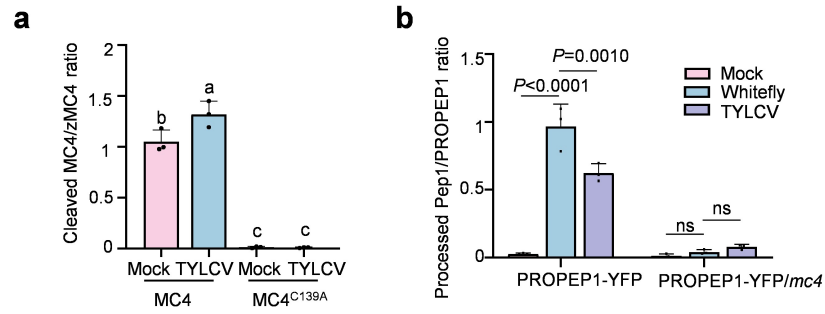
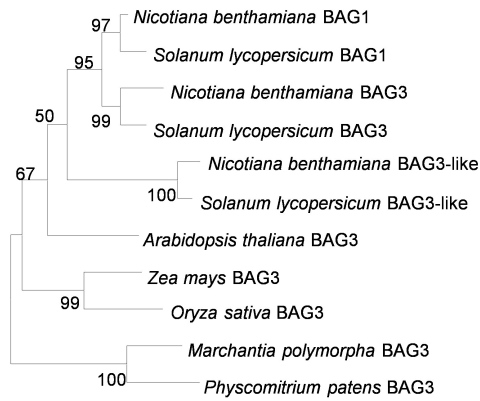
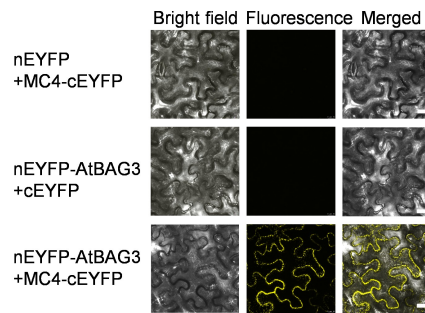




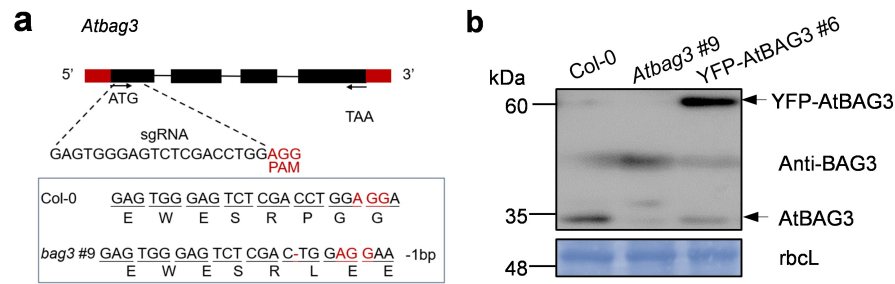
Supplementary Fig. 1 Quantification of MC4 self-cleavage and PROPEP1 processing. (a) Quantification of MC4 self-cleavage shown in Fig. 1c was based on three independent biological replicates. Data are presented as means $\pm$ SD. Different lowercase letters indicate significant differences according to Tukey's multiple range test ($P < 0.05$). **(b)** Quantification of PROPEP1 processing by MC4 shown in Fig. 1d was based on three independent biological replicates. Data are presented as means $\pm$ SD. Statistically significant differences between groups as determined by Tukey's multiple range test are indicated with P -values on the figure.



