, A.K., Perkins, T.D., Godshall, M.A., Lloyd, S.W. and Isselhardt, M.L. 2009a. Metabolism off-flavor in maple syrup Part I: Identification of the compound responsible for metabolism off-flavor. Maple Syrup Digest 21A(1): 15-80.

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., Godshall, M.A. and Lloyd, S.W. 2009b. Effects of air injection during sap processing on maple syrup color, chemical composition and flavor volatiles. International Sugar Journal 111(1321):37-42.


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DEVELOPMENT AND TESTING OF THE CHECK-VALVE SPOUT ADAPTER

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INTRODUCTION

Several major changes in sap collection equipment and methods have occurred over the past 10-15 years. The introduction of small spouts, a transition in composition from polyvinyl chloride (PVC) tubing to polyethylene (PE) tubing, and improvements in fittings have occurred. These changes, along with continued modifications in tubing system design, installation, and maintenance as well as alterations in vacuum systems and their operation have led to significant improvements in sap yields for maple producers. The result has been a steady increase in sap yields from those producers adopting this technology and methods to the point where annual yields of 0.3-0.5 gal of syrup equivalent are not uncommon.

Because sap flow reductions and stoppage is ultimately due to taphole drying, which is induced by microbial contamination of tapholes (Naghski and Willits 1955), a significant barrier to sustained high sap yields in tubing systems is related to contamination with various microorganisms. In particular, microbial biofilms develop in sap collection tubing systems as they age (King and Morselli 1983, 1985, Legacé et al. 2006). Despite several research studies and the experience of thousands of sugarmakers, no cleaning methods are clearly capable of returning tubing to the level of sanitation of a new, unused system. The maple industry has responded to this challenge most recently by introducing annually replaceable spouts or spout adapters, which provide a very clean spout-tree interface. Research has demonstrated that these adapters can provide some benefit to sugarmakers in terms of increased sap yield (Perkins, Wilmot, and Stowe unpublished), however they still do not provide an adequate barrier against the migration of microorganisms from the spout stubby, dropline, and lateral line back into the taphole. Thus the use of spout adapters, although helpful, does not completely address the problem of microbial induced taphole drying. The use of vacuum in tubing operations greatly exacerbates this problem by creating a fairly substantial negative pressure within the taphole zone. Under such circumstances, when a leak occurs, or the system is shut-down rapidly, or even when some types of releasers dump their contents by admitting air, this negative pressure in the taphole can cause sap to briefly surge backward in the tubing system towards the tree, carrying microbes into the taphole. The more this backflow of sap occurs, the higher the temperature, and the greater the number of microbes reaching the taphole, the stronger the taphole drying response will be. Eventually sap will cease flowing due to the blockage of vessels resulting from this natural wound response, and the season is over for the sugarmaker.

Decades ago, taphole drying due to microbial contamination was delayed via the use of paraformaldehyde (PFA) pellets in tapholes, resulting in substantially higher sap yields (Sheneman et al. 1959, Costilow et al. 1962, MacArthur and Blackwood 1966). Unfortunately the use of PFA also greatly impeded the ability of the tree to compartmentalize the wound caused by tapping, which resulted in cambial dieback and internal wounds that were much larger in size (Shigo and Laing 1970). Because sustainable maple tapping relies upon the ability of the tree to regrow more wood in the succeeding growing season than is effectively "removed" by tapping, the larger wound due to the use PFA caused a gradual decrease in conductive tissue within trees, eventually resulting in decline and mortality. PFA use was subsequently banned in the U.S. and Canada, with the result that the EPA exemption for PFA use in maple operations was not renewed. Although other taphole sanitizers, including silver, chlorox, and ethyl alcohol among others have been investigated (Sheneman et al. 1959, Perkins unpublished, Perkins and van den Berg unpublished), they are generally not greatly effective, or are not permitted due to various federal, state, provincial food safety regulations. The use of silver or other chemicals added to spouts, incorporated into droplines, or placed into the taphole are unlikely to be permitted under organic certification rules.

The goal of this project was to find alternative ways to reduce microbial contamination of tapholes. One approach we investigated was to use a check-valve to prevent microbial contamination of tapholes by preventing backward movement of sap from the tubing system into the taphole.

2007-2008 PROTOTYPE DEVELOPMENT

During the fall of 2007, we focused on developing a spout that would prevent backflow of sap into tapholes using a check-valve. We investigated a wide variety of commercially available check-valves for their suitability in maple use. Earlier attempts at using valves to prevent microbial contamination of tapholes proved ineffective (Marvin and Greene 1959), and reduced sap yield. However the earlier attempts were done prior to the widespread use of vacuum in tubing systems.

