

Study of Polyphenol Profile and Antioxidant Capacity in Italian Ancient Apple Varieties by Liquid Chromatography

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Abstract : Safeguarding, studying and enhancing biodiversity play an important and indispensable role in re-launching agriculture. The ancient local varieties are therefore a precious resource for genetic and health improvement. In order to protect biodiversity through the recovery and valorization of autochthonous varieties, in this study we analyzed 12 samples of four ancient apple cultivars representative of Friuli Venezia Giulia, selected by local farmers who work on a project for the recovery of ancient apple cultivars. The aim of this study is to evaluate the polyphenolic profile and the antioxidant capacity that characterize the organoleptic and functional qualities of this fruit species, besides having beneficial properties for health. In particular, for each variety, the following compounds were analyzed, both in the skins and in the pulp: gallic acid, catechin, chlorogenic acid, epicatechin, caffeic acid, coumaric acid, ferulic acid, rutin, phlorizin, phloretin and quercetin to highlight any differences in the edible parts of the apple. The analysis of individual phenolic compounds was performed by High Performance Liquid Chromatography (HPLC) coupled with a diode array UV detector (DAD), the antioxidant capacity was estimated using an *in vitro* essay based on a Free Radical Scavenging Method and the total phenolic compounds was determined using the Folin-Ciocalteu method. From the results, it is evident that the catechins are the most present polyphenols, reaching a value of 140-200 $\mu\text{g/g}$ in the pulp and of 400-500 $\mu\text{g/g}$ in the skin, with the prevalence of epicatechin. Catechins and phlorizin, a dihydrochalcone typical of apples, are always contained in larger quantities in the peel. Total phenolic compounds content was positively correlated with antioxidant activity in apple pulp ($r^{>2} = 0,850$) and peel ($r^{>2} = 0,820$). Comparing the results, differences between the varieties analyzed and between the edible parts (pulp and peel) of the apple were highlighted. In particular, apple peel is richer in polyphenolic compounds than pulp and flavonols are exclusively present in the peel. In conclusion, polyphenols, being antioxidant substances, have confirmed the benefits of fruit in the diet, especially as a prevention and treatment for degenerative diseases. They demonstrated to be also a good marker for the characterization of different apple cultivars. The importance of protecting biodiversity in agriculture was also highlighted through the exploitation of native products and ancient varieties of apples now forgotten.

Keywords : apple, biodiversity, polyphenols, antioxidant activity, HPLC-DAD, characterization

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