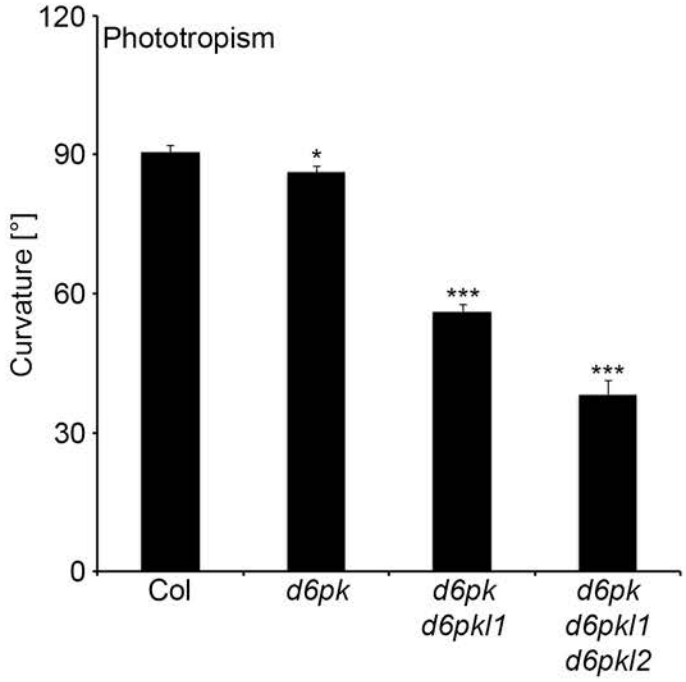
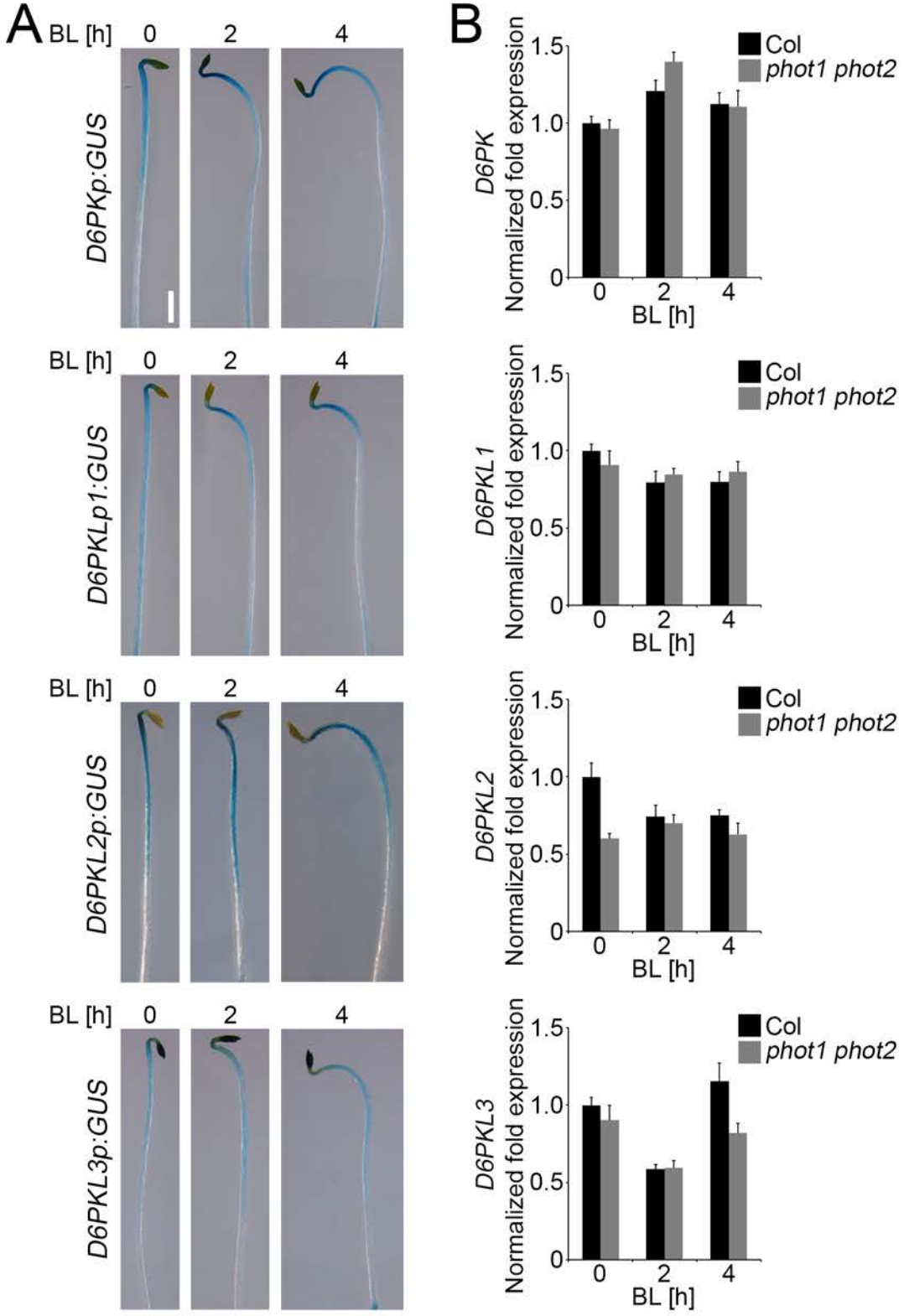
Supplemental Figure 1



