DNA microarray-based discovery of molecular markers for the improvement of tomato color and nutritional quality

Audrey Darrigues, Wencai Yang, David M. Francis.
Department of Horticulture and Crop Science
The Ohio State University, OARDC, 1680 Madison Avenue, Wooster OHIO 44691

Color is among the most important attributes of tomato for processing into whole and diced products. Both color and color uniformity are greatly affected by yellow shoulder disorder (YSD), a ripening disorder that results in discoloration of the proximal end tissues of the fruit. We show that lycopene and beta-carotene concentrations are reduced by 18% and 22%, respectively, in fruits affected by YSD. Variance partitioning suggests that YSD incidence and severity is affected by both genetics and environment. In order to elucidate the genetic basis of YSD, we are developing single nucleotide polymorphisms (SNPs) as molecular markers for application in three inbred backcross populations derived from either *L. esculentum* x *L. esculentum* or *L. esculentum* x *L. pimpinellifolium* crosses. SNP discovery for application in these populations is based on both analyses of large public EST databases and on hybridization to a custom oligonucleotide array. The array was hybridized with target cDNA from *L. esculentum* (OH7814) and *L. pimpinellifolium* (LA1589). We developed algorithms to detect outliers and identified 1,296 potential SNPs. These putative SNPs are being verified by sequencing, screened for utility as markers on a collection of 92 *L. esculentum* lines and wild relatives, and applied to the genetic dissection of YSD. Implementing SNP-based marker technology has the potential to dramatically alter our approach to genetic characterization. Results and interpretation from this study will help bridge the gap between the goals of genetic and crop improvement research by facilitating the use of population structures that favor simultaneous genetic analysis and crop improvement.