

## Rheology of "skyr"

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**Objective:** The project's main objective is to study the impact of raw materials and processing parameters on chemical and physical characteristics of "skyr", which is an Icelandic fresh cheese made from skimmed milk. The main emphasis will be on the use of rheological methods and image analysis to gain information on structure, texture and shelf life of skyr.

**Materials and methods:** In the first phase of the project rheological characteristics of skyr were investigated and compared to the characteristics of German quark. For this purpose, blended skyr from two companies was used. The companies were MS and Nordurmjolk. The quark, which was from skimmed milk, was produced by BioBio in Germany. According to the nutrition labels the skyr from MS contained 11.5 g protein, 3.3 g carbohydrate and 0.2 g fat in 100 g, the skyr from Nordurmjolk contained 13.3 g protein, 3.3 g carbohydrate and 0.5 g fat and the quark contained 12.2 g protein, 3.9 g carbohydrate and 0.1 g fat. Stresstech frá Reologica Instruments AB was used for rheological measurements. Viscoelastic properties of skyr were assessed by two methods. One was creep-relaxation where changes in compliance were measured. The other was oscillation stress sweep at a constant frequency. During the stress sweep changes in elastic modulus ( $G'$ ), viscous modulus ( $G''$ ), complex shear modulus ( $G^*$ ) and phase angle were observed. Shear thinning and thixotropical characteristics of skyr were also studied.

**Results and significance:** In creep-relaxation skyr revealed typical viscoelastic behaviour. When stress was applied compliance rose rapidly, but the rate of change gradually decreased when the elastic response was superseded by viscous behaviour. During relaxation compliance decreased swiftly but again gradually levelled off at a positive compliance. At a low oscillating shear stress the phase angle was small and elastic behaviour dominated. When a certain stress limit was reached, the phase angle increased rapidly, the elastic modulus decreased and viscous behaviour became prominent. The skyr exhibited shear thinning at increasing shear rate and thixotropy at a constant shear rate. Dynamic viscosity exhibited hysteresis when shear rate was increased and decreased again. According to the study, skyr is a viscoelastic gel with similar rheological properties as quark from skimmed milk.