The search for "forgotten" apple trees

Cider maker brews small batches to highlight unique flavours

After experimenting with a borrowed cider press, Peter Milner built his own rack-and-cloth press for producing small-batch cider that highlights the unique flavours of wild apples. (Faraway Cider photos)

by Joan Allaby

Peter Milner has put on a lot of miles travelling the roads of Cumberland County, Nova Scotia. No, he's not a sales representative, a repairman, or an Amazon delivery driver. He's a cider maker on the hunt for wild apple trees.

An electrical and software engineer by training, Milner was keen to pursue his interest in permaculture when he moved back to rural Nova Scotia seven years ago. He wanted to find a perennial edible that would be suited to his property near Amherst, and apples quickly came to mind. But when he received an offer of free apples from a neighbour who had a bumper crop of Golden Russets, Milner embarked on his cider journey, using a press borrowed from a friend.

"That first carboy of cider was so delicious that I wanted to try again the following year," he says. "But my neighbour didn't have any extra apples the next year, so I tried making cider from some wild apple trees instead. That cider was even better than the first batch, and I knew I would be foraging wild apples for cider from that day forth!"

Since then, Milner has been foraging for apples and developing his cider-making skills. In 2018, a batch that he called Apple Prospector's Favourite won a gold medal in the "non-commercial traditional dry cider" class at the 2018 Great Lakes International Cider and Perry Competition, held in Grand Rapids, Michigan. Encouraged by that success, and with the support of family and friends, he launched Faraway Cider in the fall of 2019. He sells his products at local farmers' markets,

and directly to customers who contact him through the company's website or Facebook page.

PROSPECTING

Milner's prospecting expeditions take him to abandoned orchards and old homesteads, across grassy fields and through shady woods, in search of what he calls "forgotten" trees. The parents, grandparents, or even great-grandparents of these trees may have grown in tidy orchards or in someone's garden. Seeds from cultivated trees are spread far and wide by deer, bear, raccoons, and other animals helping themselves to low-hanging and fallen fruit. Sometimes, the trees have simply been left untended for years, and have returned to their more natural form, their progeny growing up around them.

Unlike a cultivated apple tree that is propagated by grafting or other vegetative means to produce fruit with the same characteristics as the parent tree, an apple tree grown from seed is a unique genetic mix. (See "Feral fruit," on page 27). With such a high degree of diversity among these trees, Milner spends a lot of time looking for suitable cider apples. When he finds a likely tree, he'll sample several apples. In the field, he performs basic tests for sugar concentration, using a refractometer, and for starch content (an indication of ripeness), using iodine. He's looking for fruit that's sweet and slightly acidic, with an astringency that indicates a good tannin content.

Milner keeps the apples from different trees separate, and records test results and location. Whenever possible, he uses the apples from one tree to make a single batch, though he seldom has enough to make a significant quantity of cider. For commercial production, he blends small batches together to balance flavours.

PRESSING MATTERS

Back at the cidery, Milner grinds the apples – stems and all – using a commercial fruit grinder, which is powered by an electric motor. He then presses the crushed apples to extract the juice. The borrowed press that he used for his first foray into cider making was the barrel type, but when he set about making his own press, he chose the rack-and-cloth type, preferring the efficiency and aesthetic of this traditional design. While he had never seen one in operation – except on YouTube – he felt confident that he could apply his engineering skills and come up with a workable design.

In a rack-and-cloth press, the crushed apples are wrapped in strong, open-weave cloths and sandwiched between wooden racks. Layers of cloth-wrapped apples and racks are stacked inside the wooden frame of the press, and when pressure is applied, the juice is squeezed out, flowing into a stainless-steel tray that drains into a collection bucket. Stems, seeds, and pulp are held back by the cloths.

Milner runs a few tests on his fresh juice, to help him decide whether the batch will be suitable for cider. To measure total acidity, he uses a method of chemical analysis known as manual titration. The acid in the juice helps to prevent bacteria from growing and spoiling the cider; it also influences the flavour.

"In general, the total acidity correlates well with the perceived sharpness of the cider," says Milner. "I've seen total acidity anywhere from two grams per litre up to 24 grams per litre in the wild apples I've found. Two grams per litre can taste quite flat and uninteresting, while 24 grams per litre brings tears to your eyes and feels like your teeth might be dissolving – so somewhere in between is best."

While test results inform his blending decisions, Milner trusts his palate to guide him. "At the end of the day, I am always relying on taste," he says. "Some ciders taste great with a particular total acidity, and a different cider will taste too sour or too flat with

Milner uses a pipette to extract a sample from one of his carboys, to test the fermenting cider for sugar content and acidity.

Peter Milner wears ear protection while running apples through the electric grinder – which is the first step in cider making.

the same total acidity, depending on its other qualities."

