Supporting Information

Meng et al. 10.1073/pnas.1119864109

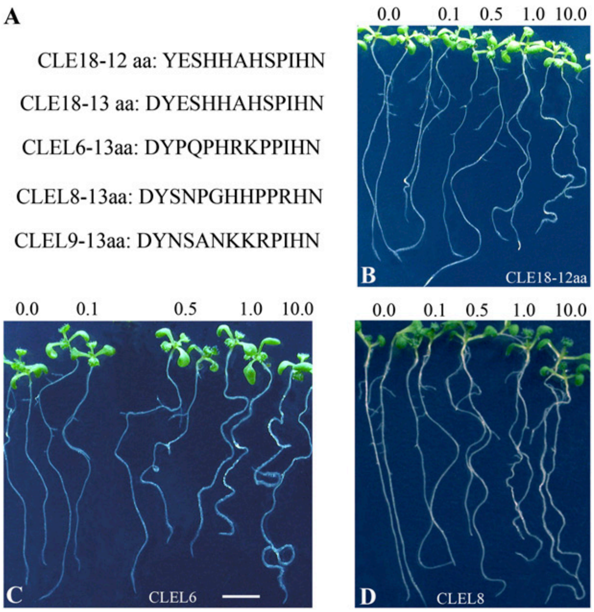

Fig. S1. The synthetic 12- or 13-amino acid (aa) peptides derived from a CLE-like (CLEL) motif triggered a wavy-root phenotype. (*A*) Sequences of the synthetic CLEL peptides used in this study. (*B*–*D*) Nine-day-old wild-type seedlings grown vertically in the light on MS medium containing the indicated concentration (0, 0.1, 0.5, 1.0, 10.0 μM) of the synthetic CLEL peptide specified: 12-aa CLE18 (*B*), 13-aa CLEL6 (*C*), and 13-aa CLEL8 (*D*). (Scale bar, 5 mm.)

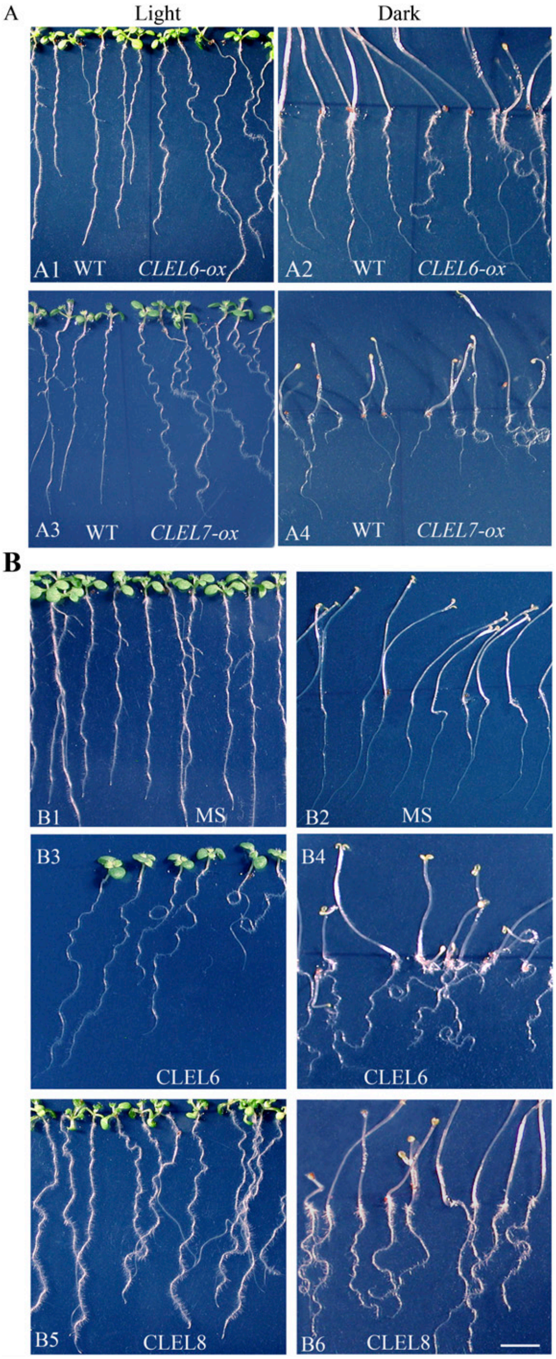

Fig. S2. Overexpression of *CLE-like* (*CLEL*) genes (*A*) or exogenous application of CLEL peptides (*B*) caused wavy roots under both light and dark conditions. Nine-day-old *Arabidopsis* seedlings were grown on 1.5% agar plates inclined at 45° in the light (*Left* columns) and dark (*Right* columns). Shown are plants overexpressing *CLEL6* (*CLEL6-ox*) (*A1* and *A2*) or overexpressing *CLEL7* (*CLEL7-ox*) (*A3* and *A4*). Also shown are plants grown in the light (*A1* and *A3*) or in the dark (*A2* and *A4*). Wild-type plants grown on MS medium (*B1* and *B2*) or on medium containing 1.0 μM synthetic 13-amino-acid CLEL6 (*B3* and *B4*) or CLEL8 (*B5* and *B6*) peptide. Seedlings were grown in the light (*B1*, *B3*, and *B5*) or in the dark (*B2*, *B4*, and *B6*). (Scale bar, 5 mm.)

