National Maple Syrup • DIGEST •

TRI-ENNIAL
MAPLE CONFERENCE
ISSUE

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Editorial

I guess I won't even attempt to write an editorial for this issue. It really isn't necessary anyway.

As you will see, we have printed many good reports and an excellent message from the new Council President, Adin Reynolds. Most of these were papers given at the Sixth Conference on Maple Products held in Philadelphia in October, so we are devoting the major portion of this issue to the Maple Conference.

Room prohibits printing all the reports presented at this Conference. We will have to hold some for future issues. In the meantime, all I can do is wish you all A

Merry Christmas

and a Prosperous New Year

NATIONAL MAPLE SYRUP DIGEST

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NOTICE

BACK ISSUES AVAILABLE

The following issues of the Digest have been printed to date:

Vol. 1, No. 1, 2, 3, 4
Vol. 2, No. 1, 2, 3
Vol. 3, No. 1, 2, 3, 4
Vol. 4, No. 1, 2, 3, 4

We still have a supply of most of them but they are getting scarce, and they are expensive to mail. If you lack any, drop us a card stating which copies you would like and we'll send them if available.

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We wish to take this opportunity to express our appreciation to all those connected with the Maple Industry for your cooperation in our work here at the Philadelphia Laboratory, and wish you all a

Happy Holiday Season

P. A. Wells — C. F. Woodward

C. O. Willits — J. C. Underwood — J. C. Kissinger

Reports of National Maple Syrup

Linwood Lesure

Past President

Six years have now passed since the National Maple Syrup Council was born right here at the Fourth Annual Maple Conference. 1962, the year of our last Conference saw also the birth of the National Maple Digest as a direct action of Council meetings. I believe the Digest has made a fine start in improving communications between maple producers. The maple groups are so scattered and unorganized that most had little idea of what was happening in other maple country.

Our Fourth Annual Council meeting was held in 1963 at Coopers - town, N. Y. A great portion of this meeting was devoted to problems presented to the Council by the Vermont delegation. Heavy crops of syrup in Canada and the United States made Canadian tariff regulations of importance to some of our states so the Council set up a committee to work on the problem.

As in previous years the matter of a grade that could and would be recognized in all states was discussed. It was decided that New York and Vermont, having such a majority of producers would try to come to some understanding and report back at the next Annual Meeting in 1964. Maine, having sent an observer and a request for membership was voted in as the ninth state and Ted Harding of Athens was recognized as the delegate. Officers elected were: Linwood Lesure of Ashfield, Mass., President; Adin Reynolds of Aniwa, Wisc., Vice-President; Putnum Robbins of East Lansing, Mi ch., Secretary-Treasurer. An invitation to meet in Massachusetts in 1964 was accepted.

The Fifth Annual Meeting held in the Greenfield area of Massachusetts in 1964 found Directors present from the nine member states and observers from Conn. and Minn. The first day included a maple tour, several speakers and a banquet in the evening. Ture Johnson of Burton, Ohio, was appointed chairman of a committee to study and suggest revisions to the Constitution and bylaws and to report at the 1965 meeting. Other members of the committee were Leland Schuler of Ohio, P. W. Robbins of Mich., and Dr. Willits of Pennsylvania.

Again much discussion centered around the matter of standard grade designations with most of the Directors and members being heard from. The following motion was finally made and carried. "That the National Maple Syrup Council adopt the color standards as established by the United States Dept. of Agriculture: **Light Amber, Medium Amber, Dark Amber and Darker than Dark Amber."** It was also voted to encourage producers to use the new grades along with their own state grades.

It was voted to hold the 1965 meeting at the Research Laboratory in Philadelphia at the time of the Maple Conference.

The Council voted to commend the College of Agriculture of the University of Massachusetts for its work in the Die-back problems of maples and to send a copy of the resolution to the Dean and to Extension heads.

It was moved and passed that the Council support the drive of the Vermont Maple Association and others to have an additional $90,000 assigned for the use of the U.S. Forest Service at Burlington.

The motion was carried that a letter be sent to all major syrup can manufacturers pointing out the fact that improvements were much needed in tin containers.

All officers were re-elected for the coming year.

We met yesterday for a full day of work. The constitution and by-laws were given a thorough work-over. Procedure for qualifing delegates to the Council were clearly outlined and in general the rules which were purposely left quite loose at the time of adoption several years ago were tightened up. Committees for marketing & National Maple Queen were authorized. The Council also voted to allow Ohio to be the location of the official National Maple Queen contest in 1966.

Officers elected were: President, Adin Reynolds, Aniwa, Wisc.; Vice-President, Ture Johnson, Burton, Ohio; Secretary-Treasurer, Lloyd Sipple, Bainbridge, N.Y. who was also elected editor of the Digest.

Association members elected for three years were: Extension Foresters Fred Winch of N.Y.; Ed Ferrard of Pennsylvania; Ray Foulds of Vermont; William Cowan of Ohio. Also Putnam Robbins of Michigan and Dr. Underwood of the Philadelphia Laboratory; Extension Foresters Edgar Lott of Indiana and Marvin Smith of Minnesota were elected for a one year term.

An invitation from President Reynolds to hold the next annual meeting in Wisconsin was accepted.

We were active in several fields during the past year. I think we played an important part in retaining the Maple research here at the Lab and in a smaller way I like to think we were helpful in obtaining a larger grant for the use of the U.S. Forest Exp. Station at Burlington, Vermont.

I am happy to turn over the leadership of the Council to a man of the calibre of Adin Reynolds. I know it it is in good hands.

