

Predicting Quality Attributes of Yoghurt-ice Cream Through Fluorescence Spectroscopy

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Abstract

Yogurt is a healthy fermented dairy product which possesses various health promoting effects. To transform the yogurt into ice cream tends to increase its shelf life and overall acceptability by the people of all age groups. However, eating and technical quality of ice-cream is of prime importance from customer point of view. Several traditional methods have been used to evaluate the quality of ice-cream during the storage. Nevertheless, a rapid prediction to determine the quality of ice-cream at any stage of storage is needed for on-line monitoring. Accordingly, the present study is planned to evaluate the impact of different yogurt concentrations (10-50%) on various compositional and quality attributes of yogurt ice cream (pH, acidity, meltdown properties, overrun, SNF (solid-not-fat), total solids (TS), crude protein, crude fat, ash) during storage of two months and to explicate the potential of fluorescence spectroscopy for predicting the changes in these quality attributes of yoghurt ice-cream during the storage period. The yogurt ice cream was analyzed for various parameters viz titratable acidity, pH, total solids (TS), overrun, melt down, crude fat, crude protein and ash%. In parallel, fluorescence spectra were also taken during the intervals at various excitation (250-510 nm) and emission wavelengths (300-620 nm). The findings concluded that the ranges of selected parameters were remained in the acceptable range during the storage of yoghurt ice-cream. For instance, pH, meltdown ability, acidity, overrun, crude protein, SNF, TS, ash and crude fat values were ranged as 5.52-6.56, 7.97-16.10 g/100 g, 0.11-0.73, 30.03-44.50%, 3.48-3.58%, 21.47-23.38%, 31.85-33.22%, 1.10- 1.70% and 9.33-11.50% respectively. The regression results revealed that fluorescence spectroscopy has a good prediction potential at various emission and excitation wavelengths (R^2 for pH = 0.97, R^2 for meltdown = 0.51, R^2 for acidity = 0.95, R^2 for overrun = 0.97, R^2 for crude proteins = 0.99, R^2 for TS = 0.98, R^2 for SNF = 0.97, R^2 for crude fat = 0.98, R^2 for pH = 0.11) for determining the quality attributes of yoghurt ice-cream during the storage. Ice cream is a palatable and highly nutritious food, prepared from the buffalo and cow milk or combination of the both, the other ingredients are cane sugar, dextrose, fruit juices, preserved fruit, nuts, chocolate, edible flavor and permitted food colors. Ice cream production is rapidly developing technology that has become a profitable industry because of recent advances. Diverse ingredients and methods of freezing have resulted in 240 different types of ice cream (Güven and Karaca, 2002). Many under-nourished individuals are deficient in lactase and cannot

tolerate appreciable quantities of milk or milk solids. Many who suffer lactose intolerance mistakenly believe that they must avoid all dairy products. The conversion of milk to yoghurt should make it possible for these groups to consume appreciable quantities of milk with minimal symptoms of lactose intolerance due to reduction in lactose (approximately 30%) during fermentation (Chandan and Shahani, 1993). Yoghurt is an excellent food that is easy to digest and is of high biological value and is known to lower cholesterol levels (Güven and Karaca, 2002). The use of yoghurt instead of milk decreased the viscosity of ice cream mix and over-run capacity of ice cream (Güner et al., 2007). Yoghurt ice cream (YIC) or frozen yoghurt dessert can be regarded as a healthy alternative to plain ice cream. Also use of soy derived products in food formulations can lead to the development of products of improved nutritional and health promoting values. Yoghurt ice cream was prepared using full-fat soy flour to substitute 55% of non fat dry milk content. Product formulation comprised of 12% SNF, 10% fat, 18% sucrose, 0.4% stabilizer-emulsifier and 0.1% vanillin. The effect of incorporating yoghurt at the rate of 5.3%, 15.9%, 26.5%, 37.1% and 47.7% of the total ice cream mix on the flow behavior, physico-chemical and sensory properties of Yoghurt Ice Cream was evaluated as compared with control, devoid of any yoghurt. The mixes all showed pseudo plastic flow behavior, with the viscosity increasing from 0.7 to 1.57 pa s when the yoghurt content increased from 0 to 47.7%. Higher contents of yoghurt in the mixes significantly improved the melting rate of the yoghurt ice cream where the minimum melting rate (16%) was obtained for the sample of 47.7% yoghurt content. The highest overrun value of 58% was obtained for the sample containing 15.9% yoghurt. However the specific gravity of the product decreased with increasing yoghurt content with the highest specific gravity of 1.108 being recorded for control. In the light of these findings, it can be concluded that yoghurt ice cream, containing full fat soy flour, can be successfully made by incorporating 25.6% yoghurt in the mix with the end product maintaining its acceptable sensory characteristics. Yoghurt ice cream samples were prepared as plain yoghurt and with orange and chocolate, and stored for 30 days. The samples were analysed for some physicochemical, microbiological and organoleptic characteristics on day 0, 15 and 30. The mean values of total aerobic mesophilic bacteria (JAMB), psychrotrophs and lactic acid bacteria (LAB) were determined as 6.60, 2.39 and 4.83 log cfu/g, respectively.

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