

Fig. S1. Diagrammatic representation of wild type and *pxy* mutant phenotype. (A) Wild-type vascular organisation with oriented vascular cell divisions (dashed lines) in procambium cells (light blue) parallel to the tangential axis of the plant. (B) Localised ligand model of the *pxy* mutant phenotype suggested by Fisher and Turner (Fisher and Turner, 2007). PXY interprets ligand-derived positional information leading to oriented cell divisions in wild type. Failure to interpret positional information in *pxy* mutants results in cell divisions that lack orientation, leading to intercalation of xylem and phloem. (C) Cavity model of the *pxy* mutant phenotype. Differentiation of procambium cells into xylem leads to intercalation of xylem and phloem as cell division ceases in some cell files.

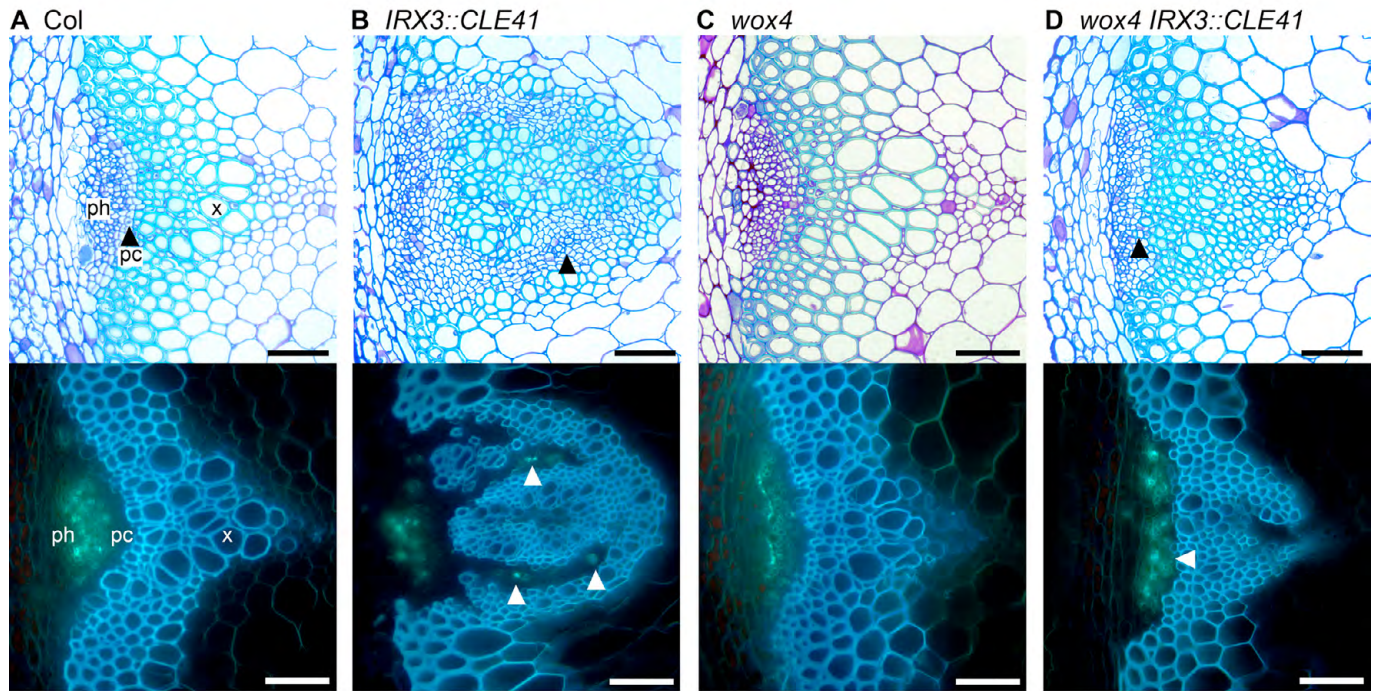


Fig. S2. Inflorescence stem phenotype of *wox4 IRX3::CLE41* lines. (A-D) Transverse sections of vascular tissue from 8-week-old wild-type (A), *IRX3::CLE41* (B), *wox4* (C), *wox4 IRX3::CLE41* (D) plants. Upper panels show Toluidine Blue-stained thin sections. Lower panels are Aniline Blue-stained hand sections viewed under a UV light (sieve plates in phloem fluoresce green). Scale bars: 50 μ m. ph, phloem; pc, procambium (arrowhead in A); x, xylem. Arrowheads in B,D indicate adjacent or intercalated xylem and phloem.

