

New ingredients with functional properties from *Hermetia illucens* and *Tenebrio molitor* through the enzymatic hydrolysis with corolase

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Introduction and Objectives

Food and protein sources demand has been increasing in the last years in part due to the increase of the world population. Therefore, new sustainable sources of protein as well as ingredients with functional properties are required and have been investigated. Recent works demonstrated the potential of edible insects to originate bioactive peptides with application in food and feed industries.

The objectives of this study were to:

- Investigate new ingredients from *Hermetia illucens* and *Tenebrio molitor* obtained by enzymatic hydrolysis
- Obtain the optimal enzymatic hydrolysis conditions with corolase enzyme (porcine pancreas) to get bioactive hydrolysates

Materials and Methods

1. Hydrolysis of <i>Tenebrio molitor</i> and <i>Hermetia illucens</i> with corolase enzyme	2. Degree of hydrolysis (DH), Protein concentration (PC), Antioxidant activity (AA)	3. Statistical analysis (Box-Behnken)	4. Hydrolysis under optimal conditions and analysis of DH, PC and AA
Different times of hydrolysis (30, 240 and 450 min) were combined with different enzyme concentrations (0.5, 1.5 and 2.5%) (pH 8; 50°C)	TNBS method was used to evaluate DH, BCA assay to obtain PC and ABTS assay to measure the AA	Used to estimate the optimal conditions of hydrolysis to get the best outcome in the three variables (DH, PC, AA)	New hydrolysates were obtained under the optimal conditions and DH, PC and AA were analyzed

Results

1. Optimization of the hydrolysis conditions

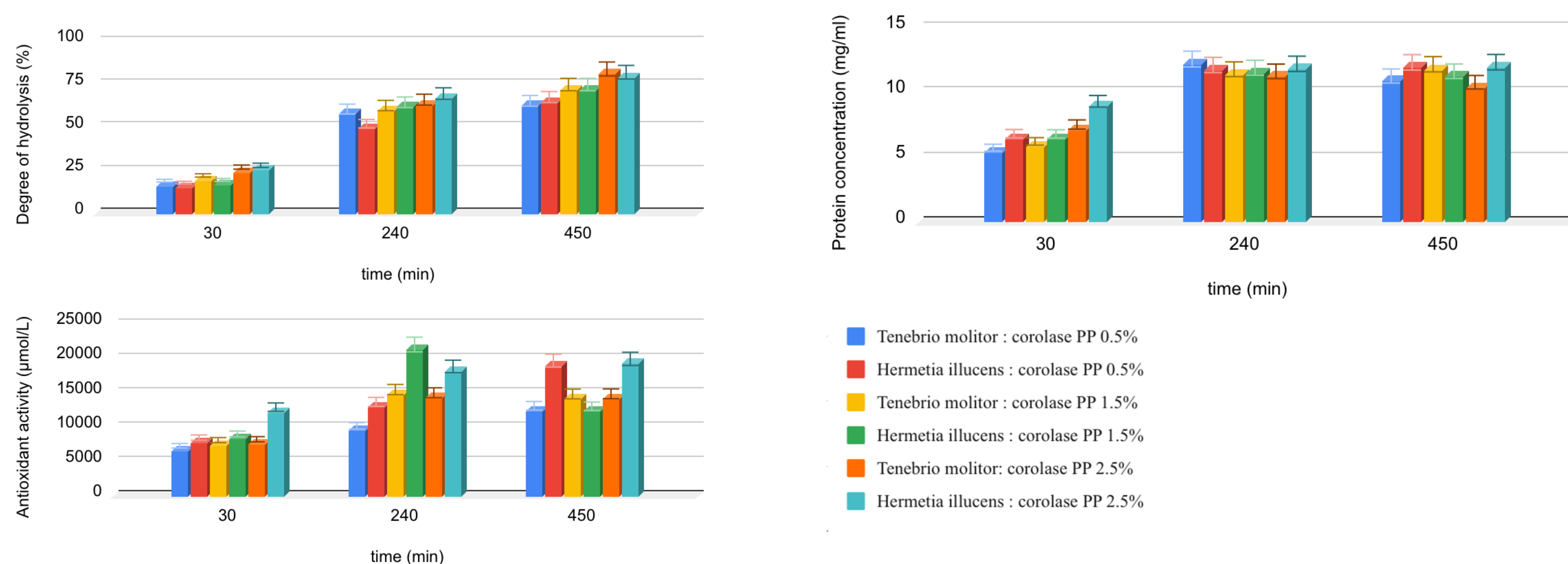


Fig.1 Effects of different hydrolysis conditions (time and enzyme concentration) on the degree of hydrolysis, protein concentration and antioxidant activity for *Tenebrio molitor* and *Hermetia illucens*.

2. Results obtained under optimal conditions

	<i>Tenebrio molitor</i>	<i>Hermetia illucens</i>
Corolase PP (%)	2.1	2.5
Time (min)	360	385
Degree of hydrolysis (%)	67.4	64.9
Protein concentration (mg/ml)	13.1	11.3
Antioxidant activity (µmol/L)	23484	19654

Table 1. Optimal hydrolysis conditions obtained after statistical analysis of results presented on Fig.1 and DH, PC and AA of hydrolysates obtained under optimal conditions.

The efficiency of protein hydrolysis usually depends on the **type of substrate, enzyme concentration, time and temperature**, amongst others, and all of these factors can affect the degree of hydrolysis, protein concentration and antioxidant activities.

The results obtained (and shown on Fig.1 and Table 1) indicate that:

- DH, PC and AA increased when the **time of hydrolysis** was increased
- **Enzyme concentration** affected positively the results of all the parameters evaluated
- **Under optimal conditions**, *Tenebrio molitor* hydrolysates apparently has higher DH, PC and AA with less time and enzyme concentration

Conclusions

It was possible to identify the optimal hydrolysis conditions to obtain new ingredients from insects with antioxidant activity observed for both hydrolysates. Thus, **they may have application as bioactive compounds to be used in functional foods** for human and animal nutrition. Further studies are needed to identify specific peptides and amino acid sequences on these hydrolysates.

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