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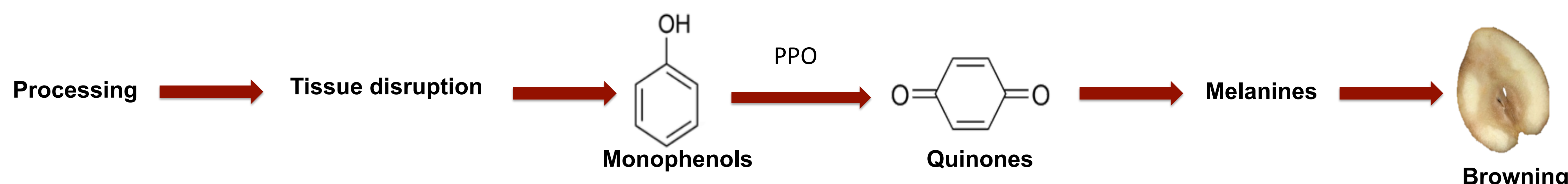
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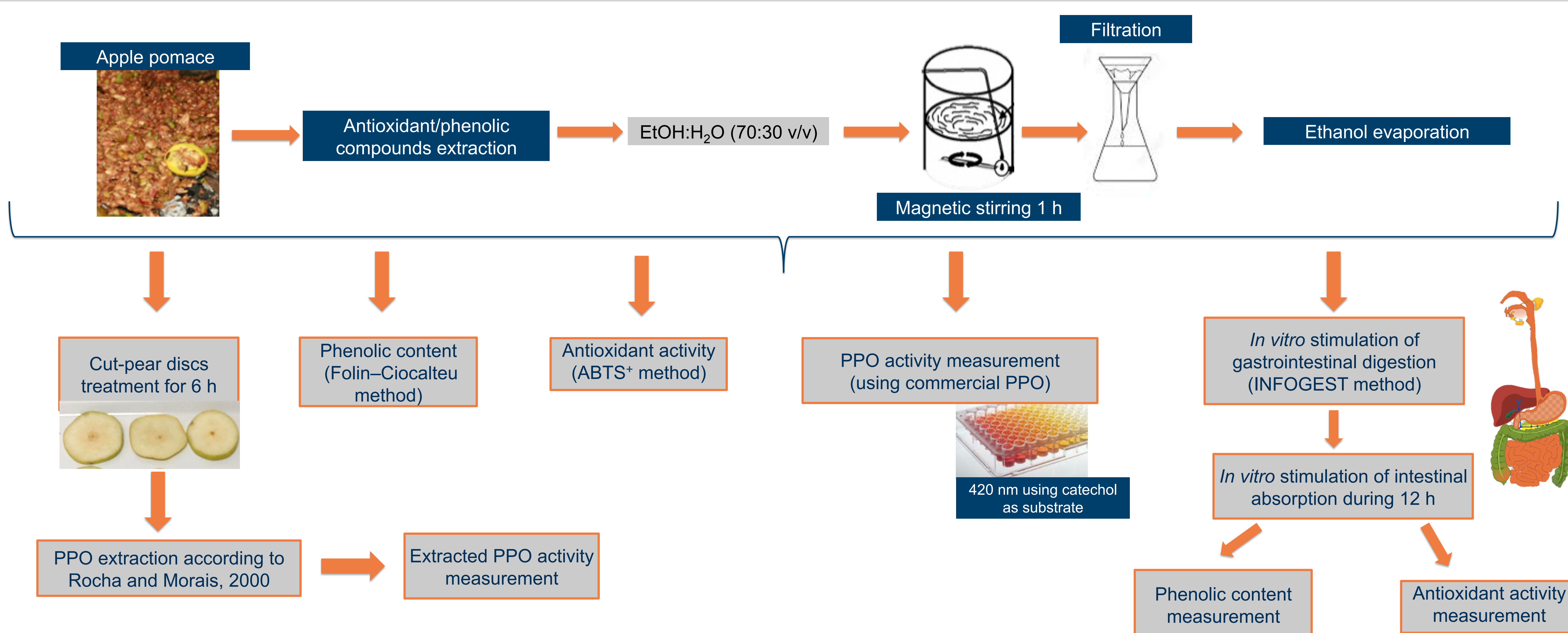
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## Introduction

