Brew Your Own

213

DECEMBER 2000, VOL.6, NO.10

THE HOW-TO HOMEBREW BEER MAGAZINE

GET COLD!

Your guide to brewing lagers

HOMEBREW LAB GIZMOS

HOLIDAY ALE TIPS AND RECIPES

OFFBEAT BLENDS

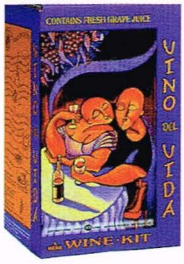
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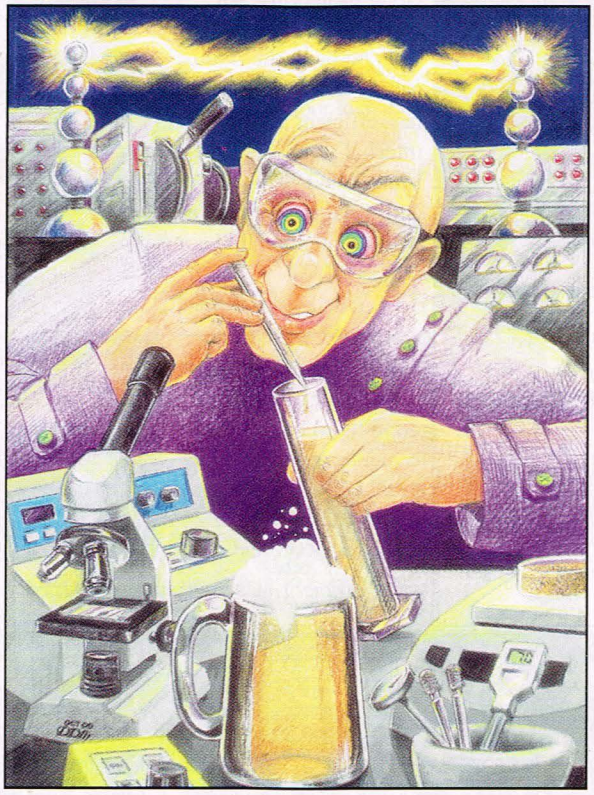
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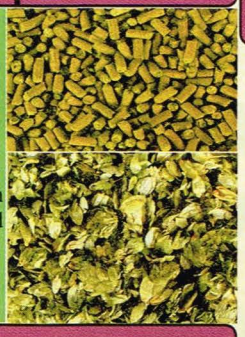
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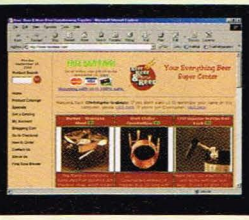
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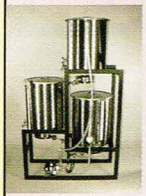
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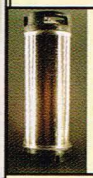
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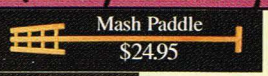
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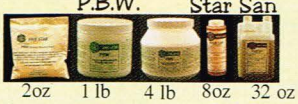
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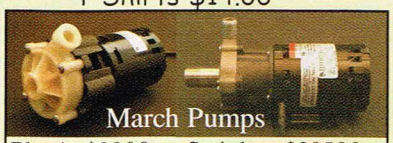


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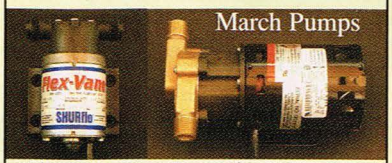


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Editor's Note

Get Cold!

There's a reason we decided to feature lager brewing on this month's cover: We love cold. Our editorial offices are surrounded by the Green Mountains of Vermont, and the closest ski area is just five miles up the road. (That would be Bromley Mountain, where intrepid photographer Charles Parker shot the December cover image.)

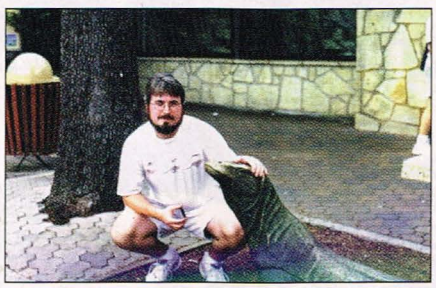
About the time this issue arrives in your mailbox, in fact, the BYO team will be hitting Bromley's slopes every Wednesday to compete in the local ski-racing league. Our prospects are decent, mostly because we've got a ringer: Managing editor Betsy Shaw — who joined our staff in June and is making an enormous contribution to the magazine — retired last year from a successful twelve-year career as a professional snowboarder. In 1998, she competed in the Winter Olympics at Nagano when snowboarding made its debut at the Games. In 1995, she was ranked number one on the World Cup circuit, a series of elite competitions held in North America, Europe and Japan. During most of her career, Shaw was one of the highest-ranked alpine racers in the United States.

This is all by way of saying: Since we love cold, we also love lager brewing. When the mercury drops, our thoughts immediately turn to filling our cool cellars with carboys full of lager. So we're happy to publish Keith Yager's cover story, which tells you how to brew a batch of this cold-conditioned beer. Yager's feature also includes a quick question-and-answer session with lagermeister Greg Noonan, author of the well-respected book, "New Brewing Lager Beer."

We'd love to hear your thoughts on this article — and on anything you read in our pages. Just don't call on Wednesdays. We'll be skiing.

Kathleen

Contributors



Contributing writer Chris Colby is a science guy. By day, he's a science editor for Holt, Rinehart and Winston in Austin, Texas. In his spare time, he writes our regular "Techniques" column, which focuses on the nitty-gritty details of the brewing process (this month he tells homebrewers how to produce crystal-clear beer; the article starts on page 49). Chris also contributes features, like this issue's "Homebrew Lab" (page 40). From a hydrometer to a pH meter, Chris gives the lowdown on gizmos every homebrewer should have.

Chris was a biology and chemistry major at Augustana College in South Dakota. He earned his master's degree at Boston University, where he studied molecular evolution and population genetics.

A devoted homebrewer, he whips up a batch of beer at least once a month. His favorite styles: pale ale and porter.

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THE HOW-TO HOMEBREW BEER MAGAZINE

EDITOR
Kathleen James Ring

MANAGING EDITOR
Betsy Shaw

CREATIVE DIRECTOR
Coleen Heingartner

TECHNICAL EDITOR
Ashton Lewis

CONTRIBUTING WRITERS
Thom Cannell, Chris Colby, Alison Crowe, Thomas Miller, John Oliver, Scott Russell, Tess and Mark Szamatulski

CONTRIBUTING ARTISTS
Don Martin, Ian Mackenzie, Shawn Turner, Jim Woodward

CONTRIBUTING PHOTOGRAPHERS
Kent Lacin, Charles Parker

PUBLISHER
Brad Ring

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Kiev Rattee

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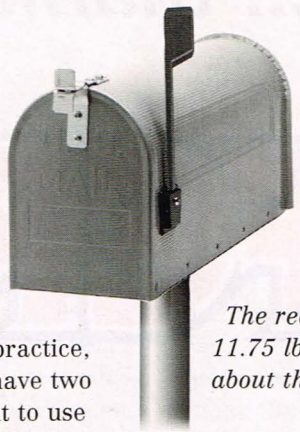
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Hops and Spice

I read "Don't Boil It" by Mark Henry in the October issue. For a parent of three small children who is just trying to figure out how to get everyone to school or soccer practice, the advice was great! I have two quick questions: If I want to use unhopped malt syrup and add my own hops, does this affect boiling or the process you laid out? Also, can I use this same process to make a spiced Christmas beer?

Chris Cottle
Perrysburg, Ohio

Author Mark Henry replies: "The hops will need to be boiled if you want to extract bitterness. But you don't need to have the malt extract in the water during the boil. In fact, you will get better bitterness extraction if you don't add it until the last few minutes.

Bring your brewing water to a boil, add your bittering hops, boil for 30 minutes (20 if you are using hop pellets) and add your malt extract and flavoring hops. Boil another couple of minutes, turn off the heat, add aroma hops, steep for 5 to 10 minutes and cool.

With spices and herbs, a lot depends on which spices you use and in what form you are using them. Most herbs are added at the same time you add your aroma hops. For better aromatics, you can add some of your herbs post-fermentation."

Missing One

I just purchased the October issue and it has a lot of interesting articles. The recipe for Young's Special London Ale *("Style Calendar," page 19)* has a mistake in the all-grain option. It calls for 1.75 lbs. of Maris Otter two-row pale malt. Shouldn't it read 8.75 or 9 lbs., depending on the assumed mash efficiency? One small mistake in a great issue. Keep up the good work.

Ed Howell
Houston, Texas

The recipe should have read 11.75 lbs. of Maris Otter. Sorry about the typo.

When to Sanitize

In your "Style of the Month" column, on your brewing calendar, you always recommend sanitizing two days in advance. I always thought you should sanitize just prior to using an item. Or do you sanitize twice?

Rex Chapin
Sheldon, Iowa

Former Style columnist Mik Weaver sanitized his equipment two days in advance. New columnists Tess and Mark Szamatulski have a different approach:

"We instruct our customers to sanitize everything immediately before use. It's also a good practice to sanitize and completely dry equipment after using so your equipment stays in good condition."

Another Way

I was glad to see the article on building a counterflow wort chiller *(October 2000)*. The author was honest when his homemade chiller didn't meet his expectations. Building a chiller requires some engineering and producing one that works as well as storebought isn't easy. None of us want to discourage the adventurous, but we should save them some heartache and money whenever we can. For your readers who want a high-performance chiller, my FEARLESS Wort Chiller sells for $60 to $72. ■

Ken Johnson, President
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Editorial and Advertising Office:
Brew Your Own
5053 Main Street, Suite A
Manchester Center, VT 05255

Tel: (802) 362-3981
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E-Mail: BYO@byo.com

Advertising Contact:
Kiev Rattee
kiev@byo.com

Editorial Contact:
Kathleen James Ring
kath@byo.com

Subscriptions Only:
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TIME TO TIP THE PORTER

BRIESS PORTER

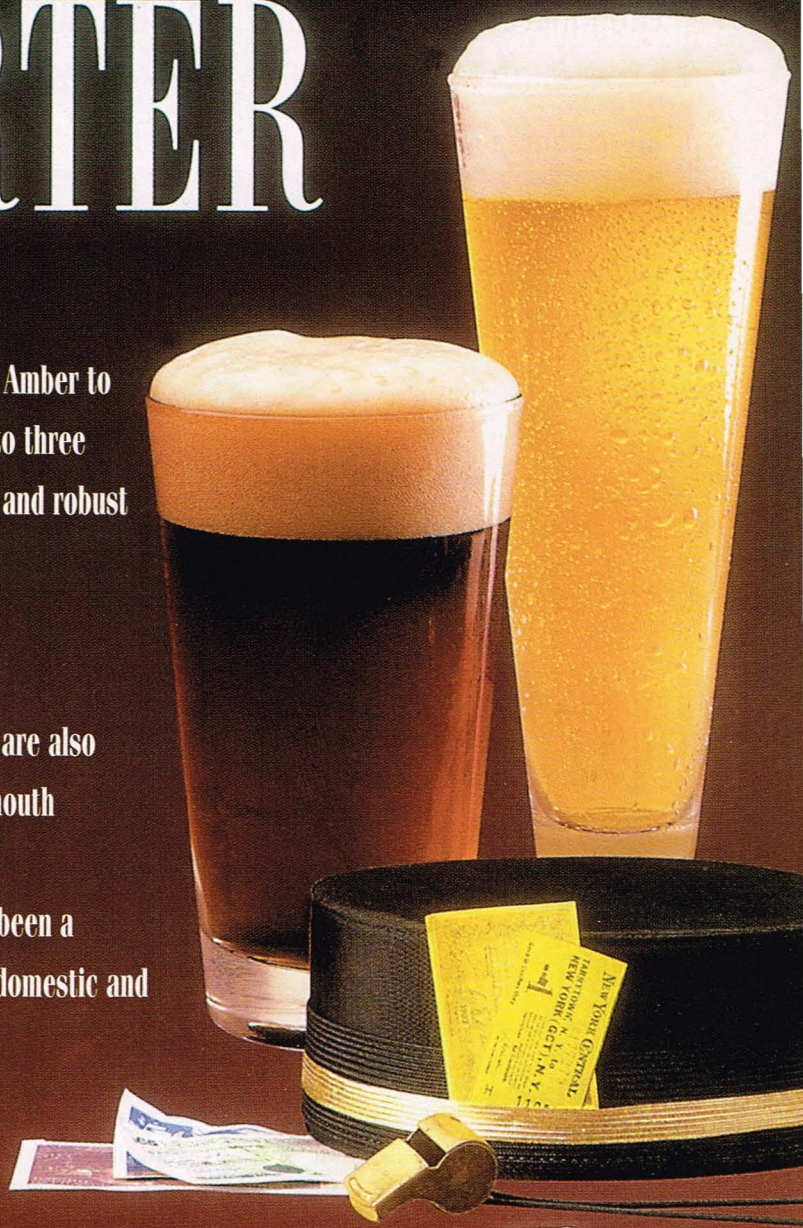
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Ezekiel Ale

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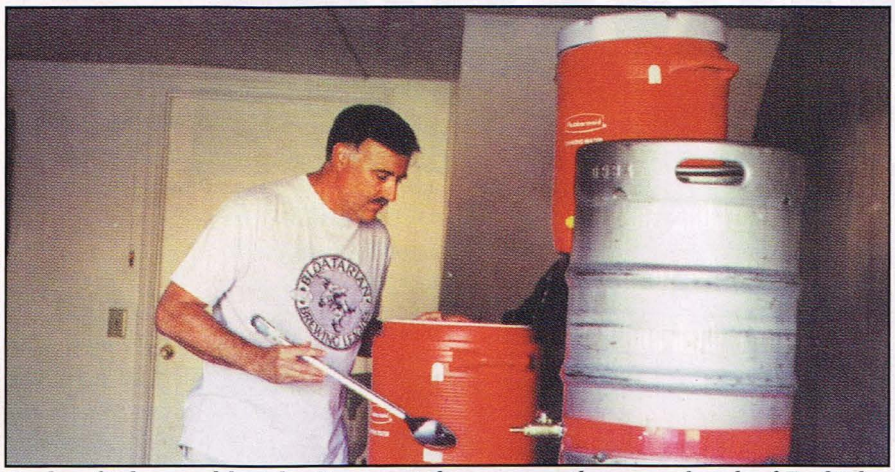


PHOTO COURTESY OF STEVE BORUP

Barley, fitches and lentils: Steve watches reverently over a batch of Ezekiel ale that he is hoping will impress the Bible study group.

What is the appropriate beer to quaff after a Bible study? This was the question I had after some members of our Thursday evening Bible study class sampled and enjoyed some of my current brews. While this imbibing had nothing to do with the study, I felt a Bible-related theme for a beer was appropriate.

The first question was: What's in beer? Barley! Looking up barley in the Concordance, I found several references. The reference that immediately caught my eye was in Ezekiel 4:9, concerning a bread recipe. Bread ... liquid bread ... beer ... works for me!

Ezekiel 4:9: "Take thou also unto thee wheat, and barley and beans and lentils and millet and fitches and put them in one vessel and make thee bread thereof."

A few questions immediately arose. What are fitches? It turns out to be rye. The next problem was proportions. What would lentils, millet and beans do to beer? Would the legume oil kill the head retention?

As for the proportions, I found a recipe for Ezekiel bread on a bread Web site. Regarding the lentils, millet and beans, I had to use them since they are part of the recipe. According to Scripture, Zeke was instructed to cook the bread over cow dung — I substituted propane.

After tweaking the grain bill, determining the hop variety and the IBUs, I went for it. The brewing went off without a hitch but — contrary to homebrewing instructions — I worried.

