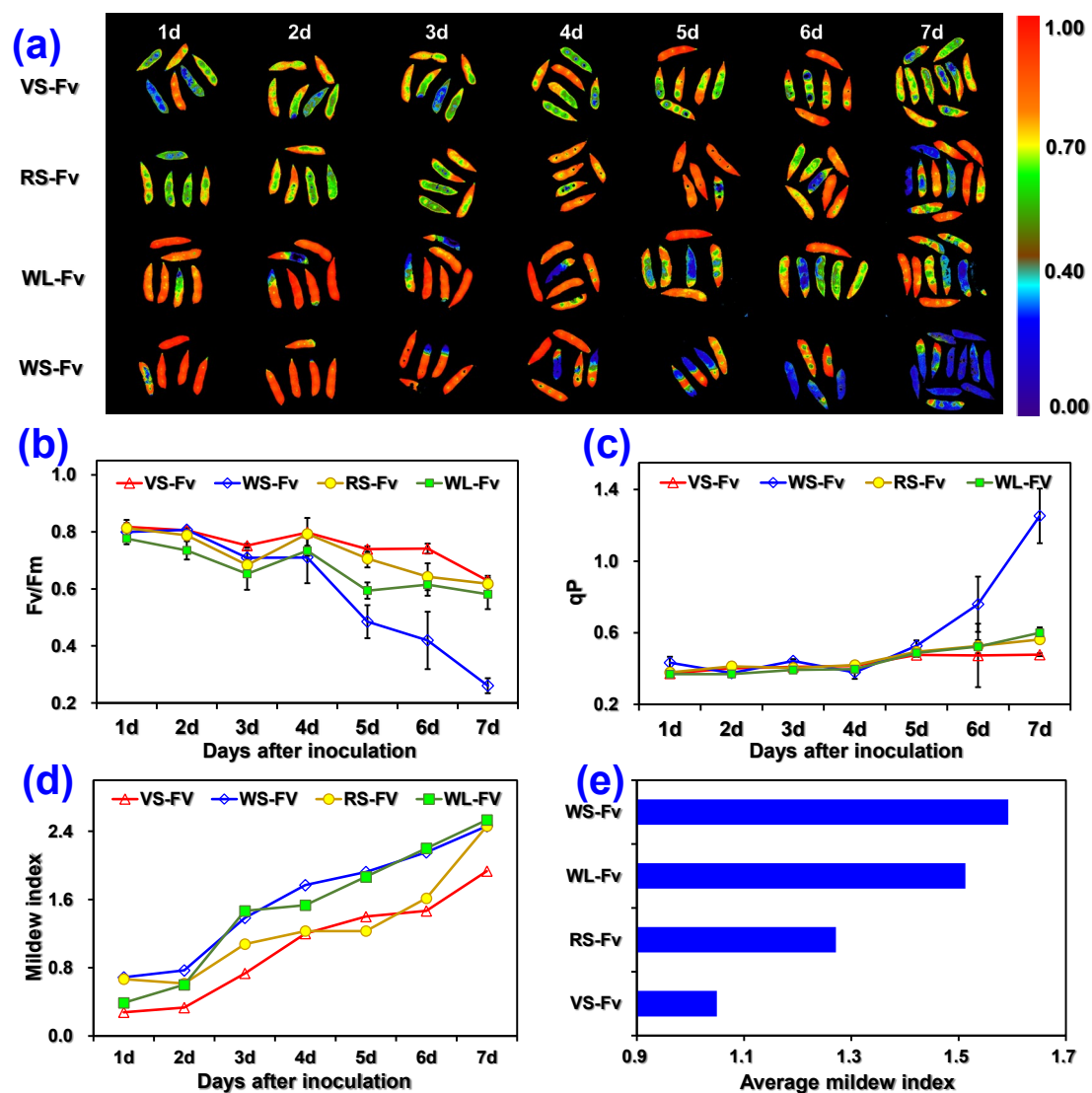
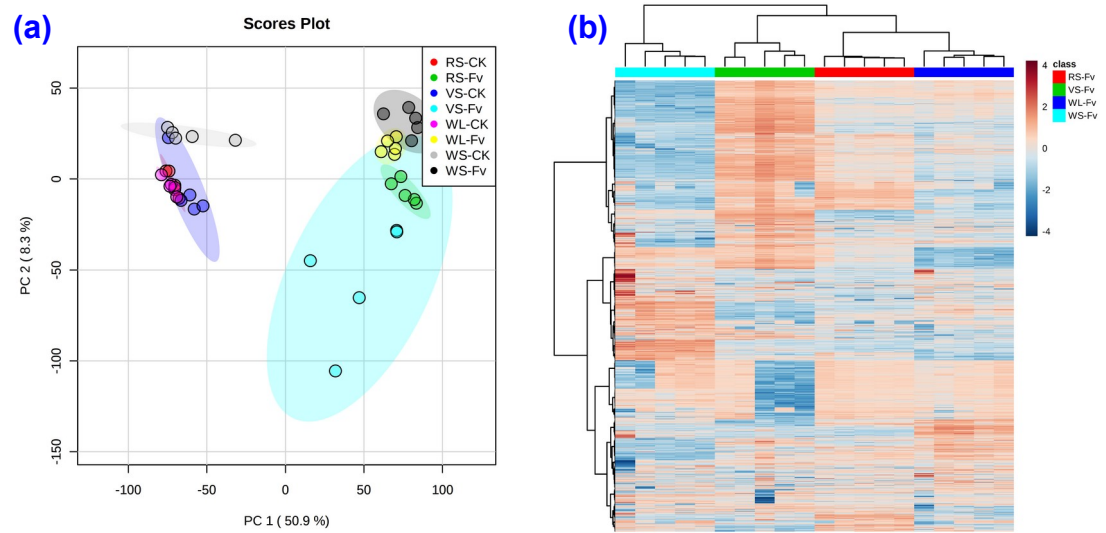