Council

Adin Reynolds

President

I suppose all new Presidents wonder just what to say or how to acknowledge their election. I am sure that they all wondered if they could measure up to their new responsibilities. Since the forming of this (quite young in years) National Maple Council, it has been a real pleasant experience to meet and get to know personally the various state delegates and leaders of the Maple Industry in their individual states. To choose the best qualified for President among these delegates would be impossible, so perhaps it is well that a rotating system is practiced. We are thus assured of continued good leadership, - providing all member states continue sending such fine delegates. To follow as dynamic and capable a personality as Linwood Lesure is indeed a real challenge, so I can only promise my best.

I want to thank the National Council delegates for the honor of being chosen president, and I also want to thank my own state Council for the privelege of representing Wisconsin on the National Council.

These brief years of the National Council have been filled with important changes in the Maple Industry. We have seen the advent of new sap collecting methods, such as the development and popular use of plastic pipe lines, new types of buckets and spouts, (and may I add a new plastic bag.) We have seen the entry of chemicals into the industry, with various degrees of acceptance.

This has definitely influenced earlier tapping and has extended the sap flow season. We have seen a trend toward larger individual sugar bush operations and a real sharp interest and development of Central Evaporating plants. Another very noticeable trend is the changing from wood fuel to oil and also gas. Electronics are involved and in several ways, such as allowing automatic controls and timing devices to be used. We first thought of it as only a source of light and then to operate pumps, but we now depend on it for countless other jobs such as providing energy for lamps to sterilize our sap and later protect the syrup. As larger operations developed, it required more rapid handling and measuring of sap and accurate sap meters are now in use. Many new and more accurate testing instruments are now in common use today. Faster and longer distance transportation of sap is now common.

Many of these developments can be credited to the fine work of the research people in the various states and the Federal Laboratory. People that are not syrup makers, but have taken our problems and have found many of the solutions for us. We are perhaps 100 years ahead of our time by having this help, if we measure progress by comparing with developments over the last 100 years. The threatened and actual partial loss of some of this research work is of real concern to all of us, and it definitely will be our goal to improve some of these conditions. Uncontrolled imports of syrup is still to be corrected as well as other problems, but if we can continue to work together, we are going to find solutions.

I have listed only a few of the milestones since the birth of the National Council but these demonstrate some of the progress made, and I think we can be real proud of this kind of progress. The very fact that you are able to read this message today, shows another real important step made, and of course, I refer to the publication of the Maple Digest. This is the first and only national maple producers medium ever published and deserves real credit and our sincere support.

Now one of our most important goals should be to tear down the "iron curtains" along our state lines and bring more complete harmony and more sincere co-operation among all syrup makers. Remember, your fellow syrup maker has the same problems and the same goals that you do, so lets work together in a united way.

DIRECTORS OF NATIONAL MAPLE SYRUP COUNCIL
Seated: Ture Johnson, Ohio, vice president; Linwood Lesure, Mass., Past president, Adin Reynolds, Wisc., president; George Keim, Penna. Standing: Gordon Gowan, N.H.; Charles Hager, N.Y.; Robert Coombs, Vt.; Floyd Moore, Mich; Ted Harding, Maine. Photo by Cliff Ardsley, USDA, Phila.

New Maple Developments at Eastern Utilization Research and Development Division

C. O. Willits

Eastern Utilization Research and Development Division
Agricultural Research Service
United States Department of Agriculture
Philadelphia, Pennsylvania 19118

The three years which have elapsed since we reported on our work to you at the preceding maple conference have been exciting ones as well as fruitful.

Sap Harvesting Studies:

The taphole germicidal pellets were first made commercially available during the spring of 1962, the year of our last conference. Since then we have had a chance to appraise them. The results appear to be mostly good. The major effects as determined by reports reaching us are: improvement in the quality of the sirup made from treated sap, increased sap yields and the creation of conditions whereby trees can be tapped early (ahead of the sap flow season) permitting the sap producer to better economize his time. The current 1965 season sap in many areas proved its value by extending the useful life of the taphole late enough into the season so that the last large flow of sap was realized, without which man many bushes would have reported a sap crop failure. However, use of pellets extends the sap flow season into the period when buddy sap begins to flow. In anticipation of this we have (a) developed a chemical test and an odor test for detection of buddy sap, and (b) developed a method to remove the buddy principal from either buddy sap or from buddy sirup. The chemical test for buddy is quite rapid but not enough for roadside tank truck pick-up. The test is an adaptation of the ninhydrin test for free amino acids.

The reclaiming of buddy sap or buddy sirup is a fermentation process by which the free amino acids in sap, which appear to be implicated in buddy flavor formation, are removed by fermentation of either the sap or a diluted sirup, with a culture of **Ps. geniculata.** The resulting sirup is free of buddy flavor and therefore of commercial value but due to its dark color and strong flavor is classed as commercial.

While the movement of establishing central sap evaporation plants began several years ago, the past 3 years have seen the largest growth in these plants both in number and in size. One of the major problems in maple sirup making is obtaining and keeping sap sound and unfermented. Fermentation is the direct cause of dark color and unwanted flavors in maple sirup. The central evaporator plants focused attention on this problem. Earlier work here indicated that the actinic rays of ultra-violet irradiation would cause the destruction of microbes in maple sap. Tests over the past two seasons have proven that field tanks for the collection of maple sap, when provided with overhead ultraviolet germicidal lamps with which any sap in the tanks can be continuously irradiated, will control microbial growth in the sap. At the Laboratory, sap collected and held in outdoor tanks under ultraviolet irradiation was kept sterile for 2 weeks even though air temperatures were as high as 80°F. The sirup made from this two week old sap was of fancy grade and of excellent flavor. The depth of penetration of ultraviolet rays of 260 mu in clear maple sap has been calculated to diminish ½% per cm or 50% effective at a depth of 5 feet. Since no data is available on the exposure required to kill sap organisms at different depths below the irradiated surface, we are conducting such a study now.