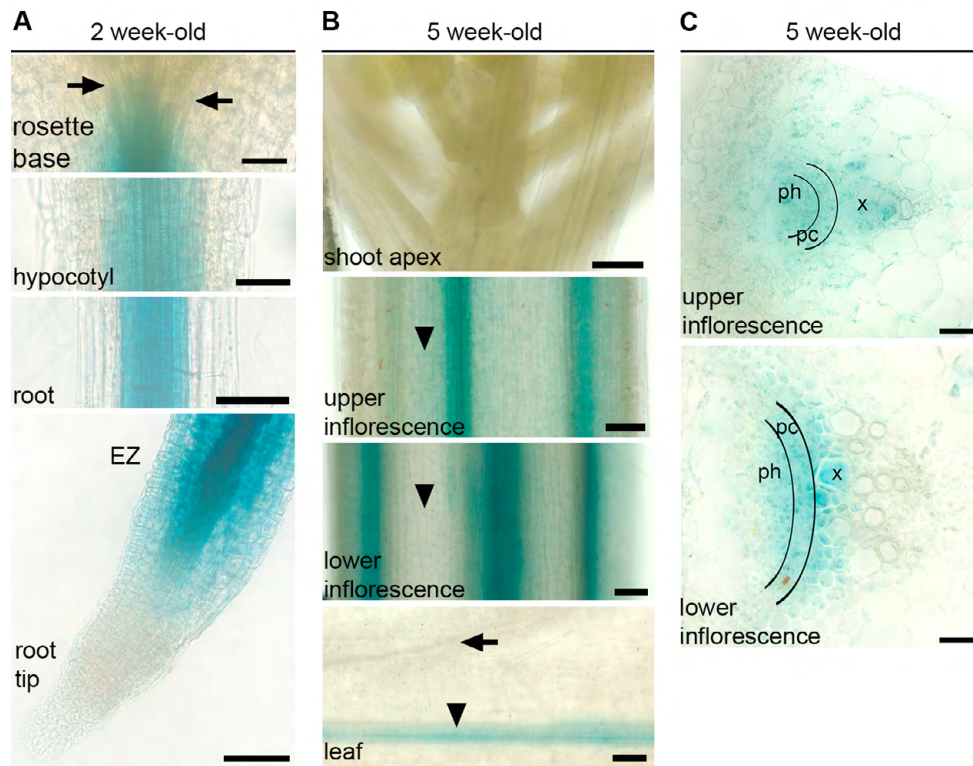


Fig. S3. GUS staining in *WOX14::GUS* plants. (A) Seedling subjected to GUS staining, 2 weeks post-germination. Arrows in upper panel show staining where rosette leaves meet the stem. The root elongation zone (EZ) coincides with initiation of GUS staining in the root (lower panel). (B) Five-week-old *WOX14::GUS* plants subjected to GUS staining. Arrowheads in middle panels mark tissue between inflorescence stem vascular bundles. In the lower panel, the arrowhead marks the midvein of a fully expanded leaf and a secondary vein with no staining is also marked (arrow). (C) Hand sections of *WOX14::GUS* stained stem. Upper panel shows section 2 cm below the shoot apex; lower panel shows section 1 cm above the rosette. The phloem (ph), procambium (pc) and xylem (x) are marked. Scale bars: 100 μ m in A,B; 25 μ m in C.

