ReStoragePear- Development of strategies to the prevention of superficial scald and internal browning in the Rocha pear and quality assurance in long-term storage

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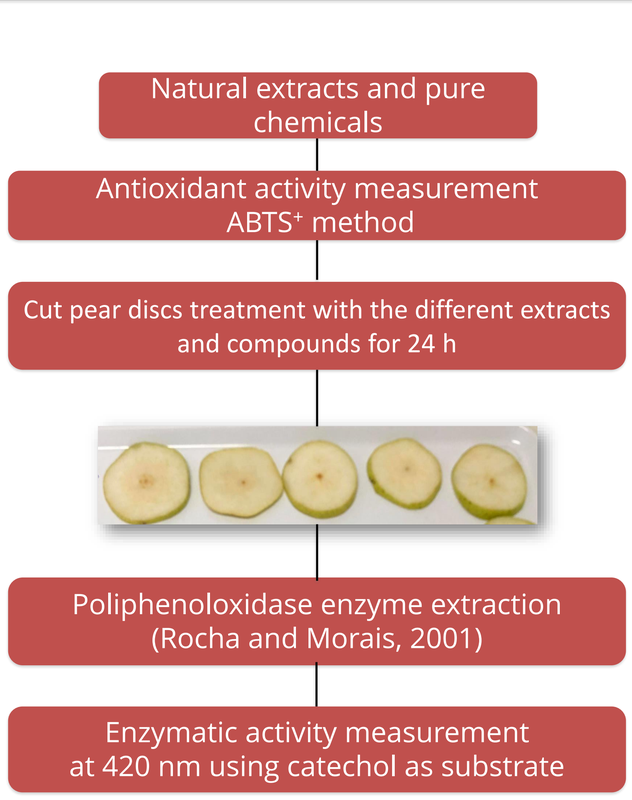
Description/Objectives

The Rocha pear is a Portuguese pear variety, with Protected Designation of Origin (PDO), that represents about 93% of the national production of pear. Currently, Portugal has the capacity to produce around 200-230 thousand tons of Rocha pear per year, representing about 120-130 million euros, of which 70 – 80 million come from this fruit exportation. However, nowadays, the Rocha pear sector is facing significant losses and struggling to deal with a difficult challenge. The European Union brought forth legislation to prohibit the use of the antioxidant "diphenylamine", known as "DPA" since the beginning of 2014. This measure weakened the national pear sector. The situation is quite serious once that without this antioxidant potential, the conservation of Rocha pear and some varieties of apples produced in Portugal is reduced to three months, when symptoms of superficial scald and internal browning become evident. These physiological disorders, superficial scald and internal browning, are the major physiological disorders affecting postharvest pear quality, leading to major economic losses. The overall objectives of this project proposal are to develop strategies to reduce the incidence of pears and apples physiological disorders, namely superficial scald and internal browning, and ensure fruit quality during long storage. The identification, characterization and extraction of natural bioactive compounds is one of the strategies for the evaluation of their impact as antioxidant agents in preventing disorders. Enzymatic oxidation of natural phenolic compounds present in pears by polyphenol oxidase is one of the major causes of the disorders. Partial control can be obtained with the application of antioxidants, which can reduce back the reactions catalysed by browning enzymes, and thus, inactivate them (Di Guardo et al., 2013; Macheix, Fleuriet, & Billot, 1990). Herein, we present the antioxidant activity and the anti-browning activity of a total of 14 natural extracts, rich in phenolics compounds, triterpenic acids and amine groups and 17 pure chemical compounds found within a number of natural substances.

