2013 High Altitude Hop Variety Research Trial at the Old Fort at Hesperus

The Newbies:

**Willamette**: is a triploid aroma-type hop, which originated in the mid 1970’s and is a seedling of Fuggle. It is a very popular aroma hop, contributing in 1998 to 18% of the total USA hop crop. A variation on English Fuggle hops grown in Oregon and Washington. Willamette has a mild and pleasant, slightly spicy, fruity, floral, little earthy/woody aroma. An excellent American aromatic hops for ales and lagers. (alpha acid: 4.0-6.0% / beta acid: 3.5-4.5%)

**Vanguard**: is somewhat noble and mild in aroma. At an average of 5.5 to 6% AA, Vanguard is great as an aroma addition in any German style beer (Munich Helles, Kolsch, Hefeweizen, Alt.) Its US parentage lends Vanguard an ever-so-slight herbal citrus that is quite restrained, but perfect for hybrid styles like American Wheat. Because of its US breeding and relatively higher Alpha compared to its parent Hallertau, Vanguard is a great substitute and money-saver both due to its availability and Alpha quantity.

**Teamaker**: has an alpha acid content of 0.6 to 1.8 percent, giving it the lowest alpha acid concentration of any commercially available hop variety. In addition, its beta acid levels (5.4 to 13.2 percent) are significantly higher than those found in most varieties. An extremely high beta-to-alpha ratio gives Teamaker all the health benefits of traditional hops cultivars without their characteristic bitterness, creating opportunities for nontraditional uses, such as in making organic herbal teas and compounds. Teamaker’s alpha and beta levels are reversed. Has antibiotic properties and has potential use as a replacement for antibiotics in animal husbandry. The high beta acids inhibit bacterial growth and can replace formalin in sugar processing. Teamaker is used as a “late hopping” aroma hop to add flavor where additional bittering is not desired. Also makes a good flavored ice tea.

**Chinook**: is a bittering variety with aroma characteristics released in May, 1985. It was bred by crossing a Petham Golding with the USDA 63012 male. A high alpha acid hop with a medium heavy aroma; and has a spicy, pine-resiny, grapefruit character. Typically used as an aromatic during the last few minutes of the boil when dry hoping. Excellent for hopping American-style Pale Ales, especially those brewed to higher gravities. (alpha acid: 12.0-14.0% / beta acid: 3.0-4.0%)

**Cascade**: is an aroma-type cultivar which originated as the first commercial hop from the USDA-ARS breeding program. It was bred in 1956 but not released for cultivation until 1972. It reached its peak in 1975 when it produced 13.3% of the total American crop. It was obtained by crossing an English Fuggle with a male plant, which originated from the Russian variety Serebianka with a Fuggle male plant. It is one of the most popular hops for craft brewing and is great for dry hopping. Cascade is often used in highly hopped West Coast ales that have a citrus-floral hop character. (alpha acid: 4.5-6.0% / beta acid: 5.0-7.0%)

**Centennial**: is an aroma-type cultivar, bred in 1974 and released in 1990. The genetic composition is 3/4 Brewers Gold, 3/32 Fuggle, 1/16 East Kent Golding, 1/32 Bavarian and 1/16 unknown. A relatively new hop on the market, this hop used to be called CFJ90. Described by some as a “Super Cascade” and we tend to agree, but it’s not nearly as “citrusy”. Some even use it for aroma as well as bittering. Bitterness is quite clean and can have floral notes depending on the boil time. (alpha acid: 9.5-11.5% / beta acid: 4.0-5.0).

**Crystal**: is a triploid aroma-type cultivar, released for commercial production in 1993. It originates from a seedling selection (No. 8309-37) made at Corvallis in 1983 between the colchicine - induced tetraploid ‘Hallertauer mfl (USDA 21397) and the diploid male downy mildew resistant aroma hop, USDA 21381M. Crystal is a half-sister of Mt. Hood and Liberty. A Mild bittering, perfume blend of spices and flower. A craft brewer’s specialty type for finishing aromas. (alpha acid: 4.0-6.0% / beta acid: 5.0-6.7%).

