

Polyphenolic extracts of *Arbutus unedo* and *Myrtus communis* fruits and their possible inclusion in whey, a common dairy waste product

Detti C.¹, Gori A.¹, Nascimento L.B.S.¹, Bilia A.R.^{3,4}, Vanti G.³, Ferrini F.^{1,2}, Brunetti C.²

cassandra.detti@unifi.it

¹University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Sesto Fiorentino (Florence), Italy

²National Research Council of Italy, Institute for Sustainable Plant Protection (IPSP), Sesto Fiorentino (Florence), Italy.

³University of Florence, Department of Chemistry "Ugo Schiff", via Ugo Schiff 6, 50019, Sesto Fiorentino, Italy.

⁴Institute of Food Sciences, (CNR-ISA), via Roma 64, 83100 Avellino, Italy

Myrtus communis L. and *Arbutus unedo* L. are two typical species of the Mediterranean basin. Their fruits, rich in polyphenols, are important sources of biomolecules that may be used as nutraceutical or food additives. Whey constitutes one of the most polluting by-products of cheese manufacturing. However, this waste product can be utilized as an ingredient to functionalize foodstuffs thanks to its large content in proteins and mineral nutrients. In this context, the inclusion of polyphenolic rich extracts in whey could be attractive for the further valorization of this product. The aim of this study was to obtain polyphenolic enriched extract from *M. communis* and *A. unedo* fruits and to investigate their inclusion in whey. To this end, fresh, dried and lyophilized fruits were extracted using two different methods: decoction and ethanolic ultrasound-assisted extraction. Then, the most polyphenolic rich extracts were included in whey and stored at 4°C for 60 days. The whey-based products added with the polyphenolic extracts were evaluated for their physicochemical properties, in particular pH and polyphenolic content stability, every 15 days (T0, T15, T30, T45, T60). The decoction of fresh fruits of both species resulted the extract with the highest polyphenolic content and it was added in whey in two forms: powder (powder inclusion, PI) and liquid (liquid inclusion, LI). *M. communis* fruit extracts were rich in myricetin, galloyl quinic acid derivatives and four anthocyanins (myrtillin, kuromanin, petunidin and oenin). These compounds were stable in whey, both in PI and LI, from T0 to T60. In addition, for both types of inclusion, the pH was similar and remained stable until T15, whereas a decrease was observed till T60. *A. unedo* fruit extracts were characterized by gallic acid and galloyl quinic acid derivatives. For this species, the whey-based product with PI was richer in polyphenols than the LI. Indeed, despite a slight decrease observed in PI from T45, this type of inclusion maintained a higher polyphenolic content compared to LI. In addition, in both types of inclusions, the pH was stable till T15 and then decreased.

In conclusion, whey-based products with PI and LI of *M. communis* and *A. unedo* fruit extracts showed to be chemically stable maintaining their high polyphenolic content. Nevertheless, for *A. unedo*, the powder extract showed to be a better choice for the inclusion in whey compared to the liquid one. These results are important for a possible valorization of whey as a functional ingredient to formulate novel products with potential application in nutraceutical and food industry.

Keywords: decoction, green extraction, HPLC-DAD, Mediterranean plants, polyphenols.