

Stacks

# THE Amateur Brewer

FOR THE SERIOUS HOME BREWER

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FEB 10 1978

PORTLAND, OREGON

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AMATEUR BREWER no. 4, Winter 1977.

# Talk to Your BEER

LATE AGAIN--what can I say, only that this special hop issue is very informative on the subject of hops. The tables and formulas that we have put together represent a lot of work and time, and this is one reason why we are late.

The photographs are my own, of course, and the special cover design is the work of a friend, Rev. Suigetsu Turner of Seaside, Oregon.

We are grateful to author Lee Coe for his fine article on the use and nature of hop pellets. Lee is the author of the Beginner's Home Brew Book, and was for several years the beer editor of the now defunct Purple Thumb. Lee may be reached by mail at Box 2265, Station A, Berkely, CA 94702.

Our other contributor is John Dunphy, proprietor of the Winemaker's Shop, formerly of Nashua and now from Hudson NH. John is a much appreciated correspondent, who takes the time to be very critical of what I have to say on these pages, and in my book. The next issue of Amateur Brewer (No. 5) will have his review of the new FOURTH Edition of my Treatise on Lager Beers, and you can see for yourself where he disagrees with my ideas. I should say, that for the most part we agree, and he is also a traditionalist brewer.

You may search in vain for information on growing your own hops in this special HOP issue, but you'll find none--there wasn't room. I hope to rectify that in a future issue, but we ran out of space--as you may notice we are half again as many pages.

Some of our regular features are also missing: Beer Club News, Other News of Interest, and Brewery News, but they'll all be back in the next  
--continued inside back cover

## Hops

By FRED ECKHARDT

One of the most important ingredients in beer comes from the beautiful aromatic green cones which provide the gentle bitterness. Hops were originally used in beer and ales as a preservative agent, and this is still their most important function for the amateur brewer. Modern brewing methods have made them obsolete for this purpose in commercial beer, but not so for the amateur. Both commercial and amateur brewers highly prize fine quality hops for their taste.

Hops are found wild in most temperate climes, and have been used in beer-making since the middle ages. Before that they were used for medicine and sometimes as pillow stuffing to help people sleep. Although wild hops were native to North America, cultured hops were first brought to North America from England in 1629, and by 1648 they had spread to New Netherlands and Virginia. Both the Dutch and English colonists valued their beer highly, and it was a staple in their diet. Beer was so important that its lack may have been a major cause of the colonists' landing at Plymouth Rock, rather than farther south as they had originally planned. By the end of the seventeenth century the new world hop production was around 1,500,000 lbs. annually. In the United States the hop industry has centered on the West coast since about 1909, becoming a major crop in western Canada only recently. 1977 U.S. production was 54,777,000 lbs., mostly from Washington's Yakima valley (37,904,000). Oregon production 9295,000 (mostly Willamette valley), Idaho 5,133,000 (Boise-Caldwell), and California 2,450,000, from Sacramento Sloughouse V.

Canadian production averages around 1,500,000 lb.

The hop plant (*Humulus Lupulus*) is a dioecious perennial which produces a climbing annual stalk. The stalks are trained in the spring and climb to a high wire trellis by means of twine. In the spring the young hop vines will grow as much as 6-12 inches in 24 hours. Only the female plants will grow the valuable green cones, and very few male plants are allowed to grow. By late August the stalks will have climbed to the trellis wires, which are about 18 feet high; from there they hang almost to the ground, heavily laden with the green cones. The harvest consists of cutting the vines and carrying them to the hop picker, which separates the cones from the vines. The cones are then dried for 8-12 hours at 150°F.; during this time they are bleached with sulphur gas, which removes some of the harshness. The dry hop cones are then cooled and cured for 24 hours to prevent their shattering when they are baled. The hop baler compresses the cones into 200-lb. bales, which bring around \$150 for Yakima Cascades, \$166 Yakima Clusters, \$190 Oregon Cascades, and as high as \$250 for Oregon Fuggles from the hop buyer.

Most U.S. hops are Late and Early Cluster, Fuggles, Fuggles II, Bouillion, Northern Brewer, Brewer's Gold, and Cascades, of which Clusters are

the most popular. Most Canadian hops are grown in B.C., centered in the Fraser, Creston and Kamloops valleys. Canadian hops are marketed directly with brewers, but most hops used in

Canada are imported from the U.S. or Europe. American hops are characterized by rather fruity flavour, which is considered unsuitable for most European beers.

Both German and English hops are considered superior to the American product. The best English hops are grown in the Kent area, and the chief varieties are Fuggles and Goldings. British hops are characterized by a rich aromatic flavour. The finest German hops are from Hallertau and Spalt; best characterized by the rich continental *lager* flavour. The finest hops in the world come from Czechoslovakia, whose Saaz hops, from the Zatec area between Sudetenland and Bohemia, are used to flavour the equally famous Pilsen Lager beer. The flavour of these great hops is best studied through a glass of Pilsner Uhrquel. No description does them justice.

As near as I can determine, the biggest reason why these German hops are not grown successfully in this

country seems to be that they require much more care and attention than American hop growers can provide with their mass-production techniques. There seem to be a few areas where Hallertau and Saaz hops could grow readily, both Idaho and Oregon are growing a few commercially.

If you were to cut the hop cone down the middle (see Fig. 2), you would be able to see the lupulin glands, which secrete the bitter resins and essential hop oils. These appear as a mass of yellow powder at the base of the bracts. Almost all of the hop resins are found in these lupulin glands. There are three hop-resins: most important the alpha-resin contains humulon and has a soft thickly fluid consistency and is pale reddish brown in color. This resin has an intense and lasting bitter taste, but no odor. Beta-resin is similar but contains lupulon, with a strong hop odor. The gamma-resin is a solid brittle and dark brown body but not bitter and with no odor. The hard gamma-resin

*Photos by Fred Eckhardt*

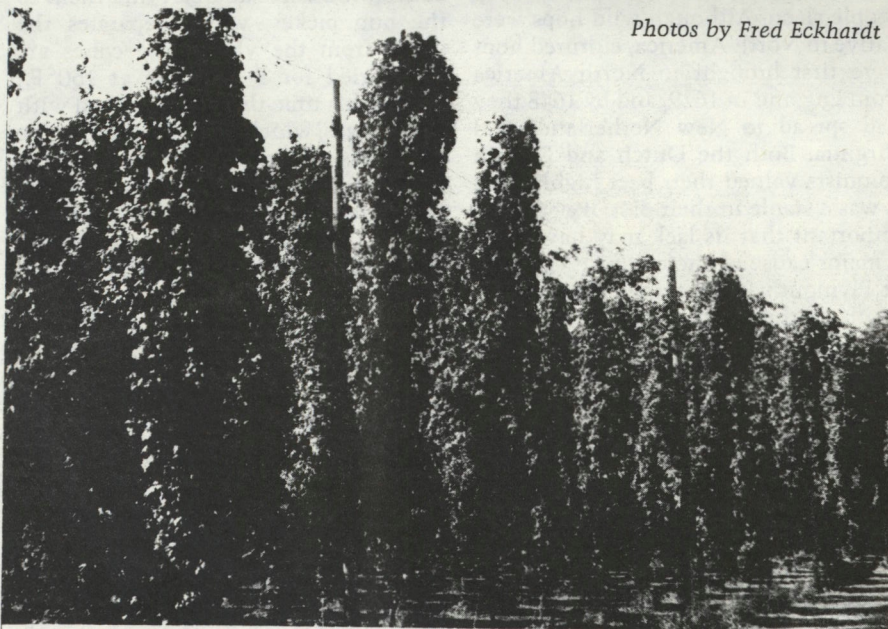


Fig. 1. Boullion hops at the Mt. Angel Abbey.

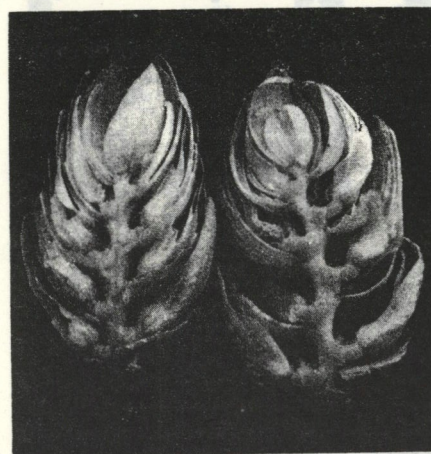


Fig. 2. Closeup showing the difference between the late harvesting English type Boullion hop (left) and the early harvesting English Fuggle (right). Note the closer bracts, and greater amount of powdery lupulin in the Boullion.

has no value in brewing.