The design goals were to find a check-valve that would operate at very low vacuum levels, that could be fabricated of food-grade materials, and would operate over the range of conditions found in maple tubing (above and below-freezing, and wet or dry). None of the commercial check-valves proved entirely satisfactory, so we fabricated a prototype system using a standard maple stub spout and spout adapter. Although we successfully adapted stubs/spout adapters from several different companies, we eventually standardized on the Leader Evaporator Co. (Swanton, Vermont) for the prototype to be used in field trials.

The prototype was constructed by placing a small ball composed of Buna-N rubber between the spout stub and 5/16" spout adapter. This composition was found to have the proper Durometer "hardness" that would provide a good seal at the expected operating temperatures (30-50°F). A groove was cut on the lower internal part of the spout stub with a fine saw blade. This groove would prevent the ball from moving back (away from the tree) and sealing against the back of the spout stub, thereby providing an outlet for sap to pass through the spout into the dropline. However, the movement of the ball forward (towards the tree) would cause it to seat against the forward inner ring of the spout adapter, thereby preventing sap from moving from the dropline back towards the tree.

2008 PROTOTYPE TESTING

During the spring of 2008, we tested the prototype spouts using vacuum chambers. Chambers were connected to a mainline which was under vacuum via a 5/16" lateral line at the top of the chamber. A 36" used (but cleaned) 30P dropline connected the chamber to the stub spout. Ten standard spout adapters and ten prototype check-valve spout adapters were on individual chambers. Tapholes were placed such that treatment direction alternated. The sap level in each chamber was measured following each sap flow period and the chambers drained. Sap depth was converted to volume using a simple calibration. Sap yield for each period was totaled for the 2008 season.

At two dates near the end of the 2008 sap flow season, sap samples from each chamber were collected for microbial contamination testing using a Charm Sciences, Inc. FireFly ATP Luminometer and Watergiene swabs. This system provides a rapid estimate of the microbial population of liquid samples.

2008 PROTOTYPE RESULTS

Over the course of the 2008 sap-flow season, the control spout produced 14.3 gal sap/tap, while the prototype check-valve spout produced 16.1 gal sap/tap. Thus the check-valve spout produced 26.1% more sap than a standard spout at the same vacuum level.

ATP luminescence showed that microbial contamination was significantly lower in sap collected from chambers with check-valve spouts than control spouts on both collection dates. Sap microbial loads from check-valve spouts were 18% and 31% that of control spouts on 4/4/2008 and 4/9/2008, respectively.

As a consequence of these promising results, a preliminary patent application for the check-valve spout invention was filed by the University of Vermont during the summer of 2008. The patent covers the use of a check-valve anywhere in the lateral line or spout system (from the mainline to the tree). A brief description of this invention was presented at the North American Maple Syrup Council/International Maple Syrup Institute meeting in Amherst, Massachusetts, in October 2008.

2008-2009 LEADER CHECK-VALVE SPOUT ADAPTER DEVELOPMENT

In the fall of 2008, Leader Evaporator Co. signed an agreement which allowed UVM PMRC researchers to discuss in depth the details of this invention and to allow further cooperative research and development of a commercial product to occur. Over several months representatives of Leader and Proctor worked out a design that eventually lead to a test mold for injection molding being produced. The new design incorporated the check-valve concept directly into an annually-replaceable spout adapter (Figure 1) that worked in combination with the Leader Spout Stub. The spout adapter is designed to fit several other (but not all, due to differing stub spout geometries) spout stubs from various maple equipment manufacturers. The ball is captive within a short "straw" within the adapter and is held in place by small projection-like fingers. The straw has openings at the spout stub side which allow sap to pass through under normal operating conditions when the tubing system is under vacuum. When backflow conditions occur, the ball trav-

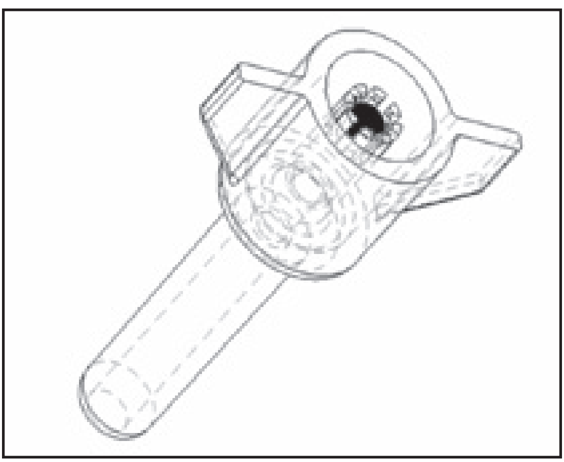

Figure 1. Schematic diagram of the Leader Check-valve adapter based upon the ball check-valve concept.

els a very short distance and seals against an inner ring to prevent sap that has already passed through the adapter from moving back into the taphole.

The new design was produced in limited quantities (approximately 15,000) to allow testing at UVM PMRC and by several sugarmakers. Two variants with different ball compositions with the specified "hardness" specification were tested. These were eventually shown to have no difference in functionality or yield, so no further discussion of these will be made.

