

Title Biological activities of tropolone and hinokitiol: the tools in plant physiology and their practical use

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Abstract

Hinokitiol (β -thujaplicin) is a tropolone-related compound that is present in the heartwood of several Cupressaceae trees, such as *Chamaecyparis obtusa*, *Thuja plicata*, *Thujopsis dolabrata* var. *hondai*, *Hiba arborvitae*, *Cupressus lusitanica*. Tropolone and some hinokitiol-related compounds have a strong inhibitory activity on plant growth and are known to have antimicrobial and insecticidal activity. Strong antifungal activity and broad antimicrobial spectrum of tropolone and hinokitiol have led to their wide utilization in agriculture, clinical products, cosmetics and other areas. The mechanism of the antimicrobial and insecticidal activity of tropolone and hinokitiol is unknown but it was well documented that tropolone greatly inhibited polyphenol oxidase. Tropolone and hinokitiol decreased ethylene production in young excised peach seeds. In case of wounded winter squash mesocarps both tropolone and hinokitiol inhibited ethylene production through suppression of 1-aminocyclopropane-1-carboxylate (ACC) synthase and oxidase. Tropolone and hinokitiol are known as chelating agents and form complexes with iron. Tropolone considerably delayed wilting of cut roses, *Dendranthema grandiflora*, *Astilbe* and *Viburnum*, mostly by blockade of wound-induced and bacteria-induced xylem. Tropolone and hinokitiol greatly inhibited the formation of red pigment in wounded scales of *Hippeastrum*; probably as strong inhibitors of polyphenol oxidase block the oxidation of colourless flavans to oxidized red-coloured flavans after wounding. Plant cell cultures derived from *Cupressus lusitanica* can produce low level of hinokitiol. The biosynthesis of hinokitiol in *Cupressus lusitanica* cell cultures can be stimulated by a yeast elicitor, H₂O₂ and methyl jasmonate. Recently, it was found that ethylene and jasmonate pathways interact in mediating hinokitiol production. The role of oxidative stress in production of hinokitiol by *Cupressus lusitanica* suspension culture is also presented.