

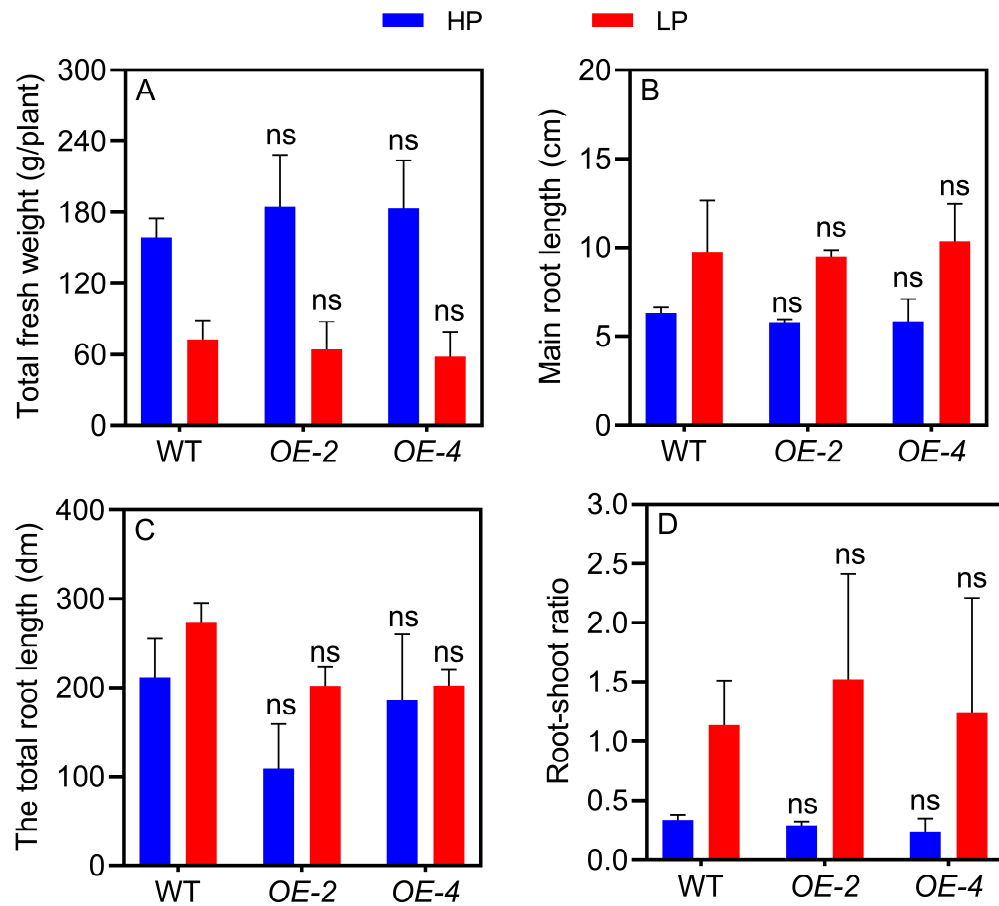
## Supplemental Information

The Supplemental Material for this article can be found online at:

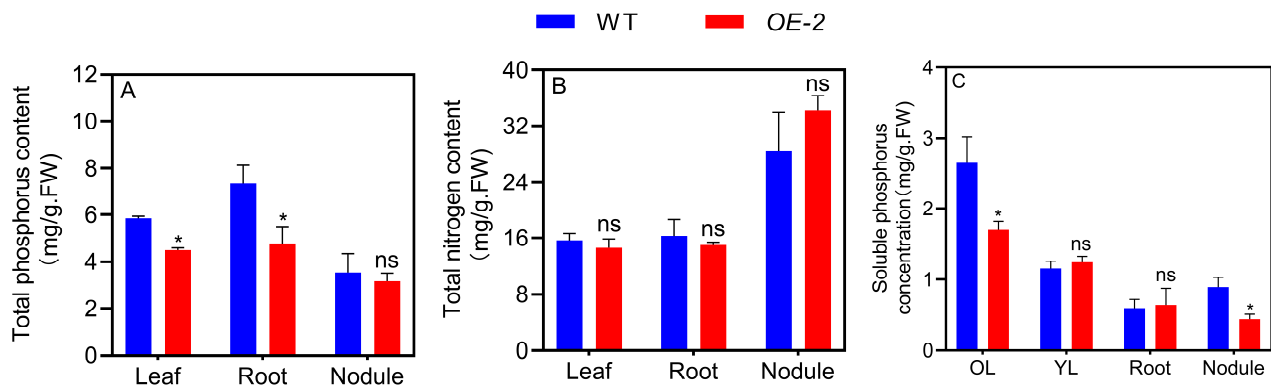
**Supplemental Table S1.** Predicted miR159 target genes in soybean