Another important variable is specific gravity, which is an indicator of sugar concentration, and helps to determine a beverage's alcohol by volume (ABV). Milner uses a hydrometer – a graduated instrument that bobs in a liquid, providing a measurement of its relative density (i.e., specific gravity), based on buoyancy. A sweet liquid like apple juice has a high sugar content, so it has a higher specific gravity than water. During fermentation, yeast consumes the sugar, converting it into alcohol and CO2, lowering the specific gravity. The alcohol content can be calculated from the original and final specific gravity readings.

Through testing, Milner continues to grow as a cider maker. "Total acidity and specific gravity help me to characterize the apples that I'm finding, so I can learn what to expect from these new wild varieties," he says. "Over time, it all helps to make the process a bit more predictable."

FERMENTATION

With tests completed, Milner transfers the juice to buckets for the initial fermentation. Some cider makers pasteurize the juice or add sulphites to kill off the wild yeast and bacteria, then add a commercial yeast – but he doesn't heat it or add anything at this point. He lets the natural yeasts and bacteria in the juice work their magic.

The initial fermentation is quite vigorous, and a lot of foam forms in the buckets. When he judges this stage completed, Milner transfers the juice to carboys, and adds a Champagne yeast to ensure further fermentation. He prefers this variety of yeast because it is tolerant of low temperatures and high acidity, and it doesn't contribute much flavour. He likes to keep the fermentation process slow by keeping the cider at a low temperature, in the range of 12-14 degrees C. Often, he leaves it to ferment in the carboys for several months, although it can be kept for years.

During this period, Milner regularly tests the acidity and sugar content of the fermenting cider, and monitors the CO2 levels. The carboys are equipped with airlocks, allowing CO2 to be released without introducing any oxygen or contaminants.

Milner spends time mixing and testing samples to achieve the flavour, mouthfeel, body, and colour he's looking for, before blending whole batches. He lets the blend sit in the tank so the flavours can fully meld together – another process that can take days, months, or even years.

Once he's happy with the flavour, Milner conducts a few final tests, then bottles the cider. He does not use force carbonation; any carbonation happens naturally in the bottle as the remaining sugars are fermented – a process known as bottle conditioning.

Because of the diversity of the apples Milner uses, every batch of cider he makes is unique, and there is no standard recipe. The finished product ranges from six to nine percent ABV, and sometimes more.

Even if the process were standard, Mother Nature is unpredictable. A tree that produces great cider apples one year may not produce many apples another year, or they may not be as sweet, depending on the growing season. From a business perspective, this can be challenging, but Milner says it makes his work interesting. "My engineering brain is struggling with it, but my artistic side is enjoying it."

It's obvious that Milner is hooked on cider making – and in a year that has been so strange and uncertain, his devotion to the craft has helped him stay anchored. He is thankful for the support he has received from the community since he launched Faraway Cider – and especially grateful to the landowners who have invited him to forage on their property. "I'm always interested in talking apples with people, and hearing the stories behind the trees," he says.

(Joan Allaby is a Fredericton-based freelance writer with a background in science. She worked for the New Brunswick Department of Agriculture, Aquaculture and Fisheries for a number of years, primarily as a technologist in the provincial dairy lab, and she remains keenly interested in agriculture-related endeavours.) ●

FERAL FRUIT

by Joan Allaby

In recent years, concerns about food security have led to increased interest in foraging – gleaning nutrition directly from Mother Nature. Baskets in hand, a growing number of people have been heading out into woods and fields to gather edible roots, mushrooms, and wild fruit such as berries, cherries, and apples.

But are all these plants truly wild? Dr. Sean Myles, associate professor in Dalhousie University's Department of Plant, Food, and Environmental Sciences – and principal investigator at the Apple Diversity Lab – explains that a wild plant is one whose reproduction has never been altered by humans. The apple and crabapple trees we find growing in the woods and fields across the Maritimes, for example, do not fit that description.

"A better word for these trees would be 'feral,'" Myles says. "The apples we might forage in Nova Scotia are likely grown from the seeds of a Cortland or McIntosh tree that was previously used for commercial production but escaped the orchard."

The apple belongs to the genus *Malus*, which is a member of the rose family (*Rosaceae*). The domestic apple we find in our grocery stores, *Malus domestica*, has been cultivated by humans for several thousands of years.

Truly wild apple trees do exist in other parts of the world, and even in North America – but not in Atlantic Canada. In 2010, Italian researchers sequenced the complete genome (i.e., the genetic material or DNA) of *Malus domestica*. They identified more than 57,000 genes – the highest number of any plant genome studied to date. (In comparison, the human genome has an estimated 30,000 genes.) Through this work, the researchers were able to identify *Malus sieversii* – an ancient species that grows in Kazakhstan's Tien Shan Mountains – as a wild ancestor of the domestic apple. Further research has shown that several other wild apple species – including *Malus sylvestris*, the wild European crabapple – also contributed genes to *M. domestica*.

