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The possible explanation of obtained results was the activity of other enzymes incorporated in NOLA™ Fit 5500. According to the information obtained from the literature cellulases and proteases have been used for more efficient dispersion and extraction of proteins, particularly after heat treatment, used in yogurt production, making them denaturated (Aguilera, Stanley, 1999).

Microstructure of yoghurts

The results from the microstructural analyses of yoghurts are presented in Fig. 4. The microstructural observations showed that sample with less enzyme had smaller whey pockets rather than those with higher concentration of enzyme. Similar results had also been reported by other studies (Ibrahim, 2018; Schmidt et al, 2017). This might be due to the high water-binding capacity of EPS as well as modifications of yoghurt microstructure by EPS culture. Thus, the yoghurts made from EPS producing starters showed better textural characteristics. Furthermore, yoghurt cultures producing EPS may decrease the extent of syneresis (the lower whey separation). Syneresis is considered as a major defect in yoghurt and connected with extensive rearrangements of the gel network (Han et al., 2016). Whey pockets became wider depending on the enzyme concentration used on each sample due to the reason mentioned above.

According to the measurements, size of the whey pocked also increased: control sample (248 μm^2); 500 BLU L^{-1} (642 μm^2); 1000 BLU L^{-1} (2640 μm^2); 1500 BLU L^{-1} (4004 μm^2); 2000 BLU L^{-1} (101 494 μm^2). Sugar profile and concentrations in yoghurt samples are given in Table 4. Results from chromatography analysis provided no lactose presence in any sample with enzyme, the galactose was dominant monosaccharide in each sample treated with enzyme.

Complete lactose conversion to galactose and glucose in each sample (B, C, D, E) with NOLA™ Fit 5500 enzyme was detected in the research.

In order to achieve the highest conversion of lactose with less amount of commercial enzyme is beneficial from financial side.

Conclusions

Rheological properties of lactose-free yoghurt significantly depend on enzyme concentration used for lactose hydrolysis, reflected in a significantly lower viscosity, firmness, consistency, but higher size of whey pockets in yoghurt samples with increased amount of enzyme comparing to the control sample. Results show that rheological properties of the yoghurt strongly depend on the lactose hydrolysis level.

For obtaining lactose free yoghurt with acceptable rheological properties the lowest concentration of β-galactosidase (500 BLU L^{-1}) is recommended.

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