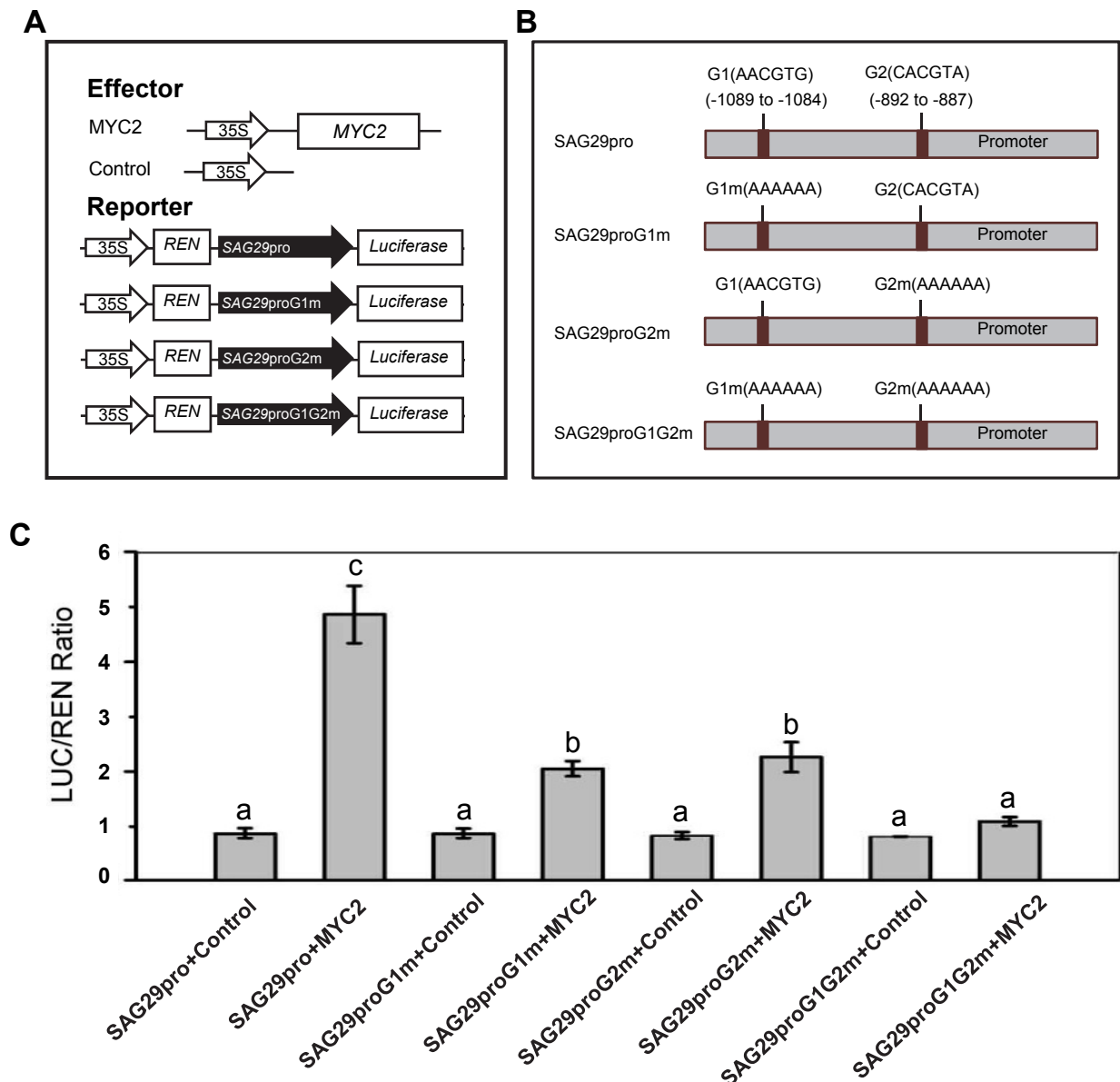**A**

B

Supplemental Figure 1. TT8, GL3, EGL3, MYB21, and MYB24 are not involved in JA-induced leaf senescence.

