

ABSTRACT

This study investigates the biochemical interrelationship between the C₁₃ alcohol vomifoliol and its sesquiterpenoid structural relative abscisic acid (ABA), both of which are known to possess powerful antitranspirant properties.

Using gas-liquid chromatography, a search for plant systems capable of synthesising vomifoliol led to the identification of four new sources of the natural product vomifoliol. These sources were leaves and stems of Croton linearis Jacq, Eichornia crassipes Mart Solms, Murraya paniculata (L) Jack, and Blighia sapida Konig.

By exploiting the standard methods for synthesising ABA, dehydrovomifoliol and vomifoliol, the isotopically labelled analogues were prepared. These were [³H₃] and [³H₆]- ABA, [1,3-¹⁴C]- dehydrovomifoliol and [2-¹⁴C], [³H₃] and [³H₆]- vomifoliol.

The biochemical experiments were conducted in three different plant systems; twigs of Blighia sapida, mesocarp tissue of Persea americana, and seedlings of Phaseolus vulgaris.

The first system (Blighia sapida), when supplied with [2-¹⁴C]- mevalonic acid converted it to vomifoliol. This system also biosynthesised vomifoliol from ABA.

In the second system (Persea americana), [1,3-¹⁴C]- dehydrovomifoliol and [³H₃]- vomifoliol, like [2-¹⁴C]- mevalonic acid, were all found to be precursors of ABA. Of these three precursors, dehydrovomifoliol was the most efficiently incorporated into ABA and vomifoliol the least.

Under sterile conditions, the third system (Phaseolus vulgaris) was unable to biosynthesise ABA from vomifoliol, or vomifoliol from ABA. However under non-sterile conditions, both biochemical pathways were activated. Thus vomifoliol was converted into the products ABA and dehydrovomifoliol, and conversely, ABA was converted into dehydrovomifoliol and vomifoliol. For both pathways, the precursor was converted more efficiently into dehydrovomifoliol than to the other product. The biosynthesis of ABA from vomifoliol was more efficient in waterstressed seedlings than in turgid ones. These results suggest that a reversible equilibrium exists between ABA and vomifoliol with dehydrovomifoliol being the intermediate.

Preliminary investigations of the photochemistry of vomifoliol led to identification of a novel isomer of vomifoliol, 4-(1',2'-epoxy-2',6',6'-trimethyl-1'-cyclohexan-4-one)-2-cis-butenol.

The first synthesis of roseoside, the naturally occurring β -D-glucoside of vomifoliol is also reported.