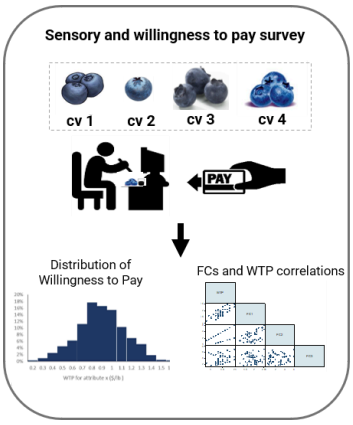
VacCAP
IMPROVING FRUIT QUALITY
ISSUE 11 | DECEMBER 2024

CONSUMER PREFERENCE AND BEHAVIOR

VacCAP Objective 4 assessed the potential socio-economic impact of blueberry and cranberry fruit quality improvements on market demand



Understanding Consumer Preferences for Fresh Blueberries

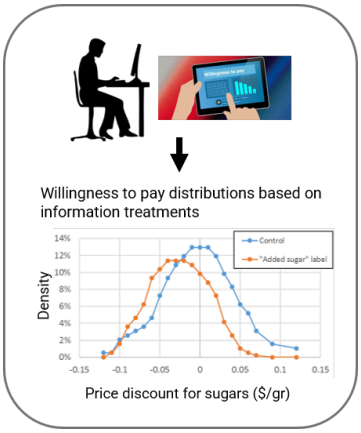
Socio-Economic Team

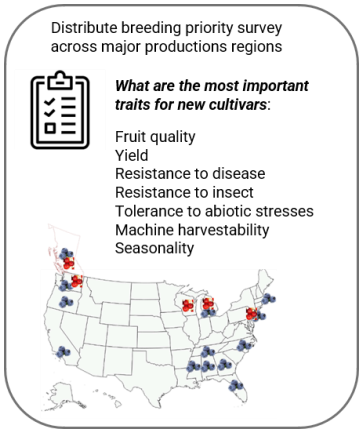
Conducted an online survey and a consumer panel to asses how consumer and fruit characteristics, along with sensorial attributes, affect willingness to pay for fresh blueberries and to identify factors affecting purchasing behavior.

Used an online survey to assess consumer perception for added sugar labeling in cranberry processed products and for genetic approaches to lower added sugar content.

Understanding Consumer Preferences for Cranberry Products

Socio-Economic Team





Reassessing cranberry and blueberry breeding

Extension & Socio-Economic Teams

Surveyed growers, distributors, breeders and scientists to reassess blueberry and cranberry breeding priorities.

ACCOMPLISHMENTS IN SOCIO-ECONOMIC STUDIES

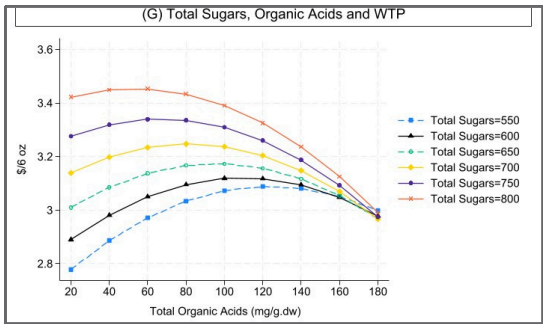
OUTCOMES ARE

- Generated new insight into consumer preferences for blueberry quality attributes and their impact on purchasing behavior
- Advanced knowledge about consumer reactions to added sugar labeling and the use of gene editing technology for cultivar development in cranberry products
- Identified stakeholders breeding priorities

UNDERSTANDING CONSUMER PREFERENCES FOR FRESH BLUEBERRIES: THE IMPACT OF SENSORY AND FRUIT QUALITY TRAITS

Blueberries have become one of the most economically significant berries in the United States, with per capita consumption soaring by 879% between 2000 and 2021.

As the blueberry market becomes increasingly selective and quality-driven, it is important for the industry and breeders to focus on fruit quality traits that enhance consumer demand. While current selection efforts prioritize agronomic traits like yield and storage performance, consumers tend to value attributes like flavor, texture, appearance, and fruit size. Despite this, research connecting blueberry sensory and quality attributes to increased consumption remains limited. The two studies featured in this newsletter aim to bridge this gap by exploring consumer preferences for quality attributes and their impact on purchasing behavior. By understanding these preferences and the role of quality descriptors, the industry can better meet consumer expectations, drive higher consumption, and implement targeted marketing strategies.



Willingness to Pay for Blueberries: Sensory Attributes, Fruit Quality Traits, and Consumers' Characteristics

LINK TO PAPER

This study investigates how sensory attributes and fruit quality traits influence consumers' willingness to pay (WTP) for fresh blueberries. Using a combination of consumer sensory tests and a double-bounded contingent valuation method, the study assessed consumer preferences for various northern and southern highbush blueberry cultivars across Oregon and Florida over two years.

Sensory attributes and WTP: This study assessed how various sensory attributes—such as flavor, sweetness, and firmness sensory liking and intensity scores— influence how much consumers are WTP for fresh blueberries. Flavor emerged as the most important factor in determining consumer acceptance and WTP. Blueberries with higher flavor liking scores were associated with higher WTP. Consumers generally preferred blueberries with a sweeter taste and lower sourness intensity.

Instrumental quality measurements and WTP: The study also examined the relationship between instrumental measures of fruit quality—such as soluble solids, titratable acidity, sugars, organic acids, and firmness—and WTP.

The findings revealed that higher sugar content increases WTP, while higher organic acid content enhances flavor but can reduce WTP if the concentration is too high. The balance between sweetness and acidity seems to be key to consumer satisfaction.

Firmness also positively correlates with WTP, except at extreme values. Consumers generally preferred firmer blueberries, but extremely firm blueberries saw a decrease in WTP, suggesting that there is an optimal level of firmness that consumers find most desirable. Larger fruit size (over 17mm) also contributed to higher WTP.

Consumer characteristics and WTP: WTP varied among different consumer groups, with younger individuals, females, and frequent blueberry consumers showing a greater WTP.

This research offers insights for blueberry breeders and producers, highlighting the importance of selecting for specific fruit quality traits. By aligning production with consumer preferences, the industry can enhance market demand and ensure the continued growth of the blueberry industry.

Quality-Related Descriptors to Increase Fresh Blueberries Purchase—Evidence from a Basket-Based Choice Experiment

LINK TO PAPER

With growing interest in the health benefits of blueberries, this research sought to identify marketing strategies that can drive increased consumption. The study investigated how quality-related descriptors on blueberry packaging affect consumer purchasing decisions, particularly their likelihood of buying blueberries and their sensitivity to price changes.