(A) The senescence phenotype of leaves that were detached from 3-week-old Arabidopsis Col-0 (WT), *gl3 egl3 tt8* and *myb21 myb24* and treated without (Mock) or with 100 µM MeJA in dark for 6 days.

(B) Chlorophyll content of the detached leaves with the same treatment as shown in (A). The maximum value of the chlorophyll content as 2.02 mg/g FW. Data are means (±SD) of three biological replicates.
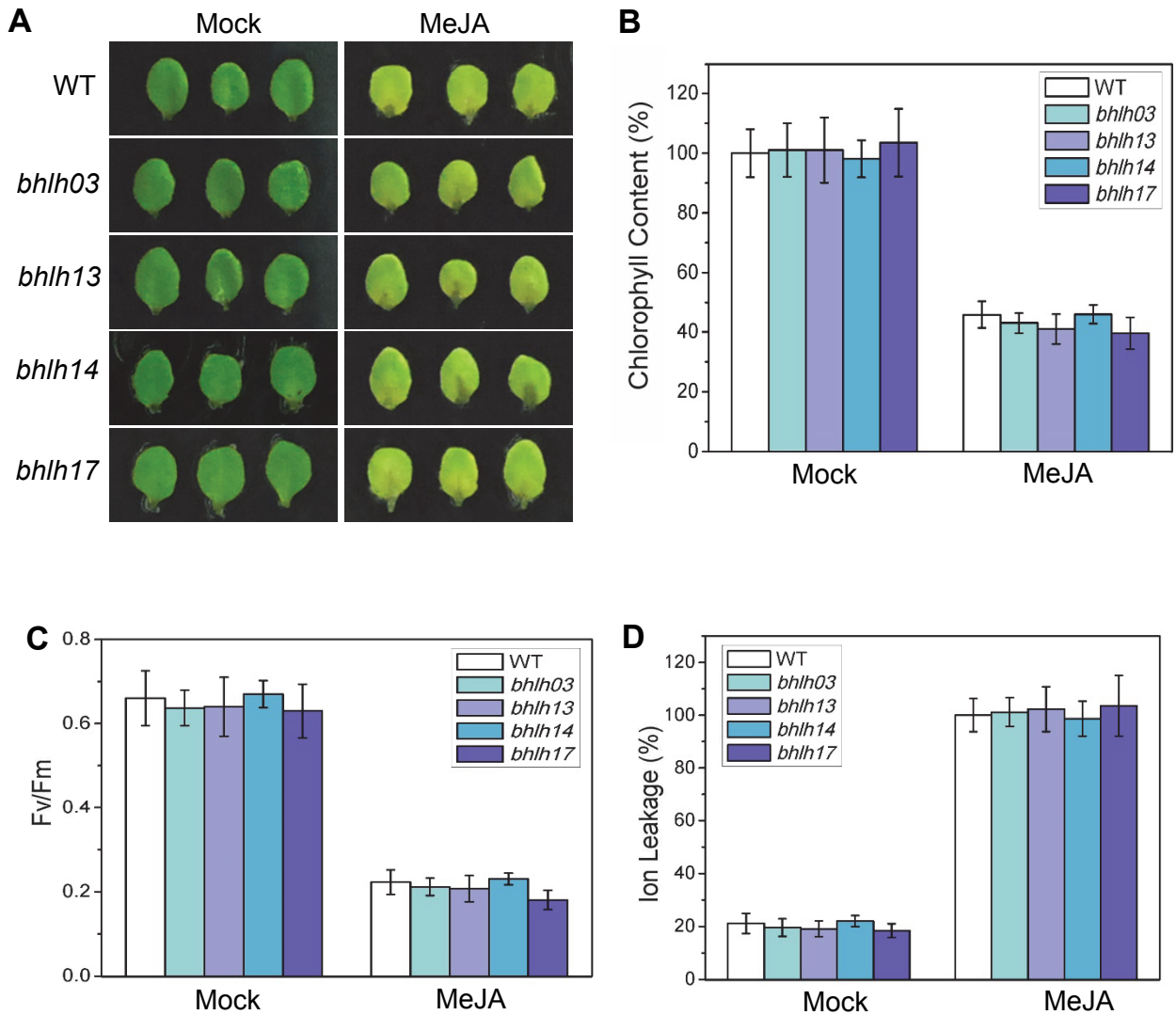
Supplemental Figure 2. MYC2 activates the *SAG29* promoter via G-box like motifs in Arabidopsis protoplast transient expression assay.

