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

A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF
TECHNOLOGY IN FOOD TECHNOLOGY

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2002

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 120μl 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).

ACKNOWLEDGMENTS

I would like to gratefully acknowledge my chief supervisor, Professor Harjinder Singh, for his excellent supervision, constant help and encouragement throughout my study especially for guiding me through writing my thesis, experimental works and discussion.

My gratitude and appreciation are extended to my supervisors Dr. Keith Johnston and Dr. Lawrie Creamer for their help during the experimental works and guided me through difficulties encountered during the experimental works and contribution of their expertise in the area. I am also appreciated that the New Zealand Dairy Institute funded this project.

Most warm thanks to Ms. Nicky White (NZDRI) for her assistance with the rheometer and other equipment. Her warm caring and sharing of knowledge are greatly appreciated.

Special thanks to Mr. Graham Holdaway and Mr. Gary Taekema (NZDRI) for helping me with the pilot plant trials and analysis of the results. I am very grateful for their warm encouragement and loving heart during my time of sickness.

I also appreciated the help from Mrs. Liz Nickless for her assistance on the confocal microscope and helpful advice on the sample preparation.

I am very grateful to all the Massey staff Mrs. Michelle Tamehana, Mr. Steve Glasgow, Mr. Garry Radford, Mrs. Geedha Reid, Mr. Byron McKillop, Dr. Yacine Hemar and Mrs. Karen Pickering for their excellent technical assistance, providing materials for this research and constant encouragement.

Thanks to my fellow post-graduate students and friends Maya Sugiarto, Aiqian Ye, Carol Ma, Kelvin Goh, and Hong Ping Gao for their friendship, constant encouragement, helpful advice for my study and life. Their loving hearts toward me are greatly appreciated.

Lastly, I would like to thank God for getting me through my study and without you I would not be able to do this. I am very grateful that I have such supportive, loving parents without them nothing can be accomplished. I can not thank them enough. I also appreciated the support and love from my sister and brothers. Final thanks to people who helped me along the way.

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