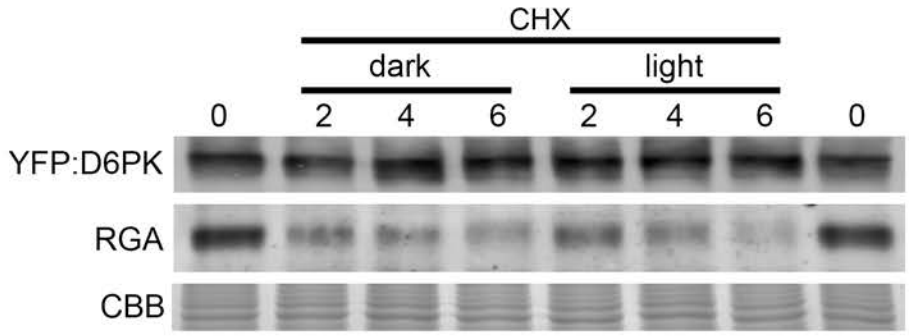
Supplemental Figure 1: Phototropism defects of *d6pk* mutants in weak blue light. Quantification of hypocotyl bending in five-day-old etiolated seedlings that had been exposed for 20 h to unilateral blue light (5 µmol m^{-2} s^{-1}). The graphs show the average and standard error of a representative experiment with at least 24 seedlings. Agravitropically growing seedlings were reoriented towards the gravity vector in safe green light before phototropism response experiments were initiated. Student's t-test, compared to Col: * $0.01<P<0.05$; *** $P<0.001$.

