BIOSYNTHETIC ORIGIN OF ABSCISIC ACID IN RIPENING AVOCADO FRUIT

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ABSTRACT

Mesocarp of ripening avocado fruit incorporated label from [2-^{14}C]mevalonolactone, [1-^{14}C]acetic acid, [1-^{14}C]glucose and [1-^{14}C]pyruvate into ABA, although incorporation from mevalonolactone was significantly higher. Inhibition of the mevalonate pathway at the HMGR level using mevastatin reduced incorporation from acetate and MVL, while increasing incorporation from pyruvate and glucose. The carotenoid biosynthesis inhibitors AMO 1618 (inhibitor of lycopene cyclase) and fluridone (inhibitor of phytoene desaturase) both decreased incorporation of MVL into ABA, while the plant growth regulators ancymidol (inhibitor of GA synthesis and cytochrome P450) and jasmonic acid (senescence stimulator reducing the carotenoid content of plants) both increased incorporation of MVL into ABA. Tungstate was found to reduce incorporation from all four substrates into ABA, although more significantly from MVL and acetate. Further investigation revealed that the tungstateinduced decrease in MVL incorporation into ABA occurred concomitantly with increased label incorporation into XAN. Cobalt, an inhibitor of ACC oxidase and therefore of ethylene production, increased incorporation of MVL into ABA. Nickel had a similar effect. Analysis of the methyl ester of ABA extracted from avocado mesocarp supplied with either [1-^{13}C]acetic acid or [1-^{13}C]glucose revealed incorporation of label from acetate consistent with formation of ABA *via* the acetate/mevalonate pathway whereas glucose was incorporated *via* the triose phosphate pathway of isopentenyl pyrophosphate formation. Methane, positive ionchemical ionisation-mass spectrometry of the *cis,trans* and *all-trans* isomers of ABA indicated more intense labelling of *trans,trans-ABA,* irrespective of substrate used. These results indicate that *trans,trans* and *cis,trans*-ABA are derived by different pathways and that ABA is formed in avocado by both the mevalonate and nonmevalonate pathways of isopentenyl diphosphate synthesis.