UTILIZATION OF WHEY BY USING THE MEMBERANE FILTRATION TECHNIQUE

BY

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رسالة دكتوراه

اسم الطالب : حسن محمد حسن حسان
عنوان الرسالة : الإستفادة من الشرش باستعمال تكنيك الترشيح بالأغشية

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ABSTRACT

Hassan Mohamed Hassan Hassaan, Utilization of whey by using the membrane filtration technique. Unpublished Doctor of Philosophy dissertation, Department of Food Science, Faculty of Agriculture, Ain Shams University, 2000.

The possibility of complete utilization of derived whey in some varieties of frozen desserts was aimed to study depending on some effective techniques.

Whey was centrifuged, ultrafiltrated (UF) to concentration factor (CF) of 20 and diafiltrated (DF) after the dilution with tap water amounted 20 times of the yielded UF whey protein concentrate (UFWPC). The obtained UF whey permeate was concentrated by reverse osmosis (RO) to CF of 3.

The DFWPC was used as a milk solids not fat (MSNF) source proportionally in combination with skimmilk powder (SMP) in frozen yoghurt at the level of 25, 50, 75 and 100%. The control of frozen yoghurt based on 3% fat, 12% MSNF, 12% sucrose, 5% corn syrup and 0.25% CMC stabilizer was done using SMP as MNSF supply.

The results revealed that, the levels of total nitrogen, specific gravity (sp. gr.), freezing point (fp), dynamic viscosity (dv), consistency coefficient (cc) and yield stress (ys) increased as the protein of DFWPC in frozen yoghurt mix rised. While, the overrun, melting resistance and count of lactic acid bacteria of the resultant frozen yoghurt decreased by increasing the DFWPC level. The overall organoleptic quality of samples of 25% DFWPC frozen yoghurt was superior to them.

The RO concentrate of UF whey permeate was exposed for acidic lactose conversion compared with the enzymatic one. The enzymatic hydrolysis was carried out at 5 or 40 °C and pH 6.5 using certain concentrations of β - galactosidase of nil, 125, 250, 500, 750 and 1000 U / ml and incubated for 6 h. The acidic hydrolysis was done at 40, 50 and 60 °C for 24h at pH 1.2 or 1.7 using concentrated HCl. The obtained acidic hydrolyzed RO concentrate of UF whey permeate (ACP) at pH 1.2 and originalized to pH 5.5, using any group of the following three alkaline agents namely sodium & potassium

carbonate (1:1); sodium & potassium carbonate in combination with sodium bicarbonate (1:1:2) or sodium carbonate & bicarbonate in combination with potassium hydroxide (1:2:3), was used for Strawberry water ice based on 30, 25 and 20 % sucrose, 0.5% CMC stabilizer and 0.001% natural red colour & flavour essence. The control was made using tap water instead of ACP.

The acidic conversion of lactose was slowly at the beginning and rapid near the end of the conversion period conversely to enzymatic one. The highest level of enzymatic lactose conversion (88.74%) was obtained at 5 °C using 1000 U/ml, while the corresponding figure of acidic conversion (74.67%) was achieved at pH 1.2 and 50°C. The ACP with conversion level of about 74% gained at pH 1.2 and 40 °C, that was converted into water ice mix, led to increase the levels of dry matter, total sugar, ash, sp. gr., dv, cc as well as ys of the mix and decrease in its fp. The levels of sp. gr. and overrun of ACP water ice, especially at 25% sucrose, were higher than those of the control. The ACP frozen product of the third alkaline agent, especially at 25% sucrose, resisted to melt more than the others involving the control. The palatability of ACP water ices with 25% sucrose and originalized with the first alkaline agent group as the control was superior to them.

The results led to concluded that, the full utilization of whey could be achieved via the use of DFWPC as partial (25%) MSNF supply in frozen yoghurt making, Likewise, ACP could be used for water ice making provided that more discharging of minerals is needed to expand the utilization possibilities. Nanofiltration or ion exchanges process was recommended in this respect.

Key words: - Mozzarella whey, ultrafiltration, diafiltration, reverse osmosis, lactose conversion, frozen yoghurt, water ice.

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