EFFECT OF HIGH HYDROSTATIC PRESSURES AND MILK PASTEURIZATION ON YOGURT QUALITY MADE WITH SHEEP MILK

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1. AIM AND INTRODUCTION

High hydrostatic pressure (HHP) processing technology has recently received considerable attention among food researchers. For example, high pressure treated milk has been successfully used to manufacture low-fat set-type yogurt (12% total solids) with creamy thick consistency, requiring no addition of polysaccharides (Penna et al., 2007).

The objective of this work was to study the effect on physicochemical, rheological and sensory parameters of a yogurt made with milk treated at high hydrostatic pressure compared to a yogurt made with pasteurized milk.

2. MATERIALS AND METHODS

The procedure for preparing the batches can be seen in the flow diagram in Figure 1.
Color determination was carried out with a CR-410 HS colorimeter (Konica, Spain) in the CIELAB color space with the chromaticity (a * and b *) and luminosity (L*) coordinates.

For the determination of the texture parameters (firmness, consistency, stickiness, adhesiveness), the back-extrusion test was applied in a TA-XT2 texturometer (Stable Micro Systems, England) with a cylindrical probe (P / 25 a) of 25mm diameter.

To study the behavior and rheological properties of yogurts (elastic modulus [G´], viscous modulus [G´´], consistency index [*K*] and apparent viscosity [η50]), a Paar Physica MCR rheometer (Anton Paar GmbH, Germany) was used, using a CC27 coaxial cylinder system coupled to a C-PTD200 Peltier cylinder system. The data were analyzed with the Rheoplus program (Anton Paar GmbH, Austria) installed on the computer connected to the rheometer.
First, an oscillatory test was performed with a frequency sweep between 0.01 and 10 Hz at a constant strain of 1%.

Next, a rotation test was carried out by means of a shear rate sweep between 0 and 300 s-1, subjecting the sample to three flow ramps (ascending, descending and ascending) in order to evaluate and eliminate the effect of thixotropy.

Sensory analysis was carried out by a ten trained panelist according to ISO standards.
The descriptors lactic odor, firmness, stringiness, creaminess, flavor and global preference were evaluated. Using an ordering method and using Friedman's statistical analysis, it was observed whether there were significant differences.
All analyzes were carried out in triplicate.

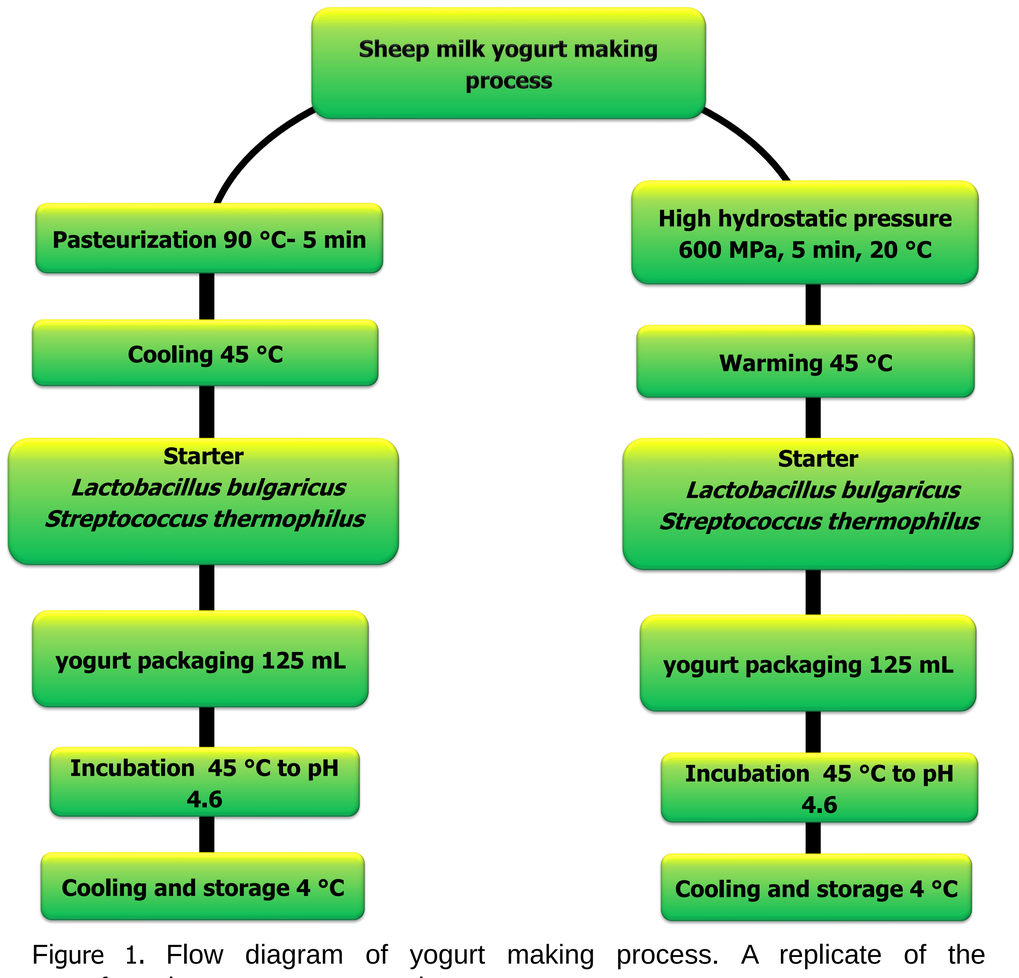

Figure 1. Flow diagram of yogurt making process. A replicate of the manufacturing process was made.