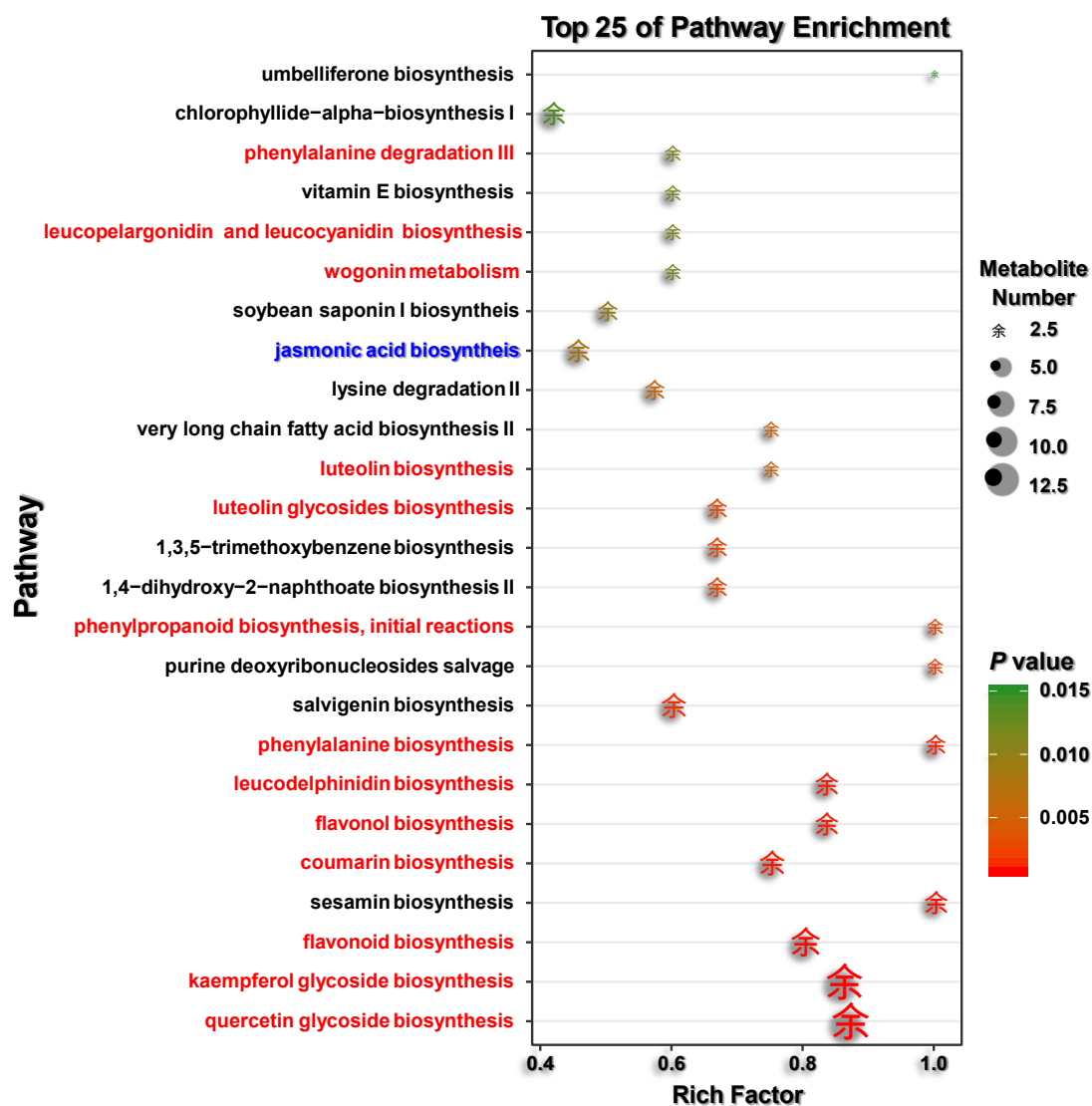
FIGURE 1. Experimental design and workflow.



