VacTrait

Blueberry Shelf Life

WHY IS THIS TRAIT IMPORTANT?

When you open a clamshell of blueberries in your fridge, what are you excited to eat? Probably berries that are firm and plump, and that look fresh. Certainly not berries that are wrinkly, soft, mushy, or moldy. These qualities are part of a cluster of shelf-life traits. Shelf life is an important characteristic for a crop like blueberry that contributes to the economic success and consumer enjoyment of the fruit. Consumers want blueberries that are consistently high quality and appetizing. Blueberry producers want fruit that will maintain quality through the process of harvest, to shipping, to being stocked in grocery stores. Improving traits in new cultivars that contribute to shelf life is an important part of this process.

Blueberries after 6 weeks of cold storage

Date: 4/18/2023

WHAT DO WE KNOW ABOUT THE TRAIT IN TERMS OF DIVERSITY AND GENETICS?

Genetics are a major contributor to variations in shelf life traits. There is plenty of diversity in texture and firmness in the genetic pool for blueberries, so there is still plenty of opportunity to improve these traits through breeding. We can quantify this opportunity with heritability. The closer heritability is to 1, the more likely the trait can be improved through breeding. Previous studies have shown firmness has a heritability range of 0.43 and 0.70 (Cellon et al. 2018). Heritability of fruit rot due to anthracnose has been measured at 0.32 (Polashock et al. 2005). Heritability of scar size has been measured at 0.67 (Rowland et al. 2020). We've seen improvement on many of these traits over the years, like firmer blueberries over time with breeding (Cappai et al. 2018).

DID YOU KNOW?

- There are several components that contribute to shelf life in blueberries. In VacCAP, we are measuring texture, scar size, scar tear, wet/dry scar, fruit weight, fruit height, mold, wrinkle, and leakage. These traits are measured at harvest and 6-8 weeks post-harvest.
- Preliminary data collected in VacCAP indicated that extensive variation for most of the shelf-life parameters exist in blueberry germplasm.

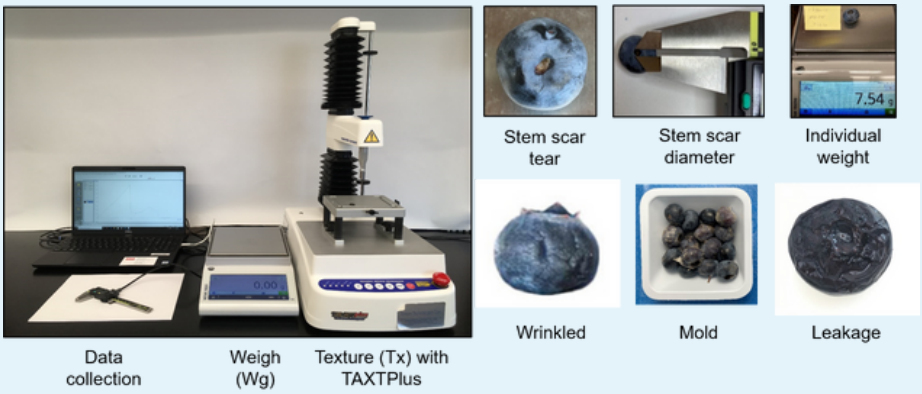
HOW DO WE PHENOTYPE THIS TRAIT?

Texture is a very difficult trait to measure. It can be measured by a panel of trained sensory specialists; however, this is impractical for the scale of a breeding program. For this project, we are using a machine called a texture analyzer that measures a suite of parameters related to texture in both the skin and pulp of the fruit (Giongo et al. 2013). It uses a probe that travels through the fruit and measures resistance at different points. From this data, we will be able to figure out some of the most important measurements needed to assess texture.

We are also measuring traits related to the picking scar. This includes measuring the scar diameter with digital calipers, noting whether there has been a tear at the scar site, and if the scar appears wet or dry. These traits are important since the scar can be a site of water loss or fungal and bacterial growth during storage. We are also measuring fruit weight and height to be able to get a sense for water loss between harvest and storage, as well as how the size of the fruit relates to shelf life.