Further, since commercial units are now available for controlling the microbial growth in a flowing stream of water we are now engaged in such a study testing their use for maple sap. These tests have already shown that a stream of infected sap flowing in a ½" concentric layer about a long germicidal tube, required only 8 seconds to effect a 99% kill of the contained microorganisms. These data have supplied information that is now being applied to studies on storing sap at central plants.

Sirup Processing Studies:

During this period we have demonstrated the effectiveness of the use of a separate pan for completing the final stage of evaporation of sap to sirup. This has brought about a revival of its use for making possible the production of a lighter grade (lighter colored) sirup and a savings in man-hours spent in sirup making. In general, however, the finishing pans, now commercially available and gas-fired, are of too large a size.

Another equipment improvement has been the use of tight fitting steam hoods with stacks for steam removal. These have been widely adcepted; for example, today more than 50% of the evaporations in New York are so equipped, and the evaporator companies are now offering them as optional equipment. This method of steam removal has, more than any other development, made possible the construction of sap processing plants that are clean, warm, and steam-free which are factors neces-

sary for the sanitary operations of the plant. Because these covers exclude air (oxygen) from the surface of the sap, they prevent the formation of scum on the boiling sap and thereby eliminating the need for scumming the sap and reduce the material that needs to be removed by filtration.

Another very important advance in sirup processing is in instrumentation. The only direct way to determine the stage of evaporation in boiling sap is by noting the elevation of its boiling point over that for water. Since the boiling point temperature of sirup is not constant, but varies with changes in barometric pressure. a device has long been sought that would automatically correct the boiling point of sirup to compensate for changes in the boiling point of water. Such a device was not on the market nor could we find a company interested in developing one. Mr. Joseph Connelly of this laboratory therefore undertook the task and successfully built two different models. Both have been field tested and performed precisely as required. One of these, together with commercial models based Connelly's design, are on display.

In principal, these instruments consist of two temperature sensing devices, probes, that are a part of a wheatstone bridge. When one of the temperature sensors is in boiling water, or its equivalent, it serves as the master and the other sensor, the slave, is placed in boiling sirup. When the slave (sirup) reaches some predetermined temperature, such as 7 degrees or 7.5 degrees F. above that of the master (in boiling water) the slave sensor causes relays to operate which in turn can operate switches, lights and/or solenoid valves. Thus when sirup reaches a pre-determined boiling point (density) it can be automatically withdrawn from the evaporator or finishing pan.

With better methods of sap handling and processing being put into practice, 80-90% of the sirup produced is of the top two grades. This sirup is not only too light in color and too delicately flavored to permit its use in making cane sirup-maple sirup blends, the largest single use of wholesale or drum sirup, but some is too delicately flavored even for table use.

This sirup must be high-flavored i.e. heat processed to bring out more flavor so as to make it suitable for these end uses. The previous high-flavoring process developed by this Laboratory, which is used to process 80-90% of the drum sirup, is slow and unwieldy. During the past year we have devised a new process which is not only continuous but permits almost instantaneous changes in conditions so that the desired amount of high-flavored sirup can be obtained irrespective of the nature of the raw sirup being supplied to the machine. This apparatus is on display in room 0129 of this Laboratory.

Problems yet to be solved:

In the handling and processing of sap to sirup, a large number of problems remain to be solved. A few of these are as follows:

1. Preservation of sap collected and held in tanks located in woods where there are no electric power lines.
2. Procedures for hauling sap long distances (50-100 miles) without spoilage.
3. Tests for sap quality for use in grading sap at the evaporation plant and at the site of the road tank pick-up. In either case the sap would have to be tested before mixing a given lot with other lots of sound sap. This requires that these methods must not only be simple but very rapid as well. These sap tests would be for:
   (a) microbial continuation
   (b) color as from bent wood, or leachings from bark or leaves and other sources.
   (c) buddyness
   (d) amounts of invert sugar
   (e) maple flavor precursors
4. Tests for conventrations of flavor in sirup.
5. Develop methods for the removal of sugar sand or sugar sand precursors, but which has no effect on the flavor of the produced sirup.
6. Develop methods for the removal of color derived from foreign sources.

Problems of sap processing:

1. Improved filtering techniques
2. Develop teflon coated evaporation equipment for finishing pans, sirup pans, and flue pans to eliminate sugar sand scale formation. Requires study of metal backing, thickness of teflon layer and its heat transfer properties.
3. Better packaging procedures, including new and improved types of containers (can or bottle), improved confections, and methods of packaging.
4. Establish the design for a completely integrated evaporation plant.
5. Develop procedures for adapting existing fruit and vegetable processing plants for use as sap evaporation plants.

New Maple Products

In addition to high-flavored maple sirup, we have developed and patented a fluffed maple product that is similar to maple cream but because of light texture, it is suitable for cake frostings. This product, unlike most maple confections, can be made from the lower as well as from the top grades of maple sirup. We have also developed and patented a honey-maple spread which utilizes these two farm products, often produced on the same farm.

Currently, we are working on new processes that may yield products that will cause maple sirup again to be used as a casing agent for cigarettes. We are also working on the formation of a hard candy type of confection that would have a long shelf life. We are also working with meat packers in developing a product for use in curing smoked meats.

