

Title Genetic analyses of correlated solids, flavor, and health-enhancing traits in onion (*Allium cepa* L.)

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Abstract

Onion possesses organosulfur compounds and carbohydrates that provide unique flavor and health-enhancing characteristics. Significant phenotypic correlations have been reported among soluble solids content (SSC), total dry matter, pungency, and onion-induced in vitro antiplatelet activity. A genetic map and segregating F₃M families derived from a cross between two inbred populations were used to identify and estimate the effects of quantitative trait loci (QTLs) controlling these traits at 30 and 90 days postharvest. In vitro antiplatelet activities among different onion populations were consistent across six human blood donors. Most of the populations showed in vitro antiplatelet activities; however, for some donors, one of the parental lines and two F₃M families had pro-aggregatory effects under our experimental conditions. SSC, dry matter, pungency, and in vitro antiplatelet activity showed significant positive phenotypic and genetic correlations. A chromosome region on linkage group E accounted for a significant amount of the phenotypic variation for all of these traits. The correlations among these traits may be due to linkage or pleiotropy of genes controlling solids content. Our results indicate that it will be difficult to develop onion populations with lower pungency and high in vitro antiplatelet activity; however, the strong genetic and phenotypic correlations between high in vitro antiplatelet activity and high SSC are beneficial for the health functionality of onion.