DNA-tests and marker-assisted seedling selection to improve new strawberry varieties

Seonghee Lee

Summary

DNA tests for day-neutality and anthracnose fruit rot resistance were newly developed for marker-assisted seedling selection (MASS) in 2018. In the 2018 MASS program, DNA tests for fruity aroma, Phytophthora crown rot resistance, day-neutrality, and anthracnose fruit rot resistance were utilized. Approximately 55,000 seedlings were screened, and 12,500 seedlings possessing the target traits were retained for field evaluation during the 2018-2019 season.

DNA test for Phytophthora resistance

DNA tests for the PhCR resistance locus (*FaRPc2*) have been successfully utilized for seedling selection since 2016. This year we improved the DNA tests for more accurate and easier screening. As shown in Fig. 1, DNA tests precisely detected the presence (blue curve) and absence (red curve) of resistance with 95% accuracy.

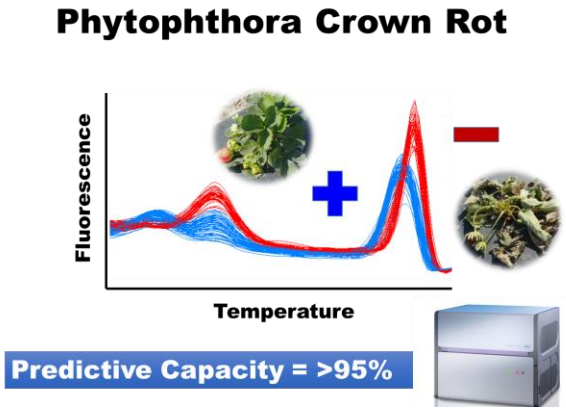

Figure 1. A DNA test for Phytophthora crown rot resistance in cultivated strawberry.

DNA test for day-neutrality

In cultivated strawberry, a chromosome region associated with day-neutrality has been identified, *FaPFRU*. We developed high-throughput DNA tests tightly linked to *FaRFRU*. The tests successfully selected day-neutral seedlings (blue curve) with 95% accuracy (Fig. 2).

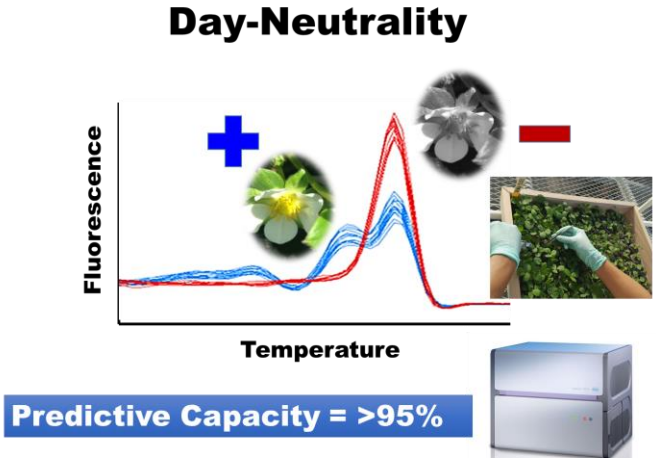

Figure 2. A DNA test for day-neutrality in cultivated strawberry.

DNA test for anthracnose resistance

The genetic location that accounts for most of the difference between resistant and susceptible varieties for anthracnose fruit rot was recently identified on chromosome 6B and named *FaRCa1*. DNA tests tightly associated with *FaRCa1* were developed for MASS. Figure 3 shows the genotyping results for resisant (blue curve) or susceptible (red curve).