miRNA	Target gene			
miR159a	<i>Glyma.06g134200</i>	<i>Glyma.05g169200</i>	<i>Glyma.18g014400</i>	<i>Glyma.09g053400</i>
	<i>Glyma.02g205700</i>	<i>Glyma.17g094800</i>	<i>Glyma.03g045700</i>	<i>Glyma.14g220600</i>
	<i>Glyma.17g259500</i>	<i>Glyma.15g231300</i>	<i>Glyma.15g231100</i>	<i>Glyma.15g230900</i>
	<i>Glyma.15g233100</i>	<i>Glyma.20g248200</i>	<i>Glyma.18g265900</i>	<i>Glyma.15g233400</i>
miR159b	<i>Glyma.09g202900</i>	<i>Glyma.18g062700</i>	<i>Glyma.02g220200</i>	<i>Glyma.14g187600</i>
	<i>Glyma.11g200800</i>			
miR159c	<i>Glyma.20g047600</i>	<i>Glyma.13g073400</i>	<i>Glyma.15g225300</i>	<i>Glyma.13g187500</i>
	<i>Glyma.19g206100</i>	<i>Glyma.06g312900</i>	<i>Glyma.04g125700</i>	<i>Glyma.16g029800</i>
	<i>Glyma.19g121000</i>	<i>Glyma.16g144200</i>	<i>Glyma.13g031500</i>	<i>Glyma.14g154200</i>
	<i>Glyma.03g099000</i>	<i>Glyma.03g005000</i>	<i>Glyma.04g161400</i>	<i>Glyma.05g022800</i>
	<i>Glyma.06g204300</i>	<i>Glyma.06g096000</i>	<i>Glyma.07g061200</i>	<i>Glyma.03g187400</i>
	<i>Glyma.08g032100</i>	<i>Glyma.15g181500</i>	<i>Glyma.16g145300</i>	<i>Glyma.07g061100</i>
miR159d	<i>Glyma.02g086800</i>	<i>Glyma.16g214900</i>	<i>Glyma.U035700</i>	<i>Glyma.16g214600</i>
	<i>Glyma.16g215000</i>			
miR159e-3p	<i>Glyma.12g032600</i>	<i>Glyma.06g312900</i>	<i>Glyma.04g125700</i>	<i>Glyma.03g115400</i>
	<i>Glyma.04g100900</i>	<i>Glyma.20g047600</i>	<i>Glyma.13g073400</i>	<i>Glyma.15g079800</i>
	<i>Glyma.15g225300</i>	<i>Glyma.13g187500</i>	<i>Glyma.13g271900</i>	<i>Glyma.12g228100</i>
	<i>Glyma.14g107600</i>	<i>Glyma.12g217800</i>	<i>Glyma.13g282800</i>	<i>Glyma.20g211100</i>
	<i>Glyma.02g061200</i>	<i>Glyma.20g149200</i>	<i>Glyma.18g277700</i>	<i>Glyma.08g240200</i>
	<i>Glyma.03g222300</i>	<i>Glyma.19g219500</i>	<i>Glyma.11g107600</i>	<i>Glyma.14g125900</i>
	<i>Glyma.14g125600</i>	<i>Glyma.15g271900</i>	<i>Glyma.08g030100</i>	<i>Glyma.08g152500</i>
miR159e-5p	<i>Glyma.20g211800</i>			
	<i>Glyma.06g134200</i>	<i>Glyma.18g014400</i>	<i>Glyma.09g053400</i>	<i>Glyma.05g169200</i>
	<i>Glyma.03g045700</i>	<i>Glyma.14g220600</i>	<i>Glyma.17g259500</i>	<i>Glyma.15g231300</i>
	<i>Glyma.15g231100</i>	<i>Glyma.15g230900</i>	<i>Glyma.15g233400</i>	<i>Glyma.18g265900</i>
miR159f	<i>Glyma.20g248200</i>	<i>Glyma.02g205700</i>	<i>Glyma.17g094800</i>	
	<i>Glyma.09g202900</i>	<i>Glyma.18g062700</i>	<i>Glyma.02g220200</i>	<i>Glyma.14g187600</i>
	<i>Glyma.11g200800</i>			

Note: Target genes were predicted using the psRNA Target website (<http://psrna.target.org>). Genes with a score of  $\leq 3.0$  were selected.



**Supplemental Figure S1.** Effects of *MIR159e* over expression on growth and development. WT, wild type (YC03-3); OE-2, *miR159eOE-2*; OE-4, *miR159eOE-4*; HP, plants treated with a high phosphorus concentration of 250  $\mu$ M; LP, plants treated with a low-P concentration of 5  $\mu$ M; treatment time was 40 days. Results are means  $\pm$  SE from three independent experiments. Student's *t*-test was used to compare the differences between Col-0 and transgenic *MIR159eOE* plants (ns, no significance).



**Supplemental Figure S2.** Total phosphorus, nitrogen, and soluble phosphorus contents in soybean overexpressing *MIR159e* under low-nitrogen conditions. WT, wild type (YC03-3); HPLN, high phosphorus and low nitrogen; treatment was performed for 40 days. Results are means  $\pm$  SE from three independent experiments. Student's *t*-test was used to compare the differences between Col-0 and the transgenic line *MIR159eOE* in the same plant part sampled at the same time point (ns, no significance; \*, P < 0.05).



**Supplemental Table S2.** List of primer pairs used in this study

Name of primer	Forward Primer (5'-3')	Reverse Primer (5'-3')
Gma-miR159a	AATTAAAGGGGATTATGAAGTGGA	AGAAAAGAAGAGAAGGGTGTAGAG
Gma-miR159b	TGCTAGTTCATGGATACCTCTG	TCCCTTCACTCCAATACCAAA
Gma-miR159c	ACCCAAGTTGGAGCTCTCT	AAGGCCTAATTTCGGAGCTC
Gma-miR159d	GGGTGAATTGAGCTGCTTAG	AGGCAAATGAAGCTCCCC
Gma-miR159e	CAAAGGGGGTTATGGAGTGG	ACAAAAGGGGAGAAGGGTG
Gma-miR159f	ACCCTCTGGAGCTCCCTT	TGAAGCTGTGATTATACCGA
GmEF1 $\alpha$	TGCAAAGGAGGCTGCTAACT	CAGCATCACCGTTCTTCAA
Gma-miR159e.ox	AAcccgggTAGCAAGGGTTTAGGTGGTG	AAtctagaAGAGCAAGAACGAGATTATGG

Note: Lowercase letters indicate different *MIR159* gene family members.