This was a fun beer to make. It was an adventure not having any idea how it would taste. It turned out pretty good — a little cloudy, but well balanced with a nice aroma and finish. It went over well with the group. I'm not planning to make it again in the near future, but I am thinking of using the Bible again as a resource. How does "loaves and fishes beer" sound? →



Ezekiel Ale
(5 gallons, all-grain)

Ingredients

6 lbs. two-row pale malt
3 lbs. wheat malt
1 lb. rye malt
0.50 lb. cara-pils malt
0.08 lb. Black Patent malt
0.50 lb. lentils
0.25 lb. millet
0.25 lb. beans
4.8 AAU Nugget hops
(0.40 oz. at 12% alpha acid)
3.75 AAU Willamette hops
(0.75 oz. at 5% alpha acid)
8 AAU Perle hops
(1 oz. at 8% alpha acid)
1 qt. starter of American Ale II yeast (Wyeast 1272)

Step by Step

Crush grains and other ingredients. Mash in with 3.25 gal. water and hold at 152° F for 45 min. Sparge with 5 gal. of water at 168° F, collecting 6.5 gal. Bring to rigorous boil. After 15 minutes add Nugget hops and boil for another 40 min. Add Willamette hops and boil 20 min. Turn off heat and add Perle hops. Steep 10 min. Cool to 70° F, aerate well and pitch yeast.

Ferment at 70° to 72° F for 7 days. Transfer to secondary and condition for 7 days at 70° F. Keg or bottle.



COURTESY OF POLAR WARE

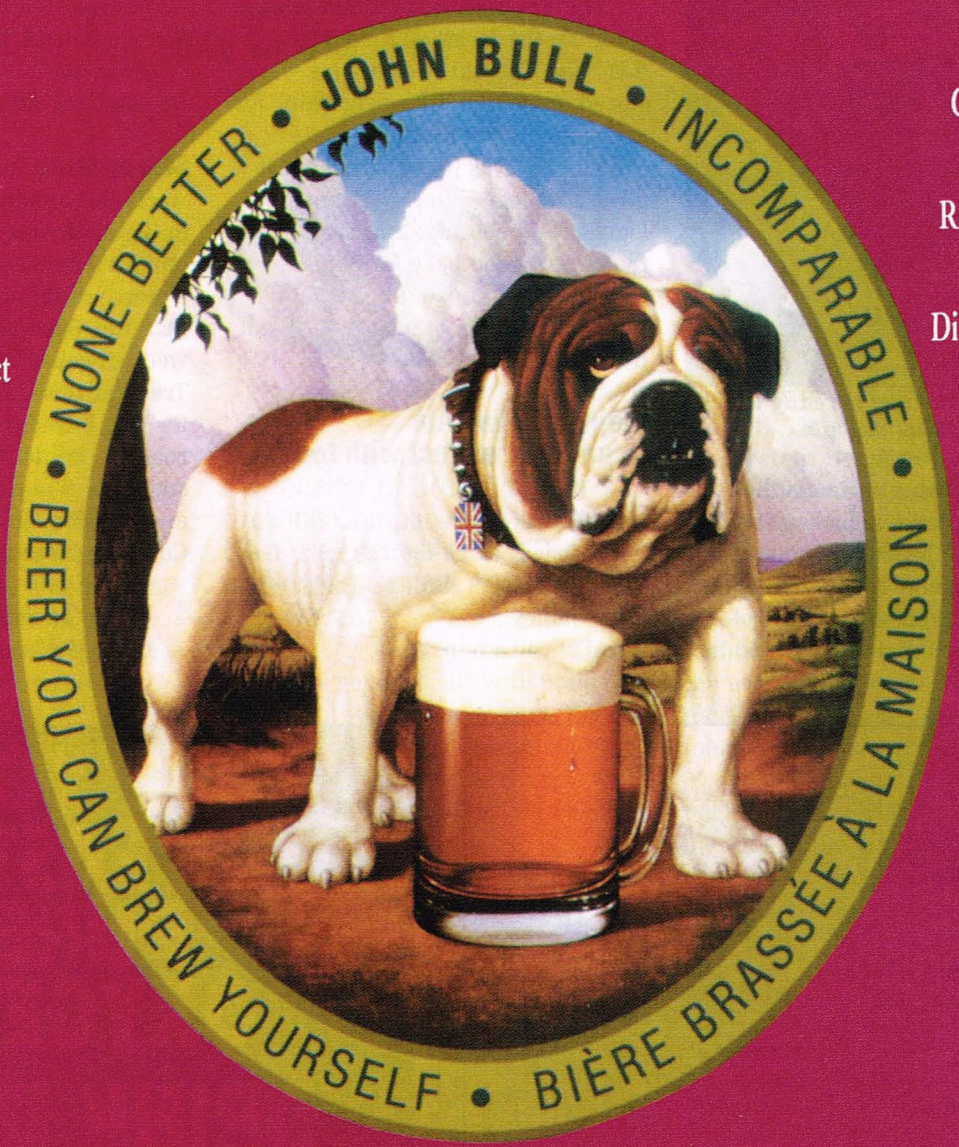
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Tea-bag and old-hop holiday ale



PHOTO COURTESY OF MICHAEL MATUSZCZAK

It's tea time! Michael is ready to test his berry weird holiday ale.

The following recipe is the best batch I've brewed using some different ingredients. It's a holiday beer: I was looking to brew an uncomplicated, light-colored, light-bodied ale that would be ready to serve in time for the annual festivities.

The dry malt extract and honey made up the fermentable portion of this beer. The old Eroica hops were stored opened in the refrigerator for approximately 9 months.

The tea was just a whim but it gives a delicate aftertaste that leaves you guessing. The basic recipe is a good base for experimenting with unusual ingredients. Who knows, maybe next time it will be ... horseradish?

Weird Holiday Ale (5 gallons, extract with tea)

Ingredients

3 lbs. Briess extra-light dry malt extract (DME)
2 lbs. honey
9 AAU Eroica hops (1 oz. at 9% alpha acid)
10 Celestial Seasonings "Raspberry Zinger" tea bags
Yeast cultured from Sierra Nevada Pale Ale
3/4 cup corn sugar for bottling

Step by Step

Boil the malt extract and honey in 3 gal. of water. Add the hops and boil for 1 hour. Cool wort and add water to bring the volume up to 5 gal. Add yeast and ferment for 1 week at cellar temperature. Transfer to secondary and ferment for 1 to 2 weeks. When you are ready to bottle, boil 3/4 cup of corn sugar for 5 min. Turn off the heat and add the tea bags to the syrup. Cover and let steep until cool. ■

Michael J. Matuszczak, Sr.
Wilbraham, Massachusetts



CIRCLE 29 ON READER SERVICE CARD



CIRCLE 31 ON READER SERVICE CARD

Holiday Brews

Festive beer is only a hop, spice and fruit away

by Thomas J. Miller

With the holidays approaching, this is the perfect time to expand your repertoire with a festive holiday beer recipe. Friends and family will soon be visiting, and with all the parties you'll attend, stronger and more experimental beers can make this a year to remember. Spices, fruits or heavy hop additions are three ways to create that special brew.

In most cases, there is no trick to making holiday beers. Usually it just involves tweaking an old recipe to raise the malt content and balance the increased sweetness with more hops. Any other additions are clearly a matter of taste.

This month, three professional brewers offer some advice on what it takes to make holiday beer. They tell us what the style "should" be like and what kind of targets they shoot for in their holiday brews. Their thoughts reveal one simple fact: this is one "style" with plenty of room for experimentation.

CROOKED RIVER® BEER

Brewer: Stephan Danckers is the founder of Crooked River Brewing Company in Cleveland, Ohio. He has a Master's Degree in Brewing Science from U.C. Davis.

My general rule with holiday brews is moderation. I've had plenty of brews with intense hoppiness or heavy spices, but these aren't qualities we shoot for at Crooked River.

Our Yuletide Ale is a big English ale with a strong malt character. We get a starting OG of about 1.068 and ferment down to about 1.020 OG. The result is a full-bodied brew that's heavy in alcohol. Celebration ales should be a bit stronger. I suggest homebrewers aim for a starting OG of 1.064.

We use Cascade hops to achieve medium hoppiness and add a combination of clove, ginger, cinnamon chips and orange peel at the end of the boil. The cloves are used very moderately. Between 5 to 10 whole cloves should add a nice hint of flavor to 5 gallons. Ginger is the next spice (about 1/4 ounce per 5 gallons), followed by the cinnamon chips. Crush between 5 to 10 cinnamon sticks for five gallons. Finally, the orange peel is the most dominant spice. Use the peels of three or four oranges for 5 gallons.

We add the spices in a big tea bag, then steep it for the last ten minutes of the boil. Longer than this and the aroma will boil away. The spices continue to sit in the wort during the whirlpool for about an hour. As for yeast, we use our standard house ale strain: Wyeast 1056.

SIERRA NEVADA®

Brewer: Steve Dresler has been head brewmaster at Sierra Nevada Brewing Company in Chico, California for 18 years.

We're starting to brew our Celebration Ale today (September 13)! And we just finished brewing our Harvest Ale, which is kind of our precursor to the Celebration Ale. It's made with 100% wet hops. That means the hops have been off the vine for less than thirty hours when they are added to the brew. Though the Harvest Ale is quite similar to Celebration Ale, the hops make for a noticeable difference.

When creating our holiday brews, we had to work within our traditional boundaries. This meant we would focus on hops to create the flavors we wanted instead of herbs and fruit. We found that the right hops would give us the spice and citrus flavors normally associated with the holiday style. We use Chinook hops for bittering, Cascade hops to finish, and we dry-hop with Cascade and Centennial hops.

We shoot for about 60 to 65 bittering units which, for homebrewers, translates to double the hops of regular pale ales and goes quite a bit heavier with the final hop addition. The hop oils that contribute the spice and citrus are extracted only during dry-hopping. Whole hops are clearly superior and will give you the desired holiday flavors that we're talking about here.

We wanted something big, like a winter warmer. Our target starting OG is 1.064 and ending OG is 1.056. This gives us an alcohol content of 6.8% by volume.

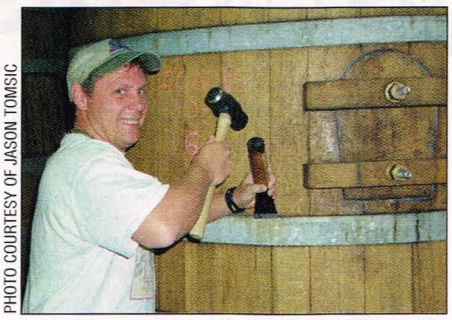


PHOTO COURTESY OF JASON TOMSIC

Brewer: Jason Tomsic of the New Belgium Brewing Company in Fort Collins, Colorado, has been with NBB for three years. He previously worked at Abita Brewing Company in Abita Springs, Louisiana. He attended the diploma course at the Siebel Institute.

Frambozen — a fruited brown ale of Belgian origin — was first brewed by New Belgium Brewing Company during the winter of 1992.

Our Frambozen is not a traditional Christmas beer in any sense, but the high gravity makes it a great winter warmer, and the full raspberry flavor gives you a refreshing memory of stopping to snack on wild raspberries during long midsummer hikes.

If you would like to brew this beer at home, I would shoot for an OG of 1.064. The mash should be roughly 75 percent pale malt, 10 percent Munich malt, 4 percent sugar, 10 percent caramel malt, and 1 percent chocolate malt. Add corn sugar during the boil.

Bittering hops are very low. roughly 20 IBUs. Add these hops early in the boil. We hop very minimally for flavor or aroma as we find that the hops will conflict with the fruit characteristics of the finished beer. Ferment down to 1.014 FG, holding temperatures barely above 68° F. Use a neutral ale yeast (like Wyeast 1056) or a Belgian ale yeast, or even both. After fermentation rack your beer off the yeast and chill it around 30° F if possible.

After 2 weeks of aging, rack your beer (being careful not to transfer any sediment) onto raspberry pulp. This pulp should equal 20% of your total beer volume, so if you are making five gallons of beer, you should rack onto 1 gallon of pulp. If you use raspberry juice, decrease the amount to 10% of your total beer amount (1/2 gallon for a 5-gallon batch). The high alcohol content should eliminate any sanitation concerns but wash the berries as well as possible.

Rack off the raspberry pulp after about two weeks, then let your batch settle again for several days before bottling. ■

Tom Miller is an avid homebrewer who previously worked as a professional brewer in Wyoming. He now lives near Buffalo, New York.

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The Replicator

Hübsch Märzen from Sudwerk Privatbrauerei

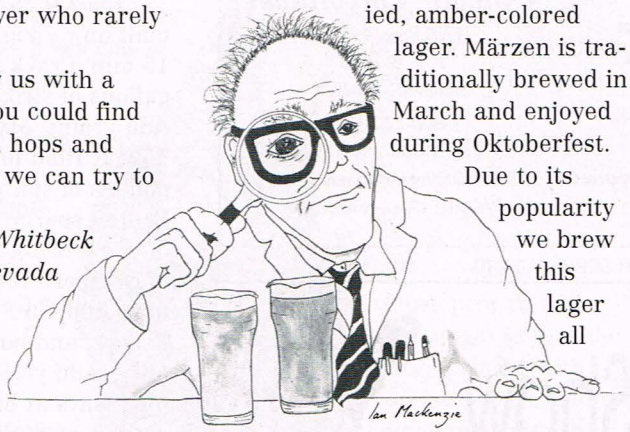
by Scott R. Russell

Dear Replicator,

I was wondering if you could get your loyal subscribers a clone recipe for Sudwerk's Märzen. It's my favorite beer and any time I travel through Davis, I stop there, not only for a fresh draft, but also to buy a case or two to bring home. And I am a homebrewer who rarely ever buys beer.

If you can't supply us with a clone recipe maybe you could find out what type of malt, hops and yeast they use so that we can try to clone it ourselves.

Chris Whitbeck
Washoe Valley, Nevada



If only it were that easy. Two years ago, I tried to get information from Sudwerk Privatbrauerei Hübsch in Davis, California, for my book, *North American Clonebrews*. They were hesitant to talk, though they did refer me to their Web site. Here's what it says:

"Sudwerk Märzen is a full-bodied, amber-colored lager. Märzen is traditionally brewed in March and enjoyed during Oktoberfest. Due to its popularity we brew this lager all year. It's brewed with five roasted specialty malts and the highest quality Bavarian hops. It's slightly sweeter than our other beers. Original gravity is 13.5 Plato."

This isn't much to go on, but we have devised the following partial-mash recipe (with hints for all-grain and all-extract brews as well). This is a well-made, smooth Märzen Oktoberfest style — just like you'd find in Germany, but made in America. It's rich, semi-sweet and nicely balanced by noble hop bitterness and aroma. Sudwerk was established in Davis in 1990 to "bring a touch of Bavaria to America." For brewery information call (530) 756-2739 or go to its Website at www.sudwerk.com.

Sudwerk Hübsch Märzen
(5 gallons, Partial Mash)

OG = 1.060 FG = 1.015 IBUs = 25 to 30

Ingredients

2 lbs. pilsner malt
1 lb. Munich malt
0.5 lb. cara-Munich malt
0.5 lb. carapils malt
0.25 lb. malted wheat
2 lbs. unhopped German pale dry malt extract (DME)
2 lbs. unhopped German amber dry malt extract
6 AAUs Tettnang hops (1.5 oz. at 4% alpha acid)
3 AAUs Saaz hops (0.75 oz. at 4% alpha acid)
Bavarian Lager yeast (White Labs WLP820; Wyeast 2308, 2206 or equivalent)
1 cup pale dry malt extract (for priming)

Step by Step

Heat 7 quarts water to 163° F. Crush grains, add to liquor and hold at 152° F for 75 minutes. Sparge with 10 quarts water at 168° F. Add the DME to runnings, bring to a boil, add Tettnang hops. Boil 60 minutes, turn off heat and then add Saaz hops. Steep 30 minutes, remove as much of the hops as you can. Cool, top up to 5.25 gallons with chilled pre-boiled water, cool to 60° F and pitch yeast.

Ferment at 50° F for one week, move to a cooler location (40° F) for two weeks, then transfer to secondary and condition cold (38° to 40° F) for six to eight weeks. Prime with DME, bottle and age at 40° to 45° F for six weeks.