The soft alpha- and beta-resins give the beer its bitter taste and provide the major germicidal and sterilizing action, which is the original reason for their use in beer. These resins are released during the boiling of the wort, since they are not readily dissolved in water, but must be boiled in saccharine solution such as beer wort. During fermentation much of the hop resin is gradually precipitated out of the beer.

The second most important constituent the hop furnishes is its aromatic oil, which is only slightly soluble in water. Hop oil is dissipated by boiling, and this is the reason we save our best hops until last, adding them at the last few minutes in the kettle. The aromatic hop flavour is what gives beer its delightful hop essence, and it is preserved by adding your best hops at the last minute.

The third ingredient, hop tannin, acts to precipitate proteins, removing them and helping to prevent protein haze. Tannin adds to the beer's flavour and clarity after fermentation.

Hops also contain various nitrogenous constituents, the enzyme diastase and dextros and levulose.

Highly compressed hops are less affected by the oxidizing action of air during storage, but compression risks rupturing the lupulin glands, with their resins and oils, leading to rapid and direct oxidizing.

Hops should be stored in airtight cellophane bags, in the refrigerator at 30-40°F., where they may be kept for 18-30 months, after which they will lose much of their value. Oxidation changes the Alpha and Beta resins to hard resins which have no value to the brewing process.

Hop storage at ordinary temperatures or for too long at cold storage temperatures changes the color from green or greenish yellow to yellow or brownish green. The lupulin changes from lemon-yellow to light brown and loses its stickiness, becoming dry and powdery to touch. The soft resins become hard and the hops acquire a disagreeable cheesy odor.

The large hop suppliers deal in 200-lb. bales, and since we use only a few ounces at most in our small brews, you can see that a hop supplier cannot afford to have much variety on hand. If the amateur uses 2½ ounces per brew, one bale will supply over 1200 such purchasers.

There is one thing that amateur brewers can do to help the situation. We can request our supplier to acquire information about his hops, such as what variety they are; and perhaps the year and whether they are a seedless variety and where grown.

I only mention this because I would like to see much more information made available to the amateur, and I recognize that the suppliers are often without much information themselves.

I am listing below what I have been able to find about U.S. hop varieties, to help us to sort this problem out.



Fig. 3. Hop top cutter at work, showing how it is mounted on a tractor, note blades ready to engage the hop vines, which then fall into the carrier for transportation to the picking station. These photos are from the Phillip Goulet Farm, in Gervais, Oregon.

#### SIGNIFICANCE OF HOP VARIETIES

As we have shown elsewhere, there are two basic ways to use hops: in the kettle--during the boil--for bittering; and at the end of the boil--during the ferment or aging--for aromatic and flavoring purposes. Any hops with active

alpha-resins will suffice for bittering purposes. We call these boiling hops. You may use older or less expensive varieties or hop extracts or hop pellets. The important thing is the total active alpha-resin content. Quality, although very important, is not as urgent as active alpha-resin

#### fig 4 Gathering the Hoppe.



"Cutte them" (the hop stalkes) "a sunder togh a sharpe hook, and togt a forked staffe take them from the Poakes."

content. Remember that by June your last years' hops may be as low as 40% active  $\alpha$ -resin content. Your 1976 hops should be used early this year, don't hoard them.

Some hop varieties are cultivated especially for bittering purposes, these are used by the breweries. Cluster and Talisman--an improved Cluster, are examples of bittering hops.

Cluster Hops: These constitute about 88% of the U.S. crop. The Late Cluster probably stems from the English Cluster brought in by the earliest English colonists on the east coast and carried to the west coast by settlers. Early Cluster probably originated in Oregon around 1908 as an early budding Late Cluster. Large hop growers try to plan their crops so the harvest is spread out to make the best use of their equipment and labor. The two varieties are interchangeable; most are grown in Eastern Washington and some in Idaho. They are often seedless. These are the hops which most of us are accustomed to, since they are the type used in most U.S. beer, good Cluster hops have 5-7% alpha resin in them.

Recently (1974) there has been a new bittering hop introduced to supplement the Cluster varieties, this is the new Comet variety, best suited to Yakima Valley climate types. This hop has a higher cone yield than Cluster, and also higher alpha resin content. An excellent bittering hop.

#### AROMATIC HOP VARIETIES

The aromatic hop varieties are used as finishing hops to add the delightful hop bouquet to your beer. These are hops added at the end of the boil, or at a later stage (fermentive and post-fermentive). Aromatic hops must be fresh hops or pellets, and any will do, but some are better than others for that purpose.

The most famous aromatic hops are the European varieties: Hallertauer, Saazer, Tattnanger, Savinia (Styrian) Goldings (a type of seedless Fuggle grown in Yugoslavia), and Bavarian Northern Brewer (seedless Northern Brewer).

In this country Fuggles, Cascades, Willamettes, and Columbias are the varieties grown. The last three are new types: Cascades (1972), and the others in 1976. These three were developed to augment American (Oregon) Fuggles which have a very low yield/acre, and a relatively low (4-6% alpha-resin content). The new varieties are more disease resistant and better suited to machine picking, although only the Cascade does well in the Yakima Valley. In the Boise-Caldwell Valley of Idaho, German type hops are grown. These are Hallertauer, Mittlefrueh, and Tettnanger varieties, but they have not proven to be successful for U.S. style commercial growing.

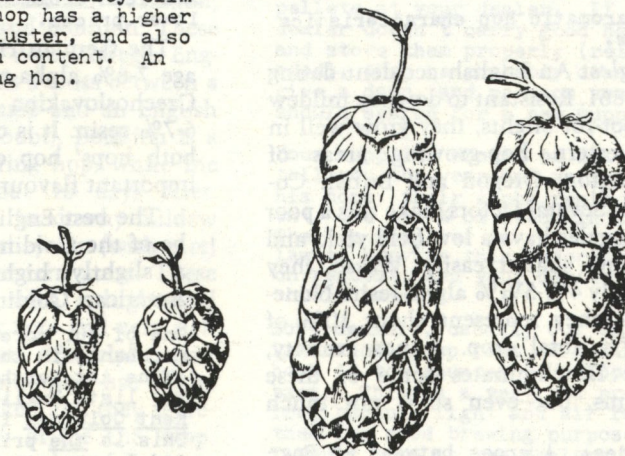


FIG. 5. VARIOUS SHAPES OF HOPS.

The aromatic hops are not boiled, or if so only briefly, and are best used in the fermentor to be cold extracted. Fresh hops or hop pellets are quite satisfactory for this purpose, although I am inclined to prefer fresh hops.

The breweries use isomerized hop extracts, pellets, and hop oils. Theoretically at least, hop oils should be good for aromatic purposes, but they do not seem to do well in amateur practice, and are difficult to obtain in this country.

In practice you may use any fresh hops for aromatic purposes, as well as fresh pellets. It is my personal feeling that if you use pellets for bittering (boiling) you should use fresh hops for aromatic purposes, or the reverse. I do not think pellets should be used for both purposes in amateur beermaking. If I had to choose, I would prefer to use pellets for boiling and fresh hops for finishing. I don't have a lot of evidence, and the feeling is personal rather than scientific. (See Reader Questions, p 69).

Aromatic hops must be stored very carefully and the brewer is advised to purchase his years supply when they are first available (at years-end or early in the next year), and store them himself in the freezer or refrigerator.

Some aromatic hop characteristics follow.

Fuggles: An English accident dating from 1861. Resistant to downy mildew and root-rot blights, they grow well in the western hop-growing areas of Washington, Oregon and British Columbia. Several factors make this a poor hop. Fuggles have a low field yield and the cones shatter easily. Worse, they have only 4½-5½% alpha-resin. Nonetheless, they represent about 10% of the U.S. total crop. A new variety, Fuggle II, eliminates some of these problems, but even so is not much better.