LEADER CHECK-VALVE SPOUT ADAPTER TESTING AT UVM PMRC

The Leader Check-Valve spout adapter was tested at UVM PMRC in Underhill Center, Vermont, in two separate field trials during the spring of 2009.

In the first study, we utilized vacuum chambers as described in the prototype development, again using standard (non-check-valve) Leader stubs and spout adapters as the control. In both cases, new Leader Spout stubs and spout adapters (non-check-valve and check-valve), and 1-year-old used (but cleaned) 30P droplines were used. A total of 16 chambers were used with eight chambers for each treatment. Average tree diameter (at breast height) was 10.4", and vacuum was operated at an average of -22.5" Hg for the season with all chambers connected to the same vacuum line and pump. Sap depth was measured after each flow period and converted to volume.

Over the 2009 season, sap yield in control spout chambers was 0.81 gal syrup equivalent/tap, whereas sap yield from Check-valve chambers was 1.00 gal/tap, an improvement of 23.5% using Check-Valve spout adapters (Figure 2).

For a larger scale test, we utilized plots that had been retubed prior to the sap flow season in 2004 and operated over the previous five years of operation. Sap yield on a per tap basis from each section was roughly similar (Perkins, Stowe and Isselhardt unpub-

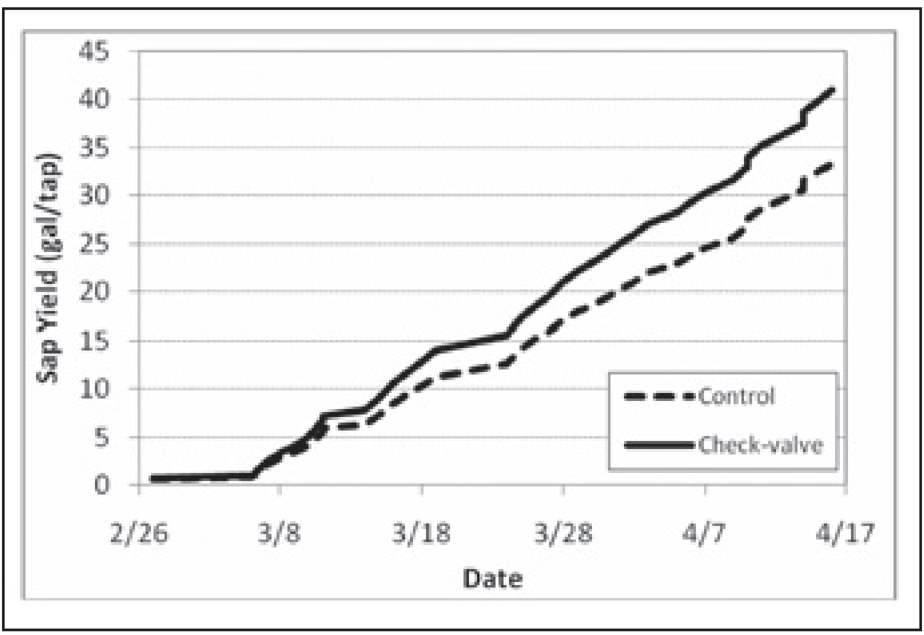

Figure 2. Sap Yield from Leader Check-valve and control spouts during the 2009 maple season (vacuum chamber study).

lished) in these plots, and all systems typically performed quite well, averaging over 0.5 gal syrup/tap throughout testing.

In 2009, one of the tubing sections had all droplines and spouts replaced, two sections had no changes, and the forth section had new droplines with Leader Check-Valve spout adapters installed. Droplines were Flexelene AG (Eldon James Corp), made with anti-microbial silver. All the sections were tapped within a few days of the first sap run in late-February 2009. Each treatment ran through an individual mainline system to a calibrated releaser equipped with an electronic counter system so that the total number of releaser dumps could be tallied. Releasers were calibrated to allow calculation of sap volume collected. All systems were connected to a common vacuum flood pump system which operated at approximately 22.5" Hg at the pump. The pump was turned on whenever the temperature rose to near freezing, and was run for at least 3+ hrs past the time of the final releaser dump. All sections were checked and maintained regularly throughout the entire sap flow season.

All systems performed very well over the 2009 season. Yields were 0.57 and 0.69 gal syrup/tap on the systems that had no changes (Figure 3) and 0.62 gal syrup equivalent/tap on the system with new spouts and droplines installed. The system with new droplines and Check-Valve spout adapters performed exceptionally well (Figure 3, line D), yielding 1.09 gal syrup equivalent/tap, representing a 58.0 - 91.2% increase in yield over the season compared to other sections of the same woods.