**Galena**: is a bittering-type cultivar which was bred in 1968 from Brewers Gold and an open pollination, i.e. an unknown male plant. It was released for cultivation in 1978. Galena is the most “mellow” hop of the high-alpha varieties, and has replaced Cluster as the most widely grown US hop. The bitterness is clean and well balanced. Great general purpose bittering hop. (alpha acid: 12.5-14.0% / beta acid: 7.5-9.0%).
Mt. Hood: is a triploid aroma-type cultivar, the 1983 result of a cross between the colchicine-induced tetraploid female Hallertauer mf (USDA 21397) and the USDA 19058M, male plant. It is a half-sister to Ultra, Liberty and Crystal. An aromatic variety derived from Hallertauer with a refined, spicy aroma and clean bittering. A good choice for lagers. (alpha acid: 4.0-6.0% / beta acid: 5.0-7.5%).

Nugget: is a bittering-type cultivar, bred in 1970 from the USDA 65009 female plant and USDA 63015M. The lineage of Nugget is 5/8 Brewers Gold, 1/8 Early Green, 1/16 Canterbury Golding, 1/32 Bavarian and 5/32 unknown. Nugget is a great bittering hop with a heavy herbal aroma. (alpha acid: 12.5-14.5% / beta acid: 4.0-6.0%).

Columbus/Tomahawk/Zeus (CTZ): One of the most popular all-purpose hops on the market. CTZ hops are very complex in their flavors and aromas: Citrus, Herbal, Woody, and Spicy. Not for the weak of palate as a bittering hop, but can bring in a wonderful layer of complexity when blended in as a flavor or aroma hop. (alpha acid: 12.1-15.4%).

The “old’ crew: 4 years old

Magnum: is a bittering/aroma type cultivar, bred in 1980 at Huell, the German Hop Research Institute, from the American variety Galena and the German male 75/5/3. No distinct aroma characters (faint spice and citrus), considered a clean bittering hop with very high alpha acids. Used in a wide array of beers. (alpha acid: 10.0-12.6% / beta acid: 5.0-7.0%).

Red vine: A very vigorous hop of French-Canadian origin. It is a low alpha, high cohumulone profile. CRV has a very heavy clustering and cone set with very long side arms (30 – 50 inches). Growth habit is similar to Cluster hops. It found its best use commercially by being interplanted with low yielding Cluster varieties to “boost” a field’s total yield. Aroma: Mild berry/cherry flavors, grapefruit peel aroma. In brewing it should be mixed with other hops because its cohumulone level is high and creates a pretty harsh beer by itself. On the other hand, this hop is so hardy you could probably have a hop yard near the Arctic Circle. (alpha acids: 5% or less, cohumulone 47%).

Chinook: see above.

Nugget: see above.

Definitions:

Triploid: occurs when a tetraploid (40 chromosomes) is crossed with a diploid (20 chromosomes) male to produce a triploid (30 chromosomes); The resulting plant contains two-thirds of the female parent's genetic characteristics, it is most likely sterile, and it usually produces seedless cones, which are of greater value to brewers. Triploids represent the highest level of vigor and growth rate in the species.

Alpha Acids: The alpha acid percentage represents the amount of the hop, by weight, that is composed of alpha acids. The “alpha acid” percentage actually encompasses multiple separate chemicals, each of which adds a unique flavor and style of bitterness. The primary alpha acids are: Humulone (R=isovaleryl) is the primary alpha acid occurring in most hops. It is thought to give a desirable “soft” bittering to the finished beer. Cohumulone (R=isobutyryl) has been considered to add a harsh, unpleasant bitterness to beer, and so low-cohumulone varieties were considered more desirable for brewing purposes; most noble hops have relatively low cohumulone. For this reason, cohumulone is often the only alpha acid identified specifically by hop producers. Cohumulone is indicated as a percentage (by weight) of the total alpha acid content of a hop. Adhumulone (R=2-methylbutyryl), which usually occurs in relatively small amounts. Its effect on bitterness and flavor is not well understood.

Beta acids: principally lupulone, colupulone and adlupulone. These are rarely considered separately, but the beta acids as a whole are important to a beer’s flavor. The beta acids do not produce as much bitterness during the boil as the alpha acids, but during fermentation and storage, as alpha acid bitterness breaks down, beta acids slowly create bitterness through oxidation. This affects the long-term character of aged and lagered beers.

Noble hop: The term “noble” is used to describe hops that share a particular set of characteristics. Unfortunately, nobody agrees on which characteristics these are, and therefore there is very little agreement on which hops qualify as “noble.” It is generally agreed that to be noble, a hop must have a relatively low total alpha acid content (usually around 2-6%), and a mild, pleasant aroma.