Chemical Investigation

Color of maple sirup:

Color is important in maple sirup not because it has an intrinsic value but because it is a principal grade determining factor. We have

now established the pathway by which the color is formed; this is by the following successive steps: (a) fermentation in sap to yield hexose sugars; (b) alkaline degradation of these sugars during first stage of evaporation to trioses; and (c) polymerization of the trioses to large polymolecules (color bodies) last stage of evaporation.

Obtaining pure unaltered maple sirup colorant was only successful after we applied a new technique that was developed for the separation of large protein molecules from other substances. This procedure is called gel filtration. This technique effects a separation by retaining small molecules and permitting **only** large ones to pass through the jelly like filtering medium. The colorant of maple sirup is brown polymeric molecules with molecular weights varying from 7 to 45,000 with an average weight of 12,000 and an imperial formula of

The macro-molecules exist in two groups . . . those of the higher and those of the lower molecular weights. The ratios of the amounts of the high to the low molecular weight colorants vary with different sugar sirups. In maple, this ratio is low. In blended maple sirup, the ratio is high. Thus, this ratio provides another **constant** for judging the purity of maple.

Flavor

This is the only part of maple that has any intrinsic value. It is that quality that makes maple sugar 80¢ more per pound as compared to 10¢ for cane sugar.

What is maple flavor and what can we do about it?

To identify it we must first separate it from the sugars and whatever else there is associated with it in sirup. This is not easy. We now know that it exists in sirup in very small amounts - a few parts per million. Further it is not normal to maple sap but is made from materials in sap called flavor precursors which interact during heating (evaporation) of sap and especially during the last stage of the evaporation. We have approached the chemistry in maple flavor in two different ways. One is the isolation or separation of a fraction rich in maple flavor. This provides pure flavorant for study and analysis. The other approach is the isolation and subsequent identification of those substances from which the maple flavor is derived. We will designate these substances in maple sap as maple flavor precursors. A fraction of maple sirup rich in maple flavor and relatively free of sugars, color, lignins and salts was obtained by the classical procedure of liquid extraction, in this case extraction with chloroform. The crude chloroform extract was then purified and concentrated to provide a solution relatively rich in the flavoring substance of maple. This extract, when analyzed by gas liquid chromatography (GLC) has shown the major constituents present to be: syringaldehyde, dihydroconiferyl alcohol, vanillin, cyclotene, acetol, and acetoin. Of these, only the last four appear to have characteristics suggestive of maple as noted by the odor effluent from the GLC absorption tube.

All of these compounds are important and have aided our knowledge of maple flavor. For example, the discovery of syringaldehyde, which has the syringol group, suggests that a part of the flavor is derived from a lignin-like substance. This group is known to be dominant in the lignins of maples which contain the dimethyl ester group of phenyl propanol. These compounds were obtained from a 2,000 fold concentration of the flavorants original in sirup. We now know that this concentration was not enough due to the minute traces of the flavorants present, other important flavor producing compounds being in such small amounts that they escaped detection. We therefore have proceeded to make much larger extractions using the glass plant in our Hazardous Operations Building. The other approach to the flavor identification problem consists of the flavor precursor components by selective liquid solvents from sirup that has been rendered flavorless and colorless. As of now since we have only succeeded in the selection of the appropriate solvent, no attempt will be made to discuss it further.

Participation in the AOAC

This is an area of work which has not been discussed in prior meetings. Chemical or physical methods of analysis of maple products and other substances used by state or federal regulatory agencies are usually performed according to the methods that have been proven for their accuracy and precision by collaborative tests conducted by the Association of Official Agricultural Chemists. We have worked with this organization serving as Referees for Methods of Analysis of Maple Products, and have been responsible for improvement in method for determining the conductivity value, the test most widely used and the first one applied for the detection of adulteration. Other AOAC methods of analysis include the determination of formaldehyde in maple sirup. This method which is specific for formaldehyde was essential for the approval of the use of paraformaldehyde pellets by the Food and Drug Administration, Department of Health, Education and Welfare. Because of its specificity for formaldehyde it should be the one used in state or federal regulatory work. Another method which we have developed as an official method of the AOAC is that for malic acid in maple sirup. The test previously used for maple products did not specifically measure the malic acid as such, but as a part of a mixture of organic acid salts of lead and it was less precise than the current one. We have also had accepted as an official method of the AOAC, the determination of the color of maple sirup by permanent glass color standards.

It is our hope that in our flavor studies we will be able to develop a test or tests that identify substances found only in maple sirup and not in cane or beet sugar sirup. Such a test may be the one we now have under study for the determin-

ation of syringaldehyde in maple products.

The ideal test would be one that identifies the sugar used as the adulterant to dilute maple sirup. Unfortunately, this is not a simple task since the most common adulterant used is sucrose, either cane or beet sugar. This sugar already comprises 98% of the solids of maple sirup and does not differ chemically from that obtained from cane or beets. We hope we will find an inherent impurity in these two sugars that will identify them when they are used as maple sirup adulterants.

MAINE MAPLE MEETING

The Annual Winter Meeting of the Maine Maple Producers Association and the Winter Extension Service Maple Meeting will be held on Thursday, January 20, as a part of the Agricultural Trades Show at Lewiston, Maine. This Annual Maple Syrup Meeting is held during Morning and afternoon at this fine show. The public has always been invited and in recent years we have had some excellent meetings. The program is not set for next January, but the date and place is now definite.