Part of the increased yield from the Check-valve section is undoubtedly due to the fact that new spouts and droplines were used. It is clear from ongoing studies that replacing spouts, using a new spout adapter annually, and/or replacing droplines can increase sap yield (Perkins, Wilmot, and Stowe unpublished, Steve Childs - Cornell Maple Program,

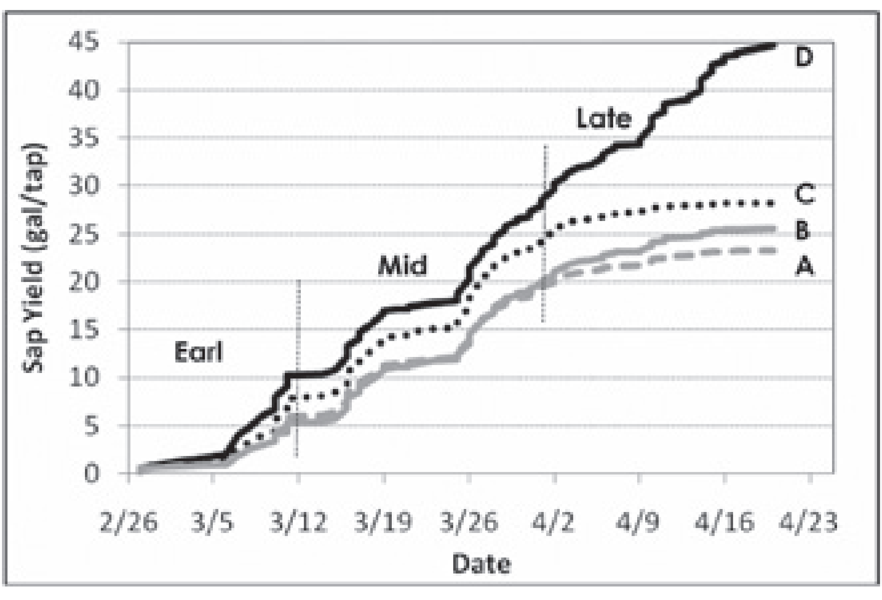

Figure 3. Sap yields from four similar sap collection treatment areas at UVM PMRC in 2009. Sections are: **A.** Dual-line system, six year old droplines and spouts, **B.** Single-line system, new droplines and spouts, **C.** Dual-line system, six year old droplines and spouts, **D.** Dual-line system, new droplines and Check-valve spouts.

personal communication). However, the increases expected from such changes on vacuum systems is typically only about 10-20% (Perkins, Wilmot and Stowe, unpublished). Also, the section where new spouts (non-Check-Valve) and new droplines were installed (Figure 3, line B) did not experience large increases in sap yield, but instead appears to have had only slightly higher flow at the end of the season than the two sections that did not receive new spouts and droplines (Figure 3, lines A and C). Therefore, the bulk of the increase in sap yield observed in the section with check-valves was most likely in large part due to the action of the check-valve itself, and not simply because the spouts and dropline were new. The anti-microbial properties of the droplines appeared to have little effect on sap yield. Yields of chamber studies and field studies were similar, yet chambers did not have anti-microbial silver droplines. This will be discussed in detail in a forthcoming paper on anti-microbial silver in maple operations.

The majority of the increased sap yield from Check-Valve spout adapters occurred during two phases of the season. During short-duration flows in the early season, the Check-Valve spout adapters appears to produce marginally more sap than spouts without check-valves. This is likely due to reduced resorbtion of sap from the dropline as trees go from the positive pressure phase (sap exudation) to the negative pressure (water uptake) phase. Without a check-valve, some sap that had previously been exuded may be sucked back out of the dropline, resulting in slightly lower yields for sections without Check-Valve spout adapters. The average yield from this during testing in the 2009 season was approximately 1 pint of additional sap per Check-Valve adapter per freeze. In controlled experiments, Marvin and Greene (1959) measured sap resorbtion during the uptake phase of approximately 1.5 pints per taphole. Preventing this mechanism appears to roughly increase sap yield by a slight, but noticeable amount over the course of the entire season, but is particularly apparent during the early season when frequent short-duration thaws predominate.

Throughout the mid-part of the maple season, sap yield is essentially equal between control sections and the section equipped with Check-valve spout adapters. In early-April, at what would normally be part of the late season, sap flow from sections that did not have Check-valve spout adapters began to slow abruptly. The section that received new spouts and droplines showed similar patterns, but the decrease was slightly more gradual, and the effective sap flow season lasted about a week longer than the sections without new spout and droplines. The section that received Check-valve spout adapters continued to run well for at least 2.5 weeks beyond the time the other sections had almost completely stopped. Sap sweetness did not drop off appreciably, and the sap did not turn buddy.