Cascades: A cross between an English type Fuggle female and a male

resulting from a cross with a Fuggle male and a Russian Serebrianka female--what a pedigree! Introduced in 1972 this has proven to be a very successful hop variety with good a-resin (5-6.5%) content and a pleasant and fragrant aroma, delicate and slightly spicy. They may be grown in all of the major hop growing areas, and are available to home brewers fresh and in pellet form. I use Cascades for both bittering and aromatic hopping, and I like them.

Columbia and Willamette: Introduced in 1976, these hops are the result of new polyploid breeding techniques, and are not yet available to amateur brewers. Columbia has a pleasant continental aroma, good (7.5-9%) a-resin, and very low seed content. Willamette is similar, but matures earlier, has a lower alpha resin (5.5-7%). All of the above store better than the Fuggle.

#### IMPORTED HOPS

Continental hops--Hallertauer, Tettmanger, Saazer, Mittlefrau, Savinja (Styrian) Goldings, and Bavarian Northern Brewer are all available fresh (although well-compressed) in this country. We also have a good supplier of quality Hallertauer hop pellets, although these latter are very expensive. These imports are of high quality, although I sometimes wonder if the extra expense is worth it, with so many good American aromatics available at lower prices.

The German Hallertau has an average 7-8% alpha-resin yield, while the Czechoslovakina Saaz has a lower 6-7% resin. It is clear in this case that both hops' hop oil provide the most important flavour element.

The best English Kent hops seem to be of the Golding type, and they have a slightly higher resin yield than American Goldings.

One of our more careful retail merchants in the Hop catalogue (Wine Art Northwest, Bellevue, WA) lists English 1976 East Kent Goldings in his stock.

This is the prime English hop, and I have never found a good sample in the US in my travels.

I called him to verify. He said they were good, but not as good as his Yakima Cascades.

If you'd like to try English hops these seem to be the best available. Basically, however it is wise not to buy English hops from English merchants, because they seem delighted to send their lousiest, greyest, cheapest, cheesiest, oldest hops to their American customers. When the English clean up their act, maybe we can try some of those "good" English hops. An Englishman told me they store their hops loose in brown paper bags, so what can one expect from such people.

Poland and Yugoslavia also grow good hops, while French, Russian and Belgian hops are only average or poor in quality.

#### ALE HOPS

These are English style hops, which are stronger in aroma and bittering power than either hop types mentioned above.

These hops are used to produce English style beers, but are by no means limited to that use. They go well in any beer, and are added both for bittering and aromatic purposes, often in complementary combinations. See John Dunphy's article elsewhere.

English Type: Basically two kinds, Brewer's Gold (with a minor variation, Northern Brewer) and Bouillion. These were developed at Wye College, England, around 1919 as a cross between a wild Manitoba female and an English male (stodgy, no doubt). Bouillion is a medium late-maturing hop, while the Gold matures about 10 days later. Mildly resistant to the downy mildew blight and root-rot they can (with care) be grown in the western areas. These are vigorous hops with a high field yield in pounds per acre and very rich in resin with about 8% alpha-resin yield. This fact limits their use in the American beer market, and they represent only about 2% of the U.S. crop. This fact, however, makes them very useful to Canadian brewers, who prefer

a stronger hop flavour, and to all amateur brewers who often want stronger hop flavour; of course if you are making ales they are very desirable--when you can get them. I have found Northern Brewer hops impart a distinct fruity nut-like flavour.

I strongly recommend them. These English type hops are very strong in

hop oils; this makes them valuable for dry hopping or sugar-hop kraeusening. They need careful refrigeration storage to keep their flavour.

#### YOUR SUPPLIER

There are a growing number of retail outlets in this country (see our catalogue p 70), where the merchant makes a real effort to acquire the finest hops for his customer. There is at least one wholesaler

making available a great variety of small samplings of various hops to their retail customers. A dealer can offer a good variety of hops under those circumstances. Other dealers have managed to acquire full bales of really good hops, but usually such dealers try to share a bale with one or two competitors, or offer them at wholesale rates across the country. What this means to you is that you can now expect to find really good hops and hop pellets at your dealer. If your dealer doesn't carry good hops, and store them properly (refrigerated), then he probably doesn't give a damn, and perhaps you should search for a new supplier.

Your supplier should be able to tell you the year and variety of his hops, their alpha resin content, and the % of seeds in them. The hop supplier is required by law to provide this information on request, and your dealer should have it.

Some dealers, usually out of ignorance, keep most of their hops on the counter in cellophane bags. This is a very bad practice, because light and air ruin them for good brewing purposes. I would like to see dealers keep only sample packets on the counter, with a sign showing what

TABLE I, DOMESTIC HOP VARIETIES

Variety	Type*	Aroma**	% Alpha	% Beta	Primary State
<u>Early Cluster</u>	B	Mild pleasant	7.5-8	5.5-6	WA
<u>Late Cluster</u>	B	mild	5.5-7.5	4.5-6	WA ID
<u>Fuggle</u>	A	Spicy mild	4-6	2.5-4	OR
<u>Bullion</u>	E	Strong Pungent	8.5-11	4.5-5.5	OR WA
<u>Brewer's Gold</u>	E	"	"	"	OR WA
<u>Talisman</u>	B	Strong	7.5-9	4-5	WA
<u>Cascade</u>	A	Pleasant fragrant	5-6.5	5-6.5	WA OR
<u>Comet</u>	B	Strong	9.5-10.5	3.5-4.5	WA
<u>Northern Brewer</u>	E	Strong fragrant	9.5-10.5	4-5	WA OR
<u>Hallertauer</u>	A	Pleasant spicy	5-6.5	4-6	ID WA
<u>Mittlefrueh</u>	A	Pleasant spicy	5-6.5	4-6	ID WA
<u>Tettnanger</u>	A	Mild fragrant	5-6.5	4.5-6.5	ID WA
<u>Pride of Ringwood</u>	E	mild	5.5-7	5-6	ID

\* A-Aromatic, B-Bittering or Boiling, E-English type, both A & B  
 \*\*Aroma becomes more intense with over-maturity (on the vine), and seedlessness.

TABLE II, IMPORTED HOP VARIETIES

Variety	Type*	% Alpha	Country	notes
<u>Hallertauer</u>	A	7-8	W.Ger.	good; fresh & pellet
<u>Tettnanger</u>	A	7-8	W.Ger.	Fresh
<u>Saazer</u>	A	6-7	Czech.	Fresh
<u>Bav.North. Brewer</u>	A	9-10	W.Ger.	seedless-disease resistant, may replace other W.G. hops.
<u>Savinja Goldings</u>	A	6-7	Yugosl.	Seedless Fuggle
<u>East Kent Gold's</u>	E	9-10	England	1977 not avail.

types he has, and the information that the hops are kept refrigerated for the customer's protection. He would then retrieve what you order from his refrigerator, where they would retain their color and resin content.

Not all dealers are willing to follow these procedures, so you might be wise to calculate your year's brewing needs, then order them from your dealer in the fall, pick them up when he gets the shipment, and store them yourself. At the end of your brewing year, if there are any left over, use them for boiling hops for the next season. Most dealers retail their hops in 1-, 2-, 4-, and 16-oz packets. To calculate your needs consult the article: "The Use of Hops in Brewing",

**EDITOR'S NOTE:** Much of the above information was published in the Amateur Enologist, Spring 1972: 2:5. The Hop variety Bullion is consistently misspelled. Our apologies--the article has been expanded and updated.

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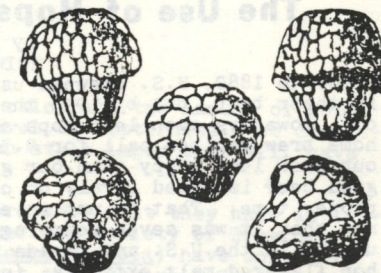


FIG. 6 GRAINS OF LUPULIN. Highly magnified.

**BEERTASTING and Evaluation for the Amateur**, by Eckhardt and Takita. 16-page book Classification table for all the world's beers. How To Judge and taste. With Judging forms. .... \$1.00  
 see p72 to order.