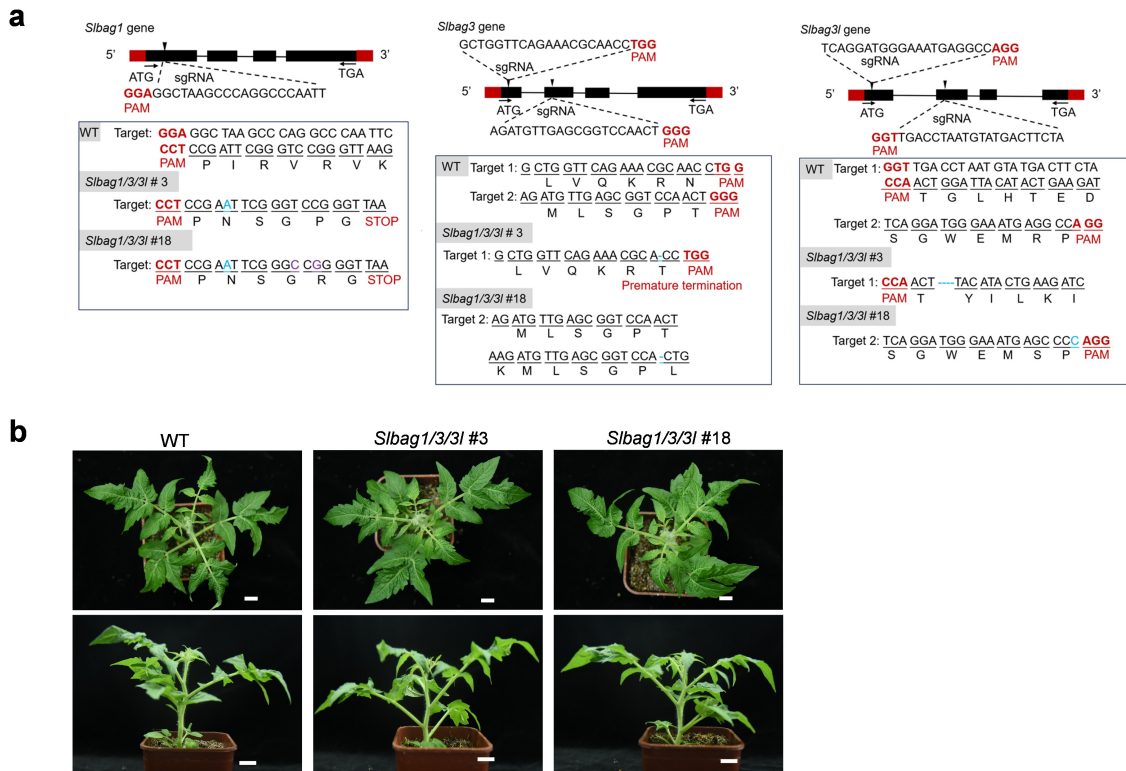
Supplementary Fig. 2 Maximum likelihood phylogenetic analysis of BAG3 homologs. A maximum likelihood phylogenetic tree was constructed using MEGA based on the full-length amino acid sequences of 11 BAG3 homologs identified in *Oryza sativa* (Os-), *Zea mays* (Zm-), *Arabidopsis thaliana* (At-), *Solanum lycopersicum* (Sl-), *Nicotiana benthamiana* (Nb-), *Marchantia polymorpha* (Mp-), and *Physcomitrium patens* (Pp-).



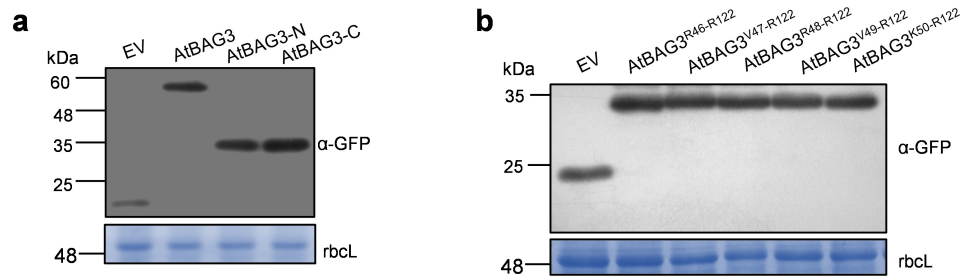
Supplementary Fig. 3 BiFC assay verifying the interaction between MC4 and AtBAG3. BiFC assay verifies the interaction between MC4 and AtBAG3 in planta. MC4-cEYFP and nEYFP-AtBAG3 were transiently expressed in *N. benthamiana* leaf cells via agroinfiltration. Scale bars = 25 μ m. The experiment was repeated independently three times with similar results.



