**Title** Kinetic modeling of ethylene biosynthesis in jonagold apple

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**Citation** Abstracts of 7th International Postharvest Symposium 2012 (IPS2012). 25-29 June, 2012. Putra World Trade Centre (PWTC), Kuala Lumpur, Malaysia. 238 pages.

**Keywords** apple; ethylene

**Abstract**

Although the basic mechanisms of ethylene biosynthesis evolving during ripening of climacteric fruit are well known, their quantitative behavior is still only poorly understood. To enhance this quantitative understanding and to exploit this knowledge for optimizing long term storage of fruit like Malus domestica, a kinetic model of the ethylene biosynthesis in apple was developed. The model is based on the known underlying pathway using experimental data on the intermediates and enzymes involved to calibrate the model.

Experimental data during ripening, CA storage and shelf life was gathered. Fruit from three harvest dates were stored either or not treated with 1-MCP. The effect of harvest time on ethylene production rate were considerable shortly after harvest, but became negligible after long term storage. The suppression of ACC synthase activity during CA storage depended on the picking date. ACC oxidase activity strongly increased during storage, which leads to the conclusion that ACC synthase is the rate limiting step during CA storage. The application of 1-MCP resulted in clear differences in ethylene production rate, enzyme activities and most metabolite concentrations, except for S-adenosyl-L-methionine.

The experimental data was successfully used to calibrate the model incorporating the effects of harvest time, CA storage and shelf life on ethylene biosynthesis. It contains a climacteric switch factor to account for the autocatalytic ethylene response in function of harvest time. To include the effect of 1-MCP an elaboration towards the ethylene signaling pathway was accomplished.