The study used a Basket-Based Choice Experiment (BBCE), simulating a real shopping experience by allowing participants to select a combination of fruits from a virtual basket. Conducted via an online survey, the study included 3,208 U.S. participants. Respondents were asked to choose from various baskets containing 14 types of fresh fruits, including blueberries labeled with descriptors like "Crunchy," "Stay Fresh," and "Sweety," at different price points. We use these words to refer to the attributes: crispiness, extended shelf-life, and sweetness.

Key insights revealed that price, short shelf-life, and freshness concerns are the primary reasons for infrequent blueberry consumption, with 55% of respondents citing price as the main deterrent. The profile of consumers most likely to purchase blueberries includes male, older individuals who are employed, hold college degrees, have higher fresh fruit budgets, reside in the Northeast, and prioritize health.

Impact of quality descriptors on purchasing behavior: The study found that blueberries labeled with “Stay fresh”, which indicates a longer shelf life, increased the likelihood of blueberry purchases. In contrast, the “Sweety” and “Crunchy” descriptors did not effectively boost purchase intent.

Blueberries labeled with “Stay Fresh” or “Sweety” showed lower price elasticity compared to unlabeled blueberries, indicating that consumers were less likely to reduce their purchases in response to price increases. Notably, the “Stay Fresh” label had the strongest impact on reducing price sensitivity, aligning with the finding, also in this study, that consumers prioritize freshness as a key quality attribute.

This research highlights that while sensory and hedonic descriptors on blueberry packaging can influence consumer behavior, not all descriptors are equally effective in driving purchases or reducing price sensitivity. For instance, the “Stay Fresh” label enhanced consumer appeal more than the “Crunchy” label, which did not significantly impact purchase intent. These findings can help guide blueberry marketers and producers in crafting strategies to boost sales.

UNDERSTANDING CONSUMER PREFERENCES FOR CRANBERRY PRODUCTS: THE IMPACT OF ADDED SUGARS LABELS AND CRISPR TECHNOLOGY

Two studies were conducted, the first one explored consumer reactions to added sugar labeling in cranberry products. It found that disclosing added sugars reduced willingness to pay (WTP) for sweet and dried cranberries and cranberry juice.

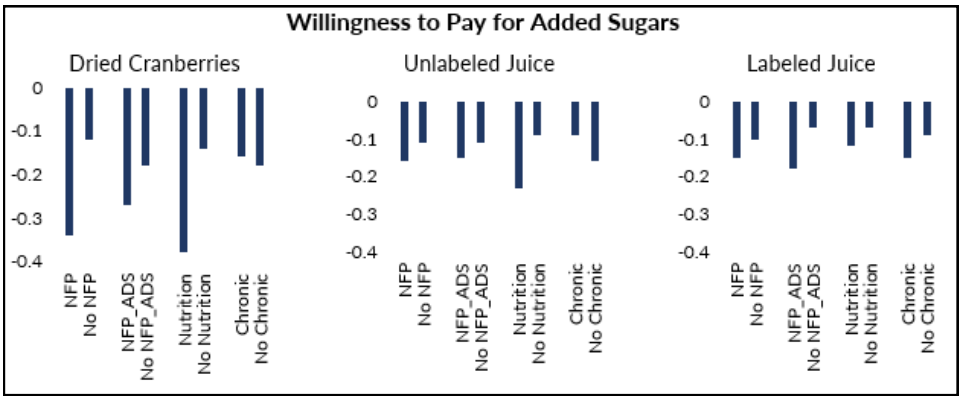
Health benefits and sugar intake recommendations did not increase WTP, suggesting strong negative consumer perception of added sugars despite product health benefits. The second study examines consumer attitudes towards CRISPR-edited cranberries versus conventionally bred and genetically modified (GM) crops. Findings show consumers are generally less willing to pay for CRISPR-edited products unless they offer clear benefits like reduced sugar. Effective communication about CRISPR's advantages and distinctions from GMOs could enhance acceptance and market appeal.

Consumer Response to "Added Sugar" Labeling in Cranberry Processed Products

LINK TO PAPER

This study examines the impact of disclosing added sugars in packaged cranberry products on consumer choices. We first determined the willingness to pay (WTP) for added sugars in sweet and dried cranberries (SDCs) and cranberry juice. Willingness to pay is the amount of money an individual is willing to give up obtaining a product with the levels of attributes (added sugar content, different sweetening methods) described in the survey. Then, we assessed how providing information about cranberry health benefits and recommended sugar intake influences WTP estimates, aiming to understand if health claims can offset the negative impact of the added sugar information on the label of cranberry products.

Additionally, we analyzed how various consumer groups reacted to the added sugar information. This research shed light on how labeling policies affect consumer behavior and the efficacy of health information on decision-making. The study collected data through a survey conducted by Qualtrics Research Services, comprising 2,000 respondents.



Heterogeneous WTP across different cranberry survey sub-samples of respondents.

NFP means: Respondents for whom the information in the Nutrition Facts Panel (NFP) is important. NFP_ADS means: Respondents for whom added sugars are the main piece of information in the NFP. Nutrition means: Respondents who are nutrition conscious. Chronic means: Respondents who have been diagnosed with diet-related chronic diseases.

SDC: Findings revealed that each additional gram of added sugar decreased respondents' WTP for dried cranberries by $0.20/6-oz bag. For example, if a 6-oz bag is priced at $3.99, and the label indicates it contains 12 grams of added sugars, individuals would only be willing to pay $1.79 for the same bag if the label indicates it contains 23 grams of added sugars. Respondents showed no preference between SDC sweetened with fruit juice plus regular sugar versus regular sugar alone. Information on cranberry health benefits didn't increase respondents' WTP, but information on recommendations to limit sugar intake lowered respondents' WTP (i.e., consumers were willing to pay even less for the cranberry products with added sugar). Combining both (i.e., cranberry health benefits and recommendation to limit sugar intake) reduced respondents' WTP.

Unlabeled cranberry juice: Respondents' willingness to pay decreased by $0.13/64-oz bottle for each gram of added sugar. For example, if a 64-oz bottle is priced at $3.49 and indicates it contains 12 grams of added sugars, individuals would only be willing to pay $2.06 for the same bottle if it indicates it contains 23 grams of added sugars. Considering other findings, respondents preferred cranberry juice sweetened with a combination of fruit juices and regular sugar over regular sugar alone. Information on cranberry health benefits or sugar intake recommendations did not increase the estimated WTP for added sugar.

Labeled cranberry juice: Respondents' willingness to pay decreased by $0.11/64-oz bottle for added sugar increases. Therefore, if a juice labeled as 100% juice is priced at $3.49 for 0 grams of added sugars, then individuals would be only willing to pay $2.17 for the same bottle, if it indicates it contains 12 grams of added sugars. Respondents showed no preference between juice sweetened with fruit concentrate plus regular sugar versus regular sugar only. Information on cranberry health benefits or sugar intake recommendations didn't raise WTP. However, presenting both sets of information lowered WTP.

