

Title Regulation of ethylene biosynthesis in fruits by aminoethoxyvinylglycine and 1-methylcyclopropene

Author Susan Lurie

Citation Stewart Postharvest Review, Volume 1, Number 3, October 2005, pp. 1-8(8)

Keyword aminoethoxyvinylglycine; ethylene; 1-methylcyclopropene; ReTain®; ripening; SmartFresh™

Abstract

Purpose of review: Ethylene is known as the ‘ripening hormone’, although it has additional roles in plant development and responses to biotic and abiotic stresses. Therefore, affecting either the rate of ethylene synthesis or its perception by the fruit tissue will have a major effect on the ripening process. Although ripening is under the control of both developmental signals and ethylene, inhibition of the perception of the hormone in the fruit will slow the ripening process, thereby increasing storage and shelf life of fruits. The main pathway in plants for ethylene biosynthesis begins with methionine which is converted to S-adenosyl methionine (SAM), 1-aminocyclopropane-1-carboxylic acid (ACC) and ethylene in three consecutive reactions catalyzed by the enzymes SAM-synthetase, ACC-synthase and ACC-oxidase, respectively. The purpose of this review is to outline the steps where ethylene synthesis and signaling can be regulated by commercially available external treatments and to discuss what the consequences of these treatments are in various fruits

Recent findings: Inhibitors are known for all three enzymes mentioned above and one inhibitor of ACC-synthase, aminoethoxyvinylglycine, is available as a commercial formulation known as ReTain® and is in use in preharvest orchard applications. Ethylene receptors are membrane bound proteins and when ethylene binds to the proteins a series of phosphorylation reactions are initiated, which activate transcription factors and which in turn activate gene expression. An inhibitor of these receptors, 1-methylcyclopropene is available as a postharvest treatment marketed as SmartFresh™ and is applied as a gas.

Directions for future research: There is room for further research on compounds to modulate both ethylene synthesis and ethylene action, in addition to utilizing the two compounds currently available to examine the role of ethylene in ripening of different fruits.