Title Regulation of harvest-induced senescence in broccoli (*Brassica oleracea* var. *italica*) by cytokinin, ethylene, and sucrose

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Abstract

Broccoli (*Brassica oleracea* var. *italica*) deteriorates rapidly following harvest. The two plant hormones ethylene and cytokinin are known to act antagonistically on harvest-induced senescence in broccoli: ethylene by accelerating the process, and cytokinin by delaying it. To determine the level at which these hormones influenced senescence, we isolated and monitored the expression of genes normally associated with senescence in broccoli florets treated with exogenous 6-benzyl aminopurine (6-BAP), 1-aminocyclopropane-1-carboxylic acid (ACC), a combination of 6-BAP and ACC, and sucrose, in the five days following harvest. Exogenous 6-BAP caused both a reduction (Bo*ACO*) and an increase (*BoACS*) in ethylene biosynthetic gene expression. The expression of genes used as senescence markers, Bo*CP5* and Bo*MT1*, was reduced, whereas Bo*CAB1* levels were maintained after harvest in response to exogenous 6-BAP. In addition, the expression of genes encoding sucrose transporters (Bo*SUC1* and Bo*SUC2*) and carbohydrate metabolizing enzymes (Bo*INV1* and Bo*HK1*) was also reduced upon 6-BAP feeding. Interestingly, the addition of ACC prevented the 6-BAP-induced increase in expression of Bo*ACS*, but 6-BAP negated the ACC-induced increase in expression of Bo*ACO*. The culmination of these results indicates a significant role for cytokinin in the delay of senescence. The implication that cytokinin regulates postharvest senescence in broccoli by inhibiting ethylene perception and/or biosynthesis, thus regulating carbohydrate transport and metabolism, as well as senescence-associated gene expression, is discussed and a model presented.