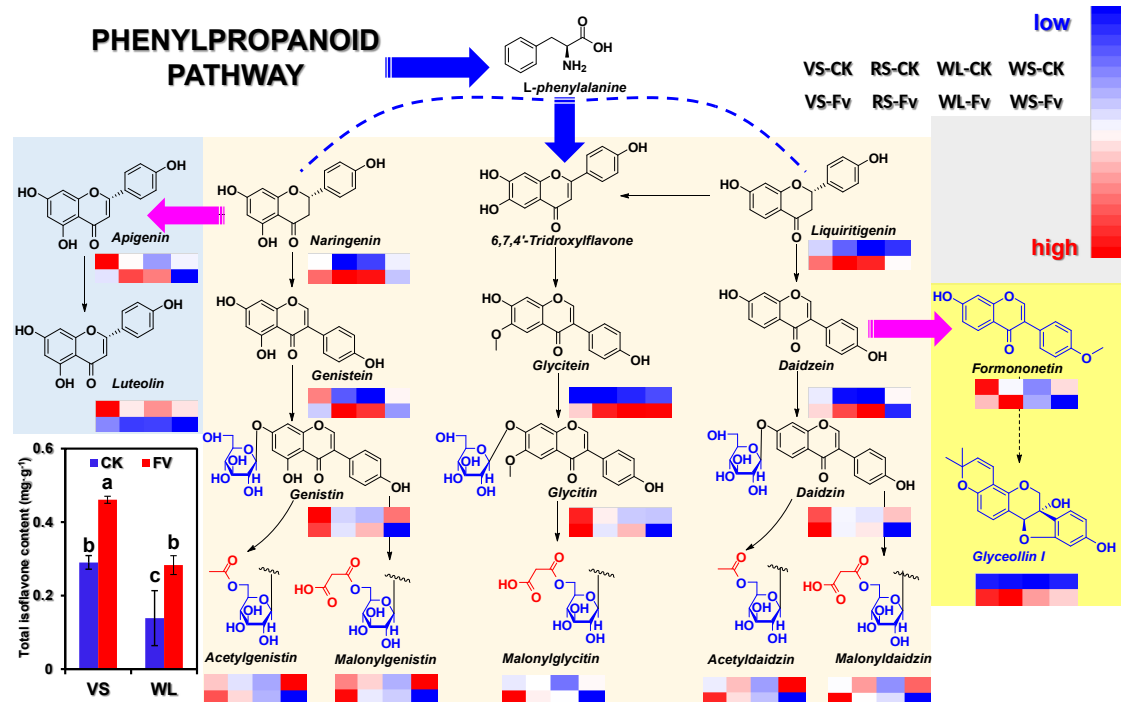
**FIGURE 2. Comparison of mildew resistance of soybean pods.** Chlorophyll fluorescence imaging of pods showing a mildew gradient (a),  $F_v/F_m$  (b),  $qP$  (c), mildew index (d), average mildew index (e).



