

Brew

OCTOBER 1999, VOL.5, NO.10

YOUR OWN

THE HOW-TO HOMEBREW BEER MAGAZINE

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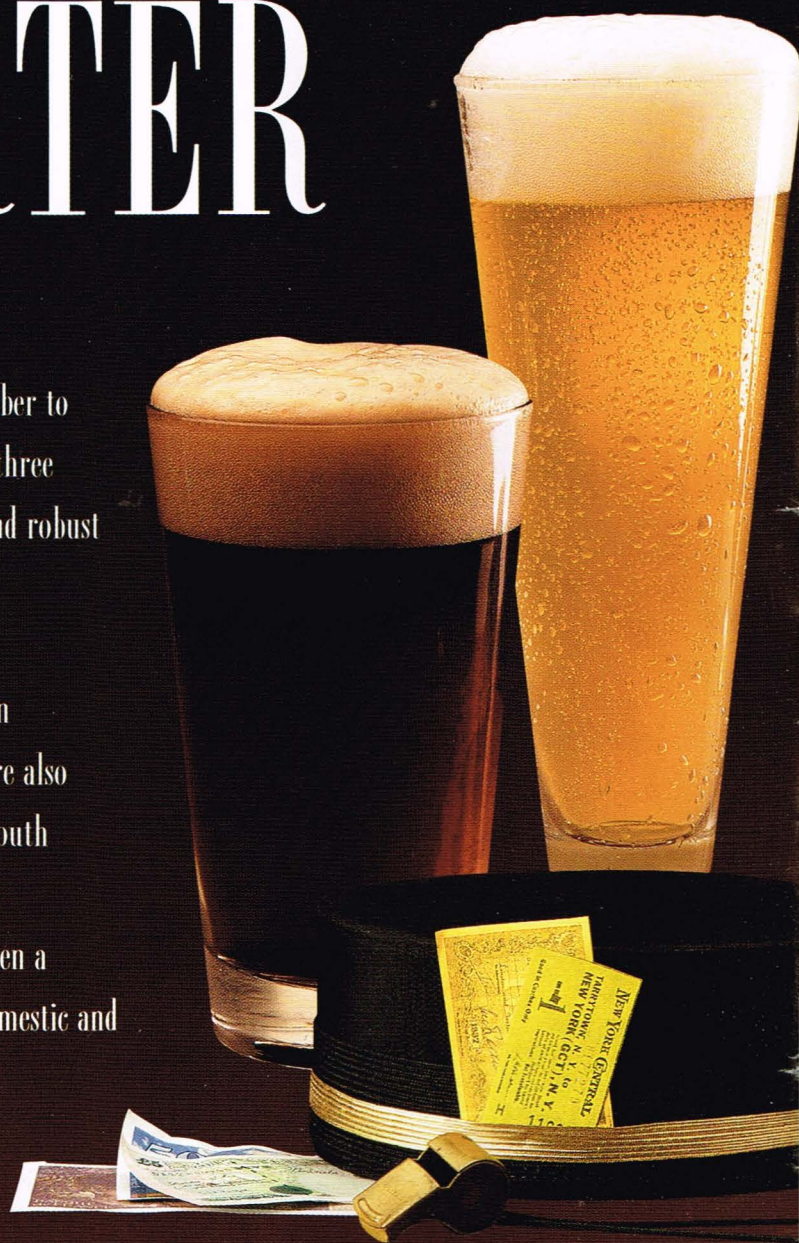
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The Beverage King

I have a confession to make. Those of you who live in California might understand. The rest of you will think I'm a nutty Californian.

Once a week I take a bunch of jugs to a vending machine outside a local drugstore. At a rate of 25 cents per gallon, the vending machine dispenses drinking water. Usually I get about 10 gallons. I do this because the vending machine water tastes better than what comes out of our taps. Besides, didn't I see something on "Dateline" about how polluted city water supplies are?

After I had been doing this for six months or so, I made a disturbing discovery. It turns out those vending machines are hooked up to the store's taps. They dispense the same city water that I get out of my taps at home. This was a jolt, but I keep making my weekly trips. The water just tastes better (I swear!).

I bring this up because I have a friend, a fellow homebrewer, who complains that all mass-produced beer tastes the same, and he refuses to drink any of it. I find this ironic because if he's at a restaurant that has Coke instead of Pepsi, look out! His response generally starts with "yuck" and sometimes gets a lot worse. He thinks New Coke was a plot to make Coke taste more like Pepsi, thus proving that Pepsi is best. And he doesn't consider himself a zealot at all. He's just sure he's right.

I mentioned once that if he thought all megabrews taste the same, how could he be so adamant about the differences between mass-produced colas? He brought up my trips to the tap-water vending machines and mentioned something about my amazingly acute taste buds. I brought up the \$25 he owed me from our last "brewery tour." He mentioned the

power sander he lent me eight months ago (hey, I wasn't done with it). Come to think of it, we never did get anything resolved. But I know the answer.

Besides my wife, Heidi, and me, there's one other homebrewer in our family. It's our 12-year-old nephew, Ryan. He homebrews root beer. In a country where soda is king — it outsells most other beverages combined — Ryan has the right idea.

Just as beer doesn't begin and end with Bud, Miller, and Coors, soda isn't limited to Coke and Pepsi. Many craft brewers are now making craft-brewed soda, and for good reason. Craft-brewed sodas taste terrific, they're fun to make, they come in a wide range of styles, they can be made to appeal to adult tastes as well as to kids, and they require the same equipment that's used in brewing beer.

Just as with beer, homebrewing soda puts you in control. You can make soda that replicates the taste of the popular brands, or you can branch out into the many different styles of root beer, birch beer, spruce beer, ginger ale, fruit-flavored soda, and more.

In this month's issue expert soda maker Polly Goldman offers tips, techniques, and some delicious recipes to make your own great soda at home. The story, "Pop Art," begins on page 26. Check it out, and expose yourself to a real variety of soda flavors.

Craig Bystrynski

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Yeast Strain Secrets

Dear Brew Your Own,

I would like to add, or subtract, a bit from Mr. Wizard's advice on culturing Belgian yeast strains from bottles of Chimay and Orval (August '99 BYO). Belgian ales do owe their uniqueness to yeast strain, and the brewers know this. Chimay in particular uses one yeast strain for fermentation and, after filtering, uses another for bottle conditioning to prevent others from obtaining their particular yeast strain. I would assume that other breweries do as well. Culturing yeast from bottles can be done, and the beer made from it can be quite good (yes, I've tried it, too). But it won't have the same character as the original.

Jim Barbarics
via e-mail

Belgian brewers guard their yeast strains to protect their flavors and frequently filter the fermenting strain from the beer and add a different strain for bottle conditioning. The same practice is used by many breweries in Germany that specialize in hefeweizen. Of course, Mr. Wizard didn't say the beers would be the same; he merely said the yeast could be used to brew a decent beer.

Sparkling Wine

Dear BYO,

In "Easy Steps to Great Sparkling Wine" (Winemaking, January '99 BYO) 360 mL of wine conditioner is used in the dosage. So I ordered some conditioner at my favorite shop. They sent me glycerin, but not enough. Another order to another favorite shop, and lo and behold, glucose! Who's right? Or are they both wrong?

Rick McDermitt
St. Augustine, Fla.

The wine conditioner that the sparkling wine recipe calls for is a mixture of glucose and either



potassium sorbate or sorbic acid (basically the same thing). This mixture usually comes packaged as "wine conditioner." Only use the glucose you purchased if there is potassium sorbate or sorbic acid in the mixture. Glycerin also can be used as a wine conditioner (it also adds sweetness and body), but always use caution when adding it to wine because glycerin can be an energy source for acetic acid bacteria (which are responsible for turning wine into vinegar). Since you will be bottling the sparkling wine right away and therefore not exposing it to airborne bacteria for very long, you could substitute an equal amount of glycerin for wine conditioner in this recipe.

Hop Heads

Dear BYO,

The Maple Wheat extract recipe ("Great Summer Beers," July '99 BYO) calls for 0.5 g. Mt. Hood hop pellets, 0.3 g. Saaz hop pellets, and 0.3 g. Hallertauer hop pellets. This doesn't seem like enough hops.

Boyd Ferriera
Byron, Calif.

The unit of measurement should have been ounces. The correct hop amounts are: 0.5 oz. Mt. Hood hop pellets, 0.3 oz. Saaz hop pellets, and 0.3 oz. Hallertauer hop pellets.

Sterilizing

Dear BYO,

I'm making an IPA (Style of the Month, July '99 BYO), and the recipe calls for dry hopping in the secondary. Do I need to sterilize the hops and dry hop bag?

Michael R. Tucker
via e-mail

Hops added to beer in the secondary do not need to be sterilized because the organisms that are found on hops do not survive in beer. You may want to sanitize your hop

bag by soaking it in hot (180° F or hotter) water for 15 to 20 minutes.

Yeast Sediment

Dear BYO,

It's been a few years since I have brewed any beer. I noticed some new conical brewing containers on the Web. Are there new methods of brewing so that the

yeast can be eliminated from the bottom of each bottle?

Dennis D. Castle
via e-mail

These are small versions of the commercial cylindroconical fermenting vessel. These vessels, also known as unitanks, are typically used in commercial breweries for fermenting and aging beer in one

vessel, hence the name unitank. One of the great advantages to the unitank fermenter is that yeast is harvested very easily from the bottom of the tank. This method of cropping works well for lager and ale strains of yeast. Unitank fermenters do not eliminate yeast sediment from the bottom of bottles.

Grains of Paradise

Dear BYO,

I just got done enjoying a 12-pack of Samuel Adam's Summer Ale and want to know a little about one of its main ingredients, grains of paradise. What are they, where do you get them, and how do you recommend using them in beer?

Michael Erickson
Postville, Iowa

Grains of paradise are the seeds from the West African plant Amomon melegueta. This plant is in the ginger family, and its most similar spice cousin is cardamom (Amomon cardamomum), also in the ginger family. Grains of paradise were a common substitute for black pepper in the 15th century before the sea route to India was discovered. Since this time, the use of grains of paradise has all but vanished. One notable use of the spice is in certain brands of gins.

Like most spices, grains of paradise are best added toward the end of the boil. They must be used liberally in a ground form for good results. For information check out the Web site: www-ang.kfunigraz.ac.at/~katzer/engl/Afra_mel.html.

/Internet Recipe Exchange

Dear BYO,

I downloaded and brewed the Pocahontas Pumpkin Pleaser recipe from the BYO Web site (www.byo.com). I've just brewed my second batch of this (it's in the primary, fermenting merrily). I will store the whole batch in my cellar until Thanksgiving. Thank you for posting such a great recipe.

Rick Henley
via e-mail

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Bob Elliott and Rick Huth, Baltimore, MD

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Dan McCann Clarksburg, Calif.

I would like to offer my bottling rack solution for the rest of the diehard "every droplet" bottlers out there. My problem came from the bottling hose and filling cane, which had a mind of its own when I stuck it in an empty sanitized bottle while I capped the full counter's worth of filled bottles to make room for the next group to be filled. In close quarters the wing capper does its own destruction to uncapped filled bottles.

This is a picture of a simple wood device that has eliminated all my problems associated with knocking over bottles, caps falling off, and setting the filling cane somewhere sanitary between sets.

The device (pictured at right) has seven holes. I fill a six-pack, one bottle at a time, and place the filling cane in bottle number seven while capping. I set the bottling bucket on top of my beer refrigerator and



This simple tool helps prevent accidents during bottling.

bottle at counter height. Another tip for getting every droplet: I use a 3/4-inch piece of wood to tilt the bottling bucket up and place the suction tip in the opposite corner.

The bottle-holding device is easy to build. Here are the construction details: 3/4-inch clear pine, base is 29 inches by 11 inches, sides are

3 inches by 11 inches, top is 3 1/2 inches by 29 inches. Use a 2 1/2-inch diameter hole saw and evenly space and cut out seven holes, then assemble. If you bottle 22-ouncers, Grolsch-style bottles, or Champagne bottles, other top pieces can be custom cut for your setup and screwed together for easy switchover.

Tom Zulkoski Wood River, Neb.

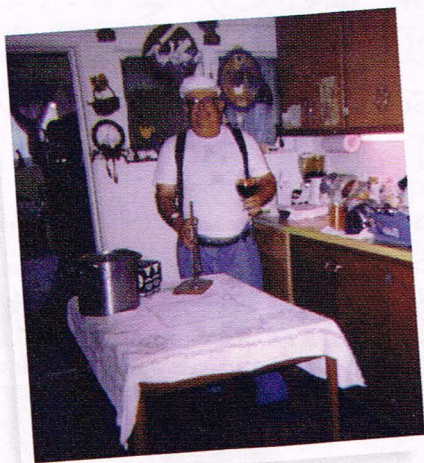
This is a story about my dad and brewing in his day. During Prohibition my father and a man he hired made beer, as most everybody did in the neighborhood.

The phones in those days each had a hand crank. A long ring meant help was needed. One such day the phone rang and rang. A neighbor lady excitedly said, "The feds are here and are tearing up the farm." Luckily, Dad and the hired man were home. They began to uncapped the bottles, dumping the beer into the hog trough. Not a single pig was able to walk upright.

A short time later, after they threw the empty bottles into the horse tank, the feds arrived. Meantime, the hired man had trapped a baby mink, who claimed the horse

tank as his home. When one of the feds saw the bottles in the tank with the moss, he thought the moss was a cover-up. As he stuck his hand into the tank to get a bottle, the mink, seeing the hand and thinking it was a meal, bit off a finger.

That ended the search. It was the last visit the feds ever made in the neighborhood. I still have Dad's beer capper, and I still use it.

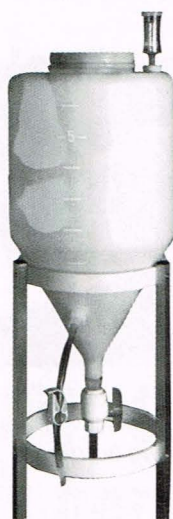


Dad's bottle capper is a reminder of a time when homebrewing had a different reputation.

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A Great Time to Brew

by Scott R. Russell

At this time of year, a man's thoughts turn sadly to the coming winter. Especially here in the Northeast, the changes that occur from September's end to the beginning of October are very dramatic. A brewer's thoughts, however, are not as sad as those of other mere mortals. Cooler weather means cooler fermentation temperatures, cleaner tasting beers, and brewing sessions that are easier to control and clean up.

The brewer in me always looks forward to the beginning of fall. I plan out the great recipes I'm going to try, the old favorites I'm going to dig back up, and the new ones I'm going to invent. I mark my calendar for every possible

brew day, cross-reference it with my ingredient inventory, and make a shopping list.

And then I look at my other calendar, the one where, for years, I've kept the dates and years of significant personal and historical milestones. Because for me, the brewing schedule often gets adjusted to accommodate historical dates and holidays. I really like to commemorate certain events, people, and ideas with special brews. One of those, as I've mentioned before, is Saint Andrew's Day, November 30. Not being Catholic, I'm not particularly tuned in to the lore and traditions of

saints in general. But being Scottish American and a golfer, my

personal saint has always been Saint Andrew. On a trip to Rome this past April, I even managed to get a photo of a huge statue of Saint Andrew in Saint Peter's Basilica in the Vatican.

In case you missed it last time I mentioned it, Saint Andrew is the patron saint of Scotland, just as Saint Patrick is the patron saint of Ireland. The Scots do not celebrate the day in the same manner, however, and I've never understood



Smoked Wee Heavy (5 gallons, partial mash)

Step by Step:

Heat 1.5 gal. water to 160° F. Mix in pale and crystal malts and oats. Hold at 150° F for 75 min. Sprinkle roasted barley and smoked malt on top of mash, then sparge with 2.5 gal. of 168° F water. Take the first 2 qt. of run-off and boil in a wide, flat pan for 20 min. or until caramelized (nearly burnt is fine).

Add caramelized wort, malt extract, and brown sugar to the kettle and bring to a boil. Add Goldings hops and boil 60 min. Remove from heat, begin cooling. Top up in the fermenter with enough chilled, pre-boiled water to make 5.25 gal. When cooled to 65° F, pitch yeast slurry (aerate the wort well — cover the fermenter and shake for several minutes before pitching the yeast).

Ferment cool (58° to 60° F) for three weeks, then transfer to secondary and age cooler (48° to 50° F) for three to four weeks.

Long, slow, and cool fermentation is a crucial element for this beer, which otherwise gets too fruity and bitter; the smoked malt can develop fusel and/or sulfury notes if overdone or if fermented too warm. Hop levels are deliberately low; this beer is all about malt.

Ingredients:

- 2 lbs. pale malt
- 1 lb. medium crystal malt, 50° Lovibond
- 0.5 lb. flaked oats
- 2 oz. roasted barley
- 1 oz. peat-smoked malt
- 7 lbs. unhopped amber malt extract syrup
- 0.25 lb. light brown sugar
- 1 oz. Kent Goldings hops (4% alpha acid, 4 AAUs) for 60 min.
- Scottish ale yeast (Wyeast 1728) slurry
- 1/2 cup light brown sugar to prime

Prime with brown sugar and bottle condition cool (50° to 55° F) for at least three weeks or until needed! The longer it's in the bottle, the better.

OG = 1.070
FG = 1.022
18 IBUs

Notes:

All-grain: Omit the malt extract, increase the pale malt to 10 lbs. and the crystal to 1.25 lbs. Mash in 3 gal. water, and sparge with 4 gal. Maintain the same times and temperatures, but caramelize the first 1 gal. The rest of the procedure remains the same.

Extract: Omit the pale malt, steep the oats, crystal, roasted barley, and smoked malt in 3 gal. at 150° F for 30 min. Increase the brown sugar to 0.5 lb., dissolve it in 1.5 qt. of water, and caramelize as indicated. Increase the malt extract to 8.5 lbs., then proceed as above.

why. (Perhaps because Andrew was actually Irish? But then, Patrick was actually Italian.) I celebrate, though, with an authentic Scottish meal (usually lamb and barley stew, unless I can find haggis), Scottish music, a toast or two (*Slaith!*) with a single malt whisky, and a round of Scottish ale.

The recipe this month is probably my all-time favorite Scotch Ale (a more potent version of a Scottish ale), which I doctor with a touch of peat-smoked malt (despite the historical debate over its appropriateness) and oats. Perfect for a cool, foggy night on the shore of the loch.

Saint Andrew's day is celebrated in parts of eastern Europe, Bohemia, Romania, and elsewhere, where it is much like our Halloween, the night when the dead walk again, when the door between the worlds is open for awhile. I'd prefer to have a glass of this Scotch ale with me to face the demons.

Reader Recipe

Bawdy Shepherd Bitter (6 gallons, extract with specialty grains)

This beer is the perfect British pub bitter.

*Sean Saunders
Spagnol's Wine and Beer Ltd.
Vancouver, British Columbia*

Ingredients:

- 6.6 lbs. pale malt extract
- 7 oz. De Wolf-Cosyns Biscuit malt
- 2 oz. De Wolf-Cosyns Special B malt
- 17.5 oz. crystal malt, 60° Lovibond
- 1 oz. Northern Brewer hop pellets (7.4% alpha acid, 7.4 AAUs) for 60 min.
- 2.25 oz. Goldings hop pellets (3.9% alpha acid, 8.8 AAUs: 1 oz (3.9 AAUs) for 60 min., 0.25 oz. (1 AAU) for 2 min., 1 oz. (3.9 AAUs) for dry hop
- 1 oz. Fuggle hops (5% alpha acid, 5 AAUs) for 2 min.

