Cleaning maple syrup tubing : A Priority

The sap collecting system is an ideal growth medium for microorganisms. A biofilm is formed along the walls of the tubing, providing a protective layer for the bacteria, where nutrients are readily available and microorganisms can multiply. This biofilm consists mainly of composite sugars called glycocalyx. As the glycocalyx reaches higher levels, the microorganism contamination in the sap becomes increasingly affected. In an ideal incubator, the population of certain microorganisms can double in 20 minute intervals.

When considering le complexity of a given system, it is idealistic to believe that microorganisms can be eliminated completely. Alll measures taken by a maple syrup producer are strictly to *control* the presence of microorganisms. Several of the following recommendations may seem difficult to implement due to the need for system modifications and the considerable completion time. They are, however, the price to be payed for avoiding a significant contamination, which, under the right conditions, may lead to complete deterioration of the sap.

End of Season Maintenance

This is the ideal time to implement thorough cleaning solutions that involve the use of disinfectants. A solution of 600ppm of sodium hypochlorite is recommended. This disinfectant corresponds to the requirements of maple syrup exploitation : efficiency of disinfectants and cleaning process, harmlessness to food products, low costs, low reactivity to material, etc.

The cleansing procedure must begin immediately following the end of the collection season. Start by flushing each tube with a solution whose volume corresponds to the contents of the tube with a ratio of one to one. Next, leave the same amount to soak for a few hours if the system is well propped (be aware of the gel). After this solution is withdrawn, remove and clean the spouts with a fresh batch of solution. For each spout, 0.5 litres of

solution should be discharged. A brush can be used to clean the tapping devices to ensure a complete cleansing process.

To increase efficiency of the operation, pressure pumps or vacuum pumps can be used to flush out the entire system. Compressed air is added to the solution in all cases, especially when the system is not level. This creates turbulence and divides the water tower, allowing a higher altitude to be reached. Once the process has been completed, withdraw as much of the remaining solution as possible.

Maintanance During the Season

When performed throughout the season, the following recommendations will control the development of glycocalyx as well as the microorganism population within the tubing system. **The use of disinfectants is not advisable** because it will be impossible to rinse the complex system with water. Furthermore, the elimination of these residuals would lead to a considerable sap loss.

Tubing equipment should be rinsed every two to three days using **potable water**. Ideally, the system would be divided into sections so that rinsing can occur daily. This eliminates the risk of contamination. The collecting equipment should be washed regularly with a solution whose volume is equivalent to two times the capacity of the equipment. Where tapping is involved, it is best to start at the highest point of the system, with a tank as the source. This procedure should begin at the end of, or after, the collection period. In systems that are relatively level, the flow may become inverted. According to certain observations, this technique might cause a decrease in the tap's productivity. Consequently, it is recommended that a pressure of 40 livres à la pompe is maintained.

Note : This process must be implemented within the first few days of the season, and must be performed on a regular basis. Otherwise, results may be misleading.

In large networks, this procedure is very demanding. Instead of cleaning the entire system at once, it is best to start with collectors linking empty distributors, transportation tubes, and tubes with large diameters and low sap discharge. Gleucometers can be used to identify parts of the system that are at risk. It is important for each reading to be taken at a given point in time.

These recommendations, when performed individually, will not provide sufficient control of the microorganisms. When accomplished concurrently, however, the desirable results will be acheived.

André Boucher, Consultant in the Maple Syrup Industry; Ministry for Agriculture, the Fisheries and the Food of Quebec

Reference : *Techniques de lavage et d'assainissement du matériel acéricole*, CPVQ, AGDEX 300/756

Tube capacity per 100 metres, as a function of its diameter :

Tube Diameter	Volume in Litres per 100 metres (300 ft)
19 mm (3/4 inches)	30 litres (7 gallons)
25mm (1 inches)	50 litres (11 gallons)
32mm (1.25 inches)	80 litres (17 gallons)