Supplemental Figure 2



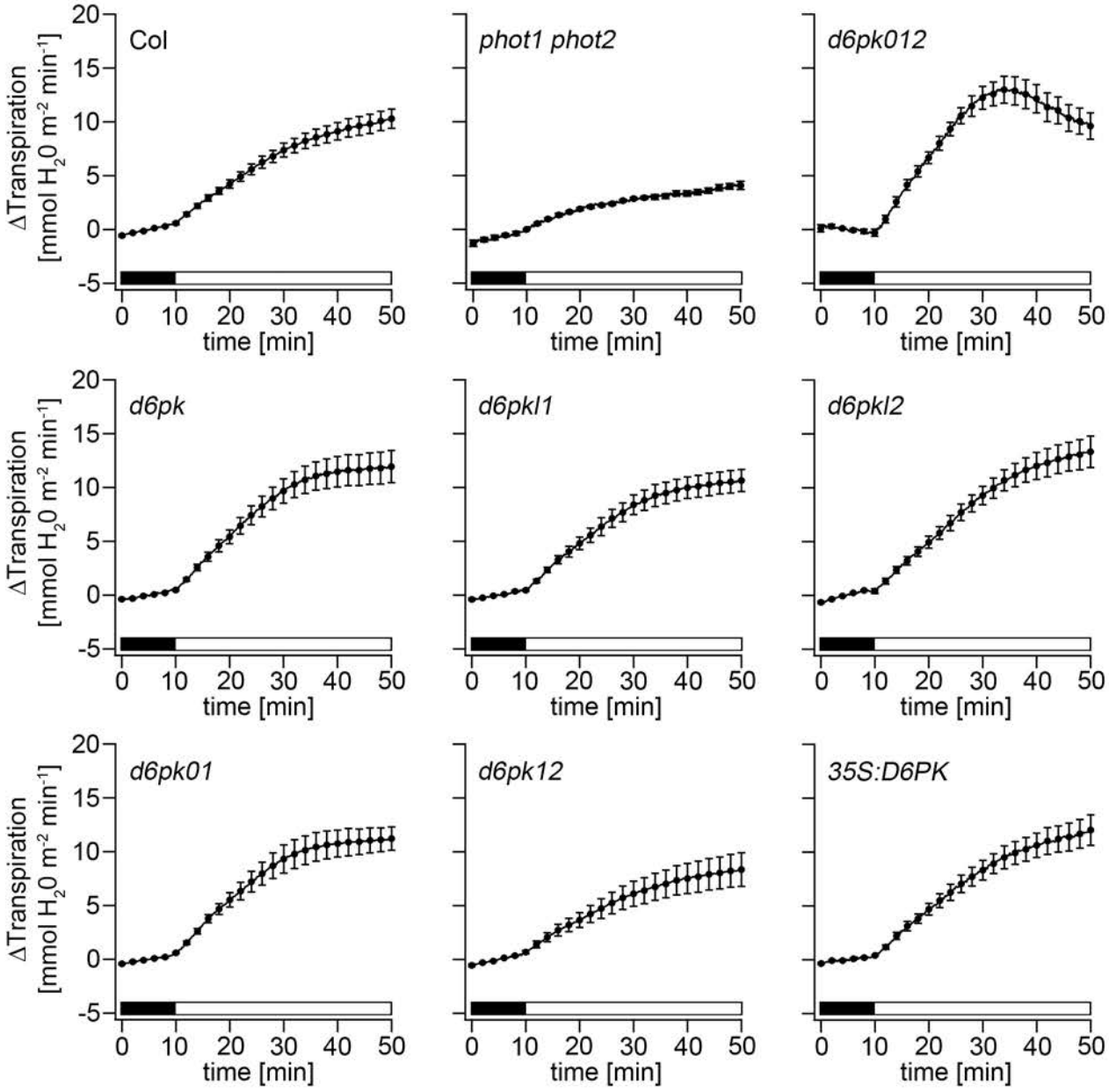
Supplemental Figure 2: Analysis of *D6PK* gene expression in response to blue light irradiation. A. Representative photographs of five-day-old etiolated Arabidopsis seedlings carrying the promoter-GUS transgenes *D6PKp:GUS*, *D6PKL1p:GUS*, *D6PKL2p:GUS* and *D6PKL3p:GUS* before and after exposure to blue light (5 µmol m^{-2} s^{-1}). Scale bar = 1 mm. **B.** qRT-PCR analysis of *D6PK* gene expression before and after exposure to blue light (5 µmol m^{-2} s^{-1}) in the wild type and the *phot1 phot2* double mutant. Data were normalized to the transcript abundance in the dark-grown wild type. The graphs show averages and standard errors.