- 1/2 tsp. gypsum
- 1/8 tsp. Epsom salts
- Wyeast 1335 (British ale II)
- 3.5 oz. cane sugar for priming

Step by Step:

Dissolve Epsom salts and gypsum in 1.5 gal. cold brewing water. Turn on heat and steep grains until liquor reaches 170° F, no higher. Remove grains. Add 5 gal. water, malt syrup, and Northern Brewer and 1 oz. Goldings hop pellets and bring to a boil. Total boil is 60 min. Boil for 58 min., add Fuggle hops and 0.25 oz. Goldings hops, and boil 2 min. more. Cool to 78° F and pitch yeast.

Ferment at room temperature (68° F) for three to five days. Rack to secondary, add 1 oz. Goldings hops, and ferment seven to 10 days. Prime and bottle. Allow at least a week to carbonate.

OG = 1.040

FG = 1.007

Bitterness = 50 IBUs ■

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Preventing Beer Slime

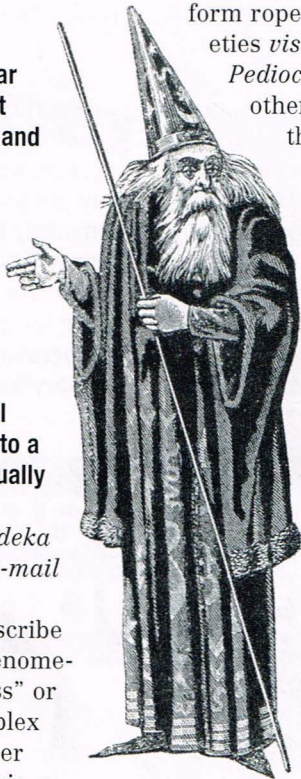
Mr. Wizard

I have a brewing problem that I have not been able to solve. I am an extract brewer and occasionally add grain. I have brewed approximately 60 batches of beer over the past four years.

My problem: About a year ago I suddenly started to get beer that was thick, syrupy, and very disgusting. It seems to take two or three weeks after bottling to start to show up, a little at a time.

I suspected sanitation, but I have been extra careful and it still happens. I now suspect my water, which is from a well. I also add a little extra water to a typical five-gallon batch, usually ending with 5.5 gallons.

Peter Hadeka
via e-mail



The problem you describe sounds like the phenomenon called "ropiness" or the development of a complex polysaccharide slime in beer produced by certain bacteria. The slime produced by rope-forming bacteria is thixotropic in nature, which means the viscosity of the beer will drop when it is stirred or shaken and will increase once the beer is left still. The famous Belgian brewing scientist Jean De Clerck wrote in his *Textbook of Brewing*, published in the 1940s, that ropiness is "the most unpleasant infection which can be encountered in beer."

Ropey beer is caused by two different kinds of bacteria. The aerobic, vinegar-forming *Acetobacter* are known to secrete slime — that has such a nice sound to it!

Ropiness from the *Acetobacter* species is only common in beer

exposed to oxygen, like cask ale and beer left in beer taps. Your bottled beer does not have enough oxygen for *Acetobacter* to grow and form rope.

The other bacteria known to form rope in beer are the varieties *viscosus* and *limosus* of *Pediococcus damnosus*. Unlike other strains of *Pediococcus*, these guys do not produce diacetyl (buttery or butterscotch flavor). *Pediococcus* is a common spoilage organism in beer and grows best under anaerobic conditions like those found in a bottle. Like other beer-spoilage bacteria, *Pediococcus* is commonly found in the environment and is often carried into beer through yeast or other ingredients added after the boil.

In general your problem is most likely a result of insufficient sanitation. This does not necessarily mean that you are using "dirty" brewing practices, rather it simply means that you are contaminating your beer somehow. Good sanitation after the boil requires all implements that touch beer or wort to be cleaned with a detergent and sanitized before use. Make sure you are using a recognized sanitizer and that its concentration is correct. If you are using hot water, make sure the water is hotter than 180° F and that you allow at least 20 minutes at this temperature before considering your tools sanitized. This includes carboys, hoses, spoons, bottles, and bottle caps.

Good sanitation also means that any ingredient added to beer should be properly treated before its addition. If you are adding well water to beer after fermentation, the water should be boiled. This rule also applies to priming sugar and other post-boil additives.

This is the first time I have had a ropey beer question, or at least a problem that sounds like rope. If your problem persists, write back with more details and a sample. Good luck!

Mr. Wizard

In using specialty grains with extract homebrewing, what is the best method to get the most flavor and color out of the grains but still reduce tannins? Some recipes say to steep grains until water comes to a boil and remove, while others say to bring water to 150° F and steep for 30 minutes.

I just made a Belgium ale in which I steeped the grains in 170° F water for 30 minutes and then sparged with 170° F water. Was this temperature too high for the steep and did it release unwanted tannins?

C. Zurich
Baltimore

The two most influential factors affecting the extraction of tannins from malt into wort are pH and temperature. All-grain brewers are very careful not to allow wort pH to reach more than about pH 6 during sparging because tannin extraction increases with pH. In all-grain brewing wort pH typically rises during the last stages of wort collection and is one of the factors letting the brewer know that wort collection should be stopped.

When a relatively small weight

of specialty grains is steeped in a large volume of water, the result is a very thin mixture. The pH is only slightly affected by the malt (pale malts tend to lower the mash pH during all-grain mashing to about 5.4 pH). This means the pH of the solution during steeping will be higher than the pH of a normal mash, which has an oatmeal-like consistency.

To combat this problem the pH of the steep can be adjusted to around 5.4. Although all-grain brewers typically use calcium sulfate (gypsum) or calcium chloride to lower mash pH, these salts lower pH by reacting with phosphates from the malt. Steeping mixtures don't contain much malt and lowering the pH with water salts can be difficult. Food-grade lactic or phosphoric acid are alternatives to water salts; both of these acids are sold in homebrew stores.

The key to adding acids is to add them slowly with continual

stirring and monitoring with a pH meter or pH paper. I recommend adding a small amount while stirring the pot, checking the pH, and continuing until the pH is around 5.4.

Temperature also affects tannin extraction. This relationship is pretty simple. If you don't want to run the risk of getting too much tannin in your wort, keep the temperature just below 170° F. This is where the answer to your last question begins.

You ask whether steeping and sparging released "unwanted tannins" in your beer. For starters, all beer contains tannins. Some tannins are implicated in haze and some lend astringent flavors to beer. The type most homebrewers are concerned about are those affecting flavor. In any case, it is up to the brewer to decide if the level of tannins in their beer is too high.

The (in)famous decoction mash is frequently recommended when a

brewer is in search of more malt flavor. Decoction mashes boil malt and — among analytical brewers who are not afraid of rocking the boat with unpopular ideas — are known to increase the astringent character associated with tannins. In general I wouldn't consider 170° F dangerously high with respect to tannin extraction. However, if you believe your beers may suffer because of too much astringency, consider adjusting your steep pH and lowering the temperature a few degrees.

Mr. Wizard

I brewed a maibock and a pilsner and put both in the fridge simultaneously to go through primary fermentation, diacetyl rest, and secondary conditioning under the same temperatures. I raised the temperature of the fridge 10° F above primary fermentation (45° F) so they

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both would do the diacetyl rest at 55° F (like I have read in some books), racked to secondary for conditioning of at least four weeks, and bottled. Both had the noticeable trademark of diacetyl (buttery flavor). Was I doing the diacetyl rest at the correct temperature? If not, what is the right temperature for a diacetyl rest?

*Guy Gustafson
via e-mail*

I think I should change my name to "More Than One Way to Brew Dude" because that's where I always seem to wind up in my columns. There is no "right" temperature at which to do a diacetyl rest, the process of allowing the beer to remain on the yeast after fermentation finishes to reduce diacetyl and the buttery flavors it causes.

Ale brewers use a warm temperature (65° to 75° F), and some lager brewers use their primary fermentation temperature. Others warm the beer up to ale temperatures, and some high-tech chemical engineer-brewer hybrid types heat the beer to pasteurization temperatures and pass it over an immobilized yeast column to reduce diacetyl in only a couple of hours. The method you describe is sound and can successfully be used to reduce diacetyl.

The most helpful thing I can do to help answer your question is to go over some facts about the rise and fall of diacetyl in beer:

1. Yeast cells do not produce diacetyl but produce the precursor of diacetyl called a-aceto-lactate. This compound is secreted from the yeast cell and is converted into diacetyl in beer through a chemical oxidation reaction. The conversion of a-aceto-lactate to diacetyl can be catalyzed by numerous oxidizing compounds including oxygen, iron, and copper.

2. Yeast can only reduce diacetyl if the a-aceto-lactate has had an opportunity to convert to diacetyl. Higher-temperature "diacetyl rests" speed up aging because the conversion rate of a-aceto-lactate to

diacetyl increases with temperature.

3. Yeast will only reduce diacetyl if the yeast cells are alive, kicking, and have access to diacetyl (beer). Yeast that is too flocculent often produces beer high in diacetyl because by the time the diacetyl is ready to be reduced, the yeast is lying on the bottom of the fermenter. The need to increase yeast surface area during aging is one of

the reasons a certain big brewery says it uses beechwood chips.

4. Diacetyl also can come from bacterial contamination. Certain lactic acid bacteria that spoil beer have the ability to crank out enormous quantities of diacetyl. For example the rich butter aroma found in so many California wines comes from an intentional bacterial "malolactic fermentation" usually

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accomplished by adding *Leuconostoc oenos* following primary fermentation. Yeast, especially lager yeast, is a common vector of lactic acid bacteria.

5. Diacetyl also can mysteriously appear in a beer following packaging if the beer still contains a-aceto-lactate. Remember that a-aceto-lactate converts to diacetyl when it is oxidized. Since bottling always incorporates some oxygen, beers that have been insufficiently aged at very cold temperatures may develop a nice diacetyl nose after bottling. This is a good sign that the diacetyl rest was unsuccessful.

Hopefully these facts will help you discover what went wrong with your beer. When I brew lagers, which is very often, I use a fairly specific temperature profile during fermentation. I ferment my lagers at 50° F until the gravity reaches about 1.014. At this point I transfer the beer to a keg for natural carbonation. The keg is held at 50° F

for four days, and the pressure is maintained at 15 psi. This gives me a naturally carbonated lager without the need for carbonating after aging. After this period I cool the lager to 40° F and hold it for 10 days. Finally I cool my lagers to 32° F and lager them for three to four weeks. This method works for me, but as I said, there is more than one way to age a lager!

Mr. Wizard

I need your help in color design in my homebrewing. I have been homebrewing (extract with specialty grains, partial mash) for about six years and have loved every minute of it. My friends are blown away that my homebrews taste so much better than their commercial brews. However, my latest challenge is that even though my wife, Cristy, supports me in my homebrewing endeavors, she will not drink any unless they are "light" in color. As

you know, this presents a challenge to the homebrewer.

In attempting to brew a light-colored blonde pale ale I have gone to a full-wort boil system (five gallons) with the purchase of a 7.5-gallon stainless steel brew pot. I am using extra light pale malt extract (liquid and dry malt extract) and using dextrose. I am coloring with 8° to 10° Lovibond specialty grains (crystal). Can you recommend any changes in the specialty grains to achieve the light color?

Michael Riley
via e-mail

A "light-colored" beer is a hard term to quantify because it depends on what your wife typically drinks. One of my favorite brews is my Helles (German for pale or light) lager. Although this beer is typical for the style, it looks like a pale ale when placed next to a domestic light beer, because my Helles is all malt and even the palest barley malts have

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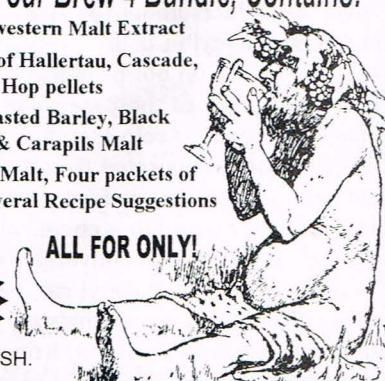
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color. The domestic light coming from the big brewery near the Continental Divide is especially light in color and makes other domestic light-colored beers look richly colored in comparison. My point is that the perception of color is affected by what a particular color is compared to.

I will assume Cristy would be happy with your homebrew if it had the color of a Bud or a similar brew. The key point to keep in mind about these beers is that they are brewed to appeal to the masses. Big brewers have certain buzz words that they use to describe their beers. They aim for "clean, balanced beers with lots of drinkability." To translate, they don't have off-flavors from bacteria or any hint of astringent flavors from malt. This is why big brewers have really great quality-control facilities and use adjuncts to dilute those pesky malt flavors.

There is a lot more to this than these two items, and brewing a clean beer is very challenging. Balanced means that no one flavor stands out in the beer. Sierra Nevada Pale Ale is inherently flawed because the first whiff forces the educated beer drinker to say "Damn! Those hops smell wonderful" — by definition, not a balanced brew. Drinkability means Joe Beer can slam down a six-pack without much effort. Since complex flavors — whether found in food or drink — tend to satiate people, the key to drinkability is to minimize flavor.

Where does color come into this tirade, you ask? Color is almost always the sidekick to flavor when referring to carbohydrates. The following word pairs make my point: white bread, white sugar, white rice, and boiled potatoes are all bland, while French bread, brown sugar, brown rice, and boiled potatoes that are later broiled all have more flavor.

When carbohydrates react with amino acids in a hot, low-moisture, high-pH (above pH 7) environment, a chemical reaction called the Maillard reaction takes place. It produces both flavor and color. If this reaction did not occur, our diet

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would be a very boring thing!

What you need to do is select ingredients that have very little color. Although there are malt extracts on the market that are lighter than others, they are not as light as regular wort. That is due to the Maillard reaction. As wort is concentrated during extract production, it tends to darken and gain certain flavors associated with the Maillard reaction. If you really want a light-colored beer, going all-grain will greatly help your effort.

Another pointer: Drop the crystal malt. This is where the objectives of homebrewing and commercial brewing clash. Homebrewers use crystal malt primarily for flavor and inherit its color. Commercial brewers really don't want crystal malt flavors unless they are making a "red" beer that is supposed to have some malt flavor.

Many mass-appeal beers that have color use roasted grains or their extracts in very low concentrations

because they add color but no flavor. In other words you can have malt color without much flavor, but you can't have malt flavor without color. If you want to preserve some body, you might want to use a very light crystal malt such as carapils.

The last tip is using adjuncts for color dilution. Rice, corn, and sugar all add fermentable sugars without contributing color. I assume you are using dextrose for color dilution. Be sure not to use too much of this because simple sugars can create strange flavors.

My favorite adjunct is rice or rice syrup because it is so incredibly flavor neutral. Because the starches of corn and rice are broken down by malt enzymes to produce a spectrum of sugars very similar to those found in an all-malt wort, they tend to ferment the same way. Worts with up to about 30 percent adjunct ferment well without the need for yeast nutrients. If too much adjunct is used, the supply of amino acids

and vitamins becomes too low for a healthy fermentation.

I like brewing light-colored beers that are hybrids between bland and flavorful beers. A light-colored wort is a good canvas for showcasing interesting yet subtle hop and yeast flavors. The trick is to resist the temptation to be too heavy-handed with flavor. ■

Mr. Wizard's Address

Do you have a question for Mr. Wizard? Write to him c/o *Brew Your Own*, 216 F St., #160, Davis, CA 95616. Or send e-mail to wiz@byo.com.

Mr. Wizard, BYO's resident expert, is a leading authority in homebrewing whose identity, like the identity of all superheroes, must be kept confidential.

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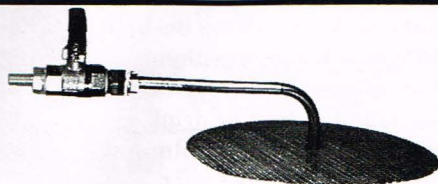
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Hearty Beers for Fall

by Mikoli Weaver

The leaves are changing, and the air is taking on a chill. What better way to greet the changing season than brewing two warming, hearty beers: doppelbock and Scottish ale.

Last month's hefeweizen is ready October 2, just in time to enjoy while brewing the doppelbock. The Oktoberfest from last month's schedule should be ready to drink October 16, but if it needs more time, try it on the October 23 when it's a full four weeks old.

Holy War and Reward

During the Protestant Reformation, Catholic monasteries were established in what is today southern Germany as counter-Revolution period strongholds. One was the cloister of the Franciscans (St. Francis) from Paula, Italy. The Paulaner monks made strong beer to carry them through fasts during Lent and Advent.

The brew was a dark liquor brewed with more grain than bock

but not fermented as thoroughly, which left a sweet finish and lots of residual carbohydrates. The monks named it Salvator, or savior. To this day the Paulaner brewery calls their doppelbock Salvator.

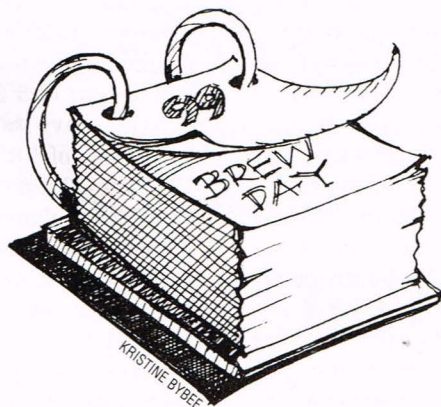
The beer was most likely made dark because the more acidic dark malts naturally lower the pH of the mash (the majority of beers from this period were most likely dark). The water in the south is very basic, so acidifying the mash provided better conversion and a better product with more sugars. The dark malt also must have contributed a sensory influence as well: a rich, dark beer in the middle of winter.

The people of Munich found it similar to bockbiers but stronger, hence the moniker doppelbock (double bock).

During the Napoleonic wars the monasteries shut down, but the Paulaner Brewery still operated. Several other breweries, particularly in Munich, copied the style and adopted the 'ator suffix to emulate the Salvator. German beer law allows any doppelbock with an original gravity of or greater than 1.074 (18.5° Plato) to carry the 'ator suffix.

According to current German law, doppelbocks must have an original gravity of 1.072 to 1.112 (18° to 28° Plato) and an alcohol content by volume of 7.5 percent to 13 percent. The Great American Beer Festival parameters are a bit different: original gravity of 1.074 to 1.080 (18.5° to 20° Plato), 6.5 percent to 8 percent alcohol by volume, bitterness of 17 to 27 IBUs, and color of 12 to 30 SRM.

Popular imported doppelbocks are produced by Paulaner (Salvator) and Ayinger (Celebrator). Celebrator is a widely acclaimed beer that is



dark tawny brown, almost like port in appearance. Its bold, malty flavor is delicately sewn with warming alcohol, caramel, and yeast character. Spaten's Optimator is a richly vinous drink that shows plenty of alcohol esters and fruits. Pale doppelbocks include Park Priminator from Parkbrauerei (Germany) and Caesarius Imperator from the Swiss Brauerei Hurlimann.

Doppelbocks are also brewed *en masse* in our country. Tabernash, Full Sail, Sprecher, Capitol Brewing, and Thomas Kemper are all shining examples from great brewers. The Capitol Brewing doppel is also a blonde or pale-style doppelbock and very much worth getting.

Formulation — Malt

Doppelbocks should have a heavy emphasis on caramel, chocolate, and roasted brown malt flavors. A smooth, silky, balanced, porter-like quality should emerge, with alcohol and sweetness combining to form the finish. Depending on the brewer, a doppelbock may have a variety of caramel malts, including pale and dark Munichs, mixed with brown or chocolate and maybe some roasted or black malt (the latter is not as common). The base of the recipe is made of pale pilsner malts and a variety of Munich malts, which can be dark or even cara-Munich. The recipe here is a simple combination of pilsner, 10° Lovibond Munich, 40° Lovibond caramel, and brown malt of about 50° Lovibond. It makes an even brown beer with accents on roasted flavors, hinting at the 40° Lovibond crystal. The large grain bill ensures lots of flavor and alcohol with a long, warming finish.