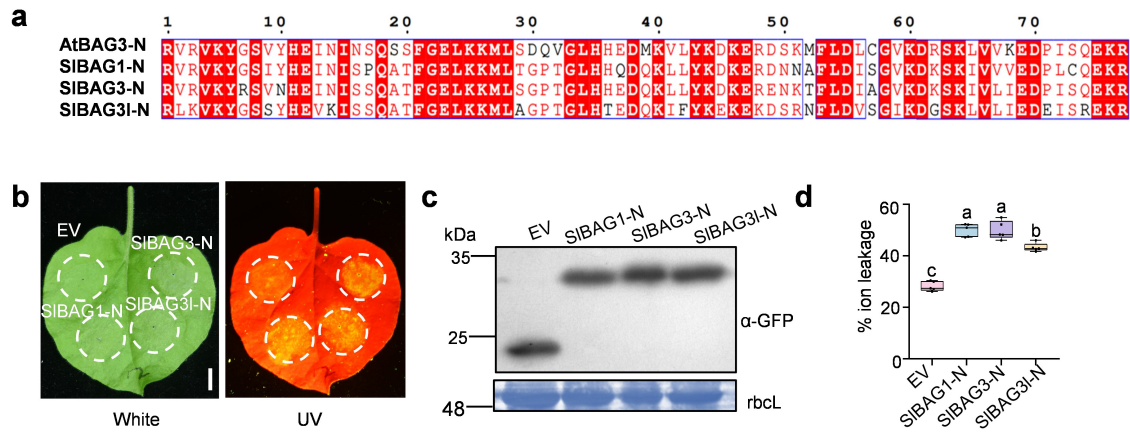
Supplementary Fig. 4 Gene structure of *Atbag3* and protein detection in different genotypes.
(a) Schematic representation of *Atbag3* gene structure. Black boxes and black lines represent the exons and introns, respectively. The gRNA target sites for CRISPR-Cas9 and mutations in *Atbag3* are indicated. **(b)** Protein detection of AtBAG3 in Col-0, *Atbag3* #9, and YFP-AtBAG3 #6 using anti-BAG3 antibody.



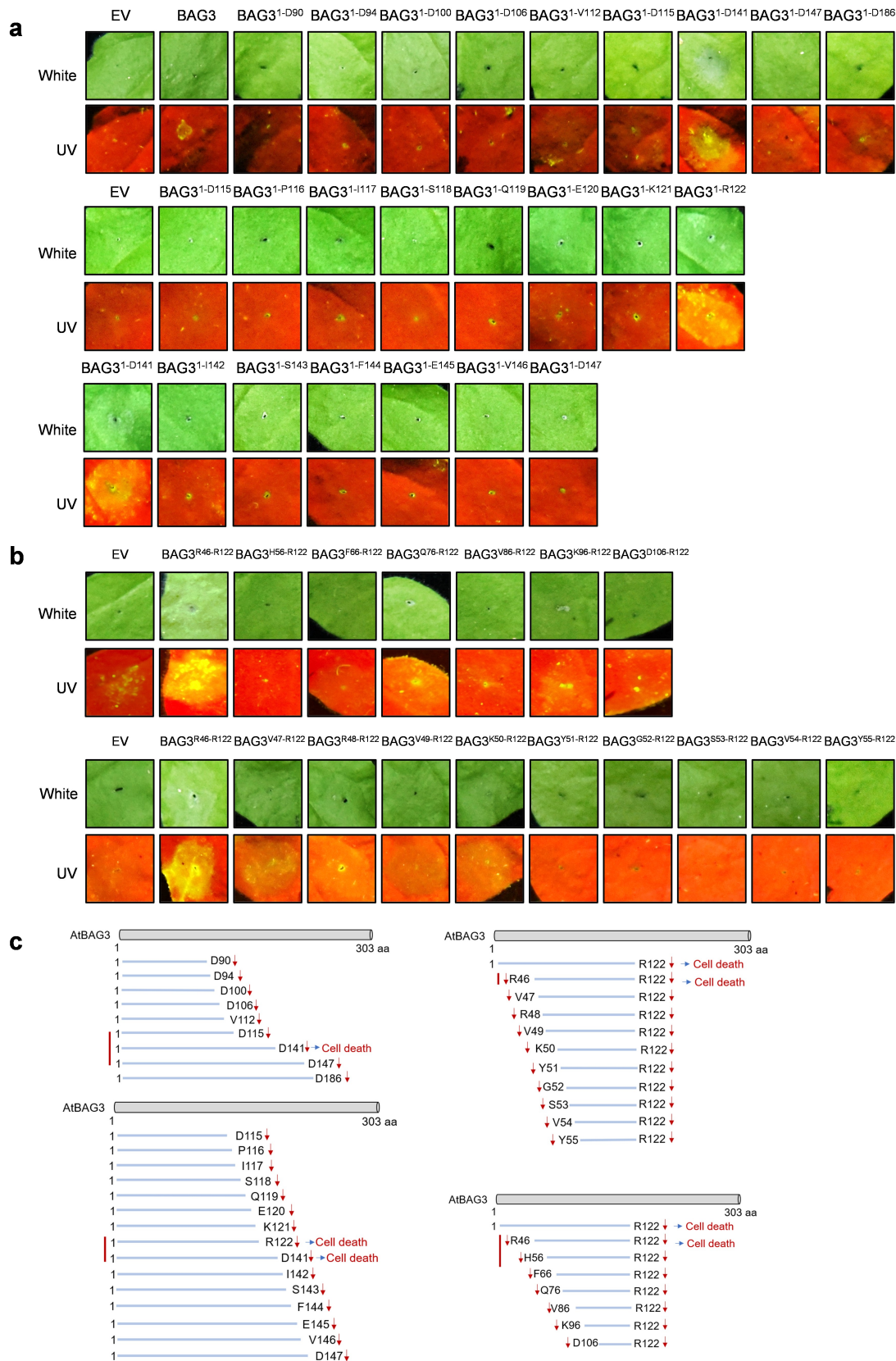
Supplementary Fig. 5 *Sibag1/3/3l* gene editing and mutant phenotypes. (a) Schematic representation of *Sibag1*, *Sibag3* and *Sibag3l* gene structures. Black boxes and black lines represent the exons and introns, respectively. The gRNA target sites for CRISPR-Cas9 and mutations in *Sibag1*, *Sibag3* and *Sibag3l* are indicated. (b) Phenotypes of 8-week-old WT and *Sibag1/3/3l* triple mutant Micro-Tom plants. Scale bars = 1 cm.