3. RESULTS

The differences between the physicochemical, color, texture and rheology parameters are shown in Table 1.

Treatment with high hydrostatic pressure significantly ($p < 0.05$) affected the fat content, dry matter, also influencing the color parameter b* blue to yellowness color ranges, are influenced by the fat and β-carotene content in milk, and high pressure may alter these values.

Likewise, the yogurts made with milk treated at high pressure did not show significant differences at the level of the texture parameters, except for adhesiveness ($p < 0.05$), with respect to the yogurts made with pasteurized milk.

At the rheological level, both treatments showed a predominantly elastic behavior with higher values G´, G´´, *K* and η50 in the yogurts that used pasteurized milk. The apparent viscosity (η, Pa·s) of the samples was calculated at a shear rate of 50 s^{-1}, representing the sensing shear rate in the mouth of low viscosity foods.

Sensory analysis using a trained panel members resulted in significant differences ($p < 0.05$) in stringiness, creaminess, flavor and global preference where the high pressure batches received the best scores (Figure 2).

Table 1. Physicochemical, color, texture and rheology parameters.

	Heat Treatment	High Hydrostatic pressure	Treatment effect
Dry Matter (%)	16.92 ± 0.16	17.54 ± 0.28	*
Fat (% of Dry Matter)	38.93 ± 0.34	39.85 ± 0.55	*
Protein (% of Dry Matter)	31.14 ± 0.76	31.38 ± 0.62	NS
Lactose (% of Dry Matter)	15.66 ± 0.21	15.39 ± 0.06	NS
Titratable acidity gL^{-1}	0.972 ± 0.02	1.044 ± 0.02	*
pH	4.55 ± 0.04	4.50 ± 0.06	NS
L*(D65)	91.47 ± 0.54	91.37 ± 0.14	NS
a*(D65)	-4.11 ± 0.04	-4.11 ± 0.11	NS
b*(D65)	11.79 ± 0.34	12.38 ± 0.07	*
Firmness (N)	1.40 ± 0.08	1.44 ± 0.04	NS
Consistency (N·s)	18.28 ± 0.81	19.28 ± 0.54	NS
Stickiness (N)	-1.00 ± 0.15	-1.08 ± 0.02	NS
Adhesiveness (N·s)	-0.79 ± 0.04	-1.08 ± 0.03	*
G' (Pa)	447.12 ± 124.32	281.63 ± 21.81	*
G'' (Pa)	117.68 ± 33.21	79.48 ± 5.14	NS
***K* (Pa·sn)**	8.17 ± 1.01	0.42 ± 0.04	*
η_{50} (Pa·s)	470.41 ± 136.12	97.47 ± 8.52	*

**: p≤0.05; NS: No significant differences*

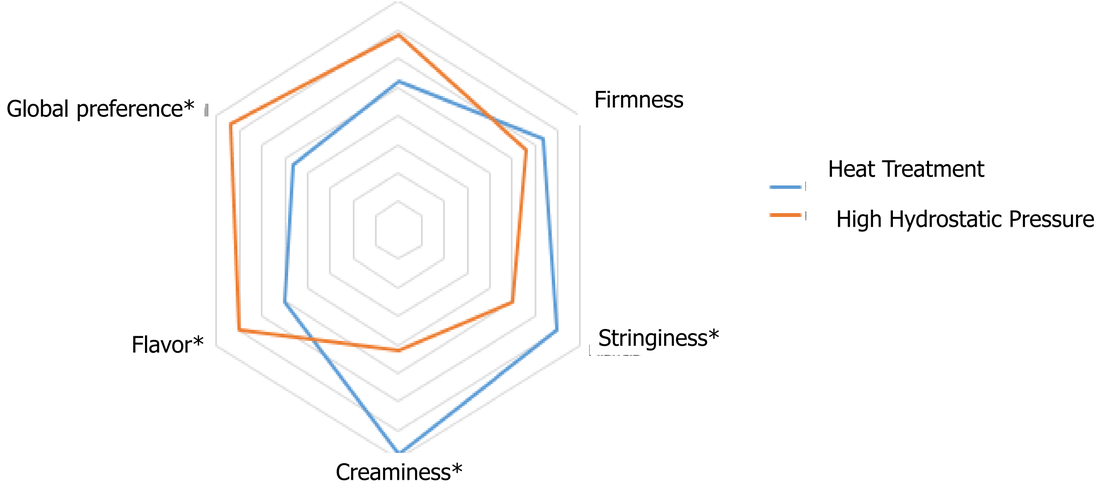

Figure 2. Sensory analysis. **: p≤0.05.*

4. CONCLUSIONS

In conclusion, the treatment exerted significant differences, being the yogurts made with milk treated with high hydrostatic pressure the best evaluated in the sensory analysis..

5. BIBLIOGRAPHY

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