

# Pheophytin formation with senescence in stored Japanese bunching onion

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## Abstract

The shelf life of Japanese bunching onion (*Allium fistulosum* L.; JBO genome FF) leaves diminished with yellowing as a consequence of chlorophyll (Chl) degradation, which seems to be the main factor in yellowing of stored JBO leaves. The aim of this study was to investigate pheophytin (Phy) formation as a Chl derivative during Chl degradation in stored JBO leaves. A series of alien monosomic addition lines (AMALs, FF+1A to FF+8A) of JBO, with extra chromosomes from shallot (*A. cepa* L., *Aggregatum* group; genome AA) was used as supportive material to study the formation of Chl *a* derivatives and the activity of Chl-degrading enzymes during storage. Chl contents in FF+3A and FF+5A decreased greatly during storage at 25°C, whereas in FF+4A the reduction in Chl content was the lowest compared to the control, FF. In JBO leaves, during Chl degradation, the presence of Phy *a* was prominent as Chl derivatives, which was not recorded in other horticultural crops. Moreover, the activities of Chl-degrading enzymes, especially Mg-dechelation, also progressively increased during storage at 25°C. The formation of Phy *a* in stored JBO leaves was further investigated. By incubating the reaction mixture of crude enzyme extract and Chl *a*, Phy *a* was formed by Mg-dechelating action. Especial significant was the greater formation of Phy *a* in FF+3A than FF and FF+4A. Electron microscopic observation elucidated the formation of plastoglobules (Pgs) in chloroplasts and its movement from chloroplast to vacuole in JBO. A large number of Pgs in vacuole of FF+3A might relate to the high Phy *a* formation with Chl degradation. These findings suggest that Chl *a* could be degraded in part, through Phy *a*, and the vacuole along with the chloroplast might be important sites for Chl degradation in JBO during storage.