PHYL	JHP																																										
original optimized	A A	T G T G	i A i A	A A	T A C A	A A A A	AG	G G	A A	T A T A	T T	T C	G G	С Т С Т	A	G	C T	A A	C C	T C	A ( T (	G T C T	A	A A	T C	A A	A -	T A C A	A A	T C	C C	A A	A A à A	A	C C	A A	T T	C / C /	4 A 4 A	C	A A	A A	50 50
original optimized	T C	T A T A	C C	T ( T (	ר כ ר כ	ГА	T T	T C	G G	A A A A	G G	A A	A G	A A A A	C	A A	T T	A T	A A	Т <sup>.</sup> Т (	T / C /	A A A A	C	T C	T   T	A C	A / A /	A A A G	T T	A A	T C	A A A A	A A	A A	T T	T C	C A	G ( G /	G G	i A i A	A G	A A	100 100
original optimized	A A	T G C G	i C i C	A T	A T A T	ГТ ГС	G G	A A	A G	A A A A	A G	A A	T T	A A C A	A	C	A A	Т Т	A C	G G	A / A (	A A G A	G G	A A	G G	A A	A / G /	Α Τ Α Τ	A C	C C	A A	A C G C	) A ) A	A G	T C	<b>T</b>   <b>T</b>	A C	т ( т (	D A D A	A	A A	T C	150 150
original optimized	A A	A T A C	A	A A	тс		T T	A A	G G	A A G A	A A	A G	A A	A T A C	· A ; A	AA	T C	C C	T T	T C (	T C	T A T C	G	T T	G T	T C	T ( T (	G A C A	A A	A G	C C	A A	A A G A	A	T C	T C	T T	A ( C (	G A G A	G	A A	A A	200 200
original optimized	T C	T T C T	A C	A A		Г С С С	A A	T T	A A	A T A C	C C	A A	A G	A A A A	A	G G	A A	A G	C C	A A	A <sup>-</sup> G (	T T C T	A C	A A	A A	A G	A ( A (	C T C C	T T	A A	T C	C A C A	A G	A i A	T T	G G	C C	т - т (	ГТ СС	Т ; Т	A C	A A	250 250
original optimized	A A	G A G A	C C	T T	TT CT	FA FC	A	A A	T C	G A G A	T T	G G	A A	A A G A	A	C	A A	A A	T C	T T	A / G /	A A																					276 276
PHYL	RYE	)																																									
original optimized	A A	T G T G	i A i A	A A	T A C A	4 A 4 A	A G	G G	A A	T A T A	T T	T C	G G	С Т С Т	A		T C	A A	C C	T C	A ( T (	G C C T	A	C C	T C	G G	G G	T A A A	A	T C	A A	A T A C	F A C A	A A	C	A A	C C	A C	A A A A		A A	T T	50 50
original optimized	A C	A A A A	C	A A	A T A C	ГТ СТ	T T	T C	T T	ст ст	A A	T T	T C	G A G A	A	A A	A A	A G	A A	T T	T ( C (	G A G A	A	G G	A A	A G	A A	A T A C	A	T T	A C	A T A T		- A 2 A	A	T C	T C	T T	A A C A		A G	T T	100 100
original optimized	A A	T A C A	AA	A G	A T A T	Г Т Г Т	C C	A A	A A	G A G A	A G	A A	A A		G C G C	; A ; T	G G	T T	T G	A A	A A	A A G A	A	A G	A A	T T	A C	A A A A	T C	A A	T T	A C	G A G A	A A	A	A A	A A	G G	A A A C	A A	T T	A C	150 150
original optimized	A A	A A A G	A	A A	A T G C	Г Т С Т	A C	T T	C C	T A T A	A A	T C	G G	A T A T	Ā	G C	T T	T T	C C	Т	A ( A (		A A	A A	A G	A A	A <sup>.</sup> A (	T A C A	T T	T C	C C	T T	T T C C	- т ; т	A C	G G	A A	A G	T T C T	- A T	A	A A	200 200
original optimized	A G	C A C A	A G	A A	A T A C	гт СС	T T	A C	G G	A A A G	A A	A A	A G	T T C T	A C	A A	T T	T C	C C	A A	T C	A A A A	C	C C	A A	A G	A A	A A A A	G G	A A	A G	с / с /	A A	A T G C	T T	A C	AA	A A	A C G C	) A ) A	A G	T T	250 250
original optimized	A A	T C C C	A A	A G	A C	G A G G	C C	T T	T T	T T C T	A C	A A	A A	C A C A	T N	G G	T C	T T	A C	A A	A . A (	T A C A	A	T C	A A	A A	A G	A A A A	C	A A	A A	T C		A A à A									291 291
PHYL	WBI	וכ																																									
original optimized	A A	T G T G	G G	A A	тс		A T	A A	A A		T T	T C	C C	CA CT	0	G G G	A A	A A	C C	T C	A ( T (	GT CT	G	A A	A G	A A	А <sup>-</sup> А <sup>-</sup>	т с т с	A A	A A	C C	C 1 C 1			T T	C C	A A	A G	C A C A	۹ ۹ ۹	i A i A	A A	50 50
original optimized	T C	СТ СТ	C C	A A		F A C A	T T	T C	G G	A A A A	G G	A A	A G	A A A A		; A ; A	T T	C C	A A	T T	T C	A A A A	C	T C	T T	A C	A A	A A A G	C C	A A	A A	A A	A A	A A A A	Т	T C	T T	A A	T G C G	à A à A	, т , т	A A	100 100
original optimized	A A	T G C G	C C	A T	A / A /	A A A G	A	A A	A G	А Т А Т	A C	A A	C C	A A C A		A G	A	T T	A T	A A	A .	T A C A		A G	A A	T T	A C (	T T C T	A C	C A	G G	A ( G (	G C	à A à A	Т	C C	A T	T T	T T T C	C A	A	T C	150 150
original optimized	A A	т с т с	A A	C C		G A G A	T T	G G	A A	т с т с	A A	A G	A A			i A i A	A G	A A	T T	T C	с <sup>:</sup> с	тс	C	T T	A C	A A	A A	A T G C	T T	A C	C C	A A A A		à A à A	AG	A	A A	T C	A C T C	ЭС СТ	; A A	A A	200 200
original optimized	A G	C A C A	AG	T C	T A T C	A G C G	T T	T G	A A	A T A C	A A	A A	T C		A C	A A	A A	A A	G G	A A	A ( G (	CA CT	A T	A	T T	A C	A A	A A A C	G G	с с	T T	т / т /	4 T 4 C		A A	A G	AA	T T	тс	) T	Т G	T C	250 250
original optimized	T T	A A C A	AA	G G	A A A A	A T A C	T C	T   T	A C	A A A A	T C	G G	A A	ТС	à A à A	C	A A	A A	T C	A A	A ( A (	ст ст	A G	A A																			279 279

