Changes in Sensory Acceptability and Physico-chemical Composition of Coconut Spreadable Cheese Substituteduring Storage

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ABSTRACT

The aim of this study was to develop a coconut milk-based cheese spread and to determine its changes in terms of sensory acceptability among semi-trained panelists and changes in physico-chemical composition during four weeks of storage. The sensory characteristics and physico-chemical composition of the coconut spreadable cheese substitute (CSCS) were evaluated and compared to a commercial cheese spread. Results showed that during the four weeks of storage, no significant changes were found in appearance, color, flavor, and spreadability. The aroma and texture however changes significantly during the four weeks of storage. There is an increasing value in sensory attributes of CSCS. The sensory acceptability of CSCS is comparable to that of the commercial cheese spread. The pH, titratable acidity, viscosity, water activity and ash does not changed significantly during the storage. The free fatty acids, moisture content, fat, protein and carbohydrate however changed significantly during storage.

Key words:coconut milk, spreadable cheese substitute and consumer acceptability

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INTRODUCTION

Due to industry efforts to provide low-cost foods or due to health considerations oncows' milk consumption [8], imitation dairy products have recently appeared on the market [16]. Cheese analogues or imitation cheese are cheese-like products in which milk fat, milk

protein, or both are partially or completely replaced with nonmilk-based components such as soy [16], starch [12], or vegetable replacers [14]. Vegetable oils and fats are most commonly used as cheap substitutes for milk fat to manufacture imitation cheese. While not being harmful to health, the imitation products may be of lesser nutritional quality (e.g., by lower calcium content) and contain several artificial flavors and food colors [13].

Cheese analogues are being used increasingly due to their cost effectiveness, attributable to the simplicity of their manufacture and the replacement of selected milk ingredients by cheaper vegetable products [17], as well as the potential to overcome problems associated with natural cheeses such as high production and storage costs, functional variability and compositional and nutritional inflexibility [9]. Processed cheese represents an extremely delicate and complex system as its properties are affected by many variables, such as the composition and nature of the cheeses used as ingredients, pH and processing parameters. Therefore, it is indispensable to study the influence of using new ingredients, like soya milk or coconut milk, in processed cheeses. The use of coconut milk as the primary ingredient of a cheese spread instead of the usual animal's milk offers an alternative to the traditional cheese spreads.

Coconut milk is a white thick liquid extracted with water from freshly grated coconut kernel. It is an emulsion containing fat, protein, sugars, minerals and vitamins [15]. Unlike cow's milk, coconut milk is lactose-free and can be a good alternative for people pursuing a lactose-free diet [19]. It also contains carbohydrates (mainly sucrose and some starch), lipid and minerals like P, Ca and K [7]. Hence, this study was conducted with the following objectives: (1) to determine the changes of the sensory acceptability of the CSCS among semi-trained panelists and (2) to determine the changes in physico-chemical composition of CSCS and compare it with commercial cheese spread.

MATERIALS AND METHODS

Preparation of Coconut Spreadable Cheese Substitute

The CSCS was prepared by combining the two mixtures: mixture A (starch, carrageenan, salt, sugar, carboxymethyl (CMC) powder, cheese powder and distilled water) and mixture B (coconut milk, cheese flavor, carbonated water, nutritional yeast and diced pimiento). The measured ingredients were placed in order of liquids and dry ingredients. Both mixtures were combined and cooked at 60^{o}C for 15 minutes. Continuous stirring was performed to achieve the desired consistency of the CSCS [3].

Sensory Evaluation with Semi-trained Panelists

Sensory evaluation was performed every week to determine the changes in sensory acceptability of the CSCS using 20 semi-trained panelists based on a Hedonic scale of 1 to 9. The sensory acceptability of CSCS was compared to a commercial cheese spread.

Physico-chemical Analyses

Coconut spreadable cheese substitute were examined for pH, (Jenway 350 @ 20^{o}C), titratable acidity and free fatty acids [11]. The viscosity (Brookfield viscometer @ 21oC and 20rpm) and water activity (enBSK Sensor @ 25^{o}C) were also measured. The fat content was determined through the acid hydrolysis method, protein (Kjeldhal method), moisture (oven air-drying method) and ash (muffle furnace method) were analyzed following AOAC procedures [2]. Carbohydrates were calculated by difference [2].

