RESEARCH ON OBTAINING HYPOCALORIC AND HYPOGLUCIDIC FOOD (*for overweight people*)

— short presentation PHD thesis —

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Abstract: Globesity became a public health problem worldwide with overwhelming economic implications for human society. Dietary fiber which have good water-binding capacity, low energy content or no energy are added to bread formulations to obtain low energy breads with a higher fiber content than normal breads. The effects of some ingredients on dough characteristics and sensory and nutritional properties ob breads were investigated. Cellulose gums had promising results.

Keywords: bread, cellulose gums, gums, fibers, sensorial acceptability, energy content

INTRODUCTION

Globesity became a public health problem worldwide with overwhelming economic implications for human society. The success of the efforts to control, stop and prevent this scourge, is based on the efforts of specialists from different fields and sectors of activity: medicine, nutrition, agriculture, horticulture, food, education, sports, psychology, marketing, law, politics, economics and others.

It is clear that the food industry, which provides food staples to ensure the population needment, is responsible for public health - in terms of food

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supply to the market (and no consumer choices) in accordance with ancient beliefs (practicing the art of medicine consists in choosing foods).
Bread is one of the most consumed food and have a high energy content. Bread is consumed largely in association with other products and represents a very important source of energy in the daily diet. For people with body weight problem bread with low energy content could solve some problems related to products consumed.
Usually bread is the first product removed from diets because it has high energy content, despite bread together with other cereal derivatives must represent the highest proportion in our diet. To sustain a healthy diet, in this PhD work we develop breads with low energy content and high fibers content.
After some preliminary tests, dietary fibers which have good water-binding capacity, low energy content or no energy were selected to be studied. We made that choice, because, compared with traditional products – control, they show a reduction in energy content in products by synergistic effect resulting from the two directions followed:

- diluting the energy content by linking in to the product a high quantity of water;
- reducing energy density by adding fillers (ingredients without energy or energy value less than 4 kcal / g).

The following assumptions were evaluated:

- use of wheat bran to obtain functional hypocaloric breads;
- evaluating the potential of gums –alginate, guar gum, carboxymethyl cellulose (CMC)– to obtain functional low-energy bakery products;
- the study of perspective to add cellulose derivatives to obtain functional bakery products with low energy density;
- estimating the possibility to obtain functional hypocaloric bakers using wheat fiber;
- comparative analysis of use of different types of dietary fiber from different plant sources –wheat, oats, peas, potato, apple, CMC and hydroxypropyl methylcellulose (HPMC)– to obtain functional hypocaloric bakers;
- the influence of cellulose hydrocolloids (CMC and HPMC) on enzyme activity.

All lines of investigation were aimed at obtaining bakery products with a high degree of acceptability among consumers as to have as high fiber content and energy density as low.

CONCLUSIONS

The studies aims were the obtaining of low energy bakery products. To reduce the energy value of bakers two paths were followed, a dilution of products content with water such as energy density products to be lower and the other way is to replace a portion of wheat flour, which has a high-energy with other components, with much lower energy.

Researches are not limited to obtaining products with low energy. They look to find ingredients that in addition to reducing energy content of bakery products will enable and achieve a higher acceptability from consumers, products that do not differentiate very much from those who are currently on the market, and not impose a major change of eating habits.

The addition of bran has a limited capacity to reduce the energy value of bakery since:

- bran (as fillers) are not devoid of energy - were 261 kcal / 100 g which represents two thirds of the energy content of flour (361 kcal / 100 g);
- water binding capacity of bran is not very high;
- addition of bran would affect dough rheology, with negative consequences on the characteristics of the finished product, which decreases theirs acceptability.

The best results were obtained with the addition of untreated bran, added at a rate of 10%. Products were obtained almost as well as control (except porosity) in almost all criteria considered.

Although not achieved a significant reduction of the energy, valuable items were obtained from the point of view of the fiber content - fiber content was increased by 50%, from 2.07 g/100g product to 4.26 g fibre/100 g product at 10% bran added.

This increased fiber content in bakery products offer a healthy food with functional properties.

For the overweight people these products have multiple benefits:

- delay the emergence of sensation of hunger;
- creating the sensation of satiety;
- decreased plasma cholesterol (soluble fiber);
- increases glucose tolerance by decreasing the rate of intestinal absorption of glucose.