Subsample analyses: We analyzed WTP variations across consumer segments. Not surprisingly, those prioritizing Nutrition Facts Panel information (NFP), added sugars on NFP, and health-conscious individuals expressed significantly lower WTP due to added sugars. Differences were observed based on demographics and health status, suggesting varied impacts across consumer groups.

Conclusions: Our study confirmed the concerns of the U.S. cranberry industry about FDA regulations that require the labeling of added sugars. People are willing to pay less for cranberry products with added sugars and prefer those sweetened with fruit juices instead. Even when health benefits are highlighted, the negative perception of added sugar remains strong. These labeling policies particularly influence health-conscious shoppers, but their overall impact depends on how much consumers pay attention to nutrition labels. Although cranberries have health benefits, the presence of added sugar can overshadow these positives. Future research should explore ways to minimize bias in studies, possibly using virtual reality and experimental auctions, along with actual sales data from stores.

Consumers' Perceptions of Using Gene-Editing in Cranberries

LINK TO PAPER

We conducted a study to understand consumer opinions on gene-edited cranberries, using CRISPR technology, to see if these opinions differed from those about genetically modified (GM) crops. Gene editing offers a potential way to enhance the taste of cranberries without adding sugar, addressing the issue of cranberries' naturally low sugar content, which requires added sugar to improve their palatability. This is particularly relevant following the new FDA regulations that require the separate listing of "Added Sugars" on nutrition labels, potentially discouraging consumers from choosing cranberry products.

Note that current regulations in the U.S. do not automatically consider products developed with CRISPR technology to be GM products. Also, no gene edited cranberry cultivar exists on the market and no efforts are supported by this project (VacCAP) to develop CRISPR based cranberry cultivars. This study simply sought to understand consumer perceptions about CRISPR based products. This information could be useful in the future in case the industry would need to promptly adopt CRISPR to address production/demand challenges.

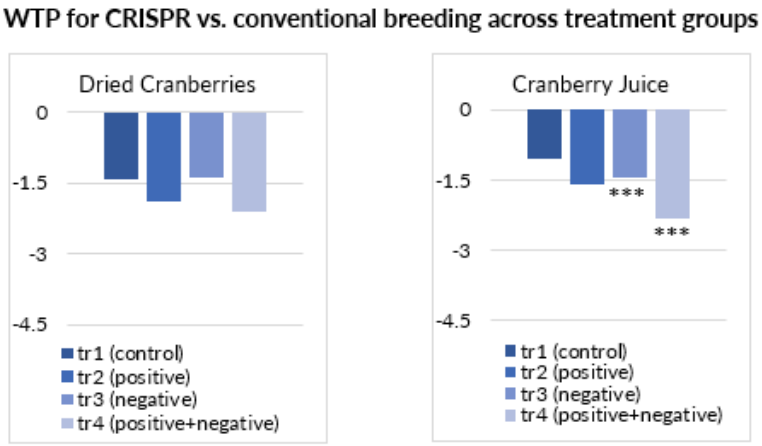
This study has three main objectives:

1. To understand if consumers are willing to pay more for gene-edited (specifically CRISPR) compared to conventionally bred cranberries.
2. To investigate how information about cranberry health benefits and recommendations to limit sugar consumption affect consumer preferences for CRISPR cranberries.
3. To evaluate if different groups of consumers have varying preferences for cranberry product attributes.

Willingness to pay for total sugar content and information effects: Respondents were willing to pay less for regular/standard compared to reduced sugar content for both SDC and cranberry juice. The effect of information varied across products.

- For SDC, information about the health benefits of cranberries didn't affect participants' willingness to pay. When participants were informed about dietary recommendations to limit sugar intake (alone or in combination with information about cranberry health benefits), they were willing to pay less for the product compared to the scenario when participants received no information.
- For cranberry juice, only when receiving both sets of information, respondents were willing to pay less compared to a scenario with no information.

Willingness to pay for CRISPR and information effects: Participants were willing to pay less for both dried cranberries and juice produced using CRISPR compared to conventional breeding. Information on the dietary recommendation to limit sugar intake alone and combined with cranberry health benefits information significantly reduced the willingness to pay.



WTP across different information treatment groups of respondents.

Single, double, and triple asterisks (, **, ***) indicate the statistical significance of the pairwise t-tests at the 10%, 5%, and 1% levels. The pairwise t-tests were based on the following hypotheses:*

- *H01: WTPtreatment1WTPtreatment2*
- *H02: WTPtreatment1WTPtreatment3*
- *H03: WTPtreatment1=WTPtreatment4.*

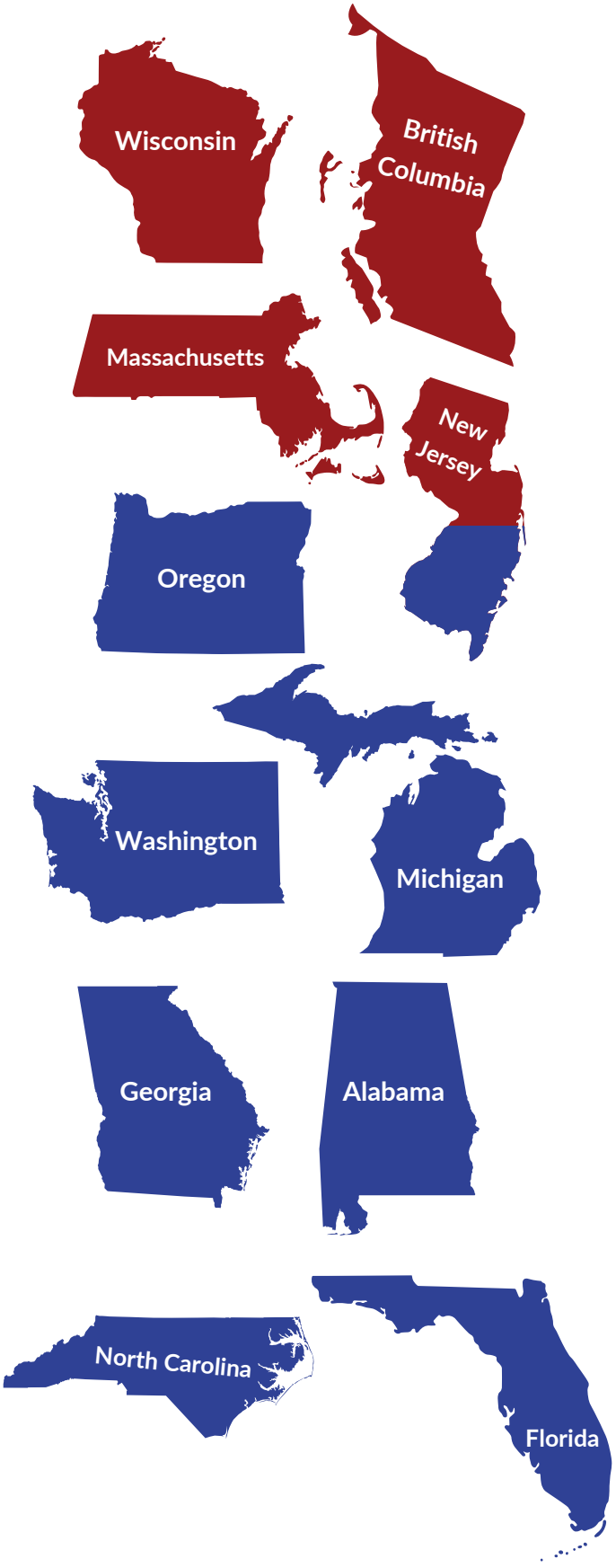
The t-test uses WTP values that were bootstrapped from the normal distribution based on estimates from the GMNL–II model.

