

## Fruit of the heirloom: ancient non-commercial plant varieties as superior sources of health-beneficial compounds

Lands subtracted to intense urbanization are home of a rich biodiversity, which is well exemplified by the occurrence of many different plant species. Plants thriving in such areas have established a perfect synergy with the local environment, i.e. soil, microbiota and microclimate. The progressive abandoning of rural areas for the expansion of cities has favoured the prospering of wild plant species under conditions of minimal human impact (fertilization, soil impoverishment, pollution). Such plants display specific phenotypic/genotypic characters that can sometimes be very different from the commercial counterparts. These last have indeed been subject to a strong selection favouring market-imposed features, such as colour and dimension. An emblematic example of such differences is the higher content of beneficial compounds, i.e. those molecules positively impacting human health and generally deriving from secondary metabolic pathways. The secondary metabolism denotes those biochemical pathways that are not strictly essential for survival, but that nevertheless contribute to plant development and stress defense. Polyphenols are one of the most diversified classes of secondary compounds, with more than 8000 structures known, among which 4000 are flavonoids. Such molecules constitute a chemical language with which plants communicate among themselves, as well as with other organisms (insects, such as pollinators). They also act as compounds mediating plant defense against exogenous cues.



Fig. 1. Ancient varieties of onion, tomato, olive, grapevine from the Germplasm Bank of Tuscany ([http://germoplasma.regione.toscana.it/index.php?option=com\\_content&view=article&id=4&Itemid=109](http://germoplasma.regione.toscana.it/index.php?option=com_content&view=article&id=4&Itemid=109)).

The basic chemical structure of polyphenols is composed of aromatic ring(s) linked to hydroxyl group(s) which confer antioxidant potential. Foods containing such molecules are considered « functional », because of their nutraceutical added value. In other words, they are rich in nutrients and provide protection against chronic diseases (cancer, neuro-degenerative conditions, vascular diseases).

Italy is characterized by a Mediterranean climate which shapes a specific landscape populated by distinctive edible plants (olive trees, tomatoes, grapevines, cherries). This country promotes the manufacture of high-

quality products deriving entirely from local bioresources, e.g. oil and wine. In this perspective, Italy has started programs aimed at preserving the regional biodiversity comprising ancient varieties cultivated in the past, but subsequently fallen out of agricultural interest. Tuscany is the first region to have established a specific law (law 64/04) allowing the recovery of ancient varieties sampled across the territory (Berni et al., 2018). All sampled varieties are maintained *ex situ* in specific places, referred to as the Germplasm Bank of Tuscany. This Bank has the mission of preserving and propagating ancient varieties threatened by genetic erosion.

Our recent studies have clearly shown that the fruits produced by the plants of the Germplasm Bank of Tuscany have higher contents of functional molecules, as compared to widespread commercial varieties. For example, Tuscan tomatoes display 2- to 3-fold higher contents of polyphenols (ferulic and caffeic acid, naringenin and quercetin), as compared to the commercial fruits. We wish to sensitize the public to the consumption of these non-commercial fruits as part of a functional Mediterranean diet. The ancient Tuscan plant varieties are also important sources of characters for breeding purposes (e.g. higher resistance to exogenous stresses). The valorisation of regional varieties favours local economic development which results in the commercialization of niche products that are fully traceable and produced according to a « 0 km » concept.

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## Publication

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