Mapping of the *Rag1* aphid resistance locus of soybean with microarray-generated SNP markers.

Affymetrix Soybean GeneChip microarrays were used to discover single nucleotide polymorphism (SNP) variation between soybean cultivars for use in fine mapping *Rag1*, a gene responsible for aphid resistance. Genomic DNA of the aphid susceptible cultivar Dwight and the aphid resistant cultivar Dowling was labeled and hybridized to arrays and more than 1500 putative single feature polymorphisms (SFPs) were identified genome-wide. SFPs were verified by sequencing the probe target sequences at an empirically-determined false-discovery rate of 20%. To find sequence polymorphisms useful for fine mapping the *Rag1* aphid resistance locus, genomic DNA samples from two near-isogenic lines (NILs) developed through backcrossing *Rag1* four times into the Dwight background were hybridized to the array. Comparison of hybridization signals between the NILs and the recurrent parent identified more than 100 SFPs in each NIL, and we focused on ~30 SFPs which were shared between the two NILs. Sequencing the targets of these probes revealed a false discovery rate of 60%. We developed molecular markers for the true SNP polymorphisms and determined that two of these markers are genetically linked to the aphid resistance region. The technique that we describe can be used to quickly identify polymorphisms in a genetic region of interest and generate molecular markers closely linked to an agronomically important trait between any two genotypes for which sequence information is poor or unavailable.