



All Hopped Up

Happenings from the Midwest Hops Scene

June 2009

Issue 2

Volume 1

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GVH Welcomes Newest Charter Growers!

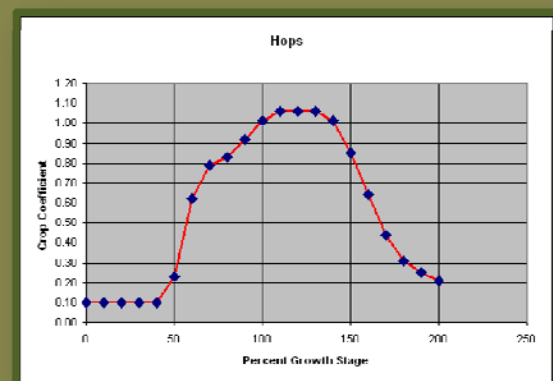
Gorst Valley Hops would like to introduce Steve and Larry Kreul of Boscobel, Wisconsin as the newest Charter Grower family members! The Kreuls plan to install approximately 6 acres for the 2010 season, getting the trellis installed this fall (smart move!). We are very excited to have Steve and Larry as members and will strive to help make them successful.

For more information on the GVH Charter Grower Program contact James at 608-334-8012 or james@gorstvalleyhops.com

Are You Starving Your Plants?

Food, water and sunlight: the three most critical components to a strong plant and high yield. But perhaps you didn't know that hops require nearly 90% of their water and nutrition in a very short window. Given how fast the plant grows it shouldn't be too surprising that any shortages in water or nitrogen during the heavy growth period between training and flowering (generally late April to mid July).

AgriMet Crop Coefficients - Hops



Beeriodic Table of Elements

Humulus lupulus

736

Hu

362.00165984

- Scientific name for hops
- Atomic Number of humulone
- Beeriodic Table Elemental Symbol
- Atomic Weight of humulone

This chart is a representation of a hop plant's water usage based on its growth rate. 100% growth indicates when the plant reaches the top of the trellis. This equates approximately to late June to early July depending on variety. *(Continued on page 3)*

Calendar of Events

In the Field

Lateral growth beginning

Weed Control: Cultivation no deeper than 2 inches.

Training: Right Now!!!!

Pest Scouting: Right Now!!!

Irrigation: This is a critical period for good yield. No flooding

Nutrients: Get your fertilizers on if you haven't already!!!

In the Classroom

Pre planning for the Fall Midwest Hops Production

Workshop, Cross Plains WI. Let us know if there is any interest...

Stupid Hops Fact

The scientific name for hops *Humulus lupulus* means "little wolf" in latin. Why? No one really knows...wacky taxonomists.....



Pesky Pests

Aphids and spider mites and mold spores, oh my! Yup it's time to start scouting for pests in the ol' plantation. So you just sort of wander through and look for bugs and stuff on leaves, right? Nope.

When scouting for pests (especially insects) we have to decide on how much pressure is too much pressure for the plant and ultimately the yield. So if you see one hop aphid per leaf on 20 leaves does that mean you're infested? Not quite.

Scouting for aphids should occur during the spring and most of the summer in the Midwest. Walk through the plantation every week or so and collect 20-30 leaves from the upper portion of the bine. Look for aphids.

If the average aphid count is 20 or more then chemical applications are in order. Since there are no registered pesticides in WI (local rules apply) that means only exempt products can be used. These materials offer good control if used while the populations are low. This is called a low pest threshold.

Scouting for two-spotted spider mites is a similar process: Choose 20-40 leaves at random and look for mites. Since mites can overwhelm hops very quickly a very low threshold should be used; less than 3 mites average on 20% of the leaves collected or if any webs are observed. Use high volume applications to ensure complete coverage on both sides of the leaves.

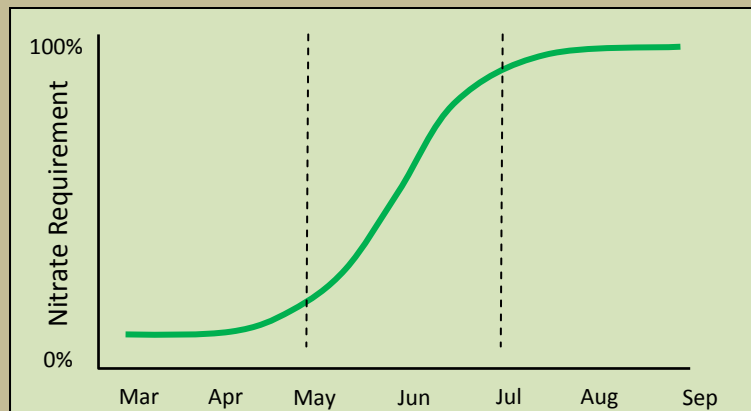
Starving Continued

So we know hops need water, but how much? Several publications say hops need 30 inches of water per season. But soil type contributes to water holding capacity and percolation and irrigation methods determine frequency and volume. So sorry, gang...no easy answer.

