Endogenous Biosynthetic Precursors of (+)-Abscisic Acid. I. Incorporation of Isotopes From $^{2}H_2O$, $^{18}O_2$ and [5-^{18}O]Mevalonic Acid

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Abstract

RS-[5-^{18}O]mevalonolactone has been synthesised and fed as the free acid via the transpiration stream or through the roots to tomato seedlings, to avocado fruit just prior to the climacteric, to cultures of the hyphomycete, *Cercospora rosicola*, to excised barley embryos and to an excised barley embryo cell-free system. Small amounts of ^{18}O from [5-^{18}O] mevalonolactone were detected in the abscisic acid from tomato plants and from the barley cell-free system but the mechanism involved is unclear. No ^{18}O was detected in abscisic acid from the other tissues.

Mass spectrometry of the pentafluorobenzyl derivative of abscisic acid extracted from tomato plants that had been waterlogged in $^{2}H_2O$ (55 atom %) for 8 or 9 days showed that 40-47% was unlabelled or contained just one ^{2}H atom. The remainder was seen as an envelope of peaks containing from two to 17 ^{2}H atoms. When plants waterlogged in $^{2}H_2O$ were subsequently wilted in an atmosphere, 80-90% of the multiply deuteriated abscisic acid was also labelled with ^{18}O while only 43% of the mono/undeuteriated abscisic acid was so labelled. By saponification and re-analysis it was shown that most of the ^{18}O, in the multiply deuteriated category of abscisic acid, was present in the carboxyl group. In the mono/undeuteriated abscisic acid a maximum of 50% was labelled with an ^{18}O atom in the carboxyl group. These experiments led to the conclusion that there were two precursor pools involved in abscisic acid biosynthesis and that neither of these pools consisted of carotenoids.

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