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Strawberry-flavored yogurts and whey beverages: What is the sensory profile of the ideal product?

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ABSTRACT

This study aimed to evaluate the sensory profile and Brazilian consumers' liking of strawberry-flavored yogurts and whey beverages (fermented or nonfermented) with different fat contents that were sweetened with sugar or nonsugar sweeteners. We also determined the influence of sensory attributes on consumer preferences and the profile of the ideal product. Nonfermented whey beverages (NFWB) and “light” yogurt were less liked. The NFWB were less acidic, less viscous, and with lower smoothness of mouthcoating, sweeter and with a more intense artificial strawberry aroma (ASA) than the fermented products. Low-fat yogurts were more liked, more viscous, and had higher smoothness of mouthcoating than nonfat yogurts. Fermented-whey beverages were as liked as yogurts. Viscosity and smoothness of mouthcoating positively influenced consumer liking. The ideal product had higher levels of brightness, artificial strawberry taste, artificial strawberry aroma, and sweet taste; intermediate smoothness of mouthcoating, color, and viscosity; and low particles, acid taste, and aroma.

Key words: whey, sensory, yogurt, fat, whey beverage

INTRODUCTION

Whey beverages are fermented or nonfermented products in which whey is used as an ingredient (Gomes et al., 2013). These products need to have a 51% milk base minimum in the formulation and the use of vegetable fat is allowed (Brasil, 2005). Yogurts are fermented milk products in which the dairy ingredients must be greater than 70%, the addition of vegetable fat

is not allowed, and whey is not a mandatory ingredient; therefore, yogurts may be produced with or without whey (Brasil, 2007).

From a technological point of view, the primary difference between fermented whey beverages and yogurts with added whey is the form in which the whey is added. In fermented whey beverages, liquid or reconstituted whey is always used, whereas in yogurts, whey protein concentrates (**WPC**) are preferred. Using WPC instead of skim milk powder results in a cost reduction in yogurts (Huginin, 2009; Castro et al., 2013). In turn, nonfermented whey beverages (**NFWB**) are products in which milk does not undergo fermentation and commercial sterilization is applied as heat treatment; therefore, these products do not require refrigerated storage and they may be transported and consumed in places where the cold chain cannot be maintained (Pelegrine and Carrasqueira, 2008).

The consumption of whey beverages and yogurts is growing around the world (Legarová and Kourimská, 2010; Castro et al., 2013; Boynton and Novakovic, 2014). In Brazil, 50% of the population consumes whey beverages, mostly for breakfast (News and Trends, 2011), and 74% of the population consumes yogurt (Silvestrini, 2013). These dairy products have been evaluated for their benefits to consumer health (Lollo et al., 2013).

In recent decades, consumers have increased awareness about health and quality of life, which has encouraged people to exercise, adopt healthy eating habits, and reduce their consumption of foods high in sugar, salt, and fat (Pinheiro et al., 2005). Replacing sugar with nonsugar sweeteners in dairy products can change their sensory profile (Esmerino et al., 2013; Paixão et al., 2014), and a reduced fat content can cause defects in products, such as a loss of taste and lack of consistency or texture (Guven et al., 2005; Pimentel et al., 2012).

Studies assessing the sensory profile and consumer acceptance of yogurts and whey beverages have been

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published around the world (Salvador and Fiszman, 2004; Thompson et al., 2007; Lovely and Meullenet, 2009; Cruz et al., 2013; Silva et al., 2013). However, these studies did not evaluate sensory attributes of yogurts and whey beverages with different fat contents and different sweeteners, and differences may exist in sensory attributes among these products that are important for consumer liking. Additionally, because of the similarity in processing steps for the 2 types of products, it would be interesting to understand the sensory attributes that characterize the affective ideal product, which could be used to create an optimized formulation for a greater probability of success with consumers (Ares et al., 2011).

The aim of this study was to establish sensory profiles, Brazilian consumers' liking, and the attributes that most influenced consumer preferences of yogurts and whey beverages (fermented or nonfermented) with different fat contents that were sweetened with sugar or

nonsugar sweeteners. Additionally, the sensory profile of the ideal product was projected.

