Haskap makes a great a food dye!

Part 1: Preparing haskap juice & basic Juice characteristics

By Dr. Bob Bors

Too much rain and mud lately! So our summer students and I headed to the Ag College's kitchen lab to investigate using haskap as a food ingredient. Mainly we investigated its use as a food dye but for some foods we wanted to know at what level Haskap flavour can be detected.

There were 6 ways that we prepared frozen haskap in our experiments. This list should make it easier to follow what was done as you read this series of articles.

1. Puree: Liquefy fruit in a food processor. We used frozen fruit that had partially thawed, so no water was added. This gave a thick liquid with texture like a milkshake.
2. Strained Juice: force puree through a sieve and then cheesecloth. This gave a smooth type juice with a texture like apple juice.
3. Thawed Juice: Place frozen haskap in a bowl overnight and pour off the juice in the morning. This was similar to the strained juice.
4. Steamed Juice: After pouring off the thawed juice, the remaining berries were put in a steam juicer (explained later) and further extracted. If steaming continues too long the juice extracted by this method loses flavour and taste strange. Once it started tasting odd we stopped the process.
5. Combined Juice: Thawed juice was combined with good-tasting Steamed juice.
6. Cooked Haskap Juice: We didn't try this method for our food combining experiments. A grower hearing of this research said you could also just cook the berries a bit, adding some water, and pour off the juice. So we did it afterwards, but presented information on its basic characteristics.

Notes about Haskap preparation:

Puree: This was a fast easy method. Puree is a great for using in baked goods or dairy products or even frosting. But if added to other liquids the particles (from chopping skin and seeds) will float or sink. This would be very bad for wine or see-through juices like cranberry or apple or grape juice. But puree is similar to orange juice with pulp and many of the smoothie type heath juices found in the produce section of many grocery stores.

Strained Juice from puree: We will use that method again! Blenderizing haskap makes particles so small that they easily clog sieves and cheesecloth. It takes much time using this method. It's much better to plan ahead and used the 'thawed juice' method described below. However, juice extracted this way is likely to have characteristics most similar to the raw fruit.

Thawed Juice: This method was so easy! By good fortune there were a few small holes in the corners of the bags holding the frozen fruit. This caused the juice to empty into the bowl when the bag was lifted. We will be poking holes deliberately next time. This type of juice extraction can have higher sugar content than any other method because water with sugar in it melts faster. Water with less or no sugar might still be left in the berries if the juice is poured out at the right time. But in our case, the berries were completely thawed.

Steamed Juice: We had the steamer/juicer so had to try it. We pulled off the juice in small batches of about ½ liter and then measured and tasted each batch. Steamed juice is always more dilute than either strained or thawed juice since water gets added. This method results in juice with lower sugar content but may be better than other methods for extracting compounds from skins. This method can be used on frozen or fresh fruit. It is especially great for using on fruits that have many stems or large seeds that make it hard to press. Fruits like seabuckthorn, raspberries, black currants, grapes would be pretty easy to do with this device.

For steam extraction we were using the left over fruit after doing the thaw method, so we were getting more juice out of the fruit. Once the steam started extracting it took about 15 minutes to get ½ liter of juice. The second ½ liter took 30 minutes and the 3rd took about 50 minutes. The 4th took longer still but I didn't keep track.

Figure 1. Steam- driven juice extractor with the diagram showing how to set it up. *The bottom pan holds water to generate steam. Steam rises through the middle pan (lower right) up to the fruit being held in the top pan which is like a sieve (top right). Juice that comes out of the fruit drips into the middle pan which has a tube to drain off the juice. I used a measuring cup to collect the juice because I was separating the output. Ordinarily a large container should be used. The steamer we used was a 'Hackman' brand*

Combined Juice: It seemed to me that if someone went to the trouble of steam extracting juice they would 1st pour of the juice that came out when fruit was thawed. Then they would steam extract the fruit, and then add the thawed and steam-extracted juices together. Out of curiosity we took measurements of the thawed juice and steam juices, but in the end combined them together for many of our food dye experiments. But we only used the steam juice that tasted good. See Table 1.

The colour of haskap juice, no matter what method used, produced an intensely dark colour that looked black. Out of curiosity we diluted the thawed juice and various steam juices to be 5% and used a spectrophotometer to measure light transmittance. In that way we could find differences between the thawed juice and successive batches of steam extracted juice. As seen in table 1, the thawed juice only lets 5% of the light through it. It was actually part way into the steam extraction that the juice had the most intense colour. Perhaps, some juice from thawing was still around the berries and mixed with the 1st amount of steam.

But steaming the berries adds some water to the juice, so I had expected the colour to decrease. Certainly the sugar content was decreasing. Perhaps companies wanting to make flavourful juices or wines would just use the thawed juice, but then steam extract to obtain juice for using as a dye.

Table 1. Characteristics of various ways we extracted Haskap Juice. Haskap fruit used in our experiments were from seedlings grown in our breeding fields and were a bulk of many kinds. This data may be representative of an 'average' haskap variety.