Hops

As usual for a German beer, the hops should be of authentic Noble type for the flavor and aroma and at least continental for the bittering. The recipes here outline a program of German Northern Brewer hops for bittering and Hallertauer hops for flavor and finishing. Other hops just as suitable are German Perle and Brewer's Gold for bittering and

Tettnanger, Spalt, Hersbrucker, and Saaz for finishing.

As with most other styles of bock, this beer should emphasize malt aromas and malt flavors. Hops should exist only to balance the middle and finish, not to create a bitter character in any way. Doppelbock also should contain no real hop aroma in the nose, although pale versions do show more hops in the secondary sensory experience — in the back of the throat during drinking, for instance. This occurs because pale doppelbocks lack dark roasted grains to offset the hop flavors.

Yeast and Lagering

The lagering technique includes primary fermentation at 45° F for the first three days, then raised to 50° F for four more days. Ferment in secondary for one more week at the same 50° F, then cool to 40° F for a final week of settling. Bottle condition at 40° F for three to four more weeks, which will put you roughly at November 14 to 21 for the finished product. Obviously you have to cheat by not filtering the beer this time, but gelatin works as an excellent fining during conditioning if you want brilliantly clear beer in little time. Otherwise it should look good after three to four weeks of lagering in the bottle. Besides, it will last longer with some yeast in there.

The yeast in the recipe is Wyeast 2124 (Bohemian lager), but you also could try the 2206 (Bavarian lager) or 2308 (Munich

lager). An alternative from White Labs is German lager (WLP830). The starter for this beer should be two pints.

Scottish Ale

Scottish ale is a category that encompasses four main types of beers. They are light, heavy, export, and strong — often known as Scotch ale rather than Scottish. In older days these particular styles were known by a designation of shillings. The light was a 60 shilling ale, the heavy was 70, export was 80, and the Scotch or strong was commonly called 90 shilling. Some brewers still use this name system today, but it got its start as a symbol of taxation. The higher the original gravity of the beer, the higher the tax per barrel.

By the numbers, Scottish-style light should have an original gravity of 1.030 to 1.036 (7.5° to 9° Plato), 3 percent to 5 percent alcohol by volume, bitterness of 9 to 20 IBUs, and a color of 8 to 17 SRM.

The heavy should have an original gravity of 1.036 to 1.040 (9° to 10° Plato), 3.5 percent to 4 percent alcohol by volume, bitterness of 12 to 20 IBUs, and a color of 10 to 19 SRM.

Scottish-style export should have an original gravity of 1.040 to 1.050 (10° to 12.5° Plato), alcohol by volume of 4 percent to 4.5 percent, bitterness of 15 to 25 IBUs, and a color of 10 to 19 SRM.

The biggest, strong or Scotch ale, should have an original gravity of 1.072 to 1.084 (18° to 21° Plato), 6.2 percent to 8 percent alcohol by

1999 Style Calendar

October Doppelbock, Scottish Ale

A big doppelbock and a Scottish ale to warm us as the nights cool and the leaves fall.

November Porter, Frambozenbier

Two festive beers for the Thanksgiving holiday. A big porter and a French raspberry ale that makes fruit beer delectable.

December Christmas Ale, Old Ale

Starts off with a hoppy Christmas ale such as Sierra Celebration and an old (strong) ale like Pyramid Snow Cap.

volume, bitterness of 25 to 35 IBUs, and a color of 10 to 25 SRM.

Yeast Strains and Fermentation

The numbers for the various styles can seem a bit confusing. Even though they ascend in gravity, the alcohol content does not increase significantly for the first three styles. This is because Scottish ales are fairly sweet in the finish. With the exception of the first style, the light, they are all very high in residual sugar and purposely fermented that way. The terminal gravities are as follows: light is 1.006 to 1.012 (1.5° to 3° Plato; can be dry), heavy is 1.010 to 1.014 (2.5° to 3.5° Plato; moderately sweet), export is 1.010 to 1.018 (2.5° to 4.5° Plato; more sweet), and strong is 1.016 to 1.028 (4° to 7° Plato; even sweeter, but with lots more alcohol and other flavors as well).

There are several specific yeast strains for fermenting Scottish-style ales. The main difference between

them and most others is that they have a very low attenuation percentage, which means that they do not ferment as much of the available sugar, leaving the beer with the desired residual sweetness. Depending on the type of Scottish or Scotch strong ale you wish to brew, you may consider one of these strains of yeast. The one in the recipe is Wyeast 1728 (Scottish ale). If you would like something that attenuates a bit more, look for one of the London strains or an Irish or British ale.

Hops

For the most part Goldings and Fuggle are the norm for hopping Scottish-style ales, although other British hops such as Brambling, Northdown, Challenger, Progress, and Target also can be used. An emphasis on the malt flavors and sweetness should dominate the palate and the nose, however, so the hopping should be very low and the

bitterness and aroma only there for balance. Remember, this is one style that is often intentionally created to be out of balance, particularly the bigger styles in the category.

Scottish Samples

There are many imported ales from Scotland to use as comparison for your brewing. Some of the more famous are Traquair House Ale, brewed since 1491, and its companion ale, Traquair Jacobite, a version spiced with coriander and named for the Jacobite revolution. They are both examples of the Scotch or strong style, with an original gravity of 1.080 (20° Plato).

Another strong ale is MacAndrew's. This brew is famous as an authentic Scotch ale. It has an original gravity of 1.080 (20° Plato), with lots of sweet malt flavors and alcohol.

Broughton Ales has a trio of Scottish ales that have recently won much acclaim. The lightest, Merlins ale, is golden colored and fairly

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CIRCLE 2 ON READER SERVICE CARD

Brewing Schedule Notes

Oct. 1, Friday

Prep day for doppelbock

Assemble all ingredients for doppelbock, sanitize equipment and start yeast culture for brewing on Sunday.

Oct. 2, Saturday

Last month's hefeweizen is ready for drinking today.

Oct. 3, Sunday — Brew day

Brew doppelbock, record original gravity and begin fermentation at 45° F for three days. Allow to raise to 50° F from day three to day seven.

Oct. 7, Thursday — Prep day

Assemble all ingredients for Scottish, sanitize equipment, and start yeast culture for brewing on Saturday.

Oct. 9, Saturday — Brew day

Brew Scottish, record original gravity, and begin fermentation at 69° F.

Oct. 10, Sunday — Transfer

Rack the doppelbock to a secondary fermenter and record the gravity. Continue for seven more days at 50° F.

Oct. 16, Saturday — Transfer

Transfer the Scottish to secondary and continue fermenting for seven days. The Oktoberfest from last month is three weeks old today and ready to try.

Oct. 23, Saturday — Bottle Scottish

The Scottish should be done fermenting and ready to bottle today. Age at least seven more days before drinking (Oct. 30).

Oct. 24, Sunday Bottle doppelbock

The doppelbock should be done today and ready for bottling. It will age for three to four more weeks (Nov. 14-21).

November brews: Porter and Frambozenbier.

dry with an alcohol by volume of 4.2 percent. Next in line is the Black Douglas, a darker, redder ale with much more malt but not tremendously sweet, with an alcohol by volume of 5.2 percent. The last is the most potent. Old Jock is darker yet and more complex. The alcohol by volume is 6.7 percent, and it shows. The malt is much richer than the other two, with nicely balanced sugar in the finish.

If you want something a bit interesting, try the Fraoch Heather Ale from Scotland. It is a light Scottish ale with heather in it, which gives the beer a very earthy quality.

From the United States there are the founding Grant's Scottish ale, a very pale, light Scottish-style ale; Mactarnahan's from Portland Brewing (although now called an amber ale for marketing purposes); Pike Kilt Lifter; Samuel Adams Scotch Ale; and Moylan's Kilt Tilter, among myriad other medal winners.

Doppelbock (5 gallons, all-grain)

Ingredients:

- 8 lbs. Chariot pilsner malt
- 2.5 lbs. Munich pale malt

October 1999

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 PREP DAY • Assemble doppelbock ingredients • Soak equipment in sanitizer • Make yeast starter	2 DRINK DAY • Hefeweizen is ready to drink
3 BREW DAY • Brew doppelbock • Primary fermentation starts, check original gravity and record	4	5	6	7 PREP DAY • Assemble Scottish ale ingredients • Soak equipment in sanitizer • Start 1 pt. yeast starter for Scottish	8	9 BREW DAY • Brew Scottish ale • Primary fermentation starts • Check gravity, record
10 TRANSFER • Transfer doppelbock to secondary • Check and record gravity • Check for off-flavors • Continue fermentation schedule	11	12	13	14	15	16 TRANSFER • Rack Scottish to secondary • Check gravity, off-flavors • Ferment 7 more days at 69°F • Oktoberfest ready to try
17	18	19	20	21	22	23 BOTTLE • Sanitize bottles and bottling vessel • Record final gravity • Rack, prime, and bottle • Age at least 1 more week
24 BOTTLE • Sanitize bottles and bottling vessel • Record final gravity • Rack, prime, bottle • Age at least 3 more weeks	25 31	26	27	28	29	30

- 1 lb. carapils or dextrin-type malt
- 3.5 lbs. crystal malt, 40° Lovibond
- 1 lb. brown malt
- 0.5 oz. German Northern Brewer hops (8.5% alpha acid, 4.25 AAUs) for 90 min.
- 1 oz. Hallertauer hops (3.7% alpha acid, 3.7 AAUs): 0.5 oz. (1.85 AAUs) for 30 min., 0.5 oz. (1.85 AAUs) at end of boil
- 2 pt. yeast starter of Wyeast 2124 (Bohemian lager)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 5 gal. 150° F water for 60 min. Sparge with 168° F water to yield 5.75 gal. wort.

Total boil time is 90 min. At beginning of boil, add Northern Brewer hops and continue for 60 min. more. Add 0.5 oz. Hallertauer hops and boil 30 min. more. At end of boil, add 0.5 oz. Hallertauer. Whirlpool and cool to 45° F to pitch starter.

Ferment at 45° F for three days, raise to 50° over four more days, then rack to secondary fermenter. Continue fermentation for seven more days until gravity is about 1.020 (5° Plato). At this point cool to 40° F or below and let settle for seven more days. Prime and bottle. Age at least three to four more weeks before drinking.

Extract with Grains Option:

Substitute 8.5 lbs. light Munich malt syrup for the pilsner and Munich malts. Increase the Northern Brewer hops to 0.75 oz. Start with 5 gal. water in boil kettle. Steep crushed grains at 150° F for 30 min. Remove bag and rinse with enough 168° F water to make 5.5 gal. Add extract. Total boil time is 60 min. At beginning of boil add Northern Brewer hops and continue for 30 min. Add 0.5 oz. Hallertauer pellets and boil for 30 min. more. At end of boil add remaining 0.5 oz. Hallertauer. Whirlpool and cool to 45° F to pitch starter.

OG = 1.088 (22° Plato)

FG = 1.016 (4° Plato)

Bitterness = 20 IBUs

Color = 46 SRM

9% ABV

Scottish Ale (5 gallons, all-grain)

Ingredients:

- 6.5 lbs. Maris Otter malt
- 1 lb. carapils or dextrin-type malt
- 0.5 lb. crystal malt, 20° Lovibond
- 0.5 lb. crystal malt, 40° Lovibond
- 0.125 lb. chocolate malt
- 1.5 oz. Fuggle hops (4.2% alpha acid, 6.3 AAUs): 1 oz. (4.2 AAUs) for 90 min., 0.5 oz. (2.1 AAUs) for 30 min.
- 1 oz. Kent Goldings hops (5.5% alpha acid, 5.5 AAUs) at end of boil
- 1 pt. starter of Wyeast 1728 (Scottish ale)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 3 gal. 150° F water for 60 min. Sparge with 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At start of boil, add 1 oz. Fuggle hops and boil 60 min. Add 0.5 oz. Fuggles and boil remaining 30 min. At end of boil, add the Kent Goldings. Whirlpool and cool to 69° F to pitch starter. Oxygenate/aerate well.

Ferment at 69° F for seven days, then rack to secondary. Continue fermentation for seven more days until gravity is about 1.112 (3° Plato) or fermentation is done. Let settle, rack, prime, and bottle. Age seven more days before drinking.

Extract with Grains Option:

Substitute 6.5 lbs. English pale malt extract syrup for the Maris Otter malt and increase the first Fuggle addition to 1.25 oz. Start with 5 gal. 150° F water. Steep crushed grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gal. Heat to boiling and add extract syrup. Total boil is 60 min. At beginning of boil, add 1.25 oz. Fuggles and boil 30 min. Add 0.5 oz. Fuggles, boil 30 min. more, and add the Kent Goldings to finish.

OG = 1.048 (12° Plato)

FG = 1.012 (3° Plato)

Bitterness = 23 IBUs

Color = 18 SRM

4.5% ABV ■

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CIRCLE 19 ON READER SERVICE CARD

Brewing on the Road

by David Griffiths

Why would a blue-ribbon, all-grain homebrewer, who routinely mashes eight- and 12-gallon batches either solo or with his club buddies, switch — regress, in some homebrewers' minds — to brewing three-gallon partial-mash beers?

Furthermore, why would he boil the wort, a mere two gallons' worth, at a gravity near twice the target gravity? Good questions. Possible answers: The club members threw him out for his comments about the club president's Peanut Butter Ale. His bursitis prevents him from lifting more than three-and-a-half gallons. He's lost his mind. All of the above.

The correct answer is: None of the above.

I'm the brewer in question, and there's a rational explanation for the apparent regression. I winter in Texas, avoiding the onset of the next Ice Age at my permanent home in New England. My wintering digs is a 30-feet-long, eight-feet-wide travel trailer — it's sufficient room for me, my partner Yvonne, and my Welsh

corgi, Guinness, but it lacks room for a big-batch, all-grain brewing system.

Nonetheless, I was determined that I would not spend five months without brewing and quaffing a pint of my favorite beer. Before leaving home I planned how I could brew on the road and what equipment I would need to make it possible.

It took some thought, and there were some errors of omission (more about them later). But for the most part I made the right choices, and the errors were readily correctable.

My experiences taught me that brewing quality beer on the road is possible and as much fun as doing it at home, maybe even more fun with the different challenges. The approach: minimum equipment and a small-volume, high-gravity boil. This approach works just as well in the small space of a boat, camp cabin, or a big city efficiency apartment.

Equipment

I decided to stick to extract-based, partial-mash beers. My mash



Homebrewer David Griffiths spends his winters in Southwest Texas in a 30-foot-long travel trailer (above). When brewing in such a small space, Griffiths uses a five-gallon plastic bucket as a primary fermenter and a three-gallon glass carboy as a secondary. Mashing, sparging, and boiling are all done on a picnic bench when Griffiths is brewing on the road.

tun is a two-gallon insulated beverage cooler. In place of a false bottom I use a mashing bag. The mesh bottom of the bag is sufficient to contain the grain, and it supports

the proper formation of a filter bed. Rather than simply steeping the specialty grains, I do a complete mini-mash infusion conversion.

I brew 3.5-gallon batches and

keg the beer (in three-gallon Cornelius kegs) rather than bottle it. My primary fermenter is a five-gallon plastic bucket, and I use a three-gallon glass carboy as a

My First Recipe — Roadkill IPA (3.5 gallons, partial mash)

My favorite beer styles are English ales, porters, and barley-wines. My first brewed-on-the-road batch was an IPA.

The hops were fresh. I lowered the hop utilization by 20 percent because the wort's specific gravity during the boil was 1.094. The beer has a pronounced bitterness, although not out of balance with its maltiness. Nevertheless, I suspect that a 20 percent reduction is overly conservative, but that's what makes homebrewing fun (and an art, not a science).

I used Wyeast 1056 (American ale), a one-pint starter made the day before brewing. I chose this yeast for its attenuation and low ester production. Alternatively, I would ferment this brew with Wyeast 1098 (British ale), a personal favorite.

Ingredients:

- 2 lbs. British two-row pale malt
- 0.5 lb. crystal malt, 10° Lovibond
- 0.5 lb. wheat malt
- 3 lbs. Coopers light malt extract
- 1 lb. extra-light dry malt extract
- 2 oz. Cascade hops (5.5% alpha acid, 11 AAUs): 1.5 oz. (8.25 AAUs) for 60 min., 0.5 oz. (2.75 AAUs) for 20 min.
- 2 oz. Kent Goldings hops (5% alpha acid, 10 AAUs): 1 oz. (5 AAUs) for 20 min., 1 oz. (5 AAUs) for 5 min.
- 1-pt. starter of Wyeast 1056 (American ale)

Step by Step:

Heat 2.75 gal. water to strike temperature (172° F). Mash grain at 151° F for 60 min. Raise mash temperature to 157° F for 15 min. Mash out. Sparge with balance of

the water. Collect no more than 2 gal. of wort.

Add malt extracts and bring to a boil. Total boil is 60 min. Add 1.5 oz. Cascade hops and boil 40 min. Add 1 oz. Kent Goldings and remaining Cascades and boil 15 min. more. Add remaining Kent Goldings, boil 5 min. more, then add cold, pre-boiled water to achieve 3.5 gal. wort. Pitch yeast at 75° F.

Ferment at 68° F for about four days, then transfer to secondary. Condition in secondary for a week.

Boil gravity = 1.094

OG after adding water = 1.054

FG = 1.009

Bitterness = 60 IBUs (estimate)

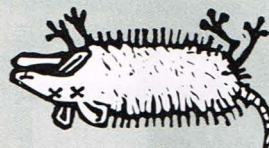
Analysis:

Taste profile: Initial maltiness and good mouthfeel followed by predominant hop assertiveness and a long hop finish.

The subtleties: In my original recipe I estimated higher extract from the specialty grains, consistent with what I have routinely realized in my all-grain brews. In the partial mash I only realized 20 points per pound. Normally I obtain 28 to 30 points.

The temperature stop at 157° F was probably unnecessary and yielded nothing. An iodine test after one hour at 151° F showed complete conversion.

Ultimately, I could have added more dry malt extract to achieve the original boil gravity target (1.112), but I chose to run out the experiment at the 1.094 gravity achieved. I reduced the hop quantities to accommodate the true boil and fermentation gravities.



After sparging at 168° F with the balance of the original water allowance, I

collected slightly less than two gallons of wort and added the Coopers malt extract and the dry malt extract, attaining the boiling gravity.

At home I cool hot wort with a counterflow heat exchanger. I chose not to bring it because of its bulk. Instead, I filled the trailer's shower basin, nearly as deep as the boil pot is tall, and immersed the pot in the cold water; necessity is the mother of invention. The beer shows no evidence of athlete's foot or any other contamination.

The beer fermented to 1.012 in four days. The temperature never reached more than 68° F. I racked the beer to the secondary, and it finished a week later at 1.009.

More About Hop Bitterness:

There are a number of factors that might have affected the perceived hop bitterness. Mentioned earlier is a suspicion that my estimate of 20 percent reduction in hop utilization is too aggressive.

Second, the Wyeast American ale strain, from my experience, ferments cleanly. There are no estery flavors to compete with the hops.

Last, Texas Hill Country water is notoriously hard, which undoubtedly accentuates the hop bitterness. The RV resort management confirmed this, although they didn't have a water analysis report handy. The water supply is a deep well.

secondary fermenter. I travel with two three-gallon Cornelius kegs. With two of the six-cubic-foot refrigerator's shelves removed, I can chill one keg and still have room for food. Consequently, I can have two beers "in the can" (kegged), with one chilled.

The five-gallon bucket has sufficient head space to allow krausening without messy blow-out, and when I rack to the secondary I fill the carboy to the bottom of the neck, which is slightly more than three gallons. When I subsequently rack to a keg, leaving behind the dregs, the excess ensures a full keg of clear, bright beer.

