Enzymatic hydrolysis as a tool for enhancing antioxidant capacity and sensory qualities of soy proteins

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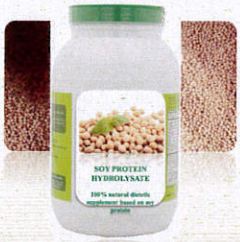
Introduction

❑ Soy proteins are widely used in several food products to improve water and fat binding ability as well as nutritional content. Recent research efforts in this field continue to look at novel functional properties of soy proteins through physical, chemical or enzymatic modifications [1].

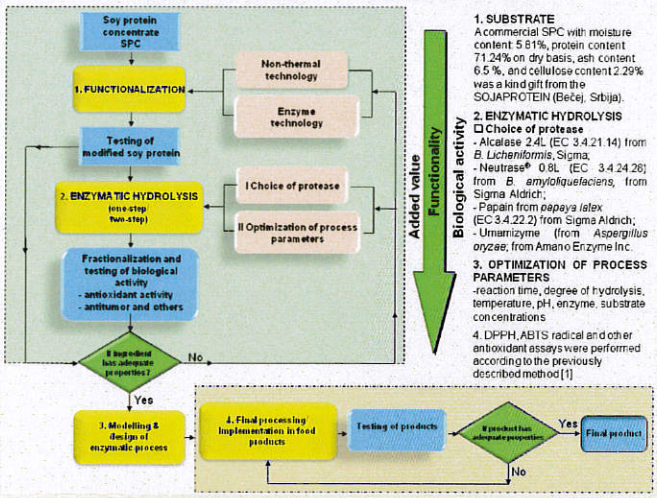


❑ Although it has been demonstrated that the enzymatic hydrolysis of soy protein isolate (SPI) is a suitable route to improve its antioxidant activity, there is a general lack of knowledge about the potential for beneficial effects of protease hydrolysis on soy products other than SPI, such as soy flour or soy protein concentrate (SPC).

❑ An advantage of using SPC as starting material is its cost, since it is one of the less expensive soy protein products.

❑ The aim of this study was to investigate the antioxidant activities, and color of spray-dried hydrolysates of SPC obtained with several proteases.

Materials and methods



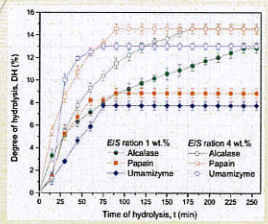
1. SUBSTRATE
A commercial SPC with moisture content 5.81%, protein content 71.24% on dry basis, ash content 6.5 %, and cellulose content 2.29% was a kind gift from the SOJAPROTEIN (Bečej, Srbija).

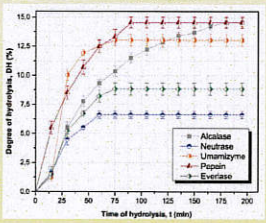
2. ENZYMATIC HYDROLYSIS
❑ Choice of protease
- Alcalase 2.4L (EC 3.4.21.14) from *B. Licheniformis*, Sigma;
- Neutrase® 0.8L (EC 3.4.24.28) from *B. amyloliquefaciens*, from Sigma Aldrich;
- Papain from *papaya latex* (EC 3.4.22.2) from Sigma Aldrich;
- Umamizyme (from *Aspergillus oryzae*; from Amano Enzyme Inc.

3. OPTIMIZATION OF PROCESS PARAMETERS
-reaction time, degree of hydrolysis, temperature, pH, enzyme, substrate concentrations

4. DPPH, ABTS radical and other antioxidant assays were performed according to the previously described method [1]

Results

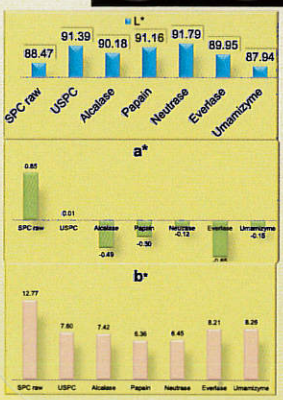




❑ Process parameters like substrate concentration, *E/S* ratio, temperature, and degree of hydrolysis have been optimized for each selected enzyme or combination of enzymes. For example, the effect of SPC concentration on reaction rate and degree of hydrolysis with alcalase is shown in Fig. 1a.

❑ The five proteolytic enzymes (alcalase, neutrase, papain, everlase and umamizyme) used for hydrolysis of SPC led to different reaction kinetics resulting also in different peptide profiles determined by gel filtration chromatography using Sephadex G-50. A graphical comparison of the hydrolytic curves obtained for one-stage enzymatic hydrolysis with different enzymes is shown in Fig. 1b.

Color of hydrolysates



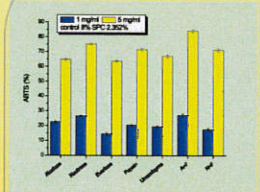
❑ The enzymatic hydrolysis in all cases resulted in an increase in the lightness and improved color of hydrolysates.

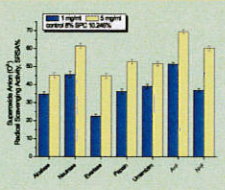
❑ Protein hydrolysates produced with neutrase, alcalase and papain had particularly light color compared with those prepared with everlase and umamizyme.

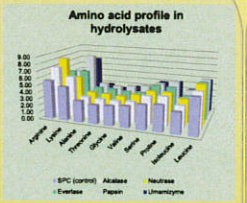
❑ The relationship between degree of hydrolysis (DH), molecular weight (MW) distribution, enzyme specificity, and antioxidant activity and color characteristics of hydrolysates was investigated.

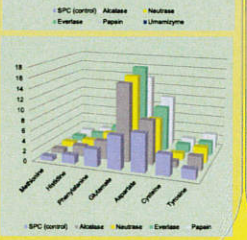
❑ CPHs had similar and adequate quantities of essential amino acids (Table .

Antioxidant activity









The hydrolysate obtained in the two-step enzymatic process with alcalase and flevorzyme seemed to be the most effective antioxidant determined by ABTS, DPPH, oxygen radical absorbance capacity, and linoleic acid emulsion system assays. The enzymatic hydrolysis in all cases resulted in an increase in the antioxidant activity of hydrolysate and improved content of amino acids.

Conclusion

The enzymatic hydrolysis in all cases resulted in an increase in the antioxidant activity of hydrolysate and all hydrolysates showed significantly changed color compared to SPC

Bibliography

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