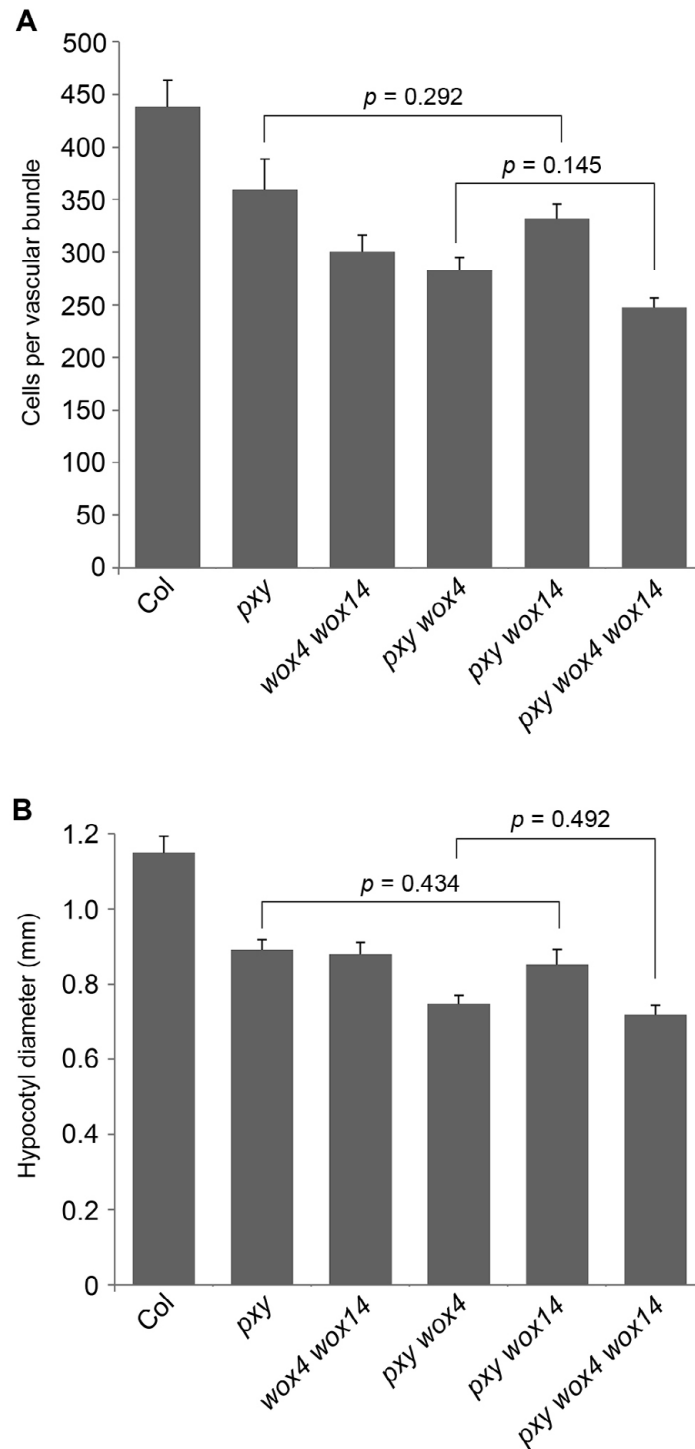


Fig. S4. *WOX14* is epistatic to *PXY*. (A) Mean number of cells per vascular bundle in *pxy wox14* and *pxy wox4 wox14* lines. (B) Mean hypocotyl diameter of *pxy wox14* and *pxy wox4 wox14* plants. In both A and B, *pxy wox14* is unchanged from *pxy*, and *pxy wox4 wox14* shows no difference from *pxy wox4*. *P* values were determined using ANOVA with an LSD post-hoc test. Error bars indicate s.e.m.