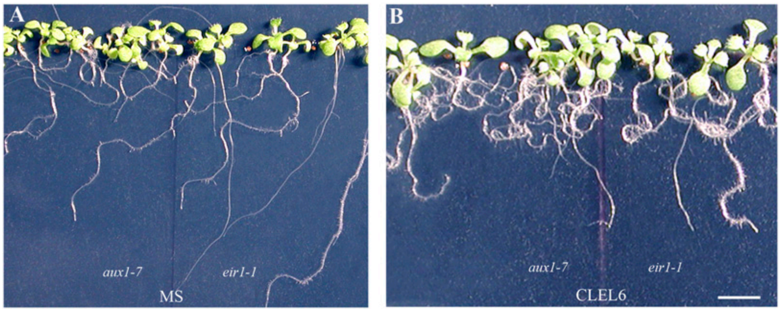

Fig. S3. CLE-like (CLEL) peptide-mediated wavy-root phenotype is independent of gravitropic response in *Arabidopsis*. Nine-day-old *Arabidopsis aux1-7* (on left in *A* and *B*) or *eir1-1* (on right in *A* and *B*) mutant plants were grown on MS medium (*A*) or on medium containing 1.0 μM CLEL6 peptide (*B*). (Scale bar, 5 mm.)

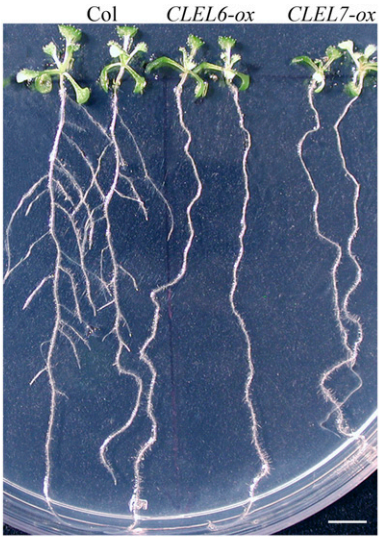

Fig. S4. Delayed lateral root development caused by *CLE-like* (*CLEL*) overexpression in 12-d-old *Arabidopsis* plants. The wild-type seedlings are shown on the left (Col), whereas the seedlings overexpressing *CLEL6* (*CLEL6-ox*) and *CLEL7* (*CLEL7-ox*) are shown in the center and on the right, respectively. (Scale bar, 5 mm.)

Table S1. ***CLEL* genes in *Arabidopsis***

CLELs (*RGFs**)	Locus no.	Size of full protein	Position of CLEL motif	CLEL motif
CLE18	AT1G66145	101	75–87	DYESHHAHSPIHN
CLEL1 (*RGF2*)	AT1G13620	109	97–109	DYWKPRHHPPKNN
CLEL2 (*RGF8*)	AT2G03830	123	104–116	DYRTFRRRRPVHN
CLEL3 (*RGF3*)	AT2G04025	111	97–110	DYWRAKHHPPKNN
CLEL4 (*RGF7*)	AT3G02240	102	90–102	DYGQRKYKPPVHN
CLEL5	AT3G02242	111	97–111	DYQGPKPRSKPLKNN
CLEL6 (*RGF6*)	AT4G16515	86	71–83	DYPQPHRKPPIHN
CLEL7 (*RGF5*)	AT5G51451	88	76–88	DYPKPSTRPPRHN
CLEL8 (*RGF1*)	AT5G60810	116	104–116	DYSNPGHHPPRHN
CLEL9 (*RGF9*)	AT5G64770	79	66–78	DYNSANKKRPIHN

CLEL, CLE-like; RGF, root growth factor.

*There is no RGF4 peptide (DYRGPARHPPRHN) in locus AT3g30350 in the TAIR10 Proteins Dataset.

Table S2. Expression levels of *CLEL* genes in roots and other representative tissues

CLELs (*RGFs*)	Expression levels in roots	Expression levels in other representative tissues
CLEL2 (*RGF8*)	22.15	70.71 (stamens, flower stage 12)
CLEL3 (*RGF3*)	96.75	45.29 (siliques stage 5 with seeds)
CLEL4 (*RGF7*)	26.26	9.81 (sepals, flower stage 15)
CLEL6 (*RGF6*)	17.55	5.18 (hypocotyl) 74.14 (vegetative rosette); 74.18 (shoot apex); 904.2 (petals, flower stage 15); 1,089.66 (stamens, flower stage 15); 140.13 (siliques with seeds, stage 3)
CLEL9 (*RGF9*)	0.36	246.83 (cotyledon); 172.68 (cauline leaf); 74.7 (vegetative rosette); 26.88 (shoot apex); 101.63 (siliques with seeds, stage 4)

Data source: *Arabidopsis* eFP Browser (http://bar.utoronto.ca/efp_arabidopsis/cgi-bin/efpWeb.cgi). CLEL, CLE-like; RGF, root growth factor.

Table S3. Primer sequences used for generating the *CLE-like* (*CLEL*) gene constructs

Primer name	Sequence 5′–3′
CLE18 Xho 5F	CGCTCGAGATGCATTTGTTAAAAGGTGG
CLE18 Bam 3R	CGGGATCCCTAGACTCCAATCAAATGAC
CLEL6 Xho5F	CGCTCGAGATGTCTTGCTCTTTGAGGAG
CLEL6 Bam 3R-NL	CGGGATCCCGAGACTTCTCGTTGTGGATCG
CLEL6 Bam 3R-CL	CGGGATCCTTAAGACTTCTCGTTGTGGATC
CLEL7 Xho5F	CGCTCGAGATGAGCTCAATCCATGTTGC
CLEL7 Bam 3R-NL	CGGGATCCCGGTTATGGCGTGGAGGCCGA
CLEL7 Bam 3R-CL	CGGGATCCTCAGTTATGGCGTGGAGGCCGA
CLEL9 Xho5F	CGCTCGAGATGGCA ATTAGGGTTTCCCA
CLEL9 Bam 3R-NL	CGGGATCCCGGCGAT GTGTATCGGTCTTTTC
CLEL9 Bam 3R-CL	CGGGATCCTTAGCGATTGTGTATCGGTCT