

## PHYSICOCHEMICAL AND MICROBIOLOGICAL PROPERTIES OF PROBIOTIC YOGHURT ENRICHED WITH INULIN AND HONEY

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### Abstract

The therapeutic properties of yoghurt can be improved by adding probiotic bacteria to yoghurt culture. On the other hand, the addition of inulin and honey as prebiotics, can reduce the fermentation process and improve the rheological and sensory product properties. The purpose of this study was to examine the effect of inulin addition and the combination of inulin and honey on: fermentation speed, viscosity, syneresis, microbiological properties and microstructure of probiotic yoghurt during 21 storage days.

Cow's milk with 1.5% fat after the addition of 1% inulin was thermally treated at 95 °C/10min. After cooling to 55 °C, honey was added in concentrations of 2% and 6%. A control sample was also produced, without supplement. Samples were inoculated at a concentration of 0.0025% with a mixed probiotic culture (*Streptococcus thermophilus*, *Lactobacillus bulgaricus*, *Lactobacillus acidophilus*, and *Bifidobacterium ssp.*) at 37 °C, and incubated until a pH of 4.6 was reached. Observation of pH, lactic acid content, viscosity and syneresis intensity was performed on: 1st, 7th, 14th and 21st day, while the change in the number of bacteria was determined on 1st and 21st day. The pH values of milk and yoghurt were measured with a pH meter (Eutech Instruments, England). The viscosity of the samples was measured for 3 minutes (value was reading every 30 s.) at a spindle rotation speed (Ø4) of 20rpm, using a digital viscometer, DV-E (Brookfield engineering laboratories, USA). Sigma 2-6 laboratory centrifuges (Germany) was used to determine syneresis by Keogh and O'Kennedy method. Syneresis was expressed as a percentage (%) of isolated serum by centrifugation at 2,000 rpm for a period of 10 minutes. The SEM (scanning electron microscopy) technique on JSM-6460LV (Oxford instruments, England) was used to study the microstructure of yogurt. Changes in the number of bacteria in yoghurt on the 1st and 21st storage day were determined using the classical dilution method, and isolation was performed on MRS agar after incubation at 37 °C under anaerobic conditions. The results were statistically processed (Tukey test,  $p < 0.05$ ) in SigmaPlot 11.0 (Systat Software, Inc. USA) and Microsoft®Excel 2007.

The obtained results showed that inulin accelerated the fermentation process, while the honey addition shortened the fermentation time even faster. Also, the synergistic effect of inulin and honey resulted in a significant reduction in whey secretion ( $p < 0.05$ ) compared to the control sample during storage, but did not significantly affect the change in viscosity. On the other hand, the positive effect of inulin and honey on the growth of probiotic bacteria has been shown. However, during the 21st storage day, there was a slight decrease in the number of bacteria, on average by two logarithmic units, but their number was above the therapeutic minimum in all samples. Micrography of the samples were directly related to the results obtained for syneresis and viscosity. The results showed that a finer and more cross-linked structure of yogurt was achieved, as well as better compactness of protein chains by increasing of honey concentration, and on that way syneresis was reduced and to a lesser extent the viscosity increased.

In general, variants of functional probiotic yogurts with better physicochemical, microbiological and rheological characteristics, and better microstructure were obtained, by using probiotic starter culture for milk fermentation and using different concentrations of honey in combination with inulin. In the future with the possible application of some more parameters, the obtained results of research could have applicative significance regarding practical application and expansion functional foods range in our market.

**Key words:** Probiotic yoghurt, Inulin, Honey, Syneresis, Viscosity, Microbiological properties.