Differences in willingness to pay across respondents' segments: Not all respondents were willing to pay less for CRISPR compared to conventional breeding.

- For SDC, 35% of the respondents (out of N=250) were willing to pay more for CRISPR. Note that this group believed that CRISPR could help reduce the need for adding sugar, however they didn't understand the difference between total sugar and added sugar on nutrition labels and didn't pay much attention to total sugar content.
- When it came to cranberry juice, 24% of respondents (out of N=250) strongly rejected CRISPR, 56% mildly rejected it, and 19% did not have a strong opinion. The group with mild rejection of CRISPR was more willing to buy CRISPR-made cranberry products if it meant less added sugars during processing.

Our findings suggest that consumers are more receptive to gene-editing technologies like CRISPR when it leads to tangible benefits, such as reduced sugar content. This has significant implications for growers, processors, and marketers: Emphasizing the health benefits and sugar reduction potential of CRISPR cranberries can improve consumer acceptance. Clear communication about the differences between CRISPR and GMOs can help mitigate negative perceptions. These insights can guide the development and marketing strategies for new cranberry products, making them more appealing to health-conscious consumers and potentially increasing market acceptance of gene-edited foods.

*Survey distributed to **cranberry** and **blueberry** stakeholders in:*



Reassessing Cranberry and Blueberry Breeding Priorities

Assessing stakeholder breeding priority traits for new cranberry and blueberry cultivars is crucial to align breeding programs with industry needs and market demands.

By understanding which traits—such as fruit quality, disease resistance, and stress tolerance—are most valued by producers, packers, and processors, breeders can focus on developing cultivars that improve production efficiency and profitability.

Reassessing these priorities on a regular basis is critical to incorporate new traits that may have become relevant due to shifts in consumer preferences or the rapid effects of climate change, which can introduce new pests and increase plant stress. This ensures that breeding programs remain responsive and adaptive to evolving industry challenges, ultimately supporting the long-term sustainability of the sector.

With this in mind, the VacCAP team conducted two surveys in 2023 to reassess the breeding priorities of the blueberry and cranberry industries.

CRANBERRY BREEDING PRIORITY SURVEY RESULTS

In 2023, the VacCAP team developed and distributed a survey to reassess cranberry stakeholder's preferences for fruit and plant quality traits. The survey was distributed to cranberry stakeholders in Wisconsin (WI), Massachusetts (MA), New Jersey (NJ), and British Columbia (BC), which are the most important regions for this crop.

The survey asked the participants to rank which group of characteristics for a new cultivar were most and least important, and those included: Disease resistance, Yield/Productivity, Insect Pest Resistance, Plant Stress Tolerance (frost, heat stress, etc.), and Fruit Quality (Table 1) . A second set of questions focused on each one of the above mentioned groups and asked participants to rank specific traits related to the individual groups (Table 2).

Results from the survey indicated that Yield/Productivity is the top priority, and fruit quality, disease resistance and tolerance to stress had similar level of importance depending on the regions. Stakeholders in NJ identified Diseases Resistance as their most important group characteristic, while MA, WI, and BC ranked Yield/Productivity as their top one, while Fruit Quality and Tolerance to Plant Stress ranked second and third in different regions.

Regarding the most important fruit quality traits, respondents in MA, WI, and NJ identified fruit size and firmness as the top 2 traits, while respondents in BC identified fruit size and shelf life as their top priority. Across all growing regions, Field Fruit Rot was identified as the top priority in the disease resistance group characteristic. Regarding top priorities in the Plant Stress Tolerance group characteristics, there was consensus among cranberry stakeholder in all growing regions that Heat Stress was within the top 2 most important stress tolerance traits for new cultivars, however WI and BC regions listed cold hardiness as their top trait. There was significant variability across all regions regarding the top priority in the Insect Pest Resistance group characteristic which was expected given the distinctive climatic conditions among growing regions that impact insect populations.

Table 1: Cranberry priority traits determined from industry surveys in MA, WI, NJ, and BC, 2023, ranked 1 (most important) through 5 (least important)

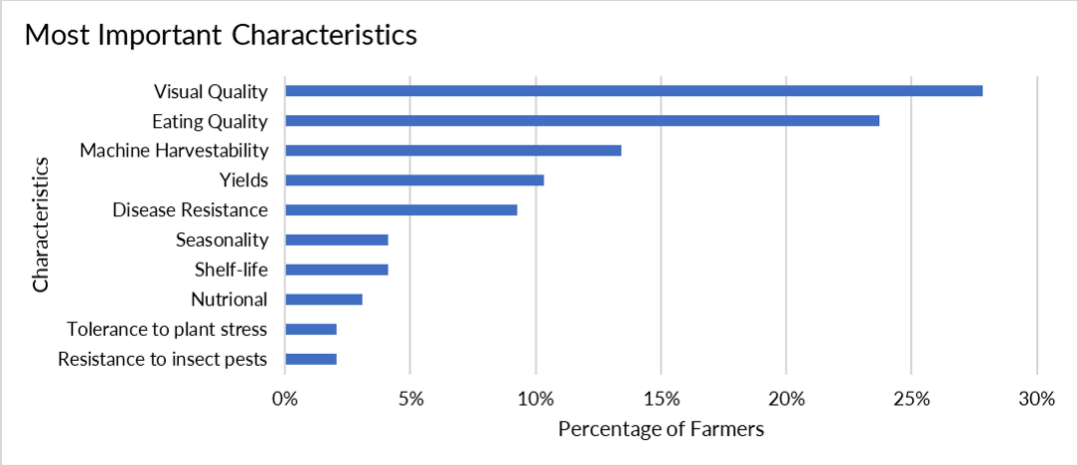
Importance	MA	WI	NJ	BC
1	Yield/Productivity	Yield/Productivity	Disease Resistance	Yield/Productivity
2	Disease Resistance	Fruit Quality Traits	Yield/Productivity	Fruit Quality Traits
3	Plant Stress Tolerance	Plant Stress Tolerance	Fruit Quality Traits	Disease Resistance
4	Insect Pest Resistance	Disease Resistance	Plant Stress Tolerance/Insect Pest Resistance	Insect Pest Resistance
5	Fruit Quality Traits	Insect Pest Resistance	-	Plant Stress Tolerance

