

DEVELOPMENT OF A LOW COST FRUIT ICE CREAM BY INCORPORATION OF
WHEY POWDER AND MINIMALLY PROCESSED FROZEN AVOCADO
(PERSEA AMERICANA)

By

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ABSTRACT

One of the objectives of this study was to determine the capability of preparation of whey powder from liquid whey under pilot scale. Liquid whey is a byproduct obtained from cheese manufacturing process and has not been given much focus on its nutritional value and its usefulness as a food ingredient in food industry. On one hand it has a higher nutrient content and on the other hand it has higher pollution strength. Therefore, if released to the environment without proper pre-treatment it could definitely leads to an environmental crisis. According to the past history records of Sri Lankan dairy industry, up to now no efforts have been taken to rectify this issue as well as no attempts have been taken for the mass scale production of whey products. Out of the two locations selected to collect liquid whey, the best suitable one was determined based on their physico-chemical analysis. The tests carried out in this effort were pH, titratable acidity, fat%, lactose %, protein %, ash% content and BOD. Based on the results obtained for above tests, liquid whey from a mid- country cheese plant was selected for processing. Mid country whey was concentrated up to 50% of its total volume using a rotavapor at 60° C and 5th rotational speed. The pre-concentrated whey was subjected to drum/roller and spray drying. Depending on the results obtained, spray-drying process was selected as a suitable technique for the preparation of whey powder of improved quality. The powder produced was packed in triple laminated aluminum sachets and stored under low temperature. The whey powders were analyzed for its physico-chemical and microbiological qualities. All routine tests such as moisture, protein, ash, fat and lactose percentage determinations were carried out whereas the microbiological quality was

determined using total plate count, total coliform and yeast / mould count were determined. The results reflected that the local sweet whey powder has a better quality over other imported sweet whey powder available in local market. This local whey powder was used to replace milk solids non-fat requirements at different levels during the following ice cream mix formulations.

The avocado was selected as the fruit base, which has dual properties. One way, it is believed that avocado fat has a capability to act as a milk fat replacer. The other way it can enhance the sensory properties of ice cream. Though it was known that this fruit has a value addition when it is incorporated in to ice cream mix, less emphasis has been given so far for its usage in ice cream industry. At the initial stage, three abundant avocado varieties were chosen for the preparation of avocado puree. Visual inspection was practiced to determine the browning tendency of different locations of avocado mesocarp of all three varieties when exposed to air. These varieties were subjected to proximate analysis, including crude protein, crude fiber, crude fat, moisture, ash content and pH. These avocado puree were subjected to ascorbic acid treatment at 200 ppm to adjust the pH up to 4.5. After uniform mixing, the puree was packed in 0.075 mm LDPE (Low Density Polyethylene) and the hermetically sealed packs were immersed in liquid nitrogen followed by storage under freezing. The browning indexes (BI) were calculated each month for 1 year. Based on the overall results "Peradeniya Breed" was selected as the best variety for the formulation of ice cream.

The local whey powder and minimally processed avocado puree were incorporated in the ice cream mix at different levels to replace the requirement of milk solids non-fat and

fresh cream, respectively. The minimum levels avocado and whey powder were obtained from SLS 223:1989 and a US Standard for ice cream. During the first phase of ice cream development three control ice cream products were formulated to determine the individual effect of whey powder and avocado on the overrun of the ice cream. The whey powder has a positive effect whereas avocado showed a slight depression in air incorporation when used separately. During the second phase of ice cream mix formulations, six products were formulated with two different levels of avocado (5% and 10% w/w) and three levels of whey powder (15%, 25% and 35% w/w). All these six products were evaluated for their sensory parameters against the control plain ice cream. The results obtained were analyzed and based on the overall preferences of the panelists, the suitable levels of avocado and whey powder are selected. In order to confirm above results, third phase of ice cream formulations was carried out with slight differences in avocado levels (6% and 8%) without any adjustments in the level of whey powder (15% w/w). The products developed in third phase were evaluated against control plain ice cream. Another tasting panel was setup (triangle test) to obtain the most preferred one, since two products obtained the same results on the nine point hedonic ranking. Ultimately the ice cream containing 5% avocado and 15% whey powder was selected as the most preferred product. The fourth phase of ice cream mix formulation was carried out with incorporation of a processed vegetable fat product instead of fresh cream without changing the 5% avocado and 15% whey powder levels. The triangle test results were significant and reflected that consumers prefer the ice cream with fresh cream than processed vegetable fat. For all sensory evaluation panels, 80 untrained panelists were

selected from the same batch of undergraduates and throughout the evaluations, same group was employed to minimize the variability. Microbiological analyses were carried out for all products developed locally to guarantee a safer product and it includes, total plate count, total coliforms and, yeast and mould count. The results reflected that all the ice cream mix formulations contained lesser loads of microbes whereas market product showed more.

In order to obtain comparative results the cost of ingredients were calculated for the formulation of most preferred selected ice cream, control plain ice cream and selected ice cream with vegetable fat. The highest cost was obtained for the control plain ice cream whereas least was obtained for selected ice cream with vegetable fat.