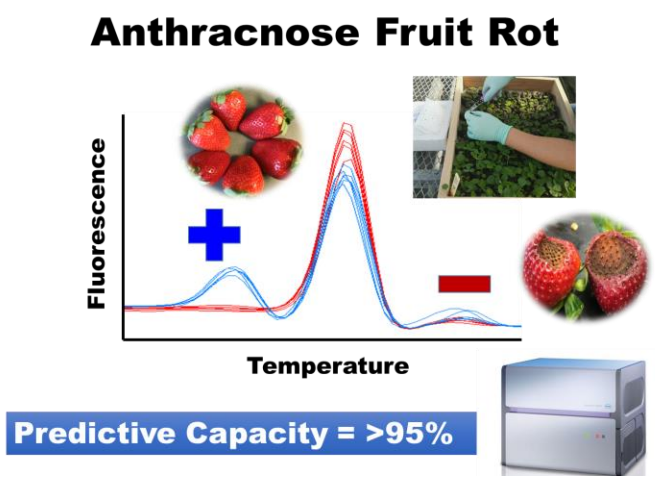

Figure 3. A DNA test for anthracnose fruit rot resistance in cultivated strawberry.

Stacking multiple disease resistances using DNA tests

We developed a method for high-throughput multiplex genotyping to screen seedlings for resistances to both diseases simultaneously. Using this method, we can precisely select an individual seedling possessing both *FaRPc2* and *FaRCa1* (blue curve) with 95% accuracy (Fig. 4).

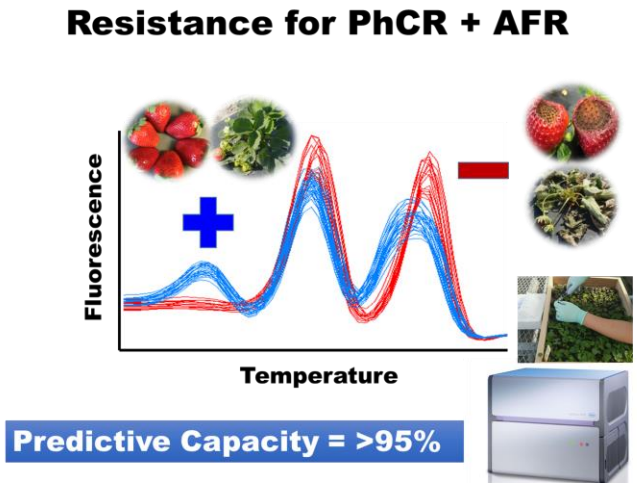

Figure 4. A multiplex DNA test for stacking multiple disease resistances in cultivated strawberry.

Hight-throughput marker-assisted selection

A total of 55,000 seedlings were screened by DNA tests for a combination of all traits. About 12,500 seedlings were retained for field evaluation in the 2018-2019 season. These tests can predict seedling traits with greater than 90% total accuracy. We are now able to combine many important traits for fruit quality and disease resistance together in future varieties.

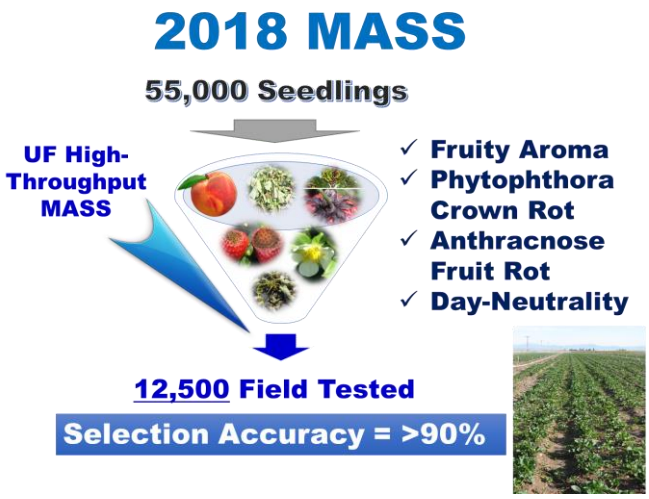

Figure 4. High-throughput marker-assisted seedling selection for improving disease resistance and fruit quality.

Contact

Dr. Seonghee Lee
UF/IFAS Gulf Coast Research and Education Center
P: 813.633.4151
E: seonghee105@ufl.edu