

BLUE LIGHT- AND UBIQUITIN-DEPENDENT INFLUENCE ON PHOTOTROPIN 1
ABUNDANCE AND MOVEMENT WITHIN THE PLASMA MEMBRANE.

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Abstract

Phototropism is the ability of a plant to bend in response to directional light. The shoot of a plant exhibits a positive response bending toward the light to optimize solar collection. The roots exhibit a negative response bending away from the light to stabilize the plant and to acquire moisture that accumulates away from direct light. Plants that are more phototropic produce more food and are more drought tolerant. The blue light photoreceptors of the plant that initiate the phototropic response are phototropin 1 and phototropin 2. Phototropin 1 (phot1) initiates phototropism when light is limited and the phototropic response is most critical. In darkness phot1 is randomly distributed at the plasma membrane. In response to high light, phot1 reorganizes into foci at the plasma membrane and is subsequently degraded in the proteasome. Under low light, phot1 remains in random distribution. Our data shows that accumulation into foci may prevent phototropic signaling suggesting a complex model for receptor signaling and desensitization in response to varying rates of light. Furthermore, phot1 is monoubiquitinated in response to low light and polyubiquitinated in response to high light dependent on the substrate adaptor NONPHOTOTROPIC HYPOCOTYL3 (NPH3). In seedlings lacking NPH3, phot1 accumulates into foci under all light conditions suggesting that monoubiquitination prevents receptor desensitization.