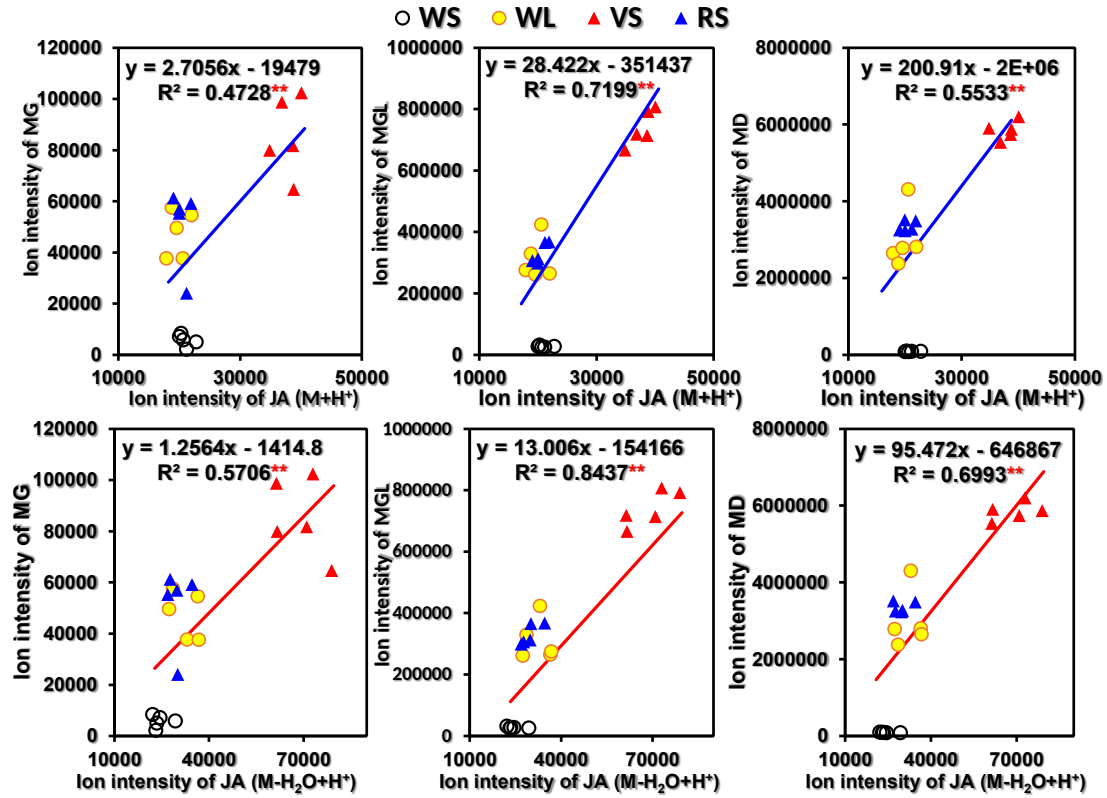
**FIGURE 3. PCA score plots (a) and clustering heatmap (b) of mold-infected soybean pods growing under different light conditions.**



**FIGURE 4. Pathway analysis of mold-infected pods growing under different light conditions (VS-Fv vs. WL-Fv).** The color and size of pathway symbols represent the significance level in the enrichment analysis and the impact factor, respectively.



**FIGURE 5. Integrated effects of shading and mold infection on isoflavone biosynthesis in soybean pods.** The isoflavone contents in soybean pods under different treatments are represented by colors ranging from blue (low) to red (high) for each compound.

