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Poster Communication Abstract – 1.37

TRANSCRIPTOMIC AND METABOLIC ANALYSES REVEAL PATHWAYS RESPONDING TO LAVENDER OIL TREATMENTS THAT DELAY ANTHESIS IN BRASSICA RAPA SYLVESTRIS (BROCCOLI-RAAB/RABE, "CIME DI RAPA")

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The process of flower opening, known as anthesis, plays a crucial role in determining the nutritional and sensory qualities of species belonging to the *Brassicaceae* family, such as broccoli-raab (*Brassica rapa* subsp. *sylvestris*). Controlling the timing of anthesis is in fact important to ensure climate adaptation and to preserve the shelf life of both fresh and packaged produce. Recent research has unraveled some genetic and metabolic mechanisms of anthesis, primarily targeted to the model brassica *Arabidopsis thaliana*, bringing up that changes in both primary and secondary metabolisms, as well as in the Gibberellic and Jasmonic acid pathways, are essential for flower opening initiation. Essential oils have been successfully used in pest and disease management, but their effects on plant development are still poorly explored. In this study, the lavender (*Lavandula officinalis*) oil was ascertained to delay anthesis in both Arabidopsis and broccoli-raab by optimized dosages, which did not alter floret morphology in greenhouse and field conditions. As for broccoli-raab, the variation of metabolite composition of florets and leaves was analyzed by non-targeted nuclear magnetic resonance (NMR) approach together with floret gene expression analysis by RNA sequencing (RNA-Seq) conducted at 24

hours after treatment. The NMR profiles discriminated the treatment effects on leaves from those on florets; overall, contents of primary metabolites (amino acids, carbohydrates, and carboxylic acids) were lower than controls in both tissues, suggesting the interference with overall energy metabolism, while the specific increase of some glucosinolate (GLS) levels occurred in treated florets. The transcriptomic analysis showed that 498 and 41 floret genes were respectively down and up regulated compared to controls; the former included amino acid and sugar transporter genes involved in primary metabolism, consistently with the metabolic profiles, and some key regulators of pollen development. Overall, these results show that lavender oil treatments can affect the primary metabolism, which may subsequently interfere with the full maturation of floral elements associated to flower opening. Finally, a few GLS biosynthesis genes were up-regulated in agreement with the higher contents of treated florets, suggesting that lavender oil might have a positive effect on flavor as well as on plant defense mechanisms, though further studies are required to test this hypothesis.

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