MSU-WARC fresh haskap, saskatoon, and dwarf sour cherry fresh fruit consumer study 2020

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Overview

Background

Haskap (*Lonicera caerulea*), saskatoon (*Amelenchier alnifolia*), and dwarf sour cherry (*Prunus x kerrasis*) bushes can withstand Montana's cold winters and produce fruit in a short growing season. We believe that growing and offering these fruits for sale is a potential opportunity for Montana growers, consumers, and visitors to both produce and taste something special from Montana. However, we had little information regarding how well these novel fruits would be accepted by potential customers. With funding from the Montana Department of Agriculture Specialty Crop Block Grant, we partnered with the Western Montana Growers Cooperative (WMGC) and the MSU Food Product Development Lab to conduct a consumer study for these three species. Fruit samples were provided to WMGC community supported agriculture (CSA) share members who signed up to participate in these taste tests over the course of four weeks. Members rated fruit likability (on a 1-to-9 rating scale, with 9 being "like extremely") as well as purchase likelihood and willingness-to-pay.

Results indicate:

1. Fresh haskaps (variety 'Aurora') seem likely to be a commercial success, with an average acceptance rating of 7.66 and excellent storage duration. We refrigerated the Aurora haskaps (34° F and 97% relative humidity) for two weeks before sending fruit out for a second consumer evaluation. CSA members rated the stored fruit just 0.01 less than initially, at 7.65. There are many haskap cultivars available with differing ripening times that would allow for an extended fresh-market harvest: we harvested fruit from mid-June to mid-July this year. We have learned there is great diversity of flavor in haskap varieties—some are excellent for fresh eating and some we've consigned to wine-making only!
2. Fresh saskatoons (variety 'Lee 3') were rated lower than haskaps, at an average of 6.21, but comments suggest that there still could be a fresh market for these fruits among a smaller segment of the community. Saskatoons may be a good fit for a U-pick, as plants are tall and easy to harvest without stooping. We and others (Saskatoon Berry Production Manual) have observed that the fresh fruits degrade quickly in storage, and we noted they seem to lose flavor when chilled. We recommend selling them within a few days of harvest.
3. Fresh sour cherries (variety 'Romeo') were rated at 5.74. Many of the comments indicated that consumers appreciate the fruit's flavor, but—due to its tartness—would prefer to use it for processing rather than fresh eating. We advise any growers considering selling this fruit fresh to leave the stems intact. If the stems are removed, fruit will shrivel overnight. Note that the University of Saskatchewan has a ripeness guide based on color for 'Romeo' and other dwarf sour cherries.
4. Based on the results of this study, we recommend pricing the fruit between $4 and $5.50 per 6-ounce container; although each grower or marketer should factor in production costs and consumer audience in this decision. For further discussion, please visit the Montana Berry Growers Association's Facebook page.

Fruit handling and consumer study recruiting

Our fruit were carefully *hand-harvested* following food safety procedures including the wearing of gloves and masks. Previous work at WARC indicates our efficient, low-tech method of mechanical harvest (see video here) is not compatible with fresh fruit sales but is acceptable for fruit to be sold for processing.

Our fruit was stored at approximately 34 ˚F and 97% relative humidity before sending to the local CSA for packing. Rapid cooling after harvest and high relative humidity are critical for storage for many fresh fruit crops. Fruit were generally harvested on Tuesday and taken to the Western Montana Grower's Cooperative the same day, following cooling. They were packed into CSA boxes on Wednesday and shipped on Thursday.

On the same day CSA members collected their produce shares, they received an email with an invitation to participate in an online survey to evaluate the fruit. Respondents were asked to complete a consent form to participate in research, as required by Montana State University. Only people who submitted this form were sent fruit. We capped the number of participants at 160, given the estimated volume of fruit we could provide.

More about the fruit in the taste test

Haskaps are also known as honeyberries, yezberries, and blue honeysuckle. Haskaps vary greatly in size, shape, and flavor among varieties. The haskaps tasted by CSA members were the variety 'Aurora', which has large, elongated berries, and is just one of the many varieties planted in the MSU-WARC research plots. Haskaps are rich in antioxidants [1, 2], with levels higher than many other small fruits, including blueberries. In addition, consumption of the berries has been found to modulate blood sugar [2], reduce liver disease (in mice) [3]. Haskaps also contain a unique class of compounds known as iridoids [4] that have anti-inflammatory properties and many other health benefits [5]. Most varieties in our trial are either from the University of Saskatchewan (Dr. Bob Bors) or Oregon State University (Dr. Maxine Thompson, Professor Emeritus) breeding programs. More information about the haskaps in our trial can be found here.

