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Study of lactose uptake rate by immobilized kefir cells during whey fermentation, using C-14 labelled lactose

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Whey or milk plasma is the liquid by-product of cheese processing units. Due to its high organic load of 40-70 g/L BOD₅ and 60-80 g/L COD, whey represents an important environmental problem, especially in Greece, where about 700.000 tones whey are produced annually. Additionally, whey contains significant amounts of lactose and therefore it is suitable for further treatment, in order to produce useful fermented products like alcohol. Kefir is a natural mixed culture consisting of various yeasts (*Kluyveromyces*, *Candida*, *Saccharomyces*, *Pichia*) and lactic acid bacteria of the genus *Lactobacillus*. It has been found that yeasts and lactic acid bacteria co-exist in a symbiotic association in kefir and are responsible for lactose fermentation of milk and whey. Also, the positive effect of kefir cell immobilization on organic or natural supports in whey fermentation rate has been confirmed and the most acceptable explanation for this was the enhancement of catalytic action of some enzymes involved in the process. However, due to the fact that fermentation rate depends on lactose uptake rate by microorganisms, research efforts have been undertaken in order to study kefir fermentation ability. So, tracers have been used to record lactose uptake rate by kefir as labelled and unlabelled molecules of the same compounds species follow the same metabolic pathways.

In the present work ¹⁴C-labelled lactose was used to study lactose uptake rate by kefir cells immobilized on delignified cellulosic (DC) materials, gluten pellets and brewery spent grains (BSG), during whey fermentation, in order to reveal the role of uptake rate in the promotional activity of these supports. Results illustrated that whey fermentation by immobilized kefir cells was faster compared to free cells and in case of DC materials, fermentation time was found only 7.2 h. Also, the lactose uptake rate by kefir immobilized on DC materials was higher compared to other supports.

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