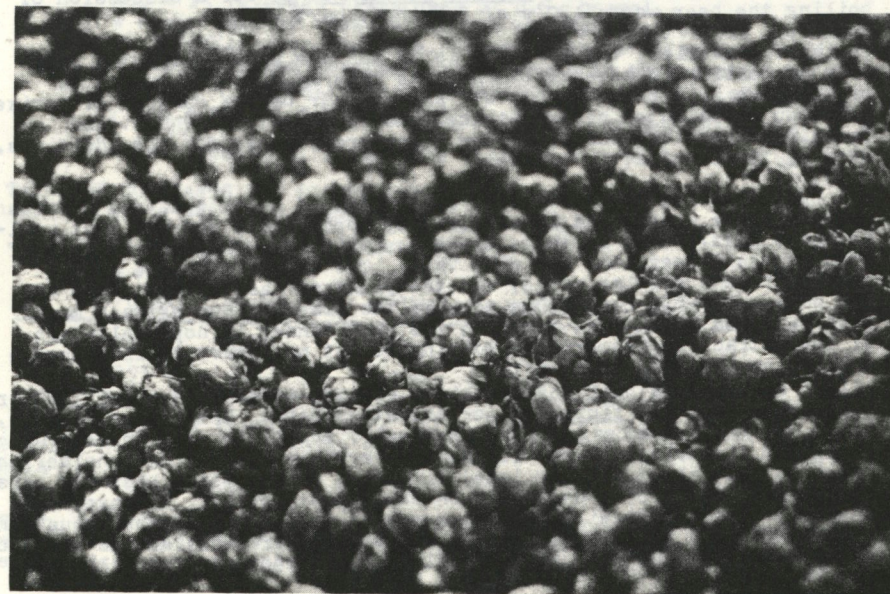


Fig. 7 Closeup of hops in kiln.

# The Use of Hops in Your Beer

by Fred Eckhardt

Prior to 1880, U.S. brewers used about 0.8 oz hops per U.S. gallon in their beer, but by 1946 the proportion had dropped to 0.2-0.3 oz. Nowadays even less hops are used (0.13-0.2 oz/USgal). Our own home brew recipes call for 0.3-0.4 oz/USgal. We all seem to prefer our beer less hoppy than our grandfathers did. Even so, the taste of good beer is based firmly on correct use of fine hops added at the proper time. That is not an easy achievement, but it is much easier now than it was seven years ago, when I first looked into the hop situation in the U.S. and Canada. At that time, most merchants sold only hop flavored malt extracts, (usually only one variety--Blue Ribbon). If they had any hops, they were likely to be old, heavily compressed floor sweepings and hops that hop dealers were unable to sell to the breweries. Some of those hops are still around, but today we have many good choices. Most of the hop varieties available to brewers are also available to the amateur. There is still much to be done, but you no longer have to accept second class hops for your beer.

As we have mentioned elsewhere, there are two basic ways to use hops in your beer. The most important use, that of adding the resin content to your beer for protection from souring bacteria, requires hops of good bittering power. These are called boiling or bittering hops. They are, according to their a-resin content. Hop resins are insoluble in cold water, but become soluble in boiling solutions of proper pH levels such as beer wort. The full rolling boil is very necessary to insure incorporation of the hop resins.

In British breweries, (ale and stout production), the hops are added as the wort approaches the boiling point. Sometimes all of the hops are added, and sometimes it is done in two or more additions, some hops being added 15-20 minutes before striking the kettle. The British brewers make good beer, but some American and German experts believe that their product would be improved by adding hops after the first break in the kettle. (See Amateur Brewer No. 1, for a discussion of boiling the beer wort; "ABC's of Brewing", part one.)

In lager breweries, the practice is to add the hops during the last hour of boiling in several batches (as many as six). A suggested program for pale beers might be: 2/5 an hour before run-off or strike, 2/5 about 20-minutes before strike, and 1/5 at strike. U.S. and Canadian breweries usually follow lager procedures, for hop additions, even in the manufacture of ales.

All breweries add hops in the reverse order of their quality, that is by adding the oldest and lowest quality hops first, and the best quality hops last. Even in those breweries which use only one variety of hops in their beer, the age will vary. The oldest hops are added earlier in the brewing cycle, and the youngest last, since these are the ones that will contribute more to the flavor. Hop extract may also be added during the boil, in the same manner as hops, although if the extract is isomerized, boiling is not necessary to incorporate the resins into the beer wort.

All of our recipes call for two kinds of hops to be used: boiling (or bittering) hops and finishing (or aromatic) hops. The bittering hops, which may vary greatly in bittering power, should be used in accordance with that bittering power. If the hops are two years old, consider that there is only about 40% (or less) bittering power, while year old hops range from 50% to 85%, depending on the variety of hop, storage, etc. The following system will help to appraise and calculate the amount and variety of hops to be added during the boiling process, and is based on modern brewery practice using the alpha-resin content of the hops to

determine quantity per gallon or litre.

## HOP BITTERNESS UNITS

The hop bitterness unit (HBU) is a way to calculate the amount of hops required to produce beer with a certain level of bitterness. We can assume, as a starting point, that an American style lager beer will have minimal bitterness levels.

Indeed, published analysis of American beers show that they have an average bitterness level of about 15 ASBC (American Society of Brewing Chemists) bitterness units. Many beers (Coors, Olympia) have only 9-12 b.u. We know, from brewing statistics, that the average U.S. beer has only 0.15-0.2 oz. (5-5.7 gm)/USgal. We also know that most of the hops used in U.S. beer are Clusters, and that their average alpha-resin content is around 7%.

Now, using that information (10-15 b.u., 0.15-0.2 oz/USgal, and hops of 7% a-resin), we can arrive at an estimate as to how much hops, of a given alpha-resin content, are needed to produce a particular level of bitterness to match our varied palates. Assuming that 0.2 oz of 7% a-resin hops will produce 15 b.u. in a finished beer, we can assemble a working formula to give us a little more accuracy in this matter. Let us call our bitterness measure Hop Bitterness Units, or just HBU, instead of the ASBC bitterness unit of measure, since we have no way of analysing the actual bitterness levels of our home made beer--the necessary equipment is quite expensive. Nevertheless the following formula will give us a fairly accurate measure, although based on an estimate.

Using the above figures, if we multiply the weight per unit of liquid volume (w) by the alpha-resin content of the hops (a), and divide that product by the expected bitterness level (HBU), we arrive at a constant (K) based on the same unit of measure. The formula  $K = \frac{a \times w}{HBU}$ , where:

a = 7 (average a-resin % of Clusters, the average hop used)  
HBU = 15 (average bitterness of U.S. beers).  
w = any unit of measure such as oz/USgal; oz/UKgal; gm/USgal; gm/UKgal; or gm/litre. Each of those units results in a different K-value. For example in this country we would probably use oz/USgallons, so to calculate:

$K = \frac{a \times w}{HBU} = \frac{7 \times 0.2}{15} = \frac{1.4}{15} = 0.093$ . We can call this value KoUS to differentiate it from the other volume units.

The TABLE OF CONSTANTS (K) (TABLE III) gives values for constants in each of the above units of measure.

TABLE III--TABLE OF CONSTANTS (K)

	oz/USgal	gm/USgal	oz/UKgal	gm/UKgal	gm/litre
	KoUS	KgUS	KoUK	KgUK	KgL
K =	0.093	2.7	0.078	3.2	0.7

Now, by turning the formula around, we can calculate bitterness in a beer using hops of a particular variety and alpha-resin content. This formula is:

$$HBU = \frac{a \times w}{K}$$

Suppose, for example, we wish to determine the bitterness of a typical home made beer with 2½-oz hops in a 5-gallon batch. Usually only 2-oz hops are added to the boil, (remaining ½-oz in fermentor, not used for

bittering purposes), so that's 0.4-oz/USgal. If we were using Clusters, with 7% a-resin, we would have the following values in the formula:

$$\text{HBU} = \frac{aw}{K\text{OUS}} = \frac{7 \times 0.4}{0.093} = \frac{2.8}{0.093} = 30.1$$

Now, let us suppose that you know you prefer a beer with about 25-HBU, how can you calculate the hops required to produce that beer. By again transposing our formula we arrive at the following for w (weight unit of liquid measure).

$$w = \frac{K}{a + \text{HBU}} \quad \text{This is more often written } w = \frac{K}{a/\text{HBU}}$$

Suppose you are using metric measures, and Cascade hops (a-r 5.7%), how many grams of hops are needed for a 20-litre batch? (see TABLE III)

$$w = \frac{K\text{gL}}{a/\text{HBU}} = \frac{0.7}{5.7/25} = \frac{0.7}{0.23} = 3\text{-gm/litre, or } 3 \times 20 = 60\text{-gm (about 2-oz)}$$

One more example: suppose you wish to make an American style low hopped beer with 15 HBU, and you have some of the new Comet hops with their 10% a-resin, better yet, suppose Comet pellets (add 20%) with 12% resin.

$$w = \frac{K\text{OUS}}{a/\text{HBU}} = \frac{0.093}{12/15} = \frac{0.093}{0.8} = 0.12\text{-oz/USgal, or } 0.7 \text{ oz}$$

for a six gallon batch. As you can see the amount of hops used can vary greatly depending on the alpha-resin content, and the style of beer you are making. The HBU formula applies only to those hops used in the kettle, and is more applicable for hops boiled for at least 15-minutes than for those boiled less than that time.