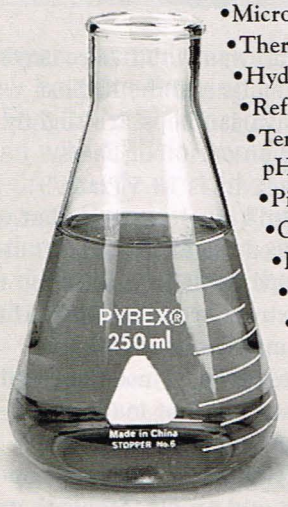
All-extract option: Steep 0.5 lb. each Munich, cara-Munich and carapils malts in 2.5 gallons at 150° F for 45 minutes. Omit pilsner, wheat and the rest of the Munich malt. Increase DME to 3 lbs. of each and follow directions from boiling.

All-grain option: Mash 5 lbs. of pilsner malt, 4 lbs. Munich, cara-Munich, carapils and wheat as above, in 14 quarts at 150° F, then sparge with 16 quarts. Omit DME and proceed as above, reducing wort volume to 5.25 gallons or below.

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reader recipes

Ship Wreck Export Ale

(5 gallons, all grain)
OG = 1.055 FG = 1.010 IBUs = 30

This is my version of Shipyard Export Ale from Shipyard Brewing Company in Portland, Maine.

Tom Adamczak
Kentwood, Michigan

Ingredients

0.25 lb. two-row pale malt
7.5 lbs. two-row pale malt
1 lb. crystal malt (40° Lovibond)
6.5 AAU Northern Brewer Pellets (1 oz. at 6.5% alpha acid)
3.25 AAU Northern Brewer pellets (0.50 oz. 6.5% alpha acid)
American Ale Yeast (Wyeast 1056)

Step By Step

Toast 0.25 lb. of two-row pale malt on cookie sheet at 350° F for 15 min. Crack grains and heat 2.25 gallons of strike water to 168° F. Add grains. Mash should stabilize at 152° F. Hold for 90 min. Preheat 4.5 gallons of sparge water to 170° F. Lauter, sparge and collect 6 gallons of wort. Bring to boil and add 1 oz. of Northern Brewer and boil for 30 min. Add 0.50 oz. of Northern Brewer and boil for 30 min. Chill to 68° F, add yeast starter and ferment for 7 days at 65° to 70° F. Rack to secondary and condition for one week. Prime with 1/2 cup of priming sugar, bottle and age for 2 weeks.

Extract with grain option: Substitute 7 lbs. of John Bull light malt extract for the two-row pale malt. Crack crystal malt and steep in 160° F water for 25 min. Bring to boil, add 1 oz. of Northern Brewer and boil for 30 min. Add 0.50 oz. of Northern Brewer and boil 30 more min. Bring volume to 5.5 gallons, chill to 68° F, add yeast starter and ferment for 7 days at 65° to 70° F. Rack to secondary. Condition 5 to 7 days. Prime with 1/2 cup of priming sugar, bottle and age for 2 to 3 weeks. ■

Share Your Recipe!

Send your favorite recipe to edit@byo.com. Be sure to include your full name and address.

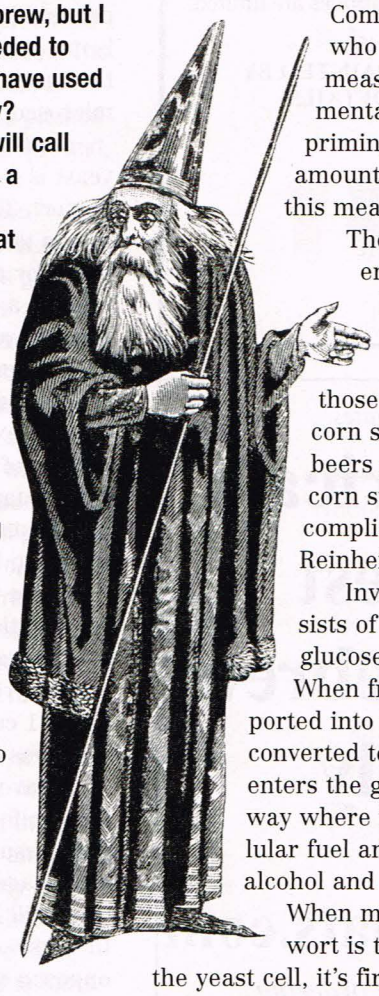
Priming With DME

Boil times, high-gravity wort and open fermentation

Mr. Wizard

Recently, I was making a batch of Scotch ale. The recipe called for wheat DME as a priming sugar. Obviously I can experiment with anything I want in my homebrew, but I was wondering if I really needed to use wheat DME or if I could have used the amber DME I had already? Depending on the recipe, it will call for different types of DME as a priming sugar, for example, wheat, light or amber. To what extent does the use of various DME as priming sugars contribute to the flavor or color of the beer? Also, could you could explain the pros and cons of using DME vs. corn sugar to carbonate beer? What does DME do for beer that priming sugar doesn't?

Dave Ross
Philadelphia, PA



This is a question I often ask myself when reading recipes. It seems to me that using DME or saving wort for priming is a pain in the neck. The contribution of color or flavor to beer from priming sugar is insignificant compared to the flavor and color present in wort before fermentation. Even if the priming sugar added some flavor, an argument could be made for adding it before wort boiling, for example, brown sugar.

I think the best sugar to use for priming is either corn or invert sugar because they are both 100% fermentable and easy to handle.

The problem with using wort or DME for priming is the inconsistent fermentability of wort. If you use DME with an unknown fermentability for priming, then it's impossible to control the carbonation level.

Commercial brewers who prime with wort measure wort fermentability before priming and base the amount of primings on this measured number.

The main difference between beers primed with DME or wort versus those primed with corn sugar is that the beers primed with corn sugar are not in compliance with the Reinheitsgebot.

Invert sugar consists of equal parts glucose and fructose. When fructose is transported into the yeast, it's converted to glucose and enters the glycolytic pathway where it's used as cellular fuel and ends up as alcohol and carbon dioxide.

When maltose from wort is transported into the yeast cell, it's first converted to two molecules of glucose and then follows the same biochemical pathway as the glucose from corn sugar. The only difference between wort and a corn sugar solution are the non-fermentable sugars, proteins and color compounds present in wort. These compounds are present in much higher concentrations in the original wort.

I expect to hear some strong opposition to these views, but that is the way I see it. This would be a good question to put up to an experiment followed by a blind tasting to determine what effect, if any, can be quantified by using different types of priming solutions.

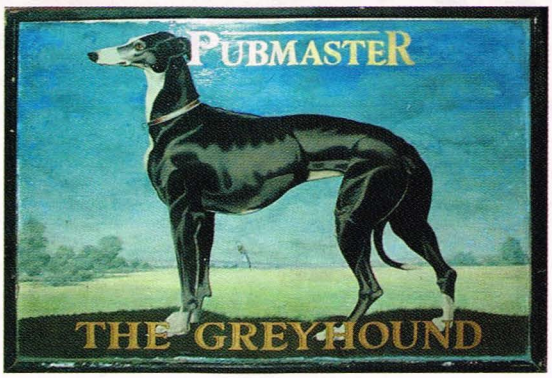
Mr. Wizard

I'm planning to brew some smaller (1 and 3 gallon) experimental batches and wanted to know if I should still boil these batches the standard 60 to 90 minutes. Or should I set the boil time in relation to the amount of wort (1 gallon = 12 minutes, for example)? Would using Wyeast (with a starter) or White Labs yeast vials cause me to over-pitch these smaller batches? I also wanted to know if you have ever used pure oxygen in your homebrewing wort before you pitched your yeast and if it made a dramatic improvement in the taste of your finished beer.

Jim Albrecht
Naperville, Illinois

Brewing small experimental batches is a good way to determine the effect of a particular brewing variable. By changing one variable at a time, you can see how yeast strain, hop variety and fermentation temperature affect beer flavor.

Homebrewing techniques are really not much different than those used by very large brewers. The main difference is the batch size. A large commercial brew kettle may contain 30,000 gallons of wort, but the timing of hop additions and length of boil are the same as for smaller batches. The duration of boiling affects chemical reactions, like hop acid isomerization, protein



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precipitation and destruction of microorganisms. These reactions are dependent on time and are not a function of wort volume. In other words, don't reduce your boil time in relation to batch size.

When it's time to add yeast, you should scale down the amount of yeast added to the smaller batch just like you scale down the malt, hops and water. If you don't scale down you will over-pitch the wort and the results of your experiment may be difficult to interpret. The most accurate language used to discuss pitching rates is "yeast cells per milliliter" of wort. This language is not practical for homebrewers because most of us don't have a microscope lying around the house.

A good rule of thumb for dried yeast is 0.5 grams of yeast per liter of wort. This translates to about 10 grams (about 1/3 ounce) of dried yeast for a 5-gallon batch. Liquid yeast is a bit trickier because cell density varies more in liquid yeast suspensions. When I'm growing yeast for pitching, I use a 10X factor. For example, if I want to brew 5 gallons of beer I will use a 0.5-gallon starter culture. Usually, I will let the starter complete its fermentation and discard the liquid above the yeast to reduce the volume of propagation liquid added to the wort. If you choose to re-use yeast from a previous fermentation, use about 1 cup of thick yeast slurry per 5 gallons of wort.

I have used both pure oxygen and air for aeration and have had good results with both. The greatest advantage of oxygen over air is that wort will hold more oxygen when the gas source is pure oxygen as opposed to air. The only time this really makes much difference is when you are brewing high gravity beers. Another advantage of oxygen is that you don't have to worry much about contaminating your wort with bottled oxygen. With that said, I typically use air that is run through a sterile filter before it's injected into the wort stream. Good luck with your experiment.

Mr. Wizard

A couple of years ago I came across a 2.5-gallon recipe for Thomas Hardy ale that called for 6.8 kilograms (15 lbs.) of pale malt and 1.7 kilograms (3.74 lbs.) of amber malt with an OG of 1.125. I adapted the recipe to my extract brewing method without being exact in the conversions. I used 7 kilograms (15-1/2 lbs.) of light extract syrup, two packages of old yeast and one package of EDME ale yeast, and 28 grams of Fuggles to dry hop.

Looking at the amount of extract I used, it's obvious that I miscalculated and used a lot more than I needed. The original gravity was so high that I couldn't even take a reading. I pitched the yeast straight from the packet and, after a slow start, fermentation chugged along for 10 days then stopped. The beer seemed quiet so I racked to a carboy and took a gravity reading of 1.120. In my fear of a stuck fermentation, I pitched two packages of Red Star Champagne yeast. The airlock activity increased for about two days and, again, it stopped. I still didn't believe that fermentation was complete. I decided to dilute the beer by adding 1/2 gallon of water and pitched another package of Red Star champagne yeast. After a month I racked again to another carboy and took a gravity reading of 1.062. Then, with a calculated guess and a lot of faith, I dry hopped.

Now, over two years later, it's time to bottle. The gravity is 1.052. After tasting a sample, I'm amazed that it's actually very good. It's malty and aromatic, almost like a brandy. My questions are: What is a good method to convert kilograms of grains to kilograms of extract (dry/liquid)? Is there a point where even a wine/champagne yeast could not begin to ferment a high-gravity wort? Given the specifics of this brew, would it have made a difference if I prepared a yeast starter? Do you believe it's safe to bottle this brew? If so, do you think it's necessary to prime and add yeast?

Dexter A. David
Stamford, Connecticut

I must say this is one of the most interesting homebrewing accounts that has been submitted for my evaluation. I'm sure other homebrewers will appreciate the patience and tenacity exemplified in brewing this batch of brew.

The amount of malt extract you used was tremendous! According to my calculations, the original gravity of this brew was about 1.205 or 45° Plato. I can't believe this stuff fermented at all. For normal brews you can substitute about 0.9 pounds of liquid extract or 0.7 pounds of dry malt extract for 1 pound of pale malt. Normal brews incorporate a sparging step to rinse the extract from the grains used in mashing. Strong beers, like barleywines, often omit the sparging step and simply

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rely on the first runnings from the lauter tun. This method of brewing sacrifices extract yield in order to produce a high gravity wort.

In practical terms this means that you substitute much less extract for malt when brewing strong beers because with extract you lose nothing in the process. My extract calculations indicate that you should have used about 4 kilograms of malt extract instead of 7 kilograms.

This level of original gravity is so high that fermentation will be slow with any type of yeast. I assume you added the two packets of yeast to the boil as a yeast nutrient. Helping your yeast out with some nutrients was on track for a very high-gravity brew. I would also want to use a higher-than-normal pitching rate and be sure to thoroughly aerate the wort with oxygen. A starter would have boosted fermentation but it would still have been rather slow.

You have probably fermented all of the fermentable sugars if the gravity is down to 1.052, but there might be some fermentables floating around. I wouldn't recommend adding more yeast and priming sugar because even a small amount of residual fermentables could result in bottle bombs. Sam Adams' Triple Bock has a very high original gravity, is bottled still (uncarbonated) and tastes very nice, almost like a sherry. I would rack this beer off of the yeast sediment, then bottle it in small bottles and drink it when you are ready.

Mr. Wizard

I bought the CAMRA homebrewing guide and followed a bitter recipe. I mashed the grain and managed to get the temperature just about spot on 66° C (151° F), sparged it and boiled with the hops and sugar for 90 minutes. After letting it cool, I tested the OG, which was 1.040. I was feeling pretty pleased with myself as the OG in the book was 1.043.

I used Gervin Ale yeast, which I made up according to the pack instructions. The temperature of the wort was about 22° C (71.6° F) when

the yeast was added. I gave it a good aerating, then covered the bucket and waited for something exciting to happen. The weather was quite warm when I brewed, and the cupboard where the I left the wort was about 20° C (68° F).

In the CAMRA book, there's a full description of the phases the yeast activity should go through and even a picture of a thick head of yeast coming over the top of the author's brew bucket. It states that "you should get a thick pancake of yeast on top of the wort, and I mean at least 2 inches thick. If you don't, there's either something wrong with your yeast or your brewing technique."

After about 12 hours, a few blobs of yellowy-grey muck came up to the surface and were still there after 24 hours. Wort temperature was about 21° C (69.8° F) at this time. After 2 days I skimmed off the lumps, then nothing else happened. I tried rousing it — nothing. After about 5 days the wort smelled revolting so I gave up and threw it away.

I tried again using different yeast, Muntons Gold this time. I was particularly careful about sanitizing. I got a similar OG and pitched the yeast. The temperature was okay and the same thing happened again. The next day there were just a few globules of muck floating about on the surface and no sign of yeast activity.

I don't believe the problem is faulty yeast so I must be doing something seriously wrong, but I can't figure out what it is.

Jon Ashby
London, England

I particularly like the description of fermentation quoted from your CAMRA (Campaign for Real Ale) homebrewing guide. The image of a thick, pancake-like crop of yeast brimming over the top of the fermenter is a classic image of open fermentation.