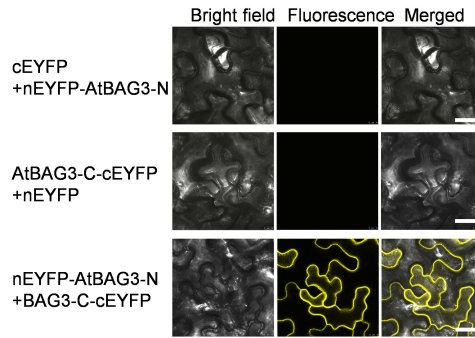
Supplementary Fig. 6 Immunoblot validation of truncated AtBAG3 proteins. (a) Proteins of Fig. 2g were detected by immunoblotting with monoclonal anti-GFP (α-GFP) antibody. Stained bands of rbcL were used as a loading control. **(b)** Proteins of Fig. 2j were detected by immunoblotting with monoclonal anti-GFP (α-GFP) antibody. Stained bands of rbcL were used as a loading control.



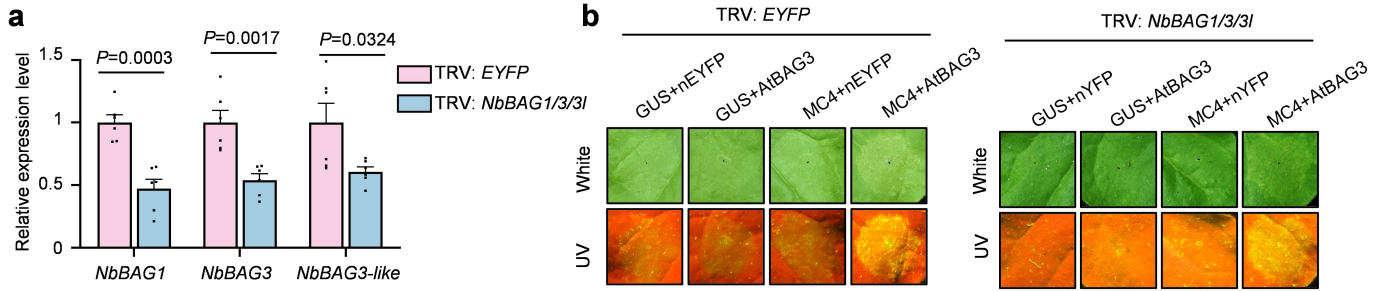
Supplementary Fig. 7 SIBAG1/3/3I-N triggers cell death. **(a)** Alignment of AtBAG3-N, SIBAG1-N, SIBAG3-N and SIBAG3I-N. **(b)** Cell death phenotypes of the empty vector (nEYFP), SIBAG1-N, SIBAG3-N and SIBAG3I-N infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Representative photographs were taken at 2-3 dpi. Images under white and UV light are shown. Scale bars = 1 cm. The experiment was repeated independently three times with similar results. **(c)** Protein detection of Supplementary Fig. 7b was performed using anti-GFP (α-GFP) antibody. Stained bands of rbcL were used as a loading control. **(d)** Quantification of cell death induction of N-terminal of AtBAG3 and SIBAG1/3/3I in *N. benthamiana*. Electrolyte leakage of leaf disks from *N. benthamiana* was measured at 2 dpi ($n = 5$). Different lowercase letters indicate significant differences according to Tukey's multiple range test ($P < 0.05$). The experiment was repeated independently three times with similar results.



