GLUCOSE OXIDASE AND AMYLOGLUCOSIDADE IMPROVE THE TECHNOLOGICAL QUALITY OF FRENCH BREAD PRODUCED FROM FROZEN DOUGH ELABORATED WITH WHOLE WHEAT FLOUR

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Whole grains have recognized nutritional and functional characteristics, but they can interfere in both the process and final product quality when incorporated into foods, driving the need for adequate formulation. Breads produced from frozen dough have the advantage of being baked in the scheduled time, thus providing fresh product to consumers and eliminating night work. However, yeast and gluten may be altered during the steps of freezing, frozen storage, and thawing, resulting in changes in the process and final product. Enzymes can be used to minimize technological problems of bakery products. This study aimed to evaluate the effect of the enzymes glucose oxidase and amyloglucosidase on the technological characteristics of French bread produced from frozen dough elaborated with whole wheat flour. Dough was produced with a mixture of refined wheat flour (40%) and whole wheat flour (60%). Four formulations were prepared, varying only the enzymes content, as follows: control (without the enzymes glucose oxidase and amyloglucosidade), GOX (0.300% flour basis glucose oxidase), AMG (0.0170% flour basis amiloglicosidade) and GOX / AMG (0.300% and 0.0170% flour basis glucose oxidase and amyloglicosidade, respectively). Dough was produced by the modified straight dough process, but the freezing, frozen storage for 60 days, and thawing steps were inserted between the modeling and proofing. A reduction of 24-31% of the proofing time was observed when the enzymes were used separately or together. Glucose oxidase potentiated the oven spring, shape regularity, and specific volume of the breads, besides reducing firmness and increasing crumb springiness. The amyloglucosidase improved oven spring and specific volume of the breads, reduced firmness, and increased crumb springiness. When applied together, the enzymes led to greater increase in specific volume than when applied alone ($p < 0.05$). Therefore, the enzymes glucose oxidase and amyloglucosidase significantly improved the technological characteristics of the dough and bread produced from frozen dough prepared with whole wheat flour, minimizing the main problems of the breads made with this technology.

INFLUENCE OF WHOLE WHEAT FLOUR AND FAT REPLACER LEVELS ON THE SPECIFIC VOLUME OF THE LOAVES

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Bakery products are largely consumed on a daily bases. They are a convenient way to deliver dietary fiber and other healthy compounds to reduce the risk of chronic diseases. Whole wheat breads, however, lack an acceptable volume. Starch derivatives can be used as fat replacers mimicking their physical characteristics, but with reduction of calories. The

aim of this work was to study the impact of different levels of fat replacer (FR) on the specific volume of bread loaves made with whole wheat flour (WWF) on an industrial scale. A Central Composite Rotatable Design (CCRD) of the Response Surface Methodology, with two factors or independent variables, whole wheat flour in substitution to refined flour (%WWF: 24.64, 35, 60, 85 and 95.35) and an enzymatically modified starch used as a commercial fat replacer, Selectamyx C150 (%FR: 0.18, 0.6, 1.6, 2.6, 3.0) were used, totalizing 14 samples, of which six are repetitions in the central point. Bread specific volume was the response or dependent variable evaluated. The fourteen blends were baked and the bread specific volume was evaluated using a modification of the AACC Method 10-10B (AACC, 2000). Analysis of variance and Tukey's test ($p \leq 0.05$) were used to determine data significance. The results of the specific volumes ranged from 1.79 to 2.49 cm3/g. Bread samples 1 (35WWF, 0.60FR), 2 (35WWF, 2.60FR) and 5 (24.64WWF, 1.60FR), prepared with lower levels of whole wheat flour, had similar specific volume values (2.49; 2.37; 2.46 cm3/g, respectively), higher than the other samples ($p \leq 0,05$), regardless of the content of fat replacer used. Comparing bread samples 1 and 2 (35WWF) and 3 and 4 (85WFF), showed no influence of the fat replacer on the specific volume ($p \leq 0,05$.) Samples 7, 8 and 9 with a higher whole wheat flour content (60%) and fat replacer levels of: 0.18, 3.00 and 1.60% respectively, had similar specific volume values among themselves. Sample 6 with the highest percentage of wheat flour (95.35WWF and 0.60FR) had a similar specific volume as bread samples 3 (85WWF, 0.60FR), 4 (85WWF, 2.60FR), 7 (60WWF, 0.18FR) and 9 (60WWF, 1.60FR) and lower specific volume than sample 8 (60WWF, 3FR) ($p \leq 0,05$). The fiber in the whole wheat flour, appeared to have a dilution effect on the gluten network, interrupting the gluten-starch matrix, decreasing gas retention and bread volume. However, the breads made with higher levels of whole wheat flour, showed an increase in specific volume with increasing fat replacer content, probably because this modified starch added some stability to the system interface mass giving additional strength to the gas cells during baking. Work funded by FAPESC. Keywords: specific volume, whole wheat bread, fat replacer.

A "FUTURE TRADITION" TOWARDS A MODERN AND SUSTAINABLE HEALTHY DIET

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The idea that modern humans have diverged too far from the lifestyle of our prehistoric ancestors, including food habits, and with consequent reduced resistance to diseases, is an interesting proposition suggested by Eaton and Konnor in 1985.

Many traditional fermented foods are based on lactic acid fermentation in association with yeasts or molds. Moreover whole grains are concentrated sources of nutrients and phytochemicals, with well-known beneficial effects for human health. Whole cereal