Statistical Analysis

Analysis of Variancewas used to determine significant difference between four weeks of storage of the CSCS and the commercial cheese spread.

RESULTS AND DISCUSSION

Changes in Sensory Acceptability of Cheese Spreads for Four Weeks

In terms of significant differences between the storage periods, all sensory attributes of the CSCS were found to be insignificantly different each week except for aroma and texture. The initial values for appearance, color, spreadability and flavor were 7.75, 7.60, 7.95 and 7.45 respectively. After four weeks of storage, the sensory values slightly increased to 7.70, 7.85, 8.35 and 7.65 respectively.

The aroma of CSCS during the 2nd and 3rd week was significantly different from the initial, 1st and 4th week. While the texture of CSCS, the initial and 1st week of storage was significantly different from the 2nd to the 4thweek storage period. Nonetheless, based on the acceptability rating, the aroma and texture increased from its initial values of 7.35 and 7.65 to 7.80 and 8.35 respectively as the storage progress.

For the commercial cheese spread, all sensory attributes were change insignificantly during the entire for weeks of storage.

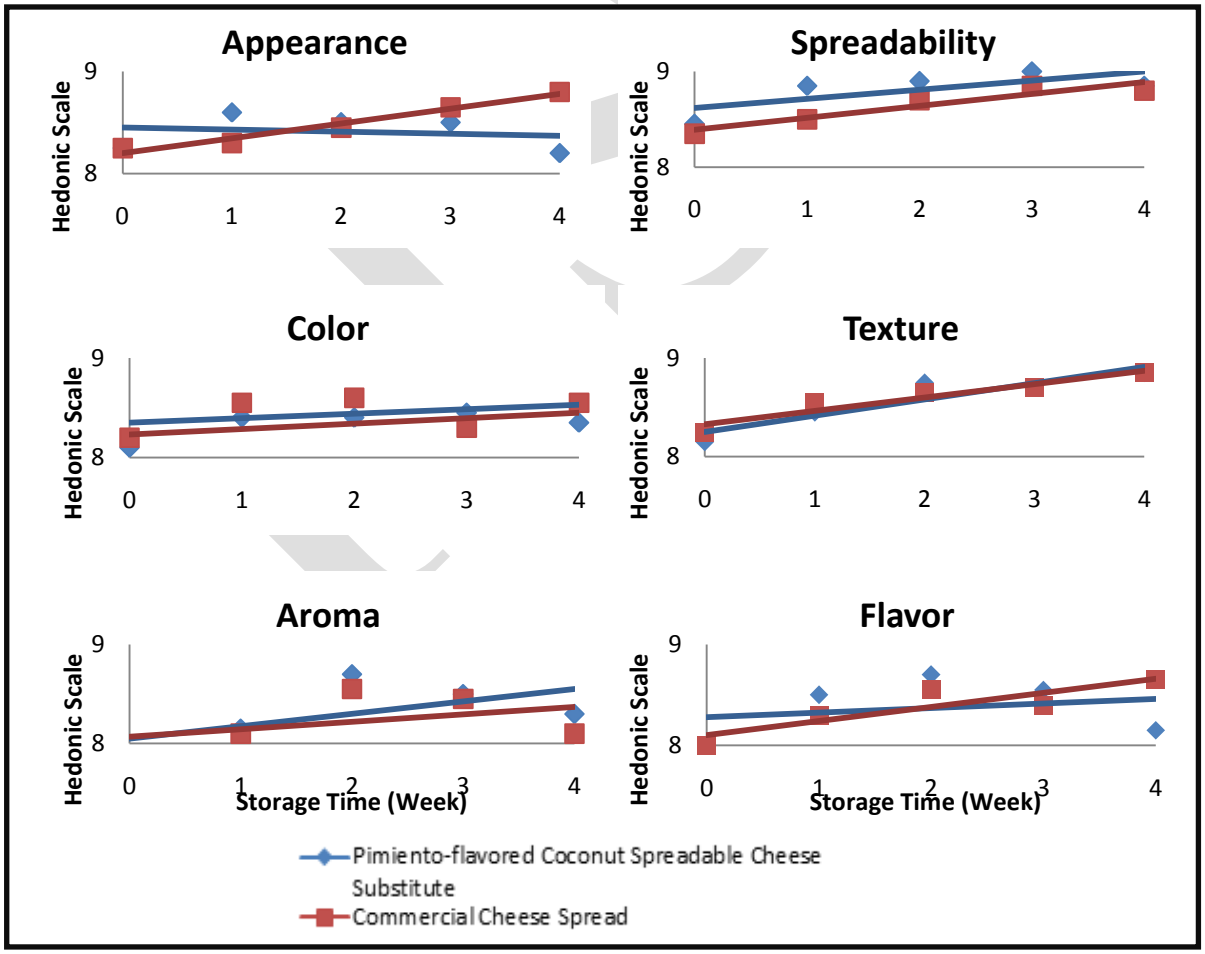

Fig 1:Sensory attributes during four (4) weeks of storage

Changes in Physico-chemical Composition of Cheese Spreads for Four Weeks

The changes of physico-chemical composition of CSCS such as pH, titratable acidity, viscosity, water activity and ash changed insignificantly starting from the initial week of storage up to the 4th week of storage. However the free fatty acids, moisture content, fat, protein and carbohydrates change significantly during the four weeks of storage. The changes of physico-chemical content in CSCS and commercial cheese spread as results of storage time are shown in Figure 2.

The free fatty acids of CSCS showed that from the 2nd week of storage, it significantly increased from 0.42 to 0.69. According to Akin *et al.*(2003) and Fox (2004), total and volatile FFAs of cheeses increase when lipase level increase because of low salt content. CSCS only incorporated 1.8 % salt out of 100 %, thus, the significant increase during the 3rd week.