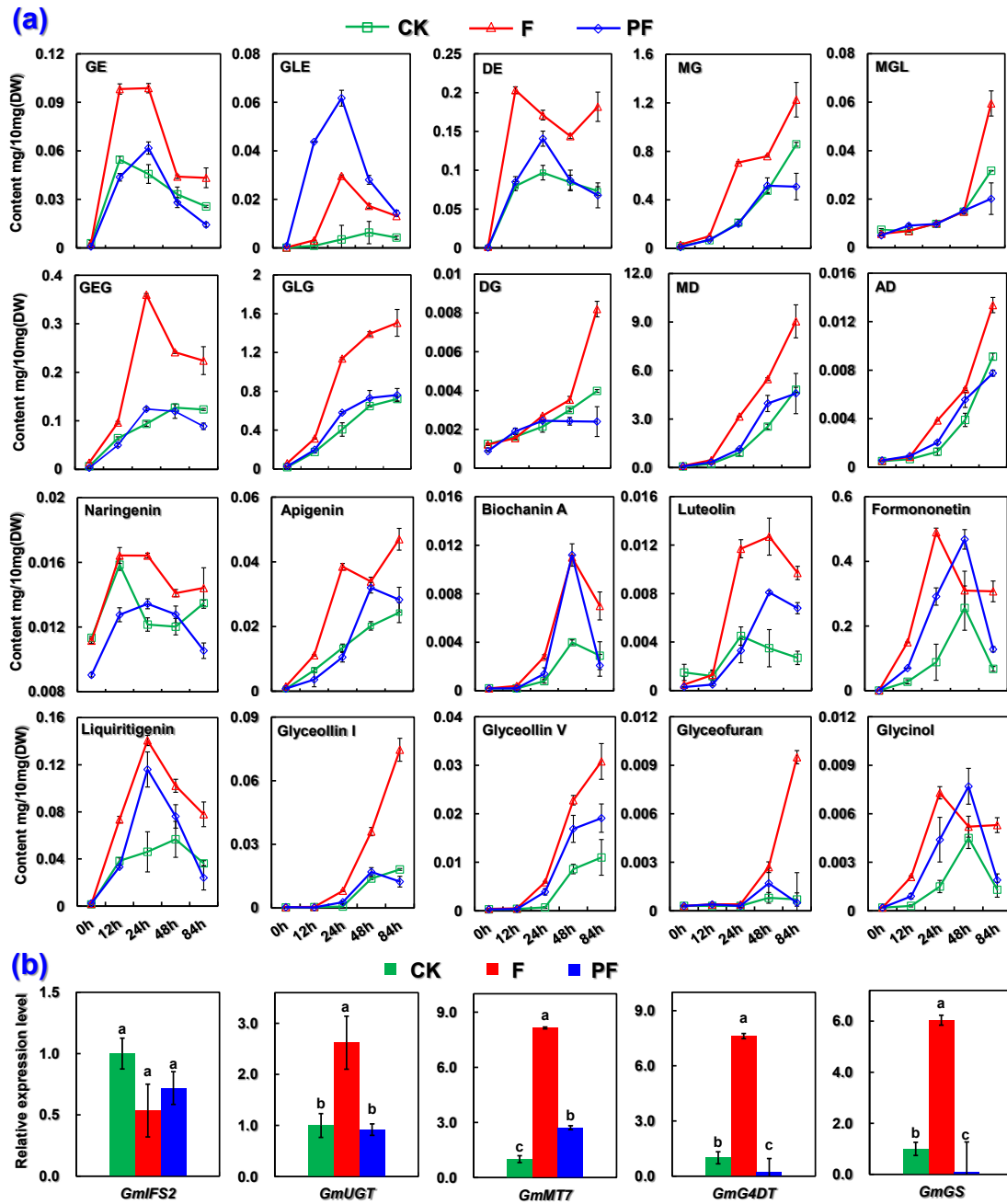


**FIGURE 6. Correlation analysis of JA and isoflavone contents in soybean pods.**

$R^2$ : The determination coefficient (squared Pearson correlation coefficient) represents the imitative effect of the linear regression equation;  $^{**}$ : Correlation is significant at the 0.01 level (2-tailed). MG: malonylgenistin, MGL: malonylglycitin, MD: malonyldaidzin.



