STUDY ABOUT DIFFERENCES BETWEEN SHORTENING USED IN WAFER FILLINGS AND BISCUIT DOUGH

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Abstract: *The objective of this study was to highlight the type of fat important to different products: wafer fillings and biscuit dough. Fats are probably the most important ingredients used in those products and they have an important part in human diet. The objective of this study was to correlate the physicochemical characteristics of different shortenings to physical qualities and consumer acceptance of wafer fillings and biscuits.*

Keywords: *shortening, wafer filling, biscuit dough, solid fat content, melting point*

Introduction: Lipids are one of the main macromolecules present in foods and are usually referred to as oils and fats (Ghotra et. Al., 2002). There is very little point in making distinctions between solid fats and liquid oils according to their physical state at 20°C. The term 'fat' tends to be used to cover the whole range (Lindea and Lorient, 1999) Fats and oils are the most concentrated source of energy of the three basic foods (carbohydrates, proteins, and fats), and many contain fatty acids essential for health that are not manufactured by the human body (41623). Shortenings are known to be soft fats that produce a crisp, flaky effect in baked products. Unlike oils, shortenings are plastic and dispense as a film through the batter and prevent the formation of a hard, tough mass (David Bender, 1999). The functions induced by shortenings include: tenderization; mouth feel; structural integrity; lubrication; air incorporation; heat transfer; and shelf life extension. Because of their functional properties (e.g. creaming ability), plastic shortenings, which are often made by partial hydrogenation, are commonly used in the baking industry (Reyes-Hernandez 2007; Zhou et. al., 2011). Physical properties of fats and oils mainly depend on their fatty acid composition (Gunstone, 2008). A high content of saturated fatty acids in the triglyceride (TAG) molecules is associated with high melting point fats, while lipids that contain a high amount of unsaturated fatty acids have lower melting points. In general, most animal fats have high melting points and are solid at room temperature, while most plant oils have low melting points and are liquid at room temperature. However, some semi-solid tropical vegetable fats exist such as palm oil, palm kernel oil and cocoa butter (Gunstone, 2008). It is necessary to outline the physical and chemical nature of fats for there to be an understanding of the handling and uses in different types of product.

Aims: Each application area requires its proper fat. The specifications of the fat depend on: recipe, equipment, procedure, temperature of fat and other ingredients, ambient temperature, storage and distribution temperature of the final product. Some conditions to attend a satisfactory fat design must be the compatibility among the components of the mixture: equivalent thermal properties (solid fat content, melting point and range); similar molecular size, shape and packing (to allow isomorphous replacement or formation of a single lattice unit in mixtures); similar polymorphism (transformation from stable to unstable forms should occur as readily for binary mixtures as with individual components) (da Silva Lannes and Ignacio, 2013).The aim of this study was to highlight the type of fat important to different products such as wafer fillings and biscuit dough. Solid fat content (SFC) is responsible for many important characters of fat like physical appearance, organoleptic properties, and spread ability. SFC also influences the melting properties indicating the behavior of a fat at different temperatures. Plasticity or consistency of an edible oil product depends on the amount of solid present (Eckel et. al., 2009). The variation of SFC with temperature and the sharpness of melting range determine the range within which a fat could be considered plastic. Wafer fillings and biscuit dough are two separate products with different characteristics. In order to find the appropriate kind of shortening for each and other one we have to take in consideration the technological process and the parameters involved in it. Very little information is available that correlates the physicochemical properties of lipids with the physical qualities of baked products and their final consumer acceptance. Consequently, understanding the physicochemical properties of lipid that in turn influence the physical properties of baked products and the relationship to their consumer acceptance is very important to both food scientists and food producers (Zohng, 2013).

Materials and Methods: 3 different samples of wafer filling shortening and 3 samples of biscuit fat were examined. We've determinate solid fat content (SFC) by using IUPAC 2.150 the indirect method. The fat samples were melted at 80-100°C and held there for 15 minutes. The samples were well-mixed consequently to remove the amount of residue. Sample temperature was maintain at 60°C for 5 minutes, after that they were transferred in a 0° environment for 60 minutes. We measured the samples at targeted temperatures after that we had insert the samples in the Bruker minispec SFC Analyzer. Iodine values were determinate using IUPAC 2.205 Wijs method (ISO 3961). The density of all 6 samples was determinate using electronic density meter Melter Toledo DE 40. In the end the samples were used to develop a final product – wafer filling for the 3 samples suitable for fat based confectionery fillings and biscuit using the 3 samples suitable for bakery. In order to determine the effect of different shortening compositions on the quality of final baked product, the dough treatments were baked at 180°C for 25 min in oven. Biscuits were baked using a simple recipe and the amount of water required was determinate by the handling properties (dough feel) of each dough. The effect of the added shortenings on the baking quality of the biscuit dough was compared with the control biscuits.