Supplemental Figure 3



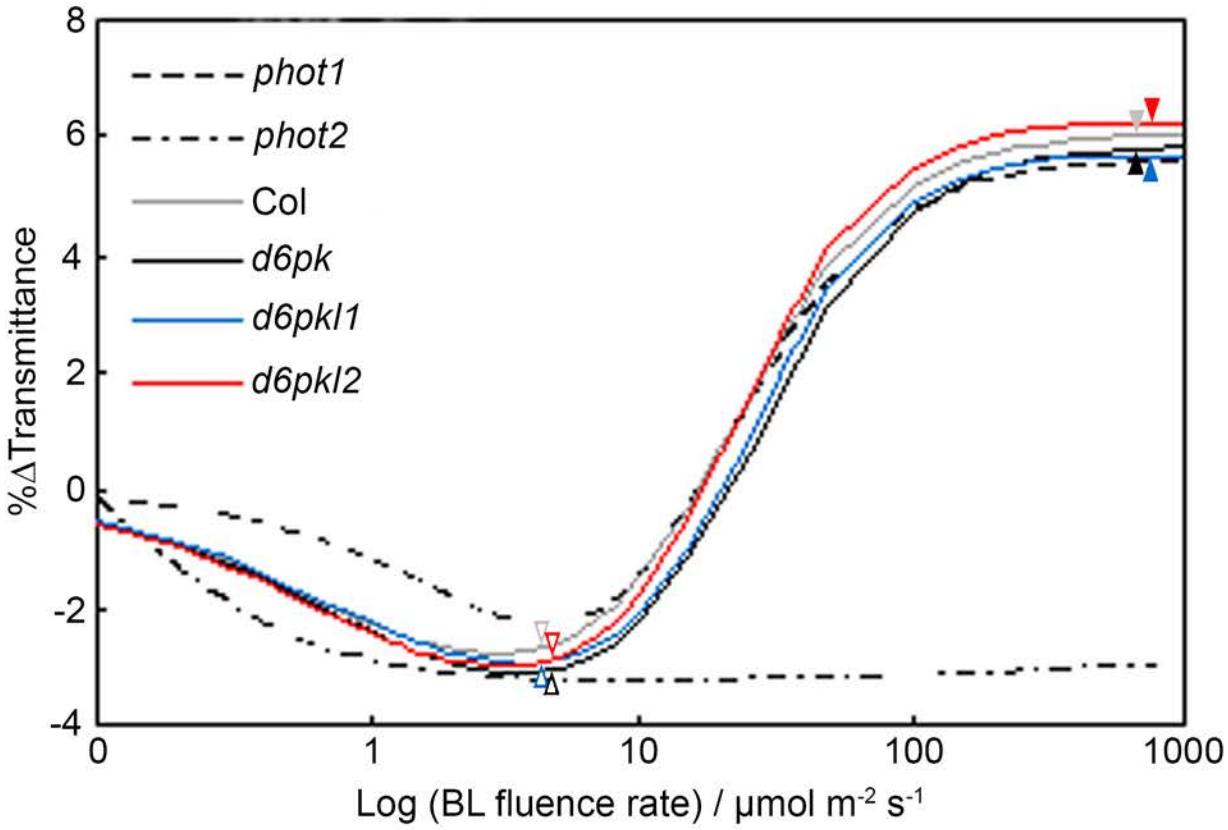
Supplemental Figure 3: Regulation of D6PK stability and abundance in the dark and in the light: Immunoblot of total protein extracts from four-day-old etiolated *35S:D6PK* seedlings that were transferred to medium containing the protein biosynthesis inhibitor cycloheximide (50 µM CHX) in the absence and presence of light (100 µmol m^{-2} s^{-1} white light) for the time points indicated in the Figure. YFP:D6PK was detected with an anti-GFP antibody. The unstable protein REPRESSOR-OF-*ga1-3* (RGA) was detected with an anti-RGA antibody and used as a control for protein turnover (Willige et al., 2007). CBB, Coomassie Brilliant Blue, loading control.