Progress in Buddy Maple Sap Fermentation 1956-1

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The cause of "buddy" flavor in maple sirup is not known; but since the flavor appears at the end of the sap season when maple trees come out of dormancy, this characteristic flavor has been associated with the physiological changes that occur in the trees as the buds begin to swell. "Buddy" flavor cannot be detected in sap from budding trees, but it becomes noticeable in the steam and sap concentrate during the manufacture of sirup. The occurrence of this "buddy" substance imparts a very disagreeable flavor to the sirup that makes it unpalatable and unsalable. Thus, 'buddy" flavor marks the end of the sap collection season for the maple producer and presents

1. "Buddy" sirup is unfit for sale as table sirup according to Federal and State specifications. (1)
2. Late runs of good quality sap can be lost by the sap producer who removes his sap collecting equipment in anticipation of the appearance of "buddiness."
3. Sap from only a few early leafing trees will, when mixed with a large pool of normal sap, cause its spoilage since a minute quantity of "buddy" substance added to sap is sufficient to produce a "buddy" flavor in the resulting sirup.
4. The producer or central plant operator who produces "buddy" sirup suffers a substantial economic loss.

Early warm weather during the 1955 maple season brought to the attention of sirup producers the economic losses which can result from the harvest of quantities of "buddy" sap. Sirup producers became aware of the need for a method to remove the "buddy" flavor from sap and sirup, thus salvaging materials which would otherwise be lost to them. Since 1955 the problem of salvaging "buddy" sap and sirup has been investigated at the Eastern Regional Research Laboratory of the U..S. Department of Agriculture at Philadelphia; and as a result of this work a means has been found whereby "buddy" flavor can be removed from maple sap and sirup to produce a salable product.

Investigations conducted at the Philadelphia laboratory confirmed unpublished data of the Ohio State University that normal sap contains little, if any, free amino acids, and that as the maple tree undergoes physiological changes attendant to its coming out of dormancy, these free amino acids begin to build up in the sap. It was therefore suspected by the workers at the Philadelphia laboratory that these free amino acids are implicated in the formation of "buddy" flavor. This being the case, it was reasoned that if free amino acids could be removed from sap before true maple flavor was formed in the sap evaporation (boiling) process, then the resulting sirup would be free of "buddy flavor. The simplest method by which these amino acids could be removed without altering other properties of the sap was by fermentation.

The salvaging of a "buddy" maple sap or sirup by fermentation was successfully accomplished by the Maple Investigations group of the Philadelphia laboratory. In 1956, Naghski, Reed, and Willits (2) observed that fermentation of maple sap has a marked effect on the flavor and color of the sirup. Further investigations reported by Willets, Frank and Bell (3) showed that the flavor and color of maple sirup can be enhanced by fermenting the sap with microorganisms, **Pseudomonas geniculata.** This led to the investigation of the effect of controlled fermentation with this organism on "buddy" sap and sirup. In 1961, Wasserman and Willits (4) reported the successful conversion of "buddy" maple sap into a marketable maple sirup by fermenting the sap with **Pseudomonas geniculata.** The sirup made from the fermented sap was dark amber in color and had a typical maple flavor without any "buddy" off-flavor. This fermentation was carried out on a laboratory scale, and the application of this process on a large scale remained to be done.

In 1963, a pilot scale fermentation of commercially produced "buddy" sirup was made using the equipment of a central sap evaporator plant which had received a large shipment of "buddy" sap. The "buddy" sirup was diluted, inoculated with a pure culture of **Ps. geniculata** and fermented. The fermented, diluted sirup was then evaporated to sirup in commercial equipment. The sirup produced was free of "buddy" flavor and was dark in color. Unfortunately, a contaminant was introduced which resulted in the production of a ropy sirup.

This experiment was repeated at the end of the 1965 maple sap season using the storage and evaporating facilities of a central sap evaporation plant. This experiment varied

from the previous fermentation in that sap in which "buddiness" had been detected was used rather than diluted "buddy" sirup. The "buddy" flavored sap was detected by evaporating two gallons from a suspected shipment of sap to sirup density in a candy kitchen steam kettle and tasting the product. A 3000 gallon tank mounted beside the evaporator house was used as the sap fermentor. To eliminate the danger of fermentation by adventitious microorganisms, sanitary precautions were taken at all stages of the experiment. The tank was washed and then sanitized with a 10% hypochlorite solution which was completely drained before the tank was filled with 2500 gallons of the "buddy" sap. The microbial population of the "buddy" sap was reduced to a very low count during the filling operation by pumping it through two Aquafine* ultraviolet water purification units at a rate of 8 gallons per minute. Each unit was fitted with two 30-watt germicidal lamps around which the sap flowed in a ½ inch layer. The exposure of the sap microorganisms to the actinic rays from the ultraviolet lamp resulted in the reduction of the population of these organisms to a very low level (essentially sterile). The sap was then inoculated with 6 gallons of a 48-hour sap culture of **Pseudomonas geniculata,** strain no. 4, containing 7 x 10 (5) cells per ml. The inoculum was added to the sap as it was being pumped into the tank. During the incubation period of 48 hours at 50°-60° F. (avg. daily temp.), 2-gallon samples were taken at 8 hour intervals and evaporated to sirup density in a candy kitchen steam kettle. These were taste tested for "buddy" flavor. After 48 hours incubation, the "buddy" flavor was no longer detectable in the sirup obtained from the two gallon sap samples. The 2500 gallons of fermented sap were then converted to a standard density sirup using commercial maple sap evaporators. This sirup was medium amber in color, had no detectable "buddy" flavor, and was of acceptable commercial grade.