STATE	MOST IMPORTANT FRUIT QUALITY TRAIT	MOST IMPORTANT DISEASE RESISTANCE TRAIT	MOST IMPORTANT INSECT PEST RESISTANCE TRAIT	MOST IMPORTANT STRESS TOLERANCE TRAIT
MA	1. Fruit Size 2. Firmness 3. Anthocyanin content (TAcy)	1. Field Fruit Rot 2. Early Rot and Phyllosticta leaf drop 3. Phytophthora	1. Cranberry weevil 2. Sparganothis fruitworm 3. Cranberry fruitworm	1. Drought Resistance 2. Heat Stress 3. Cold Hardiness 4. Flower Stress
WI	1. Fruit Size 2. Firmness 3. Anthocyanin content (TAcy)	1. Field Fruit Rot 2. Early Rot and Phyllosticta leaf drop 3. False Blossom	1. Cranberry fruit worm 2. Blackheaded fireworm 3. Flea beetle	1. Cold Hardiness 2. Drought Resistance 3. Heat Stress 4. Flower Stress
NJ	1. Fruit Size 2. Firmness 3. Flavor	1. Field Fruit Rot 2. Fairy Ring 3. Early Rot and Phyllosticta leaf drop/False Blossom	1. Blunt-nosed Leafhoppers 2. Sparganothis fruitworm 3. Spotted fireworm	1. Heat Stress 2. Drought Resistance 3. Flower Stress 4. Cold Hardiness
BC	1. Fruit Size 2. Shelf Life 3. Firmness	1. Field Fruit Rot 2. Storage Rot 3. Cottonball and Early Rot/Phyllosticta leaf drop	1. Blackheaded Fireworm 2. Cranberry Tipworm 3. Cranberry Fruit Worm	1. Cold Hardiness 2. Heat Stress 3. Drought Resistance 4. Flower Stress

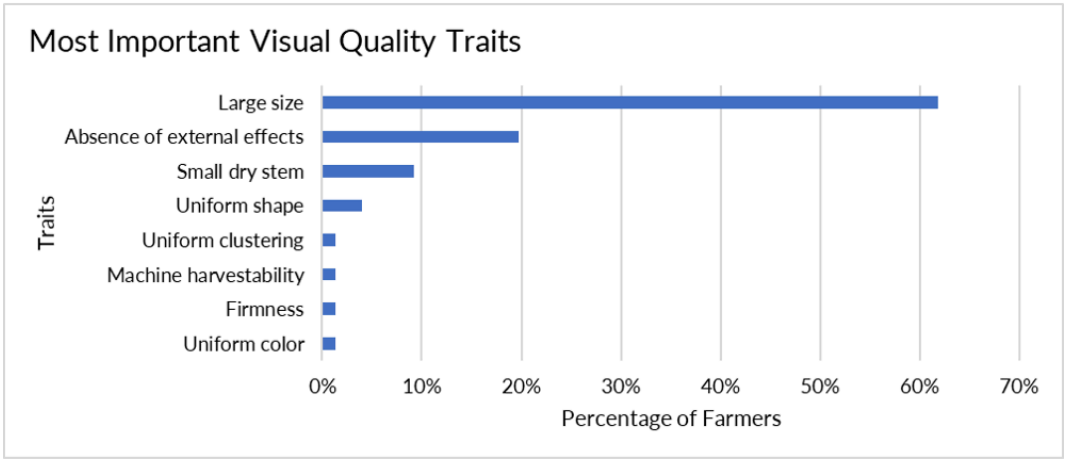
BLUEBERRY SURVEY RESULTS

The survey was distributed to blueberry stakeholders in Washington (26% of total responses were from this state), North Carolina (18%), Florida (16%), Oregon (16%), New Jersey (8%), Georgia (5%), Michigan (4%), and Alabama (2%)

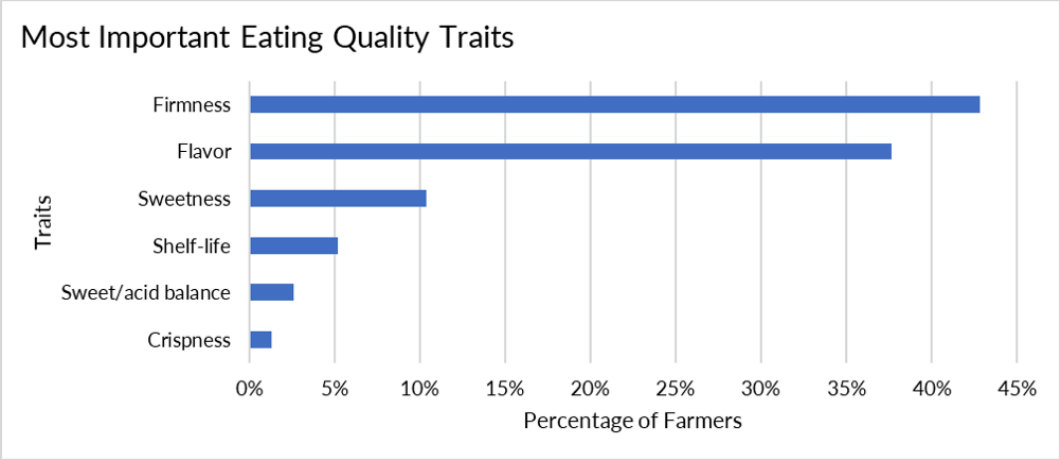
The survey on cultivar characteristic preferences revealed priorities among respondents. Visual quality was the top priority for 28% of respondents, followed closely by eating quality at 24%, and machine harvestability at 13%. These findings highlight the importance of prioritizing sensory attributes such as visual and eating quality to enhance market competitiveness. Additionally, considerations for machine harvestability reflect growers' focus on efficiency-driven practices.