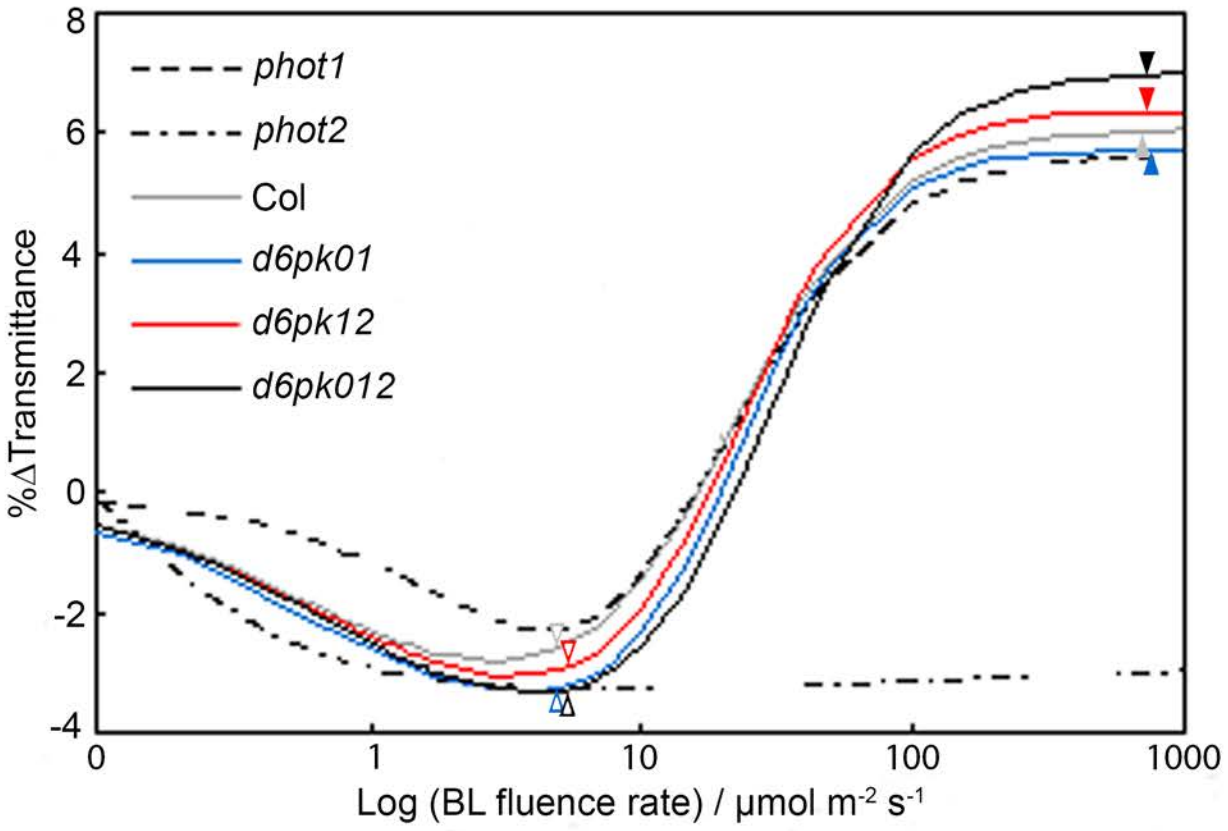
Supplemental Figure 4



Supplemental Figure 4: D6PKs are not essential for stomatal closure. Light-induced transpiration in whole leaves. Plants were grown for 8 to 10 weeks under 200 µmol m^{-2} s^{-1} white light with an 8-hr-light (22°C)/16-hr-dark (16°C) cycle. After overnight dark adaptation, the adaxial side of mature leaves was exposed to 500 µmol m^{-2} s^{-1} red light (black bars) for 60 min and then 25 µmol m^{-2} s^{-1} blue light (white bars) was superimposed for 60 min. Transpiration on the leaf abaxial side was measured over time by infrared gas analysis technique. Graphs show average transpiration levels 10 min before and 0 to 40 min after switching on blue light. Shown is the average and standard error of measurements obtained with 5 - 9 plants.

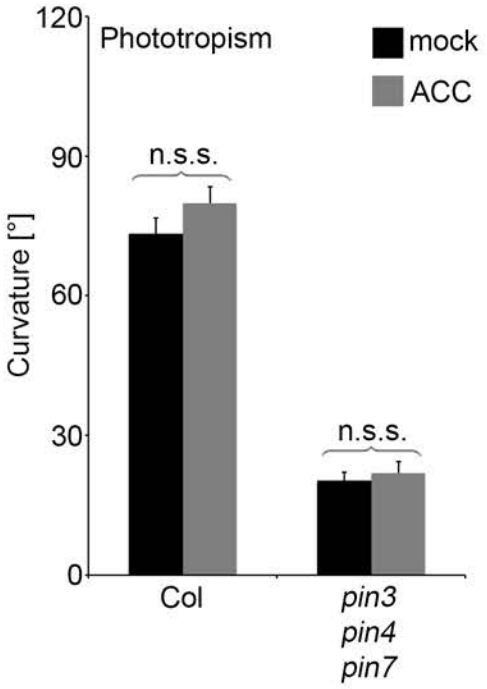
Supplemental Figure 5





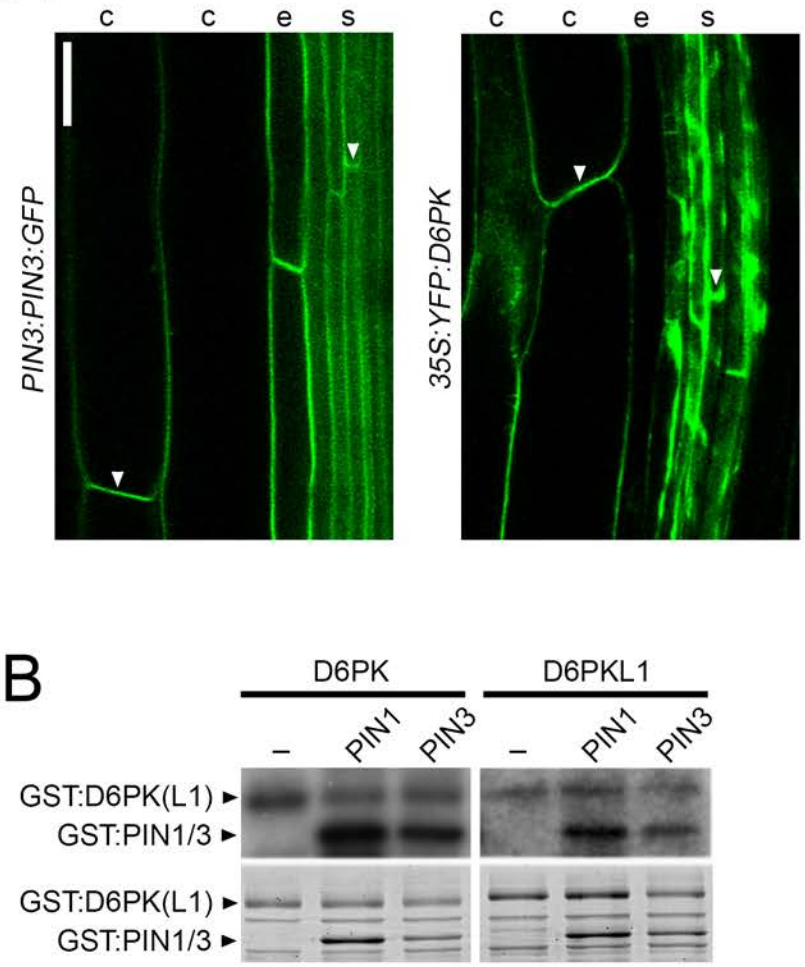
Supplemental Figure 5: Chloroplast relocation does not require D6PKs. Chloroplast movement in *d6pk* mutants. Plants were grown for 6 weeks under 100 to 120 µmol m^{-2} s^{-1} white light at 24°C with a 12-h photoperiod. Leaves were dark adapted for 18 hrs and then exposed to a progressive increase of blue light fluence rate from 0.1 to 120 µmol m^{-2} s^{-1}. Plots show dose-response curves corresponding to the change (in percentage) of red light (RL) transmittance of leaves relative to the average transmittance measured in dark-treated leaves. Data points show the average of at least 9 plants. Arrowheads point at regions of differential chloroplast relocation between the wild type and *d6pk* mutants.

