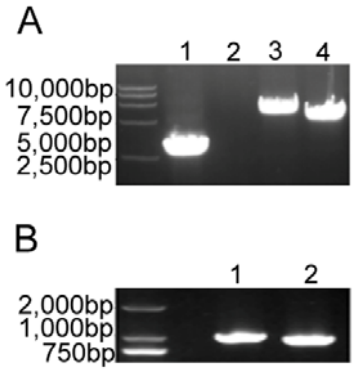
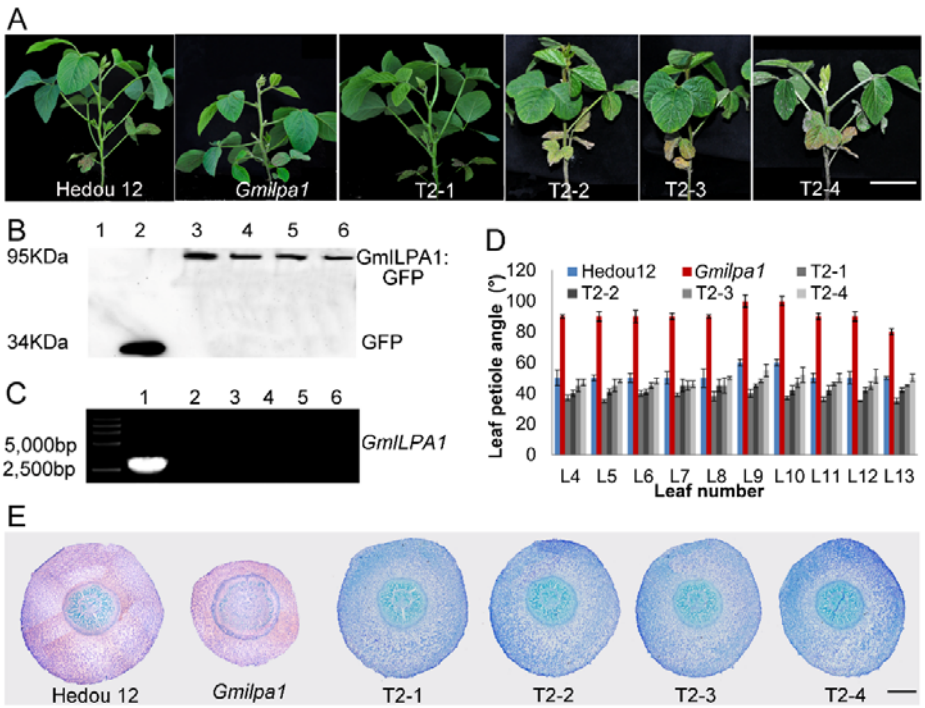
SUPPLEMENTAL MATERIALS

Supplemental Figure S1. Deletion analysis in the *Gmilpa1* mutant.



(A) PCR analysis of the deletion in the *Gmilpa1* mutant. Lanes 1 and 2 were PCR products amplified using primers OL4274&OL4277 (within the deletion) in Hedou 12 and the *Gmilpa1* mutant; lanes 3 and 4 were PCR products amplified using primers OL4274&OL4237 (outside of the deletion) in Hedou 12 and the *Gmilpa1* mutant. **(B)** Transcript analysis of *GmILPA1* and *Gmilpa1* using primers OL4352&OL1250 in Hedou 12 (lane 1) and the *Gmilpa1* mutant (lane 2).

Supplemental Figure S2. Identification of transgenic plants.



(A) Hedou 12, the *Gmilpa1* mutant and T_2 plants of four transformation events with the *GmILPA1* transgene at the V7 stage. Scale bar, 10 cm.

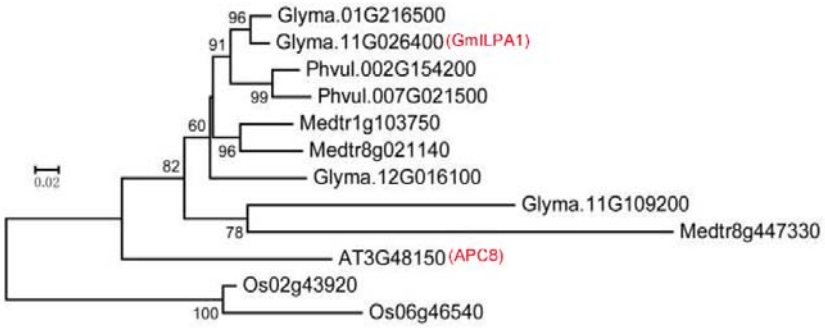
(B) Immunodetection of GFP levels in the *Gmilpa1* mutant (lane 1), *Pro35S:GFP* transgenic plants (lane 2), and *Gmilpa1* T_2 plants with the *GmILPA1-GFP* transgene (lane 3 to lane 6).

