

Subcritical water processing of fava bean concentrate to obtain bioactive compounds

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1. Introduction

Pulses are valuable food commodities worldwide that can be consumed as animal-protein substitutes due to their high protein content. Pulses like fava bean concentrates are rich in protein, which can be hydrolysed to peptides and essential amino acids such as lysine and leucine¹. Subcritical water processing is an environmentally friendly alternative to improve the biological value of fava bean protein by increasing the contents of bioactive compounds and minerals. Bioactive peptides of fava bean have shown to possess antioxidant, blood-pressure-reducing, anti-inflammatory and antidiabetic properties, which make them attractive ingredients for the formulation of functional foods²⁻⁴. Therefore, the main objective of this study is to assess the effect of subcritical water processing conditions to obtain fava bean hydrolysates with antioxidant activity.

2. Materials and Methods

Hydrolysis reactions were carried out in a Parr 4590 system⁵. Fava bean concentrate solutions were treated at 160-220°C, and 50 or 100 bar for 10-60 min.

Hydrolysates obtained were characterized for physicochemical properties (pH, conductivity, colour, etc) and antioxidant activity using the FRAP and DPPH methods.

3. Results and discussion

The highest yield of hydrolysates was obtained at 180°C and 50 bar for 40 min. Although an initial decrease in the protein dispersibility was observed during the first stage of processing, the insoluble aggregates were hydrolyzed with higher temperature and longer processing time (Fig. 1).

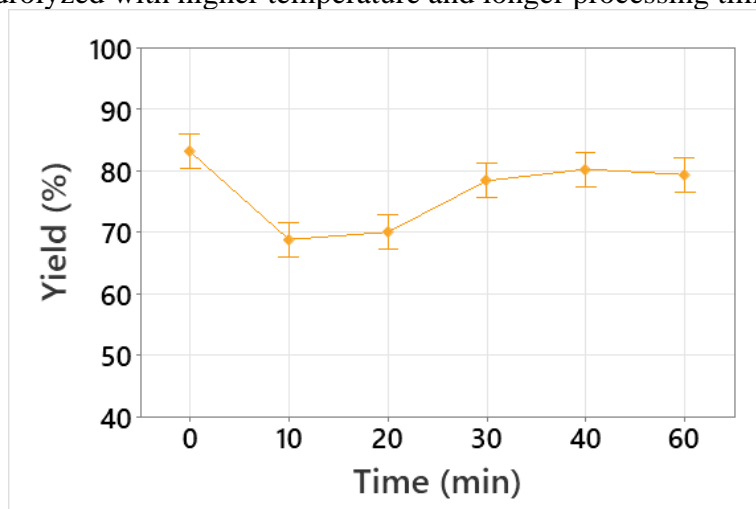


Fig. 1. Effect of time on the yield of fava bean hydrolysates.

The antioxidant capacity of the hydrolysates increased with increasing processing time and temperature. The formation of caramelization, thermo oxidation and Maillard's reaction products contributed to the increase in the antioxidant capacity (Fig. 2).

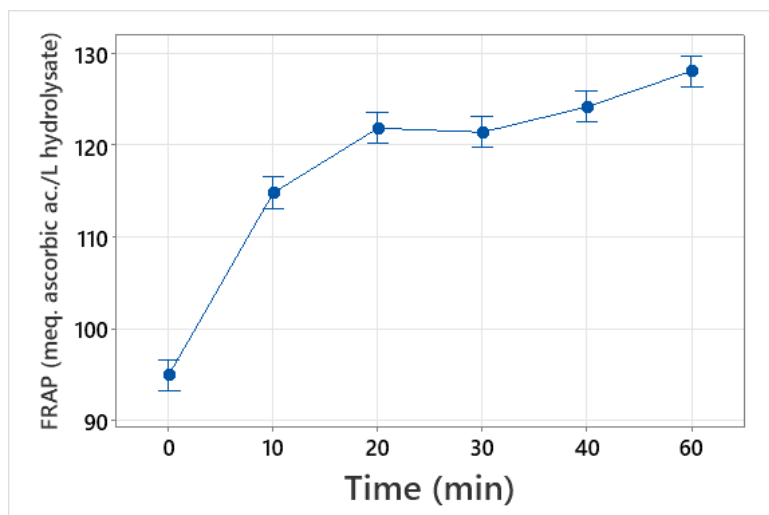


Fig. 2. Effect of temperature on the antioxidant capacity of fava bean hydrolysates.

With longer processing time, the conductivity increased which suggests the liberation of metallic ions bound to organic structures like phytic acid. The time and temperature decreased with time and temperature. However, more intensive processing conditions led to the degradation of organic acids that were initially formed and the generation of alkaline degradation products.

4. Conclusion

Subcritical water processing proved to be effective to produce fava bean hydrolysates with high antioxidant activity. The best processing conditions were 180°C and 50 bar for 40 minutes. The hydrolysates can be further dried and used as antioxidants, emulsifiers and gelling agents with high digestibility.

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