(A) The schematic diagram shows the reporter and effector constructs (A) used in the transient expression assays of (C).

(B) The schematic diagram shows the wild-type *SAG29* promoter (*SAG29pro*) and its variants (*SAG29proG1m*, *SAG29proG2m,* and *SAG29proG1G2m*) in the reporter constructs of (A). G1 and G2 denote G-box like motif in the promoter of *SAG29*, and were respectively or simultaneously mutated to AAAAAA in the variants (*SAG29proG1m*, *SAG29proG2m,* and *SAG29proG1G2m*) as shown.
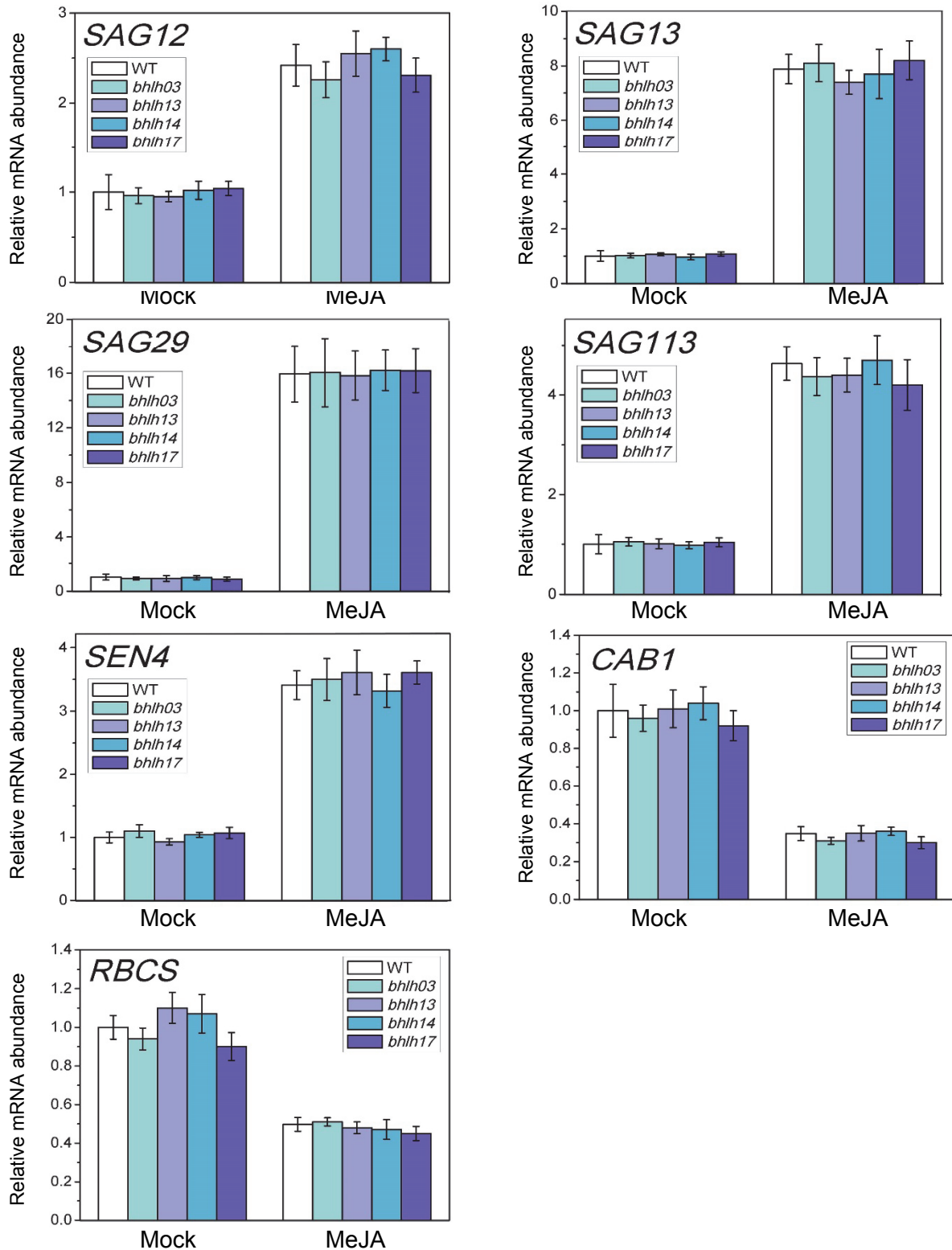
(C) Transient expression assays show that MYC2 activates the *SAG29* promoter via the two G-box like motifs G1 and G2. The LUC/REN ratio represents the *LUC* activity relative to the internal control. Data are means ($\pm$SD) of three biological replicates. Lowercase letters indicate significant differences by one-way ANOVA analysis with SAS software ($P < 0.05$).