(C) PCR analysis of genomic *GmILPA1* using primers OL4274&OL4277 (within the deletion) in Hedou 12 (lane 1), the *Gmilpa1* mutant (lane 2) and *Gmilpa1* T_2 plants with the *GmILPA1-GFP* transgene (lane 3 to lane 6). OL4277 located in the 3' UTR region of *Glyma.11G026400.1* (which was not included in the transgene).

(D) LPAs of the 4th to 13th leaf of Hedou 12, the *Gmilpa1* mutant and four transformation event plants. LPAs are shown as averages ± standard errors of the means from 12 different plants.

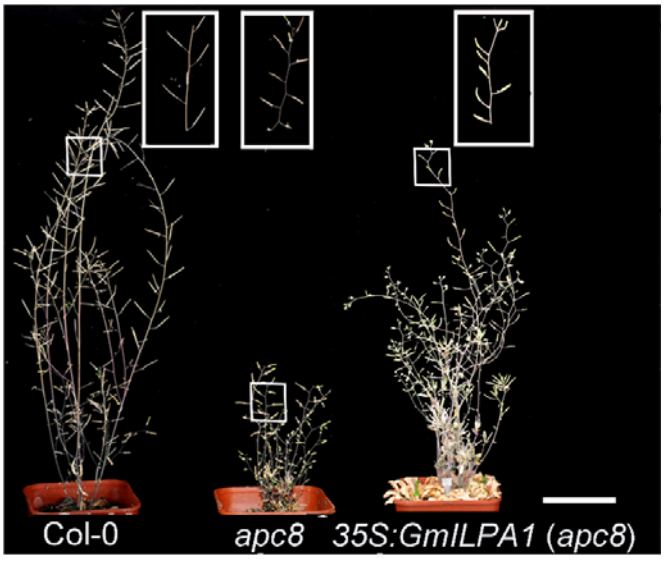
(E) Anatomical structure of the pulvini of 6-week-old Hedou 12, the *Gmilpa1* mutant and four transformation event plants. Scale bar, 400 μm.

Supplemental Figure S3. Phylogeny analysis of APC8-like proteins.



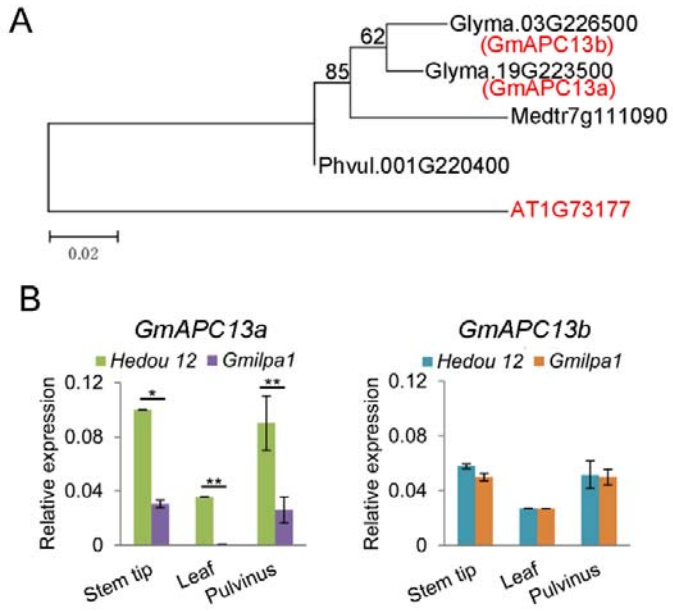
Neighbor-joining phylogenetic tree of APC8-like proteins. One homologous gene in *Arabidopsis*: *At3G48150*; two homologous genes in *O. sativa*: *Os02g43920* and *Os06g46540*; two homologous genes in *P. vulgaris*: *Phvul002G154200* and *Phvul007G021500*; three homologous genes in *M. truncatula*: *Medtr8g447330*, *Medtr8g021140* and *Medtr1g103750*; four homologous genes in *Glycine max*: *Glyma.01G216500*, *Glyma.11G026400*, *Glyma.11G109200*, *Glyma.12G016100*. Branches with bootstrap support 1000 replicates.

Supplemental Figure S4. Phenotypes of *Arabidopsis* wild type (Col-0), the *apc8* mutant, and the *35S:GmILPA1* T2 transgenic plants in the *apc8* background.



Scale bar, 5 cm. Boxes in the top right corner illustrate part of plants magnified 2X.

