Introducing Local Goat Yogurt Production on Small-scale Farms in Barbados

By: Simran Chhina, Michelle Colvin, and Stefany Ildefonso

Left to right: S. Chhina, S. Ildefonso, J. Vaughan, M. Colvin, and D. Rollins

Introduction

Goat milk and its value added products such as yogurt, cheese, and butter have the potential to play a vital role in the farming industry and economy throughout many parts of the world, especially in developing countries. Over the last few years, there has been increased interest in functional food properties. Unlike many other countries in the Caribbean region which focus on goat meat, Barbados has, throughout the years, developed an industry for goat milk production. The goat milk industry on the island started in the late 1980s with mainly three breeds: Alpine, Saanen, and Toggenburg. Recently, this industry has grown significantly, but the current production levels still do not satisfy the market demand for goat milk and goat milk products (pers. com. J. Vaughan, 2015). Local farmers do not have large contracts since they cannot supply a steady state production in large quantities and most producers are operating at a personal or phone call basis to sell their milk. Nonetheless, imported dairy products such as yogurt, cheese and butter, are in great demand in the country and many brands of different dairy products can be currently found in one of the largest distribution centers on the island, Massy supermarkets. Since these are imported from Europe (UK), the cost of import contributes to high produce costs for the Barbadian population. Overall, as determined by the FAO, two of the most prominent challenges of the goat industry in Barbados are the expansion required to meet local demand and the limited availability of value added products.

Toggenburg (left) and Saanen goats (right) from Greenland Research Station

Project objectives

The main objective of this project was to develop a procedure to produce yogurt from goat milk for local small-scale producers as a mean to diversify their production and create a value added product. We tried for an all-natural product to minimize the use of additional agents and decrease upfront costs.

Materials and Methods

During the experiment, milk from each of the three main breeds was used to make plain yogurt, by fermentation with the following three bacteria: *Lactobacillus bulgaricus*, *L. acidophilus*, and *Streptococcus thermophiles*, from a commercial cow milk Greek yogurt brand (Brand Fea) available at Massy stores. In total, fourteen trials were conducted using three kinds of thickeners: soy milk powder, whey powder and gelatin. Different quantities of these thickeners were experimented with to improve the texture of the products. Each of these trials had three replicates as a mean of standardizing the procedures. Subjective tests for viscosity were done with the help of two volunteer taste testers. The

LactiCheck LC-02, which is a machine specific to cow and small ruminant milk, was used to analyze all goat milk batches for: fat content, non-fat solids, crude protein, density, percentage of water and freezing point. The differences in quality and milk composition between yogurts from milk derived from specific breeds after the addition of whey protein were assessed. Only mixed breed milk was used for the soy milk powder and gelatin experiments.

LactiCheck LC-02 machine used for milk analysis.

Results and Discussion

Trials with no thickening agent produced a non-acceptable yogurt due to the lack of consistency and an altered flavor. This might be due to the fact that goat milk has less α-casein than cow milk which results in fewer cross-linkages formed with cysteine residues leading to a runny consistency (Zhang et al. 2015). Trials with whey and soy thickening agents determined that once a satisfactory thickening was achieved, doubling the amount of thickeners did not cause a significant difference in taste or viscosity. We suspect that once the cross-linkages formed with cysteine residues are saturated no new linkages can be formed (Zhang et al. 2015).

Our incubator-like setting was unable to keep a steady temperature throughout the incubation process; an average drop in temperature of 6.67 °C occurred. However, the final temperature of 30-35 °C was still within the desired range for our incubator-like setting. Ideally, the temperature should be at 43°C for 8 hours (Posecion 2011). Due to the lack of equipment, this temperature of 43 °C was not achieved in our experiments. This most likely contributed to the slightly more acidic taste of the yogurt determined by our taste testers.

Taste testers preferred the taste of the yogurt made from Toggenburg milk and from the soy powder thickening agent. Toggenburgs might have been preferred since their milk has the highest fat content among the breeds tested and the soy powder was the least detectable in taste compared with whey powder and gelatin.

Finally, the most preferred yogurt was made using soy milk powder as a thickener (three teaspoons in 1 L of goat milk), an insulated container, and a storage time of 3 days.

Conclusion

Plain goat milk yogurt was produced at a small pilot scale. Isolated and mixed breeds milk were used in this experiment. Three protein-based thickening agents were used and their effect on milk composition, taste and viscosity were analyzed in this project. Fat and protein content were increased after addition of whey protein and gelatin. Adding whey protein and soy milk powder resulted in the most acceptable viscosity and preferred taste for goat milk yogurt. The taste of the Toggenburg goat yogurt was the most preferred by taste testers. Additionally, significant improvement in viscosity was observed after prolonged storage time of 3 days. Except for gelatin, the thickening agents used improved the overall quality of the goat milk yogurt due to the increase in fat, non-fat solids, protein, and potential cross-linkages with cysteine residues. Local farmers will be able to produce goat yogurt following the procedure provided in this project.

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