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FOAMING PROPERTIES OF CAPRINE MILK: WHETHER ARE IMPROVED BY HEATING?

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Caprine milk shows a higher digestibility, lower allergenicity and better antioxidative activity than bovine milk and it was recognized as a source of valuable bioactive peptides which resulted in increased consumption of caprine milk and dairy products during last decade. Major caprine dairy products are cheeses, but whipped dairy products could be also very attractive for many consumers. Foaming properties of milk proteins are very important in whipped dairy products. But in contrast to the numerous literature corresponding to bovine milk, reports on foaming properties of caprine milk are very limited.
In the present study, foaming properties of untreated and thermally treated caprine skim milk at 90°C for 10 min at different pH values of milk (from 6.5 to 7.1) were investigated. Raw caprine skim milk formed very unstable foam with foam capacity of 76.3%. Heat treatment of caprine skim milk increased foam capacity for seven to ten times, depended on pH of milk, compared to value obtained for foam prepared with raw caprine skim milk. The foam stability significantly depended on the pH of milk. The best foam stability was obtained at pH 6.5 (638.8%), whereas the lowest value was obtained for foam prepared at pH 6.9 (43.8%).
The significant improvement of foaming properties of heat-treated caprine milk could be attributed to changes of caprine casein micelle surfaces due to whey protein/casein interactions during heating of milk. The obtained results indicated that thermally treated caprine skim milk could be used in formulation of whipped dairy products.

Keywords: *caprine milk, heat treatment, foaming properties*

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INTRODUCTION

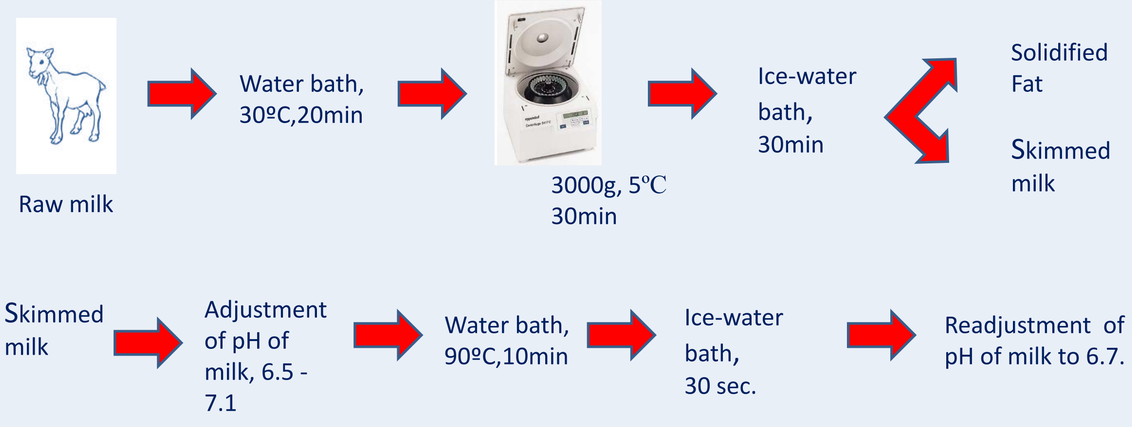
Caprine milk shows a higher digestibility, lower allergenicity and better antioxidative activity than bovine milk[1,2]. It was recognized as a source of valuable bioactive peptides[3] which was resulted to increased consumption of caprine milk and dairy products during last decade. Major caprine dairy products are cheeses, but whipped dairy products could be also very attractive for many consumers. Foaming properties of milk proteins are very important in whipped dairy products. In contrast to the numerous literature corresponding to bovine milk, reports on foaming properties of caprine milk are very limited.

Furthermore, heat treatment of milk and dairy products is one of the essential operations in most dairy processes. During heat treatment, casein-whey protein interactions were occurred which results to change of caprine casein micelles surfaces[4]. Whether this changes affect the foaming properties of caprine milk is still not investigated.

AIM

In the present study, foaming properties of untreated and thermally treated caprine skim milk at 90ºC for 10 min at different pH values of milk (from 6.5 to 7.1) were investigated.