#### HOP RATES FOR BEERS AROUND 1900

TABLE IV shows hop rates for beers at the turn of the century. In 1900 hop rates were determined by the type of hops and the amount per gallon, litre, or barrel. We are including our assesment of the HBU values so that you might compare them with your own brewing habits. The higher HBU values are not entirely accurate, because at these high hop rates, much of the extra resins were precipitated out during the ferment, so that the high gravity of some beers requires a fairly heavy rate due to loss during ferment. We've added an extra column estimating hop rates in modern beers of the same type.

#### BITTERING VALUES OF OTHER HOP SOURCES

If you know the alpha-resin content of your hop pellets, hop extract, or hop powders, they may be used in the same manner as fresh or compressed hops, if not you'll have to guess. In the case of hop pellets, assume a value of 120% of regular fresh hops of that variety, (if the pellets are fresh 1977--deduct 10% for 1976 pellets).

#### HBU OF HOP FLAVORED MALT EXTRACTS

TABLE V shows the estimated HBU values of various hop flavored malt extract types. The table is calculated on the basis of 1-lb (454-gm) hop-flavored malt extract dissolved in water added to volume indicated. The table is based on our estimate that a 5-USgallon batch of beer made in the usual manner (1-can plus sugar) will result in beers of 12 HBU with 3-lb tin Blue Ribbon, 15 HBU with 2.5-lb tin John Bull, and 12 HBU with 2.5-lb tin Gold medal. Other English hop flavored malt extracts are probably similar in content to John Bull, although they are smaller in size, the lb/gallon ratio would be similar.

TABLE IV--TABLE OF HOP RATES FOR BEERS ca 1900

	trad. hop*	O.G.	O.°Ball.	1900 HBU**	Traditional hop rate oz/USgal	hop rate gm/lit.	current HBU est 1978
<b>Continental</b>							
Pilsner	S	49	12	23-26	0.6-0.7	0.7-0.8	25
Vienna	H-S	51	12.5	19-28	0.4-0.6	0.5-0.7	unknown
Dortmunder	H	62	15	19-28	0.4-0.6	0.5-0.7	19-22
Munchner	H	51	12.5	14-19	0.3-0.4	0.4-0.5	14-19
Berlin Weissbeer	H	40-8	10-12	15	0.25	0.3	15
Modern German light	H	46	11.8	--	--	--	18
<b>English</b>							
Mild Ale	F	40	10	15-23	0.4-0.6	0.5-0.75	13-20
London Pale ale	G-F	57	14	62-77	0.8-1.0	1-1.2	43-53
Burton Strong	G	52-7	13-14	77-116	1-1.5	1.2-1.8	43-53
Burton Export	G	65-70	16-17	139-155	1.8-2	2.2-2.4	unknown
Porter	G-F	57-61	14-15	25-62	0.4-0.8	0.5-1	unknown
Double Stout	G-F	65-74	16-18	77-101	1-1.3	1.2-1.6	70-113
Imperial Stout	G-F	81-104	19-25	101-116	1.3-1.5	1.6-1.8	100-116
Irish Stout	G-F	62-70	16-18	74-97	0.8-1	0.9-1.2	40
<b>American (U.S.)</b>							
Pale Lager	C-S	51	12.5	30-38	0.4-0.5	0.5-0.6	14-18
"Light" Lager	C-S	40-49	10-12	15-24	0.25-0.4	0.3-0.5	9-14
Dark Lager	C-H	49-57	12-14	30-38	0.4-0.5	0.5-0.6	9-14
Calif. Steam	C	45-51	11-12.5	30	0.4	0.5	42
Cream Ale	C	56	14	38-60	0.5-0.8	0.6-0.9	9-14
Stock Ale	C-G	64-74	16-18	75-113	1-1.5	1.2-1.9	15-45
Porter	C	53	13	49	0.65	0.8	unknown
Weissbeer	H	40-49	10-12	15-24	0.25-0.4	0.3-0.5	Nonexist
Modern US lager	C-F	45	11.5	--	--	--	14

\* S=Saazer, H=Hallertauer, G=Golding, F=Fuggle, C=Cluster \*\* our guesstimate

① has remained the same all these years! ② in 1977 76.2% of all U.S. beers were 10-15 b.u. ③ these high HBU beers, if analysed, would not actually be this high, because most of the high bittering power is precipitated out during the ferment, whereas this not as likely in low gravity beers. ④ "Light" lager corresponds to budget beer, while Pale lager is regular beer.

TABLE V--HBU VALUES OF HOP FLAVORED MALT EXTRACTS

	lb/USgal	lb/UKgal	100-gm/litre
<u>Blue Ribbon</u>	20	17	17
English Malts	30	25	25
Canadian <u>Gold Medal</u>	24	20	20

(SHOULDN'T your brewery have a computer?)

#### THE HOP BREAK

The addition of the hop constituents to your beer is best accomplished by bringing the wort to a boil and waiting at least 15-minutes beyond the first "break", which is the point shortly after the wort comes to a boil, where the unstable colloidal proteins can be seen as whitish flakes being thrown, by the boiling action, against the walls of the kettle. The first portion of hops are added when the wort shows clear between the flakes being precipitated (about 15-minutes after the first hot break). Remember that some dark beers, made from grain malts, require a long boil, and in that case the hops should be added much later, since there is nothing to be gained by boiling the hops longer than an hour, total. The first addition should not take place earlier than an hour before the end of the boil, and not before at least 15-minutes after the first hot break in the kettle.

Each time that a portion of hops are added to the boiling wort, a new hot break is initiated. This is called a hop break, and causes the precipitation of additional protein and tannic constituents. Those hops added early in the wort boiling period contribute mostly soft resins to the wort, while last minute additions may contribute only aromatic oils, and retain their resins.

As the wort continues at a vigorous rolling boil, evaporation takes place, thus reducing the volume, and concentrating the wort. The flocculation and subsequent precipitation of proteins continues, and the color of the wort darkens. The hop resins are incorporated into the wort, some of the tannins are precipitated, while others combine with proteins to form tannates, which may be a later cause of temporary chill hazes in the finished beer. The hop tannin, along with tannin from the malted barley is very important to the beer. The presence of tannin adds to the beer's flavor, and aids in settling and clearing the beer after fermentation, in addition to aiding the removal of proteins, as we have said.

Each addition of hops will cause a new hot break, and the release of additional protein constituents. Beers which are to be boiled for less than the optimum 1½-hours should have slightly higher hop rates. High gravity beers, and those which are to be conditioned over a long period also need a slightly higher hop rate. Less hops are desired in beers with a lower percentage of malt-to-sugar-water use, such as the average low malt home brew. Beers which are to be boiled longer with the hops such as some types of English stout may need less of them for that reason.

#### USING AROMATIC OR FINISHING HOPS

These hops are added at the very end of the boil, or they are placed in the fermentor or aging vessel for cold extraction. Aromatic hops should be selected for their aroma and flavor, and not for bittering power (Hallertauer, Saazer, Fuggles, Cascade, or some of the English varieties). If you intend to keep them into ferment, they should be wrapped in cheesecloth for easy removal at skimming. The hops may be added at bottling time by the sugar-hop krausen method. Use about 0.2-0.3 oz/gal. or about 1-1½ for a batch. Boil about 2-cups beer, add the carb-

onation sugar, and boil 2-3 minutes before adding the hops, which are boiled about 5-minutes longer. This is strained, sparged (rinsed with beer to extract all of the sugar), cooled a little and added to the beer to be bottled.

