THE NPH1 GENE OF *ARABIDOPSIS THALIANA*, A PUTATIVE PHOTORECEPTOR GENE FOR PHOTOTROPISM, ENCODES A SERINE/THREONINE KINASE

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Blue light induces the phosphorylation of a circa 120 kDa plasma membrane protein in a wide range of etiolated seedlings. Physiological and genetic evidence indicate an important role for this protein in phototropism, and studies with mutants suggest it may actually be the photoreceptor. The molecular technique of Amplified Fragment Length Polymorphism (AFLP) was used to isolate the gene for this protein from Arabidopsis thaliana and it was designated NPH1 for Non-Phototropic Hypocotyl. The NPH1 gene has now been cloned and has a deduced protein sequence of 996 amino acids. This protein sequence has all of the conserved motifs found in serine/threonine kinases, as we predicted earlier from biochemical experiments. The sequence also contains two repeated domains of 107 amino acids (that we are currently designating A1 and A2) that share significant homology with a heterogeneous group of gene products from several non-plant organisms: the bat gene product from Halobacterium halobium (34.6 % identical, 47.7 % similar) that regulates the transcription of the gene encoding the bacterial opsin; the nifL gene product from Klebsiella pneumoniae (23.4 % identical, 38.3 % similar) and Azotobacter vinelandii (29.0 % identical, 43.0 % similar), a protein that regulates nitrogenase activity in response to changes in oxygen tension, recently shown to be a flavoprotein in A vinelandii; the product of the wc-1 gene from Neurospora crassa (35.5 % identical, 46.7 % similar), a zinc finger protein essential for all of the N. crassa responses to blue light; and to the N-terminal domain of the elk gene from Drosophila melanogaster (in the eag family) (31.8 % identical, 42.1 % similar) encoding a voltage-gated potassium channel protein (all comparisons made with NPH1
A1; the percentages for A2 are similar). The deduced NPH1 protein is also highly homologous (near 90 % identity) with similar domains in three plant gene fragments (ice plant, pea, and spinach) in GenBank that were obtained by PCR on kinase signature sequences. We are investigating the possibility that the A1 and A2 domains of NPH1 gene may function as redox sensors.