Supplemental Figure 6



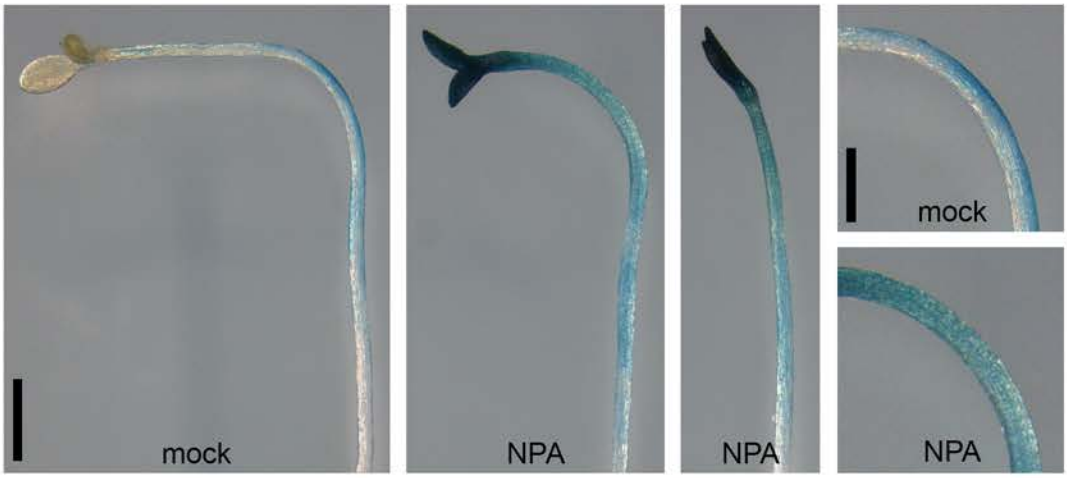
Supplemental Figure 6: Ethylene does not promote hypocotyl bending in *pin3 pin4 pin7* mutants. Quantification of hypocotyl bending in five-day-old etiolated seedlings grown in the absence or presence of 0.2 µM ACC after exposure to unilateral white light (100 µmol m^{-2} s^{-1}). Agravitropically growing seedlings were reoriented towards the gravity vector in safe green light before phototropism response experiments were initiated. Average and standard error were determined from at least 24 seedlings. Student's t-test between indicated samples: n.s.s., not statistically significant.