I boil the wort at high gravity, adjusting the hop utilization estimates for the higher gravity. My boiling kettle is a stainless steel pot with a four-gallon capacity. This choice was based on two considerations: The storage space for the pot is small, and the pot's headspace is nearly foolproof against

boilover. The picture of sugary wort caramelizing on the trailer's small gas stove — its sides and innards are almost inaccessible for cleaning — was not one I wanted to face. This strategy led to the following equipment list.

- Mash tun: 2-gal. insulated cooler and mash bag
- Brew pot: 4-gal. stainless steel stockpot with lid
- Primary fermenter: 5-gal. plastic bucket with lid and spigot
- Secondary fermenter: 3-gal. glass carboy
- 2 3-gal. Cornelius kegs
- Carbon dioxide: 5-lb. canister, with regulator and hose

Miscellaneous equipment included two airlocks, a siphon hose with check valve; a mash run-off hose; a bottling hose; a thermometer; a hydrometer with sample tube; a stainless steel, long-handled spoon; four 16-ounce or 22-ounce snap-cap bottles (Grolsch-style bottles); and one bottling wand with check valve.

Storage space is at a premium in the trailer. All of the equipment, except the two kegs, stores compactly in the space beneath one seat of the trailer's dinette.

I set up my mash tun, brewpot, and bucket for mashing, sparging, and boiling in the trailer's small kitchen. The fermenter and brew pot each have two roles. I heat pre-measured mash and sparge water in the pot, and I collect the sparge runoff from the mash in the plastic fermenter. The stove's open oven door forms a shelf at a convenient height for collecting the wort, both while sparging and subsequent to boiling. (It's a good idea to support the oven door with a box or two-by-four to avoid straining its hinge.) And I'm careful about cleaning and sanitizing the fermenter after transferring the wort to the brewpot.

Temperature Control

At home I carefully control the fermenting wort's temperature,

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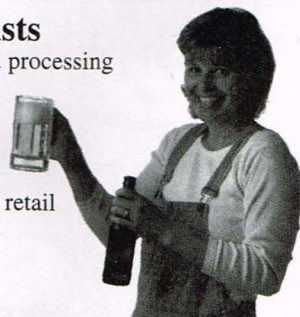


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CIRCLE 7 ON READER SERVICE CARD



Brew day in the trailer: A cooler acts as a mash tun and an open oven door makes a convenient shelf for sparging (above). With two shelves removed, this refrigerator can chill a keg (left).



essential for quality and batch-to-batch consistency, with a temperature-controlled refrigerator dedicated to brewing. I have nothing with which to control the trailer's temperature other than its woefully inefficient forced-air furnace. During the 11-day period that my first beer was fermenting, the ambient temperature plummeted to below 30° F at night and climbed to 80° F in the daytime. I hadn't come prepared for these extremes. The solutions bordered on silliness but were effective.

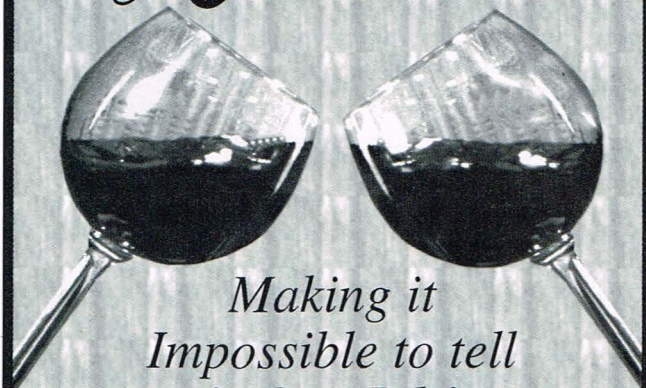
During the warm days I covered the secondary carboy with a moistened T-shirt; at night I replaced the T-shirt with a British Royal Navy sweater: crew-necked, thick wool. I have only the taste of the resulting beer to verify the efficacy of these controls; it's great.

Improvements

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CIRCLE 28 ON READER SERVICE CARD

cleaning and sanitizing brushes and chemicals. That was easily remedied because there is an excellent brewshop in San Antonio. I had researched its stock via the Internet before leaving.

My plans relied on purchasing my specialty grains locally, as fresh as possible. If, however, I had not had the luxury of a nearby brewshop, I would have gotten by with bleach and drugstore iodine (for the stainless steel kegs), and I would have packed a supply of grains for the beers I anticipated making. There is sufficient space in the trailer refrigerator's freezer compartment for at least 10 pounds of grains before encroaching on food storage space, and hop pellets or plugs occupy very little room.

The one major improvement indicated is an alternative burner. I presently use the trailer's cooking stove. The pot doesn't span two burners, so I am limited to using only one. A single burner only emits 4,000 or 5,000 BTUs. With a starting wort temperature of approximately 130° F, bringing two gallons of high-gravity wort to boiling takes about 40 minutes.

I am currently searching the local stores and mail-order catalogs for a single, portable burner and regulator that generates 30,000 to 35,000 BTUs. I can access my trailer's LP gas system with an adapter hose, and mash, sparge, and boil on a picnic bench.

I've considered managing water composition by using distilled or bottled spring water and adding hardeners that match the water profile appropriate for the beer style. But I probably won't do this. I like to keep my brewing simple, and I enjoy the occasional surprises.

Sharing the Beer

A San Antonio brew club, the Lager-Rhythmics, with typical Texan friendliness, admitted me as a guest. Sharing and critiquing homebrews is the centerpiece of their meetings. I don't have a counter-pressure bottler, and I didn't want to tote the keg, but I wasn't stymied.

I prefer the low carbonation of a

typical English pub cellar. If I chill empty bottles in the freezer for 10 minutes, I can fill the bottles directly from the keg with a minimum of foaming. The snap-cap bottles, listed among the miscellaneous equipment, serve this ad-lib bottling well.

October will see me on the road again heading for Warm Country. My improved on-the-road-brewing

kit will be with me. Come December I'll be sharing a fresh batch with my nomad neighbors and members of a local club. I think I'll do a porter first; Y2K deserves welcoming with a fine brew.

David Griffiths is a retired engineer and a member of the Hop River Brewers in Connecticut, his summer home.



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CIRCLE 9 ON READER SERVICE CARD

BREW YOUR OWN October 1999

POP ART

Brew your own...soda? Well, why not? If you have the equipment to brew beer at home, you have the equipment to make your own soda. There are a lot of reasons to make soda. You can make brewing a family activity without raising the neighbors' eyebrows. You can have something nonalcoholic but different for a picnic or other event. You can experiment with flavors without the time and monetary investment that goes into a batch of beer. Or you can just try something new.

There are several options available to home soda makers. You can choose to use a premade kit, make your own soda base and add fruit extract or other flavorings, or make your soda entirely from scratch. In other

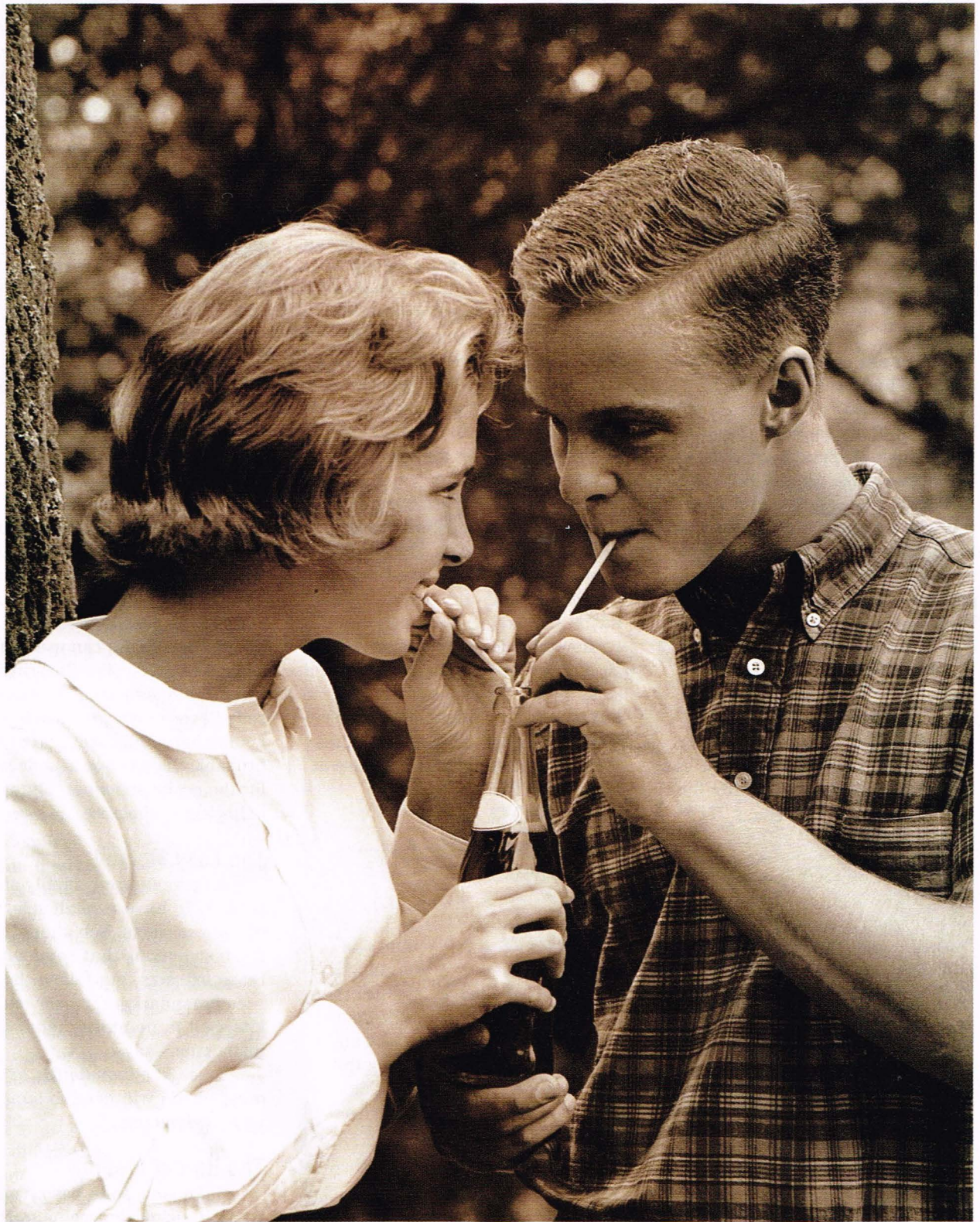
words, the range of options is about the same as it is for brewing beer. Kit, modified kit, or whole grain, the choice is yours.

The Basics

Compared with brewing beer, making soda is fast, easy, and cheap. Even a batch from scratch takes only an hour or so to make and can be consumed within 24 hours. The procedure for making soda is pretty much the same as it is for making beer: heating, cooling, and carbonating. And sanitization is every bit as important as it is for beer. In fact it is more important for soda, because you will not be introducing a good healthy yeast population to outcompete all the undesirable microbes.

Unless you have a kegging

by Polly Goldman



system and can carbonate artificially, you will be using natural carbonation supplied by yeast. This means that your soda will have a negligible amount of alcohol in it. You will be stopping the fermentation process quite early in the game, and the alcohol should not be noticeable. Should you fail to stop the fermentation, the results will be about the same as if you had dumped cane sugar into your beer. Your soda will be cidery and not in the least bit sweet.

If you use natural carbonation, bottle and add yeast to start the carbonation process once your soda base is at about room temperature. You should use plastic soda bottles. Do not use glass. Should you over-carbonate in glass, you may find yourself with little glass grenades. In addition plastic bottles allow you to "feel" when the carbonation process is finished. When the bottle is rock hard, it is time to refrigerate it to stop the carbonation process. If you need a comparison, try squeezing a commercial plastic bottle of seltzer.

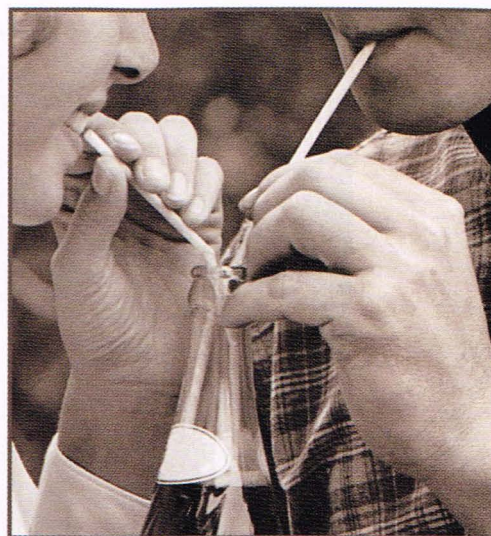
Your soda will probably be ready to be refrigerated after it has been left at room temperature for

12 hours.

You can use wine, beer, or Champagne yeast. Wine and champagne yeast strains are generally recommended, because they impart little yeast taste to the finished product. If you choose to use beer yeast, use ale yeast. Lager yeast cells continue to ferment at refrigerator temperatures, and you do not want this to occur. Do not use bread yeast unless you want a strong yeasty taste.

If you are using dry yeast, rehydrate it first. One packet of yeast works for five gallons of soda, and about half a teaspoon of a yeast slurry made from one packet of dry yeast rehydrated in one-half cup warm water works for a two-liter bottle.

Which carbonation method is best? Many soda makers prefer artificial carbonation. You get an alcohol-free soda, no yeast at the bottom of the bottle, and no yeast flavor. Use 30 PSI and hook the carbon dioxide to your "out" valve so that the CO₂ bubbles through the soda on its way to the top of the keg. With your soda chilled to the low 30° F range, about 10 minutes of shaking is sufficient. Dispense at eight to 10 PSI.



The Ingredients

If you pick up a can or bottle of your favorite commercial soda and read the list of ingredients, you will find that it has four basic elements: water, sweetness, flavor, and acid. You will want the same four basic elements in your homebrewed soda. For sweetness you can use cane sugar and honey. For flavorings you can use anything from a commercial soda flavor to whole ingredients. Lemon juice and citric acid are probably the most accessible sources for the acid component. The acid helps counterbalance the sweetness.

The Easy Method

Your homebrew supply store is likely to have a small selection of soda extracts. You should follow the instructions that come with these extracts, but follow the same recommendation for beer extract kits; boil it, no matter what the instructions say.

These kits include the extract only, so you will need to supply your own sugar.

The Harder Method

Make your soda base from scratch, using the recipe in this article, and add natural fruit extract or another source of fruit flavoring.

Realistically, this is no harder than using the preformulated soda extract, except that it might require a little creativity on your part.

Brewing Soda vs. Beer: Some Differences

- Once made and carbonated, soda should be kept refrigerated. You have a much higher chance of spontaneous fermentation with soda than with beer, because the sugar level in the end is much higher.
- Do not bottle in glass. There's just too much chance of spontaneous fermentation and

exploding bottles.

- Soda does not need to age and should be consumed quickly.
- Prepackaged soda extracts can impart a permanent flavor to your plastic equipment. Root and birch beers are infamous for this.
- Soda is ready the next day.
- You can drink homebrewed soda and drive, legally.

The Hardest Method

Use a scratch soda base and whole ingredients, such as ginger or other roots, herbs or spices.

This is still not very difficult, but you will have to make some decisions about how best to get the flavor from the ingredients. For example if you are making ginger ale, you will want to boil the ginger with the soda base. However, if you are making a pepper soda, you will probably want to add the pepper at the end of the boil to avoid getting a cooked pepper taste. Experimentation is the key to success here, and you'll want to play with a scaled-down version of the soda base so that you can try different flavors without committing to a five-gallon batch.

Choosing Flavor

The sky is the limit when it comes to flavors. Soda makers have made birch and root beer from extract kits; raspberry and cranberry soda using natural fruit extracts; ginger ale, garlic soda, and habañoero soda from fresh ingredients; guava soda using a concentrate found in an ethnic market; celery soda from celery seed (there's a commercial soda called Dr. Browns Cel-Ray soda — it's an acquired taste — to replicate it try one-quarter cup of celery seed added to the boil); and coffee soda from coffee.

Cream soda uses vanilla for its flavor. Root beer's primary ingredients are wintergreen and sassafras. Real sassafras is carcinogenic, so artificial or natural substitutes for the sassafras flavor are used in all commercial extracts and sodas.

One word of caution about using fresh fruit: Heating it is going to bring out pectin, the same substance that forms the base for fruit jellies, and give you a cloudy soda. Unless you want to add pectase, an enzyme that breaks down pectin, fresh fruit is probably not the best ingredient. The general rule about when to add ingredients is that herbs and spices should be boiled with the soda base, while fruits (including pepper),

should be added to the hot base after the boil is finished.

Think about your consuming audience when deciding what to make. Most children consider the ginger ale recipe included below much too strong. Try using one-half or one-third the ginger if it is for the kids. One home soda maker learned her lesson about knowing her consuming audience in a club

soda competition. Upon arrival she learned that the judges would be children. The sophisticated but strong ginger ale and habañoero sodas were trounced by one flavored with Kool-Aid. The next year the judges were adults, and she took all the ribbons.

Finding Ingredients

Soda extracts are available from



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most stores that sell homebrewing supplies. Very high quality, 100 percent natural fruit extracts can be ordered by mail from some companies, such as HopTech (www.hoptech.com/). HopTech's extracts are very concentrated, and they offer raspberry, blueberry, cherry, peach, cranberry, apricot, and pear, as well as root beer flavoring.

Your local ethnic grocery is a wonderful source for fruit concentrates of all sorts. You might find guava, mango, papaya, sour cherry, and tamarind syrups at the stores. Be sure to check the label because some are presweetened and some are not. Taste them and play around with the sugar levels in your soda recipe.

Recipes

The sugar/honey proportion is a matter of personal taste. Some home soda makers like to use some honey because it adds body and the

proteins aid in head retention. Many prefer a light honey, but you can make a fantastic root beer using a dark honey. Some concoctions, such as cinnamon soda, might benefit from the use of a dark, spicy honey.

Basic Soda Base (2 liters)

Ingredients:

- 2.25 liters water (some will boil off)
- 1/4 cup sugar
- 1/4 cup mildly flavored honey, such as clover
- 4 tsp. lemon juice (added at end of boil)
- 1 tsp. per liter of yeast mix, from 1 packet Champagne yeast, rehydrated with 1/4 cup of warm tap water and 1/2 tsp. sugar.

Step by Step:

Boil water, sugar, and honey, stirring to dissolve honey and sugar, for at least 15 min. Add lemon juice

and cool. Add yeast and bottle, or skip the yeast and use artificial carbonation.

Notes:

Flavoring: Fruit extracts vary widely in the intensity of their flavor, and you will need to experiment to decide how much to use.

Sweetness: There is nothing magical about the amount of sugar and honey, and you should adjust this recipe to your own tastes. Adults generally prefer less sweetness, children more. As a rule commercial soda makers aim for a gravity of 1.040 to 1.048. That's the equivalent of about 7 oz. or 2 1/4 cups of cane sugar per gallon, 2 oz. or 2/3 cup per liter.

You can use all sugar, but the use of honey adds a little body. You can also use corn syrup, molasses, or any other natural sweetener.

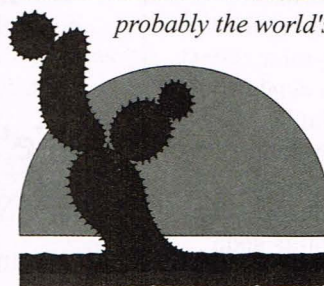
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Basic Soda Base (5 gallons)

Ingredients:

- 5.5 gal. water
- 2 cups sugar
- 2 cups mildly flavored honey, such as clover
- 6 oz. lemon juice

Step by Step:

Follow the step by step instructions from two-liter Soda Base recipe.