If sirup has been made inadvertently from "buddy" sap, the salvaging of the maple sirup by the removal of the "buddy" flavor not only recovers processing costs but adds a little to exporator plant income. By the same token, conversion of "buddy" sap already harvested to a salable product converts loss to profit for the sap producer. However, it would be to the advantage of the sap producer to avoid the reprocessing of sirup by detecting "buddiness" as it first appears in the sirup and then fermenting the unprocessed sap before it has been evaporated to sirup. Since "buddiness" in sap results from physiological changes in the trees, it may occur at any time during the sap season. The production of "buddy" sap early in the sap season is not typical, but it can and does occur. Therefore, the producer should be on the alert for its presence. A quick test for the detection of "buddy" flavor in maple sirup has been developed. (5) When the "buddy" flavor is detected, the producer will have to be prepared to ferment the sap or sirup. Tanks used for fermentation must be thoroughly cleaned and sanitized. The unprocessed sap must be pasteurized or sterilized using ultraviolet light or heat (boiling); and in the case of sirup fermentation, the water used for dilution must be free of microbial contamination. If this is done, the fermentation can be carried out successfully.

The remaining problem is to develop methods for the commercial productions of the **Pseudomonas geniculata**, so that the organism can be readily available to the maple sirup producer on a day-to-day basis in such form that he will be able to recover "buddy" stored sap and sirup. The urgency of the solution to this problem is magnified by the gain in numbers of central sap evaporator plants, because these plants must obtain their sap from a large number of sap producers, some of whom may have woods conditions favorable to "buddy" sap production.

*Mention of company or trade name does not imply endorsement by the Department over others not named.

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Cornell's Expanded Maple Program

Robert R. Morrow

Maple research was begun at Cornell's Arnot Forest (2) in 1950 and a sugar house was built in 1956. In the nine succeeding years, research was greatly expanded and the whole operation has been open to the public as a demonstration of changing techniques in a rapidly changing industry. The principal changes made at Arnot forest follow:

(1) Conversion from buckets to 90% tubing. Not only has tubing taken much of the hardest work out of sugaring, but previously inaccessable trees are now reached; also extremely deep snow is less of an impedance.

(2) Conversion from gravity flow to vacuum pumping for two-thirds of the tubing. With our variable slopes, we have found that vacuum pumping increased sap flow 10 to 20% in four of the last six years. The value of this additional sap greatly exceeds costs.

(3) Use of paraformaldehyde pellets which have increased syrup quality and, together with tubing, permit early tapping to obtain the good flows that occasionally occur in February or even earlier.

(4) Conversion to oil and addition of covered evaporator, gas finishing pan, running water, and electricity have all contributed to the efficiency and cleanliness of operation.

(5) Addition of new trees made available by intensive thinning in a young maple stand. Sugar maple is one of our fastest growing trees if located on a reasonably productive soil and properly thinned. We have increased the diameter of young trees 3 to 4 inches in a decade.

In less than a decade of operation at Arnot Forest, the number of tapped trees has nearly doubled, production per tap hole has increased by nearly a quarter, syrup quality has increased by at least a third, labor per tap hole has been halved, and wages per hour have been nearly doubled. In the last two years, most of the syrup was light amber and less than 5% graded below medium amber. In both years production per tap hole was just under 0.4 gallons syrup - and this from mostly small trees which average only 2% sap. In addition to technological change, however, much credit must be given to Mr. Alfred Fontana, our Resident Manager, who takes pride in the cleanliness and rapid handling necessary for top quality syrup and who knows the need for such mundane things as uncovering tubing with frozen sap upon anticipation of a new run.

The year 1965 marks the beginning of a greatly expanded program of maple research and demonstration in New York. Mr. & Mrs. Henry Uihlein of Heaven Hill Farm at Lake Placid leased their sugar bush to Cornell for a 10-year period and most generously provided us with funds to build and equip a new sugar house capable of producing a thousand gallons of syrup annually. The College of Agriculture then provided sufficient funds to employ a full time Resident Manager, Mr. Lewis Staats. Mr. Staats comes to us from the U.S. Forest Service with the kind of training and experience which will allow him to carry out forest experiments and demonstrate new techniques and knowledge as applied to the maple syrup industry.

The Uihlein-Cornell Syrup Project, as this new project is known, has the following purposes:

(1) develop economic and efficient maple production methods for Adirondack conditions.

(2) study market methods suitable for northern New York.

(3) conduct an extension program in maple production and marketing.

The sugar bush is far different from the one at Arnot Forest, and comparison of results from the two sugar bushes will help gain new knowledge of maple sap flow and syrup production. The Uihlein bush is possibly the highest and certainly one of the coldest in the State. It lies between 2000 and 2500 feet above sea level, while the Arnot bush is at half this elevation. Very deep, lasting snows may limit woods work. Since the Uihlein bush is much larger (5000 vs 1200 tap holes), has sweeter trees, but also has lower sap production per tap hole and more sugar sand, interesting cost comparisons can be made. Finally the variety in age classes and species composition in the Uihlein bush will permit setting up experiments and demonstrations of thinning, timber stand improvement, and reproduction of sugar bushes.

Because of the need to develop markets and to demonstrate new methods we located the new sugar house on the main road, even though the nearest maple trees are over a quarter mile distant and separated by rough and swampy ground. The sap from 3000 tap holes, some over a mile away, will be collected by gravity in one network of tubing and finally delivered through 1¼ inch plastic pipe. All trees are painted so that number of dots indicates number of tap holes, color indicates tubing line, and placing on the trees helps to indicate direction of line. The number of tap holes is determined by tree size and growth rate, rather than by the old rules-of-thumb which only consider tree size. Present roads will be improved so that visitors can drive into the bush during the summer months to see the sugar bush management at first hand.

