New Insights into Ethylene and Auxin Interplay during Tomato Ripening

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Abstract : Plant hormones are long known to be tightly associated with fruit development and are involved in controlling various aspects of fruit ripening. For fleshy fruits, ripening is characterized for changes in texture, color, aroma and other parameters that markedly contribute to its quality. Ethylene is one of the major players regulating the ripening-related processes, but emerging evidences suggest that auxin is also part of this dynamic control. Thus, the aim of this study was providing new insights into the auxin role during ripening and the hormonal interplay between auxin and ethylene. For that, tomato fruits (Micro-Tom) were collected at mature green stage and separated in four groups: one for indole-3-acetic acid (IAA) treatment, one for ethylene, one for a combination of IAA and ethylene, and one for control. Hormone solution was injected through the stylar apex, while mock samples were injected with buffer only. For ethylene treatments, fruits were exposed to gaseous hormone. Then, fruits were left to ripen under standard conditions and to assess ripening development, hue angle was reported as color indicator and ethylene production was measured by gas chromatography. The transcript levels of three ripening-related ethylene receptors (LeETR3, LeETR4 and LeETR6) were evaluated by RT-qPCR. Results showed that ethylene treatment induced ripening, stimulated ethylene production, accelerated color changes and induced receptor expression, as expected. Nonetheless, auxin treatment showed the opposite effect once fruits remained green for longer time than control group and ethylene perception has changed, taking account the reduced levels of receptor transcripts. Further, treatment with both hormones revealed that auxin effect in delaying ripening was predominant, even with higher levels of ethylene. Altogether, the data suggest that auxin modulates several aspects of the tomato fruit ripening modifying the ethylene perception. The knowledge about hormonal control of fruit development will help design new strategies for effective manipulation of ripening regarding fruit quality and brings a new level of complexity on fruit ripening regulation.

Keywords : ethylene, auxin, fruit ripening, hormonal crosstalk
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