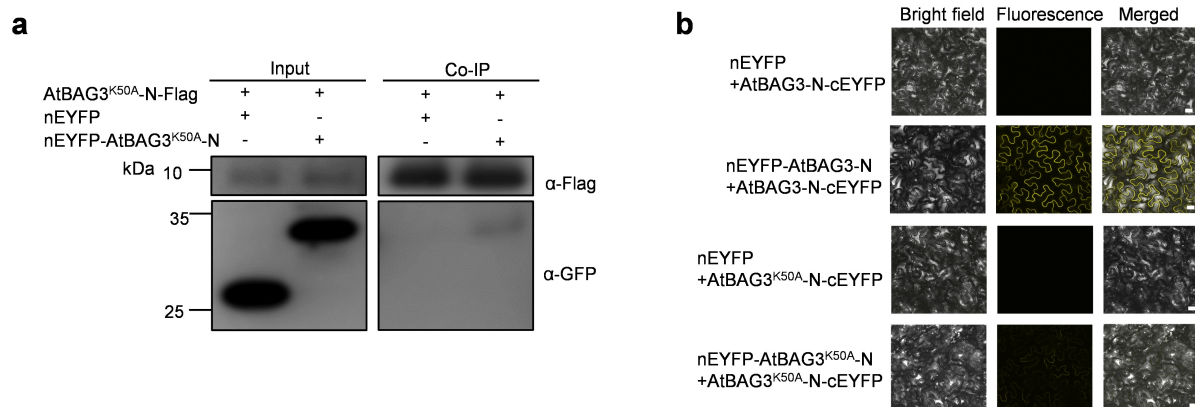
Supplementary Fig. 8 Cell death phenotypes induced by AtBAG3 truncation mutants. (a) Cell death phenotypes of the empty vector (nEYFP) and C-terminal truncations of AtBAG3 infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Photographs were taken 2 dpi. Images under white and UV light are shown. Scale bars = 1 cm. **(b)** Cell death phenotypes of the empty vector (nEYFP) and N-terminal truncations of AtBAG3 infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Photographs were taken 2 dpi. Images under white and UV light are shown. Scale bars = 1 cm. **(c)** Schematic diagram of AtBAG3 truncation constructs.



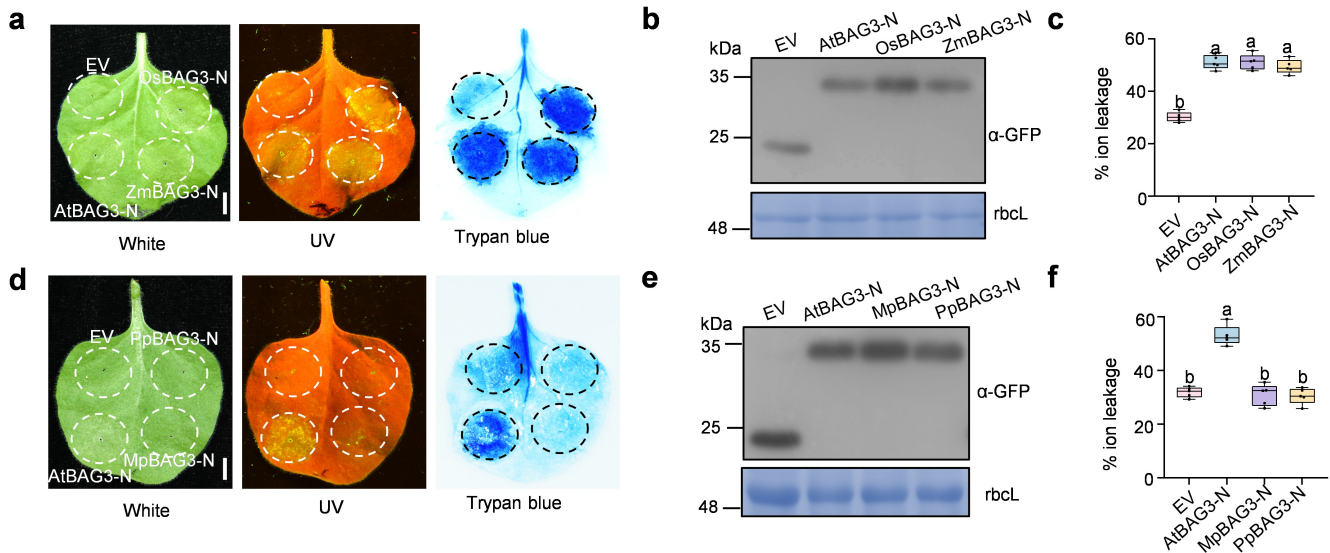
Supplementary Fig. 9 BiFC assay verifying the interaction between AtBAG3-N and AtBAG3-C. BiFC assay verifies the interaction between AtBAG3-N and AtBAG3-C in planta. AtBAG3-C-cEYFP and nEYFP-AtBAG3-N were transiently expressed in *N. benthamiana* leaf cells via agroinfiltration. Scale bars = 25 μ m. The experiment was repeated independently three times with similar results.