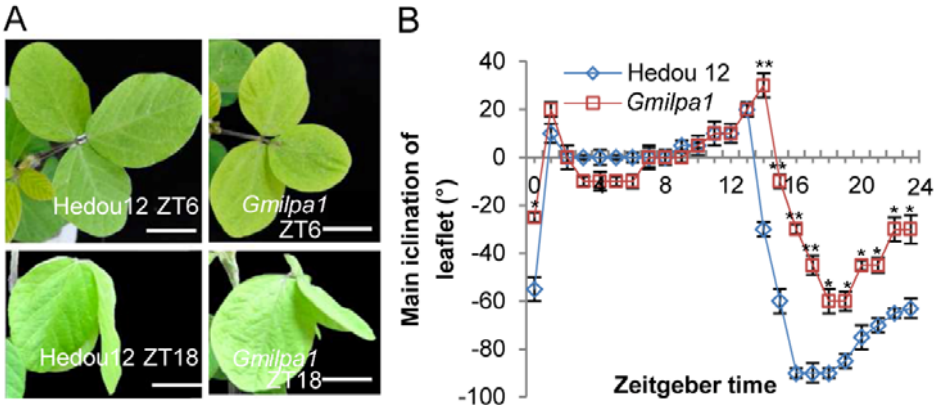
Supplemental Figure S5. Phylogeny analysis of APC13-like proteins and expression patterns of *GmAPC13a* and *GmAPC13b*.



(A) Neighbor-joining phylogenetic tree of APC13-like proteins. Branches with bootstrap support 1000 replicates.

(B) Expression levels of *GmAPC13a* and *GmAPC13b* in apical stem tips, leaves, and pulvini at the V5 stage in Hedou 12 and the *Gmilpa1* mutant. Expression levels are shown as means ± standard errors of the means from four biological replicates. **P <0.01, *P <0.05 (t-test).

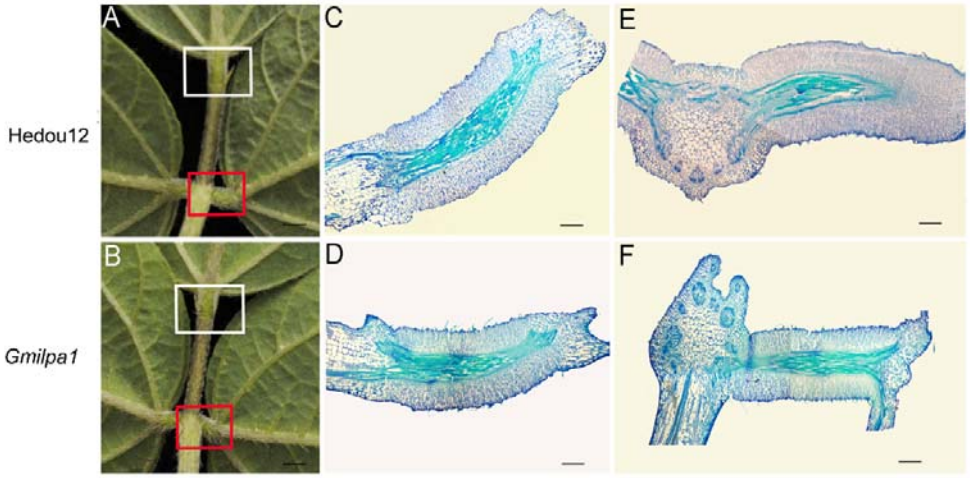
Supplemental Figure S6. Leaflet nyctinastic movement in Hedou 12 and the *Gmilpa1* mutant.



(A) Trifoliate leaves of Hedou 12 and the *Gmilpa1* mutant at ZT6 and ZT18. Scale bars, 1.5 cm. ZT, Zeitgeber time.

(B) Nyctinastic movement of leaflets in Hedou 12 and the *Gmilpa1* mutant. Angles are shown as means ± standard errors of the means from 12 different plants. **P <0.01, *P <0.05 (t-test).

Supplemental Figure S7. Anatomical structure of the pulvinulus in Hedou 12 and the *Gmilpa1* mutant.



(A) and **(B)** Pulvinulus on the inverse of leaves in 6-week-old Hedou 12 and the *Gmilpa1* mutant, respectively. Scale bars, 6 mm.

(C) and **(D)** Longitudinal section of the middle pulvinulus (in white boxes of A and B) in Hedou 12 and the *Gmilpa1* mutant, respectively. Scale bars, 500 μm.

(E) and **(F)** Longitudinal section of the lateral pulvinulus (in red boxes of A and B) in Hedou 12 and the *Gmilpa1* mutant, respectively. Scale bars, 500 μm.

The pulvinulus of the *Gmilpa1* mutant (D and F) was smaller than that of Hedou 12 (C and E), in particular, there were fewer and smaller motor cells in the *Gmilpa1* mutant than in Hedou 12.

71 **Supplemental Table S1.** Primers used in this study.