Results: The physical qualities and consumer acceptance of these products are affected by the following results. It is important to specify that all samples are a non-hydrogenated and refined vegetable fats.

Table 1

Wafer filling shortening	Density 50° (g/cm^3)	Iodine	Biscuit dough shortening	Density 50° (g/cm^3)	Iodine
Sample A	0,89	46	Sample A	0,87	50
Sample B	0,77	54	Sample B	0,89	51
Sample C	1,02	48	Sample C	0,89	55

The SFC results show the type of shortening suitable for each product.

Table 2

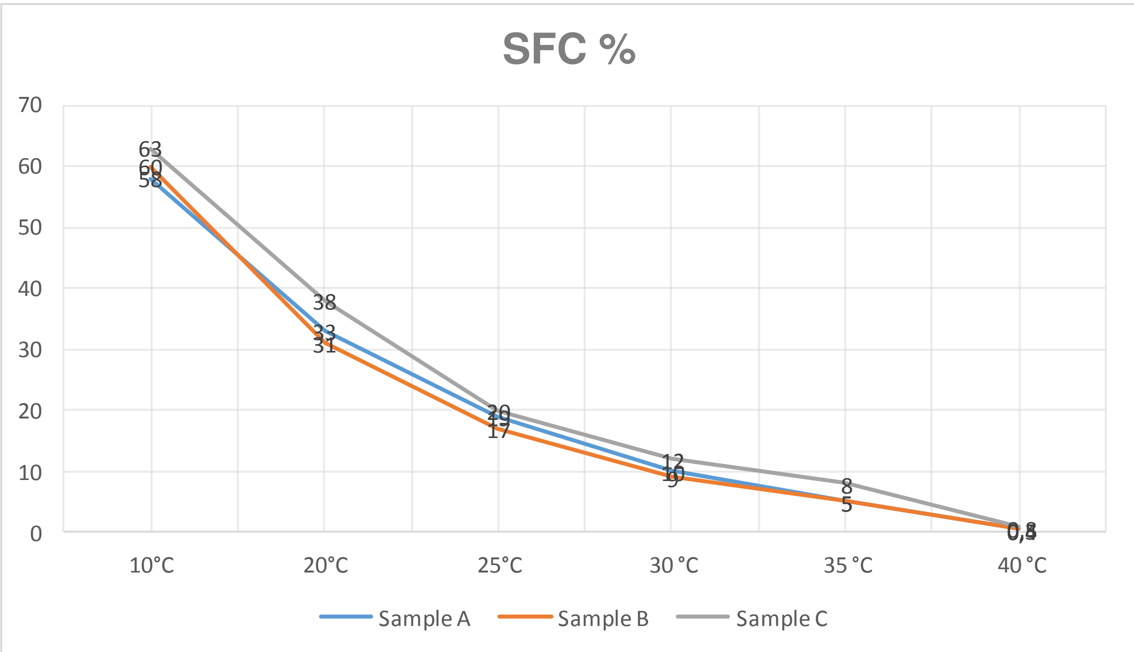
Wafer filling shortening	10°C	20°C	25°C	30°C	35°C	40°C
Sample A	58	33	19	10	5	0,5
Sample B	60	31	17	9	5	0,5
Sample C	63	38	20	12	8	0,8

Table 3

Biscuit dough shortening	20°C	25°C	30°C	35°C
Sample A	78,4	57,9	36,6	11
Sample B	80	62,3	39,2	14
Sample C	81	63,1	43,3	14,8

In *Table 2* and *Table 3* we have the results for shortening used for wafer filling and biscuit dough in this order. The solid fat content (SFC) is a measure of the percentage of solid, crystalline fat in a sample at a selected temperature. Often, the SFC is measured at selected points within a temperature range (da Silva Lannes and Ignacio, 2013). We can understand after their melting profiles why each one is used in this kind of product matching the specific parameters of the technological process. Because of the cocking process of biscuit dough it is important that shortenings used in biscuit industry have wide melting rage than those used in wafer fillings. For wafer fillings are used fats which have a much shorter melting range.