Supplemental Figure 3. JA-induced leaf senescence is not obviously altered in the *bhlh03*, *bhlh13*, *bhlh14*, and *bhlh17* single mutants.
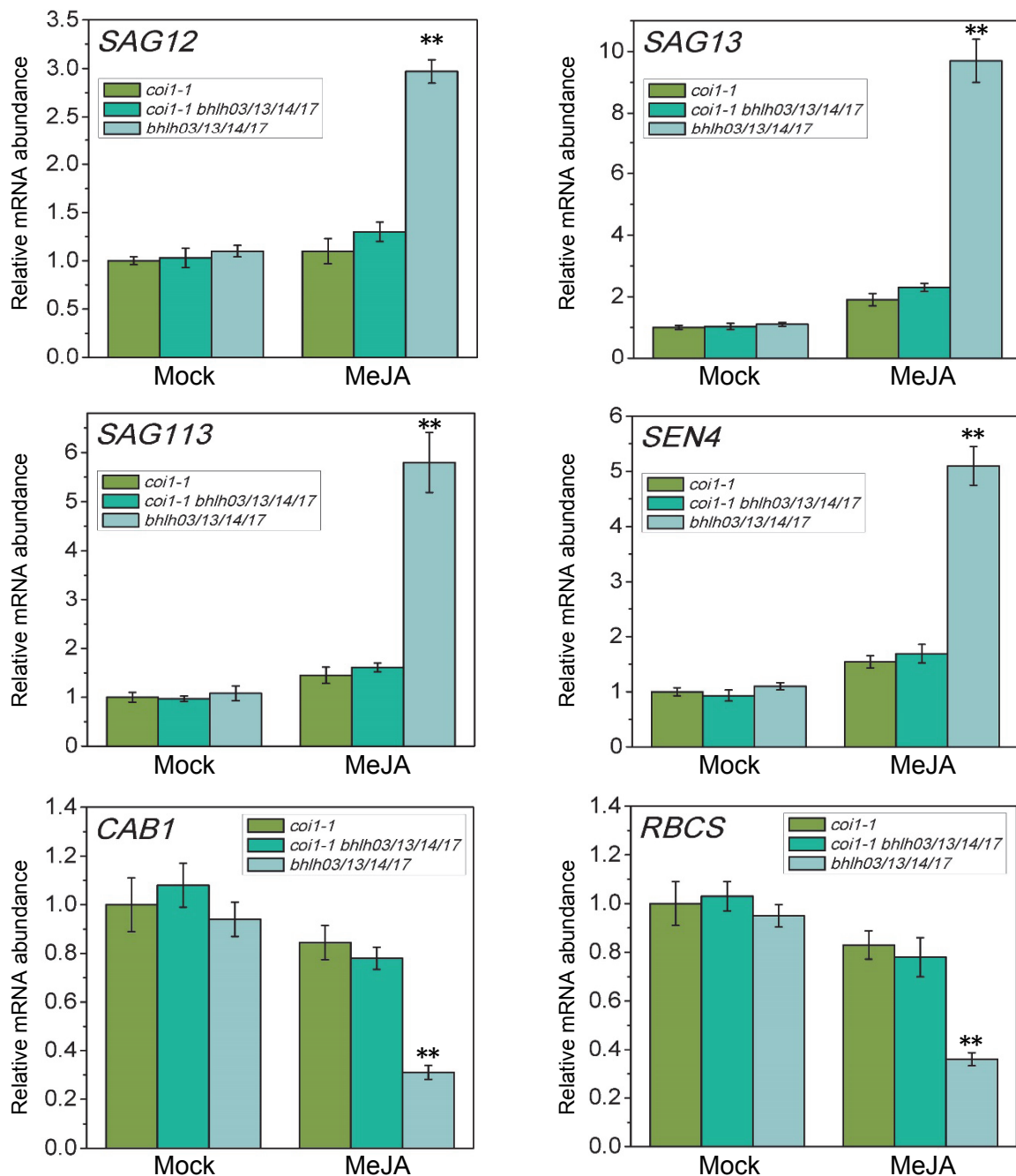
(A) The senescence phenotype of the leaved detached from Col-0 and the single mutants *bhlh03*, *bhlh13*, *bhlh14*, *bhlh17*, and treated with mock or 100 µM MeJA in the dark for 5 days.

