

**Proceedings from the March 26, 2010 UVM Extension Hops Conference: *Hopping to It!***

**Jason Perrault**

**Jason Perrault is a fourth generation hop grower in Yakima Valley. He is also a hop breeder with technical training in genetics. The following transcript was taken from a presentation he gave at the UVM Extension Hops Conference: *Hopping to It!* at the Trapp Family Lodge in Stowe, VT. This information is for educational purposes only. It should not be presumed to be prescriptive in any way. Speak with your UVM Extension professional if you have any questions or require additional information.**

**Hop Botany, Cultivation and Breeding. T**



This is a very effective way to make cuttings. Actually, when you are starting with only one plant and you want to do a fast, rapid, expansion that is the best way to get it quickly. [ qw" fqpøv get as strong a plant the first year, but you do get more plants.

As I mentioned, hops are climbing vines, so in the wild they are usually found growing with companion species. To replicate that under cultivation, in the field we have created our trellises. A typical field set up in the Yakima Valley would be an 18 foot trellis. This is a system of poles and wire worked and our plants are spaced at 3.5 feet by 14 feet, or 7 feet by 7 feet. The math is the same regardless, and you end up with 889 plants per acre. That is a typical set up, and the vast majority of the fields are in that spac



into growth the next year. At this time <sup>ngvøu</sup> go out into the field. We may not be doing much out in the field. Maybe putting on some compost, kind of working that into the ground. We may be preparing

really just learning the variety. There's nothing you can use that will tell you, "Oh, today is the day we train." There are no numbers,



determining its yield, and you need to manage plant health aggressively. Your goal is to maximize the health of the plant while managing the growth of the plant. You're managing health versus growth. It kind of sounds counterintuitive, you would think, the more growth you have, the better the plant. But you really want to control that growth because the inner node length also plays a major role in yield. You have so many nodes on that hop plant and you want all those yielding nodes to be below the wire, because once it goes up and over the wire, the signal in that apical bud changes. It's no longer growing up, but it is still pushing out growth to grow upward. It is not necessarily pushing out yielding growth. Ideally, you want all of your inner nodes underneath that wire. Well, it's nearly impossible with most varieties but you are trying to really control that growth. So you want shorter inner nodes. If you are just pushing nitrogen because you want your plants to look great, you are really hurting yourself in the long run. You want to hold back a little bit on the nitrogen, but you still need to give it what it needs. There is no magic bullet, it just takes time; you just have to learn how that plant responds. Every variety is different. Every environment is different. It is just where you should focus your efforts: learning that plant. You really have to watch your fertilizer at this point. My grandfather said, "The best type of fertilizer a farmer can have is his foot prints." I think that is the truth. I don't care what crop it is, you need to be out there learning the plants and learning what they need.

overlap. There is

**Question:** So you try not to fertilize anything in the aisles or anything that is not necessary?

**Answer:** That depends on your plant spacing, but generally you don't want to put too much fertilizer out in the middle because it is a waste of money. You are not really growing anything out there except your cover crop if you have one.

**Question:** When do you do your root cutting?

**Answer:** For planting material? That would generally be done in February or end of January. It depends on when we can get in the fields. As soon as we can get in the field we will start digging roots. You don't want to wait too long because they start growing in March. If you have growth then it is too late. We try to get out there before they start growing. They need a minimum of eight weeks of dormancy. If you can get out there and dig on them after it has been frosting for eight weeks, by all means if you need to dig, dig. But the way we try to time it is that we can go out and dig, and they might go into cold storage for just a little bit, and then we'll go directly back out to the field to plant them right away. I don't like to store them for too long, you will run into storage mildews and molds.

**Question:** Do you prune them back annually?

**Answer:** Not always annually. There are a couple of different ways we can do that. We can prune the roots back and get cuttings at the same time. We are serving the purpose of getting some propagatable material, but we are also serving the purpose of pruning that root crown back. There you have two reasons why we might go through by hand and do that. But generally our actual root pruning will happen with a disc, mechanically. We'll go through lengthways and crossways and it kind of blocks that hill.

**Question:** [ qw" jcxg" o gpvkqpgf" o quvn{"pkvtq igp" y jgp" {qwøtg"vcnmkpi"cdqww"hgtvknk |gt0""Dww" y jcv"qvjgt" nutrients do you find are needed by hops?

