

PROCESSING OF FROZEN SHEEP MILK – CURRENT PROCEDURES AND DIFFICULTIES ENCOUNTERED

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Summary

The Old Chatham Shepherding Company has been processing significant quantities of frozen sheep milk for eight years. Through extensive experimentation, the company has developed successful recipes, using a blend of frozen and sheep milk in both its yogurt and cheese product lines. The drawbacks of utilizing frozen milk include significant costs in freezing, storing, shipping and thawing prior to use. There are processing losses related to frozen milk, and the cause is sometimes difficult to determine. It is very important that additional research be conducted to identify quality control test methods that will show that milk has maintained a proper temperature during its life and at what age does the milk start to develop quality problems. Furthermore, better techniques need to be developed to handle the frozen milk during the thawing process. The market is developing for sheep milk cheeses and yogurts, and improving the reliability of using frozen sheep milk will enable producers at all levels to expand production and sales.

Introduction

The Old Chatham Shepherding Company (OCSC) has been processing frozen sheep milk since 1997. Current consumption of frozen milk is approximately 250,000 lbs per year. Old Chatham Shepherding Company also produces and processes approximately 270,000 lbs of fresh milk annually. Fresh milk production is relatively even throughout the year enabling OCSC to produce a steady supply of young sheep milk cheeses and yogurts for a national marketplace. In addition, OCSC purchases about 35,000 lbs of fresh sheep milk from a local New York state farmer during the April to August season. All frozen sheep milk purchased during the 2004 season came from members of the Wisconsin Sheep Dairy Cooperative.

Purchase Specifications

All frozen milk from Wisconsin must be produced to Wisconsin's requirements for Grade A sheep milk. OCSC is IMS (Interstate Milk Shippers) rated because of national distribution of yogurt products, resulting in the requirement for Grade **A** milk.

Freezing requirements – All milk will be chilled to 40 degrees F and held for a maximum of 4 days before shipment. Milk to be frozen will be placed in 5 gallon plastic dairy bags, labeled by date and producing farm. Initially, plastic pails were used, but the milk did not freeze as well and pails presented a disposal problem. Bags of milk will be frozen on open shelving in commercial style deep freezers and will be maintained at or below minus 10 degrees F until shipment.

Transportation

The frozen sheep milk is transported on shrink wrapped pallets weighing approximately 2000 lbs from individual farms to a freezer plant in Shakopee, Minn. OCSC uses this facility to store the bulk of its inventory throughout the year. OCSC attempts to maintain minimal inventory at its farm. Currently, 40 foot trailer loads of milk are transported to a freezer plant in Albany and on an as needed basis (5-6 pallets per week) are picked up and delivered to the farm by the OCSC' s refrigerated truck. Formerly, OCSC would receive the trailer load from Wisconsin directly and place the contents in a freezer unit designed to go on ships. Since this freezer has proven to be unreliable at times and milk has been lost, OCSC has added the above mentioned step. The transportation sequence adds considerable cost to the product.

Total Cost of Frozen Sheep Milk

Including all shipping and handling charges, the cost of the frozen milk in a ready to be used state (thawing included) at the creamery in Old Chatham is estimated to be \$0.87 per pound. Freight, handling and storage costs, after leaving the farm, amount to approximately 26% of the total cost.

Processing

OCSC uses frozen sheep milk in producing camembert cheese, ricotta, yogurt and certain 100% sheep's milk cheeses. Through many years of experimentation, it has been determined that the maximum amount of frozen milk used in any given recipe is 65%. The balance must be fresh sheep's milk, and this is the reason that OCSC has spent considerable efforts to produce fresh milk in sizable quantities on a year round basis. If more than 65% of frozen milk is used, there may be texture problems in the yogurt, including graininess. Also, the product may have a less rich taste, it may be drier and the overall flavor may not be as developed as compared to cheese made with a combination 35% fresh and 65% frozen milk.

Prior to the thawing process it is necessary to weigh each bag of frozen sheep milk, because the weight of each bag varies significantly and to have accuracy in the sizing of a batch of milk, the volume in each bag must be known. In the future we are requesting that the bags be marked with their weight.

