

Jason Perraut gave a great presentation which really covered all of the fundamentals of the hop plant, growing, and efforts for developing new hop strains. This is going to be a massive data dump so enjoy the ride!

In 2007, the hop market was valued at \$163.3M and was a top 12 crop for Washington. Overall, the balance of hop production in the United States was right around 77% from Washington, 16% from Oregon, and 7% from Idaho.

The hop plant is from the Cannabaceae family. The only other plant in that family besides humulus is cannabis. Hops have 20 chromosomes, are dioecious (male and females), are fertilized via wind pollination and are indigenous to the Northern Hemisphere (Europe, Asia, and North America). Males have no commercial value and are considered to be a pest in hop fields as they increase seed count in cones. Hops are propagated in a genetically identical form through cuttings, particularly of the root / rhizomes. They can also be propagated through softwood cuttings. If you are making a rhizome cutting, you must cut between the "eyes" on the rhizome in order to get a new viable rhizome. They are annual plants above ground and perennial plants underground. As vines, they climb clockwise around a supporting material using phototropism (reaction to light) and thigmotropism (reaction to touch).

A typical field is planted 18' high with a spacing of either 3.5' x 14' (for better access) or 7' x 7' between plants. Either way, this gives 889 plants/acre. They typically climb up a twine trellis which is usually either a coconut husk or paper material. It is best if the twine material is biodegradable so that when it is cut in the field it will soon be reabsorbed into the soil. The twine is anchored into the soil and the vines will be trained onto the trellis. They can grow as much as 1 foot in a day, and up to 18-25' in a season.

The cones contain lupulin glands which can constitute 20-30% of the dry weight of the cone. A single well-grown hop plant can have about 5,000 cones.

There are a few primary stages of growth: dormancy, spring re-growth, vegetative growth, reproductive growth, and preparation for dormancy. In March - May, new growth will begin to come through. These vines should be cut back to encourage more vigorous growth later. During this time it is good to practice weed control and fertilize the soil as necessary.

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Once the second wave of growth begins to come through, you can train three vines per string. The center vines are typically the best.

In May-July you will see most of the vegetative growth (May-June: vines and leaves, July: lateral). The internodal length is critical. If it is too long you end up with a long plant with a bushy top which is less than ideal for balanced cone production and proper cone exposure. You can control growth rates with training, nutrients, and watering, done in accordance with the weather. Throughout this time it is important to consider mildew and pest control as well, spraying (if you choose to) as necessary.

Once a critical number of light hours is reached, flowering begins (typically 16 hours). This typically works out best between the 40-50<sup>th</sup> parallels. At this point it is desired to have 20-25 nodes going up the plant (becomes a balance of encouraging growth to get the right spacing). This typically comes at the end of July. Cone growth can amount to 50% of the hop vine dry matter. By the end of August through October, harvesting can begin, depending on the conditions and variety of hops. There tends to be a correlation with alpha acid production and harvest dates. Hence, a farm that plants all high alpha acid hops can have a huge workload problem all at one time.

Summarizing again the hop harvesting process, the hop vines are cut down and the cones are separated. They are dried to about 10% moisture, a process that typically takes 8-12 hours. They are then cooled for 12-24 hours, baled, and transported for cold storage.

Alpha acid development is typically correlated with light, soil, time, and water but the nuances of these correlations is poorly known. It has been shown that there is a strong correlation to weather patterns, particularly in May. It has also been shown that overkilling on Nitrogen additions has a negative effect on alpha acids so don't just dump fertilizer out there!

There are currently two forms of the hop market. There a market which purchases by the "alpha" and one that purchases "per/lb". There is a strong trend towards the alpha market.

In the field of noble hops, they are pushing for new varieties with similar character profiles but with better yield and disease/pest resistance. Of note, Vanguard, Santiam,

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Palisade, and Glacier have come through with some higher alpha acids and a good alpha to beta balance. From looking at the numbers, you can expect to see a lot of Palisade on the market so it may be worth your while to see how you like the hop. Another new hop that will be coming soon is "Citra" which is a Hallertau relative (nice and aromatic) but with a high alpha.

In general, when they are looking for new hop varieties, they are looking for the following things:

- - High yielding, high alpha hops
- - High yield aroma hops
- - Pest and disease resistance
- - Good storability
- - Good brew characteristics (low cohumulone, good oils)

Overall, this was probably the best speech in the way of making sure you understand hops. My only complaint is that this it should have been the first speech of the school! (Understandably, working with the speaker's schedules took priority).