

BIOCHEMICAL CHARACTERIZATION AND BIOLOGICAL EVALUATION OF POLYPHENOLIC EXTRACTS FROM LOCAL APPLE VARIETIES GROWN IN AOSTA VALLEY

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Ancient and more recent apple varieties cultivated in local areas have so far been largely unexplored and might represent an important source of phenolic compounds due to the characteristics of the environment where they grown. Aosta Valley is a little region located in the North-West Italian Alps and represents a mountain area well-suited to grow apples with high antioxidant content because of its altitude, intense solar radiation and peculiar climate conditions. The aim of this work was to study phenolic profile and biological activity in the peel and flesh of four apple cultivars grown in Aosta Valley: *Raventze* (an ancient and autochthonous cultivar), *Renetta Canada*, *Jonagold* and *Golden Delicious*.

Apples were harvested at commercial maturity and immediately dried. Powdered peels and flesh extracts were extracted in methanol using an ultrasound assisted technique, and characterised in terms of total polyphenols content (TP) by an optimized Folin-Ciocalteu method and phenolic profile composition by an HPLC-MS/MS (ESI) analysis, to quantify main single phenolic compounds.

Biological activity was also investigated using an ABTS^{•+} assay to evaluate antiradical power, and a bioinformatic study with a system biology approach was performed to analyze some interesting metabolic pathways and their relations with nutraceutical properties of the extracts.

TP content in the peel varied between 614,15 and 1498,20 mg CE/100 g of dry matter (DM), and in the flesh between 247,82 and 660,69 mg CE /100 g DM, depending on variety, with the highest values reached in *Raventze* cultivar.

The phenolic profile of peel and flesh showed significant differences among cultivars. 5-*p*-coumaroylquinic acid was the predominant phenolic compound in the flesh of all the apples studied, and showed the highest concentration in *Raventze* cultivar (267,23 mg/100g_{DM}); among the peel extracts, the predominant phenolics were dihydrochalcones, procyanidins, glycosylated quercetins, 4-*p*- and 5-*p*-coumaroylquinic acids, with highest values found in *Renetta* and *Raventze* varieties.

The highest antiradical activity was observed in *Raventze* peel and flesh extract (13,52 µg_{TE}/L and 6,71 µg_{TE}/L, respectively).

As for the system biology study, 8 phenolic and nutraceutical active compounds (of 26 found in apple peel and flesh extracts) showed enough concentration to regulate up to 13 target molecules belonging to 3 metabolic pathways (cardiac, oxidative and inflammatory).

This preliminary study suggests that ancient and recent apple varieties cultivated in mountain areas show high levels of phenolic compounds and antiradical activity, and could be involved in the metabolic regulation of pathways related to cardiovascular and inflammatory diseases.

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