A limited number of clear Check-Valve spout adapters were produced for experimental purposes. Using these, we were able to observe that any microbial slime that begins to build up within the spout is removed as the sap flows due to the ball rotating around in the sap flow. This serves to keep the ball relatively clean and prevents clogging of the adapter valve system. In other experiments and observations using dye inserted into the sap column, we were able to observe and confirm that the valve was effective in preventing backflow of sap under most circumstances, whereas tapholes with normal spouts experienced significant backflow under certain conditions.

DISCUSSION

The Check-valve spout concept worked well in both prototype and commercial production versions, increasing sap yields by 23.5 - 26.1% in vacuum chamber studies, and 58.0 - 92.1% in production scale testing. Most of the effect of check-valves is seen in late season sap production through an extension of the sap collection period. Although each year is very different, it seems likely that in most normal seasons, systems employing check-valve spouts should produce more sap than systems without them. These yield results are comparable to those achieved using paraformaldehyde, although, in the current check-valve form, are achieved through mechanical exclusion of microbes from tapholes as opposed to chemical control using PFA or other chemical substances. Unlike PFA or other chemical means, the Check-Valve spout adapter does not require EPA pesticide certification, does not result in further internal damage to the tree, and does not release chemicals into the sap.

Why do we see a smaller effect on sap yield in vacuum chamber studies? There are two possible explanations for this. First, the droplines used in the chamber studies had been used for only 1 year and then cleaned. It is possible that only a slight level of microbial contamination is present in tubing of this age. Other ongoing studies seem to indicate this, and also display a reduced benefit from annually replaced spout adapters (Perkins, Wilmot, and Stowe). Tubing systems become more highly contaminated as they age (Legacé et al. 2006). Despite the relative newness of the used tubing, the Check-Valve spout adapter still increased sap production by 26% and 23% in the two years they were studied with vacuum chambers. Secondly, when used in a vacuum chamber test system, the ONLY source of contamination is the dropline, the spout stub, and the spout adapter (or spout). Contaminated sap cannot move from the chamber to the taphole. In a normal system, sap can flow back from both the dropline and the lateral line. Thus, the potential load of microbial contamination is far more highly restricted with chambers compared to a normal tubing situation, which serves to limit the benefit of the Check-valve to some degree.

Although using check-valves anywhere in the lateral line, dropline, or spout system is technically possible, and may be beneficial to some degree, there are reasons why incorporating it into a spout or spout adapter makes the most sense. Because the spout adapter is replaced annually, it is quite clean (but not completely sterile), whereas the tubing and fittings beyond that point are still contaminated with the microbes that flourish in sap. Putting a check-valve beyond the point where the system is contaminated could allow the taphole to become contaminated more readily. In addition, only a small volume of sap and air is held in the adapter. When the check-valve in the spout functions, there is very little sap or air to flow back. Placing a check-valve further out in the system does allow whatever sap or air is trapped between the taphole and the check-valve to move backward. Any leaks that might occur in the system between the check-valve and the taphole would still result in sap backflow.

One of the possible advantages to using the Check-Valve spout adapter could be in the case of early tapping. Maple producers with large numbers of taps or those with unpredictable early flows must start tapping early. With standard adapters tapholes can begin to dry-out early. By reducing taphole contamination, the Check-Valve spout adapter should reduce the amount of drying experienced and allow for better sap flows through the entire season. This has not yet been experimentally verified, however further research is planned.

How much the Check-Valve spout adapter helps in increasing sap yield is dependent upon a large number of factors relating to tubing system setup, age, and maintenance, as well as vacuum system operation, and prevailing weather conditions during the sap flow season. The following is an initial set of recommendations outlining where Check-Valve spout adapter use should result in the most benefit, and where Check-valve Spout use may result in lesser benefit.

WHERE THE CHECK-VALVE SPOUT WILL HELP THE MOST

1. Older Tubing Systems. Maple tubing systems that are more than a few years old are typically more highly contaminated with microorganisms. Although cleaning will help to keep microbial populations lower, bacterial biofilms develop in tubing systems that are almost impossible to remove, resulting in rapid recolonization of systems.

2. Tubing Systems Using High Vacuum. After a period of time, vacuum within the tubing system extends into the tree. The higher the vacuum level, the greater the potential for sap to flow backward into the taphole.

3. Releasers That Introduce Air When Dumping. The most common releaser design allows air to bleed in to one section of the releaser in order for the releaser to dump its contents. Every time this happens, sap can move backward in the system.

4. Systems with Leaks. Any new leak (heaving spouts, animal chews, vacuum testing, etc.) will introduce air and can result in movement of sap backward in the system. This can be anything from animal damage, wind or snow, or frost heaving of spouts.

5. Warmer Woods. Woods that are characteristically warmer than others will develop tubing system contamination faster than colder woods. The Check-Valve spout adapter reduces microbial contamination of tapholes, thereby extending the flow season.

6. Tapping Early. Producers who tap early due to size of operation or unpredictable weather should experience a longer flow period with Check-Valve spout adapters than with normal spouts.

