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Development and nutritional composition and sensory comparison between acceptance and bread traditional high soy protein and soluble prebiotic fiber

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Abstract

There are an increasing search for foods wich by bringing health benefits through the incorporation of functional ingredients. The objective was to develop formulations of bread, one based on wheat flour and another plus soy protein isolate (SPI) and polydextrose (PD) with how to prepare based on the literature and analysis of the nutritional composition and sensory acceptance. The physical and chemical analysis were moisture, ash, protein, fat, dietary fiber. The total carbohydrate were calculated by difference. Thirty-two people attended the acceptance test, using a hedonic scale and attitude of consumption. Data were evaluated by testing Student t at 5% probability. The result of physical-chemical, according to the Ordinances in Brazil n° 27 and 31 (1998), bread enriched when compared to traditional might be considered a good source of dietary fiber (6.40 g/100g) and rich in protein (15.07 g/100 g) providing 30% RDI and adding nutritional value and functional product. In the affective test, no significant difference ($p < 0.05$) between traditional and bread plus PD for IPS and sensory parameters evaluated. However, enriched bread hedonic values obtained slightly higher for appearance, texture and overall quality, including the attitude of consumption in case of breads are available for purchase.

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Keywords: bread traditional; bread enriched; nutritional composition; sensory analysis

1. Introduction

There are an increasing search for foods wich by bringing health benefits through the incorporation of functional ingredients. Consumers have shown more concern with the decrease lipids and carbohydrates

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as well as having a balanced meal source of protein and complex carbohydrates [1]. The Brazilian people has been used foods with fiber and protein being third place in the shopping list [2]. The composition of bread from wheat flour is usual. However, replacement of all or part of this ingredients which add greater nutritional value such as organic soy flour, cassava, banana, rice, potato and corn starch. In the United States since 1972, the fortification of bread with soy flour has been made by considering the deficit in the balance of aminoacids such as lysine in the diet [3]. The soy products, which contain bioactive compounds such as isoflavones, have been reported by adding of the health, such as benefits along with antiestrogenic activity, hypocholesterolemic and anticarcinogenic [3-5]. Isoflavones are associated with the reduction and prevention of menopausal symptoms, osteoporosis, cholesterol and cardiovascular disease [7]. In several countries like Japan, China, USA and Brazil, polydextrose prebiotic fiber is used as polysaccharide. It is synthesized by random polymerization of glucose. Also, part of the chemical reaction are used sorbitol and the catalyst. It is partially fermented in the large intestine undigested or absorbed through the small intestine. The fermentation process leads to the growth of bifidobacteria by reducing putrefactive microflora, as well as increased short chain fatty, with the elimination of carcinogenic metabolites [8]. The soluble dietary fiber in food improves flavor and texture [9,10]. It has low calorie for providing 1 kcal/g compared to 4 kcal /g of sucrose [11]. According to Decree 27/1998 MS [12], all ready to eat solid food, to be considered high in fiber must contain at least 6 g/100g. Worldwide, the consumption of bread is related to cultural factors, practicality and convenience commercial. However, the formulation with new ingredients must be assessed sensory though specific sensory attributes which drive the global acceptance and consumption. The application of emotional test is important to optimize new product formulations and evaluate innovative positioning and market potential [13]. The objective was to develop formulations basic traditional bread wheat flour and incorporated with isolated soy protein and polydextrose, comparatively by evaluating the nutritional composition, sensory acceptance and consumer attitude.