#### DRY HOPPING

Until you have sampled a dry hopped beer (such as Ballantines Ale), you are not likely to appreciate the value of that process. Any beer can be dry hopped, but fine ales and strong lagers respond best, and it is normally not done to dark beers. Use any good fresh hops or pellets, such as Fuggles, Cascades, Hallertauer, Saazer, Savinja Goldings, or the new Willamette or Columbia varieties. Good English hops are imported East Kent Goldings, or domestic Goldings, Northern Brewer, Bullions, etc. The important point is FRESHNESS. The rate is 2½-gm/USgal (2.2-gm/UKgal; 0.7-gm/litre) for beers in the OG 45-55 range, such as lagers and mild ales, (11.5-14°Ball). The dry hopping procedure is really best suited to strong ales OG 55 or higher using 30 - 60 gm for the batch of 5-6 gallons (5-10 gm/USgallon). The higher the gravity, the more hops used in dry hopping. If you used pellets in the kettle, use fresh hops. I tend to prefer fresh hops for dry hopping (being a traditionalist), but pellets are probably just as good. (See Reader Questions).

Add the hops loose, (see pellet article about their use) in the secondary fermentor a couple of days after racking. Place the fermentor in the coldest place you can (regarding the yeast minimum temperatures), and rotate the fermentors daily in each direction. For specific details see AB#2, "ABC's of Brewing, part II." (p24).

#### DETERIORATION OF HOPS AND HOP PELLETS

It is very important to store your hops properly, especially regarding light, air and temperature, and away from moisture. According to the Brewer's Digest, a trade journal, and other sources, hop deterioration is caused mainly by oxidation and light, so exclusion of air and light is the most important protection for your hops, during storage, followed in decreasing importance by low temperatures and moisture content. Temperature is more important in the first six months, and after that air exposure is more important. Hops stored in strong opaque polyethylene bags will deplete existing oxygen, and then be protected from that. The best protection then is storage, in opaque bags, at low temperature.

Other studies have shown that hop pellets loose essential hop oils if stored at normal room temperatures and over a long period of time they may develop off-odors. Hop pellets should be stored below 54°F (12°C).

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#### The Practical Use of Fresh Hops

by John Dunphy, the Winemaker's Shop, Hudson, NH  
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Whether or not you are aware of it, home brewing is coming of age here in the United States and, in my opinion, fresh hops have had a lot to do with it. Possibly Anderson's Wine-Art got things started, but then some other books became available: Leigh Beadle's, Lee Coe's, Fred Eckhardt's and more recently, Byron Burch's. These are American authors. Of course, there are many British books, but when I got started in the retail business catering to the amateur wine and beer maker there was a dock strike on the west coast and I tried to develop sources of supply that were American and American information to go along with them. Unfortunately, I think that none of those authors has really done justice to hops and what they can do for a brew. But then I'm not sure who can.

It may be considered unfortunate, by some, that a bit of experimenting is necessary to find the kind of hop that one likes best. But this is also a fun thing, although you may not particularly enjoy it, nevertheless, your brew is unlikely to be tastier than most commercial stuff. We have long had extracts of malt, both plain and hopped. We have had yeast--for making bread. And we have had water. Now we have fresh hops. In the past you could never have made the equivalent of Ballantine Ale from the ingredients that were available to you unless you lived where hops are grown. It wasn't until the advent of fresh hops that tailoring a brew to give, not only a particular taste, but also a particular aroma, was possible. It wasn't until I encountered these fresh hops that I became enthusiastic about home-made beers.

It was fortunate for me that a customer kept twisting my arm to get me to find a source of fresh hops (not hops labeled fresh). I finally found a supplier who sent me samples of four different kinds. Not knowing anything about making brews, I gave them to the customer. Time passed and he finally brought in the finished brews. What a revelation! I became hooked on hops! I liked the one made with Bullions, he preferred Fuggles, and most others seemed divided between Talisman and Clusters--those were the four samples.

A written description of the affect of hops in a brew leaves a lot to be desired. I'll give you my impressions, subjective as they are.

For most people, who are familiar with the light American beers, I suggest Talisman. They give a rich aroma to the brew and are almost tea-like on the rub.

It seems that Cascades are very popular on the West Coast. This may be due to Byron Burch's book or it may be due to the fact that Coors has switched from the imported hops to Cascades. Coors doesn't have much aroma, but it has a pleasant lingering bitterness, so perhaps Cascades should be used as a boiling hop.

Bullions have that rich smell of Ballantines Ale both on the rub and in the brew. Contrary to Turner and Moon (see Bibliography on p 70), they can be used alone.

Fuggles is a spicy hop and is gaining favor among my customers as a finishing hop although it is used both ways.

Clusters, to me, are best used as a boiling hop, but a few of my customers prefer it as a finishing hop. Clusters for boiling and Talisman for finishing is an unbeatable combination. A synergistic combination--they complement each other.

Hallertau--very poor for bittering, but what a fantastic aroma. You wouldn't believe what they can do for a brew when you sniff them on the rub--they smell that way. I like more bitterness in my brews so I use some Clusters followed by the Hallertaus.

Styrians (or Savinja Goldings) are a pleasant light hop. I've very little experience with them, but some of my customers prefer them.

I've mentioned blending some hops. There are some hops that I believe should not be blended. For example, Bullions and Hallertaus (both are aromatic varieties). I think it would come out neither fish nor foul nor good red herring. But I have one customer who is going to try that combination.

That covers my impressions about hop varieties. I had recently asked my supplier for a list of all of the varieties that he has available.

He listed Clusters from four regions, Cascades and Talisman from three, Bullions from two. Also some American Hallertaus and Tettangs, which I haven't tried. I imagine Clusters grown in different regions would have slightly different properties due to the climate and soil differences. Unfortunately, I don't have the space to store them and I'm not sure that my taster and nose would recognize the differences.

This business of storing hops brings up another topic and that is the care and feeding of the dried hop flowers. Keep them in the dark and keep them refrigerated or even frozen. If you're going to keep them very long, it's best to seal them in a wide-mouth jar or in foil--otherwise they develop a rancid cheesy taste and smell. I think the need to refrigerate has turned many dealers off, but refrigeration is essential. Put a few on the shelf at room temperature and watch them fade. Keep your hops in the best possible condition. Of course, shelf life would be greatly extended if they were sealed in dry nitrogen atmosphere as is the all-purpose yeast.

So--all of this about fresh hops--the dried, compressed flowers. I know that there are hop extracts that require a long boil, there are preisomerized extracts that require no boil and there are hop oils that provide aroma. I've fooled with these a bit, but have never come up with anything very good. I've also tried pellets. At that time only Clusters were available--no other varieties--so I didn't pursue it. I like the flowers and can handle them and know what to expect and I'm not in my ways.

Nor have I said anything about hops from England or from Canada or Australia, for that matter. I haven't had any experience with them and I feel that there is enough variety with what is available here.

I have more and more customers asking for specific hops. I have more fun experimenting with beers than I ever did with wines. So, give it a try, let us know about your results.

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## about HOP PELLETS

by Lee Coe

author of The Beginner's Home Brew Book

In the past few years, there has been a considerable change in the way hops are used by commercial breweries. Many breweries now use pellets or extracts rather than the traditional compressed hops. For example, Blitz-Weinhard of Portland, Oregon, uses hop extract in its main product, Blitz, and hop pellets in its premium beer, Henry Weinhard.

EXTRACTS are made by using organic solvents, usually methylene chloride or hexane, to dissolve resins out of the hops, then hot water to obtain tannins, sugars, gums and proteins. Most of the solvents are then removed from the extract by evaporation; traces may remain, but they do not contaminate beer because they are boiled off in the brew kettle. Partly because of the possible presence of traces of solvents, extracts cannot be used for dry-hopping, which, despite its name, is the practice of putting un-boiled hops into beer during or after fermentation.

Experience in the industry shows that hops, whether compressed or pelletized, usually produce better beer flavor than extracts do. The use of extracts has declined in recent years.