The sugar house is 60 x 24 feet and capable of expansion at one end. It features pole construction, rough wood finish, and the roof is supported by trusses spaced 12 feet apart. Because we want realistic cost figures that can be duplicated by others, only semi-skilled labor, similar to that available on many farms, is employed. The sugar house will contain an office, storage and sales room, and two rest rooms. It will have three evaporators in series which will produce about 10 gallons of syrup per hour. The best automatic draw-off and filtering and canning aids are planned to allow one man to do most of the work.

In the area of marketing, our immediate plans call for exploring the possibility of making the sugar house into a combined tourist and educational attraction for customers. Only high quality syrup will be sold; the best regional price will be asked. We will aim for thicker syrup, about 66.5 degrees Brix - both because of the better taste and to offset any tendency for the buyer to associate light color syrup with thin syrup. We have already made an individual label which features: (1) "Maple Syrup" in large print, (2) an interesting and individual engraving, (3) "Pure Adirondack" for regional promotion, and (4) "Lake Placid" making the package a souvenir.

Both the Arnot Forest and Lake Placid facilities are open to the public throughout the year. Because the resident managers have other duties, it is best to let them know of impending visits in advance. Addresses are:

Alfred Fontana, Arnot Forest, Van Etten, New York

Lewis Staats, 35 Averyville Rd., Lake Placid, New York

Lake Placid sugar house located on Bear Cub Road.

We invite your visit.

(1) Department of Conservation, Cornell Univ., Ithaca, New York
(2) Located 20 miles southwest of Ithaca, New York

Sappin'

(With apologies to St. Nicholas)

'Twas the first day of March and all through the bush,
Mother Nature was stirring, giving Life a big push.

The buckets were hung on the maples with care
In hopes that the sap would be soon running there.

The evaporator was all clean in its shed
With great piles of wood with which to be fed.

And Mamma in her apron and I in my cap
Had long been resigned to a big flow of sap,

When out in the yard there arose such a clatter
I flew to the door to see what was the matter,

The heat of the sun on the old soggy snow
Had made a morass of the mud below,

When what to my critical eyes should appear
But all of the help with all of their gear.

They were big rugged men so husky and strong
I knew that they in the woods had worked long.

More noisy than thunder their tractors they came
And they cussed and they shouted and called them by name -

"Now Fordson, now I.H., now Big Caterpiller,
On Tank Truck, on Snow Cat, on J. Case and J. Deere,

To the top of the ridge, to the top of the hill
When we get up there our gas tanks we'll fill."

As commuters in traffic watch gauges run dry
Pull up to the station and "Fill 'er up!" cry,

So up to the gas pumps the tractors they drew
With scoots on behind, and collecting tanks too.

And then in a twinkle I heard as they pumped
The gurgle of gas as in tanks it was dumped.

As I drew in my head and was turning around
Into the room came the men with a bound

They were dressed all in red from their heads to their feet
In the clothes that they wore hunting deer for their meat,

A pair of snowshoes they had strapped on their backs
The same ones they use to trail a deer's tracks.

Their eyes how they twinkled after they had said,
"Lamb's Naturalflow Tubing we have carefully laid."

Their droll little mouths were drawn down like a bow
When they told how they walked through the depths of snow.

The cuds of tobacco they held in their cheeks
Very tightly so there would not be any leaks.

They were lively and lean, right jolly big elves
Who looked as though they could take care of themselves.

They spoke but few words, lest their work they neglect
And picked up their buckets with which to collect,

And the yokes which would fit on their very broad shoulders
Which for collecting are the best bucket holders.
The pumps to be used to transfer the sap
They had greased and adjusted the spark plug's small gap

So, all laden down they went out the door
More ready for work than they had been before.

They sprang to their tractors, gave motors a start
And away they all crawled like a horse and a cart.

But I heard them exclaim ere they drove out of sight,
"We'll get you the sap. So you the fire light."

--T. R. Harding

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Beginning January 1, 1966, Naturalflow Maple tubing and supplies, Lamb Electric Tappers and Flomor Pellets will be distributed by:

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Our new building, now under construction, is located ½ mile east of the Baldwinsville village limits on Belgium Road, Route #31.

My brother, Cliff and I have operated under the name A.C. Lamb & Sons, Liverpool, N.Y., for a long time; in fact, the fifth generation is now going to school. This business, managed by common, frugal down to earth people, has grown to be the largest business of it's particular kind in the world. It has simply grown too large, and is no longer gratifying or fun to operate with so many different, unrelated lines. Like the old French blacksmith said, "We got too many fires in the iron."

But please bear in mind that this is an unusual, odd-ball business, so I can brag and not say too much. There is an old saying, "Let the fellow brag that's got something to brag about." I've got little to brag about and only for a short time longer, so I've done it.

It seems to Cliff and me that we are spending our lives running around inside of rain barrels and never touching the outside. We desire to run smaller businesses. We both hope that splitting up will result in a sort of semi-retirement, and it is with many fond memories that I prepare to leave here and move to my new location.

The actual reason that motivated this step is the Income Tax problem. With this department you are guilty until proven innocent and to protest is like fighting a mad bear with a buggy whip.

In Germany, Hitler financed his program by persecuting the Jews and taking everything he could get. It has been made clear to me that the New Deal, Fair Deal, Great Society and other related programs, requires vast sums of money to buy votes. This money has to come from the progressive, productive, worth-while citizens, and the bayonet has been stuck into my back too many times.