Ginger Ale (5 gallons)

Ingredients:

- 5 gal. soda base
- 1 large adult "hand" of ginger (about 6 oz.), peeled and chopped
- 1 Tbsp. dried ginger (optional), added to boil
- (optional) 1-2 hot peppers, sliced and steeped after boil

Step by Step:

Follow the ingredients and general instructions for the 5 gal. soda base. Chop the fresh ginger in a blender or food processor and add it to the soda base's boil. You can also add dried ginger to the boil if you want more ginger flavor. Another optional flavor addition is a hot pepper or two. Slice the pepper and steep it in the soda after the boil as the mixture cools. Strain the mixture prior to bottling.

Notes: A "hand" is about the size of an adult man's hand. The quality of ginger you find in stores varies widely. You want fresh ginger that is plump and has a thin, shiny skin. Your local Asian grocery store is probably your best source.

Coffee Soda (2 liters)

Before trying this recipe, add molasses to a cup of coffee to decide whether you like it. This recipe does not use the soda base.

Ingredients:

- 2 liters good-quality coffee

- 1/4 to 1/2 cup sugar
- 3 Tbsp. molasses
- 1 tsp. per liter of yeast mix, from 1 packet Champagne yeast, rehydrated with 1/4 cup of warm tap water and 1/2 tsp. sugar

Step by Step:

Prepare the coffee in your usual way. Add the sugar and molasses to the coffee when it is hot from your

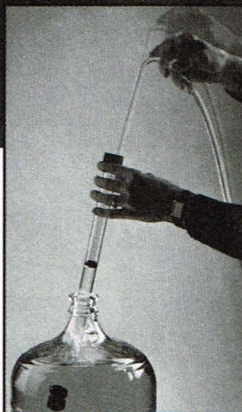
machine. Do not boil the coffee! Cool.

Add yeast and bottle, or skip the yeast and use artificial carbonation. 

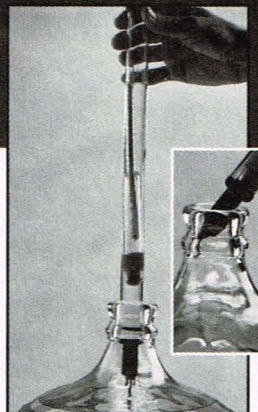
Polly Goldman has been home-brewing and making soda since 1991. She is a BJCP national judge and recently spoke at a Smithsonian educational event about the history, science, and making of soda.



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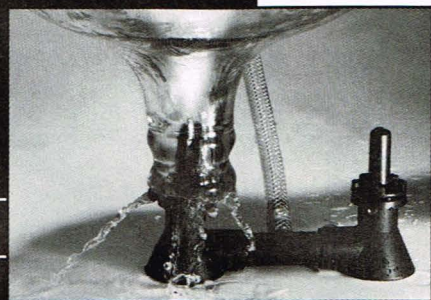
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Great Tips From 4 Top Women Brewers

by Gretchen Schmidhauser

A decade ago women brewers were rare. Today, dozens of women have made a name for themselves at breweries across the United States. We asked four successful women brewers to give us their best tips for homebrewers.

Name: Darrah Bryans, Head Brewer
Brewery: Brew Moon Restaurant & Brewery, Cambridge, Mass.
Experience: Four years homebrewing experience, six years professional experience
House Beers: Moonlight Lager, Munich Gold, Alternative Ale, Prussia's Pride, Planetary Porter
Advice: Invest in the right equipment.

Darrah Bryans, an international policy studies major in college, was bitten by the brewing bug while she lived in Washington, D.C. After working at a brewery for several years, she decided to pursue her brewing education in Germany, graduating from Doemens School, a

renowned brewing academy in Munich.

She believes there's really only one thing that separates the professionals from the amateurs: "We have the big toys," she says. Bryans is convinced that having the right equipment is the best way for



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homebrewers to get ideal results.

"Homebrewing is so imprecise. Having the right equipment can make a big difference," says Bryans, who homebrews with her husband. From milling to fermentation, good equipment for the process is simply a must for serious homebrewers.

For those who buy whole grain, Bryans believes a mill should be part of a home brewery. While the rolling pin method does an adequate job of crushing grains, only a properly set mill gives you the right crush, thus ensuring good conversion of starch to sugar during the mashing process. Properly milled (cracked, not pulverized) grain also limits the chance of a stuck mash.

When mashing, Bryans says, you don't need to know a lot about mashing technology to get good results. Although a colander works as a down-and-dirty lauter tun, a better choice is a plastic bucket with holes drilled in the bottom. That way your entire mash fits in

one vessel, so you avoid the many problems created by mashing piece-meal in the smaller container.

Also on the "must have" list for homebrewers is a wort chiller. "After homebrewing for a while, we finally bought a wort chiller. I couldn't believe what a difference it made," she says. "Before that, we'd cool the wort in an ice bath." The savings in time was a definite bonus. Plus, bringing down the temperature of wort quickly so yeast can be safely pitched is a key element in avoiding contamination.

Adding a gas burner to her home brewery also made a world of difference, Bryans says. A heat source more powerful than the stovetop not only saves time by bringing the liquid to a vigorous boil more quickly, it provides better temperature control, allowing the brewer to hit specific strike temperatures in the mash with more accuracy. Precise temperature control is a key element in successfully replicating a recipe.

To control fermentation, especially if you're interested in brewing lagers, buy an old refrigerator and install a temperature control.

Last but not least, Bryans advises, don't skimp on the brewpot. Buy a stainless steel pot that's the right size for the batch you plan to brew. Don't buy the cheaper aluminum version. Not only are stainless steel pots stronger and likely to last longer, an ample, good quality brewpot prevents sticking, distributes heat evenly and, to some extent, helps prevent boilovers.

Bryans thinks it's important to pay attention to auxiliary equipment, too. The little things can make a big difference. For example, she says, choose a good floating thermometer instead of a cheap version that could break and contaminate your wort.

To make sure you get the equipment you need, she says, develop a relationship with a well-stocked homebrew store with knowledgeable staff.

Name: Barbara Groom, Brewmaster and Co-owner
Brewery: Lost Coast Brewery & Cafe, Eureka, Calif.
Experience: Nine years professional experience
House Beers: Alley Cat Amber Ale, Downtown Brown, Eight-Ball Stout, Lost Coast Pale Ale, Raspberry Brown Ale, Great White Beer, Indica India Pale Ale, Winterbraun Holiday Ale, Lost Coast Wheat, Lost Coast Apricot Wheat
Advice: Don't be afraid to experiment.

In the six years it took Barbara Groom and her partner to get Lost Coast Brewery and Cafe up and running, she had ample time to educate herself about brewing. Some homebrewing, a lot of reading and research, and formal training at Siebel Institute, a Chicago brewing school, formed the basis of her brewing education.

Although she brewed only about 20 batches as a homebrewer,

Groom had the opportunity to familiarize herself with the process and to do plenty of experimenting. At that time the variety of supplies available to homebrewers was limited. Liquid yeast, for example, was unheard of. Dry yeast was often unreliable, but Groom solved the problem by getting yeast from a local brewery.

By the time the brewery opened in 1990, Groom was more than

ready to try her hand at large-scale brewing. Groom's philosophy is to brew what she likes — flavorful, full-bodied, well-balanced beers. Now that Groom — and her beers — are established, she sometimes misses having the opportunity to experiment. Professional brewers generally learn early on that consistency is one of the keys to success. The need for consistency can pretty much shut



the door on experimentation.

Her advice to homebrewers is to be adventurous, especially with the large variety of yeast strains available today. "That's one thing we can't do in the brewery, experiment with yeast. Homebrewers have the opportunity to try (yeast strains) out," Groom says.

Another advantage homebrewers have, she adds, is the ability to experiment with a variety of additives, including fruit (both fresh and extracts), coffee, maple syrup, and whatever else strikes an individual brewer's fancy.

One worthwhile experiment involves taking one batch of beer and splitting it into two fermenters. By using two different yeasts, you've created two brews in one. Compare the different fermentations. Do you prefer one over the other? Make sure to take detailed notes throughout the process so that you can replicate it later. Maybe you'll learn, for instance, that the German ale yeast — and not the American version — really gives your beer the right touch. If you have limited time to brew, this is a great way to satisfy that homebrewer's curiosity.

Splitting a single batch is also a good way to play around with hops. Consider dry hopping one half of a batch and not the other.

Yeast aside, take full advantage of the selection of hops and malt now available on the shelves of homebrew stores and through mail-order companies. Don't be afraid to substitute the hops or one specialty grain for another. A word of caution: Don't change too much at once. The best way to chart your progress is to alter one ingredient at a time. Otherwise, you might not realize what it is you like about the modification.

Groom also recommends all-grain brewing rather than extract as the best way to create the widest variety of beers.

Name: Melanie Miller, Microbiologist
Brewery: Sierra Nevada Brewing Co., Chico, Calif.
Experience: 10 years professional experience, chemistry and biology major
House Beers: Sierra Nevada Pale Ale, Pale Bock, Summerfest, Celebration Ale, Porter, Stout
Advice: Practice good sanitization.

When Melanie Miller started working at Sierra Nevada Brewing Co. in 1989, brewers were responsible for performing lab work. After about eight years of brewing, the two functions were formally separated and Miller moved over to the laboratory full time.

From day one, Miller has paid special attention to sanitization. Simply put, she says, good sanitization is an easy way to



produce a better product. "Personally, I feel you can't be too clean. On the other hand, you don't want your beer to taste of

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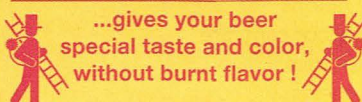
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chemicals," Miller says. The trick is finding the right balance.

For homebrewers that means finding the right agents for cleaning and sanitizing — ideally, something safe, easy to use, and economical.

Miller is a firm believer in chlorine as a sanitizing agent. In fact while many breweries have switched to other sanitizing agents, chlorine is still used in powdered form at Sierra Nevada. For homebrewers, unscented household bleach provides good results for virtually anything that contacts the wort or beer after the boil. Contact time should be limited, however, because overexposure to bleach can damage stainless steel and yellow plastic. Thorough rinsing with hot water is also necessary, because bleach can pit stainless steel if it remains in contact too long.

Miller thinks commercial iodine preparations, such as iodophor, are also excellent sanitizing agents. They are more costly than regular bleach, however. One big advantage is that iodine used in the proper proportions doesn't taint flavors, as bleach does, and requires no rinsing. Homebrewers also have at their disposal a number of commercial preparations designed especially for home use. These, too, work well but tend to be more expensive than bleach.

But before you even think of sanitizing a surface, says Miller, be sure it is completely clean and free of residue. While commercial breweries use an acid or caustic cleaner for that purpose, homebrewers can do just as well with a good brush and a little elbow grease. Cleaning or at least rinsing equipment immediately after use is the best course of action.

Miller stresses that while sanitization is important throughout the brewing process, it is essential for every step after the boil.

"Everything has to be clean, your hands included. Pull back your long hair. Try not to breathe directly on anything. If you're covered with grain dust, change your shirt or clothes. Make sure that anything that's going near the beer is clean and sanitized," she says.

Name: Katie McGivney, Quality Assurance Analyst

Brewery: New Belgium Brewing Co., Fort Collins, Colo.

Experience: Nine years homebrewing experience, four years professional

House Beers: Fat Tire Amber Ale, Sunshine Wheat, Abbey, Trippel, Blue Paddle Pilsner, Porch Swing, 1554, Frambozen, Saison

Advice: Recognize the importance of quality control.

Working as a packaging assistant at New Belgium Brewing Co., Katie McGivney never fully understood the brewery's relationship to the laboratory. As she progressed through the ranks, eventually working full time in the lab, the importance of that relationship became crystal clear. "I love it. I've learned so much more about brewing," she says.

She acknowledges that professional brewers have many more resources available to them, but homebrewers can still take measures to exercise quality control of both their raw ingredients and their finished product. Checking your ingredients prior to brewing prevents problems in your finished product.

The only way to discern fresh ingredients from unsatisfactory ones is to use your senses and become familiar with the raw materials. Malt, for example, should not taste stale, nor should it appear moldy. Malt extract should appear fresh with no mold or residue. Whole hops should not be yellowed or have a cheesy smell. You can even make a "hop tea" with the hops you plan to use. Put a few pellets or leaves into a teacup and fill about half way with 158° F water. The taste and aroma of the hop tea are good indicators of the taste and aroma the hops will create in your beer.

Tasting your brewing water is



also a good practice. If your local water tastes strongly of chlorine and you're brewing a small batch, consider using bottled water.

Unfortunately, unless you are propagating your own yeast you will have little control over the quality of the yeast that is pitched.

Of course the worst-case scenario is that you've already brewed and bottled your beer only to discover something is horribly wrong. Maybe it's an off-flavor such as a medicinal or buttery taste, both of which can be signs of bacterial contamination. Maybe the beer tastes

like cardboard, indicating that too much oxygen was present in your bottles. Or perhaps your beer appears seriously overcarbonated, again a sign of contamination or just too much priming sugar.

Determining the underlying cause of your beer's malady — with the intention of correcting the problem — is not as difficult as you might think, according to McGivney. Once you've identified the off-flavor, a good homebrewing reference book should tell you whether your problem is poor sanitization or improper brewing technique. For example did you maintain a strong boil for the required length of time? A vigorous boil will drive away sulfury (rotten eggs) smells and tastes. If you have a sanitization problem, be suspicious of your wort chiller, fermenter, bottle caps, airlock — anything that contacts the cooling wort.

McGivney also recommends performing simple tests such as taking specific gravities of your beer

throughout the brewing and fermentation process, as long as it can be done without compromising sanitization. Not only will you know if you're on target with the recipe guidelines, you'll also be able to track your fermentation. Bottling a still-fermenting beer is never a good idea.

One of the easiest tests to perform is a forced wort stability test, McGivney says. After brewing and prior to pitching yeast, set aside a small amount of wort in a sterile jar with a lid. Leave it at room temperature. If there's activity in the container, there's something wrong.

Taking notes on each batch is also a good idea. Record everything you do, including when an ingredient was added and the amount. This will help you replicate a particularly good batch, and it will help you trace the root of a problem if you discover later that something is off.

Gretchen Schmidhausler is head brewer at the Ship Inn, Milford, N.J.

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COMMON-SENSE CLEANING:

TIPS FOR THE AVERAGE SLOB

Good beer begins with good sanitation. For that reason successful homebrewers make cleaning procedures a habit, not an afterthought. That doesn't mean scrubbing your hands to the bone or freaking out when the dog's tail touches the kettle. It just means doing some basic chores for each and every batch.

So in the name of clean beer, take a look at the best ways to keep slime out of the brewhouse and delicious brews in the glass.

Brewing demands cleanliness and sanitization, two tasks with different but related goals. When you clean equipment, you remove the gunk and scum left after each stage of brewing. For the most part you focus on the gear's appearance, though your efforts also remove

bacteria-laden dirt and dust. In that respect the use of detergent and water forms the first step of the sanitization ritual.

A reliable cleaning toolbox includes brushes, scouring pads, sponges, hot water, and detergent. Occasionally, homebrewers add a few other things to the kit such as caustic soda. Caustic is an alkaline cleaner that removes trub and dirt but also reacts with aluminum to create hydrogen gas. Some people use it to wash stainless steel, but most homebrewers do quite well without the hassle of storing more potentially toxic chemicals in the house.

Conveniently, you can use bleach as both a cleaner and a sanitizer. When a carboy gets really

BY DAWNELL SMITH



funky, soaking it overnight in a chlorine solution does the trick. The next morning a quick brush and thorough rinse with hot water finishes the cleaning job.

Now you need to eliminate or minimize germs through some method of sanitization. When dealing with wort and beer-spoiling demons, you want an environment as free of bacteria and spores as possible, a difficult task, because some of these microscopic critters can endure high heat and hide in cracks and scratches.

Attention to sanitization becomes especially important when preparing fermentation vessels, siphon tubes, and anything else that contacts wort or beer after the boil. More often than not a flawed beer

results from some sort of avoidable contaminant. Good sanitization habits usually take care of the problem.

But remember that some bacteria and spores can survive sanitization procedures. Good yeast handling can help combat these survivors. Always pitch enough viable yeast cells to get things going at a healthy pace. With a good head start, yeast can prevent bacteria from drumming up enough strength to ruin the beer.

Yeast pitching, culturing, and handling techniques are topics unto themselves. Read up on these issues, and make sure you take gentle, loving care of your yeast to tame the unwanted beasts in your midst.



Sanitization Basics

Here are some popular, easy, and convenient methods for sanitizing equipment.

Heat

Boiling for 20 minutes, pressure heating for 30 minutes, or dry heating in an oven for an hour or two can sufficiently sanitize liquids and equipment.

Moist heat at 180° F or hotter works as an effective and easy sanitization method. Boiling wort for 20 minutes kills the bacteria in the kettle. Likewise, you can also boil bottle caps, utensils, wort chillers, and anything else that fits into a pot of bubbling water and won't melt. Some brewers even use microwaves to achieve and sustain effective temperatures for liquids such as yeast starters and solutions for priming sugars.

A pressure cooker works well for preparing wort agar and other media for propagating yeast. With 15 pounds of pressure at 250° F, it only takes 20 minutes or so to achieve sanitization.

Dry heat — 350° F — from an oven can sanitize bottles (and other glass) in an hour. If wrapped after they cool, bottles stay clean and sanitized for days, though it works best to heat them a short time before bottling. But be careful; this method can make bottles more fragile after repeated heating cycles.

Chemicals

Solutions of chlorine, iodine, and even alcohol can sanitize equipment and work areas. As general precautions, never mix chemicals, always read the directions, and wear gloves to prevent rashes and burns.

When using chlorine as a sanitizing agent, add about a teaspoon of bleach to five gallons of water at room temperature, then soak for 10 minutes. If the chlorine is to be used for cleaning, add two ounces of bleach to five gallons of water and soak overnight. Either way, rinse with hot tap water, sterile liquid, or grain alcohol to get rid of residual chlorine. Not only can

bleach cause off-flavors, it can also kill yeast or reduce its viability. On top of that it corrodes stainless steel and can be toxic.

When using iodine products such as iodophor, add a couple teaspoons to five gallons of water at room temperature and let soak. Keep in mind that iodine stains plastic and can cause an allergic reaction in some people. On the up side, drip-drying seems the way to go when using iodine-based sanitizers, though many people still prefer rinsing with hot water.

Rubbing alcohol and ethyl alcohol at 70 percent concentration can each disinfect utensils, countertops, glass, and rubber gloves.

Regardless of the cleaning and sanitizing methods you use, cover everything when you're done. You can use plastic wrap, foil, or even bleach-soaked paper towels to keep dust from settling on clean equipment. It pays to keep equipment covered, even if you plan to sanitize it later on.

Equipment Specifics

Now look at how to deal with specific brewing equipment.

Mashing Gear

You can clean plastic buckets, coolers, and stainless steel with hot water and a sponge. Generally, you don't need to sanitize this gear, though time and use can chip and scratch plastic surfaces, giving bacteria a place to hide. This may not cause a problem right away, but some organisms can contaminate wort during the mash. (Heating the mash to 170° F at the end, called mashing out, helps kill most microbes.)

Every once in a while, soak the vessel in really hot water or sanitizer, then vow to get rid of it when it looks really rough or cracked.

As for spoons, paddles, and the like, just wash them in soap and water, then let them drip dry. Since this part of the brewing process comes before the boil, you needn't worry too much about disinfectants.

Boiling Equipment

Wash brewpots with soapy, hot water and a sponge or scouring pad. Use the least harsh pad to reduce scratches, and soak the pot to prevent the need for excessive elbow grease. It pays to rinse everything thoroughly with hot water to get rid of soap residue.

Once the boil ends, don't stir or add anything to the wort. From this

point on, dunk or submerge each tool in a bucket of sanitizer before using it to collect, move, or touch wort or beer. As always, rinse if using bleach.