MATERIALS AND METHODS

We evaluated 8 strawberry-flavored dairy products that were sold in Brazil. They consisted of 4 yogurts: 2 nonfat (**YOG1** and **YOG3**) and 2 low fat (**YOG2** and **YOG4**); 2 low-fat fermented whey beverages (**WB3** and **WB4**), and 2 nonfermented whey beverages, 1 full fat (**WB1**) and 1 low fat (**WB2**). The **YOG3** yogurt was sweetened with artificial sweeteners (sodium cyclamate, 51.5 mg/100 g, and aspartame, 29.2 mg/100 g), and the other products were sweetened with sucrose.

Strawberry flavor was chosen because it represents the largest number of products available in the Brazilian market and the greatest consumer preference (Allgeyer et al., 2010; Ribeiro et al., 2010; Cassell, 2014). The evaluated products are described in Table 1, and their

Table 1. A description of the samples according to the manufacturer

| Product | Type | Fat content | Ingredients |
|---------|-------------------------|-------------|--|
| YOG1 | Yogurt | Nonfat | Nonfat milk, sugar, fruit preparation (sugar, strawberry pulp, modified starch, strawberry flavoring identical to natural, carmine coloring, citric acid or lactic acid and potassium sorbate preservative), skim milk powder, lactic culture, and gelatin stabilizer |
| YOG2 | Yogurt | Low fat | Full-fat milk or full-fat reconstituted milk, strawberry preparation (water, sugar, strawberry pulp, modified starch, natural carmine coloring, strawberry aroma identical to natural and preservative potassium sorbate), milk protein concentrate and whey milk protein concentrate, lactic culture, and citrus pectin and guar gum thickeners |
| YOG3 | Yogurt | Nonfat | Full-fat milk or full-fat reconstituted milk, strawberry preparation [water, strawberry pulp, vitamins, artificial sweeteners sodium cyclamate (51.5 mg/100 g) and aspartame (29.2 mg/100 g), natural carmine coloring, strawberry aroma identical to natural, guar gum thickener and potassium sorbate preservative], pectin stabilizer and starter cultures |
| YOG4 | Yogurt | Low fat | Standardized milk or reconstituted milk, whey, sugar, strawberry preparation (inverted sugar, strawberry pulp, water, modified starch stabilizer, strawberry flavor identical to natural, artificial coloring Bordeaux-5, potassium sorbate preservative and citrus pectin stabilizer), gelatin powder stabilizer, natural carmine coloring, Red Ponceau (4R) artificial coloring and dairy cultures |
| WB1 | Whey beverage | Full fat | Full-fat milk or full-fat reconstituted milk, whey, sugar, cream, full-fat milk powder, refined salt, carboxymethyl cellulose and carrageenan thickeners, disodium phosphate and sodium citrate stabilizers, strawberry aroma identical to natural and natural carmine coloring |
| WB2 | Whey beverage | Low fat | Full-fat milk or full-fat reconstituted milk, whey, sugar, water, maltodextrin, strawberry-flavored food compound, vitamins (A, B ₁ , B ₂ , B ₆ , C, E, and niacin), salt, flavoring, natural carmine coloring, sodium citrate stabilizer and potassium hydroxide and sodium hydroxide acid regulators |
| WB3 | Fermented whey beverage | Low fat | Low-fat milk or partially reconstituted nonfat milk, sugar syrup, modified starch, strawberry preparation (sugar, water, strawberry pulp, citric acid, flavoring, potassium sorbate preservative and Red Ponceau and brilliant blue artificial coloring), reconstituted whey, lactic culture and citric acid |
| WB4 | Fermented whey beverage | Low fat | Full-fat reconstituted milk, fruit preparation (water, sugar syrup, modified starch, sugar, strawberry pulp, tricalcium phosphate, powdered whey, citric acid, flavoring, xanthan gum thickener, natural carmine coloring and sorbate potassium preservative) and lactic culture |

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