Lifestyles of modern consumers, along with the demand for natural, fresh, flavourful, convenient and high-quality products with health benefits have raised the production and processing of horticultural crops. However, there is a need to improve supply and distribution chain ensuring quality of these products. Fresh and processing industries are facing a serious nutritional, economical, and environmental problem regarding their losses. Particularly, apple processing industries generate huge quantities of solid wastes, which are mainly composed of seed, skin, rind and pomace, containing potentially valuable bioactive compounds, such as polyphenols, dietary fibers and vitamins. Herein, we report the potential of apple byproduct extract to preserve the physiological quality of fruits, in particular, protecting fruits from browning. Browning is often associated with undesirable off-flavors, negative effects on taste and nutritional value and, consequently, shorter shelf life and consumer rejection.

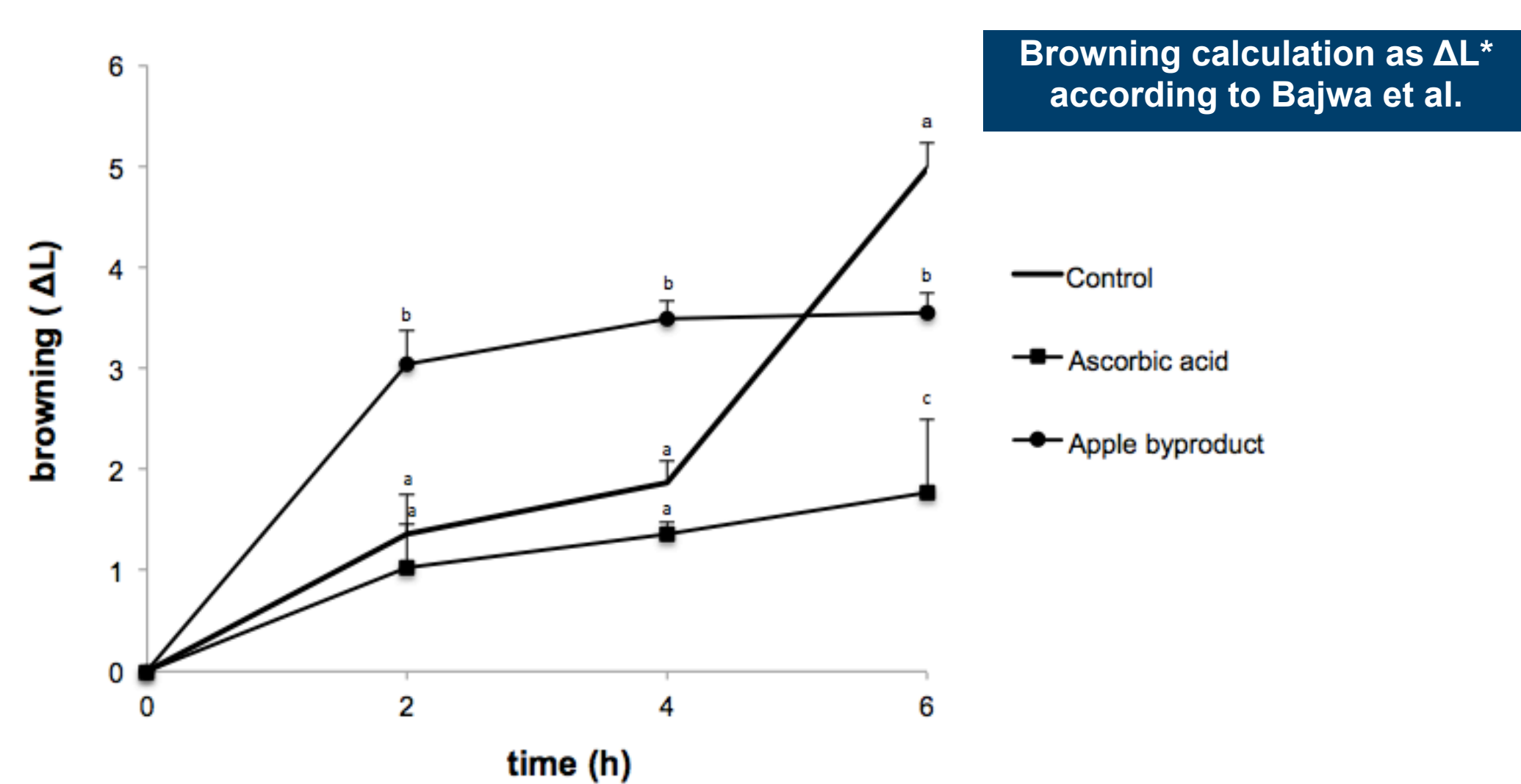


## Methods



## Results

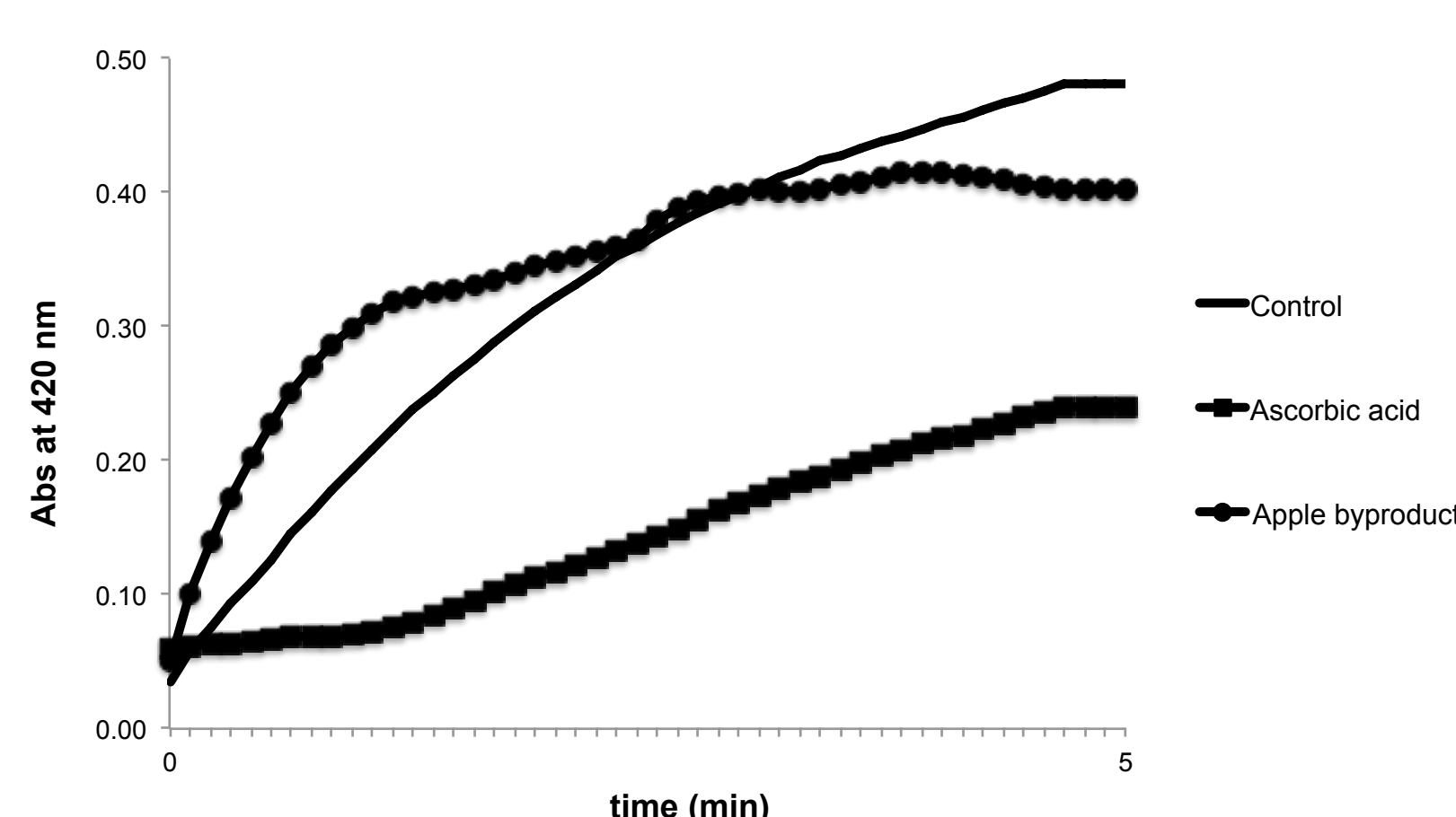
### Inhibition of pear discs browning during 6 h



