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Enzymatic extraction of protein from toasted and not toasted soybean meal

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Abstract

The soybean is one import font of vegetable protein, that contains whole the essential amino acids to the human organism. The enzymatic process is a alternative for the protein extraction and offer advantages. In this work, two commercial proteases, Alcalase and Flavourzyme, are used to extract protein from toasted and not toasted degreased soybean meal. The tests (duplicate) are carried out in 40ºC, initial pH of 7,0, enzyme concentration of 1% (protein/protein) and times from 1 up to 24 hours. At the end of the hydrolysis the suspension pH is measured and again corrected for 7,0.

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Keywords: soybean meal; enzymes; protein extraction; hydrolisys

1. Introduction

The soy, one of the most important cultivated oleaginous, is original of the East Asia from where it spread to the whole world. During centuries, its cultivation stayed restricted just to the oriental countries, where the grains were used in the preparation of large variety of fresh, fermented and dry foods. Only after to Second World War, efforts were done in order to become the soy recognized as food by the western culture, because of a growing concern with the world shortage of proteins [2].

Now the consumption of products soy has been increasing significantly, due to the announced benefits to the nutrition and the health. New soy foods are continually being developed and the soybean proteins are valued for their nutritional quality and functional properties. They are used in foods in a variety of forms, including infant formulas, flours, protein isolates and concentrates, and textured fibers (used as meat substitutes).

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The soybean meal has been considered a possible substitute of other grains in the human nutrition, due to its readiness as by-product of the oil industry. However, the nutritional value of soybean meal is limited by the presence of antinutritional factors, as trypsin inhibitors, which negatively affect protein digestion [3].

The traditional methods of processing used to isolate the soy protein and eliminated antinutritional factors can, however, to affect the retention of bioactives and medicinal natural components that aid in the treatment of diseases. Besides, they are expensive, they present losses of protein of the order of 25% and the products can contain impurities that harm its functional and nutritionals qualities.

New methodologies that would permit the protein production by processes more economic and that would preserve its functional properties started to be researched from middles of the 90's. It can make an appointment to the thermal treatments applied to the soybean meal and the use of enzymes, both, seeking mainly, the removal of antinutritionals factors and the increase of the readiness of nutrients.

So, this work has for objective to compare the extraction of the protein with commercial enzymes of toasted and not toasted degreased soybean meal.

According to Marsman [3], heat treatments such as toasting and extrusion are frequently used to improve the nutritional value of soybean meal. Heat-labile antinutritional factors are effectively inactivated and proteins are denatured to a certain extent, which makes them more susceptible to enzymatic hydrolysis. Besides, the use of feed enzymes can also take to a final product with greater commercial value.

Protein digestibility of soybean meals by enzymes in vitro has been shown dependent of thermal processing conditions. Depending on temperature and humidity conditions during heat treatment, the components of the soybean matrix may interact, resulting in a reduced enzymatic degradability and extractability of the proteins. Generally, the effects of heat treatment on solubility and the proteolytic degradation of pure soy proteins, concentrates, and isolates are well described in the literature, but, less work has been published covering the effects of heat treatment and subsequent enzymatic proteolysis of soybean meal protein [4].

2. Materials and Methods

2.1. Materials

Two types of degreased soybean meal were used in the experiments: toasted and not toasted (white). Both were coming from the industry of oil extraction of Cocamar of Maringá. The enzymes used were the commercial proteases Alcalase and Flavourzyme, both were supplied by Novozymes. All the others reagents used were of analytic degree.

2.2. Methods

Enzymatic hydrolysis of soybean meal: Ten grams of soybean meal were added to 100 mL of distilled water, in the presence of phosphate buffer. The pH of the suspension was corrected to 7.0 with NaOH 1.0 mol/L, and one hour was awaited for its stabilization in the case of the toasted, and two hours, in the case of the not toasted soybean meal. The experiments were carried out at 40ºC, 100 rpm, enzyme concentration was of 1% (protein/protein) and accompanied along 24 hours. At the end of the hydrolysis, the pH of the suspension was measured and, again corrected to 7.0. The amount of extracted protein was determined by the method of Bradford [1], before the addition of the enzyme and one hour after the final correction of the pH.