HOW DO WE PHENOTYPE THIS TRAIT? (CONTINUED)

At 6-8 weeks post-harvest, we are rating the fruit for presence of mold, wrinkle/shrivel, and leakage. By studying texture at harvest and 6-8 weeks postharvest, we can tell how well the berries hold up to being stored and determine what factors contribute to good or poor shelf life. Factors can include genetics, storage conditions and technologies, or weather and harvesting methods (Polashock et al. 2005, Cappai et al. 2018). For this project, we are primarily focused on understanding the genetic components of shelf-life traits.

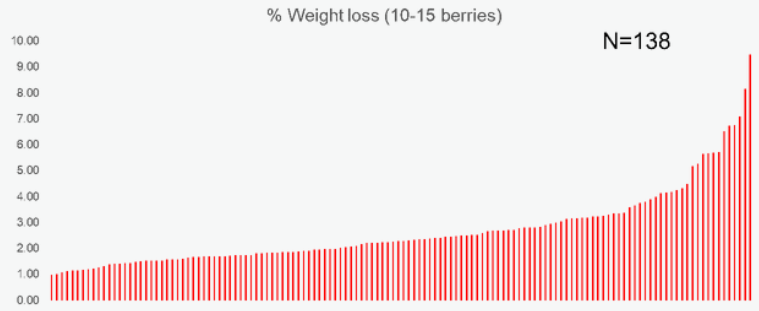


WHAT IS VACCAP DOING TO WORK ON, SOLVE, OR IMPROVE THIS ASPECT?

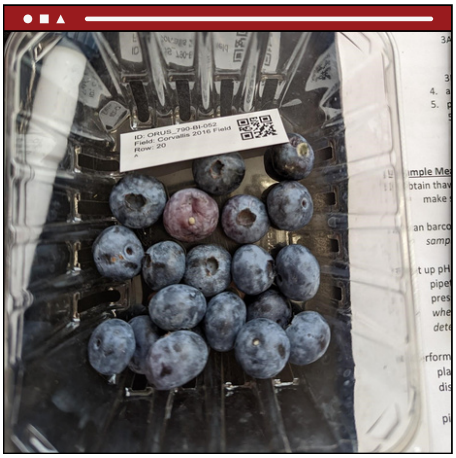
VacCAP is phenotyping about 1,000 genotypes of northern highbush blueberries and 1,000 genotypes of southern highbush blueberries for shelf life and fruit quality parameters at harvest and at 6-8 weeks post harvest. The goal is to use these parameters to understand the heritability of these shelf life parameters, how they change during storage, and if we can identify parameters that could be used to select for extended shelf life.

In addition, we are also collecting genotypic data using a 22,000 SNP array on all of these individual plants in order to identify new markers associated with various shelf lift traits. This work will inform breeding programs so that they can more effectively select for fruit with improved shelf life and fruit quality.

This project is particularly important because, to date, we don't know much about the inheritance of shelf-life traits or about the relationship of texture with other fruit quality traits for blueberries. We do know that there is a lot of variation within our breeding programs for these shelf-life traits. Our goal is to better understand how to measure shelf life so that we can improve it in new cultivars.



Variation for % weight loss observed in a subset of northern highbush genotypes (9-fold change). Fruit was stored for six weeks, at 3°C, 94 % RH.



OTHER RESOURCE AND REFERENCES:

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The Vaccinium Coordinated Agricultural Project (VacCAP) is a nationwide coordinated transdisciplinary project focused on addressing major bottlenecks limiting the growth of the U.S. Vaccinium industry by developing and implementing marker assisted selection (MAS) capacity in breeding programs. This will enable breeders to select and pyramid fruit characteristics that positively contribute to fruit quality and market value. Long term, the scientific resources developed will increase production of fruit with improved characteristics that meet ever-changing industry, market, and consumer

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VacCAP
IMPROVING FRUIT QUALITY

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