To melt the frozen sheep milk, OCSC uses the same vats that are used for pasteurization. The fresh milk is pumped into the vat and heated. Then the frozen milk is added slowly in chunk form. When the frozen milk is completely melted, the pasteurization process is continued to completion. Another reason to blend frozen with fresh is because using 100% frozen milk could result in the milk being burned on the sides, of the vat, as the vat heats up. It has been recommended that the melting temperature be increased to 140 degrees F, to prevent damage to the milk, and OCSC is currently running experiments to determine if there is a difference in quality.

Problems with Frozen Milk Processing

General comment – With the goal of making excellent and consistent quality sheep’s milk cheese and yogurt, OCSC is placing renewed emphasis on the quality of the frozen milk. Occasionally, processing problems occur that are a mystery, and we believe that the characteristics of frozen milk handling and processing must be looked at more closely. We strongly believe that additional research on both the controls and the handling of frozen milk are necessary and examples are discussed below.

Handling and Transportation

Not only is it extremely important to freeze milk properly, but the milk must remain at minus 10 degrees F or colder until it is actually utilized. If the temperature of the milk increases to around 25 degrees F, separation will occur and the milk cannot be used for the most sensitive products such as camembert and yogurt. OCSC has some success in using milk that is showing signs of separation in ricotta processing. In the case of the OCSC, the milk is transported three times, and in each case, there is an opportunity for the milk to increase in temperature. When the milk is received, there is no way to know for certain if an unacceptable temperature variation has occurred. OCSC believes that a research project should be conducted to determine if a rise in temperature and subsequent re-freezing, at any time during the life of the milk, has a negative effect on the processability of the milk and what are the maximum allowable ranges to insure good quality milk. Possibly, the use of temperature recording chips can be a part of any experiment.

Due to the transportation distances and the number of times that a pallet of sheep milk is handled before it is utilized at OCSC, broken pallets and load shifting can occur, resulting in extra handling expense. OCSC plans to develop specifications for palletizing and shrink wrappings to minimize these handling problems.

Quality Control

To determine if separation has occurred during the life of the sheep milk, OCSC has developed a simple test where a core of milk is retrieved from a bag of milk. This sample is then placed in a small (two ounce) plastic cup and microwaved for 15 to 20 seconds. The cup is then swirled around and observed. If the milk has a tendency to separate, small chunks or sedimentation of milk will be observed on the walls of the cup. If no separation exists the walls will be smooth and only the milk residue is apparent. On occasion, this test does not give us perfect results, because the milk may be on the verge of separation failure but still pass the above test. This problem will show up as a thick residue on the bottom of the vat and soft curd, presumably from the separation of the protein and fat. If this occurs in a run of Camembert, the batch will be a total loss. In yogurt, we can usually salvage about 70% of the batch. If it occurs in a run of pure sheep’s milk, the batch can usually be saved but the yield will be lower. OCSC is currently conducting experiments to determine if PH measurement is a more accurate way to determine the quality of the frozen milk.

Age of milk

Even though more research is being conducted on the handling and processing of sheep milk, an unanswered question is how long the milk can be stored, under proper conditions, before quality degradation occurs. A concern exists at OCSC that milk stored for more than one year may result in processing difficulties. This occurs because every year the milk is produced and stored in the freezer plant between March and early September, but it may take more than one year for OCSC to utilize this milk. This fall, OCSC hopes to experiment with older milk and newer milk to determine if differences are apparent as a result of the experimentation. A positive outcome might be that a greater percentage of frozen milk could be used, in a given recipe, if the age of the milk was shorter.

Conclusion

The use of frozen sheep milk has been successful, in general, for the Old Chatham Shepherding Company. However, greater quality control checks at every step are required so that better standards can be developed to reduce losses and improve product quality. Also, better handling and possibly new equipment needs to be developed to improve the thawing and handling procedures immediately prior to the actual use of sheep milk in production. Efforts in this area will hopefully lead to a reduction in processing costs.