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NEW ZEALAND**

**INFLUENCE OF THE STRUCTURE OF
RENNET-INDUCED GELS ON THE
CHEESEMAKING PROCESS AND CHEESE
COMPOSITION**

**A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

The purpose of this study was to investigate the effects of some selected processing conditions on the formation, structure and properties of rennet-induced milk gels and the impact of these conditions on the cheesemaking process and final cheese composition.

The effect of pH, temperature, calcium chloride addition, rennet concentration and protein concentration on rennet gels were determined using rheology, permeability measurement and confocal microscopy. In rennet gels formed at pH 5.8, 6.2 and 6.5, the storage modulus (G') increased with a decrease in pH while the gelation time (GT) increased with pH increase. The permeability coefficient (B) increased with a decrease in pH. Rennet gels made at 25, 32 and 40°C showed that the G' values increased while gelation time decreased with an increase in temperature, with a maximum G' at 32°C. The B values increased with an increase in temperature. The rennet gels made with zero, 0.01% and 0.02% CaCl_2 addition showed a slight increase in G' with CaCl_2 addition, but no significant differences in B values. For gels made with 40, 80 and 120 μl rennet addition/l, the G' values increased slightly with an increase in rennet concentration, but there were no significant differences in B values. For rennet gels with different protein contents (range from 3.45 to 5.10%), the G' values increased whereas B values decreased with increasing protein content. All the confocal micrographs corresponded well with the results from the permeability and rheological analyses.

Two rennet gel systems were developed in this study. “High syneresis” gel systems were made using low pH, high temperature and normal protein concentration and “low syneresis” systems with high pH, low temperature and high protein concentration. These two systems were used in cheese manufacture in a pilot plant. It was expected that ‘high syneresis’ gel system would expel more whey and result in low moisture cheese, while the ‘low syneresis’ system would yield cheese with higher moisture content. It was found that the cheese produced from high syneresis system

had higher moisture content than the cheeses made from low syneresis system. It was opposite to what was expected. The set to cut time and acid production (starter levels) are thought to be the reasons for the outcome of the first pilot plant trial. The process conditions were redesigned to investigate the effect of gel firmness and pH on the composition of cheese. Similar results were found in the second pilot plant trial.

The factors involved in the cheesemaking process are much more complex than what has been investigated in the present study. Therefore, further investigations on the other factors affecting cheese moisture content are recommended (e.g. syneretic power).

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