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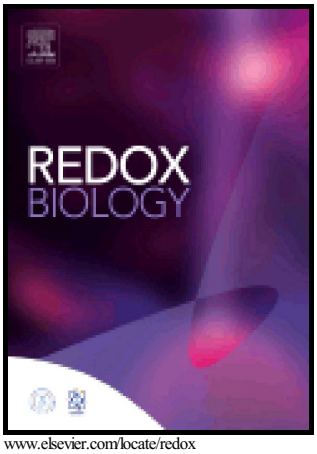

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Nitro-fatty acids in plant signaling: new key mediators of nitric oxide metabolism

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Abstract

Recent studies in animal systems have shown that NO can interact with fatty acids to generate nitro-fatty acids (NO_2-FAs). They are the product of the reaction between reactive nitrogen species and unsaturated fatty acids, and are considered novel mediators of cell signaling based mainly on a proven anti-inflammatory response. Although these signaling mediators have been described widely in animal systems, NO_2-FAs have scarcely been studied in plants. Preliminary data have revealed the endogenous presence of free and protein-adducted NO_2-FAs in extra-virgin olive oil (EVOO), which appear to be contributing to the cardiovascular benefits associated with the Mediterranean diet. Importantly, new findings have displayed the endogenous occurrence of nitro-linolenic acid (NO_2-Ln) in the model plant Arabidopsis thaliana and the modulation of NO_2-Ln levels throughout this plant's development. Furthermore, a transcriptomic analysis by RNA-seq technology established a clear signaling role for this molecule, demonstrating that NO_2-Ln was involved in plant-defense response against different abiotic-stress conditions, mainly by inducing the chaperone network and supporting a conserved mechanism of action in both animal and plant defense processes. Thus, NO_2-Ln levels significantly rose under several abiotic-stress conditions, highlighting the strong signaling role of these molecules in the plant-protection mechanism. Finally, the potential of NO_2-Ln as a NO donor has recently been described both in vitro and in vivo. Jointly, this ability gives NO_2-Ln the potential to act as a signaling molecule by the direct release of NO, due to its capacity to induce different changes mediated by NO or NO-related molecules such as nitration and S-nitrosylation, or by the electrophilic capacity of these molecules through a nitroalkylation mechanism. Here, we describe the current state of the art regarding the advances performed in the field of NO_2-FAs in plants and their implication in plant physiology.