Valorization of natural extracts as potential enzymatic browning inhibitors in processed fruits

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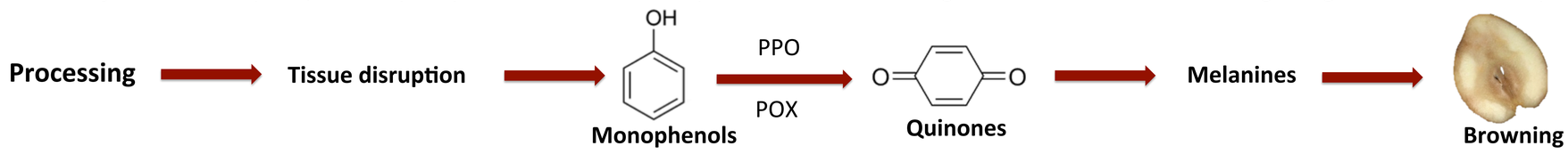
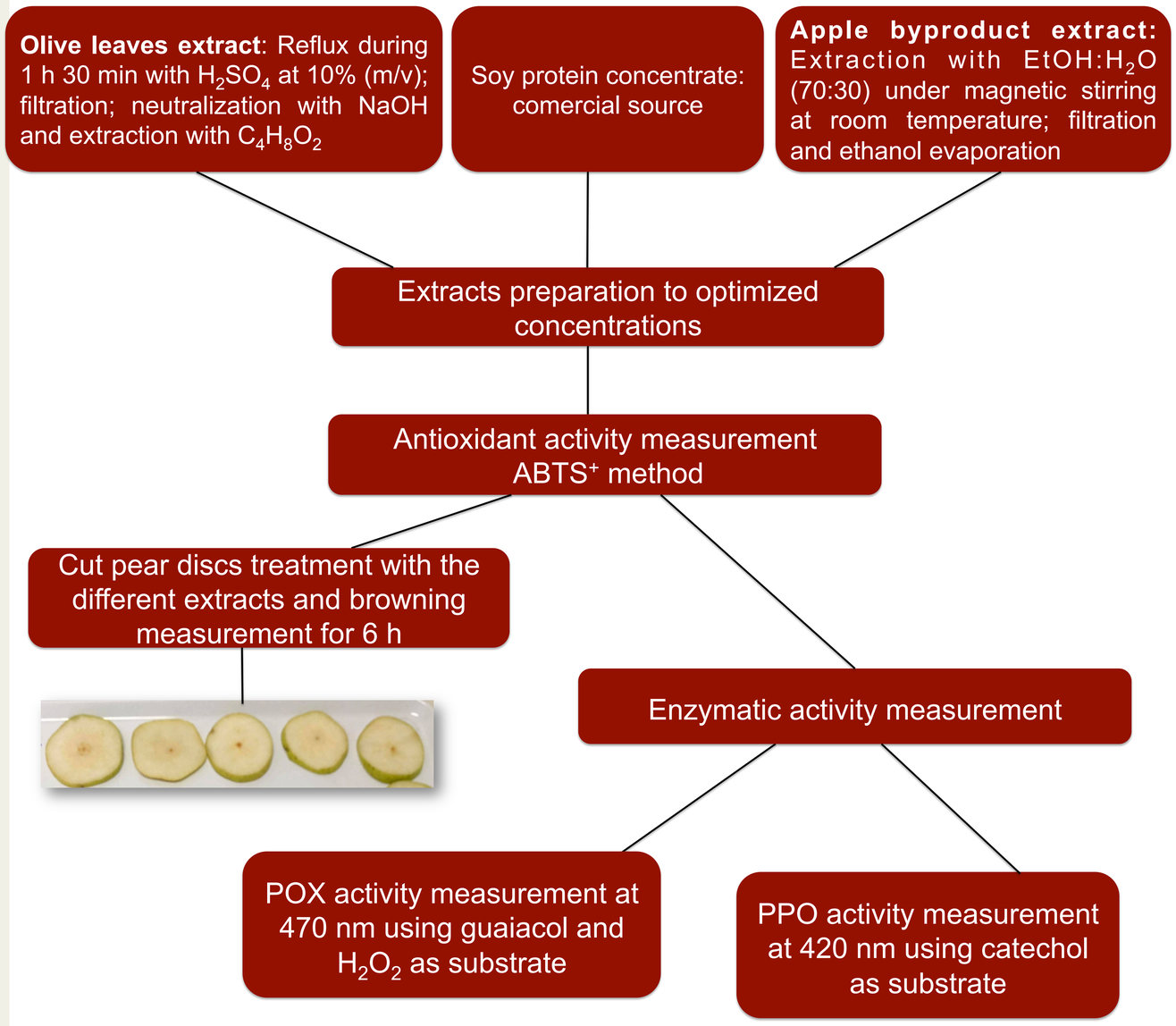
Background

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 consumption of processed fruit. This continuous increase implies the need to improve supply and distribution systems ensuring quality of these products. Processed fruit browning inhibition represents a challenge for the Food Processing Industry. **Browning** is often associated with **undesirable off-flavors, negative effects on taste and nutritional value** and, consequently**, shorter shelf life** and **consumer rejection**. Processing causes major tissue disruption, whereby enzymes and substrates sequestered in different organelles come in contact and signaling-induced wound responses are initiated[1].