**Figure 1.** Discs sprayed with water were used as control and ascorbic acid as commercial inhibitor. Values are means  $\pm$  standard deviation of five determinations.

- Apple byproduct application resulted in a similar behavior compared to the commercial inhibitor.
- No significant differences were found in  $\Delta L^*$  values from 2 h until 6 h in all the tested compounds which can indicate browning delay

### Poliphenoloxidase inhibition



**Figure 2.** Activity of PPO extracted from pears treated with two inhibitors: ascorbic acid (commercial inhibitor) and apple byproduct. Values are means  $\pm$  standard deviation of three determinations.

**Table 3.**  $IC_{50}$  (mg/mL) of two inhibitors after direct incubation with commercial PPO

$IC_{50}$	Ascorbic acid	Apple byproduct
PPO	$0.106 \pm 0.023^a$ $R^2=0.998$	$127.300 \pm 0.889^d$ $R^2=0.977$

Values are means  $\pm$  standard deviation of three determinations. Different superscript letters differ significantly ( $p < 0.05$ ).

- Apple byproduct extract treatment at the optimized concentration, resulted in about  $\pm 12\%$  of inhibition

### Impact of GUT simulation on antioxidant profile

**Table 1.** Antioxidant activity of apple byproduct

	$\mu\text{g AEAC/mg extract}$
Apple byproduct before GUT	$5.823 \pm 0.001^a$
Apple byproduct after GUT	$9.291 \pm 0.682^b$

Values are expressed in  $\mu\text{g}$  of ascorbic acid equivalent (AEAC)/mg extract and represent an average of three analytical replicates. Different superscript letters differ significantly ( $p < 0.05$ ).

**Table 2.** Total phenolic content of apple byproduct

	$\text{mg GAE/mg extract}$
Apple byproduct before GUT	$6.756 \pm 0.113^a$
Apple byproduct after GUT	$0.566 \pm 0.014^b$

Values are expressed in mg gallic acid equivalent (GAE)/mg extract and represent an average of three analytical replicates. Different superscript letters differ significantly ( $p < 0.05$ ).

- Gastrointestinal stimulation promotes the breakdown of bioactive compounds with antioxidant activity, increasing their bioavailability, and thus, its bioactivity.
- The antioxidant activity of apple byproduct increased approximately 40% after digestion.
- There is significant reduction of the total phenolic compounds content after GUT stimulation.

## Conclusions

- The present study demonstrated that apple byproduct extract decreased 30% of browning development after 6 h compared to the control. Although, not effective as ascorbic acid, apple byproduct was also effective in reducing PPO activity in both measurements performed.
- GUT stimulation led to an increase on the antioxidant capacity of this industrial byproduct, revealing its potential health benefit.
- The study has practical implications in generating novel natural extracts with potential to preserve fruits quality and promoting antioxidant protection to the human organism after ingestion of treated-fruits. Furthermore, better uses of the byproduct provide benefits to the industry as well as solutions for environment concerns.

## Acknowledgements

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