SAMPLE PREPARATION



DETERMINATION OF FOAMING PROPERTIES

Foaming properties were determined according to the method described by Barac et al. (2010)[5]. A quantity of 30ml of 2% solution of caprine milk at pH 6.7 was subjected to stream of air (6 dm^3/min) during 60 s through a Waters filter holder (Waters, Milford, MA, USA) placed at the bottom of a 250 ml graduated column. Foaming properties were expressed as foam capacity (FC) and foam stability (FS) according to following equations:

$$FC\ (\%) = A - B/B \times 100$$

where is: A = volume of solution and foam after bubbling, B = volume of solution before bubbling

$$FS\ (\%) = A1 - B/B \times 100$$

where $A1$ = volume of suspension and foam after 3 min.

RESULTS

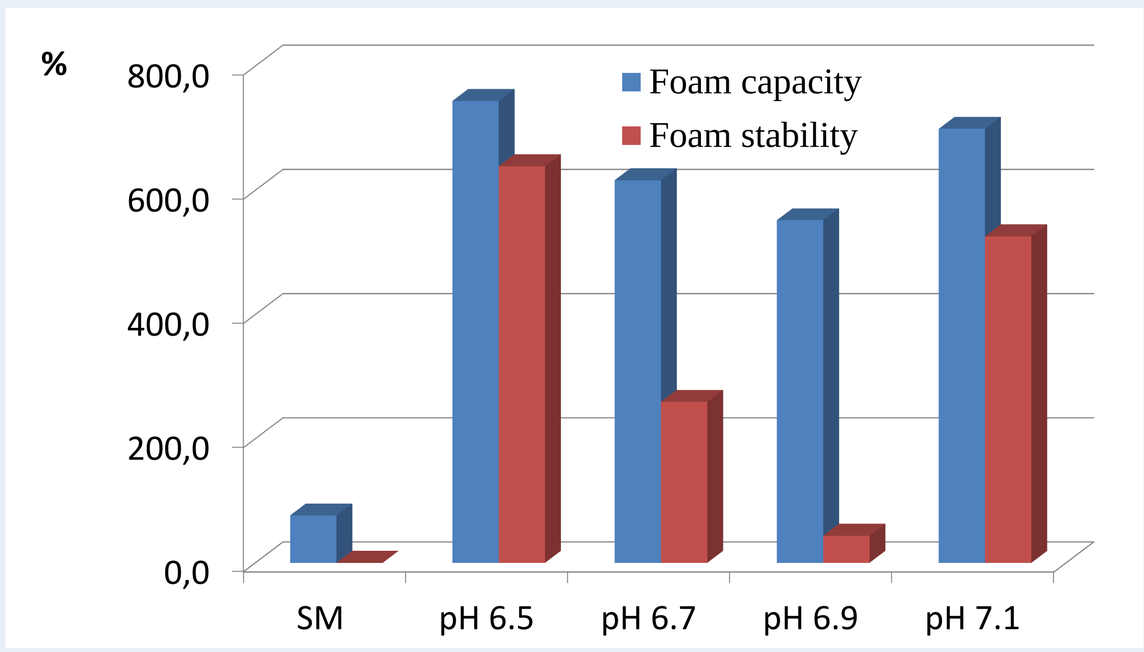


Figure 1. Foaming properties of caprine skim milk thermally untreated (SM) and thermally treated at different pHs (6.5, 6.7, 6.9, and 7.1)

DISCUSSION

Figure 2. Formation of foam, thermally treated sample at pH 6.7

Figure 3. Foam stability after 3 min. thermally treated sample at pH 6.7

Raw caprine skim milk formed very unstable foam with foam capacity of 76.3%. Heat treatment of caprine skim milk increased foam capacity for seven to ten times depended on pH of milk compared to value obtained for foam prepared with raw caprine skim milk. The foam stability significantly depended on the pH of milk. The best foam stability was obtained at pH 6.5 (638.8%), whereas the lowest value was obtained for foam prepared at pH 6.9 (43.8%).

CONCLUSION

The significant improvement of foaming properties of heat-treated caprine milk could be attributed to changes of caprine casein micelle surfaces due to whey protein/casein interactions during heating of milk. The obtained results indicated that thermally treated caprine skim milk could be used in formulation of whipped dairy products.

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