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Gluten free bread from rice flour and maize and cassava starches phosphated by infrared.

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Abstract

Bread is ussually elaborated with wheat flour, which form a dough with a viscoelastic consistence due the gluten network development. But, not all consumer can eat this kind of bread because some people present potential intolerance to gluten, an autoimune chronic enteropathy called celiac disease. This work aimed the evaluation of the performance of phosphated maize (PMS) and cassava (PCS) starches, by infrared radiation, on gluten free breads. the results indicate that was possible to produce an end product with the use of 3.19% PMS and 4.29% PCS.

Key words:

Breadmaking, phosphated starches, celiac.

Introduction

The gluten is a protein network developed by the proteins present in wheat, oat, barley and rye. However, people diagnosed as celiac needs the exclusion of gluten in the diet. The development of bakery products without gluten is a challenge, mainly for the elaboration of breads with sensory, nutritional and technological quality.

The main cereal used for the manufacture of gluten free products is rice. However, the use of hydrocolloids, such as starch, can promote the quality of the end product. But the starch has some limitation for use in food products and the physical, chemical, enzymatic or genetic modification can overcome the performance of this polysaccharides[1]. The chemical phosphatizing, with the use of non-conventional treatment method reduce the reaction time, decreasing energy requirement and reduce waste generation[2].

The aim of this work was to produce gluten free breads with rice and chemical modified starches through a central composite design with two independent variables, where: x_1 (PMS – phosphated maize starch – 0 – 10%) and x_2 (PCS – phosphated cassava starch – 0 – 10%). The chemical modification was performed by infrared radiation and the dependent variables were the batter density and the specific volume, loaves moisture and instrumental texture and color of the breads.

Results and Discussion

The degree of phosphatation was similar between the PMS (0.027±0.002) and PCS (0.030±0.003). According the Figure 1, the batter density decreased with the used of higher levels of PCS and lower levels of PMS. The better performance of the cassava starch was probably due the higher cohesiveness, promoting the air entrapment during the batter mixing.

The major air inclusion promotes also the higher cell gas nucleation, favoring the retention of the CO_2 released by the yeast fermentation, resulting in a higher specific volume. Therefore, higher levels of moisture content in the loaves resulted in lower values of firmness.

The optimal point was defined in order to obtain the minimum values of batter density and firmness of the loaves and the maximum values for specific volume and moisture content. With a desirability of 79.45%, the best condition was by the use of 3.19% PMS and 4.29% PCS.

In the Table 1 are presented the values obtained for the control sample (only with rice flour) and the optimal point (Figure 2). All the mathematical models were validated.

Figure 1. Contour plots for the dependent variables with statistical significance ($P \leq 0.10$).

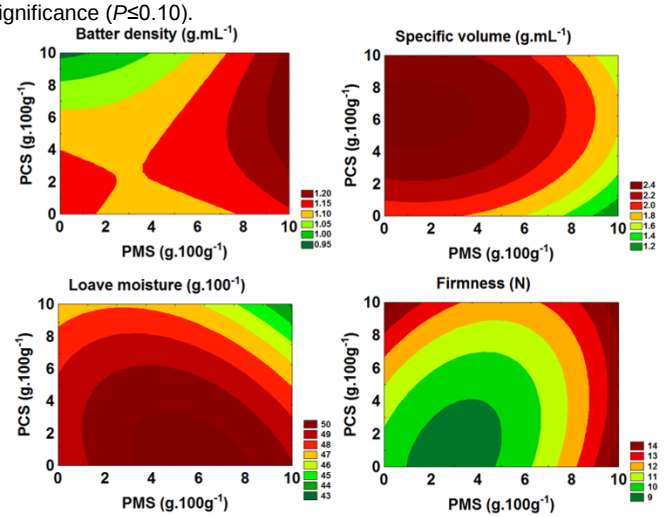
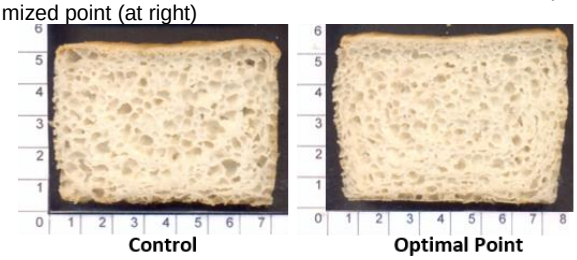


Table 1. Analysis of the control sample and the optimal point

Dependent variable	Control	Optimized point
Batter density (g/mL)	1.10 ± 0.02[a]	1.09 ± 0.01[a]
Specific volume (mL/g)	2.15 ± 0.12[a]	2.23 ± 0.05[a]
Loaves moisture (g.100g^{-1})	51.51 ± 0.42[a]	49.08 ± 0.92[a]
Firmness (N)	9.44 ± 0.20[a]	8.57 ± 0.16[b]

Figure 2. Slices of the loaves obtained from the control (at left) and optimized point (at right)



Conclusions

The use of modified starch allowed the production of gluten free breads with lower firmness. The best condition was with the use of 3.19% PMS and 4.29% PCS.

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