2. Materials & Methods

Two formulations of breads from traditional ingredients (wheat flour), according to the mode of preparation of literature [14] were developed. A recipe incorporated isolated soy protein (ISP) and polydextrose (PD), studying the best ratio of ingredients to get a product that could be considered a source of dietary fiber [12] and rich in protein [15]. The proportions of ingredients used in the preparation were for traditional basic recipe: flour (500 g), organic sugar (30 g), Himalayan pink salt (12 g) vegetable oil from soybeans (20 g), yeast powder (7 g) and filtered water (or qs 600 mL). In enriched bread, besides the basic ingredients are added: IPS (100 g) and PD (30 g). The roasting of the mass was done in combination oven (Practical), with temperature programming (150°C) and time (30 min). They were placed in forms of aluminum (roasting), and then kept at room temperature. Finally, the bread was packed in polyethylene bags with hermetic closure until the moment of analysis, which occurred at time 12-24 h after roasting. To evaluate the nutritional composition, the breads produced were separated by portions, crushed and transferred to glass bottles with standard ground cover labeled and dated. The physical and chemical tests were performed in triplicate for moisture, ash, protein, fat, dietary fiber [16], total carbohydrate calculated by difference and energy value [17]. For sensory analysis, panel of judges were staff of the Institute Adolfo Lutz, Brazil. It was used on individual questionnaire (32 individuals) about consumption habits, frequency and opinion about intake of products enriched. The methodology of hedonic scale (7 points) [16] to evaluate the appearance, odor, texture, flavor and overall quality and attitude scale (5 points) in the case of breads are available for consumption [18]. The panelist had heterogeneity schooling, then the terminology of sensory evaluation, such as appearance (shape, texture, color, brightness), texture (degree of softness, hardness, roughness, presence of particles), smell (aroma), flavor (taste and characteristic), among others was explained. The test was conducted in the laboratory quiet and comfortable, with booths illuminated with white light (appearance) and red (other attributes).

The product studied were portioned into slices bread similar to a commercial bread (100 mm) to ensure standard conditions of test. The samples were coded with three digit random whit distinct numbers for appearance and other attributes, such as completed block design. Natural water was offered to judges to use between the samples. The statistical analysis of the physico-chemical data and sensory focused on the two treatments, the traditional product and the other with addition of IPS and PD by Student test test at 5% probability [19]. The results of the profile variables percentage of consumers are provided the graphics histogram, as well as, those opinions of the ingestion the enriched product.

3. Results & Discussion

Table 1 shows the comparative results of the nutritional composition of traditional bread whit wheat flour and the bread added of isolated soy protein (ISP) and polydextrose (PD). The results indicated that the bread whit IPS and PD is a good protein source (15.07 g/100g), providing 30% of the RDI (Recommended Daily Intake) for the diet and source dietary fiber (6.40 g/100g), according to Brazilian legislation (Ordinance number 31 and 27), respectively [15, 12].

Table 1. Mean values of nutrient composition (standard deviation) and traditional bread enriched with isolate soy protein (IPS) and polydextrose (PD)

Parameters	Bread made		<i>p</i>
	Traditional	Enriched	
Moisture, g/100g	26.37 ^b (0,07)	37.53 ^a (0,17)	0.0001
Ash, g/100g	1.57 ^a (0,02)	1.23 ^b (0,01)	0.0001
Total Fat, g/100g	2.96 ^a (0,15)	2.33 ^b (0,16)	0.0001
Total Protein, g/100g	9.35 ^b (0,08)	15.07 ^a (0,13)	0.0001
Dietary Fiber, g/100g	2.70 ^b (0,07)	6.40 ^a (0,07)	0.0002
Total Carbohydrates, g/100g	57.05 ^a (0,07)	37.45 ^b (0,07)	0.0001
Energy, Kcal/100g	292	231	-

^{a, b} Means in triplicate followed by same letter in line do not differ significantly ($p > 0.05$)

The percentage results obtained by questionnaire about individual consumers were: female (81.2%) and male (18.8%), ages ranging from 20-30 years (28.1%), 31-40 years (15.6%), 41-50 years (21.9%) and 51-60 years (34.4%). For the degree of education the results were: elementary schools (3.1%), high school (25.0%), high education (40.6%) and post-graduate (31.3%). So the answers to the enriched product were: affirmative (75.0%) and negative (25.0%), whose frequency cited for consumption of the product was, as suggested, for much or daily (25.0%), moderate or weekly (40.6%), regular or monthly (9.4%) and little or annually (25.0 %) respectively. These results can be observed respectively in Figures 1, 2, 3, 4 and 5. It was possible to observe a greater tendency of panelists as being female, mostly aged between 20-30 years and 51-60 years and the prevailing level of higher education, with some individuals post-graduate.

