MAM6-2

Characterization of Phytochromes as Autophosphorylating Kinases

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Phosphorylation of a protein often serves as a signal modulation mechanism in the regulation of cellular activities. Plant phytochromes, molecular light switches that regulate various aspects of plant growth and development, are phosphoproteins and also known as autophosphorylating serine/threonine kinases. However, the functional role of phytochrome phosphorylation in the plant light signaling has remained to be answered. Thus, the autophosphorylation and kinase activity of phytochromes were characterized by using a series of purified phosphorylation site-specific and deletion mutant phytochromes. Results showed that the autophosphorylation site of phytochromes was located in the N-terminal extension (NTE) region and the autophosphorylation is important for the protein stability of phytochromes. Kinase domain mapping showed that the domain for phytochrome kinase activities was interestingly located in the N-terminal domain. In addition, possible substrate proteins that be phosphorylated by phytochromes were identified and studied. These results suggest that phosphorylation and dephosphorylation are involved in the regulation of phytochrome-mediated light signaling in plants. In the presentation, the role of phytochrome phosphorylation in plants will be discussed.