

The impact of seasonal variations on milk acid gelation

Siqi Li, Aiqian Ye, Harjinder Singh

Riddet Institute, Massey University, New Zealand

Introduction

Milk seasonal variation has been a challenge for the dairy industry to maintain product quality throughout the year, especially in New Zealand where calving occurs in late winter every year.

There is very limited research on how milk acid gelation is affected by seasonal variations. A better understanding of the acid gelation behavior will help controlling the quality of acidified milk products like yoghurt.

Aim

To investigate the seasonal variation in bovine milk properties and their impacts on the rheological properties of acid milk gels.

Methods

Fresh milk was taken for two seasons from a typical New Zealand farm. Major milk components and protein composition were analyzed using FTIR and RP-HPLC. Other milk characteristics including total calcium and ionic calcium concentration were determined. GDL-induced acid gels were made from two milk systems; seasonal skim milk without standardization and standardized full fat milk, both heated at 90°C for 6 minutes.

Results

Milk protein content was $4.65 \pm 0.22\%$ in late-season (Mar-May) comparing to $3.69 \pm 0.24\%$ during the rest of the year. Percentages of glycosylated κ -casein in total protein were 4.6%, 5.3% and 6.4% in early (Aug-Oct), mid (Nov-Feb) and late-season, respectively. Both total calcium and ionic calcium concentrations were the highest in late-season.

The average final acid gel strengths (G') of standardized milk gels were the highest in early-season, which decreased by 42.6% in late-season. In addition, the average gelation time was 50.5% longer in late-season comparing to early and mid-season. Both gel strength and gelation time were significantly ($p < 0.01$) associated with the amounts of glycosylated κ -casein, β -Lactoglobulin, total calcium and ionic calcium.

Conclusion

Shifted protein and mineral composition of late-season milks might contribute to their inferior acid gelation properties. The results indicated standardization of protein content was inadequate to control the acid gelation process of seasonal milk.