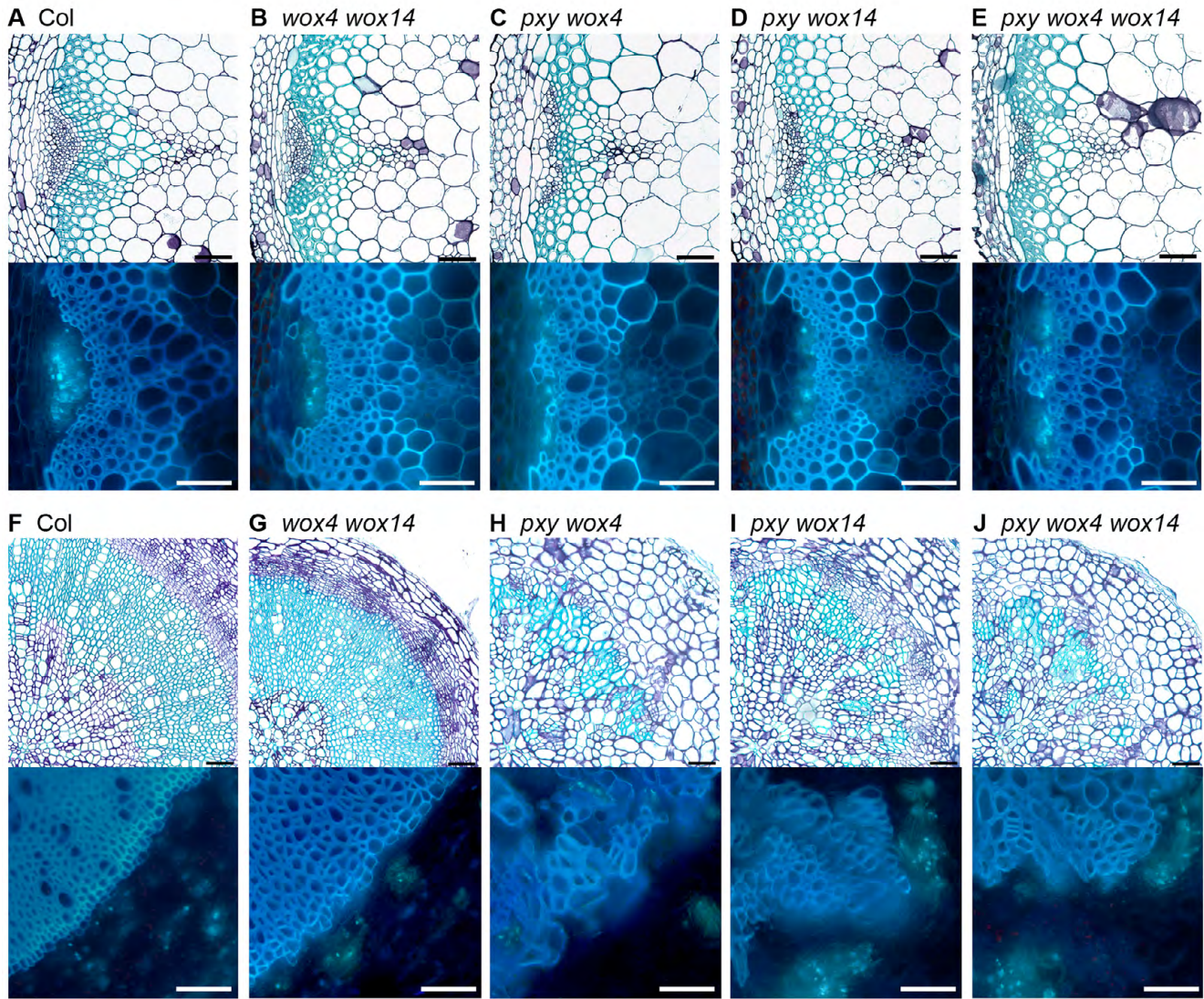


Fig. S5. Phenotype of *pxy vox4 vox14* plants. (A-E) Toluidine Blue-stained thin sections (upper panels); Analine Blue-stained hand sections (lower panels) of Col (A), *vox4 vox14* (B), *pxy vox4* (C), *pxy vox14* (D) and *pxy vox4 vox14* (E) 8-week-old inflorescence stem vascular tissue. (F-J) Toluidine Blue- (upper) and Analine Blue (lower)-stained sections of Col (F), *vox4 vox14* (G), *pxy vox4* (H), *pxy vox14* (I) and *pxy vox4 vox14* (J) hypocotyl vascular tissue. Scale bars: 50 μ m.