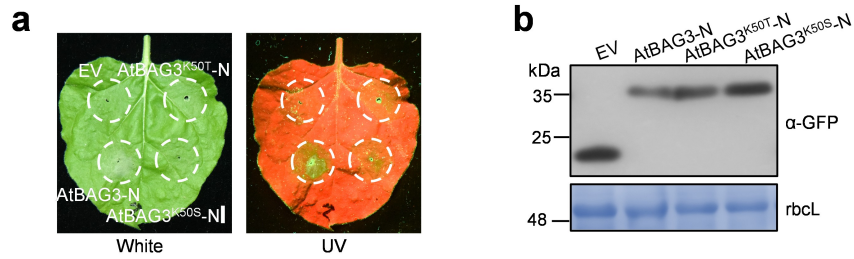
Supplementary Fig. 10 Cell death phenotypes of MC4 co-infiltrated with AtBAG3 in *NbBAG1/3/3I*-silenced *N. benthamiana* leaves. (a) Relative expression levels of target genes in *N. benthamiana* after VIGS. Relative transcript levels of *NbBAG1*, *NbBAG3*, and *NbBAG3-like* were significantly reduced in TRV: *NbBAG1/3/3I* plants compared to TRV: *EYFP* plants. Values are means $\pm$ SD ($n = 6$). P values from unpaired two-sided Student's t -test are displayed above each comparison group. (b) Cell death phenotypes of MC4 co-infiltrated with AtBAG3 in TRV: *EYFP* and TRV: *NbBAG1/3/3I* *N. benthamiana* leaves. GUS-Flag and empty vector (nEYFP) were used as negative controls. Representative photographs were taken at 2-3 dpi. Images under white and UV light are shown. The experiment was repeated independently three times with similar results.



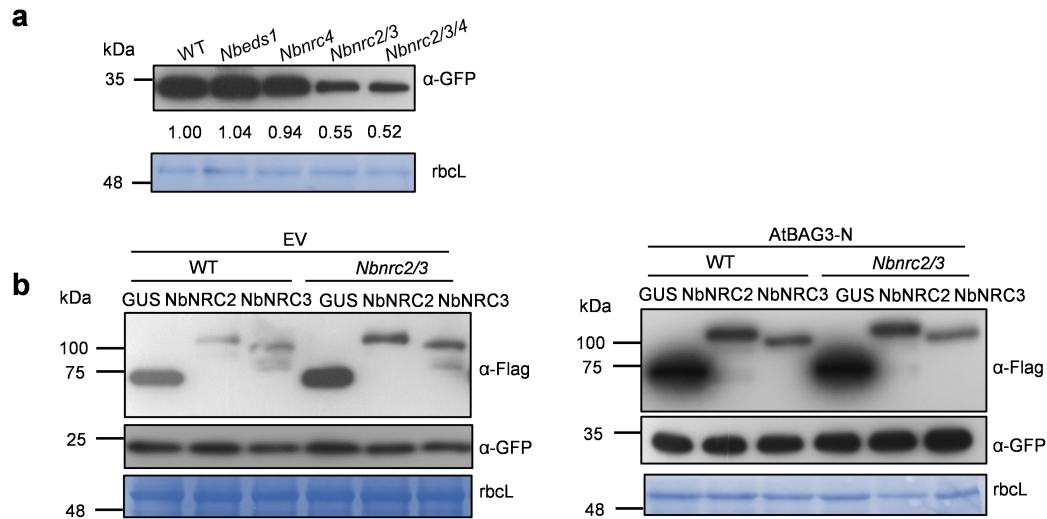
Supplementary Fig. 11 Co-IP and BiFC assays verifying the self-interaction of BAG3-N. (a) Co-IP analysis of nEYFP-AtBAG3^{K50A}-N and AtBAG3^{K50A}-N-Flag *in vivo*. Total protein was extracted from *N. benthamiana* leaves transiently expressing 35S: *nEYFP-AtBAG3^{K50A}-N* together with 35S: *AtBAG3^{K50A}-N-Flag*. Flag-trap beads were used to precipitate the interaction complex, and anti-GFP (α-GFP) and anti-Flag (α-Flag) antibodies were used for detection. The experiment was repeated independently three times with similar results. **(b)** BiFC assay verifies the interaction between AtBAG3-N and AtBAG3-N, and between AtBAG3^{K50A}-N and AtBAG3^{K50A}-N in planta. AtBAG3-N-cEYFP, nEYFP-AtBAG3-N, AtBAG3^{K50A}-N-cEYFP and nEYFP-AtBAG3^{K50A}-N were transiently expressed in *N. benthamiana* leaf cells via agroinfiltration. Scale bars = 25 μm. The experiment was repeated independently three times with similar results.