(B-D) Chlorophyll content (B), photochemical efficiency (Fv/Fm) (C) and ion leakage (D) of the detached leaves with the same treatment as shown in (A). The maximum value of the chlorophyll contents in (B) as 2.01 mg/g FW. Data are means (±SD) of three independent biological repeats.
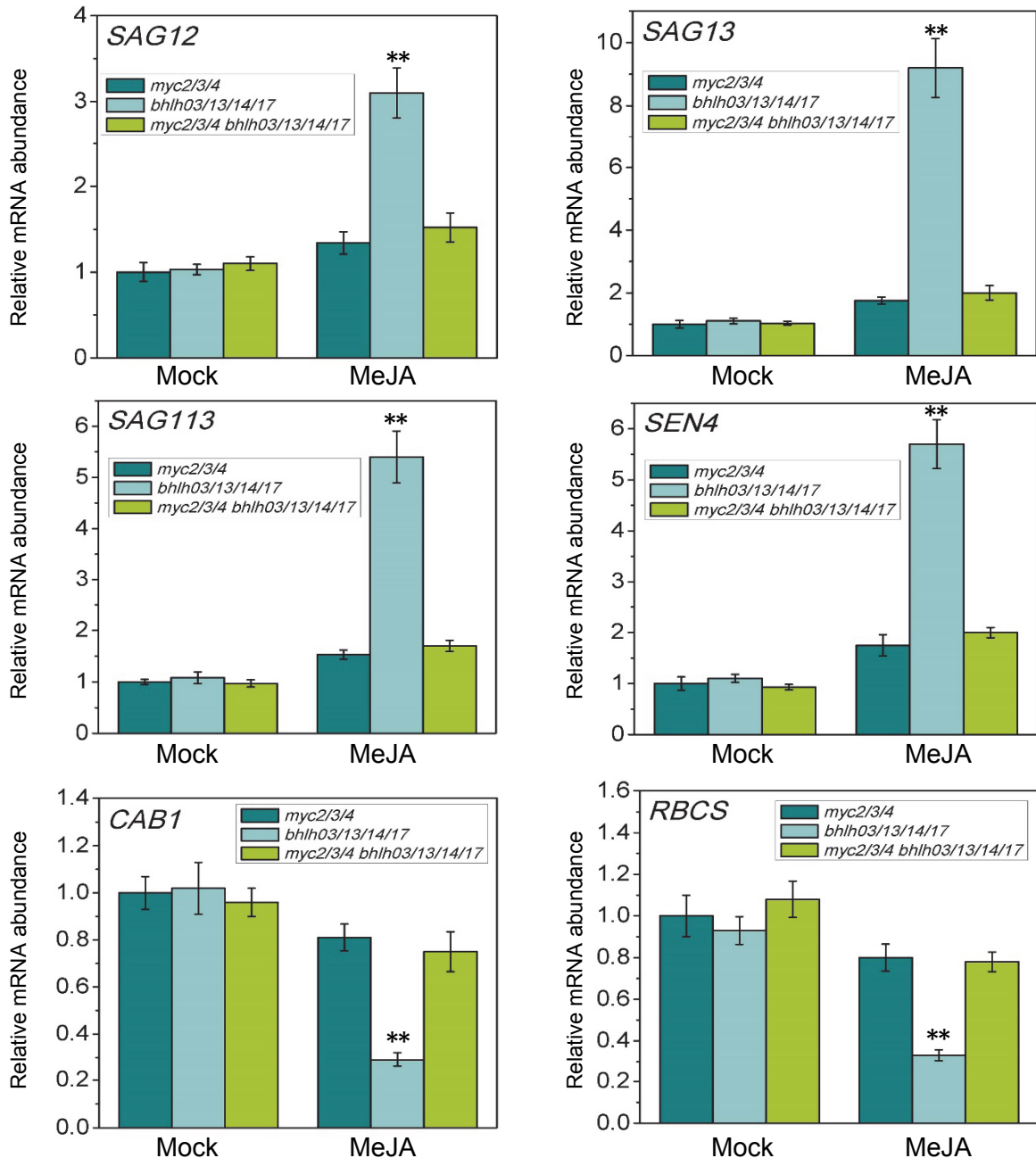
Supplemental Figure 4. Mutation of single IIId bHLHs does not alter the expression of senescence-related genes.