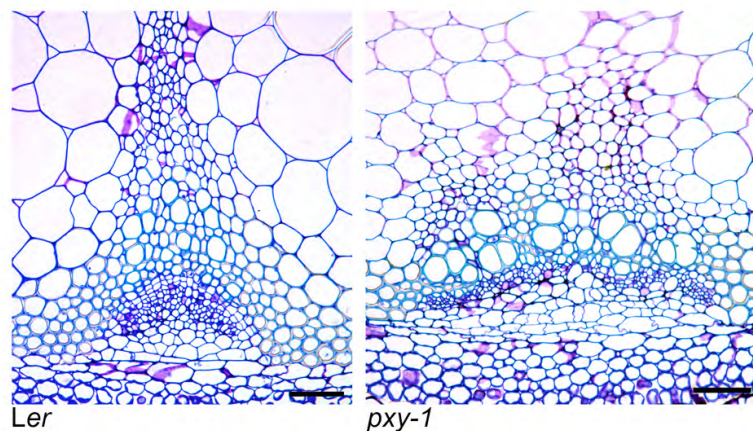


Fig. S6. Phenotype of *pxy-1* *Ler* allele. Vascular bundles from *Ler* (left hand panel) and *pxy-1* (right hand panel). *pxy-1* appears more disrupted than Col *pxy* alleles (compare with Fig. 9A). Scale bars: 50 μ m.