I have experienced some real catastrophes with fermentation and they have almost all been due to problems with yeast; the others were traced to problems with my

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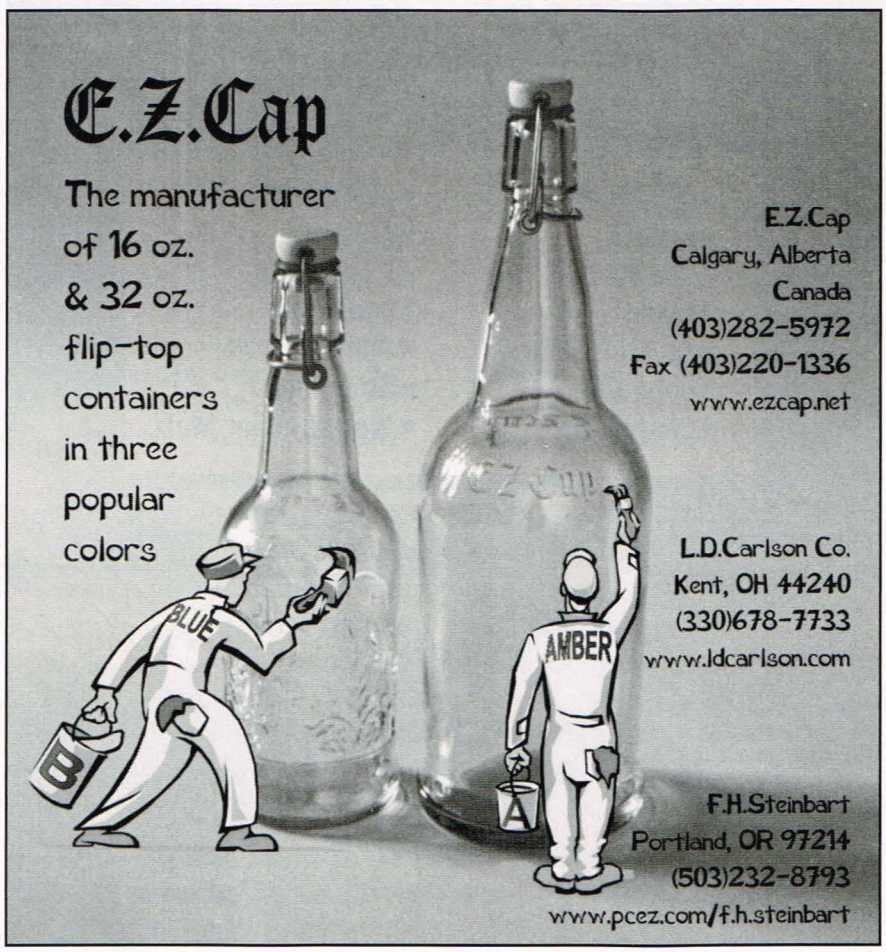
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cleaning method. These problems did not occur in five-gallon batches yet the solution was the same — dump the 500 gallons of bad brew, evaluate the problem and start all over again.

Lagging fermentation starts are usually caused by low pitching rate and/or weak, unhealthy yeast. The best way to make sure that the yeast you use is vital is to do a propagation. The beauty of propagation is that you get a preview of what is to come. If you start your propagation a few days before brew day and see no activity in a one-quart propagation container you haven't lost much and you still have time to try again.

Just because you experienced the same problem twice with different yeast strains does not rule out that the problem is your yeast. The yeast may have been weak or in less-than-ideal quantities for a thick, pancake crop. In its weak state, your fermentation started slowly. The blobs of yellow-gray muck you describe sound like the early signs of fermentation. Since you were following a CAMRA guide and were able to notice these details on the surface of the wort, I am guessing you were doing an open fermentation.

For those readers unfamiliar with CAMRA, this organization promotes the production of real ale in the UK and has a very strong reverence to traditional brewing methods. I have seen this book and it suggests covering the fermentation with a towel to prevent stuff from falling in. A towel may catch debris, but it won't keep out microorganisms! Even if I'm wrong about the open fermentation guess, my advice is still applicable.

Slow starts to fermentation make bacterial spoilage more likely since a strong fermentation deters growth of contaminating organisms. Many commercial methods can be used at home, but I would leave open fermentation to brewers with a professional facility. Closed fermentation is much safer. Covering the bucket with a lid and airlock or using a carboy equipped with an airlock or blow-off tube makes life a lot easier. ■

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



Do you have a question for Mr. Wizard? Write to him c/o Brew Your Own, 5053 Main Street, Suite A, Manchester Center, VT 05255. Or send e-mail to wiz@byo.com. Please include your full name and hometown.

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Spice It Up

A festive holiday beer and a gruit-style spiced ale



by Tess and Mark Szamatulski

This is the season for celebrations, so we have chosen two very celebratory beers to brew for this joyful time of year. The first is our version of Ballard's Wassail Special Strong Ale, brewed by Ballard's Brewery in Petersfield, England. The brewery suggests mulling their beer with a little sugar and spices to enjoy in cold weather. This unique beer is not imported into the United States.

The spiced ale is brewed with gruit. Gruit is an ancient spice and herb mixture, used long before hops were introduced to brewing. Try formulating your own version of gruit and making an intriguing one-of-a-kind brew.

Holiday Ale

OG, FG, IBUs and SRM will vary

In the BJCP (Beer Judge Certification Program) guidelines there is not a category for Holiday Ale. If you brew a holiday beer, love it and want to enter it into a homebrew competition, it should be entered in Category #24 (Specialty/Experimental/Historical). This is the category for beers that don't otherwise meet established style categories.

We like our holiday beers to be fruity ales. They should be deep to dark brown with a long-lasting whipped-cream head. Malt aroma should fill the nose, with a background of intense fruit and maybe a hint of hops. The palate should explode with malt, with hops barely present. Full-bodied and creamy, the beer's alcohol is subtle, and the finish should be long and mirror the palate. The alcohol content should be 6% ABV or above — both complex and warming.

Our example, Ballard's Wassail Special Strong Ale, was first brewed as a draught beer for Christmas in 1980. It became so popular that it's now a permanent beer in the Ballard's portfolio. Wassail pours into your glass with hints of tawny browns and a massive, rocky head. The aroma is a complex medley of dried dark fruit, sweet malt and spicy hops. Malt enhances the palate with dark, bittersweet notes, leading to the long, dry ending. This is a beer to savor before the fireplace on dark winter evenings.

For a festive hot drink, heat Wassail and pour 12 ounces into a mug with 2 teaspoons (more or less to taste) white or brown sugar, along with a cinnamon stick. Dust some nutmeg over the top and sip.

Commercial Beers To Try

There are many special holiday beers available at this time of year. Here's a partial list: Samuel Smith's Holiday Ale, Scaldis Noel, Abbey Affligem Noel, Sierra Nevada Celebration Ale, Moctezuma's Noche Buena, Traquair House Ale, King & Barnes Christmas Ale, St. Sylvester's Flanders Winter Ale, Stille Nacht by Del Dolle Brewers, Gordon Xmas, Thomas Hardy's and JW Lee

THE YEAR IN BEER

JANUARY:
Barleywine & Roggenbier

FEBRUARY:
Cream Ale & Dublin Stout

MARCH:
Belgian Dubbel & Pilsner

APRIL:
Maibock & Scotch Ale

MAY:
IPA & Mild Ale

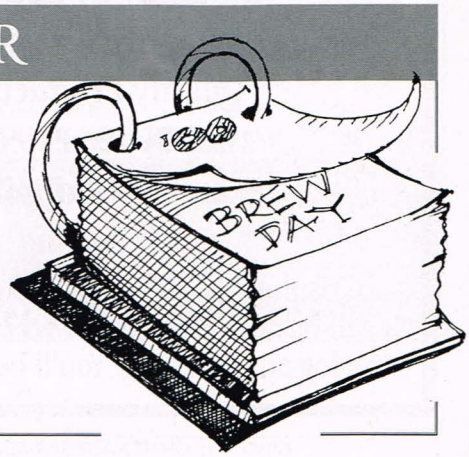
JUNE:
Golden Ale & Oktoberfest

SEPTEMBER:
Dort & Oatmeal Stout

OCTOBER:
ESB & Weizenbock

NOVEMBER:
Dunkel & Belgian Tripel

DECEMBER:
Holiday Ale & Spiced Ale



Harvest Ale. Most breweries have a holiday or winter ale.

Hops, Malt and Yeast

Hops should be subdued and the malt should dominate. We favor spicy, earthy hops for our holiday ales. East Kent Goldings, Fuggles, Challenger, Styrian Goldings and Polish Lublin are all good choices. Bittering hops should be kept to a minimum, just enough to balance the malt sweetness. Flavor and aroma hops should also be subdued. Crystal malts are necessary with a small amount of black malt for depth of color. Honey malt is a nice grain to use, along with chocolate malt to give a nutty, complex nuance to the beer. The yeast should promote a full, malty beer; we recommend Wyeast 1968 (Special London Ale), Wyeast 1275 (Thames Valley), Wyeast 1028 (London Ale), Wyeast 1084 (Irish Ale), Wyeast 1318 (London III), White Labs WLP002 (English Ale) or White Labs WLP004 (Irish Ale).

Serving Suggestions

Serve at 55° F in a pewter mug with a pancetta-wrapped filet mignon smothered with wild mushroom sauce and roasted garlic smashed Yukon Gold potatoes.

Holiday Ale (5 gallons, extract with grains)

OG = 1.062 FG = 1.015
IBU = 32

Ingredients

12 oz. British crystal malt (55° Lovibond)
1 oz. British black malt
7 lbs. Muntons extra light dry malt extract (DME)
8 AAUs Fuggles (2 oz. at 4% alpha acid) (bittering)
5 AAUs East Kent Goldings (1 oz. at 5% alpha acid) (flavor)
2 AAUs Fuggles (0.5 oz. at 4% alpha acid) (aroma)
1 tsp. Irish moss
Thames Valley (Wyeast 1275) or English Ale (White Labs WLP002)
1-1/4 cup Muntons extra light dry malt extract for priming

Step by Step

Bring one gallon of water to 155° F, add crushed grain and hold for 30 minutes at 150° F. Strain the grain into the brewpot and sparge with one gallon of 168° F water. Add the dry malt and bittering hops.

Bring the total volume in the brewpot to 2.5 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss. Boil for 13 minutes, then add the aroma hops. Boil for 2 minutes, then remove the pot from stove. Cool wort for 15 minutes in an ice bath or chill with wort chiller. Strain into the primary fermenter and add water to obtain 5-1/8 gallons. Add the yeast when the wort has cooled to below 80° F,

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then oxygenate-aerate well.

Ferment at 68° F for 7 days, then rack into secondary (glass carboy). Ferment until target gravity has been reached and beer has cleared (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F for 2 to 3 weeks. Store at cellar temperature.

Partial-mash option: Mash 2.25 lbs. British two-row pale malt and the specialty grains in 1 gallon of water at 150° F for 90 minutes. Sparge with 2 gallons of water at 168° F. Then follow the extract recipe, omitting 1.75 lbs. of Muntons extra light dry malt extract from the boil.

All-grain option: Mash 11 lbs. British two-row pale malt and the specialty grains in 3 gallons of water at 151° F for 90 minutes. Sparge with 5 gallons of water at 168° F. The total boil time is approximately 90 min. Add 5.9 AAU of Fuggles for the last 60 min. of the boil. Then add the flavor hops, Irish moss and aroma hops as indicated by the extract recipe.

Gruit-Style Spiced Ale

OG, FG, IBUs and SRM will vary

Before the use of hops in beer, European beers were often flavored with gruit (rhymes with fruit). Gruit is a blend of herbs and spices, the most common being bog myrtle, yarrow and rosemary.

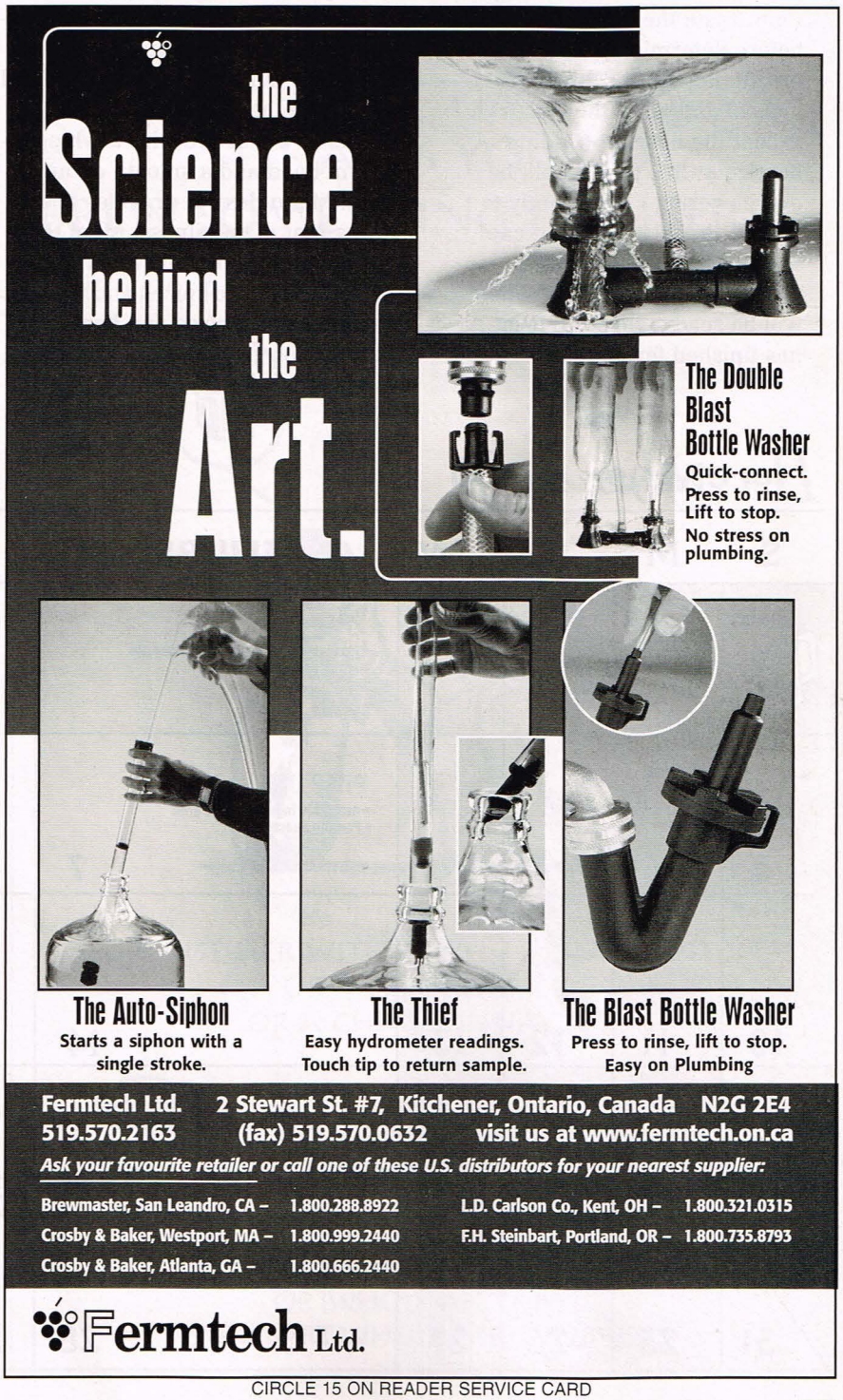
Gruit ale was the main form of ale in Europe for close to 700 years. The production of gruit was monitored by the church. Many of the religious sectors had monopolies on the gruit trade and discouraged the use of hops to protect their interests. In Holland, gruit suppliers even taxed hopped beer.

The Germans were the first to use hops in beer. In the 1500s they instituted "The Bavarian Beer Purity Law," which names hops as the only flavoring in beer. Because of the preservative qualities in hops, Germany was the only country that could successfully export beer. Eventually all of Europe changed over to hops, with England being the most resistant. When the Flemish settled in Kent, England and planted hops in the fifteenth century, King Henry the VI finally passed a law allowing the growth and use of hops. It soon became apparent that using hops made better beer and gruit ales became a fond memory.

In our version of gruit-style spiced ale, we combine hops and gruit. Hops will be used for bittering and herbs and spices are used for flavor and aroma.

Commercial Beers To Try

Some excellent spiced beers are: St. Peter's Spiced ale (spiced with cinnamon and apple), New England Holiday Ale, Anchor "Our Special



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SPICY HINTS

THE AMOUNT OF THE spices in the gruit spiced ale are restrained. This way, the spices don't need to mellow over time and the beer will be drinkable as soon as it's carbonated. If a stronger spiced beer is preferred, make a spice potion and add it at bottling time. Taste the beer first before determining how much to add. Potion: 1/3 cup of grain alcohol and all of the spices except the licorice. (Adding licorice at this time would be overpowering.) Heat gently to 120° F. Put in a glass jar, cap and let age in a cool, dark place. Use to taste. The potion will be ready when the beer has finished fermenting.

Ale," Harpoon Winter Warmer, Buffalo Bill's Pumpkin Ale, Alba Scots Pine Ale, and Grozet Auld Scot's Gooseberry and Wheat Ale.

