

Hop cultivation

A capricious Lady

Beer may be one of the oldest beverages in the world, but it was the hop ingredient that made it storable and added its unique flavor. Yet beware, the hop plant is a demanding lady: Only tender loving care and the very best growing conditions will make her yield her precious lupulin.



The hop lady is a choosy gourmet when it comes to selecting her habitat. She needs the light of sheer endless summer days to reach maturity and develop her unique aroma. Offering her this kind of light between the 35th and 55th latitudes, the northern hemisphere boasts a hop belt that spans from North America to Central Europe and China. In the southern hemisphere, farmers have to make do with just a few suitable locations – unless of course, they flatter the diva by offering her genuine limelight. South Africa, for example, is only just within the 35th latitude range. To create the illusion of longer days, local farmers illuminate their hop gardens with electric lighting. This allows South African farmers to grow hops well into the 30th latitude.

While the plant's hunger for daylight makes it choosy in terms of location, the real challenge of hop farming has always been the crop's susceptibility to diseases and insects pests. A century-old English saying describes the life of a hop plant in a nutshell:

"First the flea and then the fly / then the mould, and then they die."

Special equipment is needed to maintain the hop plants in the correct way.

In 21st century English this would translate into something like: "First the soil pest, then the aphid / then the fungus, then it's had it." In all fairness, it must be said that the blame is not entirely on the hop plant. "Hops are a spatial crop", says Otmar Weingarten, Managing Director of the Association of German Hop Growers. "A hop garden is a three-dimensional planted space. Hop plants grow seven meters tall and they stay in the field for several decades without crop rotation. Considering this, it hardly comes as a surprise that the pressure of diseases and insect pests is high."

Another challenge is the spraying process, which takes place at dizzying heights of seven meters (23ft.). To put this into perspective: The average fruit tree is only about three meters high. Then there is the time factor to reckon with: "Hop plants need to be kept clean of pests for five months – from March/April to mid-September," explains Otmar Weingarten, "in wheat, for example, we are talking about a span of five weeks only." Until the late 70ies, farmers would follow a preventive schedule, spraying 15-17 times a season. Today, early warning systems and prognosis models allow a targeted application of crop protection products. As Otmar Weingarten explains, this helped to reduce the number of treatments significantly: Fungicidal applications against the devastating peronospora disease, for example, are down to three times (or six times for particularly susceptible hop types) a season. The timing, however, is vital. Those who are late in spraying will be punished by the capricious lady herself. Unlike wheat, which is harvested at a



The *Peronospora* pathogen starts to attack the plants via the soil.



Hop plants grow very rapidly – by the time of harvest, they have reached a height of about seven meters.



Hop flowers – female plants are needed. Only they are capable of delivering the important lupulin, which gives beer its particular flavor.



Hop cones before harvest: Hop is picked at the point of its highest brewing value.

stage of physiological ripeness, hop is picked at the point of its highest brewing value. At this stage the plant is still growing, so that all the pests can keep multiplying until the very last day.

No males, please!

An old country proverb from Germany says: "The hop plant wants to see its master every day." Unless the lady gets consistent attention and timely crop protection, the hop farmer might end up empty-handed in September. Adding to the list of worries is the risk of unauthorized intruders. A hop garden is a "Ladies only" location. Only the flowers of the female plants develop

the cones that produce lupulin – the reward for all the toiling. The small yellow lupulin glands are the carriers of the aromatic oils, bitter substances, and tannins, which add up to give the beer its character. To achieve top quality brewing value, the farmer needs to beware of male hop plants: The seeds of fertilized cones affect beer characteristics such as the foam formation that is desirable in most beers. Male hop plants are therefore banned from hop gardens and their surroundings. German hop communities even ban all types of wild hops: It must be removed by law.

House five-and-a-third

If you want to get a glimpse of a male hop plant, you need to meet up with a hop breeder. One of the most important hop research institutes in the world is located in the Bavarian Hallertau region, in a tiny little village called Hüll. One of 20 odd houses, the "Bavarian State Research Center for Agriculture" is not hard to find. Its address is simply Hüll, House 5 1/3. Bernhard Engelhard, the center's coordinator for hop research, explains the mission: "For almost 100 years, the institute has been developing hop varieties that offer higher disease resistance and optimized contents. We



Brewing beer at the scale of hundreds of liters requires brewers to have experience and a good feeling for the process.

Beer is enjoyed in many regions of the world. The choice of different beers is correspondingly large: light, dark, top- or bottom-fermented, low-alcohol or alcohol-free, Pils or wheat beer. The list is as long as you like.