**Supplementary Figure 1.** Optimized nucleotide sequences of putative secreted regions of phyllogens cloned in the study. Optimized nucleotides were highlighted in gray.



**Supplementary Figure 2.** Effects of mutation Q30R and/or R64G in  $PHYL_{SY}$ . Floral phenotypes of *Arabidopsis thaliana* plants infected with the tobacco rattle virus (TRV) vector carrying  $PHYL_{SY}$  mutants were shown. Sepals, petals, and stamens are indicated as (se), (pe), and (st), respectively.



**Supplementary Figure 3.** Interactions of phyllogens with SVP in yeast. (A) Alignment of the protein sequences of PHYL<sub>OY</sub> and the screened mutants excluding putative signal peptides. Sequences were aligned using the MUSCLE algorithm. Mutations were highlighted in gray. A red arrowhead indicates an interaction-involved mutation T78A, numbered based on amino acid sequences of PHYL<sub>OY</sub> without signal peptides. (B) Yeast two hybrid assay using SVP and PHYL<sub>OY</sub>, PHYL<sub>OY</sub><sup>T78A</sup> and other phyllogen homologs. The experimental conditions were described in **Figure 1B**.



**Supplementary Figure 4.** Interactions of phyllogens with SVP *in planta* were not detected. Coimmunoprecipitation assays were performed using  $3 \times \text{myc}$  tag-fused SVP (SVP-3myc) and  $3 \times \text{FLAG}$  tag-fused PHYL<sub>OY</sub> (3FLAG-PHYL<sub>OY</sub>) and either of its mutant (Left) or PHYL<sub>WBDL</sub> (Right). The experimental conditions were described in **Figure 2**.