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Biosynthesis of Healthy Secondary Metabolites in Olive Fruit in Response to Different Agronomic Treatments

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Abstract : Olive fruit is well-known for the high content in secondary metabolites with high interest at nutritional, nutraceutical, antioxidant, and healthy levels. The content of secondary metabolites in olive at harvest may be affected by different water regimes, with significant effects on olive oil composition and quality and, consequently, on its healthy and nutritional features. In this work, a summary of several research studies dealing with the biosynthesis of healthy and nutraceutical metabolites of the secondary metabolism in olive fruit will be reported. The phytochemical findings have been correlated with the expression of key genes involved in polyphenol, terpenoid, and carotenoid biosynthesis and metabolism in response to different development stages and water regimes. Flavonoids were highest in immature fruits, while anthocyanins increased at ripening. In epicarp tissue, this was clearly associated with an up-regulation of the UFGT gene. Olive fruits cultivated under different water regimes were analyzed by metabolomics. This method identified several hundred metabolites in the ripe mesocarp. Among them, 46 were differentially accumulated in the comparison between rain-fed and irrigated conditions. Well-known healthy metabolites were more abundant at a higher level of water regimes. Increased content of polyphenols was observed in the rain-fed fruit; particularly, anthocyanin concentration was higher at ripening. Several secondary metabolites were differentially accumulated between different irrigation conditions. These results showed that these metabolic approaches could be efficiently used to determine the effects of agronomic treatments on olive fruit physiology and, consequently, on nutritional and healthy properties of the obtained extra-virgin olive oil.

Keywords : olea europea, anthocyanins, polyphenols, water regimes
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