Potential of Ultrasound Pretreatment to Improve Rennet-Induced Coagulation Properties of Milk from Thamankaduwa White and Holstein Friesian Cattle Breeds in Sri Lanka

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Increasing unfavourable health concerns of milk from improved cattle breeds, the popularity for milk of indigenous cattle breeds is increasing. Studies have shown that indigenous cattle milk possesses exceptional milk coagulation properties. However, due to their low average milk yield, the production of coagulated milk products from indigenous cattle milk is unpopular. Ultrasound treatment is an emerging non-thermal technology that can be used to improve milk coagulation properties. In the current study, the effect of ultrasound treatment to improve the rennet-induced coagulation properties were evaluated for milk from an indigenous cattle breed, Thamankaduwa White, and an improved cattle breed, Holstein Friesian. The milk was treated at three ultrasound energy densities 504, 612, and 720 J mL^{-1} using a 20 kHz ultrasonicator, and rennet gels were prepared using Maxiren commercial calf rennet. Water holding capacity, syneresis, and textural parameters of rennet gels were evaluated. Ultrasound-treated samples from both breeds showed higher ($P<0.05$) water holding capacities compared to untreated samples. In Thamankaduwa White, milk samples treated at 720 J mL^{-1} showed the highest ($P<0.05$) water holding capacity (78.74±5.88 %). In both cattle breeds the syneresis was reduced ($P<0.05$) in treated samples compared to untreated samples. Furthermore, Thamankaduwa White cattle milk showed higher water holding capacity and lower syneresis ($P<0.05$) compared to Holstein Friesian milk. In Holstein Friesian milk, the hardness of rennet gels was reduced ($P<0.05$) in ultrasound-treated samples. However, in Thamankaduwa White milk, there was no difference ($P>0.05$) in hardness values for rennet gels in both ultrasound-treated and untreated samples. Accordingly, it could be concluded that ultrasound treatment could be used to improve the rennet-induced coagulation properties of milk from both Holstein Friesian and Thamankaduwa White breeds, and the treatment at 720 J mL^{-1} was more suitable to improve rennet coagulation properties in Thamankaduwa White cattle milk.

Keywords: Holstein Friesian, Milk coagulation, Rennet, Thamankaduwa White, Ultrasound treatment

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