Facts & Figures about Hops & Beer

- About 50 countries worldwide produce hops for domestic consumption. Only Germany, the USA, the Czech Republic, Poland and Slovenia produce enough surpluses to sell abroad.
- The big hop countries Germany and the USA produce a third of the world hop harvest each.
- While Germany is a world leader in hop export, the Germans prefer to hold on to their beer for national consumption. 100 million hectoliters are brewed in Germany annually, 85 of which stay in the country.
- There are 2,800 breweries in Europe, 1,300 of them are in Germany. Only the USA has more breweries (1,500).
- Even though the German purity law allows only four beer ingredients (malt, hop, water and yeast), there is a wide range of 5,000 different beers in Germany.



focus on breeding two hop types: bitter hops and aroma hops. In bitter hops, the alpha acid content, which is important for the brewing process, is higher. Aroma hop varieties on the other hand offer significantly higher concentration of etheric oils." In addition, there are differences in cultivation: Aroma varieties offer lower yield, require more care, but sometimes fetch a better price. Bitter varieties on the other hand, are stronger and more resistant plants. Their alpha acid balances the extreme sweetness of the malt and creates the pleasant bitter note of the beer.

Today, many of the bitter varieties are produced in the USA, because the irrigated American hop yards yield a more stable alpha acid than the rain-fed European hop gardens. "On the other hand, many famous aroma varieties like the Hallertauer, Tettnanger and Saazer originate in Europe and are adapted to the continental climate", says Bernhard Engelhard. Yet the USA is also home to some highly interesting aroma varieties. In the Yakima valley, where 75 percent of the US hops are produced, the aroma variety Cascade benefits from higher

temperatures and constant irrigation to produce flavors of a type that do not exist in Europe. Leveraging this hop diversity, many famous breweries take the best of both worlds, combining, for example, American bitter varieties with aroma hops from the Bavarian Hallertau.

The brew master's concert

Even though the art of beer making is public knowledge, the exact recipe of each spicy brew and the timing for adding the different ingredients will always remain the brew master's secret. The principle is simple. Hop is added in two stages: First in line are the bitter hops. When the spicy brew is almost ready, the more precious aroma hops will be added. In that way, the volatile oils of the noble hops remain in the brew. Incidentally, the noble aroma oils offer an added value: Their antibiotic effect inhibits bacterial growth, extending the beer's shelf life.

Discussing the importance of aroma oils with Otmar Weingarten, it is obvious

that the topic is close to his heart. "You can get alpha acids all over the world," he says, "but aroma varieties – just like wine – are local specialties. Their oil content depends on the location and the soil – the 'terroir' as it is called in viticulture. Figuratively speaking, the aroma variety is the piano, and the brew master will play on it to give a concert for the customers." Lately, however, Mr. Weingarten has been worried about the future of brewing as an art, particularly in times of financial crises. "Some brew masters no longer have a piano to play on, because the corporate accountants decide on the hop variety, looking at nothing but the price. What they end up with is beers without character."

"Is beer the new wine?"

Yet it seems that beer drinkers all over the world are not willing to let this happen. Promising consumer trends indicate that taste is here to stay: In many countries across the globe, small breweries with specialty beers are experiencing a genuine revival (except of course

in Bavaria, where 50 percent of the villages have their own brewery anyway). Another interesting trend is discussed in blogs and web forums. "Is beer the new wine?" is the bloggers' rhetorical question and the answer is brewing sophistication at its best: Gourmet dinners, offering corresponding beers for each individual course, provide taste adventures for trendy connoisseurs.

Another classy trend is reflected by a pioneering brewery in Germany: In 2009, it launched a vintage beer, which is reaching maturity now. The brew master went to the antipodes of Germany to find the right 'terroir': He selected an aroma variety with spicy, resinous and earthy notes from the virgin forests of Tasmania Island, probably the most southern area of hop cultivation in the world.

It seems that beer brewers and beer lovers from all over the world are teaming up to appreciate the repertoire of the capricious hop lady, enjoying the concert of fine 'terroir' nuances on their palates. ◀

Gabriele Polensky



Hop aphid (*Phorodon humuli*)

Movento keeps up with plant growth – worldwide

The hop plant is a speedster. Its growth rate of 30 centimeters a day makes it a real challenge to protect new hop leaves against pests and diseases. New Movento® keeps up with the plant's growth. Its active ingredient enters via the leaves, then spreading systemically in the plant. Even new shoots, emerging one or two weeks after spraying, are protected. The secret behind this reliability is the unique two-way transport of Movento, which makes its active ingredient spirotetramat circulate in the plant for a long time – so long, in fact, that several generations of aphids can be controlled with just one spray application of Movento.

Movento is now registered for use in hops in the USA and Austria; further registrations are expected soon. Applications for import tolerances have been submitted to the authorities of all important hop import countries, among them Japan.

In areas with intensive hop cultivation, the trellises that support the hops as they grow are a part of the landscape.