PELLETS: Hops for home brewers are available in three forms: loose, compressed, and pelletized. Pellets, the size of peas or small beans, are composed of finely-pulverized hops, tiny particles bonded together. There is nothing in pellets except hops--the "glue" holding them together is hop resin from lupulin glands ruptured by pressure when pellets are formed.

There are three kinds of pellets: regular, concentrated and standardized. Home brew supply stores sell only the regular pellets, which are composed of hop "powder" as it comes from the machine that pulverizes the hops.

For concentrated pellets, used in some commercial breweries, the "powder" is processed: Part of the non-resinous material is removed; then the remainder is pressed into pellets; this is done to reduce weight and volume, which cuts shipping costs and conserves space in commercial brewery storage.

On the Pacific Coast, home brewers can get regular pellets made from several hop varieties, including Clusters, Cascades, Fuggles and Bullions. The character of the pellets is decided by the character of the hops, of course. For example, the content of alpha acids varies normally from 9 to 14 per cent. But some breweries want pellets with no such variation, so hop firms blend varieties to make what are called standardized pellets, which have an alpha acid content of 10 per cent.

PELLETS ARE BEST: In home breweries and in commercial breweries, pellets are better than hops--better because they can give us better beer. Reason: Exposure to air deteriorates hops. So does an undesirable amount of moisture in the air. Compressed hops do not deteriorate as fast as loose hops, and pelletized hops do not deteriorate as fast as compressed hops. Especially is this true of hop pellets packaged in a nitrogen atmosphere; they are not exposed at all to air or undesirable moisture in the months they spend in a brewery warehouse or on a dealer's shelf.

It is true that fresh hops are as good as pelletized hops--but fresh hops are obtainable only in the final months of a calendar year, and it is all but impossible for home brewers to get them.

A CONCLUSION: Dealers should stock only those pellets that come in sealed packages containing nitrogen rather than air. Home brewers should insist on this.

A CONCLUSION: Dealers now take pellets from big sealed containers and re-package them in small plastic envelopes. They should do so in small amounts, because deterioration accelerates on exposure of pellets to air. That is, re-packaging should occur only a few days before pellets are sold.

A CONCLUSION: Dealers and home brewers should keep hops or pellets in refrigerators, as cold as possible without freezing them. The most efficient commercial breweries keep them only a degree or so above the freezing point.

SUGGESTION TO DEALERS: Instead of re-packaging pellets in small plastic envelopes, weigh out the exact amount the customer wants for her/his batch. Advertise: FRESH HOP PELLETS FOR EVERY BATCH. You may have to charge extra, but most home brewers won't mind because they'll get better hops and therefore better beer.

BOILING HOP PELLETS: My own experience is limited. I urge others who have used hop pellets to report results to The Amateur Brewer.

I boil pellets in the wort. How long? That is a matter for experiment. Commercial breweries boil some hops for as much as 1½ hours, but certain aromatic hops for only a few minutes. Practice varies widely in the industry.

My method of handling wort differs from commercial methods. A commercial brewery usually cools wort rapidly very soon after it leaves the brew kettle and the hop strainer. But when I finish boiling wort (and hop pellets), I turn off the kitchen stove, cover the brew kettle with a flannel cloth, put the kettle lid on top of the flannel, then let everything cool for at least 24 hours, usually about 48. When the wort is cool enough, I start fermentation.

Thus, my pellets are kept in hot wort for several hours, in warm wort for many more hours, altogether a much longer time than hops are kept in wort in a commercial brewery. So I don't think it is necessary to boil my pellets very long. I have tried 2 minutes, 5 minutes, 20 minutes. Results: about the same in all cases. Maybe I could do it better another way, but my beer made with hop pellets tastes very good, and I'm well-satisfied.

DRAFT HOME BREW: I put most of my home brew into kegs and have it on draft in our home. For that procedure, hop pellets are entirely satisfactory.

In my brew kettle, hop "powder," now a paste, goes to the bottom as the wort cools. When I put the cooled wort into my plastic crock, I pour the green hop paste along with it, rinsing with cold water--the rinse water goes into the crock, too. Then I pitch the yeast.

So fermentation (at 60 degrees F) takes place with all the hop "powder" present. Bubbles of carbon dioxide carry hop particles to the top, and the foam is as green as an Oregon mint field. When the foam subsides and begins to thin out, I transfer the fermenting wort to a beer keg, leaving the sediment in the bottom of the crock. Much of the hop paste stays there as part of the sediment, but some of it goes with the beer into the keg.

I put the beer keg into my beer box, put carbon dioxide pressure on it (4-5 lbs. per square inch), and fermentation continues (my beer box has a special thermostat that keeps air temperature inside at 60 degrees F).

You will note that this procedure is in the tradition of good home brewing: the open crock is the primary fermenter, and the closed keg is the secondary.

A week or so later, I adjust the thermostat gradually, reducing the temperature over a period of several days to 50 degrees F. The beer ages in the keg. And the fine hop "powder" in the beer gradually settles to the bottom. When I open the tap for the first time at least two months after the yeast was pitched, the beer is clear--and good.

Others undoubtedly handle hop pellets differently. Their experience would be of interest to all of us.

**BOTTLED HOME BREW:** Unfortunately, the method described above does not work as well for bottled home brew. The hop "powder" goes to the bottom of the bottle, all right, but when the beer is poured, the "powder" is stirred up. I don't want it in the beer I drink, so I leave it in the bottle, along with some beer. And darn it, I hate to waste beer.

Initially, I tried boiling hop pellets in plain water, intending to filter the "powder" out before adding the remaining hop juice (hop "tea," some folks call it) to the wort. But my flannel filter didn't work--most of the hop particles went right through. Then I tried a coffee filter made of paper, but it too let the finest particles through, and was too slow.

So far, I have not found a good solution to the problem. Maybe one or more of you readers can tell us how to handle it.

**WHAT AMOUNT OF PELLETS?:** My experience has been that 1½ ounces of pellets for each 5 gallons of beer is about right for wort you make with your own mash, and for wort made with malt extract NOT already hop-flavored. With hop-flavored malt extract, I use about 1 ounce for each 5 gallons... If you try different proportions (I am sure you will--most home brewers like to experiment) remember that a great deal of hop flavor is contained in a small weight of pellets.

**DRY-HOPPING:** You can add un-boiled hop pellets to your fermenting wort, in the crock or in the keg--the latter is the English way. Put the pellets first into a small stew-pan, then add a little hot faucet-water, just enough so the pellets disintegrate into "powder." Cool the mixture to fermenting temperature, then pour everything into the fermenter or keg, rinsing with a little cold water.

The Practical Brewer, comparing use and deterioration rates for Yakima Cluster hops, pellets and extract, notes that compressed hops have the lowest (15-30%) utilization (by weight), and the highest alpha acid loss in cold storage in one year (14%), while pellets have 25-40% utilization and only 5% loss. Commenting on extracts: "Recently their use has declined...beer flavor changes are likely."

Much of the information in this article comes from a new book, The Practical Brewer, published in 1977 by the Master Brewers Association of the Americas, 4513 Vernon Boulevard, Madison, WI 53705. Copies cost \$30, which includes postage, and may be obtained by sending a money order or a certified check for that amount to the Association.

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## READER QUESTIONS:

(Please enclose a stamped self-addressed envelope if you want a direct answer to your question. Please ask only ONE question, and allow plenty of time. Sometimes I am quite overwhelmed with the questions people ask me.)

**Mr. R.S. Gloger, Kenner, LA,** asks: There is no good source of hops (especially by a merchant who refrigerates them), yeast, grains, etc., in my area (or even in the south). Can you describe a source or sources for those items, especially fresh hops, such as Saazer, Hallertauer, Styrian Goldings, Fuggles, Cascades and Talisman?

We correspond with many good eastern suppliers, including two in the South, but only three answered our hop questionnaire. Those are listed in our Hop Catalogue (p 70). If your merchant is not listed, ask him how he/she stores hops, and determine for yourself whether or not he merits your business. In the future we intend to compile catalogues of other commodities, and perhaps publish a complete catalogue of supply sources which we have confidence about.