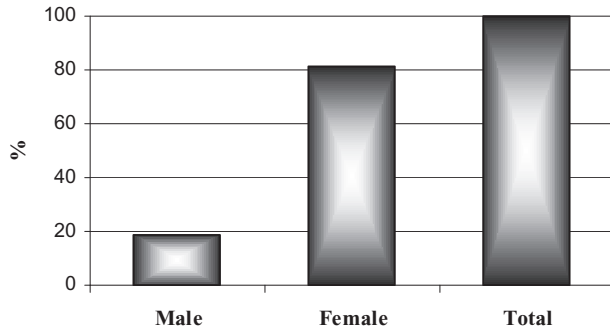


Fig. 1. Percentages (%) of the sensory team for sex

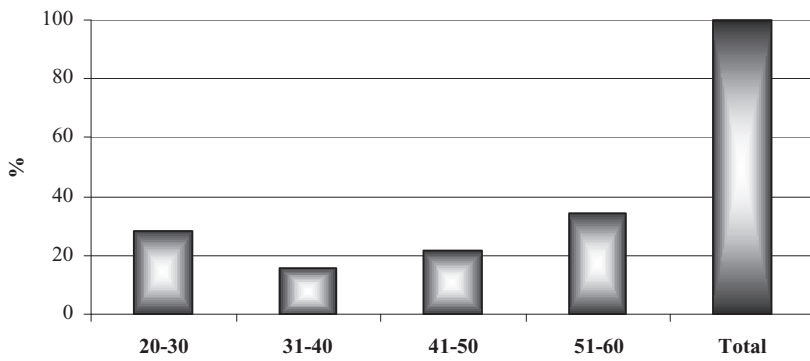


Fig. 2. Percentages (%) of the sensory team per age group (years)

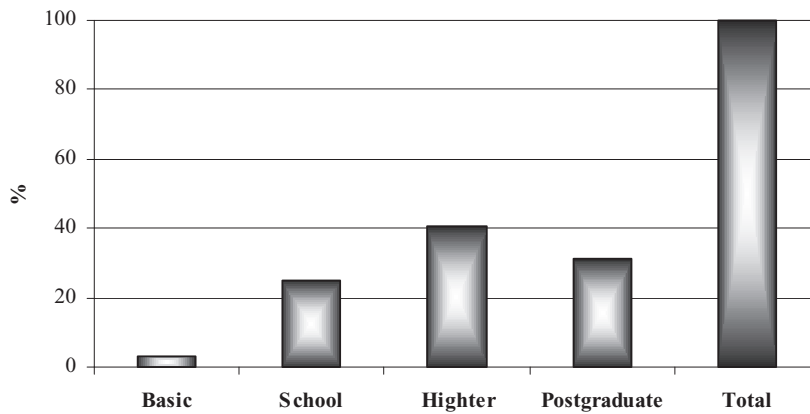


Fig. 3. Percentages (%) of the sensory team for education

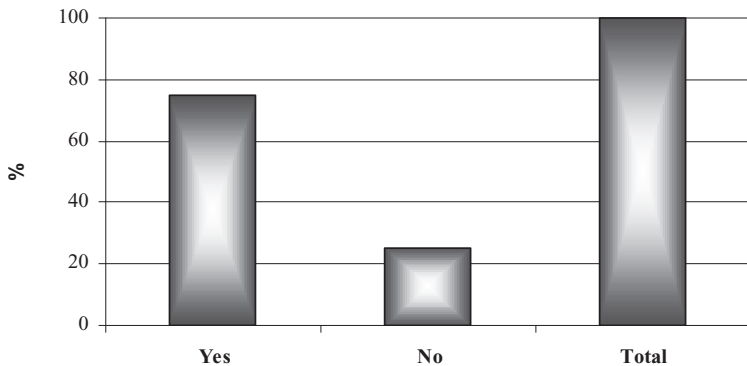


Fig. 4. Percentages (%) of the sensory team for potential consumption of the fortified breads