WHERE THE CHECK-VALVE SPOUT MAY NOT HELP AS MUCH

1. New Tubing System. Tubing systems that are new, or have only been used in one season, have reduced levels of microbial contamination. Sap moving backward in these systems is less damaging to yield, particularly in the first year. Check-Valve spout adapters can produce slight improvements in the first year and result in increasing benefits each year thereafter (spout adapters should be replaced annually).

2. Gravity Tubing or Systems with Low Vacuum Levels in the Woods. In general, the higher the level of vacuum, the greater the potential benefit from Check-Valve spout adapters. Although Check-Valve spout adapters may produce some improvement even under gravity tubing conditions, the potential for backward movement of sap in tubing systems is greater with increased vacuum level.

3. Vacuum Systems That Don't Introduce Air. Releasers that utilize pumps to evacuate the sap from the chamber do not necessarily introduce air into the system, and thus minimize the backward movement of sap. Similarly, producers who collect into bulk tanks and then close off the sap lines when the tanks are pumped out will experience less backward sap movement.

4. Vacuum System Operation. Those producers who keep their vacuum pumps running continuously throughout the maple season until the system is COMPLETELY frozen may experience a reduced level of benefit from Check-Valve spout adapters.

5. Colder Woods. Woods that are normally cold may experience reduced microbial growth in tubing systems, and thus experience a lower benefit from Check-Valve spout adapters.

LITERATURE CITED

Costilow. R. N., P. W. Robbins, and R. J. Simmons. 1962. The efficiency and practicability of different types of paraformaldehyde pellets for controlling microbial growth in maple tree tapholes. Mich. Agric. Exp. Stn. Quart. Bull. 44: 559-579.

King, W.G. and MF Morselli. 1983. Microorganisms on plastic tubing walls. Maple Syrup Digest 23(3): 23-28.

King, W.G. and MF Morselli. 1985. Bacterial adhesion to plastic tubing walls. Maple Syrup Digest 25(3): 28-31.

Lagacé, L., M. Jacques, A.A. Mafu and D. Roy. 2006. Compositions of maple sap microflora and collection system biofilms evaluated by scanning electron microscopy and denaturing gradient gel electrophoresis. International Journal of Food Microbiology 109(1-2): 9-18.

Marvin, J.W. and M.T. Greene. 1959. Some factors affecting the yield from maple tapholes. University of Vermont Agricultural Experiment Station Bulletin 611, Burlington, Vermont.

MacArthur, J. D. and A.C. Blackwood. 1966. Taphole sanitation pellets and sugar maple sap yields. For. Chron. 42(4): 380-386.

Naghski, J. and C.O. Willits. 1955. Maple syrup IX. Microorganisms as a cause of premature stoppage of sap flow from maple tap holes. Appl. Microbiol. 3: 149.

Sheneman. J. M., R. N. Costilow, P. W. Robbins, ad J. E. Douglass. 1959. Correlation between microbial populations and sap yields from maple trees. Food Res. 24: 152-159.

Shigo, A.L. and F.M. Laing. 1970. Some Effects Of Paraformaldehyde On Wood Surrounding Tapholes In Sugar Maple Trees. Northeastern Forest Experiment Station, Upper Darby, Pa. Forest Service, U.S. Department Of Agriculture, Research Paper NE-161.

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2010 NEW YORK STATE WINTER CONFERENCE IN PLANNING STAGE

January 8th and 9th, 2010

Mark your calendar now to attend the 2010 New York State Maple Producers Winter Conference. This should be one of the first events you attend in the new decade so be sure you set aside January 8th and 9th to get together with lots of other maple producers. The 2010 Maple Conference will be held in the same great location, the Vernon-Verona-Sherrill High School in Verona, New York on Friday evening January 8th and all day Saturday, January 9th. This central location provides plenty of meeting space as well as room for a large trade show with many exhibitors displaying plenty of specialized equipment for meeting maple producer needs. You will have access to the latest in research and grower experiences regarding maple production, promotion, forest management and the making and marketing of a variety of maple products. This day-and-a-half event has something for every level of maple producer. A maple conference you will not want to miss.

The conference kicks off Friday evening with a featured speaker at 7:00 PM and industry trade show highlighting maple equipment, manufacturers, and vendors scheduled from 6:00 PM until 9:00 PM. Saturday's program features 30 of the industry's leading maple experts from throughout North America presenting in a variety of concurrent workshops. These workshops focus on several major areas of emphasis: beginning sugarmakers, new and advanced technologies, marketing, promotion, value-added products, tap hole sanitation, tubing, vacuum, and forest management.