The processing technology to prevent browning reactions has traditionally been the application of various chemicals, as ascorbic and citric acids and sulfites[2]. However, there is a rising interest in the use of sustainable and natural antioxidants as food bioactive components. Thus, in this study the potential of soy protein concentrate, apple byproduct and olive leaves extracts, with antioxidant properties, was assessed as novel enzymatic browning inhibitors.

Methods



Observing the results, olive leaves extract revealed the highest antioxidant capacity, followed by soy protein and apple byproduct extract. Figure 1 shows that soy protein resulte in a similar behavior compared to the comercial control. Also, no significant differences were found in ΔL* values from 2 h until 6 h in all the tested compounds which can indicate browning delay. Regarding the influence of the extracts and soy protein on oxidative enzymes activity, it is notable the potential of apple byproduct extract on inhibiting both enzymes at the optimized concentration. It is also noteworthy the ineffectiveness of olive leaves and soy protein in inhibiting PPO activity despite being capable of POX restriction.

Results

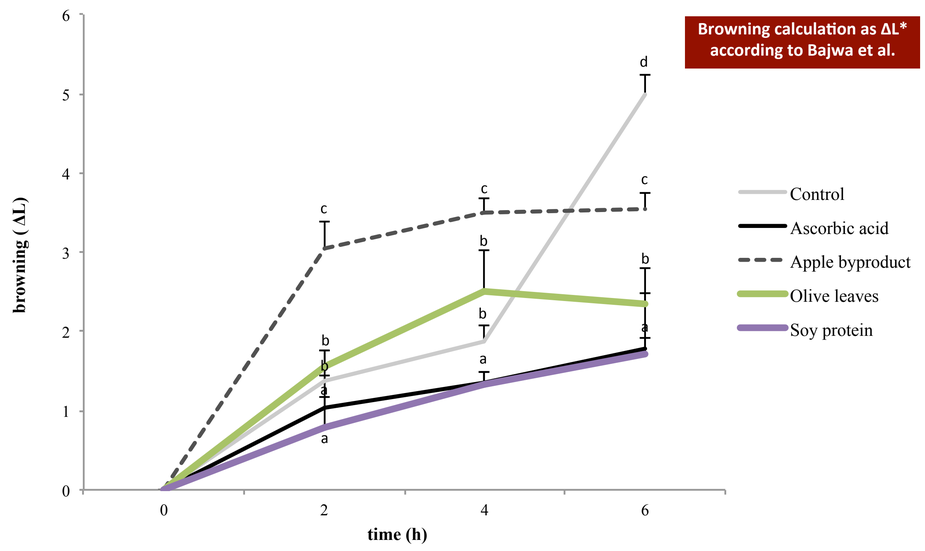


Figure. 1. Inhibition of pear discs browning during 6 h. Discs sprayed with water were used as control and ascorbic acid as commercial control. Values are means ± standard deviation of five determinations.

Table 1. Antioxidant activity of natural extracts and soy protein through the ABTS+ method. Values are expressed in mg of ascorbic acid equivalent (AEAC)/ mg extract and represent an average of three analytical replicates.

Extracts	
	mg AEAC/mg extract
Ascorbic acid	1.682 ± 0.004[a]
Olive leaves	0.107 ± 0.005[b]
Soy protein	0.009 ± 0.015[c]
Apple byproduct	0.006 ± 0.001[c]

Table 2. Different extracts and soy protein % of inhibition relatively to the control. Results are shown in mean of three replicates ± SD

Enzyme	Ascorbic acid	Olive leaves	Soy protein	Apple byproduct
PPO	100.00 ± 2.57	0	0	11.60 ± 3.12
POX	63.53 ± 0.75	44.81 ± 1.48	21.49 ± 2.34	60.00 ± 1.16

Conclusions

The present study demonstrated that, within the natural extracts tested, leaves from olive tree showed the highest values of antioxidant activity (0.107 ± 0.005 mg AEAC/mg extract). However, it is important to highlight the inhibitory effect of apple byproduct extract on both oxidative enzymes, despite its low antioxidant activity. This report has practical implications in generating novel natural extracts with potential application as anti-browning agents.

References

[1] Tomás-Barberán, F.; Espín J.C. *Journal of the Science of Food and Agriculture* **2001,** *81*, 853-876.
[2] Chen, L. et al. *J. Agric. Food Chem* **2000**, *48*, 4997−5000.

Acknowledgements

This work is a result of the project ReStoragePear, supported by COMPETE Operational Programme (COMPETE 2020) under the PORTUGAL 2020 Partnership Agreement through the European Regional Development Fund (ERDF).