The addition of food gums in bakery products can be a way to reduce their energy content. These additions affect the technological characteristics of dough and product characteristics differently, depending on the nature of gums introduced. Sodium alginate, xanthan gum, carboxymethylcellulose and guar gum added increased the amount of water bound in the dough, alginate and carboxymethylcellulose being particularly remarkable. Are affected all rheological characteristics of dough. We notice an increase in dough development time, due to competition for water between hydrocolloids added and gluten from flour. The addition of alginate and xanthan gum caused a significant increase in dough stability. Carboxymethylcellulose and guar gum had lower results. Increased stability of doughs with added gum is confirmed by the degree of softening of the dough and mixing the tolerance which are lower than control. The specific volume, crumb elasticity and porosity of samples are below control. The sensory characteristics of products are slightly improved at 3% gum added and at higher proportions they are depreciate. Worst results, in terms of sensorial characteristics, have been achieved by alginate addition. These products have significant reductions of the energy content by the large amount of water in the products but can not be used for this purpose because the products will have weak physicochemical and sensory characteristics. For these reasons gums addition more than 5% on flour basis are not recommended.

Good results had the addition of carboxymethylcellulose at 5% addition which reduced the energy content with 15% and at 10% addition at 45%. The addition of carboxymethylcellulose allows a remarkable reduction of the energy and obtaining products with good quality.

Following studies confirm high potential of cellulose derivatives (carboxymethylcellulose and hydroxypropyl methylcellulose) to obtain low energy products. The amount of water bounded in dough is directly proportional with the amount of gum added but depends on the ability of cellulose derivatives to increase the viscosity. Cellulose derivatives have different results depending on their nature. The hydroxypropyl methylcellulose addition leads to superior products in terms of both sensory and in terms of energetic value.

Sensory characteristics of bread with the addition of more than 5% cellulose derivatives were lower than control bread and from many views have been appreciated as unacceptable. Most affected are the sensory characteristics: crumb elasticity, porosity, humidity and masticability. If it is not adjust the amount of salt in the recipe, depending on the amount of water and added ingredients, the products taste is affected considerably. A strong correlation between moisture content of bread and sensory characteristics of the loaves could not be established.

The addition of cellulose derivatives inhibit amylase activity but have a protective effect at heating, so that the loaves will have a more intense color. Hydroxypropyl methylcelluloses have a stronger protective effect than carboxymethylcelluloses.
Cellulose derivatives with less capacity to increase viscosity, leads to better products in terms of quality but a smaller effect of reducing the energy. The energy value of the bread with the addition of 5% cellulose derivatives varies between 15% and 30% depending on the nature of derivatives use. A reduction greater than 40% of the energy was observed at 10% cellulose derivatives added but sensory characteristics of these products are much lower. Decreased energy value of products with added cellulose derivatives is mainly due to additional quantity of water bound in the dough. Fiber content of bread is increased at cellulose derivatives uses. The addition of 5% gum cellulose doubled fiber content. Their efficiency is lower due to the dilution of functional principles with water.
For the production value increased functional cellulose derivatives may be used but their use is limited to a ratio of 5% of flour weight, higher proportions lead to unacceptable products.
Dietary fiber from different sources can be used to lower energy value of bread. It is needed much higher proportions of fibers because they have a lower capacity to bind water. Decreased energy value of bread is due the replacement of flour with materials with less energy. Fibers affect the rheological characteristics of dough too. The fiber addition lead to the dough energy decreased elasticity and increased the extensographic maximum resistance. Technological effects of the addition of fiber are proportional to the amount that is added. Levels of fibers higher than 15% on flour basis lead to inferior products which are not acceptable. Fibers from wheat, potatoes and oats have led to the production of the lower physicochemical and sensory characteristics but the largest reductions in energy value. The most affected sensorial characteristics by the addition of fiber are the same as for bread with added cellulose derivatives and supplementary the color of the crumb and crust.
The fibers are less effective in reducing energy value compared with cellulose derivatives. For a 15% reduction of the energy is needed 10% fiber addition. Adding fiber at a rate of 15% of flour led to achieve a reduction of the energy by more than 20%. The addition of fiber from potato, wheat or oats decreased energy value by over 25% compared with control.

PERSPECTIVES

Gum or fiber addition has a beneficial impact on energy content of loaves but the sensorial characteristics worst than that of control. A better result could be achieved if cellulose gums are combined with fibers. Fibers affect negatively the gas retention of dough while the cellulose gums could help to maintain the gas in dough by sealing the gas cell. These hypotheses are needed to be verified.

Cellulose gums are recommended to obtain low calories bread while fibers are recommended to obtain breads with high content of fibers. Breads with higher fiber content and lower Breads with higher fiber content and lower energy content could be obtained by combining them.

The quality of loaves with fiber and/or cellulose gums must be improved. The effect of some additives on loaves quality should be investigated. The quality of dough and loaves with fibers and gums could be improved if gluten is added and so the public acceptance is improved. Xylanases and cellulases could have beneficial impacts on quality of doughs and loaves prepared with bran as fiber source.