The conference is open to the general public, as well as maple producers, and is geared to all levels of sugar makers. Saturday's trade show opens at 8:00 AM with workshops starting at 9:00AM. Held at the Vernon-Verona-Sherrill (V.V.S.) High School, Verona, New York, the conference is sponsored by the V.V.S. FFA, New York State Maple Producers Association and the Cornell Maple Program and Cornell Cooperative Extension. The V.V.S. High School is located between Utica and Syracuse, New York on State Route 31 just two minutes from NYS Thruway Exit 33. For additional information contact V.V.S. FFA advisor Keith Schiebel at kschiebel@vvsschools.org. Registration forms will also be available at the New York State Maple Producers Website: www.nysmaple.com or the Cornell Maple Program website: cornellmaple.com in November and December.

CROP REPORTS FOR 2008 CONTINUED

Editor's note: Each year at the annual meeting each state and province provide crop reports for that year. We will publish their findings each year in the Digest, dedicating as few or many pages as space dictates.

ONTARIO

In January, eleven Maple Information Days were hosted by OMSPA around the province. Everyone in the province who burns oil in their evaporators has to have their oil burners inspected by TSSA if they do not have a CSA sticker on their equipment.

The Maple season started in southwestern Ontario mid February with most producers in southwest started the first week of March. The rest of the province got going by mid March and the end of the seasons run was mid April in the northern regions. Southwestern Ontario had a bumper crop with lots of producers making over 3 pounds per tap with the crop getting smaller the further away from the southwest your bush is situated. Most of the province had 60 to 80% of a crop with bulk prices higher than ever before.

The annual meeting and Summer Tour was hosted by the Grey Bruce Local and the meeting was in Owen Sound on the south end of Georgian Bay.

Thursday speakers were: Dr. A. VandenBerg on: Effects of Air Injection combined with R.O on chemistry and Flavour. Dr. S. Lachance on: Energy Reduction, Economic Savings and Environmental Benefits Associated with R.O. Machines and Jim Penner on: Making Maple Syrup for Beginners.

Friday Speakers were: Danielle Tisi and Anna Maria Buck on: Liability Issues for the Maple Producer. Paul Bailey on: Food Safety Initiatives and Documentation. Todd Leuty on: Hardwood Plantations for Maple Syrup and Other Raw Forest Products. Hugh Martin and

Susanne Robinson on: Organic Maple Production and Kellie MacLean Smith demonstrated Maple Pastry.

Tour sites were at Suzanne and Rayburn Love Sugar Bush with 2500 taps and oil fired evaporator. They host Maple Fest the 1st weekend in April with 5-7000 attending. Gale and Richard Obrien have 3,000 taps and an oil fired Evaporator and a Maple Supply Business. Abby and Russel Miners have 5500 taps and an RO and a wood chip fired evaporator. Marybeth and Bob Gray have 1,000 taps with a wood fired evaporator. Nellie and Chris From have 850 taps and a wood fired evaporator. Doris and John Boddy 8500 taps boil with high pressure steam. Daryl and Peter Neve 500 taps and a wood fired evaporator.

At the annual banquet, Dave Chapeskie was presented with the Award of Merit for all his hard work for our association.

The Ontario Maple Syrup award was presented to the Thomas Family for their interest and involvement for many years of service to Maple.

PENNSYLVANIA

The state of Pennsylvania reported an excellent year with a production estimated at 95,000 gallons, up 86 percent from last year's production of 51,000 gallons.

Statewide weather conditions were ideal all through the month of March. There was a lot of light amber syrup made with excellent flavor in all grades.

In my area, Potter Tioga, the north central part of the state, there were several reports of record years. Personally we made light syrup through the whole month of March. Bulk syrup prices started, in our area, at $2.25 but soon escalated to near $3.00 per pound by the end of April. Burton Kimball reported Northwest Maple Producers had a record year with the season starting slow and picking up in the middle of March. With syrup being made almost everyday until the 4th of April. He reported that a lot of producers had run out of wood and oil before the season ended. Bulk syrup prices started at a low of $2.85 per pound with a high of $3.15. Burton reported that the sales were down attributing to high gas prices and high prices for syrup.

Don Russell from Endless Mountains, eastern part of the state, reported their area had a very good season with exceptional flavor and light colored syrup. Many producers had record production. His own production was second only to 1992 's banner year. He has been buying in bulk syrup for Bascom Maple Farms for many years and said he doesn't remember a year when he got such a light colored grade mix.