**Ken Grossman, Home Brew Shop, Chico CA** writes: I have had some problems with beers made from pellets, they have cleared much slower than the same beer made from loose hops. One hop supplier told me the breweries have encountered the same problem, resulting in longer chill-proofing. I keg most of my beers and age them cold and carbonating, I feel I get better results this way than storage in a carboy and then keg, but the deposit gives me problems. I have tried Irish Moss (a vegetable fining agent, used in the brew kettle, to settle the hot break proteins) to secure a better beer to no avail. Longer 2½-4 hour boils have helped, but I like to keep my beer light and the boil short (1½-hour):

Mr. Grossman doesn't say anything about the amount of malt extract he uses, or if it is a grain beer, or what. If the beer is a typical low malt home brew it may be that the beer lacks tannin, a necessary constituent to settling yeast and proteinous matter. This might be a possible result of using hop pellets, which add very little tannin to the wort. If so he could increase the malt/malt extract content of his beer or alternately use crystal malt in the kettle. Another possibility might be to add about 50-75 mg grape tannin per gallon (US teaspoon weight 1200-mg), or better yet substitute loose hops for part of the

pellets (half?). Dry hopping in the keg during aging might also help. There is also the possibility that his water is too alkaline (pH too high). The pH of finished beer should be 4-4.5, or around 0.12-0.15% acid, as Tartaric. I am not at all convinced that we should switch entirely to hop pellets, I would prefer a combination of fresh loose hops and hop pellets.

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#### HOP CATALOGUE

The following establishments have declared themselves willing and able to do mail order sales of hops, hop pellets, hop extracts and hop cuttings. They have certified themselves as using proper refrigeration and closed storage of fresh, current year (1977) hops or hop pellets.

The Amateur Brewer disclaims any responsibility concerning product quality from these listed merchants, but if the reader has any problems (delivery, quality, quantity) please feel free to contact Amateur Brewer, and we will do whatever we can to correct the situation. The listings below were offered to these merchants free of charge, but we would certainly appreciate the reader mentioning us in your order, and it might be wise to specify 1977 vintage hops on your order. Please contact the below merchants for price lists, etc., before ordering.

KEY TO SYMBOLS: D-Domestic, I-Imported, P-Pellets, CUT-Hop cuttings in season (March to June), E-Extract.

Varieties available: BB-Bavarian (seedless) North'n Brewer BG-Brewer's Gold, BU-Bullion, CA-Cascade, CL-Cluster, FU-Fuggles, HA-Hallertauer, KG-English East Kent Goldings, NB-Northern Brewer, SA-Saazer, SG-Styrian Golding, TA-Talisman, TE-Tettnanger. Most domestic hops Yakima V. BL-Brewer's blend (a mixture of fresh)

#### CALIFORNIA

##### Chico

The Home Brew Shop  
336 Broadway  
Chico CA 95926  
(916) 342-3768

D: BG, BU, CA, CL, FU  
I: HA, SA  
D-P: BG, CA, CL  
I-P: HA  
CUT: CA  
E: 17% a.r. content

#### COLORADO

##### Denver

Wine Art  
705 E 6th Av  
Denver CO 80203  
(303) 831-7229

D: Oregon BU, Ore CA  
D-P: BL

#### OHIO

##### Akron

Wine Art  
819 W Market St  
Akron OH 44303  
(216) 434-8833

D: '76-CA, Oregon BU (77)

#### OREGON

##### Portland

Wine Art  
2758 NE Broadway  
Portland OR 97232  
(503) 287-2624

D: Oregon CA  
D-P: BL

#### NEW HAMPSHIRE

##### Hudson

The Winemaker's Shop  
39-Sullivan Rd, R-5  
Hudson, NH 03051  
(Formerly of Nashua)  
(603) 882-2978

D: BU, CA, CL, TA, FU  
I: SG, HA(76)  
D-P: NB

#### NORTH CAROLINA

##### Chapel Hill

Specialty Prod. Int'l  
POBox 784  
Chapel Hill NC 27514

I-P: HA, 6.8% resin

## TEXAS

### Austin

DeFalco Winemakers  
POBox 1721  
Austin TX 78767  
(512) 478-0680

D: CA(76), BG (76)  
D: 77 BG, CL, FU  
E: Imported English

## WASHINGTON

### Bellevue

Wine Art  
130-102nd SE  
Bellevue WA 98004

D: CA, CL, NB  
I: BB, TE, KG(76)  
D-P: CA, CL  
I-P: HA

There are many other shops dealing mail order in hops, but the above were the only ones to answer our questionnaire concerning storage conditions, varieties and vintage. If your supplier has hops on the counter, and they are grey, etc., inquire about storage conditions, if he doesn't refrigerate, try one of the above. Don't accept poor hops unless you are desperate.

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## PUBLICATIONS AVAILABLE FROM THE AMATEUR BREWER INFORMATION SERVICE

P.O.Box 546, Portland OR 97207 (503)281-1473

These prices include postage and shipping.

Quantity prices and wholesale, please write for price lists.

## BOOKS

Eckhardt, P., NEW FOURTH EDITION, A Treatise on Lager Beers, 1977 Illus. 53pp. .... \$2.10

### Amateur Brewer back issues.

AB#1. ABC's Beermaking, Water, other info..... \$1.75  
AB#2. ABC's Barley & Malt I recipes, etc..... 1.50  
AB#3. ABC's Malt II, Jubilee Ales, etc..... 1.50  
AB#4. Special Hop Issue, 24pp..... 1.75

## MISCELLANEOUS PAPERS by Fred Eckhardt

1. Sake Procedure.....TEMPORARILY OUT OF PRINT  
2. Supplement, A treatise on Lager Beers, an Outline of advanced Beermaking procedures, 1972, revised 1976, 14pp..... \$0.80  
3. Mashing for the North American Home Brewer..... 1.00  
4. An Outline of Winemaking Procedures for the Home Winemaker, 9pp Ditto repro, used in Portland Comm Coll classes..... 0.75  
5. An Outline of Procedures for making Champagne at Home 6pp Ditto repro, used in Portland Comm Coll classes..... 0.55  
6. Beer Tasting and Evaluation for the Amateur, a guide for judging beer the connoisseur or dillitant as well as competition 16pp.. 1.00

## SLIDE LECTURES Professionally produced and narrated by Fred Eckhardt.

1. How To Make Good Beer at Home. 40-slides, 20 min. tape lecture on cassette. Complete step-by-step on making simple beer, boiling wort, racking, flow charts, brewery photos, etc. For use with Treatise.  
2. Advanced Beermaking Techniques, 60-slides, 35-min tape lecture on cassette, student guides (5-copies). Advanced procedures for ale and refrigerator lager, mashing for grain beers. Complete how-to-do-it photos, and flow charts, etc.

RENTAL--14 days: either set \$15, both \$25, plus deposit \$25 each), refundable. Rental may be applied to purchase within 90-days.

PURCHASE PRICE--either set \$80, both \$144.

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(continued from inside the front cover)

issue. There wasn't room for a recipe either, nor for part IV fo the ABC's of Brewing.

On page 63, we mention Dry Hopping. There is only one widely distributed American beer using this technique to impart a delightful aromatic hop bouquet to their beer: Ballantines Ale, currently being produced under license from General Brewing Co. of San Fransisco. Unfortunately, the beer itself doesn't live up to its beautiful promise--the taste is disappointing after the fantastic bouquet. Just the same we think the beer is worth sampling for the smell alone! That's what dry hopping can do for you--try it you'll like it. You can do it to any good pale beer. Although dry hopping is not usually associated with lager beers, they take to it like ducks to water!

Last month through the kindness of a friend, I was able to partake of three bottles of "Our Special Ale, 1977", produced by San Fransisco's Anchor brewery. The label also wished me a "Merry Christmas and a Happy New Year." Since I am a fan of that brewery's products, I wondered what they could do to make a better beer than their Steam Beer and Porter. After all, I thought, when you've done your best number, what do you do for an encore? We opened the bottles in our best beer tasting manner, ala our new booklet, Beer Tasting, and poured it into glasses: wonderful lively head with the tiny bubbles reminiscent of fine Champagne, but with extra zing. The light amber beer filled the glasses, and I leaned carefully to sniff the hop bouquet--not knowing what to expect. WOW! The bouquet was overwhelming and lovely. The beer had been dry-hopped--that's what you do for an encore! Better yet, the flavor backed it up. Bouquet AND flavor--so now you know. If I had a Gold Medal to give, Fritz Maytag and his gang would certainly get my award.

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