Title Control of ethylene activity in various plant systems by structural analogues of 1-methylcyclopropene

Author Xuqiao Feng, Akiva Apelbaum, Edward C. Sisler and Raphael Goren

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Abstract

Two structural analogues of 1-methylcyclopropene (1-MCP), 1-ethylcyclopropene (1-ECP) and 1-propylcyclopropene (1-PCP) were found to inhibit ethylene action and thereby the responses to ethylene in various plant systems. When applied prior to exposure to ethylene, the analogues considerably delayed ethylene-induced ripening of avocado and tomato fruits, delayed citrus leaf explants abscission and reversed ethylene-induced swelling and inhibition of elongation in etiolated pea plants. The analogues exerted their effect in a concentration-depended manner, at a range of several parts per million. Of the two analogues, 1-ECP was found in all cases more potent than 1-PCP but less potent then the mother compound 1-MCP. It is proposed that the analogues inhibit ethylene action by competing for the sites of binding on the ethylene receptor, similar to the mode of action suggested for 1-MCP. Findings revealed in this study imply that the competition of ethylene and the analogues for the ethylene site of binding is of a non-competitive nature. The analogues effectively inhibited ethylene action only if applied before the plant material was exposed to ethylene, or in the case of fruits shortly after harvest. Simultaneous application of the analogues and ethylene reduced the inhibitory effect of the analogues. Application of the analogues after exposure to ethylene or after fruit ripening had nullified the inhibitory effect of the analogues. Ripening of fruits, treated with the analogues, was inhibited for a finite period of time after which the fruits ripened normally. This resumption of ripening ability is attributed to presence of free binding sites on the ethylene receptor at the point of recovery from the inhibition. As the analogues are volatile, non-corrosive, non-toxic, odorless compounds and effective at minute concentrations, they can be considered promising candidates for practical use.