Toward a tastier tomato: Recovering the lost STP1 variant in modern tomato to improve soluble solid in fruit

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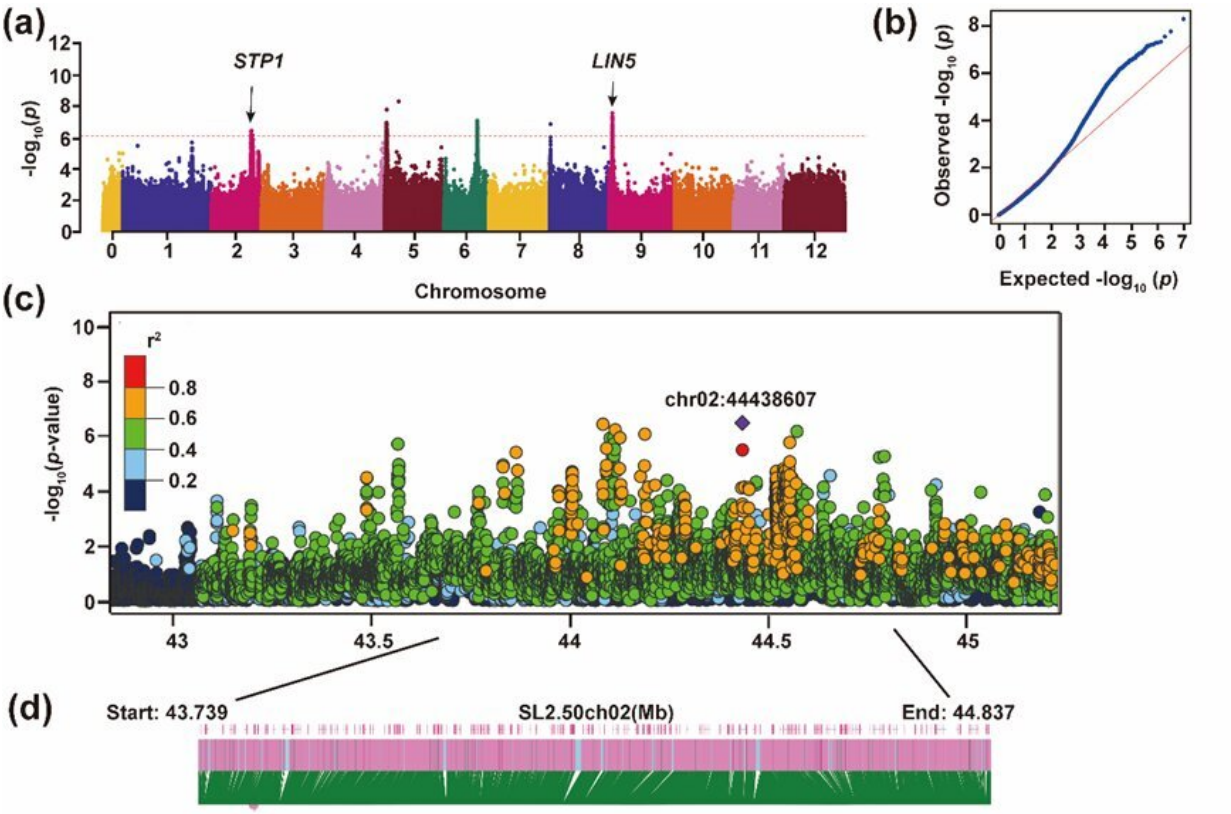

Genome-wide association analysis (GWAS) of soluble solid content (SSC) in tomato fruits. Credit: *Horticulture Research*

In a study recently published in the journal *Horticulture Research*,

researchers performed a genome-wide association study (GWAS) for SSC of the red-ripe fruits in a population consisting of 481 tomato accessions with large natural variations and found a new quantitative trait locus, STP1, encoding a Sugar Transporter Protein.

The causal variation of STP1, a 21-bp InDel, located in promoter region 1,124 bp upstream of the start codon, alters its expression. $STP1^{Insertion}$ accessions with 21-bp insertion have higher SSC than $STP1^{Deletion}$ accessions with 21-bp deletion.

Knockout of STP1 in TS-23 with high SSC using CRISPR/Cas9 greatly decreased SSC in fruits. In vivo and in vitro assays demonstrated ZAT10-LIKE, a zinc finger protein transcription factor (ZFP TF), can specifically bind to the promoter of $STP1^{Insertion}$ to enhance STP1 expression, but not to the promoter of $STP1^{Deletion}$, leading to lower fruit SSC in modern tomatoes. Diversity analysis revealed that STP1 was selected during tomato improvement.

The authors identified a naturally occurring causal variation underlying SSC in tomato, and a new role for ZFP TFs in regulating sugar transporters. The findings enrich the understanding of tomato evolution and domestication, and provide a genetic basis for breeding tasty tomato.

More information: Ying Wang et al, A 21-bp InDel in the promoter ofSTP1selected during tomato improvement accounts for soluble solid content in fruits, *Horticulture Research* (2023). DOI: 10.1093/hr/uhad009

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