Supplemental Figure 7



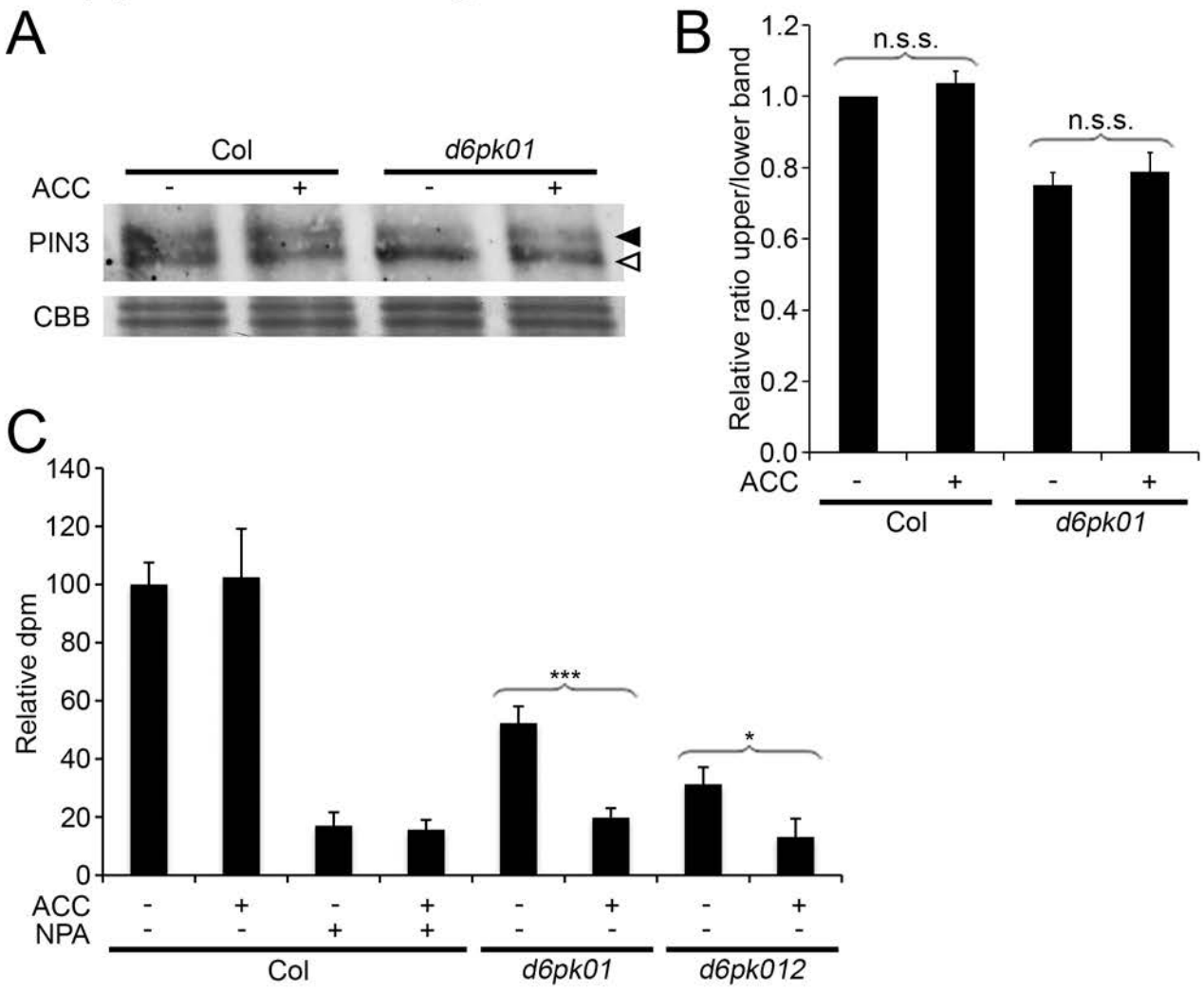
Supplemental Figure 7: D6PK and PIN3 colocalize and PINs are phosphorylation targets of D6PK and D6PKL1 *in vitro*. A. Representative confocal images of hypocotyl cells from transgenic etiolated seedlings expressing the reporter constructs *PIN3:PIN3:GFP* and *35S:YFP:D6PK*. White arrowheads point at the basally localized proteins. Cortex (c), endodermis (e), stele (s). Scale bar = 20 µm. **B.** Recombinant purified GST:D6PK and GST:D6PKL1 phosphorylate the GST-tagged purified cytoplasmic loops of PIN1 and PIN3 *in vitro*. Upper panel, phosphorylation experiment in the presence of radiolabeled ATP; lower panel, CBB stained gel as an input control.

Supplemental Figure 8



Supplemental Figure 8: NPA treatment of *DR5:GUS* seedlings exposed to a phototropic stimulus mimics the *d6pk* mutant phenotype. Representative photographs of five-day-old light irradiated (20 h unilateral white light; 100 µmol m^{-2} s^{-1}) GUS-stained mock and NPA [5 µM]-treated wild type seedlings carrying the auxin response reporter *DR5:GUS*. For the NPA treatment, two seedlings with a differential defect in phototropic bending are shown to reflect the range of phenotypes observed when wild type seedlings were treated with 5 µM NPA (compare also Fig. 4). Scale bar (left panels) = 1 mm; scale bar (right panels) = 0.5 mm.

Supplemental Figure 9



Supplemental Figure 9: ACC treatment does not have obvious effects on PIN3 phosphorylation or basipetal auxin transport. A. Immunoblot with an anti-PIN3 antibody of membrane protein extracts prepared from four-day-old dark-grown seedlings grown in the absence or presence of 0.2 µM ACC. Black arrowhead, upper band, phosphorylated form(s) of PIN3; open arrowhead, lower band of PIN3. CBB, Coomassie Brilliant Blue, loading control. **B.** Ratio of the band intensities between the upper and lower band as determined after densitometric quantification of band intensities from three independent replicate experiments. All measurements are relative to the mock-treated wild type control. The graphs show averages and standard deviations. **C.** Basipetal auxin transport measurements of four-day-old dark-grown seedlings in mock- and ACC-treated wild type and *d6pk* mutants. Average and standard error were determined from at least 12 seedlings. Student's t-test: * 0.01<P<0.05; ** 0.001<P<0.01; *** P<0.001, n.s.s., not statistically significant.

