

Molecular and chemical fingerprinting of high oleic sunflower hybrids. “A systems biology approach”

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Helianthus annuus L. (sunflower) is one of the most cultivated oil crops in the world, indeed the world production is estimated at 21 million hectares in 60 countries. It is the second largest hybrid crop, and the fifth largest oilseed crop, with an annual value of over 40 billion \$. The main use of sunflower seeds is oil production. The quality of sunflower oil depends on the quality and content of fatty acids. Besides *Helianthus annuus*, different species or cultivars of the same genus are present, each one characterized by small differences in their genome. These can affect not only the phytochemical oil profile but also the whole seed composition. Because species of the same genus have very similar phenotypic characteristics, molecular and chemical fingerprinting is one of the most important instruments to screen among varieties. On the other hand, sunflower oil production generates a dramatic waste flow, that represents an economic problem for companies for its disposal. A challenge can be represented by the reuse of residues from oil production, into a virtuous circular economy (CE) strategy. Recently, environmental CE is increasing the trend of using food waste byproducts as alternative source of bioactive compounds. Moreover, several studies have shown how from this waste byproducts polyphenols, including chlorogenic acids, can be extracted. These bioactive compounds showed the same biological activities (antioxidant, antiproliferative, antiinflammatory, antidiabetic properties). The development of new methods for the characterization of sunflower cultivars and hybrids is crucial for their unequivocal identification. This project, financed by the SO.RE.MO. S.A.M. of the Ferrero Group and scientifically supported by Biosfered Srl, aims to combine a molecular approach with chemical data to define a unequivocal and rapid method for sunflower screening.



Figure 1. Economic enhancement, molecular and chemical standardization of sunflower waste by-products; a) Neochlorogenic acid; b) Oleic acid

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