Quantitative real-time PCR analysis for senescence-associated genes (*SAG12*, *SAG13*, *SAG29*, *SAG113*, *SEN4*) and photosynthetic genes (*CAB1* and *RBCS*) of the detached leaves from three-week-old seedlings of Col-0 and the single mutants *bhlh03*, *bhlh13, bhlh14, bhlh17* treated without (Mock) or with 100 µM MeJA in the dark for 5 days. Y-axis shows the relative mRNA abundance of the detected genes. The mRNA abundance of the detected gene in Mock-treated wild-type with *ACTIN8* as the internal control was set to 1. Data are means ($\pm$SD) of three independent biological repeats.

Supplemental Figure 5. Mutation of the IIId bHLHs could not recover the expression of Senescence-related Genes in *coi1-1*.

Quantitative real-time PCR analysis for senescence-associated genes (*SAG12*, *SAG13*, *SAG113*, *SEN4*) and photosynthetic genes (*CAB1* and *RBCS*) of the detached leaves from three-week-old Arabidopsis *coi1-1*, *bhlh03 bhlh13 bhlh14 bhlh17* (*bhlh03/13/14/17*) and *coi1-1 bhlh03 bhlh13 bhlh14 bhlh17* (*coi1-1 bhlh03/13/14/17*) treated without (Mock) or with 100µM MeJA in the dark for 5 days. Y-axis shows the relative mRNA abundance of the detected genes. The mRNA abundance of the detected gene in Mock-treated wild-type with *ACTIN8* as the internal control was set to 1. Data are means (±SD) of three biological repeats. Asterisks represent Student's *t*-test significance compared with *coi1-1* (** P<0.01).