Juice Type	% Sugar Content (Brix)	Total Acidity	pH	Colour: Light Transmittance % if diluted 20X	Flavour
These were from the same batch of frozen fruit and were used in experiments					
Puree	15.6	1.69	3.58		Intense flavour
Thawed juice*	12.7	1.72	3.35	5.09	Intense flavour
Steam Juices:					
1st 500 mls*	10.7	1.55	3.58	3.16	Excellent flavour
2nd 500 mls*	10.6	1.54	3.51	1.04	Very Good flavour
3rd 500 mls*	9.3	1.22	3.65	3.94	Good but weaker flavour
4th 500 mls	7.7	1.00	3.55	16.2	Doesn't taste like Haskap
These were from different batches of fruit					
Raw	12.7	3.19	3.45		Intense flavour
Frozen then Cooked	15.2	2.38	3.06		Intense flavour

* These juices were combined and were used in many of our processing experiments

The above represents a somewhat 'average' haskap in one of our breeding fields. However in 2013 we analysed 150 of our haskap seedlings that we considered superior. Those advanced selections averaged 15.1 Brix but ranged from 10.1 to 23.1 Brix. Total acidity averaged 1.8 but ranged from 0.88 to 3.14.

Basic juice characteristics: While straining juice through sieves and cheesecloth was difficult, it most closely represents a juice that might be obtained if we had a commercial fruit press. As seen in figure 2, the strained juice was almost black at 15% and above. Even diluted 20 fold (5%), haskap juice is a vibrant red. It was however too hard for us to make large quantities of strained juice.

Figure 2. Strained Haskap juice at different concentration, diluted in ultra-pure deionized water. *5% Haskap juice gives a bright red colour similar to Cranberry juice. The vials in these photos are 2cm across.*

Haskap Juice changes colour at different pH levels.

While haskap juice is usually around pH 3.7 and is bright red when diluted with water, the colour can be altered if the pH level is changed (Figure 3). In our experiments we used ultra-pure water similar to what you might find as 'reverse osmosis' available at grocery stores. Using well water, tap water, or water that has softeners added might give different results than the picture shown. Many natural, plant-based dyes are similarly affected by pH and concentration changes. A website that helped me to understand what was going on was: http://homesteadlaboratory.blogspot.ca/2014/02/historical-lye-making-part-2.html . That website specifically mentions elderberry juice which is one of the few fruits in the same botanical family (Caprifoliaceae) as haskap. Elderberries are also used as a food dye.

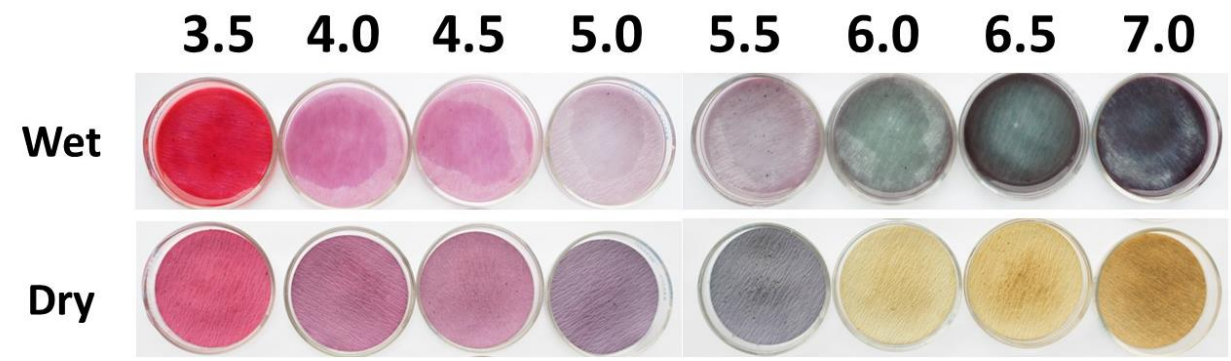

Figure 3. Colour of 5% haskap juice at various pH levels. *pH levels were adjusted by adding either lemon juice to make the solution more acid or baking soda to make it more basic. Haskap juice is naturally around 3.7. 4mls of the dilute juice was placed in small glass petri dishes that had filter paper in them. The filter paper made it easier to see the colours. The juice was allowed to dry overnight. Interestingly, when dried, the colours in the acid range are more stable. At higher pH levels the colours alter when dried. That's because the concentration changes.*

Haskap juice also changes colour when on your hands, spilled on your floor or countertops, or soaked up by a dishcloth. Perhaps alarming at first, haskap juice on your hands starts out bright red. Later turns purple then greenish black, but a few hours later it disappears. Even if you didn't wash your hands very good, the colour would be gone the next morning. The fastest way to get rid of haskap stains on countertops or floors is to use dilute bleach; the colour disappears instantly!

Haskap juice will have a different dying effect when combined with foods of various pH levels. But there is also an effect of different concentrations and whether drying occurs. There is also the colour inherent in the food itself and how the food colour will blend with the haskap juice colour. In the series of articles that follow, we combined haskap juice and puree with a wide range of food products just to see what might happen to the colour. In some experiments we investigate whether haskap flavour can come through.