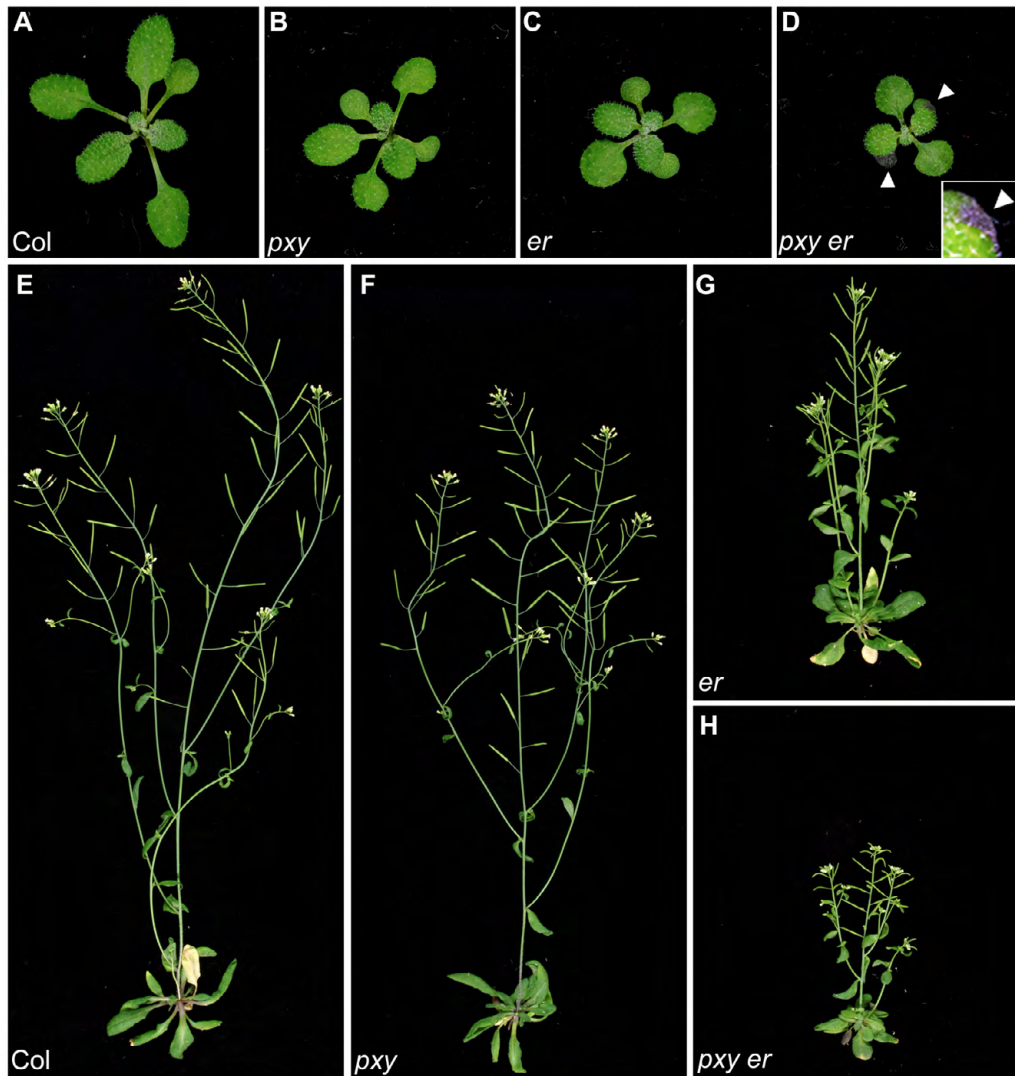


Fig. S7. Morphology of *pxy er* plants compared to single mutants and wild type. (A-D) Rosettes from 3-week old Col (A), *pxy* (B), *er* (C) and *pxy er* (D) plants. Arrowheads in D indicate anthacyanin accumulation in cotyledons (also shown magnified inset). (E-H) Gross morphology of Col (E), *pxy* (F), *er* (G) and *pxy er* (H) 8 week old plants. Scale bars: 50 μ m.

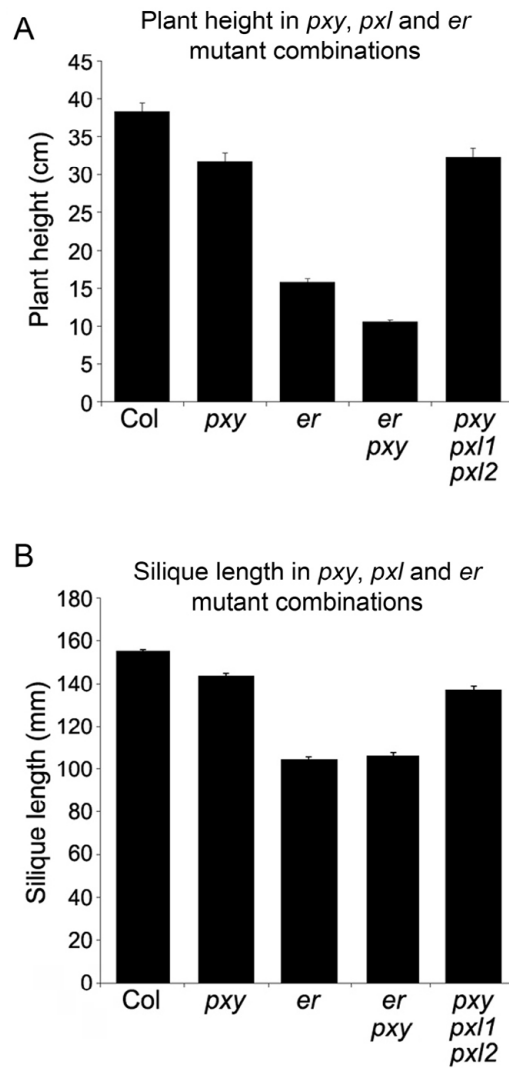


Fig. S8. *pxy er* plant height and silique length. (A) Graph showing mean height of 8 week old Col, *pxy*, *er*, *pxy er* and *pxy pxl1 pxl2* plants. (B) Graph showing mean length of mature Col, *pxy*, *er*, *pxy er* and *pxy pxl1 pxl2* siliques.