Supplemental Figure 6. Loss of the IIId bHLH factors is unable to accelerate the JA-regulated expression of senescence-related genes in the *myc2 yc3 yc4* triple mutants.

Quantitative real-time PCR analysis for senescence-associated genes (*SAG12*, *SAG13*, *SAG113*, *SEN4*) and photosynthetic genes (*CAB1* and *RBCS*) of the detached leaves from 3-week old Arabidopsis *myc2 myc3 myc4* (*myc2/3/4*), *bhlh03 bhlh13 bhlh14 bhlh17* (*bhlh03/13/14/17*) and *myc2 myc3 myc4 bhlh03 bhlh13 bhlh14 bhlh17* (*myc2/3/4 bhlh03/13/14/17*) treated without (Mock) or with 100μM MeJA in dark for 5 days. Y-axis means the relative mRNA abundance of the detected genes. The mRNA abundance of the detected gene in Mock-treated wild-type with *ACTIN8* as the internal control was set to 1. Data are means (±SD) of three independent biological repeats. Asterisks represent Student's *t*-test significance compared with *myc2 myc3 myc4* (** P<0.01).

Supplemental Table 1. Primers Used for Vector Construction.

SAG29pro-pGreenII 0800-LUC	Forward-KpnI	cggggtaccatctctgaataatatg
SAG29pro-pGreenII 0800-LUC	Reverse-Bam HI	cgcggatcctttctatagcaattga
SAG29pro-pGreenII 0800-LUC (G1 mutation)	Forward	gtacaaggaaaaaaaaaaaaaaatacctctag acaagagttag
SAG29pro-pGreenII 0800-LUC (G1 mutation)	Reverse	ttttttttttttttttccttgtacaaaaagaaaacgttaac
SAG29pro-pGreenII 0800-LUC (G2 mutation)	Forward	gtttaatctagccatcaaaaaaatatttctagctatg ttag
SAG29pro-pGreenII 0800-LUC(G2 mutation)	Reverse	ttttttttgatggctagattaaaccaacacatttatag
JAZ1-pGreenII 62-SK	Forward-SacI	atcgagctcatgtcgagttctatggaatg
JAZ1-pGreenII 62-SK	Reverse-SalI	agagtcgactcatatttcagctgctaaac
JAZ3-pGreenII 62-SK	Forward-SacI	atcGAGCTCatggagagagatttctcg
JAZ3-pGreenII 62-SK	Reverse-SalI	agaGTCGACttaggttgcagagctgagag
MYC2- pGreenII 62-SK	Forward-Sma I	agacccgggatgactgattaccggctac
MYC2- pGreenII 62-SK	Reverse-KpnI	cggggtaccttaaccgattttttgaaatc
bHLH3- pGreenII 62-SK	Forward-Sma I	agacccgggatgggtcaaaagttttgggagaatc

bHLH3- pGreenII 62-SK	Reverse-XhoI	ccgctcgagttactgtgatagagaggcaaggagc
bHLH13- pGreenII 62-SK	Forward-SmaI	agacccgggatgaatattggtcgcctagtg
bHLH13- pGreenII 62-SK	Reverse-SalI	agagtcgacctatctacctgatgatgttc
bHLH17-pGreenII 62-SK	Forward-SmaI	agacccgggatgaatatgagtgatttag
bHLH17- pGreenII 62-SK	Reverse-SalI	agagtcgacttatatatcaccagagacctg
MYC3 Overexpression	Forward-SalI	acgcgtcgacatgaacggcacaacatcatcaatcaac
MYC3 Overexpression	Reverse-SpeI	cggactagttcaatagttttctccgactttc
MYC4 Overexpression	Forward-SalI	acgcgtcgacatgtctccgacgaatgttcaagtaacc
MYC4 Overexpression	Reverse-SpeI	cggactagttcatggacattctccaactttctc
bHLH03 Overexpression	Forward-XbaI	agctctagaatgggtcaaaagttttgggag
bHLH03 Overexpression	Reverse-SpeI	cggactagtttactgtgatagagaggcaag
bHLH13 Overexpression	Forward-SalI	acgcgtcgacatgaatattggtcgcctagtgtgg
bHLH13 Overexpression	Reverse-SpeI	cggactagtctatctacctgatgatgttcttgac
bHLH14	Forward-SalI	acgcgtcgacatgtataatctcactttctctcc