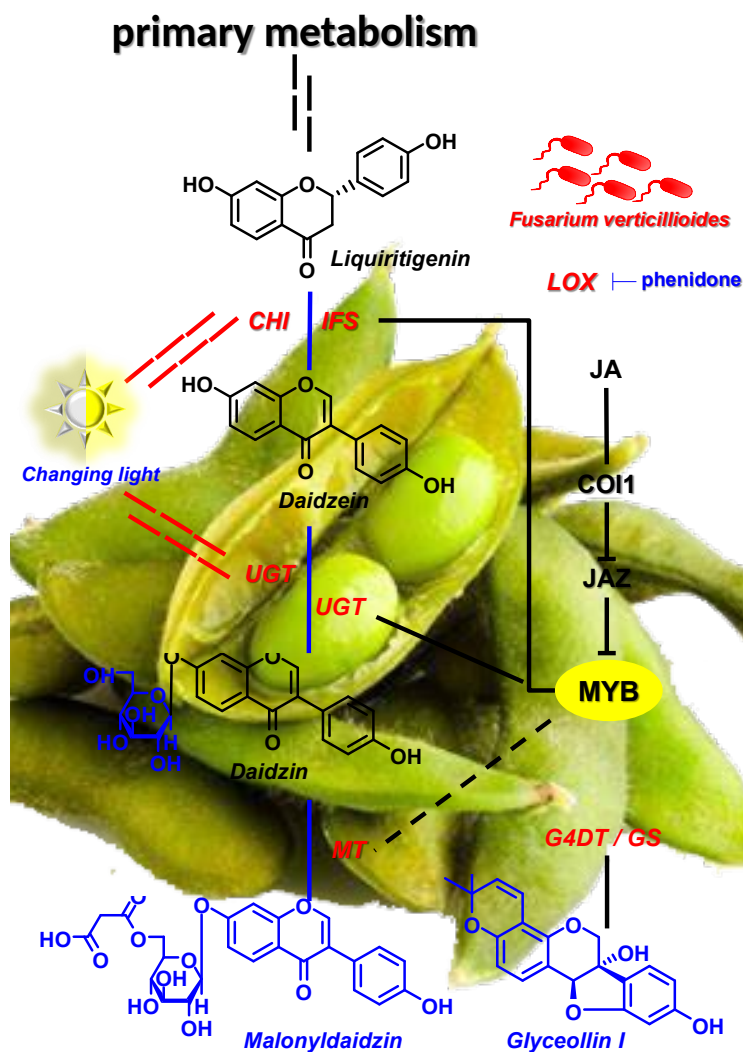
**FIGURE 7. Effects of JA synthesis inhibition on the mildew resistance phenotypes of soybean pods.** CK: sterile water control; F: inoculation with *F. verticillioides*; PF: PHD pretreatment + fungal inoculation.



**FIGURE 8. Effect of phenidone on flavonoid biosynthesis in soybean pods. (a)** Dynamic changes in flavonoid accumulation; **(b)** Expression analysis of key genes involved in isoflavone biosynthesis. CK: sterile water control; F: inoculation with *F. verticillioides*; PF: PHD pretreatment + fungal inoculation. GE: genistein, GLE: glycitein, DE: daidzein, GEG: genistin, GLG: glycitin, DG: daidzin, AD: acetyldaidzin. *GmIFS2*: isoflavone synthase; *GmUGT*: glycosyltransferase; *GmMT7*:



malonyltransferase; *GmG4DT*: glycinol 4-dimethylallyl transferase; *GmGS*: glyceolin synthase.



**FIGURE 9. A proposed model for the mechanism by which the combination of changing light and endogenous JA enhance mildew resistance in soybean pods.** CLE (VS) increases the level of carbon assimilation, providing an adequate carbon source for the biosynthesis of upstream aglycones and glucosides. In response to fungal infection, the JA signaling pathway of pods was activated; the upregulated *MYBs* induced the biosynthesis of downstream flavonoids and further enhanced the mildew resistance of soybean pods.