Saskatoons, also known as juneberry or serviceberry, are native to North America. Native Americans used saskatoons along with buffalo meat and fat to make pemmican. The varieties in our trial were bred to have larger fruit and an improved flavor relative to wild plants. CSA members tasted the variety 'Lee 3'. More information about the saskatoons in our trial can be found here.

Dwarf sour cherries are exceptionally hardy (to zone 2) and represent a fruit crop that could potentially be grown in more areas in Montana than sweet cherries. While the fruit is packed with flavor, its tartness may not be compatible with fresh eating for the average consumer. Despite this, fresh sour cherries are sold at premium prices in some places (see this article). CSA members tasted the 'Romeo' variety, which comes from the University of Saskatchewan Romance series. 'Romeo' had lower Brix in 2020 than it did in 2019, and it also was rated lower in 2020 than in our 2019 taste test (with just 19 people). The University of Saskatchewan has a ripeness guide based on color for "Romeo" and other dwarf sour cherries. More information about the dwarf sour cherries planted at WARC can be found here.

Why store the haskaps for two weeks prior to the second haskap taste test?

In 2019 we performed shelf-life experiments with haskaps and have been continuing these experiments in 2020. Results are not fully compiled, but results indicate that haskaps—when harvested and handled correctly—can store at least as long as blueberries. We added the two-week storage component to the taste test to determine whether consumers would detect any undesirable effects of storage that are not as easily measured in a lab setting.

Rating and result summary tables

Table 1. "Overall liking", also known as the hedonic acceptance scale

Category	Description	Value
1	Dislike extremely	1.000
2	Dislike very much	2.000
3	Dislike moderately	3.000
4	Dislike slightly	4.000
5	Neither like nor dislike	5.000
6	Like slightly	6.000
7	Like moderately	7.000
8	Like very much	8.000
9	Like extremely	9.000

Table 2. Purchase likelihood scale

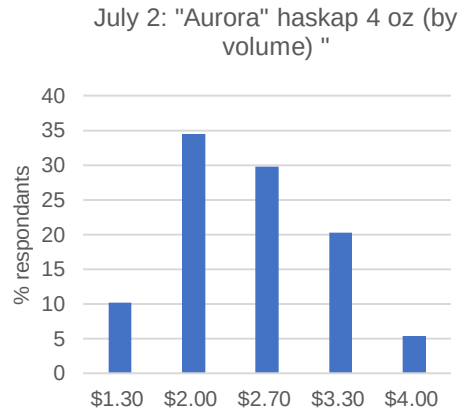
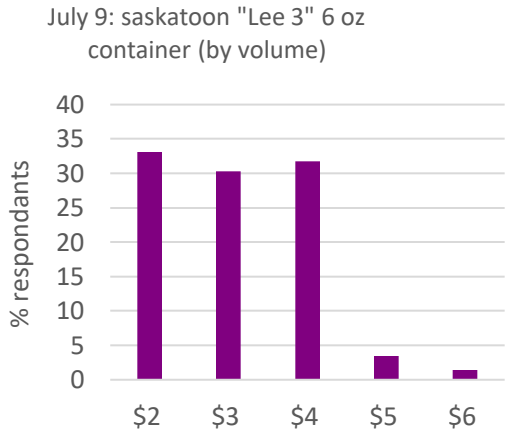
Category	Description	Value
1	Definitely will not buy	1.000
2	Probably will not buy	2.000
3	Might or might not buy	3.000
4	Probably will buy	4.000
5	Definitely will buy	5.000

Table 3. Fruit harvest dates, fruit quality, "overall liking", and "purchase likelihood"

		Measured the day CSA members received the fruit							
Fruit species and cultivar name	Fruit harvest and distribution details	Weight (grams) single fruit (n= 60 fruit)[1]	Flesh firmness (Newtons) (n= 60 fruit) [1]	Brix (n = 60 fruit) [1]	pH (n = 6 [bulked samples]) [1]	Titratable acidity[2] (n = 6 [bulked samples]) [1]	Number of participants tasting fruit	Overall liking (1 to 9); (9 = like extremely)[3]	Purchase likelihood (1 to 5) (5 = definitely will buy)[3]
Haskap 'Aurora'	Harvested June 28 or 30 (rain logistics) Packed in CSA boxes July 1 Received by CSA members July 2	1.53 ± 0.07	0.91± 0.10	14.11±0. 50	3.33 ± 0.31	19.74 ±1.21	148	7.66 ± 0.17	3.80 ± 0.16
Saskatoon 'Lee 3'	Harvested July 7 Packed in CSA boxes July 8 Received by CSA members July 9	1.27 ±0.35	0.54 ±0.21	13.896 ±1.36	3.99 ±0.03	4.29 ±0.31	145	6.21 ± 0.28	2.85 ± 0.18
Haskap 'Aurora' (stored fresh for two weeks)	Harvested July 1 Packed in CSA boxes July 15 Received by CSA members July 16	1.41 ± 0.08	0.27 ± 0.38	14.71±0. 36	3.39 ± 0.03	13.99 ± 6.04	136	7.65 ± 0.21	3.82 ± 0.19
Dwarf sour cherry 'Romeo'	Harvested July 28 Packed in CSA boxes July 29 Received by CSA members July 30	4.01 ± 0.13	0.50* ± 0.06 *(n = 30)	17.30 ± 0.91	3.21 ± 0.01	25.68 ± 2.31	139	5.74 ± 0.38	2.54 ± 0.20