2009-10 New York Calendar of Upcoming Schools and Workshops

October 10 - Chenango County, Maple Confection II Workshop, Contact: J. Rebecca Hargrave, Cornell Cooperative Extension of Chenango County, 99 N. Broad St., Norwich, NY 13815, **607-334-5841 x 16. irh45@cornell.edu**

October 17 - Ontario County, Maple Confection II Workshop, Contact: Russell Welser, Cornell Cooperative Extension Ontario County, 480 North Main Street, Canandaigua, NY 14424, **Phone: 585.394.3977, Fax: 585.394.0377,e-mail rw43@comell.edu**

October 31 - Madison County, Maple Confection II Workshop, Countryside Hardware, Contact: Sandy Wilcox, 1712 Albany St., DeRuyter, NY 13052, **Phone 315-852-3326.**

November 5 - Delaware County Beginner Maple School, Contact: Janet Aldrich, Cornell Cooperative Extension of Delaware County, P. O. Box 184, 34570 State Highway 10, Hamden, NY 13782-0184, **Phone: 607-865-653.**

November 7 - Southern Tier Maple Program, Contact: Brett Chedzoy Cornell Cooperative Extension - Schuyler County, Agriculture and Natural Resources, **e-mail: bjc226@cornell.edu, office: 607-535-7161 cell: 607-742-3657.**

November 14 - Wyoming County, Maple Confection Review and Development Workshop, Contact: Lutie Batt, Cornell Cooperative Extension of Wyoming County, 401 North Main Street, Warsaw NY 14569, **Phone: 585-786-2251**.

November 21 - Maple Confection II Workshop, Uihiein Maple Sugar Research Station. Contact: Mike Farrell, 157 Bear Cub Lane, Lake Placid, NY 12946, **Phone: 518-523-9337, e-mail: mlf36@cornell.edu**

December 5 - Fulton-Montgomery County Maple Confection I Workshop, Contact: Cornell Cooperative Extension, Fulton and Montgomery Counties, 55 East Main Street #210, Johnstown, NY 12095, **518-762-3909 ext109, cls263@cornell.edu**

THE 2009 NAMSC/IMSI ANNUAL MEETINGS

October 22-25, 2009

The annual meetings will be held at the Atlantic Oakes by the Sea Resort and Conference Center which was formerly a private estate and now offers spacious meeting rooms and 150 ocean view rooms with balconies and patios.

There will be demonstrations, producer workshops and technical sessions, equipment displays and tours to interest everyone involved in maple. These meetings will be a great opportunity to celebrate, learn, meet, eat seafood, have fun, and see the latest products developed for the maple industry.

For more information, please contact either:

Robert Smith
Phone: 207-474-3380
Email: bob@beeline-online.net
or
Eric Ellis
Phone: 207-474-3887
Email: mainemaple@beeline-online.net

Or go to the Maine Maple Producers website at http://wwwmainemaplepro-ducers.com/

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FOR SALE: Equipment & Supplies from Bakers Maple. Lamb tubing, Bacon jugs, Marcland controls, Carrageenan for maple jelly, 1 1/2 lbs. for $19.95. Used Beckett CF 2300 Oil Burner. Bainbridge, NY *(607) 967-7229.*

COMING EVENTS

NAMSC/IMSI ANNUAL MEETING 2008
October 22-25, 2009
Atlantic Oakes Resort - Bar Harbor, Maine
Contact: Robert Smith, E-mail: bob@beeline-online.net
or Eric Ellis, E-mail mainemaple@beeline-online.net

NEW YORK STATE MAPLE PRODUCERS CONFERENCE
January 8 and 9, 2009
Vernon-Verona-Sherrill High School, Verona, NY
For more information contact:
Keith Schiebel at: kschiebel@vvsschools.org

Announcing the sixth annual…
IMSI - International Maple Grading School
December 3 & 4, 2009 - Skowhegan, Maine

The International Maple Grading School is for maple producers, bulk syrup buyers, state inspectors and others needing to accurately grade maple syrup or judge maple product entries at fairs and contests. This school will provide a strong scientific base combined with intensive hands-on exercises. This approach will enable participants to learn how to grade or judge maple products with confidence. It is being held in Skowhegan, Maine on December 3 and 4, 2009.

Space is limited and pre-registration is required. For further information contact Kathy Hopkins, Phone 207-474-9622, FAX 207-474-0374 or Email: khopkins@umext.maine.edu The International Maple Grading School is sponsored by the International Maple Syrup Institute, the University of Maine Cooperative Extension and the Vermont Agency of Agriculture, Food and Markets.

A fee is charged for this Extension program to cover costs. A limited number of scholarships are available to individuals unable to pay. If you are a person with a disability and will need any accommodations to participate in this program, please call Kathy Hopkins at 207-474-9622 to discuss your needs. Please contact me at least 14 days prior to this event to assure fullest possible attention to your needs.

In complying with the letter and spirit of applicable laws and pursuing its own goals of diversity, the University of Maine shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, including transgender status or gender expression, national origin, citizenship status, age, disability, or veteran's status in employment, education, and all other areas of the University System. The University provides reasonable accommodations to qualified individuals with disabilities upon request.Questions and complaints about discrimination in any area of the University should be directed to the Director of Equal Opportunity, the University of Maine, 5754 North Stevens Hall, Room 101, Orono, ME 04469-5754, telephone (207) 581-1226, TTY (207) 581-9484.

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