The initial moisture content (MC) of CSCS decreased significantly during 2nd week from 30.68 to 24.92% However, MC for 2nd week (24.92%) was insignificantly different from 4th week (25.45%). Decrease of moisture was due to refrigeration storage, in accordance with the study of Ghosh and Singh (1992), wherein according to them, refrigeration storage affects moisture content by decreasing it.

The fat content of the cheese samples insignificantly increased from initial (6.88%) to 2nd week (7.02%) then significantly decreased at 4th week (6.67%). The sudden reduction in the fat content could result from increase in pH and protein content and the decreasing concentration of moisture in non-fat substances [18].

Protein in CSCS significantly increased from initial week (1.15%) to 2nd week (2.1%). The increase in crude protein contents could be due to low moisture content and high acidity of the CSCS (El Owmi*et al*., 2009). However, from 2nd weekthe protein of CSCS significantly decreased during 4th week from 2.1 to 1.28%, though result for 4th week was insignificantly different from initial week. According also to Muir *et al.* (1999), in processed cheese analogue there are protein degradation during refrigeration storage. Since the CSCS was stored in refrigeration temperature, the decrease of protein was similar with the study of Muir.

The carbohydrate content of CSCS significantly increased from initial (59.2%) to 2nd week (63.45%). The 2nd week however insignificantly increased at 4th week (63.97%). During storage the carbohydrate content of cheese analogue barely changed [10]. It is evident with the results obtained in 2nd and 4th week. Also, the carbohydrate content of CSCS was obtained through difference method. As expected, when the values of the other proximate analysis, ash, protein, fat and moisture content decreases the carbohydrate content of the CSCS will increase.