1. 95% confidence interval, Student's T distribution
2. Citric acid equivalents for haskaps; malic acid equivalents for saskatoons and dwarf sour cherries
3. 95% confidence interval per Compusense report

Table 4. Willingness-to-pay per unit of fruit

Photo of product for which CSA members were stating willingness-to-pay	Willingness-to-pay summary chart	Average weight of fruit per container	Crop estimates
4 oz (by volume) condiment cup filled with 'Aurora' haskaps 		0.11 lb	Aurora: 5 lbs per plant in 2019 (5-year-old plants); 7 lbs per plant in 2020 (6-year-old plants) Some varieties in the trial yielded up to 20 lbs per plant in 2020
6 oz (by volume) clamshell filled with 'Lee 3' saskatoons 		0.38 lb	4.2 lbs per plant in 2019 (5-year-old plants); 9 lbs per plant in 2020 (6-year-old plants) Some varieties in the trial yielded more than 20 lbs per plant in 2020

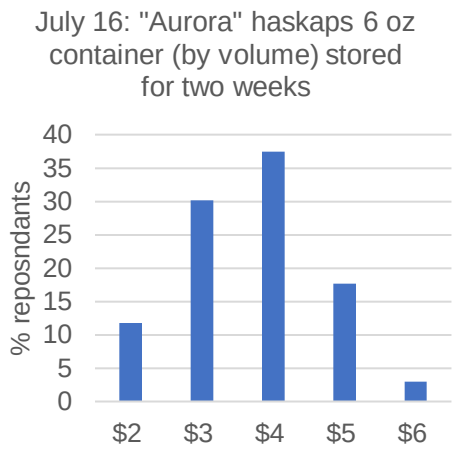
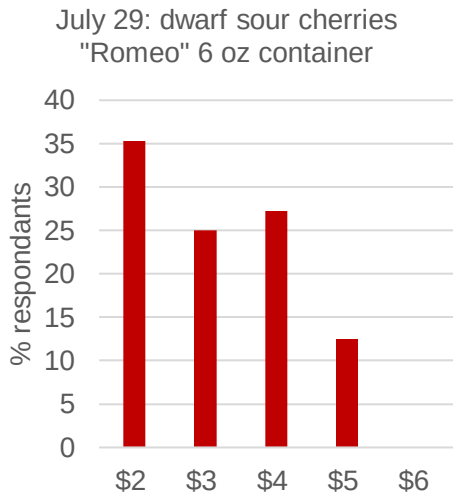
6 oz (by volume) clamshell filled with ‘Aurora’ haskaps stored for 2 weeks 		0.38 lb	Aurora: 5 lbs per plant in 2019 (5-year-old plants); 7 lbs per plant in 2020 (6-year old plants) Some varieties in the trial yielded up to 20 lbs per plant in 2020
6 oz container (by volume) clamshell filled with ‘Romeo’ dwarf sour cherries 		0.36 lb	Romeo: 7 lbs per plant in 2018 yields (3-year old plants); 8 lbs per plant in 2020 Some varieties are yielding 18 lbs per plant

Table 5. Statistical analysis of willingness-to-pay (WTP)

Fruit Type	Average WTP) for a 6 oz container of fruit (US dollars)
Haskaps	$3.70 ± 1.00 [A]
Haskaps stored for 2 weeks	$3.70 ± 1.00 [A]
Saskatoons	$3.00 ± 0.90 [B]
Dwarf Sour Cherries	$3.10 ± 1.00 [B]

[AB] Samples with the same letter code in any column did not significantly different from one another regarding WTP.

What people are saying

'Aurora' haskaps (July 2)

"I really enjoy the haskaps as do my kids. I have worked at a plant nursery for the last 10 years and the amount of people purchasing these plants to grow has increased dramatically in the last 5 years or so. I think there is a market for this fruit for sure and that we will start seeing more and more of it in years to come. Delicious! Thank you!"