Methods and Results



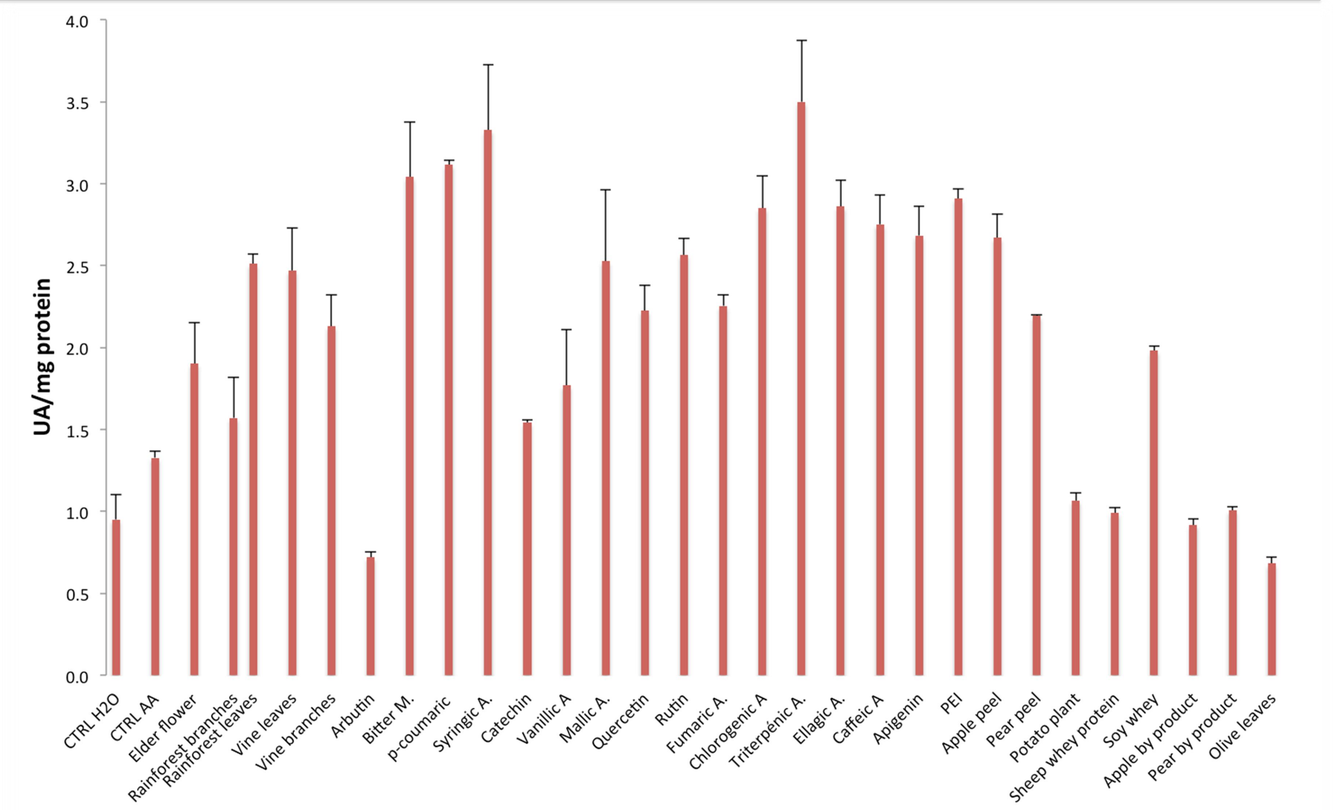


Figure 1. Polyphenoloxidase activity of different compounds treated cut pear discs. Water and ascorbic acid 1% treatments were used as controls. Values are expressed in units of activity (UA)/mg protein and represent an average of three analytical replicates.

Table 1. Antioxidant activity of a) natural extracts and b) pure chemical compounds, through the ABTS⁺ method. Values are expressed in mg/mL ascorbic acid and represent an average of three analytical replicates

a)

Natural extract	Elder flower	Bitter Melon	Potato plant	Brewer yeast	Soy protein	Sheep whey protein	Pear peel	Pear byproduct	Apple peel	Apple byproduct	Rainforest branches	Rainforest leaves	Vine branches	Vine leaves	Olive leaf
C (mg/mL)	7.42	20.43	10.94	38.3	47.62	100	23.4	18	18.97	16	5.03	9.53	4.13	9.54	4.13
ABTS ± SD	0.37± 0.03	0.29 ± 0.01	0.93 ±0.01	0.52 ± 0.02	0.44 ± 0.02	0.16± 0.01	0.53 ± 0.01	0.29 ± 0.01	0.35 ± 0.01	0.09 ± 0.01	1.68 ± 0.01	4.63 ± 0.02	2.69 ± 0.01	3.15 ± 0.03	2.69 ± 0.01

b)

Natural extract	Fumaric acid	Malic acid	Quercetin	D-quinic acid	Rutin	Ellagic acid	Apigenic acid	Triterpénic acid	Caffeic acid	p-coumaric acid	Chlorogenic acid	PEI	Vanilic acid	Catechin	Syringic acid	Arbutin
C (mg/mL)	7	558	0.125	400	0.16	98	0.18	26.67	0.5	10	4	0.03	4	1.13	5.78	77.43
ABTS ± SD	0.03 ± 0.01	0.04 ± 0.01	0.04 ± 0.01	0.05 ± 0.01	0.07 ± 0.01	0.10 ± 0.01	0.20 ± 0.01	0.12 ± 0.02	0.55 ± 0.01	1.86 ± 0.01	2.38 ± 0.01	0.01 ± 0.01	3.20 ± 0.01	3.97 ± 0.01	12.61 ± 0.01	15.09 ± 0.01

Conclusions

The present study demonstrated that leaves from vine (4.63 ± 0.02) and arbutin (15.09 ± 0.01) showed the highest values of antioxidant activity within the natural extracts and pure chemical compounds, respectively. Arbutin was also the most effective compound in suppressing the activity of PPO enzyme compared to ascorbic acid. Regarding the group of natural extracts, it is important to highlight the inhibitory effect of olive leaves on PPO activity. The present results has practical implications in generating novel natural extracts with potential application as anti-browning agents.

References

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