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Process optimisation for enhanced yield and quality of West African soft cheese: Effects of temperature control and coagulant concentration

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Abstract

West African soft cheese (WASC) remains an essential source of nutrition and a critical livelihood asset in Western Africa. In cheesemaking, processing temperature, coagulant type, and coagulant concentration are key determinants of product yield and quality. However, there is limited empirical evidence on how these factors influence the yield and quality of WASC. First, the effect of temperature was studied, followed by the effects of type and amount of coagulant. Two independent replicates of WASC were produced at three processing temperatures (60°C, 80°C, and 100°C) using 30 g of crushed *Calotropis procera* (CP) leaves as coagulant per litre of raw cow milk. Analysis of variance was performed at 5 % significance level to assess factor effects. Increasing the processing temperature from 60°C to 100°C reduced coagulation time (41.0 min to 4.2 min), cheese yield (54.1 % to 30.2 %), and magnesium and calcium contents ($p < .05$). WASC yield did not differ significantly between 60°C and 80°C. Using the optimal temperature (60°C) for WASC processing, coagulant type (CP leaves vs. stems) levels of 10 g/L, 20 g/L, 30 g/L, and 40 g/L were tested. The coagulant type and concentration significantly affected most of the measured parameters, both independently and interactively. On average, the CP leaves resulted in longer coagulation times, higher WASC yields, and lower whey volumes than the stems. Increased coagulant concentration significantly improved WASC yield from 33.6 % to 49.7 % while reducing the coagulation time from 38.5 min to 28.3 min. For interaction effects, using 30 g/L of CP leaves produced the highest WASC yield (52.6 %), whereas using 10 g/L of leaves resulted in the lowest yield (32.9 %). The leaf-coagulated WASC (notably at 40 g/L) appeared slightly green and had higher protein, iron and zinc (at 30 g/L) contents than the stem-coagulated WASC.

In conclusion, optimal WASC yield and better nutritional quality can be achieved at moderate processing temperatures (60–80°C) and coagulant concentrations not exceeding 30 g/L. Processors should maintain these conditions for increased yield and nutritional and sensory quality. Further research should assess whether yield gains translate into income improvements and evaluate market acceptance and storage stability as coagulant levels increase.

Keywords: Cheese yield, coagulant concentration, colour and nutritional traits, optimisation, temperature control