Wort Chillers and Strainers

Drop wort chillers into a bucket of sanitizer, rinse thoroughly with hot water, and set into the kettle 10 minutes before the end of the boil.

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That should kill anything on the coils as long as you clean the chiller after each use. Use a sponge and water, preferably with a shower head or spray nozzle, to really wash every curve and angle.

Similarly, you can soak strainers, wort-collection containers, and other utensils in sanitizer for a while, then rinse as necessary. If you want, drop them into the wort before the end of the boil to take advantage of the moist heat.

Fermenting Vessels, Tubes, and Other Essentials

Thoroughly sanitize anything that touches the beer or wort after the boil. Carboys, tanks, stoppers, siphon tubes, and anything else in your repertoire of gear absolutely must get soaked in sanitizer or boiling water. Stick with chemical sanitization methods for soft plastic parts to avoid melting them into mangled dog toys.

To properly disinfect siphon

tubes dunk one end in the solution and slowly coil the rest into the liquid until it's completely filled and submerged. For sanitizing glass carboys, simply soak them for 10 minutes with bleach or an hour with iodine solution.

As mentioned before, plastic gets scratched, pitted, chipped, and stained. These tiny hideouts can harbor and protect bacteria, so get rid of anything that looks worn out, beat up, or worrisome.

Bottles and Kegs

Bottles get the same treatment as glass carboys. Clean them as soon as they empty, then look inside the neck to detect any grungy material or stains. Soak for an hour in bleach mixed at two teaspoons per five gallons of water if they look dirty, then rinse them thoroughly. If they look okay, wash them in the dishwasher. Store uncovered and upside down.

Right before bottling, immerse

bottles in sanitizer for five minutes or more, then rinse if using bleach. As an alternative, put the clean, label-free bottles in the oven at 350° F for an hour. Let them cool in the oven, then cover or wrap with foil until use.

Before capping, boil bottle caps for 20 minutes or more.

Since chlorine corrodes stainless steel, consider using iodine for kegs. Clean them as soon as they're empty, then soak and wash them vigorously, taking apart the inlets, outlets, and tubes for a thorough scrub. Once your kegs are cleaned and rinsed, look inside with a flashlight to make sure each one looks shiny and free of residue.

Now, sanitize the keg and keg parts with iodine solution.

You, the Brewer

You carry bacteria on your hands, mouth, and everywhere else, making it critical to wash and sanitize yourself. Ideally, use gloves dunked in sanitizer before touching anything.

A spray bottle with rubbing alcohol gives you something easy and quick to use to clean gloves, countertops, utensils, work areas, and anything tainted by your nosy spouse. It does the job, then evaporates quickly.

Above all, keep your hands out of the beer. Avoid touching the wort or beer after the boil, and don't use your mouth to start the siphon tube's flow. Instead, submerge the tube in water until it fills completely, then put one end into the wort and the other into the receiving vessel. The top of the receiving vessel should be located below the bottom of the vessel containing the wort. If you insist on starting the transfer with your mouth, gargle with vodka or whiskey first.

That brings you to the ultimate mission of all this sweat and toil. Cleaning and sanitization take little more than time and effort yet yield something fundamentally sublime: the foamy fruits of labor. With so much at stake, even the average slob should heed Mr. Clean's advice.

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All-grain: **The Best Mash Program**

by John Oliver

Choosing the right mash program for your beer depends on your brewing goals, your equipment, and your time.

The mashing process is the key to all-grain brewing. During the mash, hot water breaks down the long-chain carbohydrates and proteins provided by malt into simpler, smaller units that serve as food and nutrients for yeast during the fermentation process. Furthermore, the proteins and sugars that are created also affect the body, head retention, aroma, and flavor profile of the finished beer.

There are three basic mashing styles, usually referred to as infusion, temperature program or step, and decoction. Within each of these mashing styles there are subtle variations in techniques that offer myriad combinations for creating sweet wort from grain and water.

Any mash program will likely result in a satisfactory conversion of starches. But to determine which mash program is the best particular one for you and the beer you are brewing requires a little bit of knowledge about how and why each of these styles evolved and its effect on the finished beer.

It is also important to realize that while certain beer styles are created most easily by using the appropriate mash program for that style of beer, historically many of the characteristics of the styles in question evolved as a result of the mashing techniques used, not the other way around. Particular mash styles evolved in response to three major variables: equipment, technology, and ingredients available. This is where you should begin when determining which mash style will work best in your own brewing.

Single Infusion

In the single-infusion mash a known quantity of water at a known

temperature is combined with a known volume of grain at a known temperature. Through the use of temperature charts or formulas, this results in a very consistent method of obtaining repeatable mash temperatures that are accurate within a few degrees. By shifting variables such as the temperature or volume of the strike water (the water into which you mix your grains), the final temperature of the mash can be adjusted up or down.

Advantages: This style of mashing is the simplest, requires the least amount of additional equipment, and uses a less expensive vessel. As such, it is usually the style used by homebrewers when they first make the move to all-grain or partial-mash brewing. Since heat is not applied directly to the mash, it is efficient to mash and laut (remove the wort from the grains) in the same vessel. This mash/laut combination can be as simple as a plastic bucket fitted with some form of false bottom and perhaps insulated to help maintain conversion temperatures as accurately as possible for the duration of the conversion process.

Minor adjustments to the strike and rest temperatures can be made by adding small amounts of cold or hot water to adjust a degree or two up or down. Conversion usually takes 30 to 90 minutes, so there is not as much time added to the brewing process as there is with some of the other mash programs such as step or decoction. Once the infusion of mash and water is complete and a consistent rest temperature is achieved, very little attention is required and the brewer is free to perform other activities such as cleaning, sanitization, or

household chores to help speed up the rest of the brew day.

The lack of special equipment required also makes this the mash program of choice for the majority of small brewpubs today.

Disadvantages: There are primarily enzymes at work in the mashing process, and each one has its own optimal temperature and performance range. Manipulation of

these different enzymes also provides a different character to the sweet wort and hence, the finished beer. Since the strike temperature is going to be pretty close to the rest temperature of the mash, most infusion mashes are done at a compromise temperature usually somewhere around 152° to 156° F. This results in a relatively fixed fermentability level; as a result, mash

efficiency, or the measure of sugars produced in the mashing process, usually suffers.

The inability to mash out (raise the mash to a temperature of 170° F to inactivate enzymes and decrease wort viscosity) further reduces the solubility and increases the viscosity (its thickness compared to water) of the wort, further decreasing mash/lauter efficiency. Since the mash will take place at a compromise temperature, it is imperative that only highly modified malts with a well-developed level of enzymes are used. This will help maximize the yield of the mash.

History: Infusion mashing was attractive to early brewers. Only one vessel was required to be heated. This one kettle could do multiple duty by heating the strike water, then later be used for boiling the wort. Early infusion mashes most likely did not incorporate any form of sparging, the process of spraying the grains with hot water to rinse as much malt sugar as possible. The sweet wort was simply run off into the kettle. The mash might have been saved to later be reinfused with more strike water for a second run-off of a weaker style of beer.

Later, as sparging was incorporated into the lautering process, the sparge water or hot liquor could be heated in the kettle and transferred to an insulated holding vessel until it was required for sparging. Almost any style of beer can be produced from any mash program, but those styles of beer such as British pale ales, stouts, porters, bitters, and brown ales that usually use highly modified pale malts are good candidates for single-step infusion mashing.

Step Mashing

Temperature program or step mashing differs from single-infusion mashing in that numerous temperature rests can be incorporated in the mash schedule. Resting the mash at a series of successively higher temperatures allows a wider variety of enzymes to work within their own optimal temperature ranges for a set amount of time. This results in more

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control for the brewer over the final characteristics of the sweet wort and the ensuing beer.

You can raise the temperature of the mash through the use of a mash tun to which heat can be applied or through repeated infusions of hot water to successively raise the mash to the appropriate rest temperatures.

The beta-glucan rest occurs at 118° F to reduce wort viscosity caused by gummy beta-glucans. This is especially important when using flaked barley, oats, and rye, as well as lightly modified malts.

The beta-amylase rest occurs at 135° to 140° F to increase wort fermentability, while the alpha-amylase rest takes place at 158° F to "convert" the mash.

Two rests no longer used by most commercial brewers are the acid rest at 110° F, which was formerly used to adjust mash pH, and the protein rest at 122° F, which current research indicates has no value.

Advantages: In this form of mashing, the brewer has a greater impact on the finished beer than he does using single infusion. Varying the times spent at the various optimal rest temperatures — or deleting certain rests entirely — dramatically

◆
**A wider variety
of enzymes can
be activated at
their optimal
temperature with
step mashing.**
◆

varies the resulting sweet wort, even if the grain bills are identical. Also, since a wider variety of enzymes can be brought into play at their optimal temperatures, mash efficiency (the percentage of sugars from the grain that make it into the wort) usually improves. As a result, the degree of modification of the grains is not as critical, and hence a wider variety and quality of grains can be used. If you use a step-infusion program, you may not need equipment in addition to that used for the single-step infusion, providing the mash/lauter tun is large enough to hold the full final volume of the mash.

Disadvantages: Because a wide variety of rests and enzymes can be incorporated into a step-mashing program, it is important to have a clear understanding of what the performance characteristics of the various enzymes are and how they affect the finished product. You can refer to most brewing texts with an extensive section on all-grain

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brewing for a more complete understanding of these temperature rests and the enzymes at work (but be prepared for a little chemistry).

The mash temperatures can be raised in one of two ways. If successive infusions of hot water are introduced to raise the temperature

of the mash, the mash usually will start out relatively thick and by the last step be rather thin and watery, which can be detrimental to mash extract efficiency. Also, if you raise the temperatures by directly applying heat to the mash, then a mash tun that can be heated will be required, possibly resulting in the expense of additional equipment such as a larger pot or more accurate metal-probe thermometers.

Because the purpose of step mashing is to incorporate additional rests, it usually takes more time overall than the simpler single-infusion technique. Also, most single-infusion mashes benefit from being left alone during the rest period, allowing the brewer the time to perform other duties such as heating water or sanitizing equipment. But a step-mash program requires continual monitoring of the mash and stirring to ensure that each rest is accurately reached and that the temperature is even throughout. In

A Brief History of Mashing

In the early days of brewing, decoction mashing was a necessary step to break down undermodified malts, which were common in continental Europe, especially Germany. The decoction mash made the chemical structures of malt available to enzymes in the mash.

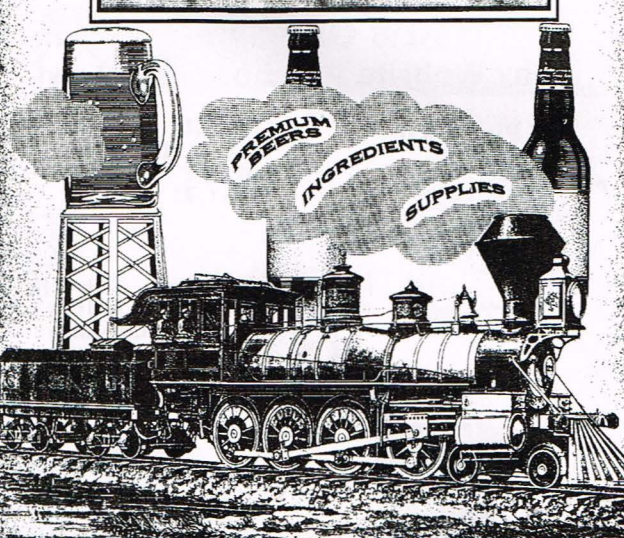
Although it is becoming somewhat rare in the brewing industry, some purists claim the process provides better extract and creates richer and more complex beer than single-infusion and temperature program mashing.

Many brewers also feel that

decoction mashing is an act of honoring German brewing tradition and carrying a part of history into the present.

Well-modified British malts were perfectly suited for single-temperature infusion mashing. Today most homebrewers use the single-infusion mash program because it is inexpensive and less time consuming. Temperature program mashing developed as a simpler, less expensive alternative to decoction's benefits. Many brewers use it because it combines the ease of single infusion with the control of decoction.

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short there are more variables to be controlled and taken into account, and there is more work to do. However, many styles of beer that focus on malt complexity, such as the various Belgian strong styles, and styles incorporating wheat in the recipe can benefit from the additional flexibility of a step-mash program.

Decoction

Decoction mashing is a form of step mashing in which the brewer removes a portion of the mash, usually about one-third of the thickest part, leaving behind as much of the liquid as possible. This thick decoction is placed into a separate kettle, where the temperature is raised until the decoction boils. Then the decoction is reintroduced into the main mash, thereby raising the temperature of the whole mash to the next step.

This entire process can be repeated as many as three times to incorporate the same temperature rests discussed in step-mashing.

Advantages: When the thick grain portion of the mash is boiled, a physical breakdown of the starches and proteins results, giving the enzymes present greater access to them. This results in a greater conversion rate (more starches are converted to fermentable sugars) than with other mash methods, particularly when low-modified or undermodified malts such as pilsner and lager malts are used.

In addition, many brewers feel that the best way to produce very malty and complex brews is to use decoction mashing.

Because the boiling point of the decoction is fixed, its reintroduction to the main mash results in surprisingly consistent temperature rests. This helps to avoid the tendency to overshoot temperatures when step mashing using a heated mash tun to raise the temperature.

Disadvantages: This is by far the most laborious and time consuming of the mash programs. A typical decoction mash program can easily be two hours or longer. Extra kettles are almost mandatory, as is a high-output heat source that can be

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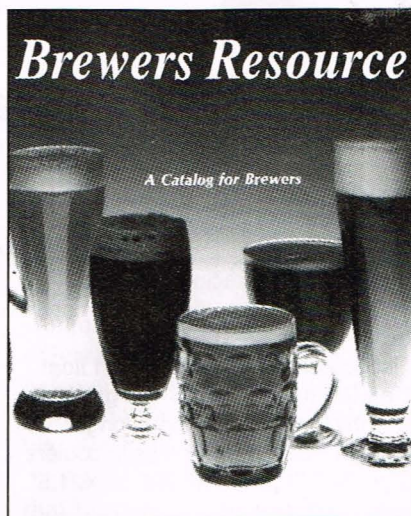
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accurately controlled to prevent scorching the mash. The decoction and main mash requires constant monitoring and stirring to ensure accuracy and to prevent any scorching or burning of the mash.

History: This style of mashing evolved on the European continent, where the malts available at the time were undermodified and lacking in the enzymatic power of their English counterparts. The decoction and resulting boiling resulted in these hard, steely malt starches being broken down so that the enzymes available were able to effectively convert the starches present. Because the temperature of a boiling mash is relatively fixed and constant, this method also allowed early brewers to perform accurate, repeatable step mashes before thermometers were widely available.

Combination Techniques

In addition to the three methods, many large and megabreweries

that incorporate a lot of cereal adjuncts in their recipe formulations use a form of mashing that is a combination of decoction and infusion techniques.

To use large amounts of adjuncts such as corn or rice effectively, these unmalted grains must first undergo a process called gelatinization. The hard, starchy interior of the grain is cooked down to make it available to the enzymes in the malted barley for conversion.

After undergoing this cooking process, the adjunct cereal grains are then infused into the main mash. They help to raise the temperature of the mash while at the same time contributing large amounts of gelatinized starches for conversion.

In such a process it is common to employ six-row pale malts both for their high levels of enzymatic potential and their ability to aid in the lautering process due to a greater husk-to-starch ratio.

Mashing Techniques

Keep in mind with all mashing programs that the natural process of converting starches to sugars takes place over a range of temperatures and not just at one set point. No matter which style of mashing best fits your equipment and ingredients, fluctuations of a few degrees will probably not ruin the resulting beer. They likely will make it only slightly different than what you might have been searching for.

Always keep good notes, taking care to record mash temperatures, water temperatures, and mash rest times. In doing so you will have a wide influence over the finished beers you create, and a great reason to keep trying new and different mash techniques. ■

John Oliver is a BJCP certified judge who takes into consideration a wide range of mashing schedules as a brewer for BJ's Brewery in Brea, Calif.

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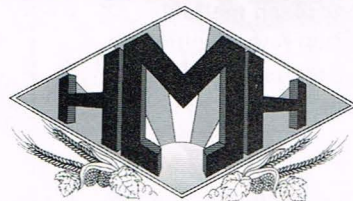
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Fermentation:

How to Choose the Right Yeast

by Larry Lesterud

Selecting the best yeast strain for your beer is a matter of knowing the qualities of the yeast you choose and the qualities you desire in your beer.

As brewers we take great consideration in selecting the ingredients we use for our recipes, because it is the recipe that defines the beer we make. Developing the recipe and deciding which ingredients would work best in a beer is the most creative and rewarding aspect of brewing, and the result is the brewer's signature.

Each brewery's product has a unique character partly from the brewer's signature and recipes, and partly from the house strain of yeast. Choosing a strain of yeast for a particular beer style is an integral component of recipe formulation, whether you're making the choice for a production brewery or a homebrewery.

The National Collection of Yeast Cultures in the United Kingdom catalogs more than 500 strains of *Saccharomyces cerevisiae*, and this list is not all-inclusive. Choices abound, and the brewer's selection of strain has as great an influence on beer flavor and aroma as any other ingredient.

There are several features to consider in choosing a strain. These include flocculation, flavor and aroma characteristics, production of fermentation byproducts, attenuation, rate of fermentation, style appropriateness and, above all, the brewer's experience with the strain.

Flocculation

Flocculation, a yeast's ability to clump and settle at the end of fermentation, can help determine the clarity of the beer. Flocculation ability is generally classified as low, medium, or high. Many English and American ale strains have medium to high flocculation characteristics. Most lager strains are low to medium

flocculators, and hefeweizen yeast and many Belgian strains are low flocculators. If you are brewing a hefeweizen, the obvious choice is a low-flocculating weizen yeast, because some of the yeast should remain in the beer.

Flavor and Aroma

The next factor to consider is the flavor profile. Are you brewing a wit, a German weizen, or an American wheat? Each yeast is unique. You wouldn't expect the clove and banana character in an American wheat, and it would be just as inappropriate not to have that character in a German wheat. Most American ale yeast strains work well in American hefeweizen, but a low flocculator would be the best choice, and there is an American hefeweizen yeast available on the market. The defining character of the style is its turbid appearance and mild fruity esters. The defining character of a German weizen is the clove and banana aroma, and this is what differentiates it from American hefeweizen. The Belgian wit yeast is similar to the German yeast but leaves a crisper, tart character.

These yeast strains are unique in that they are not desirable in a wide range of beer styles — an American hefeweizen yeast usually is used only for American-style hefeweizens. Many other strains are versatile, and perhaps the most common and versatile are the American ale strains. There are numerous American varieties, a few of which are available for purchase by homebrewers. It has become quite common for homebrewers to collect a pitch from the local brewery, and many breweries have proprietary strains.

American ale yeast strains generally are medium to high flocculators and leave a clean, slightly fruity finish. Ester profiles vary from strain to strain. The finish tends to be somewhat malty but not quite as malty as most English ale strains. If your pitch comes from a local brewery, ask the brewer about his yeast strains' characteristics and the origin of the yeast. Of course, the best way to determine whether you wish to brew with a yeast strain is to try beers brewed with it.

Other varieties, such as English ale yeast strains, leave a sweeter, maltier profile than the American, but the strains are somewhat interchangeable. An English-style ale can be brewed with an American yeast and vice versa. A stout, for instance, can be brewed with an Irish stout yeast or almost any of the American or English choices. Keep in mind, however, that while each of these may be appropriate for the style, each will produce a different beer. One will be sweeter than the next and accentuate malt more or less, and levels of byproducts such as esters (fruity) and diacetyl (buttery) will differ.

