EFFECT OF HOMOGENIZATION OF RAW MILK ON THE PHYSICAL PROPERTIES OF AGED CHEESE

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ABSTRACT

The art of cheese production is a sophisticated technology that has been refined over many years of experience. However, it is well known that the characteristics of the final product vary depending on the characteristics of the raw milk and the conditions during production. Such problems indicate that maintaining a constant product quality is a difficult task even today. Our research is focused on the question of how the condition of the milk influences the physical properties of cheese. Generally the production of aged cheese does not involve homogenization of the raw milk, because such shear stress on the milk affects to the mechanical properties of cheese. However, the reason of the phenomenon is still unknown. Therefore we investigated the effect of homogenization of raw milk on the physical properties of aged cheeses.

In this p aper, Gouda-type cheese was produced by relatively low pressure homogenization (2-4 MPa) of raw milk, and rheological properties were examined immediately after production and throughout the 8-weeks ripening period. The fracture strength of homogenized cheese immediately after production was lower than the control. During the ripening period, the fracture strength reached a minimum around 10 days and then converged to a constant value which was dependent on the homogenization strength (Fig.1). Linear viscoelastic properties were also examined throughout the ripening period to obtain information on the structure of the cheese. The mechanical spectrum of the cheese can be analysed with a weak-gel model (Eq.1).

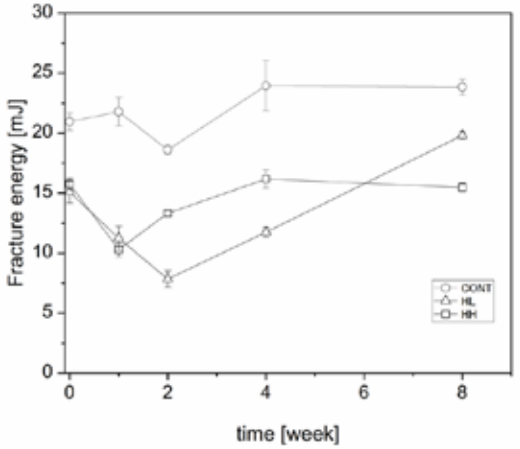

Fig.1. Changes in fracture energy during the ripening period for each sample. Circles, triangles, and squares denote the results for CONT(non homogenized), HL (2MPa), and HH(4MPa), respectively.

$$G^* = A_f w^{1/z} \qquad (1)$$

The coordination number (z) in this model is a parameter of the degree of filling of the hypothetical flow unit in the system, and this parameter is considered to represent structural information at the colloidal level. Fig. 2 shows the transition of z during the ripening process. It was found that the structure at the colloidal level changes discontinuously around 10 days of ripening. Nanostructures in the cheese during the ripening period were also examined by SAXS measurements. We found that the behaviour of structures a few nanometers in diameter, which we believe to be colloidal calcium phosphate (CCPs), changed around 10 days of aging, and this phenomenon was thought to correspond to a discontinuous change in mechanical properties around 10 days of aging.

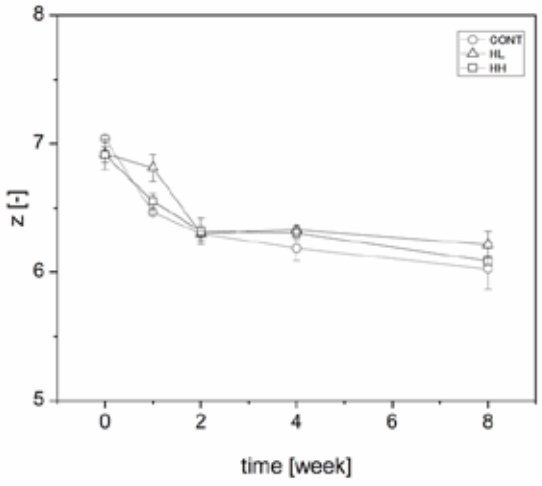

Fig.2. Change in coordination number during the ripening period for each sample. Circles, triangles, and squares denote the results for CONT (non homogenized) , HL (2MPa), and HH (4MPa), respectively.

Reports of studies tracking rheological properties during the cheese ripening process are rare, and we hope that the results of this study will encourage more thought about the events that are occurring in cheese during ripening.

ACKNOWLEDGEMENTS

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