

**Table S1.** Training (about 80%) and validation set (about 20%) size for cross-validation (CV) scenarios used to evaluate within-family genomic selection for fusiform rust disease.

| <b>Scenario / Training data</b> | <b>Test set</b> | <b>Training size</b> | <b>Testing size</b> |
|---------------------------------|-----------------|----------------------|---------------------|
| 1) <i>Random-CV</i>             |                 | 578                  | 145                 |
| 2) <i>Family-CV</i>             |                 |                      |                     |
| CxD, CxE, FxC, GxE              | AxB             | 677                  | 46                  |
| AxB, CxE, FxC, GxE              | CxD             | 596                  | 127                 |
| AxB, CxD, FxC, GxE              | CxE             | 499                  | 224                 |
| AxB, CxD, CxE, GxE              | FxC             | 617                  | 106                 |
| AxB, CxD, CxE, FxC              | GxE             | 503                  | 220                 |
| 3) <i>Within-family-CV</i>      |                 |                      |                     |
| AxB                             | AxB             | 579                  | 9                   |
| CxD                             | CxD             | 579                  | 25                  |
| CxE                             | CxE             | 579                  | 45                  |
| FxC                             | FxC             | 579                  | 21                  |
| GxE                             | GxE             | 579                  | 44                  |