Overexpression		
bHLH14 Overexpresion	Reverse-SpeI	cggactagtttataggcttagggttcggacaag
bHLH17 Overexpression	Forward-SalI	acgcgtcgacatgaatatgagtgatttagg
bHLH17 Overexpression	Reverse-SpeI	cggactagtttatatatcaccagagacctg

Supplemental Table 2. Primers Used for Quantitative Real-time PCR Analysis and ChIP PCR.

SAG12-Realtime PCR	Forward	atccaaaagcaacttctattacagg
SAG12-Realtime PCR	Reverse	ccactgccttcatcagtgc
SAG13-Realtime PCR	Forward	aggaaaactcaacatcctcgtc
SAG13-Realtime PCR	Reverse	gctgactcgagatttgtagcc
SAG29-Realtime PCR	Forward	gccaccagggagaaaagg
SAG29-Realtime PCR	Reverse	ccacgaaatgtgttaccattagaa
SAG113-Realtime PCR	Forward	ccatggctgttcccatgta
SAG113-Realtime PCR	Reverse	aagctacgcgccattgac
SEN4-Realtime PCR	Forward	aaggtgacaaagagcaacaattc
SEN4-Realtime PCR	Reverse	ctctctaatgggtgtgtcatcg
CAB1-Realtime PCR	Forward	gcaaggaaccgtgaactagaa
CAB1-Realtime PCR	Reverse	tccgaacttgactccgtttc
RBCS-Realtime PCR	Forward	cgctcctttcaacggactta
RBCS-Realtime PCR	Reverse	agtaatgtcgttgttagccttgc

Actin8-Realtime PCR	Forward	tcagcactttccagcagatg
Actin8-Realtime PCR	Reverse	ctgtggacaatgcctggac
MYC2-Realtime PCR	Forward	tccgagtccggttcattct
MYC2-Realtime PCR	Reverse	tctcgggagaaagtgttattgaa
MYC3-Realtime PCR	Forward	aggttgggatgtgatgatacg
MYC3-Realtime PCR	Reverse	aacctagcaccgggatgat
MYC4-Realtime PCR	Forward	aactctttaatctccggtggtg
MYC4-Realtime PCR	Reverse	tgtaacttcttcatctccagcttc
bHLH3-Realtime PCR	Forward	ggctgcaccgctgagcagttg
bHLH3-Realtime PCR	Reverse	gttggcttgcaatagtacattg
bHLH13-Realtime PCR	Forward	cgagttcaagggcttcagag
bHLH13-Realtime PCR	Reverse	ccactgcatctgcccatt
bHLH14-Realtime PCR	Forward	cctcttctttgctctcttttacaca
bHLH14-Realtime PCR	Reverse	aatccggaggagaagaggac
bHLH17-Realtime PCR	Forward	cagagaaaagaccagtgagcttg
bHLH17-Realtime PCR	Reverse	gtctcttctcatcaacaacagaaacta
SAG29pro-ChIP	P1 (Forward)	cgctccgtttcgacgcgtggag
SAG29pro-ChIP	P2 (Reverse)	ccaaagtaggaatgaaaccattcac
SAG29pro-ChIP	P3 (Forward)	gaacggcgtcaattttctgcaaag
SAG29pro-ChIP	P4 (Reverse)	ggggtgggactggtttcatc
ACTIN2pro-ChIP	Forward	cgtttcgctttccttagtgttagct

| ACTIN2pro-ChIP | Reverse | agcgaacggatctagagactcaccttg |