Fermentation Byproducts

Fermentation byproducts are another aspect of flavors and aromas. Byproducts include diacetyl, esters, fusel alcohols (spicy, wine-like), and other products. The advantage of using an English ale yeast when brewing an English style is the maltier profile it produces, but some English strains have the tendency to produce detectable levels of diacetyl. While diacetyl is not necessarily a desirable character, very low but detectable levels are acceptable in many English ales. Some American ale strains are also very prone to diacetyl production. If you wish to brew a beer without this flavor profile, it would be best to select a different yeast.

Degree of Attenuation

Degree of attenuation directly affects the flavor of the final product and is one of the most important factors to consider. Attenuation is

the process of sugars in the wort transforming into alcohol and carbon dioxide through fermentation. Knowing a strain's degree of attenuation helps the brewer predict the final gravity of a given beer. One yeast might complete fermentation at 1.010, while another stops at 1.014 given the same wort.

Compare degrees of attenuation among strains. The less attenuative a yeast strain is the higher the final gravity will be and, thus, the more unfermented sugars will remain in the beer. The amount of this residual sweetness in a beer dramatically affects the final flavor.

A brewer needs to know before the brew begins whether the yeast is a poor attenuator or a high attenuator. To produce beers of similar terminal gravities, a brew fermented with a yeast with a low degree of attenuation will have to be mashed cooler than one fermented with a high degree of attenuation.

Attenuation may be listed as low, medium, or high, or it may be represented as a percentage range. For instance a California ale yeast is listed with an attenuation of 73 percent to 80 percent, which is fairly high. An English ale yeast from the same lab is listed as having an attenuation of 63 percent to 70 percent, which is quite a bit lower. Expect a much sweeter, maltier product from the English yeast than the Californian. To brew a beer with the same malty character that the English yeast would produce, the mash temperature would have to be adjusted upward by a few degrees to compensate for the higher fermentation characteristics of the California yeast.

Rate of Fermentation

Rate of fermentation generally does not concern the homebrewer to a great degree but is related to the degree of attenuation. Slower fermenters are generally lower attenuators and produce maltier beers. Fermentation rates of various strains are hard to come by in any literature available to homebrewers.

It would be nice to know if your beer is going to be ready for that

bachelor party next month, but you used a Vienna lager yeast and your batch is chugging along very slowly at a rate of one or two points of gravity a day. Had you known that it was a slow fermenter and low attenuator, you might have chosen another yeast. Now you have two worries. Will the beer be ready on time? And should you have dropped the mash temperature three or four degrees to compensate for a low attenuator so the finished beer won't turn out overly sweet?

Style and Experience

Two remaining factors to consider are the appropriateness for style of a particular strain and the experience of the brewer with that strain. All of the factors described above lead the brewer to determine whether a strain is appropriate or not. If you wish to brew that German hefeweizen, then you must choose a strain with the characteristics expected of the style. The best way to assure that whatever style you brew is as close to the authentic style as possible is to use the yeast suggested for that style, such as a Czech yeast for a Czech pils and an English yeast for an ESB. If you prefer not to use the authentic yeast or if it is unavailable, look for yeast strains with similar characteristics and adjust your brewing processes to compensate for any expected differences.

While reading the literature about a strain is helpful, nothing is more important than the brewer's experience with that yeast. The brewer needs to know the yeast well to be able to predict with confidence what the terminal gravity will be and how the final beer will taste and smell. There is nothing wrong with experimentation for the fun of it and for the learning experience. But when you want to brew a certain style of beer, arm yourself with the information to achieve your goal. Nothing is more rewarding than achieving what you expected because you knew what you were doing. ■

Larry Lesterud is head brewer at Humboldt Brewing Co., Arcata, Calif.

160 Great Yeast Strains

	Name & Number	Lab	Floc.	Atten.	Ferm. Temp.	Description
ALE YEASTS	Alt Ale BRY 144	Siebel Inst.	Medium	High	59° to 68° F	Full-flavored but clean tasting with estery flavor.
	American Ale A02	Yeast Lab	Low	Medium	65° to 66° F	Very fruity aroma and soft, smooth flavor.
	American Ale BRY 96	Siebel Inst.	Medium	High	64° to 72° F	Very clean ale flavor.
	American Ale Y-1056	BrewTek				Ferments smooth, clean, and malty.
	American Ale 1056	Wyeast	Low to Med.	73% to 77%	60° to 72° F	Well balanced. Ferments dry, finishes soft.
	American Ale II 1272	Wyeast	High	72% to 76%	60° to 72° F	Slightly nutty, soft, clean, slightly tart finish.
	American/California Ale Strain YTA002	YeastTech	Medium	70% to 75%	63° to 68° F	All-purpose strain for any traditional ale recipe.
	American Microbrewery Ale #1 CL-10	BrewTek	Normal	73% to 76%	62° to 72° F	Clean malt flavor ideal for cream ales.
	American Microbrewery Ale #2 CL-20	BrewTek	Normal	73% to 75%	62° to 70° F	Rich and creamy malt profile with detectable diacetyl.
	Australian Ale A01	Yeast Lab	Medium	Medium	65° to 68° F	Woody and flavorful beer.
	Australian Ale (Dry) Y-60	BrewTek				
	Australian Ale CL-270	BrewTek	Normal	74% to 76%	66° to 76° F	A malty, bready, nutty character with honey-like finish.
	Australian Ale (Dry)	Yeast Lab	Medium	Medium	65° to 70° F	Very complex, woody, and full-bodied ale.
	Belgian Abbey II 1762	Wyeast	Medium	73% to 77%	65° to 75° F	Slightly fruity with dry finish.
	Belgian Ale Y-1214	BrewTek				Abbey-style yeast, with rich clove and banana esters.
	Belgian Ale 1214	Wyeast	Medium	72% to 76%	58° to 68° F	Abbey-style top-fermenting yeast, for high-gravity beers.
	Belgian Ale #1 CL-300	BrewTek	Medium to High	75% to 77%	66° to 72° F	Robust and estery with big notes of clove and fruit in aroma and flavor.
	Belgian Ale #2 CL-320	BrewTek	Normal	74% to 76%	66° to 72° F	Dry, fruity, and estery malt profile.
	Belgian Ale #3 CL-340	BrewTek	Med. to High	74% to 76%	66° to 72° F	Trappist character with esters of spice and fruit.
	Belgian Ale Strain YTS003	YeastTech	Medium	High	63° to 68° F	Dry, estery flavor with light clove-like spicy character.
	Belgian Strong Ale 1388	Wyeast	Low	73% to 77%	65° to 75° F	Fruity nose and palate, dry, tart finish.
	British Ale A04	Yeast Lab	Medium	Medium	65° to 68° F	Light-bodied ale, ferments dry with sharp finish.
	British Ale 1098	Wyeast	Medium	73% to 75%	64° to 72° F	Ferments dry and crisp, slightly tart. Fruity and well-balanced.
	British Ale II 1335	Wyeast	High	73% to 76%	63° to 75° F	Malty flavor, crisp finish, clean, fairly dry.
	British Ale WLP005	White Labs	High	67% to 74%	65° to 70° F	English strain that produces malty beers.
	British Draft Ale CL-160	BrewTek	Normal	72% to 78%	64° to 70° F	Full-bodied, well-rounded flavor with a touch of diacetyl.
	British Microbrewery Ale CL-110	BrewTek	Med. to High	73% to 75%	64° to 69° F	A complex, oaky, fruity ester profile.
	British Pale Ale #1 CL-120	BrewTek	Med. to High	75% to 77%	63° to 68° F	Bold, citrusy character with mineral and hop flavors.
	British Pale Ale #2 CL-130	BrewTek	Normal	74% to 76%	64° to 69° F	Smooth, well-rounded with caramel and other malt nuances.
	British Real Ale CL-150	BrewTek	Med. to Low	66% to 70%	64° to 69° F	Woody, almost musty ester profile with a mild sweetness in the finish.
	Burton Ale WLP023	White Labs	Medium	69% to 75%	68° to 73° F	Subtle fruity flavors — apple, clover honey, and pear.
	California Ale WLP001	White Labs	Medium	73% to 80%	68° to 73° F	Clean flavors accentuate hops; extremely versatile.
	California Pub Brewery Ale CL-50	BrewTek	Normal	74% to 76%	60° to 70° F	Big, soft, well-rounded caramel malt flavor.

Floc. = FLOCCULATION / Atten. = APPARENT ATTENUATION / Ferm. Temp. = FERMENTATION TEMPERATURE RANGE

160 Great Yeast Strains

	Name & Number	Lab	Floc.	Atten.	Ferm. Temp.	Description
ALE YEASTS	Canadian Ale A07	Yeast Lab	High	High	65° to 66° F	Light-bodied, clean, and flavorful fruity beer.
	Canadian Ale CL-260	BrewTek				Lightly fruity and pleasant with a complex finish.
	Classic British Ale CL-170	BrewTek	Med. to High	75% to 77%	64° to 69° F	Complex ale with very British tones and fruit-like esters.
	Coopers Homebrew Yeast (dry)	Coopers	High	High	70° to 80° F	Results in clean, rounded flavor profile.
	Dusseldorf Ale A06	Yeast Lab	High	Medium	65° to 68° F	Finishes with full body, complex flavor, and spicy sweetness.
	East Coast Ale WLP008	White Labs	Medium to High	70% to 75%	68° to 73° F	Very clean and low esters.
	Edinburgh Ale WLP028	White Labs	Medium	70% to 75%	65° to 70° F	Malty, strong Scottish ale.
	Edme English Ale (Dry) Y-50	BrewTek				
	English Ale A09	Yeast Lab			61° to 66° F	Clean, fairly neutral yeast with fruity, soft, estery finish.
	English Ale BRY 264	Siebel Inst.	Very high	Medium	68° to 72° F	Clean ale with a slightly nutty and estery character.
	English Ale Strain YTA001	YeastTech	Medium	High	63° to 68° F	Used for traditional English-style ales.
	English Ale WLP002	White Labs	Very high	63% to 70%	65° to 68° F	Best suited for English-style ales; leaves behind some residual sweetness.
	European Ale 1338	Wyeast	High	67% to 71%	60° to 72° F	Full-bodied complex strain that produces a dense, rocky head in fermentation. Malty finish.
	German Ale Y-1007	BrewTek				Produces a dry, slightly estery ale.
	German Ale 1007	Wyeast	Low	73% to 77%	55° to 66° F	Ferments dry and crisp with an extremely rocky head and mild flavor.
	German Ale/Kölsch WLP029	White Labs	Medium	72% to 78%	65° to 69° F	Super clean, lager-like ale.
	German Ale YTA003	YeastTech	Low	73% to 75%	63° to 68° F	Crisp, clean German-style ales.
	Irish Ale A05	Yeast Lab	High	High	65° to 68° F	Slightly acidic with a hint of butterscotch in the finish.
	Irish Ale Y-1084	BrewTek				Tart and slightly fruity.
	Irish Ale 1084	Wyeast	Medium	71% to 75%	62° to 72° F	Slight residual diacetyl and fruitiness.
	Irish Ale WLP004	White Labs	Medium to High	69% to 74%	65° to 68° F	Hint of diacetyl, balanced by light fruitiness and slight, dry crispness.
	Irish Ale YTA008	YeastTech	Medium	75%	63° to 68° F	Slight diacetyl production with some fruitiness.
	Irish Dry Stout CL-240	BrewTek	Normal	76% to 78%	60° to 68° F	Has a vinous, almost lactic character.
	Kölsch CL-450	BrewTek	Med. to High	75% to 78%	58° to 66° F	Clean, lightly yeasty flavor and aroma.
	Kölsch 2565	Wyeast	Low	73% to 77%	58° to 64° F	Maltiness with subdued fruitiness and a crisp finish.
	Kölsch Y-2565	BrewTek				Clean finish with a firm maltiness.
	Kölsch Strain YTA009	YeastTech	Low	75%	63° to 68° F	Combines the characteristics of ale and lager yeasts.
	London	Danstar		Med. to high	64° to 70° F	Clean and well balanced.
	London Ale A03	Yeast Lab	Medium	Medium	65° to 68° F	Crisp, clean with a hint of diacetyl and a rich mineral profile.
	London Ale (Dry) Y-28	BrewTek				
	London Ale YTA005	YeastTech	High	75%	63° to 68° F	Produces very light, fruity flavors.
	London Ale 1028	Wyeast	Medium	73% to 77%	60° to 72° F	Bold and crisp with a rich mineral profile.
	London Ale III 1318	Wyeast	High	71% to 75%	64° to 74° F	Very light, fruity, with soft, balanced palate; finishes slightly sweet.

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	Name & Number	Lab	Floc.	Atten.	Ferm. Temp.	Description
ALE YEASTS	London ESB Ale 1968	Wyeast	High	67% to 71%	64° to 72° F	Rich, malty character with balanced fruitiness.
	Manchester	Danstar		Medium	64° to 70° F	Very complex, woody, and full-bodied ale.
	Northwest Ale 1332	Wyeast	High	67% to 71%	65° to 75° F	Malty and mildly fruity with good depth and complexity.
	Norwich Ale YTA006	YeastTech	High	75%	63° to 68° F	Clean and very fast fermenting.
	Nottingham	Danstar	High	High	57° to 70° F	Neutral for an ale yeast, with fruity/estery aromas.
	Old German Ale CL-400	BrewTek	Normal	75% to 77%	58° to 66° F	Smooth, attenuated yet mild flavor.
	Old London YTA004	YeastTech	High	70%	63° to 68° F	Rich, malty character balanced with yeast fruitiness.
	Ringwood Ale 1187	Wyeast	High	68% to 72%	64° to 74° F	A malty, complex profile that clears well.
	Saison CL-380	BrewTek	Normal	74% to 76%	66° to 72° F	Smooth, full character with mild esters, flavors of apple pie spices.
	Scottish Ale CL-200	BrewTek	Med. to High	77% to 80%	60° to 68° F	Fruity, malt profile with woody ester like malt whisky.
	Scottish Ale 1728	Wyeast	High	69% to 73%	55° to 70° F	Suited for Scottish-style ales and high-gravity ales of all types.
	Scottish Ale YTA007	YeastTech	High	70%	63° to 68° F	Ideal for Scottish ales and any high-gravity ales.
	Scottish Ale Y-1728	BrewTek				Strong fermenting yeast with complex, woody, fruity esters.
	Scottish Bitter CL-210	BrewTek	Med. to High	73% to 75%	62° to 68° F	Big ester complex of ripe fruit, apricots, and rose petals.
	Special London Y-1968	BrewTek				Mild, fruity sweetness and buttery diacetyl to malt flavor.
	Swedish Ale 1742	Wyeast	Medium	68% to 72%	64° to 74° F	Scandinavian origin; floral nose, malty finish.
	Thames Valley Ale Y-1275	BrewTek				Mild but complex ester profile for bitters and pale ales.
	Thames Valley Ale 1275	Wyeast	Medium	72% to 76%	62° to 72° F	Clean, light malt character with low fruitiness and low esters.
	Trappist Ale A08	Yeast Lab	High	High	64° to 70° F	Belgian strain, producing a malty flavor with a balance of fruity, phenolic overtones.
	Trappist Ale BRY 204	Siebel Inst.	Low	High	68° to 72° F	Dry, estery flavor with a light, clove-like spiciness.
	Trappist Ale Yeast WLP500	White Labs	Med. to Low	73% to 78%	Below 65° F	Produces distinctive fruitiness and plum characteristics.
	Trappist High Gravity 3787	Wyeast	Medium	75% to 80%	64° to 78° F	Ferments dry with rich ester profile and malty palate.
	Whitbread Ale (Dry)	Yeast Lab	High	Medium	65° to 70° F	Fruity aroma with smooth, complex flavor.
	Whitbread Ale (Dry) Y-30	BrewTek				
	Whitbread Ale Yeast 1099	Wyeast	High	68% to 72%	64° to 75° F	Mildly malty and slightly fruity.
	Windsor	Danstar		Medium	64° to 70° F	Full-bodied, fruity English ale.
	Wyeast Ale Blend 1087	Wyeast		71% to 75%	64° to 72° F	A blend of the best ale strains to provide quick starts.
LAGER YEASTS	American Lager 2035	Wyeast	Medium	73% to 77%	48° to 58° F	Bold, complex, and aromatic; slight diacetyl.
	American Lager BRY 118	Siebel Inst.	High	Medium	50° to 57° F	Produces a slightly fruity beer with a little residual sugar.
	American Megabrewery CL-620	BrewTek	Normal	74% to 76%	46° to 54° F	Best for lightest, cleanest lagers with an unobtrusive yeast character.
	American Microbrewery Lager CL-630	BrewTek	Normal	74% to 76%	48° to 56° F	Strong fermenter that leaves a clean, full-flavored, malty finish.
	Amsterdam Lager (Dry) Y-34	BrewTek				
	Amsterdam Lager (Dry)	Yeast Lab	Medium	Medium	58° to 68° F	All-purpose dry lager yeast. Produces a clean, crisp lager with great flavor.
	Bavarian Lager L32	Yeast Lab	Medium	Medium	48° to 52° F	Rich in flavor with clean, malty sweetness.

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	Name & Number	Lab	Floc.	Atten.	Ferm. Temp.	Description
LAGER YEASTS	Bavarian Lager Y-2206	BrewTek				Sharp, clean, almost tart flavor.
	Bavarian Lager 2206	Wyeast	Medium	73% to 77%	48° to 58° F	Produces rich, malty, full-bodied beers.
	Bohemian Lager Y-2124	BrewTek				Ferments smooth and malty; leaves a subtle residual sweetness.
	Bohemian Lager 2124	Wyeast	Medium	69% to 73%	46° to 54° F	Ferments clean and malty with residual maltiness in full-gravity pilsners.
	California Common YTL002	YeastTech	High	70%	53° to 58° F	Traditional yeast for brewing West Coast lagers.
	California Gold CL-690	BrewTek	Normal	74% to 76%	58° to 64° F	Slightly estery, well-attenuated finish.
	California Lager Y-2112	BrewTek			58° to 64° F	Distinct, mildly estery flavor.
	California Lager L35	Yeast Lab	High	Medium	64° to 66° F	Malty with sweet, woody flavor and subtle fruitiness.
	California Lager 2112	Wyeast	High	67% to 71%	58° to 68° F	Produces malty, brilliantly clear beers.
	Continental Lager YTL001	YeastTech	High	70% to 75%	53° to 58° F	Produces clean, crisp pilsners.
	Czech Pils Y-2278	BrewTek				Traditional, full-flavored, malty pilsners.
	Czech Pils 2278	Wyeast	Med. to High	70% to 74%	48° to 58° F	Dry but malty finish.
	Danish Lager 2042	Wyeast	Low	73% to 77%	46° to 56° F	Rich Dortmund style with crisp, dry finish.
	East European Lager CL-680	BrewTek	Normal	75% to 78%	46° to 54° F	Smooth, rich, almost creamy character with big malt flavor and clean finish.
	European Lager (Dry)	Yeast Lab	Medium	Medium	58° to 68° F	All-purpose dry lager yeast for clean lager.
	European Lager (Dry) Y-36	BrewTek				
	European Lager II 2247	Wyeast	Low	73% to 77%	46° to 56° F	Clean, very mild flavor, slight sulfur production with dry finish.
	German Lager WLP830	White Labs	Medium	74% to 79%	50° to 55° F	Very malty and clean.
	Munich Lager Y-2308	BrewTek				Rich, full-bodied, and malty Continental flavor.
	Munich Lager L33	Yeast Lab	Medium	Medium	50° to 52° F	Smooth and soft, with a hint of sulfur when fresh.
	Munich Lager 2308	Wyeast	Medium	73% to 77%	48° to 56° F	Very smooth, well-rounded, and full-bodied.
	North American Lager 2272	Wyeast	High	70% to 76%	48° to 56° F	Traditional Canadian lagers and light pilsners, malty finish.
	Northern European Lager BRY 203	Siebel Inst.	High	High	50° to 57° F	Produces fewer sulfur compounds than most other flocculent strains; well-balanced beer.
	N. German Lager CL-660	BrewTek	Normal	74% to 76%	46° to 54° F	Classic, clean, strong-fermenting lager.
	Old Bavarian Lager CL-650	BrewTek	Normal	74% to 76%	46° to 54° F	Well-rounded and malty with subtle ester complex and citrus tones.
	Original Pilsner CL-600	BrewTek	Normal	74% to 76%	48° to 54° F	Full-bodied lager with a sweet, mildly under-attenuated finish and subdued diacetyl character.
	Pilsner Lager L31	Yeast Lab	Medium	High	50° to 52° F	Light lager in both flavor and body that ferments dry and clean.
	Pilsen Lager 2007	Wyeast	Medium	71% to 75%	48° to 56° F	Smooth, malty palate that ferments dry and crisp.
	Pilsner Lager WLP800	White Labs	Medium to High	72% to 77%	50° to 55° F	Somewhat dry with malty finish.
	San Francisco Lager WLP810	White Labs	High	65% to 70%	58° to 65° F	Unique lager strain that can ferment up to 65° F and still retain lager characteristics.
	St. Louis Lager L34	Yeast Lab	Medium	High	50° to 52° F	Round, crisp, clean, and fruity flavor with medium body.