Hops, Malt, Yeast, Herbs and Spices

Bittering hops should not be more than 10 AAUs so that the bitterness does not detract from the spice and herb flavors. Almost any variety of bittering hop can be used. Crystal malt is used for body, roundness, color and sweetness. Chocolate malt is used for color, and to give the beer another dimension. Torrified wheat provides a whipped-cream head and a smooth creamy body. Malto-dextrin provides body and a hint of sweetness. All of these characteristics provide a perfect backdrop for the spices and herbs. The following spices and herbs can be used for gruit: cumin, yarrow, sweet gale, anise, rosemary, caraway seed, coriander, cinnamon, ginger, juniper berries, nutmeg, millefoil, bog myrtle, nutmeg, elderflowers, cardamom, lavender, licorice stick, rosemary, mace, cloves, vanilla bean, woodruff, black pepper and marjoram.

Gruit can be a mix of a few or many spices, depending on the brewer. Some combinations that compliment each other are: sweet gale, coriander and cumin; nutmeg, mace, cinnamon, cloves, ginger and vanilla bean; or cumin, black pepper and lavender. The combinations can be as few as two or as many as ten. Use your imaginations and your taste buds.

Serving Suggestions

Serve gruit-style spiced ale in a tankard mug at 55° to 57° F. Enjoy with a simple dessert of lemon pound cake topped with freshly whipped cream and raspberries.

December 2000

S	M	T	W	THURSDAY	F	SATURDAY
				PREP DAY • Assemble ingredients for holiday ale • Prepare yeast starter	1	BREW DAY • Sanitize equipment • Brew holiday ale • Record original gravity • Ferment in primary for 7 days 2
3	4	5	6	PREP DAY • Assemble ingredients for gruit • Prepare yeast starter 7	8	BREW DAY AND TRANSFER DAY • Sanitize equipment • Rack holiday ale to secondary and ferment three weeks • Brew gruit ale • Record original gravity and make potion 9
10	11	12	13	14	15	TRANSFER DAY • Transfer gruit into secondary and ferment for three weeks 16
17	18	19	20	21	22	23
24 / 31	25	26	27	28	29	BOTTLE DAY • Prime, bottle and keg holiday ale if desired gravity is reached 30

Gruit-Style Spiced Ale (5 gallons, extract with grain)

OG = 1.058 FG = 1.015
IBU = 28

Ingredients

12 oz. U.S. crystal malt (60° Lovibond)
4 oz. torrified wheat
3.5 oz. British chocolate malt
6.5 lbs. Muntons extra light dry malt extract (DME)
2 oz. malto dextrin
8.5 AAUs Northern Brewer (1 oz. at 8.5% alpha acid) (bittering)
1 tsp. Irish moss
Gruit Mixture: 1-inch vanilla bean (chopped), 1/2 tsp. sweet gale, 1-inch piece broken licorice stick, 2 tsp. anise seeds (crushed), 1-inch of fresh ginger (grated).
London ESB Ale (Wyeast 1968) or English Ale (White Labs WLP002)
1-1/4 cup Muntons extra light dry malt extract for priming

Step by Step

Bring one gallon of water to 155° F, add crushed grain and hold for 30 min. at 150° F. Strain the grain into the brewpot and sparge with one gallon of 168° F water. Add the dry malt, malto dextrin and bittering hops. Bring the total volume in the brewpot to 2.5 gallons.

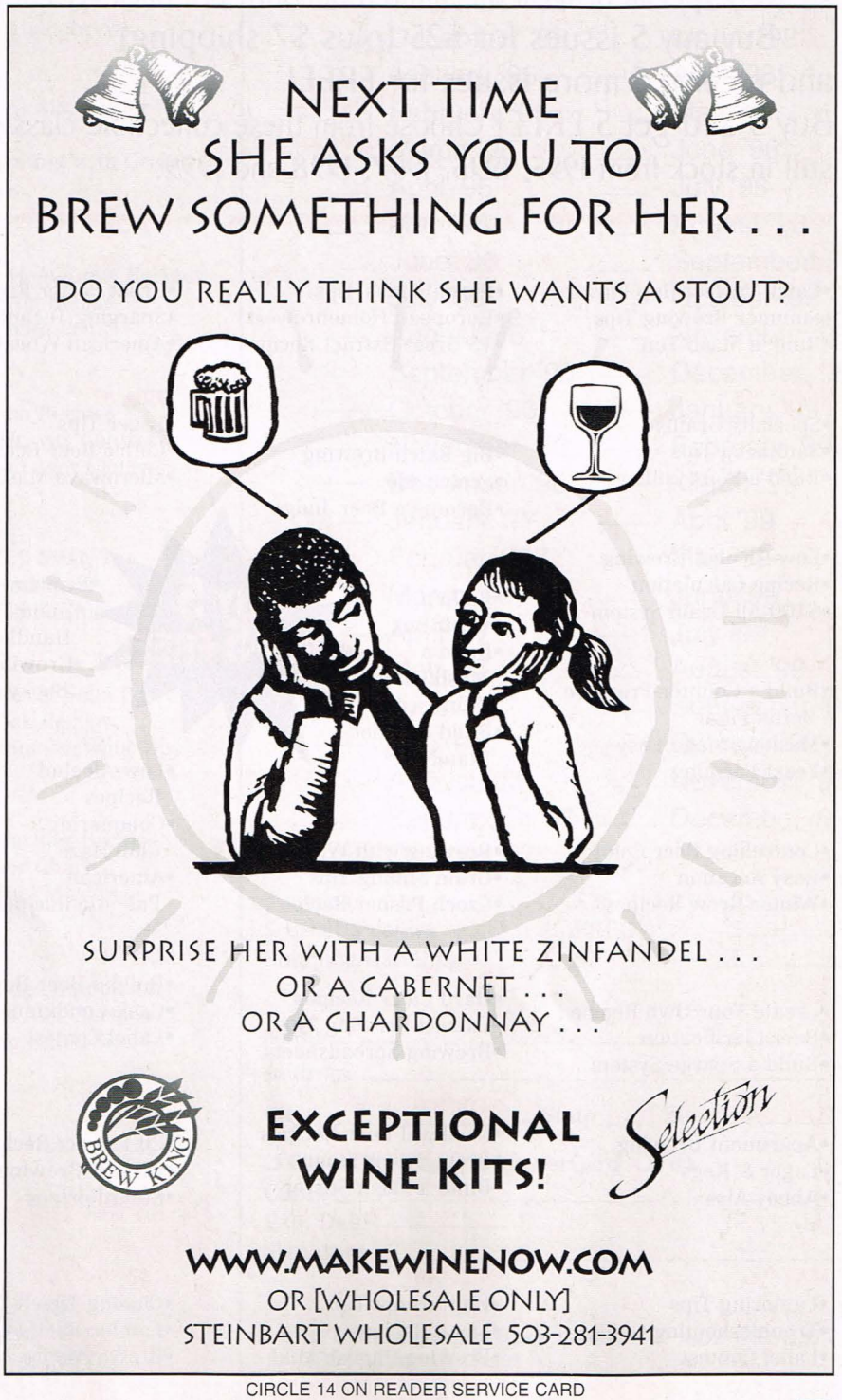
Boil for 45 min., then add 1/2 of the gruit mixture and Irish moss. Boil for 10 min., then add 1/2 of the gruit mixture. Boil for 5 min., then remove pot from stove. Cool wort for 15 min. in an ice bath or chill with wort chiller. Strain into the primary fermenter and add water to obtain 5-1/8 gallons.

Add yeast when wort has cooled to below 80° F. Oxygenate-aerate well. Ferment at 68° F for 7 days then rack into secondary (glass carboy). Ferment until target gravity has been reached and beer has cleared (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F. for 2 to 3 weeks. Store at cellar temperature.

Partial-mash option: Mash 1.75 lbs. U.S. two-row pale malt and the specialty grains in 1 gallon water at 150° F for 90 min. Sparge with 2 gallons water at 168° F. Then follow the extract recipe, omitting 1.75 lb. of Muntons extra light dry malt extract (DME) from the boil.

All-grain option: Mash 9.67 lbs. U.S. two-row pale malt and the specialty grains in 3 gallons of water at 152° F for 90 minutes. Sparge with 5 gallons of water at 168° F. The total boil time is 90 minutes. Add 6.8 AAU of bittering hops for the last 60 minutes of the boil. Add the spices and Irish moss as indicated by the extract recipe. ■

Tess and Mark Szamatulski, owners of Maltose Express in Monroe, Connecticut, are regular contributors to BYO.



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BEYOND THE black-and-tan

BY LYNNE O'CONNOR

Lambic, lime and soda pop: Beer can be blended in traditional ways ... and also mixed with some surprising stuff!

WHEN ONE THINKS OF BLENDING BEERS, THE CLASSIC BLACK-AND-TAN COMES TO MIND. A BLEND OF BASS AND GUINNESS, IT'S EQUAL PARTS OF TWO BEERS THAT ARE NOT MEANT TO BE STIRRED TOGETHER, BUT RATHER ARE LAYERED FOR A LOVELY AESTHETIC. BLENDING TO ENHANCE APPEARANCE IS COMMON FOR COCKTAILS BUT UNUSUAL FOR BEERS. HOWEVER, NUMEROUS BEERS ARE BLENDED FOR OTHER REASONS, PRINCIPALLY TO MELD FLAVORS; THE TOTAL IS GREATER THAN THE SUM OF THE PARTS. THIS BLENDING MAY BE DONE IN THE GLASS, AS WITH THE BLACK-AND-TAN, OR IN THE FERMENTER, CASK OR BOTTLE. ADDITIONALLY, BEERS ARE OFTEN BLENDED WITH NON-ALCOHOLIC BEVERAGES TO PRODUCE REFRESHING THIRST-QUENCHERS. ALL OF THESE OPTIONS ARE AVAILABLE TO HOMEBREWERS, SO LET'S EXPLORE THE WIDE (AND SOMETIMES SURPRISING) WORLD OF BLENDING.

LAMBIC: THE BLENDED BEER OF BELGIUM

Lambic beers are made in the Senne Valley near Brussels, Belgium. Lambics are unique on a number of fronts. The grist often is made from at least 30 percent unmalted wheat and stale hops are added to the boil. The most distinctive character is derived from "spontaneous fermentation," which means that open fermenting vessels are exposed to natural microflora, including *brettanomyces bruxellensis* and *brettanomyces lambicus*. Lambics are aged in oak, further contributing to their idiosyncrasy. The resulting beer is quite acidic.

As one would expect for a brewing process lacking the rigor of modern quality control, the product varies from batch to batch. So lambic breweries retain master blenders. The blender melds the varying oakiness, sweetness and acidity of two lambics to produce "gueuze." Gueuze is typically a blend of one-third young lambic (aged three to six months) and two-thirds old lambic (aged at least two years). Faro and fruit lambics are produced by adding a candi sugar (similar to our rock candy) or fresh fruit for a secondary fermentation.

Homebrewing lambics appears daunting, as well it should. However, it is not so difficult to produce close approximations with widely available ingredients and a little effort. One popular approach used by brewpubs and homebrewers is to make an ale with a traditional yeast and then add a blend of *brettanomyces lambicus* and *brettanomyces bruxellensis* for a secondary fermentation to produce the characteristic tartness.

As the Belgians do, this homebrewed lambic can be aged for up to two years and then blended with a young lambic. This requires patience that I lack. I enjoy blending this lambic, particularly as it becomes increasingly dry, with bocks or porters. These sweet, malty beers serve much the same function as the young lambics: to balance the dryness and acidity of the old lambic.

LYNNE'S BASIC LAMBIC

(five gallons, extract)
OG = 1.045 FG = 1.016 IBUs = 0

Ingredients

7 lbs. Briess wheat syrup extract
2 oz. stale whole leaf Saaz hops
Starter of Wyeast 1056 (American Ale)
Wyeast 3272 (Lambic Blend)
8 oz. oak chips
1.1 cup corn sugar for priming

Step by Step

Note: You need to use hops that have very little bitterness and flavor left in them. The main purpose of using hops at all in a lambic is for the preservative quality. Stale the hops by spreading at room temperature on baking sheet for at least 2 weeks.

Bring 5 gallons of water to a boil, add hops and wheat extract at beginning of boil. Cool to room temperature and pour into sanitized fermenter. Add Wyeast 1056 (American Ale) yeast, aerate and keep in primary fermenter for two weeks. Rack to secondary and add Wyeast 3272 (Lambic Blend) yeast and oak chips. Ferment at 65° to 70° F for at least three months. Prime and bottle when pH reaches 3.2 to 3.6.

All-grain version

For the all-grain lambic, replace the wheat syrup extract with 5 lbs. pale malted barley and 3 lbs. flaked (unmalted) wheat and mash at 150° F. Sparge with 170° F water and bring the runnings to a boil in brew pot. Add staled hops and boil for 1 hour. Cool to room temperature and pour into sanitized fermenter. Add Wyeast 1056 yeast, aerate and keep in primary fermenter for 2 weeks. Rack to secondary and add Lambic Blend yeast and oak chips. Ferment at 65° to 70° F for at least three months. Prime and bottle when pH reaches 3.2 to 3.6.

Illustration by Shawn Turner

BLENDING IN THE GLASS



In Ireland, Smithwick's ale and barleywine are often blended in equal proportions. The resulting concoction is known as a "barley fill-up." Smithwick's ale is a low-alcohol amber ale with a biscuit flavor while the barleywine is a moderate-alcohol, burgundy-colored, full-bodied brew.

Blending beers at the tap is often done to introduce a quality from one beer into another. Beer writer Michael Jackson, while at home in his local Young's pub, often blends Young's ordinary bitter, which is low-alcohol and lightly hopped, with special London ale, a hoppy brew of moderate strength. "As a semi-adoptive American," writes Jackson, "I cannot find a sufficiently hoppy ale in Britain. My 'hop fill-up' is rather strong for session drinking but the same is true of American favorites such as Tupper's Hop Pocket and Anchor Liberty."

Other reasons to blend in the glass include:

- Carbonation: A beer too low or too high in carbonation can be blended to correct this problem.
- To add hop bitterness and flavor, as with Jackson's "hop fill-up."
- Alcohol: High-alcohol beers such as barleywine or doppelbock can be blended with low-alcohol beers to allow for longer sessions.
- Diacetyl: High-alcohol beers with excessive buttery tones can be mellowed by blending with clean-tasting ales.
- Acidity: Beers lacking the appropriate tartness, particularly wheat beers but also many pilsners, can be adjusted before bottling with the addition of lactic, phosphoric or acetic acid. This can even be done in the glass.

There is one beer that should never be blended — problem beer. Novice homebrewers occasionally make the mistake of trying to salvage a beer that has gone off by blending it with good beer. The inevitable result is two bad beers.

The possibilities of blending beers is limited only by our imaginations. Peter Bouckaert, former brewer at Rodenbach and now brewmaster at New Belgium (Fort Collins, Colorado), has produced La Folie, a wonderfully complex Belgian-style beer blended from several beers, some aged in French oak. Peter says, "Blending beers is not an exact science; you have to imagine what is going to happen to the beer, how it will change. Tasting the beer while it is flat requires you to be able to imagine all of the qualities that the beer will take on. It's difficult to tell you how to do this, but experience helps."

Irish Barley Fill-Up

In a pint glass, mix equal parts of the following recipes for Barleywine and Irish Ale.

Barleywine

(five gallons, extract with grains)
OG = 1.092 FG = 1.020 IBUs = 90

Ingredients

0.5 lb. dark crystal malt (>100° Lovibond)
10 lbs. Moravian pale malt extract
1.5 lbs. corn sugar
3 oz. English Challenger hops
1 oz. Kent Goldings hops
Starter of Wyeast 1084 (Irish Ale) yeast
3/4 cup corn sugar for priming

Step by Step

Put crystal malt in muslin bag and steep in 150° to 170° F water for 15 minutes. When water comes to boil, discard grain bag and add malt extract, 1.5 lbs. corn sugar and Challenger hops. Boil for 1 hour. Add Goldings for last 10 minutes. Cool to room temperature and pour into sanitized fermenter. Pitch yeast, aerate well and ferment at 65° to 70° F. When fermentation is finished, add 3/4 cup corn sugar for priming and bottle.