**Answer:** It is similar to any other fixed crop, where your N, P, and K are obviously important and depend on where you are at. A lot of soils have a sufficient amount of P and K where you don't have to add any. In our case we generally need it. It depends, we go field by field, we will soil sample and we'll make a decision on what each field needs. Generally speaking we will have a little bit of phosphorus going on and a little bit of potassium. Calcium is also key; it will usually come in a fertilizer blend. It will come on with one of our other fertilizers.

**Question:** Is there a particular time when you would apply those?

**Answer:** Generally speaking, calcium would go on in the same peak period as your nitrogen, the vegetative growth stage. You want to get it on before your potassium because the potassium will actually antagonize the calcium, make the calcium unavailable. You have to watch your timing and get it just right. Otherwise, you could be tying up one or the other.

We are going into dormancy. What is going on in the field? Well we are picking hops. On a typical operation in Yakima Valley, the vines are cut and transported to the picker. Alternatively, there are field strippers that will strip the vines out in the field and carry just that material back. Regardless, that material has to be shipped back to the stationary picking machine and then that is where the cones are separated from the rest of the material. We then dry the cones for eight to ten hours down to 10% moisture. Then

we cool them using ambient temperature air for twelve to twenty four hours in big piles. This allows cooling, but also is a kind of mixing action, and it allows us to equilibrate the moisture level within that pile so that we are not getting real dry pockets mixed with real wet pockets. Then immediately after that twelve to twenty four hour period we bale and immediately transport them to cold storage.

**Question:** How cold do you store them?

**Answer:** Generally, just below freezing is the ideal temperature, between 27 ó 32° F, depending on the varieties. Some varieties don't store very well. In fact some are a hazard in storage. Take the CTZ's, once you compress those into a two hundred pound bale, if they weren't dried properly to the right moisture level, it would become a fire bomb hazard. They could actually blow up. It doesn't matter, they could be too wet and blow up, or they could be too dry and blow up. If they are too dry, it is like an oil soaked rag problem í it will combust. If they are too wet, it is like a wet bale of hay, same type of spontaneous combustion. You have it on both sides. That is why with certain varieties, we want to get them into cold storage as soon as possible, but also if they are a risk, they go into pellets as fast as possible.

Pictures regarding harvest. Mechanization is key. We mechanically sort the leaves from the vine. Rick mentioned his time frame for hand picking and he is right. We used to do that for the breeding program. We used to hand pick everything. We had a crew of five or six people and it would take about an hour per vine. It was a pain. The mechanical picking is key. Back when my great grandfather first started growing hops it took a hundred people thirty days to harvest thirteen acres of hops. Mechanization is needed if you are going to do anything on any type of commercial scale.

We are drying them in forced air at fifty cubic feet per minute at 130 ó 150° F, the lower the temp the better. If you are high volume, you run into problems. If you are harvesting a lot of volume on high yielding varieties sometimes you fill your kilns up. It costs you a lot of money to shut everything down and stop and wait for your kilns to empty out to start picking again. Sometimes, you'll fill them a little more than you'd like.

**Question:** Can you ai

have the same equipment behind this where we are running through the same belts and everything but at our front end we actually come in and dump the load completely. We don't have the vine hangers. It saves us about ten people per shift. This whole load comes off at once and then it is cut into eighteen inch sections by a big blade. The whole vine is still coming in, but we are able to unload all of them at once

areas. Our goal is to realize our maximum genetic potential of each of these hops plants. The problem is, in certain environments the maximum genetic potential cannot be reached. The solution that farmers and researchers have been coming up with for years is to breed varieties to match your environment.

This is an example of yields from the new US aroma hops varieties. The far left bar here is our noble European aroma hops. The average yield in the US is below a thousand pounds per acre. It makes it very difficult to actually grow those hops and still be economically viable. So the answer over the years was to start breeding better and better varieties. All of these were developed in the US, derived from the noble aroma hop varieties. The latest one of these releases was Palisade which came out of our breeding program. We have seen yields as high as three thousand pounds per acre, but it averages around twenty four hundred pounds per acre, versus Mount Hood and Glacier which are just over fifteen hundred pounds per acre. You can see that over time we have been able to take these hops, hopefully with similar characteristics that the brewers are looking for, from the noble aroma hops and make them a little more economically feasible to grow. Take a

looking at the specialty or dual purpose hop. Then increasingly we have started a program within our breeding program breeding specifically for organic varieties. The goal is to combine all of these quality parameters with pest and disease resistance, good storage stability, and desirable brewing characteristics. A typical breeding scheme would run through a parental selection and crossing, early selection, intermediate selection, advance selection and cultivar release.



**Question:**

We are going to work really hard to get hops off that list. It will be a shake up at the start to actually