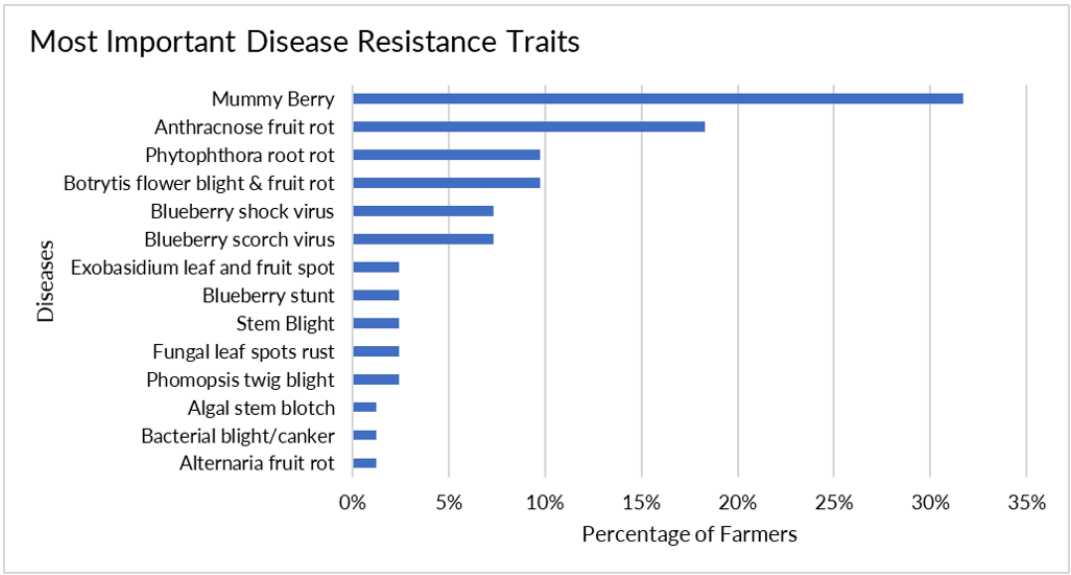
The survey on visual quality traits within blueberry operations revealed key insights into growers' priorities. The overwhelming preference for large size, shown by 62% of respondents, reflects consumer perceptions of value and taste. Additionally, the emphasis on the absence of external effects, shown by 20% of respondents, reveals the importance of fruit integrity in maintaining market competitiveness. By prioritizing these traits, growers can strategically select and breed cultivars that meet consumer expectations, enhancing their position in the blueberry market.



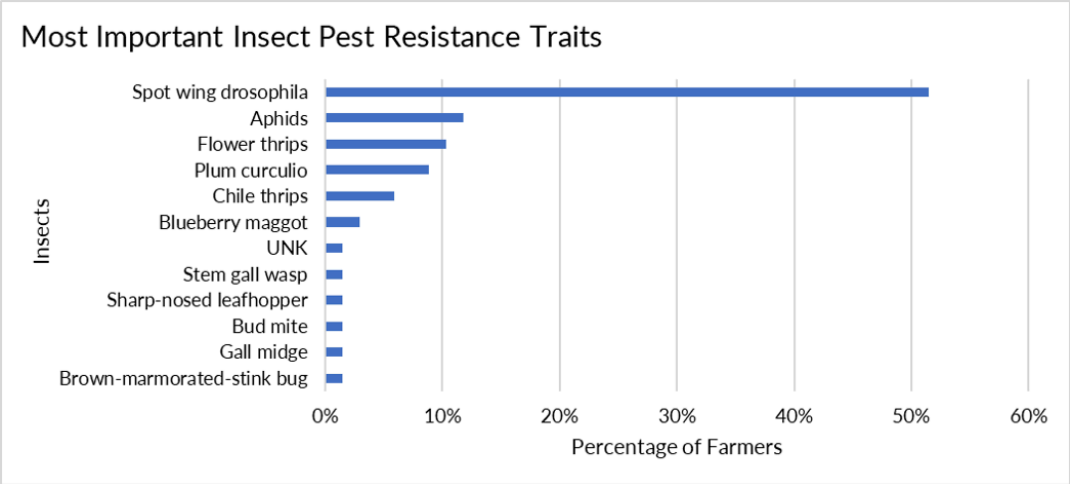
The examination of eating quality traits provided valuable insights into growers' focal points. Among the various attributes assessed, firmness emerged as the top priority, with 43% of respondents highlighting its significance. This preference reflects consumers' expectations for a satisfying texture and prolonged shelf life. Additionally, flavor was emphasized by 38% of respondents, underscoring its pivotal role in driving consumer satisfaction and repeat purchases. These findings show the critical importance of eating quality traits in shaping consumer preferences and market competitiveness within the blueberry industry.



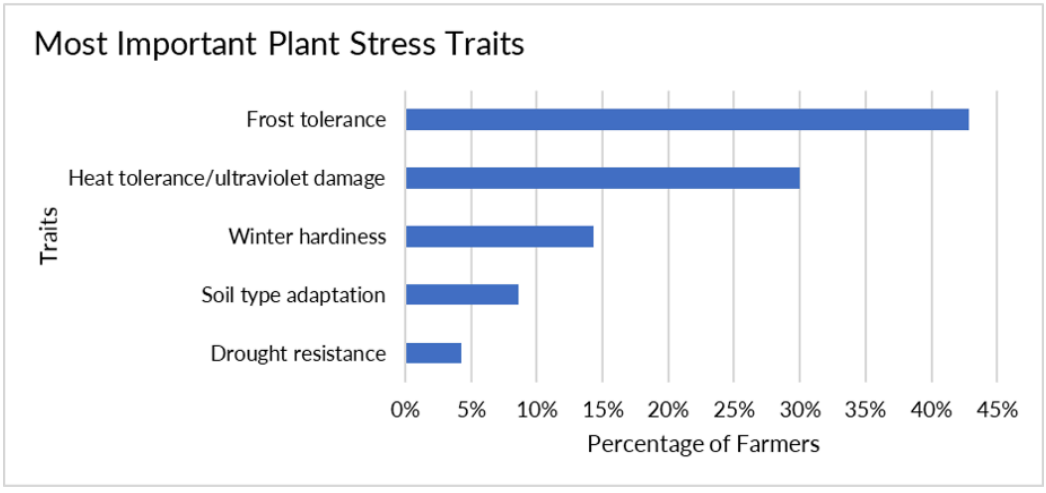
The exploration of disease resistant traits unveiled crucial insights into growers' concerns. Among the various disease resistant traits surveyed, mummy berry emerged as the most important, with 32% of respondents highlighting its significance. This preference reflects growers' recognition of the devastating impact mummy berry disease can have on blueberry crops if left unchecked. Additionally, anthracnose fruit rot was noted by 18% of respondents. These findings underscore the critical importance of disease resistance traits in safeguarding crop health and productivity. By prioritizing cultivars with robust resistance to mummy berry and anthracnose fruit rot, growers can mitigate risks and ensure sustainable yields, thereby securing their position in the competitive blueberry market.