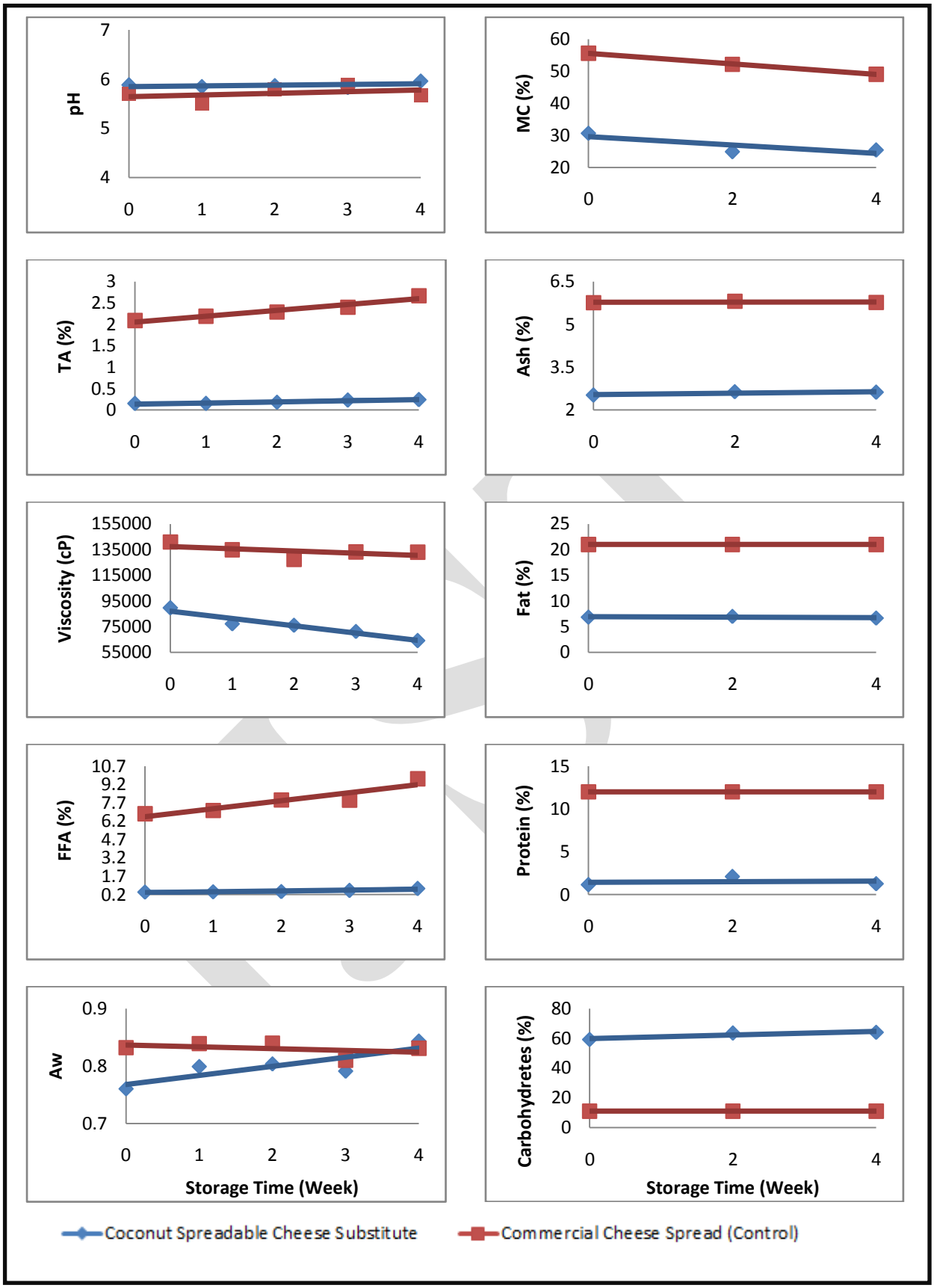

Fig. 2: Physico-chemical composition during four (4) weeks of storage

CONCLUSION

The sensory acceptability and physico-chemical composition of the CSCS were observed for four weeks to ensure the stability of the product. Results indicates that during the four weeks of storage, sensory attributes namely appearance, color, spreadability and flavor of the CSCSchanges insignificantly except for aroma and texture.The changes in physico-chemical composition of CSCS such as pH, titratable acidity, viscosity, water activity and ash changed insignificantly while free fatty acids, moisture content, fat, protein and carbohydrates however changed significantly during the four weeks of storage.It is recommended to determine the functional properties of the CSCS, like its spreadability and meltability as well as its shelf life.

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