All-grain version

Replace extract with 12 lbs. pale malted barley and mash with crystal malt at 158° F. Sparge with 170° F water and bring the runnings to a boil in brewpot. Add Challenger hops and 1.5 lb. corn sugar to boil as in the extract version. Boil for 1 hour. Add Goldings hops for last 10 minutes. Pitch yeast, aerate well and ferment at 65° to 70° F. When fermentation is finished, add 3/4 cup corn sugar for priming and bottle.

Irish Ale

(five gallons, extract with grains)
OG = 1.042 FG = 1.016 IBUs = 33

Ingredients

3/4 lb. Special Roast malt
1/8 lb. chocolate malt
5 lbs. Moravian pale malt extract
1.5 oz. English Fuggles hops
0.5 oz. Goldings hops (finishing)
Starter of Wyeast 1084 (Irish Ale)
3/4 cup corn sugar for priming

Step by Step

Put Special Roast and chocolate malt in muslin bag and steep in 5 gallons of 150° to 170° F water for

15 minutes. Discard grain bag and add Fuggles hops and malt extract and boil for 1 hour. Add Goldings hops for the last 10 minutes. Ferment at 65° to 70° F until fermentation is finished. Prime with 3/4 corn sugar and bottle.

All-grain version

Replace extract with 6 lbs. pale malt and mash with Special Roast and chocolate malt at 155° F. Sparge with 170° F water and bring the runnings to a boil in brew pot. Add Fuggles hops and boil for 1 hour. Add Goldings hops for last 10 minutes. Add yeast, aerate well and ferment at 65° to 70° F. When fermentation is finished, add 3/4 cup corn sugar for priming.

MEXICAN CHELADA: BEER BLENDED WITH LIME JUICE

The reputation of the lime has been unfairly sullied by the ubiquitous slice on bland Mexican beer. Limes, and in particular Mexican limes, are a component of a refreshing blend called chelada. The name is derived from the Mexican slang for beer, "chela."

Chelada is popular in Merida, the colonial city of the tropical Yucatan. I was exposed to chelada while dining at midday in late August on the central square, across from the Merida cathedral, the oldest cathedral in North America. The sweltering heat begs for a crisp and cold beverage and chelada fits the bill. Chelada is made with either light or dark lager, although the local dark lager, Leon Negra, was more common. Any quality lime juice will suffice, but, as with margaritas, I prefer the small Mexican limes. Chelada is not only a thirst quencher but pairs well with ceviche and fresh shrimp.

To make chelada

Fill a tall slender glass with ice. Add two to three ounces of fresh lime juice (preferably from small Mexican limes). Top off with dark lager or pilsner.

A variation of the chelada, the "michelada" is mixed with Clamato tomato juice and flavored with Maggi, a salty soy sauce. If Maggi isn't available, regular soy sauce can be substituted.

To make michelada: Fill a tall slender glass with ice. Add 2 oz. fresh lime juice (preferably from small Mexican limes). Add 4 oz. Clamato tomato juice and top off with Carte Blanca beer, add a dash of maggi and sprinkle with pepper.

GERMAN RADLER: BEER BLENDED WITH SODA POP

The blending of beer with citrus can be found in Germany, Austria and England. Hefeweizen with a lemon twist is widely appreciated throughout Bavaria and America. The most common blend in Germany is the "radler," a fifty-fifty mix of pilsner or Bavarian helles with lemonade or Sprite or 7-Up.

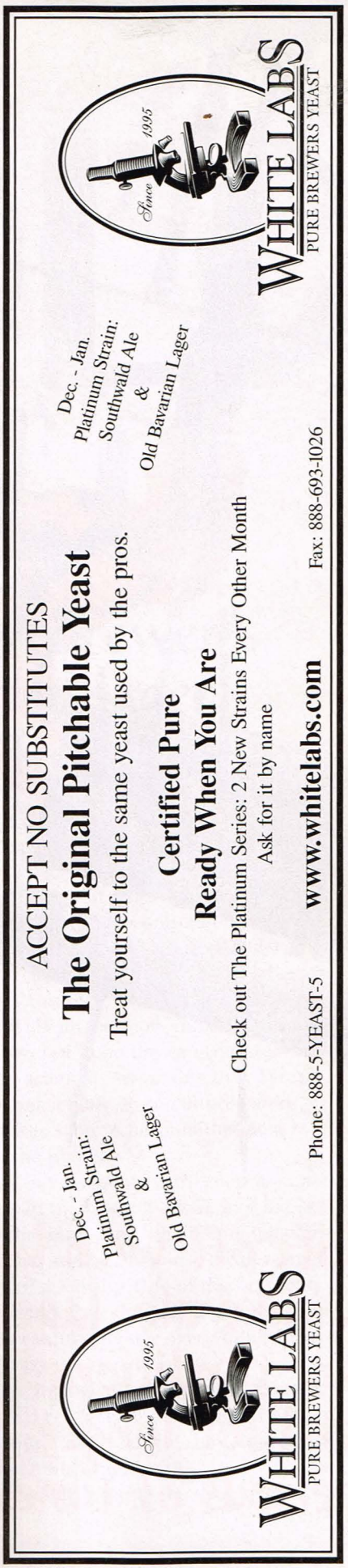
Radler is thought to have originated in Bavaria in 1922 when the proprietor of a pub, short on beer and facing a group of thirsty cyclists, blended lemonade with dark lager. In fact, the name "radler" is German for cyclist. A twist on radler is "russ," in which the lager is replaced with hefeweizen. Both radler and russ are quite popular, particularly with young Germans. Another popular blend replaces the Sprite with Coca-Cola. The English version is known as shandy, a fifty-fifty blend of light ale and Sprite or 7-Up.

To make radler

6 ounces pilsner or Munich helles
6 ounces Sprite or lemonade

Blend both ingredients in the glass. To make russ, substitute hefeweizen for the pilsner. ■

Lynne O'Connor owns St. Patrick's of Texas Brewers Supply. She is most grateful to Michael Jackson (London), Peter Bouckaert (Fort Collins), and Juan José Jiménez Osornio (Merida) and Heriberto Lugo (Quatro Cienegas Coahuala).



CIRCLE 45 ON READER SERVICE CARD



Lift off with lager! Unlike ale, lagers are conditioned cold and for longer periods of time.

PHOTO BY CHARLES PARKER / IMAGES PLUS

BE BOLD GET COLD

Nothing can showcase a homebrewer's skills better than a clean, crisp lager. Here's our step-by-step guide to making a batch of the coolest beer around.

I like to talk about beer. I like to walk into my local tavern and ask my fellow patrons, "So, what's the difference between lager and ale?" Answers range from "there's no difference," to "lagers are light-colored beers and ales are dark," to "huh?"

I then joyfully launch into my pedantic explanation: "Ales are beers that are fermented with top-fermenting yeast at relatively warm temperatures, while lagers are cold-fermenting beers with yeast that sediment thickly near the bottom. Lagers, unlike traditional ales, also undergo a longer period of cold conditioning from which they take their name. In German, 'lager' literally means 'to store.'"

Oftentimes, my fellow imbibers' eyes glaze over as they search the bar for a seat farther from my proximity. And other times, people argue with me (I've had people insist that Budweiser is absolutely, positively not a lager). And occasionally — rarely — the listener tunes in for more. I'm always happy to oblige.

By 1200 A.D., German brewers had discovered that cooler fermenting and storage temperatures produced cleaner beers with subtler flavors. This probably had to do with the fact that cooler temperatures inhibited the formation of esters. So in the cool, dark, limestone caves of southern Germany, a form of natural selection began to take place. What endured in the bottom of German fermenting barrels was yeast that preferred cooler temperatures, while their cousins, who preferred warmer temperatures, slowly vanished.

None of this was truly understood until 1841, when yeast was finally discovered to be the catalyst of fermentation. Soon after, scientists were able to separate and propagate single yeast cells. Pure cultures were born and lager yeast was soon to become the most widely used yeast on the planet.

Two technological achievements were soon to happen. In 1842, brewers in the town of Plzeñ, in what is now the Czech Republic, introduced the blonde pilsner. In a world of red, brown and black beers, pilsner must have been something of a novelty. One of the first truly clear, golden beers, pilsner quickly gained popularity in Germany. By the next century, nearly every other brewer in the world would try to emulate it.

The other great technological achievement came in 1860, when commercial refrigeration became available. Brewers anywhere could finally control the temperature of their fermenting beer with regularity.

In time, "lager brewing" became the synonym for

by Keith T. Yager

BE BOLD GET COLD

"pilsner beer" over much of the world — even though the Germans had been brewing dark, malty lagers for centuries. Which brings us back to that common misconception that I mentioned earlier.

Why Brew Lager?

But we are brewers, not unenlightened bar patrons, and all that history sounds familiar. So why do most homebrewers brew ales and turn their backs on lagers? Because brewing ale is relatively easy. Ales are wonderful, easy to make and distinctive. They are tough, heady brews that are full of flavor.

But nothing can showcase a brewer's skill like a lager. Lagers are delicate creations that must be tended and nurtured by the brewer. Time and craftsmanship are essential to the brewing of lagers. The fragile, clean flavor of lager leaves little room for error and truly canvasses the brewer's skill.

Equipment (or the lack thereof) discourages some homebrewers from making lager: Every homebrewer in America likely owns a refrigerator, but probably few of them own two. And even fewer own a spare deep chest freezer.

Time is also a major factor in a homebrewer's preference for ales. While an ale might be ready to drink in two to three weeks, some styles of lager may take more than three months! Simply stated, lagers are brews created out of time, care and patience. Which is why every brewer should brew one.

Lager Yeast

Colder fermentation temperatures lend a cleaner flavor to beer because the yeast release significantly less compounds that affect flavor, such as fruity esters and fusel oils. Ale yeast tend to leave a more complex, spicy and fruity character, while lager yeast showcase the harmony of malt and hops.

It is important to choose the right strain of yeast when brewing lager beers. In addition, remember that liquid yeast, fresh sediment (from a starter) or pure cultures work best when fermenting lagers.

For pilsner and lighter-colored lagers, find yeast with medium-high to high flocculation to assure that the yeast drops out and clears the beer. Use yeasts such as Wyeast 2035 (American Lager), Wyeast 2278 (Czech Pils) and White Labs WLP800 (Pilsner Lager).

For darker lagers, flocculation is not as much of an issue. For märzens, bocks and dopplebocks try to find yeast cultures that produce beers that are rich, full-bodied and malty, such as Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager) and White Labs WLP920 (Old Bavarian Lager).

As in ale brewing, starter cultures are a good way to guarantee a strong fermentation. This extra step becomes almost essential in fermenting lagers. Because of the lower temperatures, lager yeast are not as active as ale yeast, and lager cultures do not multiply as much. Therefore, the viable yeast cell count at pitching should be maximized. Generally, a culture should be made from a smack pack or pure yeast vial and built from a twelve-ounce starter into a one-gallon starter in two or three steps. The beer should be allowed to finish fermenting in the starter vessel and then poured off the sedimented yeast right before pitching.

An even better idea is to discard this finished beer and add a pint or two of sterile wort to the starter vessel a few hours before pitching. With this method, the yeast will be fully active when it enters its new environment. The yeast should be pitched at the same temperature as the ready wort so as not to shock the cells and prolong the lag before primary fermentation begins.

An optional practice that some brewers have adopted is to warm the secondary before dropping the beer slowly to lagering temperatures. This may help to improve attenuation by energizing the yeast before they drop into their cold slumber (this practice is also commonly used to speed up diacetyl reduction). If you'd like to follow this practice, warm the beer to 60° or 65° F and hold at that temperature for 24 hours after the beer has been racked to the secondary.

Lager Hops

American craft brewers often brew ales and the ales they brew are often heavy in finishing hops — heavier even than their related brews across the pond. These beers have hops in the nose and hops in the finish. Oftentimes, the only impression these beers leave are grassy hop bitterness. On the other hand, many American lagers are pale, fizzy brews with only trace amounts of detectable hops.

Good lagers enjoy hops mingled and laced through the body of malt. This is a fine balancing act achieved by adding the hops circumspectly and moderately through the boil. Generally, flavoring hops are added in half and quarter ounces after the initial bittering hops have been added. Almost no German lagers use dry hopping (though I have heard of one) to finish their beers. Even the most ardent hopheads should use moderation when adding hops to most styles of lagers.

In ale brewing, hops high in alpha acid are often used in the beginning of the boil to add specific bitterness. Mainly, this is because the brewer uses less hops to achieve the same amount of bitterness. However, many German brewers use only noble hops, such as Hallertau and Saaz, to bitter their beers. While bittering (high alpha acid) hops may be used in lager brewing, it should be remembered that lager beer is generally less bitter than ale.

Primary Fermentation

To brew lagers it is absolutely necessary to control fermentation temperature. The beer should be fermented between 45° and 55° F for one to two weeks and the brewer must keep this temperature consistent. There are a couple of methods for achieving this, but the easiest way is to procure a deep chest freezer or spare refrigerator with a separate adjustable thermostat. *(For information on building your own temperature-controlled lager fridge, see "Ice Cold Beer" in the November issue of BYO.)*

Deep chest freezers are the brewer's first choice for convenience and control when it comes to fermentation and lagering. With a separate thermostat made especially for lagering (available from many homebrew-equipment suppliers) the brewer can control the temperature at which their beer will ferment — and do so with precision. Deep chest freezers, in combination with a thermostat, can also reach the low temperatures needed for perfectly lagering beer.

A spare refrigerator works well for this purpose, but it probably won't be able to reach close-to-freezing temperatures. Some older refrigerators have a wide-range manual thermostat. Test your refrigerator to see what its temperature range is. If you can reach temperatures as high as 45° or even 50° F and temperatures as low as 40° or even 35° F, you have the ability to lager your beer.

Look to spend at least $150 for a brand-new, small cubic-capacity deep chest freezer and $300 for a freezer able to hold two or more carboys. Usually the classified ads will yield a less-expensive option, but be warned that older refrigerators can be energy hogs.

Refrigerators and freezers, even purchased used, can be expensive. They take up space and consume energy. This might deter some homebrewers from trying to brew a lager. Thankfully, there are a few alternatives.

5 Questions I've always wanted to ask Greg Noonan

Greg Noonan wrote the book on lager brewing, literally: He's the author of the well-respected "New Brewing Lager Beer" (Brewers Publications, 1996). The founder of Seven Barrel Brewery, Noonan is also owner and brewmaster at the Vermont Pub and Brewery. Keith Yager tracked down the Lager Meister in Burlington to ask five key questions about brewing lagers at home.

Homebrewers often propagate their yeast from small yeast cultures. At what temperature should lager yeast be cultivated?

"Although yeast growth accelerates with increasing temperatures, grow a lager starter at the temperature at which it will be expected to ferment. Why? So cells that reproduce well at that temperature are favored, and so the culture will not react sluggishly upon pitching, because it has been acclimated to that temperature."

Do you prefer European or American malt? Why?

"I prefer to use European malts when brewing European style beers; that said, it is possible to brew outstanding examples of most ales and lagers using higher-protein American two-row malts. If the domestic malt is fresher than the European malt, it is even likely to make better beer. My preference is strictly because I prefer to use authentic ingredients and methods when reproducing any beer style."

What is the coldest temperature you ferment your lagers at? Which styles are fermented at what temperatures?

"Fermentation temperature should reflect the temperature preferences of the yeast strain employed. I am a firm believer that any primary fermentation should be 90 percent complete within 5 days, or there will be detrimental effects on the beer flavor. In my experience, lager yeast ferment best at 46° to 55° F, depending on the strain. Within that range, I would choose the lower temperature for malty, robust lagers, 48° to 52° F for crisp pilsner-style and Vienna-Oktoberfest lagers, and up to 55° F in any case if the yeast strain was sluggish at lower temperatures."

What varieties of hops do you prefer for lagers?