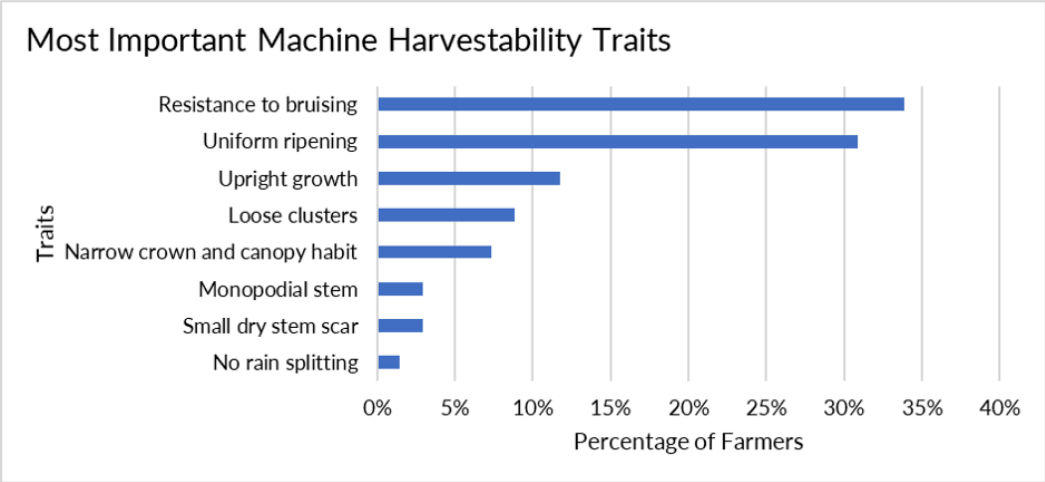
The exploration into the most important insect pest resistance traits within blueberry operations showed insights into grower's primary concerns. Spot wing drosophila (SWD) emerged as the predominant focus, with a staggering 51% of respondents highlighting its significance. This overwhelming response underscores the significant threat posed by SWD to blueberry crops and the urgent need for effective pest management strategies. While aphids and flower thrips were also noted by 12% and 10% of respondents, respectively, their relatively lower mentions suggests that the attention is primarily directed towards mitigating the impact of SWD infestations. These findings emphasize the critical importance of prioritizing insect pest resistance traits, particularly against SWD, in safeguarding crop health and ensuring sustainable yields within the blueberry industry.



The examination of plant stress traits revealed crucial insights into growers' concerns. Frost tolerance emerged as the top priority, cited by 43% of respondents, reflecting awareness of its impact on crop health, particularly in colder climates. Additionally, 30% of respondents emphasized the importance of heat tolerance and protection against ultraviolet damage, showing the need to mitigate the effects of extreme temperatures and environmental stressors. These findings highlight the critical role of plant stress traits in ensuring crop resilience and yield stability in blueberry cultivation.



The exploration of the most important machine harvestability trait within the survey unveiled crucial insights into growers' priorities. Resistance to bruising emerged as the top concern, cited by 34% of respondents, reflecting their emphasis on minimizing post-harvest damage. Additionally, 31% of respondents highlighted the importance of uniform ripening, showing the need for consistency in fruit maturity to optimize mechanical harvesting efficiency. These findings show the critical role of machine harvestability traits in ensuring efficient and damage-free harvesting processes within the blueberry industry.



OVERALL SURVEY RESULTS

Overall, compared with a previous breeding priority survey distributed in 2016, the results of this survey indicated that fruit quality continues to be the most important priority for the blueberry and cranberry industries.

However, traits associated with mechanical harvestability and resistance to biotic and abiotic stresses are becoming more important. These results reflect some of the challenges that the industry is facing. Blueberry cultivars that produce fruit with inconsistent texture and sensory profile (e.g., firmness, crispness, sweetness) often do not meet consumer expectations which limit consumption growth. Also, most of the cultivars that are currently grown are not well-adapted to mechanical harvest and not resistant to major diseases. These challenges, combined with increasing labor costs for hand harvest, for inputs to manage disease, increasing competition due to rapid and significant increasing production from other countries, are limiting profitability of this industry in the U.S.

In cranberry, the market shift from juice to higher value products such as sweetened dried cranberry (SDC), requires fruits with stricter quality parameters (e.g., larger size, uniform color, and firm berries). As a result, a large portion of the production is sold into the juice concentrate market which depresses the price for juice concentrate and limit the expansion of the higher value SDC market. In addition, increasing disease pressure and more frequent extreme weather events (heat wave, early or late frost) are increasing the risk of production losses. On the consumer side, the new FDA regulation that requires the declaration of added sugars on the Nutrion Fact Panel of packaged foods and beverages is creating a negative perception by consumers for cranberry juice and SDC.

Given these challenges, the economic sustainability of the blueberry and cranberry industries is dependent on finding solutions that allow for increasing availability and adoption of cultivars that produce fruit that consistently meet consumer expectations and processing needs while can reduce production costs and risk of crop loss. Also, developing strategies that can increase and sustain blueberry and cranberry consumption are critical for continued success.

Testimonials From the Marsh

Nicole Hansen
Plant Health and Operations Manager
Cranberry Creek Cranberries, Inc

Why is it important for the cranberry industry to understand consumer reactions to added sugar information on the labels of processed cranberry products?

It's important for the industry to understand consumer reactions, because consumer reaction drives buying decisions. Cranberries are an extremely healthy product, but we have to add sugar to make them palatable. Depending on how that is portrayed and how the consumer interprets it, it can be extremely important to whether you're going to be able to continue to sell a product that's healthy versus sell a product that consumers might think is unhealthy due to influences. It is extremely important to understand the reactions, because it's going to drive your knowledge of how to educate the consumer and market.

Do you think that knowing the reactions of the consumer has any implication of push for new products, changing what you're doing, for innovation in the kind of products that that are being produced by the by the industry?

The difficulty with new products is the time that it takes to make a change like that, and by the time you make a change, the consumer's reactions have changed. Somehow, we have to understand from an industry standpoint, and a consumer standpoint, how to balance that. Where the product can be healthy, but palatable and something that consumers are willing to include in their diet. Some of it is changing products for the consumer, but some of it is educating the consumer, because you just can't make quick changes on some things.

How can insights into consumer reactions to sugar content information on cranberry product labels inform the industry's labeling and marketing strategies?

I believe it's going to be really important to actually repeat these surveys. Just like we do research and we have replicated data, I'd like to replicate this and see if consumer reactions stay the same. Because what we saw during Covid, when you're in a health scare, consumers look for functional foods that are healthy, so, all of a sudden, the consumption of cranberry juice increased tremendously. That data shows for itself, without doing surveys, the consumer realizes cranberries are healthy and the added sugar is acceptable as long as that's what is the healthiest.