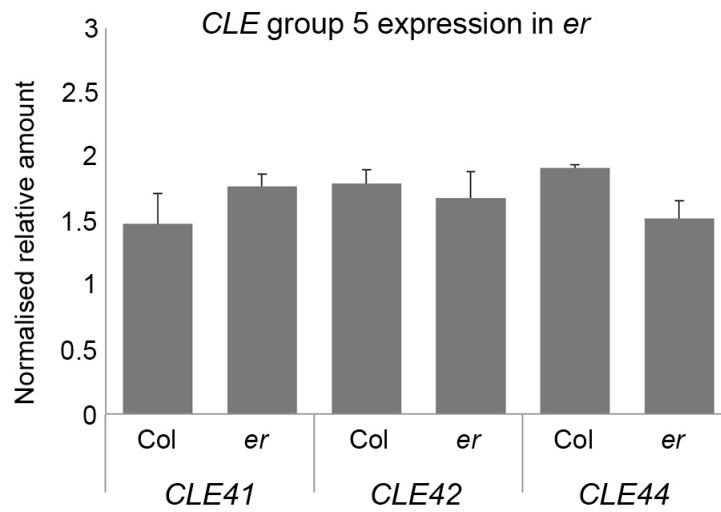


Fig. S9. *CLE41*, *CLE42* and *CLE44* expression in wild type and *er* mutants. qRT-PCR showing *CLE41*, *CLE42* and *CLE44* inflorescence expression normalised to *ACT2* in 5-week-old Col and *er* plants. Samples were measured in technical triplicates on biological triplicates. Error bars indicate s.e.m.

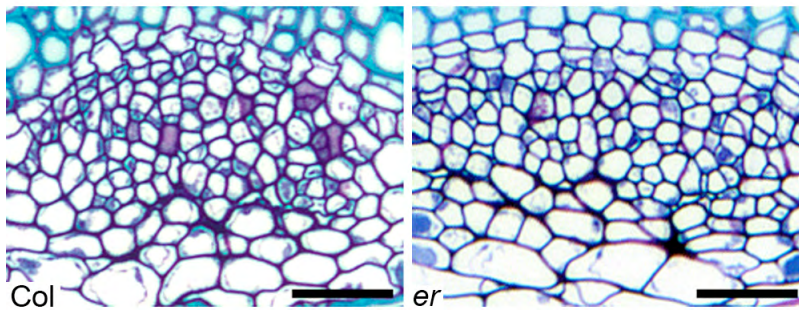


Fig. S10. Wild-type and *er* phloem are indistinguishable. Wild type (LHS) and *er* (RHS) phloem.

Table S1. Oligonucleotides used in this manuscript

Oligo name	Oligo sequence
GENOTYPING	
Salk_LBa1	TGGTTCACGTAGTGGGCCATCG
GABI-LB	ATATTGACCATCATACTCATTGC
pxy-3f	CCCCACACAAAAACCATAATG
pxy-3r	AAAAATCGAGAAGCTTGAGGG
pxy-5f	GGCATTGTGTGATTTGGTTTC
pxy-5r	AGCTGCTGGAATCTCTCCTTC
wox4-1 LP	TTTTTAGCGTGGTTCATGTCC
wox4-1 RP	CATTTTTCCCTTCGATTTTCC
GK-wox14-F	TGAATACCGTCGACCAAAATC
GK-wox14-R	GAAGCTGTGTTGAAGTCGGAG
IRX3prom-F	TGAGAGAGACCTGCAAAGGA
CLE41R-IRX3promComp	TTCGAGGAGAACCCTCTTGA
QUANTITATIVE RT-PCR	
qRT-wox4f	TCACGACCACTGGTGTCTTT
qRT-wox4r	CCCAGCTCCTACATGTCCTC
qRT-WOX14F	AAACGAAAGCAGCCTCAAAC
qRT-WOX14R	CCCTGAATCTCCACAACCTC
qCLE41f	TCAAGAGGGTTCTCCTCGAA
qCLE41r	TGTGCTAGCCTTTGGACGTA
qCLE42f	ACTTCGCCTGAAGGGAAAAG
qCLE42r	ATTGGCACCGATCATCTTTC
qCLE44f	TTTGGACCACTTGGAACCTC
qCLE44r	ACGCAGTGGCACTTCTTCTT
qACT2f	GCCATCCAAGCTGTTCTCTC
qACT2r	ACCCTCGTAGATTGGCACAG
18s rRNAf	CATCAGCTCGCGTTGACTAC
18s rRNAr	GATCCTTCCGCAGGTTCAC
CLONING	
WOX14promF	CACCAAAGGTGCTGCTAAAGA
WOX14promR	TGAACAAGACAATGAGAAAGTGAA
WOX14probeF	TACGCCGTTATTTGTGACCA
WOX14probeR	GCCTGACCATTAGCTGTCGT