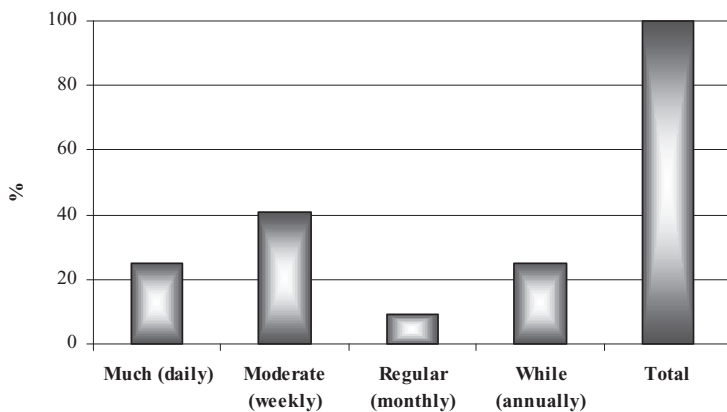


Fig. 5. Percentage (%) of frequency of consumption of fortified breads

Table 2 shows the test results for acceptance and attitude of consumption compared to traditional bread with wheat flour and enriched with IPS and PD. Considering the average values obtained by hedonic scale, no significant difference ($p < 0.05$) comparing the sensory attributes of this work, the same by occurring in relation to consumer attitude. Enriched bread were attributed to slightly above average for appearance, texture and overall quality, which were located between liked slightly (5) and moderately (6) on seven-point scale. Also for enriched bread, the average (3.38) attributed to the attitude of consumption was slightly higher in five-point scale, compared to traditional bread. In a literature, study with biscuits made from different levels of wheat flour by mixing isolated soy protein ingredients and gluten (30%) did not significantly affect the moisture, water activity and texture [20]. Another study of bread made with wheat flour, isolated soy protein and lower carbohydrate content showed an acceptable final volume [21].

Table 2. Mean values of acceptability and consumer attitude of traditional bread and enriched with soy protein isolate (SPI) and polydextrose (PD)

Hedonic scale *	Bread made		<i>p</i>
	Traditional	Enriched	
Appearance	5.38 ^a (0.20)	5.56 ^a (0.24)	0.27
Aroma	5.18 ^a (0.23)	5.00 ^a (0.28)	0.30
Texture	5.16 ^a (0.22)	5.41 ^a (0.23)	0.22
Flavor	5.44 ^a (0.21)	5.34 ^a (0.26)	0.39
Overall quality	5.8 ^a (0.26)	5.31 ^a (0.26)	0.47
Intention of consumption**	3.31 ^a (0.20)	3.38 ^a (0.20)	0.41

N = 32 trials

^{a, b} Means followed by same letter in line do not differ significantly ($p > 0.05$)

() Standard error of mean

* Hedonic scale (7 = liked very much, 4 = neither liked nor disliked and, 1 = dislike very much)

** Scale of attitudes of consumption (5 = consume whenever he had the chance, 3 = would consume if it was accessible, but I do not strive for it; 1 = consume only if forced)

4. Conclusion

The addition of isolated soy protein and polydextrose to the traditional bread, increased levels of protein and dietary fiber, with commensurate reduction of fat content, resulting in lower caloric value. The incorporation of these ingredients into the bread, there was no significant difference in sensory acceptance. There was improvement in the attributes of appearance, texture and overall quality, with good intention of consumption. The development of new formulations source of protein and dietary fiber adds important nutritional values and so functional beneficial biological effects on human health.

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