

Comprehensive insight into the chlorophyll degradation mechanism of postharvest broccoli heads under elevated O₂ controlled atmosphere

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Abstract

Postharvest broccoli heads undergo yellowing quickly in unsuitable conditions, which diminishes their quality and commercial value. We investigated the pattern and molecular regulatory mechanism of chlorophyll (Chl) degradation in broccoli under elevated O₂ controlled atmosphere. As results, the 40% O₂ + 5% CO₂ treatment accelerated the Chl degradation and the change in color of postharvest broccoli heads, while the 5% O₂ + 5% CO₂ treatment delayed the yellowing. The results indicated that Chl degradation pattern of postharvest broccoli heads concurrently involved the Pheide *a* oxygenase (PAO)/phyllobilin and oxidative degradation pathways, and the latter might be the dominant pathway of Chl degradation. The regulatory mechanism of elevated O₂ on Chl degradation may be related to its ability to accelerate cell damage and death, destroy the light-harvesting complex II, and promote up-regulation of genes in the PAO/phyllobilin and oxidative degradation pathways. In contrast, low O₂ treatment may down-regulate the expression of Chl degradation-related genes by increasing H₂O₂ content, thus delaying the yellowing of broccoli heads.