However, I realize that this first season will be a bugger to get settled and start over and it is my sincere desire to follow maple and its people much closer. I want to do a much better job than I have in the past and operate a completely profitless venture.

All I can say is: many, many thanks for past assistance and patronage and it is a great pleasure to still be with you.

Bob Lamb

Women's Page

Shirley P. Coombs

A WOMAN'S POINT OF VIEW

In October my husband represented the Vermont Sugarmakers at the National Maple Council meeting followed by the sixth Triennial Conference on maple products. These conference meetings were held at U.S.D.A. Research Laboratory in Philadelphia. Many wives accompanied their husbands, as did I. They were welcome to sit in on any of the meetings.

Perhaps you are thinking, what a boring trip for a woman. On the contrary ! While our husbands were hard at work the first afternoon a group of us drove out to Valley Forge. After leaving the bustling traffic of the Pennsylvania Turnpike the atmosphere was tranquil and peaceful. Yet years before this was the scene of cold, hunger, bloodshed and death that only war knows.

Those soldiers who lived in the log huts with the dirt floors, boards for beds, and a tiny fireplace for heat must have had to fight for survival to say nothing of the battles of the war.

The old stone house that George Washington used as his headquarters has been restored. There is nothing magnificent or pretentious about it. The simplicity itself tells a great deal about this period in history. Walking down the same halls and paths that General Washington had walked made me stop and think. This wealthy man was accustomed to luxury and leisure, yet he was willing to give this all up for the cause of freedom.

The cannons are quiet now. The father of our country has long since passed away, but his deeds will live in our hearts forever.

Several of us climbed the nearby tower. I must admit however, that I was the last to reach the top. (Probably due to the fact I had to hang on with both hands.) Height really gets me ! The view of the rolling country - side on one side and the city on the other was well worth the effort.

The second day of our visit was well planned for us by Mrs. Drahaim and Mrs. Zabarsky of the Laboratory staff and Mrs. Kissinger, wife of Dr. Kissinger. We saw three colored films about Pennsylvania and the Philadelphia area. Later we visited a high rise apartment building. The manager showed us several types of apartments which were available. They were all lovely, but the one that took my eye was a penthouse on the 19th floor. (Probably because I live on a hill at home.) This particular apartment rented for $450 per month, utilities included.

We joined our husbands for lunch. Mealtimes were so very informative. It gave us a chance to chat with sugarmakers from other sections of the country. Many good ideas were exchanged. We also learned that others have problems as well as ourselves. Solutions were worked out in many instances.

A tour of a shopping center followed. We found that the stores weren't too different from our own. However, they were all under one immense roof, which has its advantages in bad weather. The manager of the E.J. Korvette store, one of a department store chain, showed us the various departments in his store. We were given a behind the scene view when we saw merchandise from the time it was unloaded from a trailer truck until it reached the shelves. This was most interesting. We were treated to coffee and pastries in their coffee shop at the conclusion of the tour.

Many thanks to the ladies who took time from their busy schedules to make such an enjoyable day for us. We certainly appreciated their day's agenda.

Mrs. Kissinger kindly volunteered her services the following day. Thanks to her extensive knowledge of the area I can report that not one of us got lost. We went by train to downtown Philadelphia and walked several blocks to Independence Hall. There we viewed the famous Liberty Bell and touched the crack in this historic relic.

The tour of the "American Wax Museum" was most interesting.. Wax reproductions of famous Americans from the Indians to John F. Kennedy were intriguing. We also viewed the grave of Benjamin Franklin. The Cradle of Liberty is certainly an appropiate name for Philadelphia. One lady said she had wanted to visit the Independence Hall since she was a little girl. She was so pleased to have one of her ambitions fulfilled.

Did I enjoy this trip? Needless to say I did ! It was pleasant to see old friends and acquaintances. There is a saying that "strangers are the friends you haven't met yet." How true this is. Many new friendships were begun at the conference at Philadelphia, "The City of Brotherly Love." How appropiate, that name.

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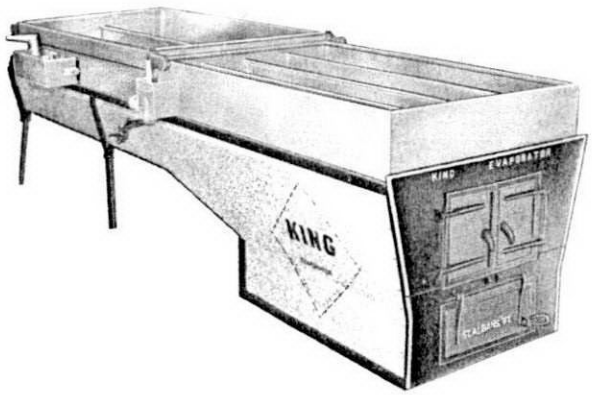

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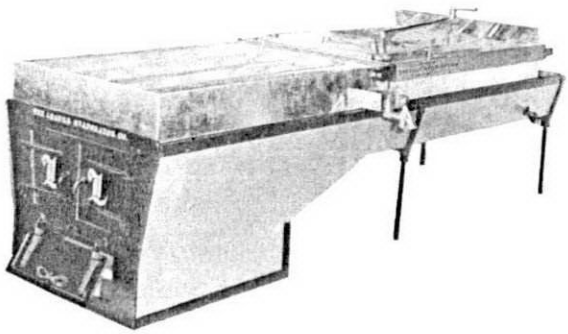

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