"For both bittering and flavor-aroma, I prefer noble varieties. I have never found a high-alpha hop that did not give an unpleasant, coarse bitterness to the beer, especially inappropriate in lagers. I prefer Perle for early additions, because it is higher-alpha than the noble hops and more economical, but has a pleasant, refined bitterness. My favorite flavor and aroma hop is Czech Saaz, followed by the Hallertaus. Although it has an 'American' character (pine, soap), domestic Saaz has a flavor and aroma I love in hoppy lager styles."

Is it beneficial for homebrewers to employ a decoction mash?

"A decoction mash is only beneficial if the malt being mashed is under-modified. In fact, unless you really wish to brew a 'thin' beer, do not employ a decoction or any other sort of step-mash if you are using well-modified malt. On the other hand, a decoction mash from under-modified malt will give the beer a malty character unobtainable by any other means. If the malt has a Soluble Nitrogen Ratio (SNR, SN/TN, S/T, Kolbach Index) below 36, it is eminently suitable for decoction mashing; if the base malt's SNR is over 38, don't even think about it."

BE BOLD GET COLD

The best option is to use the ice-bath method. This method may take some practice but once mastered it offers an alternative to the spare refrigerator or freezer.

Basically, the carboy is immersed in a large trash can filled partway with water. Ice is added to the trash can until a floating thermometer (which you can buy at any pet-store fish department) indicates the desired temperature. The ice water should cover — or come close to covering — the beer without (obviously) splashing over the top of the fermenter.

You'll have to add ice to the trash can to regulate the temperature. It may be desirable to install a spigot near the bottom of the can to drain water. You also could use a siphon, or drill a hole in the garbage can about three-fourths of the way up; when the water level gets that high, it'll simply flow out the hole.

If wrapped with an adequate piece of house insulation this trash-can method works well, though the beer must be checked frequently (at least two or three times daily) to monitor the temperature. Keep the ice bath someplace in the house or garage where the ambient temperature stays relatively stable.

Whatever fermentation method you choose, it is important that the temperature remains consistent. Constant temperature fluctuation of more than 2 or 3 degrees over twelve hours can cause the yeast to flocculate early and stop working. If the beer warms too much it will develop ale-like characteristics.

The Secondary

Two things should happen before secondary fermentation begins: The krausen should fall back into the beer and the color of the beer should darken. Yeast and sugar will still be present in moderate amounts and the beer should still be fermenting, albeit slowly.

Initial fermentation takes one to two weeks; afterward, the beer should be racked to a secondary vessel or keg. The temperature should then be slowly lowered to as cold as possible over seven to ten days. Do not exceed a temperature drop of more than four degrees over a period of 24 hours. The temperature should be lowered slowly to insure that the yeast will continue their consumption of sugars.

Lagering

As the beer sits at its cold temperature it conditions into perfection. Acetaldehyde and diacetyl are reduced and the remaining yeast and other particulates slowly settle out of the beer.

Lager the beer as cold as possible without freezing for 60 to 90 days (in some cases longer) depending on the style of the beer and your own preference. If you're using the immersion method this will mean keeping the trash can loaded with plenty of ice. It must be carefully insulated and regularly monitored.

Light lagers should be crystal clear before they are removed from lagering temperatures. Many styles may be ready in as little as six weeks. Other malty, rich lagers, such as the Oktoberfest-Märzen style, may be allowed to lager for as long as six months to completely blend and mellow their complex flavors. With longer lagering times, freezers and refrigerators become must-have items.

Don't get excited. Relax and wait for the beer to finish. Monitor airlock levels and keep the beer quiet and away from light.

When the beer has fermented to its target final gravity, prime with corn sugar (or whatever priming sugar you prefer) and bottle, or force-carbonate your lager in a keg, just as you would with an ale.

Extract Tips

There are many excellent extract bases for lager brewing. Look for German-made extracts such as Ireks and Bierkeller. When brewing pilsners and other light lagers, try to find the palest malt extracts available.

Generally, extract worts do not require boil times as long as all-grain worts. Long boils darken the wort, especially extract worts. If the brew is a dunkel or bock this does not present a problem. But for lighter beers, try to keep boil times down around 45 minutes. (Just a caution: This may sacrifice some hop utilization.)

All-Grain Tips

Traditionally, German and Czech lagers are brewed using under-modified malts that require difficult decoction mashes and protein rests. Brewers who are attempting to brew their first lager should stay away from complex decoction mashes at first and instead concentrate on finding a good, well modified two-row malt.

For brewing pilsners and helles lagers only the lightest malt (1.5° to 2° Lovibond) should be used. Also, for lighter-colored beers, a protein rest is recommended. This helps enzymes to break down proteins in the malt, improving the head, body and clarity of the beer.

To initiate the protein rest, stabilize the mash temperature at 122° F and rest it for 30 minutes. Afterward, use bottom heat or infusions of boiling water to raise temperature to saccharification rest. Pilsner saccharification rests should be targeted at around 149° to 151° F. This range will convert the majority of starches into sugar and will build a wort of lighter character and mouthfeel with fewer dextrins. Anticipate the conversion to take up to 50 percent longer at this temperature and be sure to check dextrins percentage with an iodine test. Maltier, sweeter lagers may be targeted at warmer temperatures, between 154° and 158° F.

Lager Recipes

Because lager brewing is more complex than ale brewing, it is a good idea to start lager brewing with a dark, malty brew that will give enough flavor to hide any minor mistakes and still be tasty. After the steps become familiar, the brewer will have a better chance at perfecting the extremely delicate pilsner recipe included below. All of these recipes yield a five-gallon batch of beer.

MUNICH DUNKEL

OG = 1.054 FG = 1.013 to 1.015
IBU = 23

In Munich they brew dunkel, which simply means "dark" in German. The recipe below is for a dark, clean, malty lager that goes great with oompah bands and Bavarian pretzels.

Extract Dunkel

Ingredients

6.6 lbs. Bierkeller pale malt extract (unhopped) or 5 lbs., 10 oz. light dry malt extract (DME)
1 lb. medium German crystal malt (40° Lovibond)
8 oz. cara-Vienne (20° Lovibond)
4 oz. chocolate malt
5.1 AAU Hallertau Mittelfruh hops (1 oz. at 5.1% alpha acid) at boil
2.55 AAU Hallertau Mittelfruh hop pellets or whole hops (0.5 oz. at 5.1% alpha acid) at 20 minutes
1.05 AAU Saaz pellets or whole hops (0.25 oz. at 4.2% alpha acid) at 50 minutes
Starter of Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager) or White Labs WLP920 (Old Bavarian Lager)

Step by Step

Add crushed grains to 1/2 gallon 155° F water. Hold for 20 minutes. Run entire volume through kitchen colander (preferably fine wire mesh) and rinse with 3/4 gallon of 170° F water. Add malt extract. Top off boiling vessel to 5.5 gallons. Boil for 60 minutes, adding hops as indicated by the hopping schedule above.

Cool wort as quickly as possible to 55° F and pitch yeast starter. Hold temperature for 14 days. Transfer lager to secondary fermenter or keg. Slowly lower temperature to as cold as possible without freezing. Hold this temperature for 60 days.

All-Grain Dunkel

Ingredients

8 lbs. two-row pale lager malt (1.8° Lovibond)
1 lb. medium German crystal malt (40° Lovibond)
8 oz. cara-Vienne (20° Lovibond)
4 oz. chocolate malt
5.1 AAU Hallertau Mittelfruh hops (1 oz. at 5.1% alpha acid) at boil
2.55 AAU Hallertau Mittelfruh hop pellets or whole hops (0.5 oz. at 5.1% alpha acid) at 20 minutes
1.05 AAU Saaz pellets or whole hops (0.25 oz. at 4.2% alpha acid) at 50 minutes
Starter of Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager) or White Labs WLP 920 (Old Bavarian Lager)

Step by Step

Add 2.5 gallons 130° F water to crushed grains. Stabilize at 122° and rest for 30 minutes. Then add 1.25 gallons boiling water and bring mash to 155° to 157° F (adding bottom heat if necessary). Rest, checking for conversion at 45 minutes. Mash out at 168° F and sparge with 5 gallons water. Collect 5.5 gallons of wort and continue with boil.

Boil per hopping schedule indicated above. Total boil time is 60 minutes. Cool beer as quickly as possible to 55° and pitch yeast starter. Hold temperature for 14 days. Transfer lager to secondary fermenter or keg. Slowly lower temperature to as cold as possible without freezing. Hold this temperature for 60 days.

CZECH-STYLE PILSNER

O.G = 1.049 F.G. = 1.010 IBU = 35

This beer will require full attention and all of the brewer's resources. The long lagering time will ensure that this beer is clear and golden.

Note: The water in Plzen, the Czech town where this style of beer originated, is very soft. If the water is hard in your area, try boiling your water to settle out the "temporary hardness." Boil for 30 minutes and let cool till lukewarm. Siphon or gently decant water off white sediment. (Temporary hardness means the water contains soluble calcium and magnesium; if you boil the water, these bicarbonates will precipitate out.)

If the water is permanently hard in your area — which means boiling won't help — try using distilled water and add a small amount of gypsum (three teaspoons per five gallons) to raise the mineral content of the water. Another option: Brew with a 50-50 blend of tap water and distilled water.

Extract Pilsner

Ingredients

6.5 lbs. Bierkeller pale malt extract or 5.5 lbs. extra light dry malt extract (DME)
1 lb. light Munich (9° Lovibond)
8 oz. carapils (1.7° Lovibond)
5.1 AAU Hallertau hops (1 oz. at 5% alpha acid) at boil
2.1 AAU Saaz hop pellets or whole hops (0.5 oz. at 4.2% alpha acid) at 15 minutes
2.1 AAU Saaz hop pellets or whole hops (0.5 oz. at 4.2% alpha acid) at 30 minutes
1.05 AAU Saaz hop pellets or whole hops (0.25 oz. at 4.2% alpha acid) at finish
Starter of Wyeast 2278 (Czech Pils)

Step by Step

Add crushed grains to 1/2 gallon 155° F water. Hold this temperature for 20 minutes. Raise to 165° F. Run entire volume through kitchen colander (preferably fine wire mesh) and gently rinse with 3/4 gallon of 170° F water. Add malt extract. Top off boiling vessel to 5.5 gallons. Boil

for 45 minutes, adding hops as indicated by the hopping schedule above. Cool the beer as quickly as possible to 50° F and pitch yeast starter. Hold temperature steady for 14 days. Transfer lager to secondary fermenter or keg.

Slowly lower the temperature to as cold as possible without freezing the beer. Hold this temperature for 90 days.

All-Grain Pilsner

Ingredients

8 lbs. two-row pilsner malt
1 lb. light Munich (9° Lovibond)
8 oz. carapils (1.7° Lovibond)
5.1 AAU Hallertau hops (1 oz. at 5.1% alpha acid) at boil
2.1 AAU Saaz hop pellets or whole hops (0.5 oz. at 4.2% alpha acid) at 20 minutes
2.1 AAU Saaz hop pellets or whole hops (0.5 oz. at 4.2% alpha acid) at 40 minutes
1.05 AAU Saaz hop pellets or whole hops (0.25 oz. at 4.2% alpha acid) at finish
Starter of Wyeast 2278 (Czech Pils)

Step by Step

Add approximately 2.25 gallons 135° F water to crushed grains. Stabilize at 122° F and rest for 30 minutes. Then add one gallon boiling water and bring mash to around 149° to 152° F. Rest, checking for conversion at one hour. Mash out at 168° F and sparge with 4.5 gallons water. Collect 5.5 gallons of wort and continue to boil. Boil as indicated by hopping schedule above. Total boil time is 60 minutes. Cool beer as quickly as possible to 45° F and pitch yeast starter. Hold temperature for 14 days. Transfer lager to secondary fermenter or keg. Slowly lower temperature to as cold as possible without freezing. Hold this temperature for 60 days.

HEARTY BOCK BIER

O.G = 1.066 F.G. = 1.016 IBU = 25

Early bock beers were brewed with plenty of wheat and were dark and malty. Bock is not bitter beer; instead, it should be brewed with the emphasis on the malt. The addition of small amounts of aromatic or biscuit malt will add a pleasant malt aroma to the beer.

Extract Bock

Ingredients

4 lbs., 14 oz. Bierkeller pale malt extract or 4 lbs. light dry malt extract (DME)
3.25 lbs. dry wheat malt (2° Lovibond)
1.5 lbs. German crystal malt (40° Lovibond)
0.5 lbs Cara-vienne (20° Lovibond)
0.5 lbs biscuit or aromatic malt (22° Lovibond)
0.5 lbs chocolate malt
6.3 AAU Hallertau hops (1.25 oz. at 5.1% alpha acid) at boil
2.5 AAU Hallertau hops (0.5 oz. at 5.1% alpha acid) at 30 minutes

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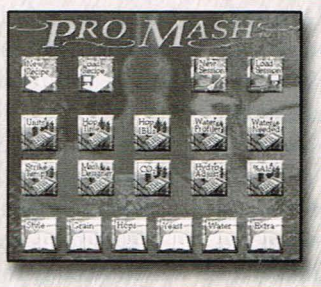
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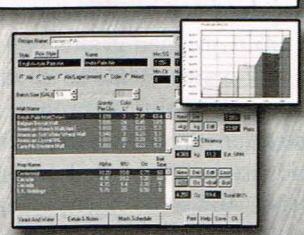
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2.5 AAU Hallertau hops
(0.5 oz. at 5.1% alpha acid)
at 30 minutes
Starter of Wyeast 2206
(Bavarian Lager) or
White Labs WLP920
(Old Bavarian Lager)

Step by Step

Add 0.75 gallons water to grains and slowly raise temperature to 155° F. Hold for 20 minutes and raise to 165° F. Run entire volume through kitchen colander (preferably fine wire mesh) and gently rinse with one gallon 170° F water. Add malt extract. Top off boiling vessel to 5.5 gallons.

Boil for 1 hour, adding hops as indicated by the hopping schedule above. Cool beer as quickly as possible to 50° F and pitch yeast starter. Hold temperature for 14 days. Transfer lager to secondary fermenter or keg. Slowly lower temperature to as cold as possible without freezing. Hold this temperature for 60 days.

All-Grain Bock

Ingredients

6 lbs. two-row lager malt
(1.8° Lovibond)
3.5 lbs. wheat malt
(2° Lovibond)
1.5 lbs. German crystal malt
(40° Lovibond)
0.5 lbs. Cara-vienne (20° Lovibond)
0.5 lbs. biscuit or aromatic malt
(22° Lovibond)
0.5 lbs. chocolate malt
6.3 AAU Hallertau hops
(1.25 oz. at 5.1% alpha acid)
at boil
2.5 AAU Hallertau hops
(0.5 oz. at 5.1% alpha acid)
at 30 minutes
2.5 AAU Hallertau hops
(0.5 oz. at 5.1% alpha acid)
at 30 minutes
Starter of Wyeast 2206
(Bavarian Lager)
or White Labs WLP920
(Old Bavarian Lager)

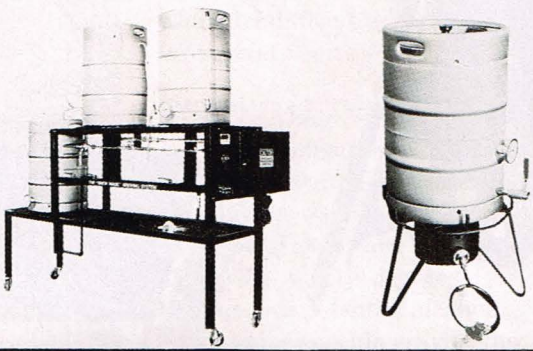
Step by Step

Add approximately 3 gallons 130° F water to crushed grains. Stabilize at 122° F and rest for 30 minutes. Then add 1.5 gallons boiling water and bring mash to around 155° to 157° F (add bottom heat if necessary). Rest, checking for conversion at 45 minutes to an hour. Mash out at 168° F and sparge with five of gallons water. Collect 5.5 gallons of wort and continue to boil.