Primers	Illustration	Locus	Forward sequence 5'→3' Reverse sequence 5'→3'
MOL1397	Marker	Chr11: 1696485	GCTTTGGTTCGGAGGTTTG GATAGCTGACGGAGGTCAAGAG
MOL1439	Marker	Chr11: 1726926	CGAAGGAGACACATATATAATACCAGTCGA GGCCTGGAGATTCTGGCATT
MOL1435	Marker	Chr11: 1738185	TTAGTAGCTTTGGTGTGGCAATCGA CCAATGCCTTTGTGGAACTTTACT
MOL0257	Marker	Chr11: 1741407	CCACGATTATAAATAGCAGACAGGATC GACCCTCACCGTTGGGAAGC
MOL2385	Marker	Chr11: 1781926	TCTTACTTTGTAGAGGTCGGTGG GTAGTAATATGGTAATTCTCTTAACCCTAA
MOL2387	Marker	Chr11: 1874988	TGATTTCCGGCCATCAAAG AACACATACCTTTATTTCCTACGATG
MOL1233	Marker	Chr11: 1899870	CGAGCATCATTGTAGATTTGTAGTG GCGACTATCATTTTATCCTACGTGA
OL4274	Deletion test	*Glyma.11G026400*	CTTCATTGGCGGGCTACAT -
OL4277	Deletion test	*Glyma.11G026400*	- GATAAGAATTCACCTAATAACGCTTC
OL4237	Deletion test	*Glyma.11G026400*	- GCCGAAAGCATCCAGAAGTC
OL4234	3'RACE	*Glyma.11G026400*	AGTGTAGCCGAAGGCAATGAG -
OL1249	3'RACE	*Glyma.11G026400*	- GACCACGCGTATCGATGTCGACTTTTTTTTTTTTTTTV
OL4352	3'RACE	*Glyma.11G026400*	GGAAGGACCTAAAATGGTTGAGGCT -
OL1250	3'RACE	*Glyma.11G026400*	- GACCACGCGTATCGATGTCGAC
OL4735	q RT-PCR	*Glyma.11G026400*	TTATCGGCTTGGACACTTATGG GCGGGTTCTTCGCACAATC
OL4738	q RT-PCR	*Glyma.11G026500*	CGTCGTTCCTGGCGTCAT AATCACGTGGGTCTATATCTACTGC
OL6555	q RT-PCR	*Glyma.11G026600*	GCCTAGCAGCCCATCAGTT GCCCATTCCTTTATCTTTCCAT
OL6553	*Cons4*	*Glyma.12G020500*	GATCAGCAATTATGCACAACG CCGCCACCATTCAGATTATGT
OL4391	*GmILPA1* CDS	*Glyma.11G026400*	CGAGCTCATGAGTTCCAAAGAGAGT CACCATGGTGGCGACCGGTGGGGGAGGAAAATGCTCAAC
OL4392	*GFP* CDS	-	CTCCCCCACCGGTCGCCACCATGGTGAGCAAGGGCGAG

			TCCCCCGGGTTACTTGTACAGCTCGTC
OL4401	Probe	*Glyma.11G026400*	GAATCTGAAGAAAGGGAAGGACC ACATGTGGATTAAGATCGAAGTGC
OL5984	q RT-PCR *GmAPC13a*	*Glyma.19G223500*	GGCAGAACTGAGTTTGGGAATT TTGTTGCGTCTCCTGATTTGA
OL6556	q RT-PCR *GmAPC13b*	*Glyma.03G226500*	CAGTTTGTTATTCACCAACGTTA CTCAAAGTAAGAGGTTTCAAATTAT
OL4506	*GmILPA1* for pColdTF	*Glyma.11G026400*	CGCATATGATGAGTTCCAAAGAGAG CGAGCTCGGGAGGAAAATGCTC
OL4507	*Gmilpa1* for pColdTF	*Glyma.11G026400-m*	CGCATATGATGAGTTCCAAAGAGAG GTCGACACTAACCTGTTTCAAAT
OL4535	*GmAPC13a* for pGEX-4T-3	*Glyma.19G223500*	ACCCGGGATGGCAGAACTGAGT GGTCGACTTCTTGACCAAAGGCAAG
pGWC-GmAPC8a	*GmILPA1* for pGWC	*Glyma.11G026400*	ATGAGTTCCAAAGAGAGTTGCAGAAG GCGGGAGGAAAATGCTCAACAT
pGWC-Gmapc8a	*Gmilpa1* for pGWC	-	ATGAGTTCCAAAGAGAGTTGCAGAAG GCACTAACCTGTTTCAAATCGAAAG
pGWC-APC13a	*GmAPC13a* for pGWC	*Glyma.19G223500*	ATGGCAGAACTGAGTTTGGGAATT GCTTCTTGACCAAAGGCAAGATC

72