USE OF SSR-PRIMERS FOR PROGENY SELECTION IN A CHESTNUT BREEDING PROGRAM

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ABSTRACT

The introduction of the fungus *Cryphonectria parasitica* into North America at the beginning of the 20th century almost eliminated the once dominant forest tree, the American chestnut. However, the Chinese chestnut, its Asian counterpart, has remained resistant to the fungus. A breeding program began almost two decades ago to develop a blight-resistant variety of the American chestnut for restoring it to eastern U.S. forests. The Chinese chestnut, although it has resistance to the fungus, lacks the desirable superior timber qualities of the American variety. The hybrids that have resistance are being backcrossed to the American parent to develop a true American variety that has resistance and all the superior timber traits. The American Chestnut Foundation, which initiated the backcrossing program, has been using traditional techniques to determine the resistance and growth characteristics of a mature tree to screen the progeny. These methods are not precise and require long times for identifying the desired progeny. Molecular techniques to ascertain true resistance and presence of desirable traits will speed the project to develop a resistant American chestnut variety for restoration efforts. In the past, we have used PCR and RAPD primers to screen progeny for desirable traits. We have now included short sequence repeat (SSR) primers as selection tools.

Genomes of plants contain high levels of length polymorphism in dinucleotide and trinucleotide tandem repeat sequences. Such repeat sequences, known as SSRs, are abundant, uniformly distributed, hypervariable, codominant, and highly reproducible. A linkage map has been generated for the Chinese and American chestnut trees based on these SSRs. We are using this information to screen for the presence or absence of specific alleles in the progeny of American chestnut backcross breeding program.

SSR screening helps identify progeny that are truly resistant and have desirable traits of the American chestnut. Through every backcross, progeny are screened for those having more American alleles and fewer Chinese alleles. Some of those having resistance to the blight will be selected for further analysis. This technique of screening progeny would be a valuable addition to the breeding program and will greatly contribute to its success.