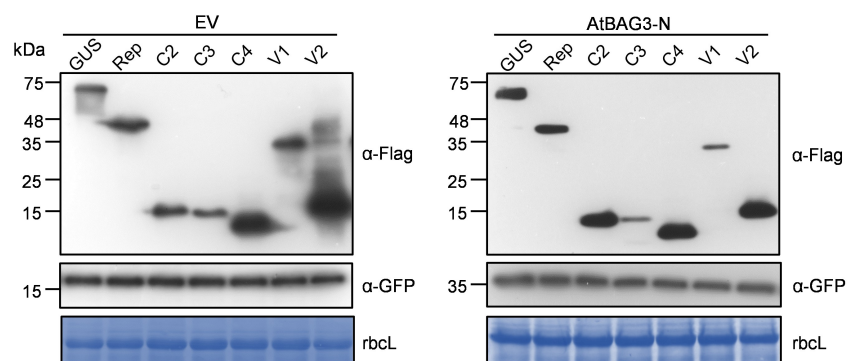
Supplementary Fig. 12 Cell death induced by monocot BAG3-Ns. **(a)** Cell death phenotypes of *AtBAG3-N*, *OsBAG3-N* and *ZmBAG3-N* infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Infiltrated leaves were stained with trypan blue, and representative photographs were taken at 2-3 dpi. Images under white and UV light are shown. Scale bars = 1 cm. The experiment was repeated independently three times with similar results. **(b)** Proteins of Supplementary Fig. 12a were detected by immunoblotting with monoclonal anti-GFP antibody (α -GFP). Stained bands of *rbcl* were used as a loading control. **(c)** Quantification of cell death induction by *AtBAG3-N*, *OsBAG3-N* and *ZmBAG3-N*. Electrolyte leakage of leaf disks from *N. benthamiana* was measured at 2 dpi ($n = 5$). Different lowercase letters indicate significant differences according to Tukey's multiple range test ($P < 0.05$). The experiment was repeated independently three times with similar results. **(d)** Cell death phenotypes of *AtBAG3-N*, *MpBAG3-N* and *PpBAG3-N* infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Infiltrated leaves were stained with trypan blue, and representative photographs were taken at 2-3 dpi. Images under white and UV light are shown. Scale bars = 1 cm. The experiment was repeated independently three times with similar results. **(e)** Proteins of Supplementary Fig. 12d were detected by immunoblotting with monoclonal anti-GFP antibody (α -GFP). Stained bands of *rbcl* were used as a loading control. **(f)** Quantification of cell death induction by *AtBAG3-N*, *MpBAG3-N* and *PpBAG3-N*. Electrolyte leakage of leaf disks from *N. benthamiana* was measured at 2 dpi ($n = 5$). Different lowercase letters indicate significant differences according to Tukey's multiple range test ($P < 0.05$). The experiment was repeated independently three times with similar results.



