Blueprint for blueberry improvement: Genetic and epigenetic discoveries

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A maturing 'Polaris' blueberry (Vaccinium corymbosum) Credit: Public Domain

Blueberries, part of the Vaccinium genus, are renowned for their

nutritional benefits and increasing global demand. However, cultivation faces challenges like climate adaptability and fruit quality. Modern blueberries have a short domestication history, primarily through interspecific hybridization. These challenges necessitate deeper research into the genetic and epigenetic factors influencing blueberry traits.

Researchers from Peking University and Jilin Agricultural University, in collaboration with international experts, have made significant strides in blueberry genetic research. Published in *Horticulture Research* on May 14, 2024, their study presents a comprehensive analysis of blueberry genomic variation, marking a pivotal moment in agricultural science.

The study involved whole-genome re-sequencing and bisulfite sequencing on various blueberry cultivars to understand their genetic and epigenetic differences. Researchers identified significant gene introgression from V. darrowii and V. ashei into southern highbush (SHB), aiding its subtropical adaptation.

They discovered the VcTBL44 gene, crucial for regulating fruit firmness in SHB. Additionally, they found significant differences in DNA methylation patterns between northern highbush (NHB) and SHB, particularly in CHH-DMRs associated with transposon regulation. These findings offer a comprehensive understanding of the genetic and epigenetic mechanisms that have improved blueberry cultivars, providing valuable resources for future breeding programs aimed at enhancing fruit quality and climate resilience.

Dr. Haiyue Sun, a leading researcher in the study, stated, "Our research provides a detailed genetic and epigenetic map of blueberries, offering crucial insights for breeding programs. The identification of key genes like VcTBL44 paves the way for developing cultivars with improved fruit quality and climate adaptability."

The insights from this study have significant implications for blueberry breeding. The genetic and epigenetic resources identified can develop new cultivars more resilient to climate changes and superior in fruit quality. This research enhances our understanding of blueberry genetics and provides practical tools for breeders to meet the growing consumer demand for high-quality blueberries.

More information: Zejia Wang et al, Genetic and epigenetic signatures for improved breeding of cultivated blueberry, *Horticulture Research* (2024). DOI: 10.1093/hr/uhae138