160 Great Yeast Strains						
	Name & Number	Lab	Floc.	Atten.	Ferm. Temp.	Description
LAGER	Swiss Lager CL-670	BrewTek	Normal	74% to 76%	48° to 54° F	Clean, crisp lager flavor with a soft, smooth maltiness.
	Wyeast Lager 2178	Wyeast		71% to 75%	48° to 56° F	Blend of the Brewer's Choice lager strains for the most complex flavor profiles.
WHEAT YEASTS	American Hefeweizen Ale WLP320	White Labs	Low	70% to 75%	65° to 69° F	Produces a light amount of the banana and clove notes, as well as some sulfur.
	American Wheat 1010	Wyeast	Low	74% to 78%	58° to 74° F	Produces a dry, slightly tart, crisp beer.
	American White Ale CL-980	BrewTek	Low	74% to 76%	64° to 70° F	Round, clean malt flavor with a cloudy hefeweizen look.
	Bavarian Weizen BRY 235	Siebel Inst.	None	High	61° to 72° F	A very estery beer with mild clove-like spiciness.
	Bavarian Weizen W51	Yeast Lab	Medium	Medium	66° to 70° F	Produces moderately high, spicy phenolic overtones, reminiscent of cloves.
	Bavarian Wheat 3056	Wyeast	Medium	73% to 77%	64° to 70° F	Mildly estery and phenolic wheat beers.
	Belgian Ardennes 3522	Wyeast	Medium	72% to 76%	65° to 85° F	Mild fruitiness with complex spicy character.
	Belgian White Y-3944	BrewTek				Light, sweet, earthy clove character.
	Belgian Wit Ale WLP400	White Labs	Low to Med.	74% to 78%	67° to 74° F	Slightly phenolic and tart.
	Belgian Wit Beer YTS004	YeasTech	Medium	72% to 75%	63° to 68° F	Good for light, Belgian-style ales.
	Belgian Wheat 3942	Wyeast	Medium	72% to 76%	64° to 74° F	Apple- and plum-like nose with dry finish.
	Belgian Wheat W52	Yeast Lab			66° to 70° F	Soft, elegant finish with moderate esters and mild, spicy phenols.
	Belgian Wheat CL-900	BrewTek	Normal	72% to 74%	66° to 72° F	Soft, bread-like flavor that leaves a sweet, mildly estery finish.
	Belgian Witbier 3944	Wyeast	Medium	72% to 76%	60° to 75° F	Alcohol tolerant, with a tart, slightly phenolic character.
	German Weiss CL-930	BrewTek	Normal	74% to 76%	66° to 72° F	Produces clove and phenol characters.
	German Wheat 3333	Wyeast	High	70% to 76%	63° to 75° F	Sharp, tart crispness, fruity, sherry-like palate.
	German Wheat CL-920	BrewTek	High	75% to 77%	66° to 72° F	Intensely spicy, clove, and phenolic.
	German Wheat Y-3068	BrewTek				Produces a pronounced, slightly clove-like character in wheat beers.
	Hefeweizen Ale WLP300	White Labs	Low	72% to 76%	68° to 72° F	Produces banana and clove nose associated with German wheat beer.
	Hefeweizen Strain YTS001	YeasTech	Low	greater than 75%	63° to 68° F	Creates phenolic clove, banana, and bubblegum flavors.
	Weihenstephan Weizen 3068	Wyeast	Low	73% to 77%	64° to 70° F	Produces a unique and spicy weizen character, rich with clove, vanilla, and banana.
LAMBIC CULTURES	Belgian Lambic Blend 3278	Wyeast	Low to Med.	65% to 75%	63° to 75° F	Rich, earthy aroma and acidic finish.
	<i>Brettanomyces Lambicus</i> CL-5200	BrewTek				
	<i>Brettanomyces Lambicus</i> 3220	Yeast Lab				Produces an odd, horse-like aroma and flavor.
	<i>Brettanomyces</i> and <i>Pediococcus</i> Combo CL-5000	BrewTek				
	<i>Pediococcus Cerevisiae</i> 3200	Yeast Lab				Slow-growing organism responsible for some of the intense lactic sourness in lambic beers.
	<i>Pediococcus Damnosus</i> CL-5600	BrewTek				

*information provided by the manufacturers and compiled by Susan Mills

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Controlling Malolactic Fermentation

by Alison Crowe

Most wine, under the right conditions, naturally goes through the chain of reactions called malolactic fermentation.

Today, many home and commercial winemakers employ malolactic fermentation, though they also can prevent it if they choose.

What Is ML?

A malolactic (ML for short) fermentation is so called because it involves a microorganism (bacteria) and a chain of chemical reactions similar in principle to yeast fermentation. In the primary fermentation of a wine, yeast turns sugar into ethanol and carbon dioxide gas. In a malolactic fermentation a class of bacteria, usually of the *Lactobacillus* or *Leuconostoc* species, turns the malic acid naturally present in grapes and other fruits into lactic acid and carbon dioxide gas.

The bacteria live on the grapes, on winery equipment, and in the air. They also can be purchased as a pure culture and introduced by the winemaker before, during, or after the primary yeast fermentation.

The lactic acid bacteria effect three major changes in juices, musts, and wines: stabilization, deacidification, and the addition of flavor and aroma compounds. Each winemaker should evaluate his program and decide whether these effects will make the wine better.

Stabilization

Because lactic acid bacteria is widespread in the winemaking environment and malic acid is naturally present in juices, musts, and wines, there is always the possibility that a malolactic fermentation will occur. This is wonderful if you are encouraging it but potentially disastrous if you aren't. Many winemakers

actively encourage malolactic fermentation at an early stage because if the malic acid isn't all used up by the time the wine is bottled, then the malolactic fermentation can happen after the wine is bottled. If it does, the bottled wine will be spritzy and prone to unpleasant off-flavors and aromas.

Since the lactic acid bacteria aren't the only microorganisms that can use malic acid as a food source or a substrate for other necessities, ML fermentation can be an insurance policy. If you encourage the disappearance of malic acid in a controlled manner, there's no chance that any spoilage bacteria can use it later. This is why the malolactic fermentation is said to "stabilize" young wines.

De-acidification

Before the development of appropriate soil management, viticultural operations, and modern rootstocks, winemakers often had to deal with unripe, poorly balanced grapes that were too low in sugar and too high in acid. For vintners dwelling in the colder northern regions of Europe, it was difficult to get their grapes to ripen enough to make a wine that wasn't too tart. Enter the malolactic fermentation that, even today, is a boon for those who must make wine with fruit that is less than perfect.

The lactic acid bacteria take up malic acid as a carbon source and spit out lactic acid in the same ratio. Lactic acid is a "less acidic" acid per unit than is malic acid. Once all the malic acid in the wine has been consumed and turned into lactic acid, the wine essentially has been deacidified to a moderate degree. Some say that malic acid is a harsher acid on the palate and that ML fermentation smooths out the rough edges.



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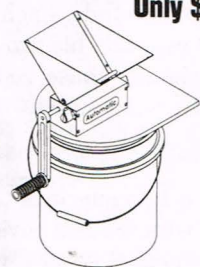
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Even if your grapes are perfectly ripe, you can use the ML fermentation to stabilize, de-acidify, or make flavor changes. Be careful, however, because malic acid decreases with ripeness, so any grapes more than 22° Brix may need additional acid in the form of tartaric acid (TA) to make up for the acid lost due to the ML fermentation. Red wines typically should have total acidity in the 4.5 to 7.5 grams per 100 mL region and whites should be around five to eight grams per 100 mL. It's a good idea to keep an eye on the TA before, during, and after any malolactic fermentation to make sure the process hasn't de-acidified your wine too much. A normal ML fermentation will not drop the TA too much below these levels if the rest of the acids are in their appropriate balances.

Aroma Changes

ML fermentation can cause a significant and noticeable difference in the flavor profile of wine. As a byproduct of the ML fermentation, many lactic acid bacteria generate a compound called diacetyl, which shows up in wine as a buttery aroma.

This buttery note adds complexity to dry white and red wine varieties that also see a little oak aging, namely Chardonnay, Sauvignon Blanc, Cabernet Sauvignon, Merlot, and Pinot Noir. Vintners employ ML in many other winemaking schemes, excluding their white wines only when fruitiness, low alcohol, or high acidity might make both the buttery aroma and the acidity-lowering effects unwelcome.

Aside from the diacetyl alone, the lactic acid bacteria produce other compounds that have not been shown to consistently contribute any significant aroma/flavor changes to wine, though some think they add to the overall complexity. It is up to you to determine whether or not these flavor and aroma changes fit into your personal winemaking style.

Taking Charge of ML

The following advice covers how to encourage malolactic fermentation. To discourage any lactic acid bacteria from carrying out an ML

fermentation, simply do the opposite. The ML fermentation can last for several days or be protracted over a few weeks, depending on the strain of bacteria, the amount of malic acid present, temperature and pH of the wine, and other factors.

Buying a commercial strain of lactic acid bacteria through a reliable winemaking supply source is best. Follow the directions for inoculation included with the bacteria. You can monitor ML fermentation — watch for the disappearance of malic acid (once it is gone, the ML fermentation is over) with a chromatographic solvent kit, available through home winemaking stores, catalogs, and Web sites. Or you can simply wait for any visible (or audible) evidence of carbon dioxide gas to disappear.

ML in Primary or Secondary

- To ensure that the bacteria will have enough malic acid to use as energy, do not use grapes that are too ripe (more than 24° to 25° Brix). Check the TA of your wines during all stages of their early development, adjusting with tartaric acid if the levels get below your liking.

- Keep the sulfur dioxide in your wine low (as low as you can safely allow, keeping below 20 ppm free). Lactic acid bacteria are very sensitive to SO₂ as an antimicrobial agent.

- Keep the pH between 3.2 and 4. Lactic acid bacteria can't survive in a very low pH environment.

- Keep the temperature of your juices, musts, or wine warmer than 55° F. If the ambient temperature is not warm enough, wrap an electric blanket around the fermenter.

- Don't filter your juice or wine at any point before inoculating with the lactic acid bacteria. The bacteria are nutritionally fastidious and do poorly on material that has been stripped of vitamins and nutrients.

- Add yeast hulls (yeast ghosts) or a vitamin mix for yeast to give the bacteria the vitamins they need. ■

Alison Crowe works at Byington Winery & Vineyards in Los Gatos, Calif. She has a degree in winemaking from the University of California, Davis.

What Homebrewing Was Like in 1972

by Roy Maddox

I began homebrewing way back in 1972. The need for a decent brew had been festering in the back of my mind since I returned from Europe in 1966 when I got out of the Army. There were precious few imports available then, and at that time I mistakenly assumed that a skunky-smelling beer from a green bottle was good stuff. (But I had an excuse: I did the engineering school thing. It warped my taste buds.)

I had heard stories about homebrew — both bad and good — so I knew that it could be done. In 1972 homebrewing became legal in California (where I lived at the time). At some point that year I was between jobs for a week, so I decided to go ahead and try it. I had to submit a form to the state alcoholic beverage control department. Approval allowed the “head of household” to brew 200 gallons per year (I still have the official approved forms from the state). No transportation of product was allowed. This “licensing” requirement lasted for about three years.

Back then there were only a few books on homebrewing available, mainly written by British country types in the late '50s. These old recipes were all developed by trial and error, which is the most fun anyway. It was a far cry from today's software-based technology for creating beers or cloning them based on their published parameters.

The authors of the homebrew books I tried all used the same methods and ingredients: malt syrup, lots of invert sugar, hop plugs, adjuncts, Campden tablets (potassium metabisulfite to prevent contamination), yeast harvested from commercial bottles of beer, a hydrometer for calculating specific gravity, and priming of individual bottles for bottle conditioning. This

method for bottling reminded me of stories I'd heard of old Uncle Jake's midnight explosions in the basement during Prohibition (although in all my years of homebrewing, I haven't had a single bottle explode...knock on wood hard!).

I purchased the necessary ingredients at a local hardware store. I bought an enameled four-gallon pot from K mart to use as a brew pot. Then I obtained a used bottled-water dispenser crock with a spigot for primary fermentation. I used a sheet of plastic with rubber bands

smoothly as well, considering that I had to let the beer cool overnight before pitching the yeast packet (no starters or liquid yeast then). I had average lag times of about eight hours. The total fermentation was usually done (including secondary) in about a week, depending on the ambient temperature.

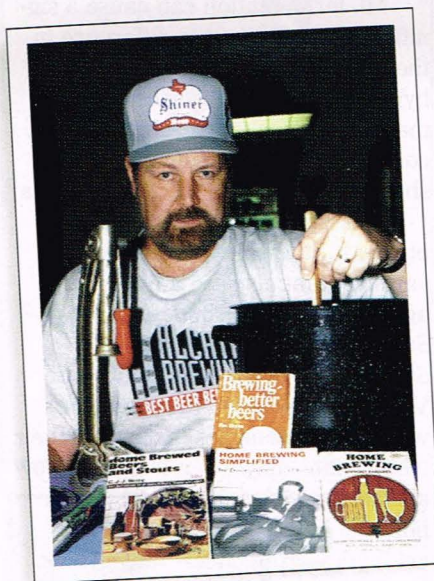
The most work was, of course, at bottling time with all the soaking in bleach, rinsing, and siphoning. We knew nothing of aeration or oxidation.

Getting the beer neatly into bottles was also a pain. We had no bottling-line wands then, so I rigged a spigot to the primary fermenter and used a funnel. The beer occasionally had a very slight swampy smell when the bottle was first opened, but this aroma went away after the brew was decanted into a glass. I guess I was lucky with respect to airborne yeast contamination and bacterial growth.

The recipes I used then would all be considered some form of amber nowadays, due mostly to the ingredients. I did try to clone Guinness early on; I used one pound of black patent malt in a 2.5-gallon batch. It tasted like triple espresso, and I ended up blending all the bottles back into a newer batch of amber beer and calling it “thin Guinness.”

Brewing has always been fun. I've never had a truly rotten batch. These days I buck the trend of 10-gallon batches by brewing a large variety of different beers in two- to three-gallon batches. This allows for a lot of low-risk experimentation and minimizes boredom of the taste buds, a condition that I suffer from. ■

Do you have a 750-word story for Last Call? Mail it with a color photo to Last Call, c/o Brew Your Own, 216 F St., #160, Davis, CA 95616.



A brewing time capsule nets some interesting — and even useful, if dated — information.

for the cover. Later, I graduated to a new plastic trashcan. My secondary was a five-gallon water bottle with a plastic fermentation lock.

Overall, my initial brewing experience went smoothly. I credit this to several weeks of studying the books and recipes I had plus asking for advice from ancient homebrewers. The fermentation went fairly

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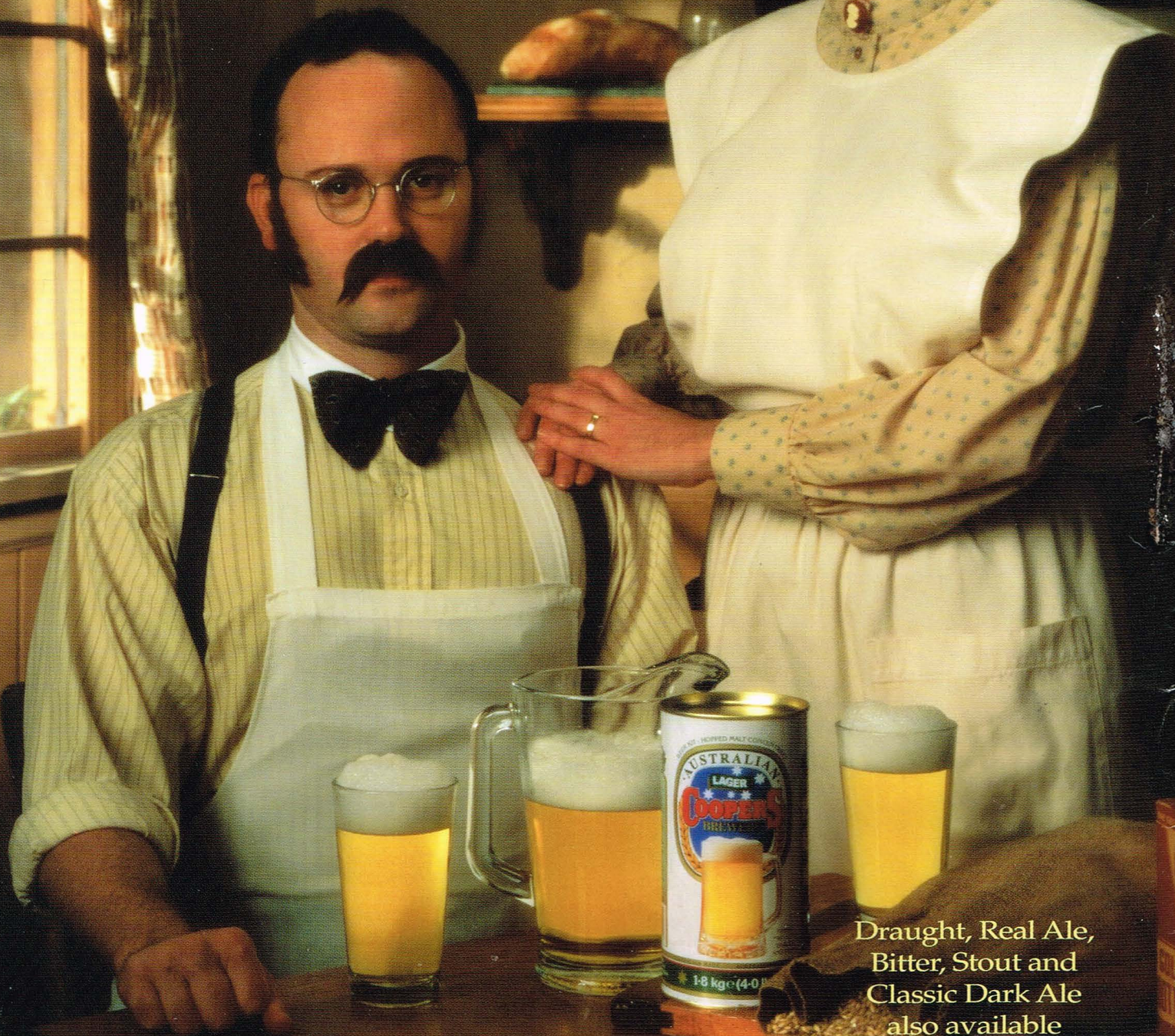
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