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Maple Syrup Factsheet

Maple Syrup Factsheet No. 211b1094

A few rules to reduce the risks of contamination of maple syrup products by lead residues

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Maple Syrup Factsheet	**A FEW RULES TO REDUCE THE RISKS OF CONTAMINATION OF MAPLE SYRUP PRODUCTS BY LEAD RESIDUES**
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Issue

Based on all the data available, it seems that the vast majority of maple syrups produced in Quebec very easily meet the accepted standards concerning the presence of lead (Pb) in food products. It should be noted, however, that several countries (including countries that import our maple syrup) are currently revising these standards. If current trends are any indication, the accepted maximum limit for lead in food products will shortly be fixed at 0.250 ppm.

With respect to these new standards, it has been noted that in very rare cases, some syrups may be considered not in compliance even though they do not present any risks to consumer health.

It is agreed, however, that the maple syrup industry must take all necessary steps to prevent all forms of contamination and to aim for complete elimination of lead residues from its products. It should be noted that the equipment developed and marketed by the major maple syrup manufacturers in recent years is clearly designed with this in mind. It is therefore possible for the maple syrup industry to go beyond safety standards to improve further the image of quality of its products on markets.

Sources of contamination at the main stages of maple syrup production and possible corrective measures:

Special attention must be given to all possible sources of enrichment or contamination when the product being handled is maple sap.

No matter how limited the enrichment at this stage, it may become important since all the elements present in maple sap will be concentrated anywhere from 30 to 100 times during the concentration and evaporation process. Table 1 illustrates this phenomenon.

Let's suppose that there is no other source of lead contamination and that the measurable concentration in the syrup is below a detection threshold arbitrarily fixed at 0.002 ppm. Let's also suppose that all the lead added during the process is in the filtered syrup (no accumulation in the system or no loss during filtration). If equipment is installed and it is able to enrich the solution with which it comes in contact by 0.002 ppm, we would have:

Table 1. Illustration of the residue concentration phenomenon

Type of solution during enrichment		Measurable lead concentration in the syrup
Maple sap	at 0.75° Brix	0.233 ppm of lead (warning!!)
	at 2° Brix	0.087 ppm of lead
Maple sap concentrate	at 8° Brix	0.021 ppm of lead
Maple syrup	at 66° Brix	0.002 ppm of lead

Maple sap

At this time, we have no indication that maple sap naturally contains measurable levels of lead. This means that if lead residues are found in the syrup, they can only come from the equipment, additives, techniques or maintenance products used during the manufacturing process.

Collection system

Since it is almost exclusively made of lead-free materials (plastic, polyvinyl, etc.), the collection system can therefore not be linked to such contamination, unless the tubing manufacturer has added stabilization agents or other additives containing lead or unless the maple syrup producer has installed unsuitable metal plumbing to convey the sap to the storage tanks, for example.

Suggestions:

Eliminate all metal fittings (other than those made of stainless steel) in the collection system, especially those with tin solders (see Table 1, Factsheet No. 751a1299).

Obtain a guarantee from your tubing vendor that the resin used in the tube is of food grade quality and that none of the manufacturing processes used are liable to cause contamination of the tubing and the release of lead [or other contaminants such as iodine (I_2) for example] into the maple sap, when it comes into contact with the parts of the collection system.

Maple sap and inverse osmosis concentrate storage system

Galvanized steel tanks may be a source of contamination by certain heavy metals such as zinc. Unless the original surface has been damaged (dented, corroded, treated with abrasive materials), however, these tanks should not cause significant lead enrichment of the solution.

Suggestions:

Promptly replace galvanized steel tanks that have rust spots.

Do not use maple sap that has remained for more than 24 hours in this type of tank.

Never use primer paint to repair a damaged or rusted tank surface. Use only epoxy paints specifically labelled as being of food grade quality. These operations must be performed by a professional in the field to be effective, and the cost of such repairs may easily become prohibitive.

Eventually replace this type of tank with tanks made of stainless steel (grades 302, 304, 316 or 430) with lead-free solders.

Evaporation system

The most serious risk of lead contamination of maple syrup comes from the old tin plate pans with tin-lead solders, still widely used in small sugar bush operations, and from stainless steel pans also with tin-lead solders. These pans should be replaced as quickly as possible by stainless steel pans without tin-lead solders («TIG» or «MIG» solders).

Suggestions

Never use pans normally used to concentrate maple sap for any other purpose, such as evaporating or concentrating other types of solutions (apple juice or fermented products).

At the start of the season, before evaporating the maple sap and manufacturing a syrup that may end up on the market, evaporate the potable water for an hour or two and rinse thoroughly.

Take note of the numbers of the first two drums of each year's production (in fact, a complete record should be kept of the entire production) and give this information to the syrup buyer.

To control foaming of the solution in pans, use only commercial products that are compatible with food grade application and that are sold expressly for this purpose. Never use a vegetable or animal fat that could cause food allergies (e.g. peanut oil, almond oil, etc.) and that is not specifically certified to be lead-free.

If you have to wash evaporation pans during the production season, obtain the guarantee from your supplier (a document written or signed by the vendor is always preferable to verbal assurances) that the product used does not contain any lead. Rinse thoroughly with potable water before resuming evaporation.

Syrup conditioning system

If the syrup collected from the evaporator has a low lead content, it is important to avoid contaminating the product before packaging. If the lead content is high, it is important to take all necessary means to reduce it to a level that will allow product compliance.

Suggestions

Since some of the lead present in the syrup is associated with suspended particles, the concentration in the finished product may be reduced by carrying out the best filtration possible. A syrup that still appears cloudy because of suspended sugar sand particles will almost always have higher levels of lead than the same syrup that has been perfectly filtered.

Pressure filter pumps are generally made of brass, a material that may contain up to 5% lead. Material removed from the pump gears by abrasion can therefore increase the lead content of the maple syrup. To reduce this type of enrichment as much as possible (until the industry makes pumps constructed of other materials such as stainless steel available), allow the sugar sand to settle before filtering the syrup. The pump speed can also be reduced by changing the gear pulley ratio to avoid excessive recirculation of syrup through the pump.

Use filter tank and boilers made of stainless steel without tin-lead solders. Use food grade fittings and tubing to connect this equipment.

Avoid packaging syrup from the first day's runs in individual-size containers (metal containers of 450 mL, glass containers of various sizes, etc.). These syrups may have the highest concentrations of lead and they should be diluted with syrups produced later in the day. If there are no other sources of significant and chronic contamination, these syrups can be virtually free of lead.

Storage system

Galvanized steel drums commonly used in the maple syrup industry should not be a major source of lead contamination of syrups. They should gradually be replaced, however, by genuine drums of food grade quality (made of soldered stainless steel), which ensure better storage of the product.

Suggestions

For storage of more than a few days, ensure that the drum is completely filled.

Always inspect all drum interior surfaces visible through the bung hole.

Never use a drum that smells strongly of fermentation, that has rust stains, unusual dents or obvious repair marks such as solders.

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