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Do you think [this study] is something the industry would take and say "Okay, we need to do something about the labeling,"? Who would take this information and say something needs to be done if we want to continue having increasing the consumption of cranberry products?

From a processor standpoint, the best one to work through it would be Ocean Spray Cranberries and other cranberry marketers, because they do the majority of the marketing. They're already working on analyzing product labels. Cranberry Institute could be involved to support processor and grower needs.

Unfortunately, navigating a health claim on a product is difficult. So, the environment to add sugar to a healthy product to make it palatable, is not conducive to supporting the cranberry. Especially in the current atmosphere where we have labeling requirements that advertise added sugar. There needs to be dialogue with FDA working through, 'What is the proper way to label if we do have a healthy product.'

Even natural added sugars to the cranberry require to be labeled as added sugar. This can be misleading to the consumer based on their understanding of what the labeling is trying to accomplish. In comparison, the total sugar content of cranberries can be lower than the natural sugar in products like raisins. When you're computing it up against something that's comparable, all of a sudden, you're giving cranberries a black eye, even though they have less sugar. That's the challenge.

I think that this study's information will be helpful to show the industry that added sugar does have an impact to consumer decisions. I think they know that already, this just confirms it.

How can the cranberry industry balance the need for added sugar labeling with the goal of maintaining product appeal across different consumer segments?

I believe the industry needs to continue to work toward finding other product categories that the cranberry can be beneficial in. The industry can continue to work on products with added sugar that consumers approve of.This is a wide basket, depending on the consumer.

Do you think there will be a push to develop products are no added sugar or things that have artificial sweeteners?

That's been happening for years; These products do have a dedicated customer base that is important. The bigger question is why these products don't pull in the entire consumers base in a large manner. What variables are limiting consumption on these products that should be meeting a larger consumers preference? Is it price point, or what other variables? Is it, how do you get the product out so the consumer buys it, is it distribution, is it customer follow through?

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How might the studies' findings inform policy makers, processors, and producers about the potential impact of sugar labeling on the cranberry industry?

I think that's the key with this research and the studies' findings, is that it tells us that consumers say they aren't going to buy the product, even though it's healthy, because it shows added sugar, and so I think that it gives the industry the data to actually put in front of policymakers to help conversation. Advocate for changing what they're requiring on the label and come to a balanced approach to promote a healthy product that needs some added sugar depending on the preference of consumption.

How has your knowledge regarding consumer reactions to added sugar information on cranberry products changed. How do you plan to use this information?

This data provides background for the industry to have the conversations, to drive leadership, to either take action or make decisions.

We did one study that looks at the consumer attitude towards CRISPR edited cranberries. The consumers are more willing to accept the product and consume them, and we actually didn't expect that that was going to be the case. So we'll be willing to accept those products if there's no sugar added?

I think that that information is extremely important. My first reaction was "Well, this is great," because that tells me that we should be using CRISPR. We should be working on developing a cranberry and that has higher sugar content, that would be more palatable, and have the health benefits as well. We're trying to do that now through traditional breeding, but it is going to take so long that the CRISPR could actually help us. The cranberry industry is a niche industry, and it's not a staple food, and so they've always been concerned that they don't want to touch the GMO side of things. The hope was that, because CRISPR was not considered GMO, that this would be an avenue for us to actually do some work with CRISPR and get a cranberry that has higher sugar content naturally. The industry will have to decide how to move forward.

What did you think about the results of the CRISPR? Were you surprised that they that the consumer is actually willing to accept CRISPR, as long as you can clearly show them that there's a health benefit?

I was surprised that they were willing pay less for CRISPR edited product. I figured that they would either respect the cranberry for it's health benefits and flavor or not like it. They're still willing to buy it, but they are going to pay less. That was surprising to me.

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Given VacCAP's generation of information regarding consumer preferences, what new information could VacCAP generate to help the industry and expand consumption of cranberries? What are new things we could do?

The biggest key is educating the consumer. But also to understand the changing customer preference over time and study if the consumer preference on surveys actually follows through to actual buying.

What is deterring them from consuming more cranberry products, and what are the kind of products that we could develop to try to target that new generation to also be a cranberry consumer?

That question is best suited for the processors with all the analytics they have on consumer preference. Personally, I would think that a product that would appeal to the grab and go market of convenience stores, coffee shops, and smoothie shops would have new generation appeal.

What about the supplements? Do you think that that is something that that should be studied more like? Do we have enough data about the potential like cranberries as a supplement.

We need more data on the total chemical composition of the cranberry. What does a cranberry actually have in it? The supplement/powder side of cranberry would be considered one of the product categories.

Testimonials From the Field

Dr. Paul Sandefur
Blueberry Breeding Manager, Fall Creek Farm and Nursery

Based on the results of our studies, do you think the industry will consider including quality descriptors in their fresh blueberry packaging?

There are already examples of quality descriptors on fresh fruit packaging (e.g., Driscoll's Sweetest Batch) and I would expect this to increase as more data emerges showing an increased likelihood of purchase when such descriptors are used on packaging. Now we just have to make sure that our "crunchy" labeled blueberries are truly crunchy and "sweet" labeled blueberries are exceptionally sweet.

Do you think information about consumer preferences for certain quality attributes will impact future breeding efforts?

Yes. Clear information on consumer preferences can provide guidance for specific trait level selection thresholds in breeding programs. Any breeding program that uses a multi-trait selection model would be amiss to not factor in consumer preference weights.

Price and freshness or shelf-life was found to be a barrier to frequent blueberry consumption. Is this information useful to you? If so, how do you plan to use it?

In our breeding program we have been specifically selecting genotypes that maintain exceptional quality (firmness, flavor, and lack of breakdown) over long-term storage periods (60+ days). The finding that poor shelf-life was a barrier to frequent consumption was valuable to see as it validates our focus on these traits and dedication of the substantial resources it takes to evaluate. New blueberry varieties with improved shelf-life have the potential to help the entire industry via reduced fruit waste in grower fields and warehouses, and increased consumption at retail.

What new information could VacCAP generate to help the industry and expand consumption?

To continue to grow the industry we need to increase consumption globally, not just in the mature markets. Information on consumer preferences across more regions would be helpful in increasing our breeding efforts to target traits preferred by different and emerging consumer groups. It has been my experience that "one size fits all" is not true for blueberries. Although the recent findings show that as a whole consumers prefer specific trait levels (e.g., sweet), the more granular we can get on the preferences of different consumer groups the better. With this type of information, we can develop different blueberry varieties targeting specific consumers, thereby giving growers and retailers more customer tailored variety options and driving up global consumption.

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