The transition from wild apple trees in Central Asia to the modern apple growing in Canadian orchards was a long journey. Some researchers have suggested that the Silk Road was key to the development of new apple species. Along this ancient network of Asian trade routes, linking east to west, travellers helped spread apple trees by planting seeds (either intentionally or by tossing away apple cores), and carrying seedlings from one place to another. New trees grew and bloomed, then cross-pollinated with local wild species, giving birth to new varieties.

An important characteristic of *Malus* species is that they are self-incompatible. This means that an apple tree cannot pollinate itself; to produce fruit, it must receive pollen from a different variety of apple. This process, known as cross-pollination, is primarily carried out by bees. Thousands of years of cross-pollination have led to great genetic diversity among the different species of apple trees, which has helped them adapt to diseases, changes in growing conditions, and other adversities.

Commercial apple growers plant several varieties of trees in their orchards, to ensure that pollination occurs. They often plant crabapples (*Malus floribunda*) at the end of the rows, because this popular ornamental, with its abundance of flowers, is a great source of pollen – and although a different *Malus* species, it can pollinate the domestic apple.

Once pollination occurs and fertilization takes place, seeds develop, and the apple forms around the seeds. The fruit develops from the ovary of the

(Faraway Cider photos)

There are no apple species native to Atlantic Canada, so the apple trees we find in forests and hedgerows cannot truly be called "wild." Dr. Sean Myles, a Dalhousie University professor and principal investigator at the Apple Diversity Lab, says it would be more accurate to call these trees "feral," because they are essentially escapees from orchards.

mother plant. The tree the pollen came from (the "father") has no influence on the characteristics of the fruit that forms. A Cortland tree will always produce a Cortland apple, regardless of where the pollen came from. The seeds, however, are a different story. The seeds inside that Cortland apple will contain genetic material (DNA) from the father and the mother plant. If that seed is planted, and if it germinates, it will grow into a tree with characteristics of both varieties.

Because commercial orchardists want trees that are going to produce a specific variety of apple (McIntosh, Cortland, Golden Delicious, etc.), they use vegetative propagation – a form of asexual reproduction in which a new plant is grown through cuttings, grafting, and layering (when a branch is bent down to touch the ground, causing it to send out adventitious roots). Apple trees are usually propagated by grafting, which involves the stem of the desired variety (scion) being joined to the base of another variety (rootstock). To create a graft, the scion and rootstock are cut at an angle, so they will fit together with the insides of the stems touching. The join is then bound securely with grafting tape. If the graft is successful, new plant tissue will have grown after six to eight weeks, melding the two parts into one tree.

In a grafted tree, the scion determines the variety of apple, and the rootstock determines other important characteristics such as the size of the mature tree, how well it will grow in certain conditions, and resistance to disease or insects. Rootstock is classified as dwarf, semi-dwarf, semi-standard, and standard – tree size being an important consideration in orchard planning and management.

As part of our diet for thousands of years, the apple is ingrained in human history. Whether consumed fresh, cooked, or in beverage form, it remains the quintessential tree fruit. ●

Reclaiming lost flavours

Researchers at the University of Guelph have recently shed new light on the genetic makeup of wild apple trees in Ontario, with potentially important implications for craft cider makers. Dr. Dane Cronin and Dr. Brian Husband, professors in the Department of Integrative Biology, along with research associate Paul Kron, conducted DNA analysis on samples from 578 naturalized feral trees, and published their findings in 2019, in the journal *Molecular Ecology*.

"A relatively small number of varieties that were grown in Ontario more than 100 years ago, some of which are no longer grown commercially, are showing up as likely parents of these feral apples," says Husband, in a University of Guelph research bulletin. "The origin of feral trees wasn't so much the commercial apples fertilizing native crabapple, but rather these escaped apples that were now out there and growing wild. The legacy of these old cultivars, some of which are no longer in production, reside in the mixed genomes of these wild apples."

This helps to explain why feral apples tend to be preferred by producers of hard cider. During the past century, the apple industry has shifted toward the fresh market; varieties with stronger flavours and aromas, which are better suited for cider, have largely disappeared from commercial orchards.

Cronin suggests the resurging popularity of cider could spur the industry to reclaim those flavours. "There is a vast trove of untapped genetic potential in the natural landscape of southern Ontario that could be used to enhance or diversify the commercial cider industry," he says.

Husband points out that some cider makers are now mapping hedgerows, old homesteads, and abandoned orchards where unique apple strains have been identified. "Cider producers are looking for interesting flavours," he says, "and feral apples with heritage traits may be just what they are looking for."