Table 4



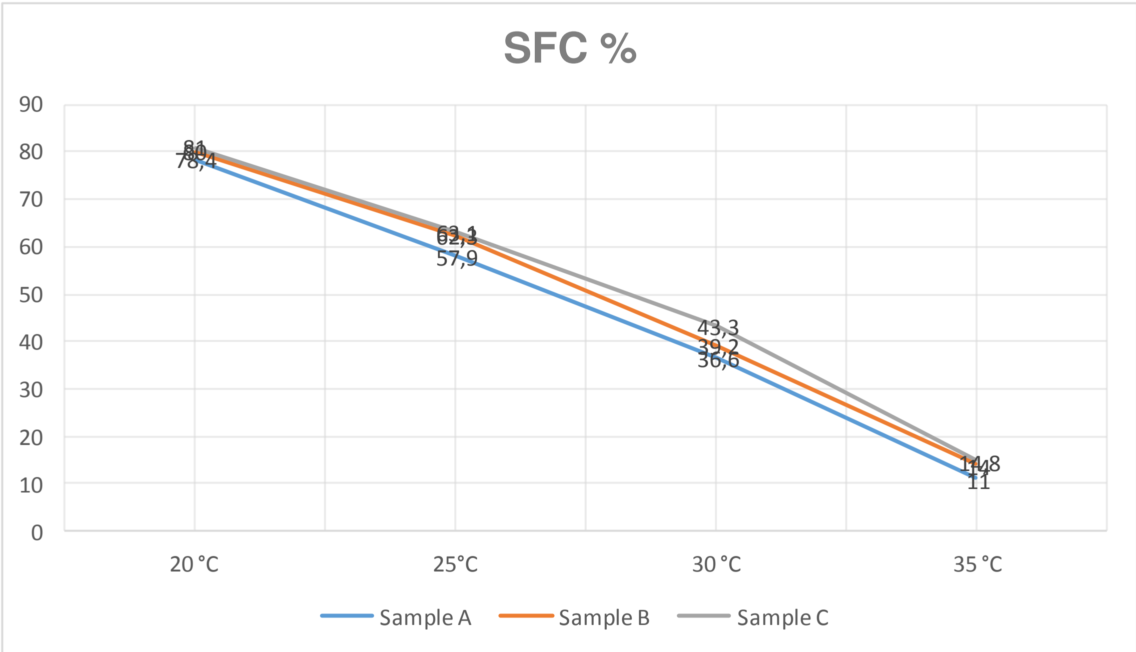


Table 5

For the final product, the wafer application requires slightly soft cream with the ability of holding together multiple wafer layers. There is also a process challenge of this kind of product due to the high amount of sugar that has to be dispersed into the fat mixture. The 3 samples we had study in this research had the ability to set firm up shortly and the crystallisation of the fat takes place immediately after the filling process.

All biscuits dough were baked and evaluated in terms of their surface appearance and internal texture. Internally, they showed a dense structure with very small open areas. This represents a typical biscuit with acceptable appearance and overall texture.

Conclusion: It is necessary to outline the physical and chemical nature of fats for there to be an understanding of the handling and uses in different types of products. Solid fat content (SFC) is responsible for many important characters of fat like physical appearance, organoleptic properties, and spredability (Santana et al., 2013). The results obtained from the present study showed that SFC in shortenings it's an important parameter for food industry. SFC in rangers of 15-25% at usage temperature (23°) is recomanded for shortening to have excellent baking performance. Shortening with lower SFC rated higher for sensory texture scores due to the desired soft texture of product.

Accordingly, it is concluded that the composition of shortening is an important factor, which affects dough behaviour during both processing and baking. Understanding how shortening composition and physical measurements are related to each other and how processing conditions can influence the quality of the final product is essential for formulation of suitable shortening (O'Brien, 2004). An understanding of principles of manufacturing processes is important in developing workable specification and quality control tests of the shortenings.

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