Optimization of transformation and regeneration systems in highbush blueberries

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Abstract:

Blueberries are valued for their health benefits due to high amounts of polyphenol compounds, such as anthocyanins. Farm laborers harvest fresh market blueberries by hand, but increasing production costs and labor shortages force farmers to rely on mechanical harvesting methods. Mechanical harvesters bruise and otherwise damage blueberries, resulting in loss of firmness and reduced shelf life. Genome editing tools, like CRISPR, have been previously used to solve crop problems by enhancing nutritional value and resistance to environmental conditions and disease. However, to date, only a handful of studies have explored the idea of applying CRISPR technologies to blueberries. Developing a gene-editing system will enable us to generate transgene-free blueberries that can withstand damaging mechanical harvesters or have a better taste and flavor. Before starting the genome editing processes, *in vitro* tissue culture (TC), regeneration, and transformation are the essential prerequisites for successful gene editing. *In vitro* TC and regeneration of blueberries have been optimized for a few cultivars, but the published protocols do not work for all genotypes. Protocols were developed to optimize adventitious shoot regeneration and transformation from four Southern Highbush cultivars, NC 3104, NC 5288, ‘Jewel’, ‘Emerald’, and one Northern Highbush cultivar, ‘Legacy’. Our project aims to optimize these protocols for a broader range of blueberry cultivars to pave the way for genome editing projects.