GVH advocates drip irrigation and can point you to equations that will help you calculate volume and duration based on your needs. But regardless of the soil situation, we can see from the chart that hops want nearly 100% of their 30-inches between mid May to Mid July. Deficit irrigation during this period will stunt growth and result in fewer and smaller flowers.

So what does water have to do with nitrogen? We know hops require lots of nitrate (NO_3^-) nitrogen for all that biomass production. Soil type will also determine just how much N is required, but in general plan on 80-150 lbs/acre. That's a load of N! But then again think about how fast these plants are growing. In the heat of late June these plants will grow 10-14 inches per DAY. How much would you need to eat if you were growing that fast?

The nitrogen uptake curve for hops looks something like this:



The vast majority of N is required within a narrow 6 week window. Remember this is *nitrate* N. Organic growers are warned that biological N obtained from manures, fish extracts, compost, etc requires several weeks to months to undergo transformation from ammonium (NH_3^+) form to nitrate (NO_3^-) form before it becomes available to the hops.

Excessive irrigation or rain will leach the nitrate from the soil. This is the link between water and nitrogen. Hops need a lot of water, but also a lot of N during the same period. Ah, the dance of horticulture continues...

By Plant Geek James Altwies, Gorst Valley

Hop Chemistry 101

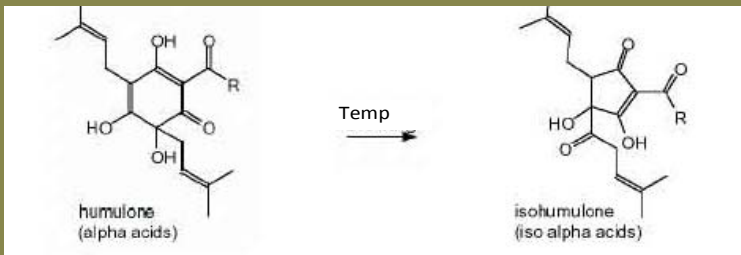
As any beer connoisseur knows, hops has a dramatic affect on the taste of beer. One of the first sensations that hit the palate from a "hoppy" beer is the bitter taste. The bitterness comes predominately from the alpha-acids.

The alpha-acid component is comprised of a mixture of humulone, cohumulone, adhumulone, posthumulone, and prehumulone. Different varieties of hops will have differing levels and ratios of the alpha acids. All of the alpha-acids have limited solubility in water and do not impart the bitter taste that hops are known for, but upon *isomerization* the acids become water-soluble and the bitter taste develops

Isomerization is a process in which there is a structural change in a molecule without changing the overall composition of a molecule. The total numbers of carbon, oxygen, and hydrogen atoms in the molecule do not change, but the order in which they are put together does.

In the case of alpha acids, the isomerization process proceeds when the alpha-acids are held at an elevated temperature for prolonged periods of time. This can be done as part of the brewing process through an early addition of the hops to the boiling wort or it can be achieved by keeping hop pellets at an elevated temperature (around 50°C or 122°F) for one to two weeks. (Continued on page 4)

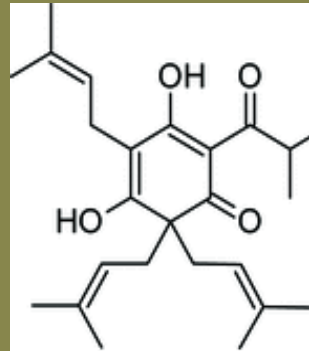
Chemistry Continued



While iso-alpha acids are desired for their bitter taste and preservative qualities, they also have some drawbacks. The biggest concern of the beer drinker is the dreaded skunky beer. Skunky beer occurs when iso-alpha acids oxidize by light generate free radicals and react with cystein (an amino acid brought into the beer with the protein from the hops) and riboflavin to form thiols (similar to compounds that are found in skunks and in natural gas to alert people to leaks, on both accounts). So think of this the next time you drink a Corona on a sunny day and run out of limes.

The other acid components of the hops are the beta-acids. Beta-acids mainly consist of lupulone, colupulone, and adlupulone. Unlike the alpha-acid, the beta-acids do not undergo isomerization. They can contribute to the flavor and bitterness profile, especially when they undergo oxidation reactions.

Oxidation is different than isomerization in that the molecule will actually change its composition, generally with the addition of oxygen atoms forming new alcohols, acids, ketones, or aldehydes.



Beta-acid, Colupulone

Most people recognize the bitter taste of a well hopped ale, but the more subtle notes found in most well made craft brews comes from the oil component of the hops. Both flavor attributes come from the oily extract of the lupulin gland in the hops cone.

There have been over 300 compounds isolated from hops essential oil, but the main flavor components come from the terpenoids, sesquiterpenoids, and their oxidation products. Of the 40 or so identified terpenoids and sesquiterpenoid oils, the three with the highest proportion in most hops varieties include myrcene, α -humulene, and β -caryophyllene. Due to the various unsaturated sites on the sesquiterpenoid rings, they are highly prone to oxidation.

By Joe Wegner, Chemist and Owner, Gorst Valley Hops.

IN THE NEXT ISSUE...

Joe continues his rant on hop oils...

We finally track down Kirby for an interview...

Christine talks about wild hops...

James talks about hop anatomy...

Readers sound off...