Table S1: List of primers used in this study.

Purpose	Name	Sequence
d6pk-1(SALK_061847) genotyping	D6PK-FW	TGAGAATCATCAACTGTGGAAAC
	D6PK-RV	TTTGGTGATGGAGTTTTGTCC
	Lb1.3	ATTTTGCCGATTTCGGAAC
d6pkl1-1(SALK_056618) genotyping	D6PKL1-FW	ACTCCAGAACCATACTTCGAGGCCAT
	D6PKL1-RV	CATTTCCATGGAAGGAAGGTGATGAGCT
	Lb1.3	ATTTTGCCGATTTCGGAAC
d6pkl2-2(SALK_086127) genotyping	D6PKL2-FW	AGTGACGAGAGTAGCTGCAGC
	D6PKL2-RV	CTTCGCCTTTGATGATCTCTG
	Lb1.3	ATTTTGCCGATTTCGGAAC
d6pkl3-2 (SALK_047347) genotyping	D6PKL3-FW	TAA CAA GCT TCT TCC TCG CTG
	D6PKL3-RV	CCATTAAACGACGAAACATCGAAC
	Lb1.3	ATTTTGCCGATTTCGGAAC
pin3-3 genotyping	MT6	GGAGCTCAAACGGGTCACCCG
	MT7	GCTGGATGAGCTACAGCTATATTC
pin3-4 genotyping	PIN3-4-FW	TGCCACCTTCAATTCAAAAAC
	PIN3-4-RV	TGATTTTCTTGAGACCGATGC
	Lb1.3	ATTTTGCCGATTTCGGAAC
pin3-5 genotyping	PIN3-5-FW	CCCATCCCCAAAAGTAGAGTG
	PIN3-5-RV	ATGATACACTGGAGGACGACG
	Lb1.3	ATTTTGCCGATTTCGGAAC
pin4-101 (GABI N337314) genotyping	CF448	TTATTCAGCCCTGCTGTAGC

	MT12	TCGAATCTTACCGGAGCTGAGA
	GABI Left border	CATTTGGACGTGAATGTAGACAC
pin7-101 (SALK_048791) genotyping	CF450	GATTGAAGTTAGATCCTCTTGG
	CF451	TAGCCATGATCCTCGCTTAC
	Left border	GGCAATCAGCTGTTGCCCGTCTCACTGGTG
pin7-102 (SALK_062056) genotyping	CF450	GATTGAAGTTAGATCCTCTTGG
	CF449	TGATCACATGGCACGACCTG
	Left border	GGCAATCAGCTGTTGCCCGTCTCACTGGTG
D6PK promoter cloning	D6PK promoter ApaI FW	GAGATGGGCCCATTGTTTCTGTTCGATTTAAATGTG
	D6PK promoter XhoI RV	ATCATCTCGAGTAACACAGAGCAATCTTAAACAC
GST:D6PKL1 cloning	D6PKL1-FW	GGGGACAAGTTTGTACAAAAAAGCAGGCTTCATGG CCTCGAAGTATGGTTCTGGA
	D6PKL1-RV	GGGGACCACTTTGTACAAGAAAGCTGGGTCTCAAA AGAAATCGAACTCCAG
qRT-PCR *UBC21*	UBC21 2step-LP	TCCTCTTAACTGCGACTCAGG
	UBC21 2step-RP	GCGAGGCGTGTATACATTTG
qRT-PCR *D6PK*	D6PK 2stp LP	GTCCTGGTGGTGATTTGCAT
	D6PK 2stp RP	AGCACTTCCGCGACATAAAA
qRT-PCR *D6PKL1*	D6PKL1 2stp LP	ACAAGATCTTTCAATCCAAAAGCTA
	D6PKL1 2stp RP	AACACTCAAGATTCAAGGAGCTG
qRT-PCR *D6PKL2*	D6PKL2 2stp LP	TTTGGCAGCGTCAAGACC
	D6PKL2 2stp RP	TGCCAAGACTGCTCGTACC
qRT-PCR *D6PKL3*	D6PKL3 2stp LP	TTCTTGTTTGGTTATGGAGTTTTG
	D6PKL3 2stp RP	AGCAAGAAGAACTTCAGCAACAT