"We have realized that the flavors of the berries tend to vary widely. On one test we tried a berry and answered the questions, then came to appreciate the berries more and more as we worked our way through the cup. Answered questions based on a single berry seems ill-advised..."

"They are ugly in a cute sort of way. Like a Pug."

"The taste is the best part of these berries. The texture is a little softer than I'd prefer, but the taste trumps that. I would buy these for snacking for my family, but I could see trying them out in a pie."

"Fantastic taste, like a blueberry but a thousand times better. Some of them had a bit of a mushy texture but the firm ones were divine. I very sincerely hope these become readily available I would buy the shit out of them. I think they would make amazing jams and sauces."

"I love the sweet and then tart flavor of the haskap. They are very tasty and balanced. They have a good texture, much like a blueberry. My kids love them (I cannot sample fruit without them wanting to try it too). I would purchase at farmers market or in store it they did not exceed the price of blueberries. If offered at markets, I suggest a sample to people who will try. Education and experience will get people excited about something new!"

'Lee 3' saskatoon (July 9)

"These were good, but I didn't like the texture very much. If I had more, I would have liked to try them in a smoothie or ice cream."

“These saskatoons are the total bomb! The burst you get in the mouth is fab! Juicy and sweet and yum!”

“These were good, but we probably wouldn't buy them. They're a little bland with big seeds. I think these grow in the woods near our house—fine for a quick snack on a hike but probably not something we'd seek out.”

“I like the nutty flavor.”

“The saskatoon berry was good but too seedy to be enjoyed raw. I think it would be amazing in baked goods where the seediness would be a benefit.”

“Saskatoons look enough like blue berries it’s easy to expect the flavor to be similar but it’s definitely nuttier with a chewier seed and less sweet than a blueberry.”

“I'd been looking forward to trying a saskatoon after hearing about them on a show from Canada. These berries were delicious, and I would make all kinds of things out of them: pies/jams/juice/wine/etc. This berry was good-sized and still remained very flavorful which isn't often the case with blueberries. They didn't get stored and were all eaten immediately upon receiving them.”

‘Aurora’ haskap, stored for 2 weeks (July 16)
“This Haskap one was much better than the first- loved the tart taste!”

“This week was a repeat from the first week and they were just as tasty! I'm definitely enjoying this taste test!”

“When I opened it up, I thought for sure it was the Haskap we had tried in our first trial. I like it more the second time around.”

“This fruit seemed a little sweeter than the original haskap from week 1! Still not sure I would purchase.”

“Delicious, flavorful, will absolutely buy.”

“Texture was too squish for me. Would be better to use in jams or syrups.”

“I think I liked this week’s haskap even more than the first weeks. They’re lovely and I wish I had a larger container to put on salads. Would also like to try them in a sourdough pancake or muddled with some gin and mint. Yum yum. Sold on haskap.”

“I like these, but they look funny. Probably just takes some getting used to.”

“Best sample so far!”

“These were my favorite! They are sweet, have great texture and are refreshing. These would also be great in jams or for snacking. I would definitely buy these if they were available. We had the opportunity to do a side-by-side taste test with the saskatoons because the saskatoons were in my share this week. These haskaps were much sweet than the Saskatoons. They are tender and have a very soft skin.”

'Romeo' dwarf sour cherry (July 29)
"Great texture and freshness, too tart to eat alone, may be good in jelly or other prepared goods."

"They look very appealing, great color. They flavor was a bit tart and bitter, which was not unappealing, but not quite what is like for a snacking fruit. This may be better in a sweetened product or blended with a with a sweeter fruit in jam or preserves."

"They are extremely sour! The fruit itself looks really delicious but is so tart!"

"This was a hard fruit to finish. It was good at first then the tartness overwhelmed my mouth."

"Too sour for my taste. Visually and texturally appealing though."

"I love the tartness. I've only ever tasted sweet cherries before, but these were wonderful. Definitely like the idea of juice or dried fruit snacks/fruit leather made with these. Or frozen for smoothies."

"I'm generally into all sour fruits!"

"These are a gorgeous color; bet they would make lovely jam or fruit leather. Nicely complex flavor too, not just delightfully tart, but a rich cherry taste as well."

"Compared to other sour cherries, these are pretty good. Given the short cherry season, however, I would rather eat sweet cherries instead of sour cherries."

"Texture is very pleasant and what's expected of a cherry. Seemed fresh and firm. I like the sourness. Will definitely look for a larger batch to preserve in brandy for manhattans and old fashions."

"Love the soft texture of the cherries and sour taste. $4-5 would be reasonable for 6 oz. I would likely use there for jams, sauces for meat or breakfast items, and possible pies. The hardest part about buying these would be buying them over the cheaper Flathead [sweet] cherries that are available."

"Would definitely buy at a market."

Acknowledgements

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