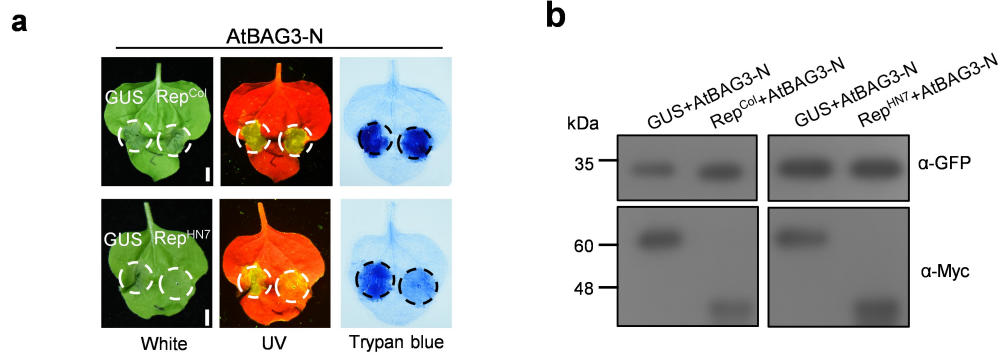
Supplementary Fig. 13 K50 mutation impairs BAG3-N-induced cell death. **(a)** Cell death phenotypes of the empty vector (nEYFP) and AtBAG3-N mutations infiltrated in *N. benthamiana* leaves. The empty vector (nEYFP) was used as a negative control. Photographs were taken at 2 dpi. Images under white and UV light are shown. Scale bars = 1 cm. The experiment was repeated independently three times with similar results. **(b)** Proteins of Supplementary Fig. 13a were detected by immunoblotting with monoclonal anti-GFP antibody (α-GFP). Stained bands of rbcL were used as a loading control.



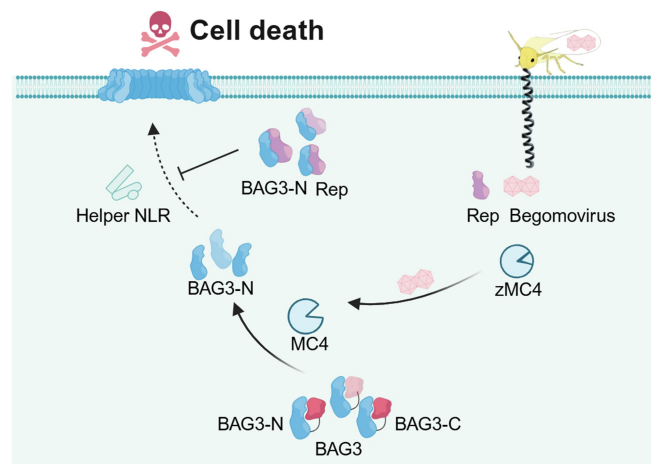
Supplementary Fig. 14 Immunoblot validation of BAG3-N and NRCs. (a) Immunoblot detection of nEYFP-AtBAG3-N protein corresponding to Fig. 5b using anti-GFP (α -GFP) antibody. Stained rbcL was used as a loading control. Band intensities were quantified from three biological replicates using ImageJ. **(b)** Immunoblot detection of nEYFP, nEYFP-AtBAG3-N, GUS-FLAG, NRC2-FLAG, and NRC3-FLAG proteins corresponding to Fig. 5c. Anti-GFP (α -GFP) and anti-FLAG (α -FLAG) antibodies were used for detection. rbcL staining served as a loading control.



Supplementary Fig. 15 Cell death phenotypes of BAG3-N co-infiltrated with each of the six canonical TYLCV-encoded viral proteins. Protein detection of Fig. 6a was performed using anti-GFP (α-GFP) and anti-Flag (α-Flag) antibodies. Stained bands of rbcL were used as loading controls.



Supplementary Fig. 16 Suppression of BAG3-N-induced cell death by Rep variants of SLCMV. (a) Cell death phenotypes of AtBAG3-N co-infiltrated with SLCMV Rep^{Col} and SLCMV Rep^{HN7} respectively in *N. benthamiana* leaf cells. GUS was used as a negative control. Photographs were taken at 2 dpi. Images under both white and UV light are shown. Infiltrated leaves were stained with trypan blue. Scale bars = 1 cm. The experiment was repeated independently three times with similar results. **(b)** Protein detection was performed using anti-GFP (α-GFP) and anti-Myc (α-Myc) antibodies.



Supplementary Fig. 17 A hypothetical working model of the MC4-BAG3 module in regulating plant antiviral immunity. In the resting state, BAG3 adopts an autoinhibited conformation maintained by intramolecular interactions between its N-terminal (BAG3-N) and C-terminal (BAG3-C) domains. This self-inhibitory configuration prevents the activation of downstream immune responses, thereby allowing normal plant growth. When plants are infected by TYLCV, MC4 is activated, leading to the cleavage of BAG3, which releases the N-terminal functional domain, BAG3-N. The released BAG3-N induces cell death in plant leaves, thereby restricting viral infection, and this signaling interfaces with NLR networks in certain plant species. However, to overcome this plant defense mechanism, the viral replication-associated proteins Reps interact with BAG3-N, inhibiting its cell death-inducing function.