Boil as indicated by the hopping schedule above. Total boil time is 60 minutes. Cool beer as quickly as possible to 55° F and pitch yeast starter. Hold temperature for 14 days. Transfer lager to secondary fermenter or keg. Slowly lower temperature to as cold as possible without freezing. Hold this temperature for 60 days. ■

Keith Yager is a long-time homebrewer, part-time freelance writer and professional graphic designer in Alabama. He wrote "Designing Great Labels" in the March 1998 issue of BYO and "Simple, Delicious Stock Ales" in April 1999.

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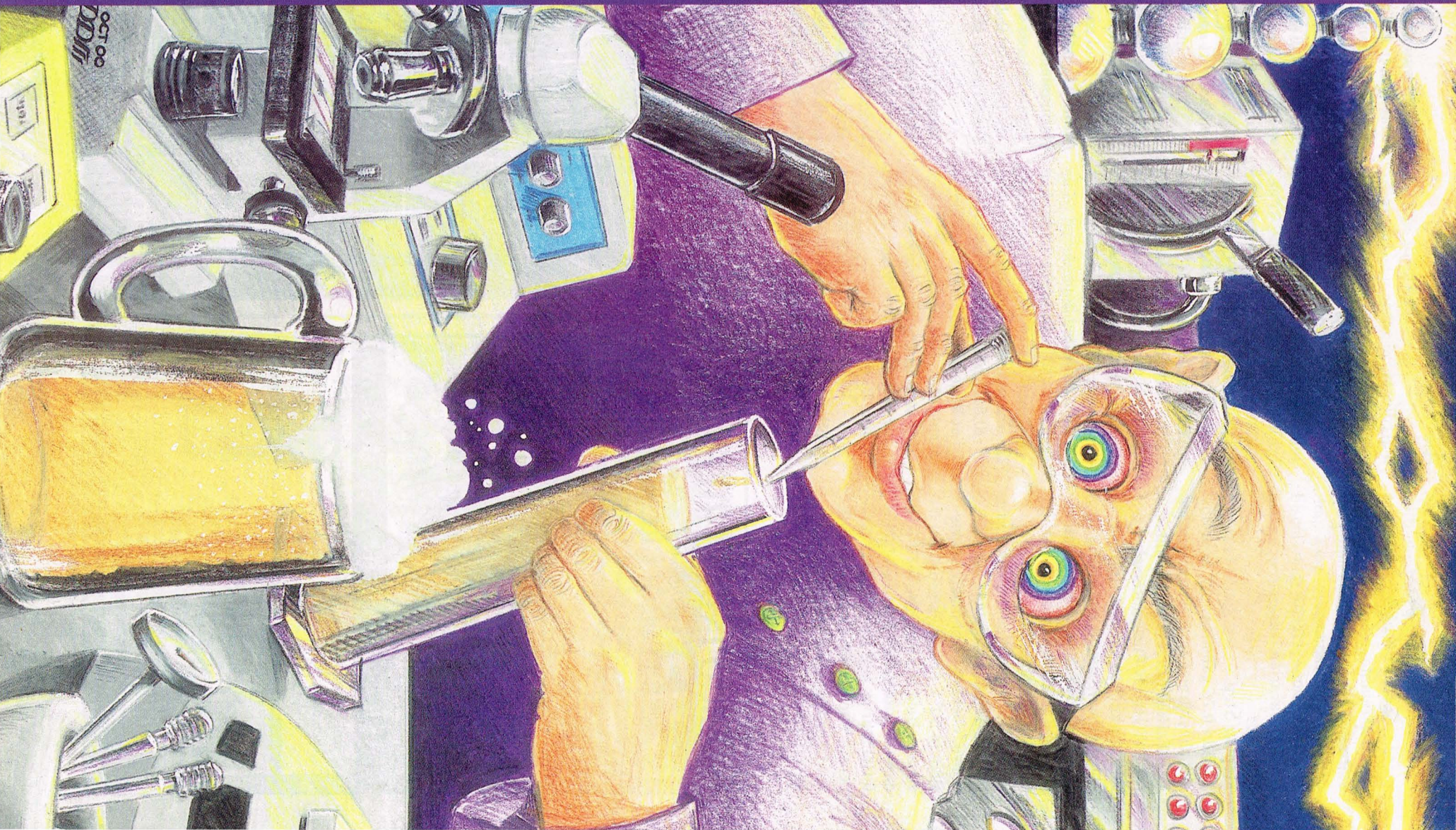
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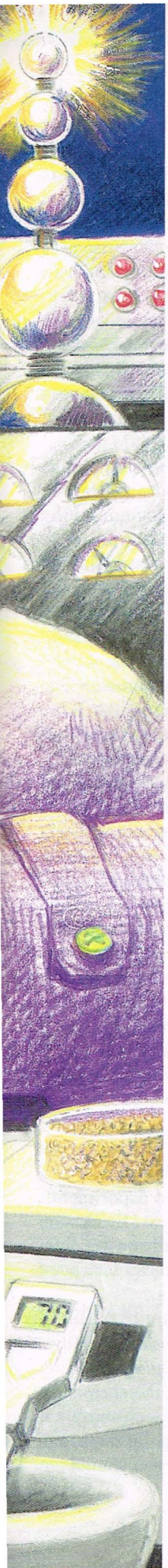
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HOMEBREW LAB





Homebrewing can be as simple or as complex as you make it. Some brewers just follow the directions on their extract kit. Others make up their own recipes and fine-tune their brewing procedures in an effort to brew superior beer. Whatever your attitude towards brewing, there is a set of lab equipment for you.

Having the proper instruments to measure key brewing variables allows you to repeatedly brew great beer. Equipping your lab can cost as little as $15 for the essentials, or hundreds of dollars for a full-blown mad scientist set-up.

LAB EQUIPMENT FOR EVERY BREWER

There are three tools every brewer should use every brewing session: a hydrometer, a thermometer and a brewing notebook. Without them, it would be difficult to consistently brew good beer.

HYDROMETER

A hydrometer is a floating instrument that measures the density of a solution. Brewing hydrometers typically give units of specific gravity, degrees Balling, and potential alcohol. To measure specific gravity, the hydrometer is floated in a test cylinder with the solution to be tested. The hydrometer is read by determining what the scale reads at the level of the liquid.

The wort or beer sample should be at 60° F when a reading is taken. If you have a beer pitcher handy on brewing day, fill it with ice water and use it to quickly cool down wort samples. If the wort is hotter than 60° F, the hydrometer will sink farther than normal into the wort and give a lowered gravity reading. If the wort is too cold, the hydrometer will ride high and give a high reading. There are conversion charts that correct for temperature; ask at your local homebrew shop.

If bubbles stick to the hydrometer, they will cause it to ride high, giving a high reading. To get rid of bubbles on the hydrometer, just give it a spin. The bubbles should fly off the glass. If you are measuring the gravity of a finished beer, bubbles can be a major problem. To deal with bubbles in a finished beer, you should decarbonate it first. The American Society of Brewing Chemists recommends this method: Pour the beer back and forth between two containers (like a pitcher) a total of eight times.

There are several times during a brew session when taking a gravity reading is useful. For all-grain brewers, measuring the gravity of the final runnings can tell you when to stop sparging. The general rule of thumb is to stop before the gravity drops below 1.010 or 1.008. Below this gravity, tannins are extracted. Excess tannins in your wort can make your beer taste astringent.

Taking the gravity of your wort before the boil starts can tell you if you will hit your target gravity. To estimate your original gravity at the beginning of the boil, use this equation:

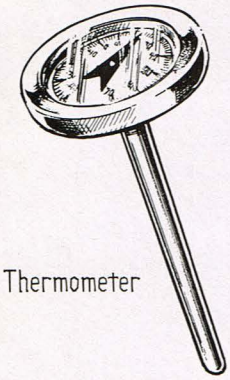
ORIGINAL GRAVITY EQUATION

OG (original gravity) = [BBG (before boil gravity) * BBV (before boil volume)]/ABV (after boil volume).

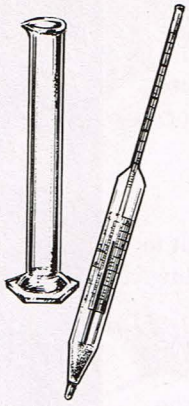
Use only the decimal portion of the gravities when using this equation; for example, use "55" for a beer with an original gravity of 1.055. When using this equation, you will slightly overestimate your OG. The OG is

From the humble hydrometer to a hand-held pH meter, here are the gizmos every science-inclined homebrewer should have.

Story by Chris Colby • Illustrations by Don Martin



Thermometer



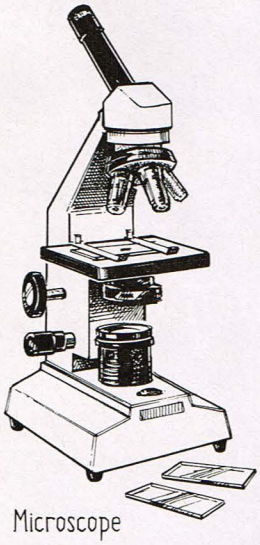
Hydrometer



Brewing Notebook



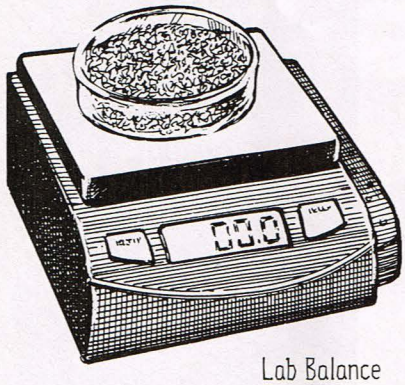
pH Meter



Microscope



Iodine Dropper



Lab Balance

overestimated because dissolved proteins and lipids figure into the pre-boil gravity. These compounds, however, sediment out of the wort during boiling. This results in a lower gravity than you estimated.

If your gravity is too low, you can add malt extract. 1 3/4 ounces of dried malt extract will raise the gravity of five gallons of wort by approximately one gravity point. If your gravity is too high, you can decide to make the batch size larger by adding water. Alternately, you can adjust the hop addition to compensate for the heavier wort.

It's always best to check any piece of brewing equipment to see that it is reading right. At 60° F in pure water, the hydrometer should read 1.000. If it does not read 1.000, note how far it's off and take that into account when taking your readings. For example, if the hydrometer reads 0.098 in water at 60 degrees, add 0.002 to all your gravity readings.

THERMOMETER

Thermometers come in many shapes and sizes. There are bimetal dial thermometers, liquid (mercury or alcohol) probe thermometers, digital thermometers, and temperature strips that change color. Although different in form, they all do the same thing — measure temperature.

Like hydrometer readings, there are several times in a brewing session when it is useful to take a temperature reading. For all-grain brewers, the temperature of each mash rest is important. If the mash is not at the correct temperature during the starch conversion rest, the amount of sugars extracted from the grain will be significantly lowered. (If the conversion temperature is between 150° and 158° F, the yield should be normal.)

The temperature of the sparge water should also be taken. If it is too hot (over 170° F), tannins will be leached out the grains, causing astringency.

All brewers should monitor their fermentation temperature and keep it within its proper range. Usually, ales are fermented at 60° to 72° F, lagers at 45° to 55° F. To monitor fermentation temperatures, the brewer should use a thermometer that measures the temperature of the wort, not the ambient temperature of the surroundings. The wort in a carboy can be as much as 10° F higher than ambient temperature at the peak of fermentation. Using a temperature strip similar to those used on aquariums is a great way to measure temperatures.

Brewers should test all their thermometers for accuracy. The easiest way to do this is to measure the temperature of boiling water and ice water. Boiling water should be 212° F (100° C) at sea level; ice water should be 32° F (0° C). Of course, some thermometers do not cover either of these ranges.

To calibrate a thermometer whose range doesn't cross 32° F or 212° F, get a good-quality laboratory thermometer. Use the good thermometer to take the temperature of a liquid. Then, measure the temperature of the liquid with your other thermometers. If the readings don't agree, add or subtract the amount of error when using your everyday thermometers. In addition, some electronic thermometers have calibration screws.

Whenever taking thermometer readings, be sure to wait until the reading has stabilized before recording it. Few thermometers give instant measurements.

BREWING NOTEBOOK

Without a notebook to record the results of tests and experiments, lab equipment is useless. Every brewer should keep a brewing notebook and record his recipes, procedure and tasting notes.

It is more important to record how your brewing session actually went than to record the original plan for your brew. If the recipe is altered in any way — for example if you run out of one type of hops and substitute another — you should

record this. If you goof up one of your procedures, you should record this as well. With this, you will be able to distinguish between inconsequential deviations in brewing procedures and errors that may cause serious problems.

Your detailed brew-day and fermentation notes should be complemented by extensive and focused tasting notes. It doesn't make any sense to record your recipes and procedures if you don't correlate them with the finished product.

One of the simplest ways to ensure that you are taking complete tasting notes is to fill out a homebrew contest judging form for each of your beers. Most homebrew books have examples of contest forms. You can also download beer judging forms from the Beer Judge Certification Program website at www.bjcp.org. These forms have spaces for comments on appearance, smell and taste of your beer.

Although your impression of each isolated sensory element is important, it is also important to record your overall impression of the beer. Beers with easily detected faults are usually not very good; however, a beer without faults may still not be very good. Your overall impression is as important, perhaps more so, that your element-by-element analysis of your beer.

LAB EQUIPMENT FOR THE SERIOUS BREWER

The equipment in this section is for serious brewers, especially those who are using all-grain techniques. Using these gadgets, a homebrewer can focus on consistently brewing good beer and also can troubleshoot a variety of common brewing problems that may arise.

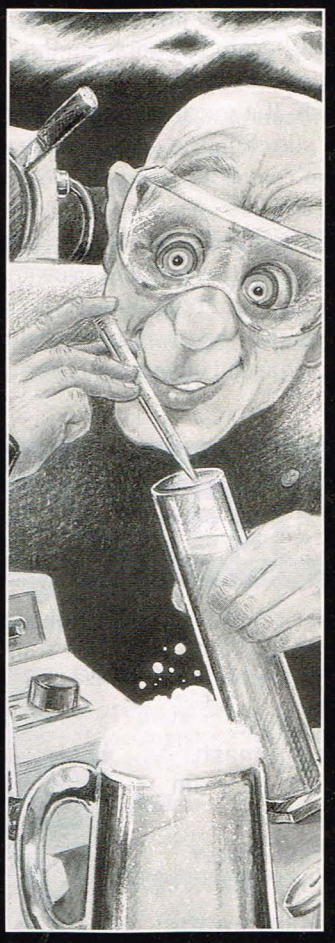
IODINE AND TEST PLATE

The iodine test detects the presence of starch in a solution. The only equipment you need is a dropper full of iodine solution and a light-colored dish or test plate. To perform the iodine test, a brewer

PRICES FOR HOMEBREW LAB EQUIPMENT

HERE ARE THE AVERAGE RETAIL PRICES for the equipment mentioned in this article. As you can see, some scientific equipment is expensive. If you live near a college or university, you may want to check with the chemistry or biology departments there. The equipment in student teaching labs gets updated fairly regularly. The teaching labs may have old, student-model equipment they are getting rid of. You might be able to find a good, usable microscope or balance for a reasonable price.

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SUPPLIERS

You can find much of the equipment in this article — including hydrometers, thermometers and pH meters — at most homebrew stores or homebrew store Web pages. For the more advanced stuff — microscopes, hemacytometers — you may have to check a scientific supply house. Here are a few options:

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simply adds a drop of iodine solution to a small volume of wort. Usually the wort is on a light-colored plate or in a specialized test dish with multiple little reservoirs to hold liquid. (If you use a dinner plate, don't use it for food after iodine has been on it. This is a bit paranoid, but it's better to be safe than sorry.) If starch is present, the wort and iodine solution turns purple or black. If there is no starch, there is no color change. Note: It is very important to cool the wort sample before performing the test.

All-grain brewers use the iodine test to assess the success of their mash. If a mash was successful, all the starch in the grains will have been converted to sugar. The iodine test is done only once per brewing session, unless the test is positive. If the test is positive, the brewer should extend the time of the mash, or correct the mash temperature, until starch conversion is correct.

If an incomplete starch conversion is not detected and corrected, the resulting beer may suffer from starch haze. Many all-grain brewers use the iodine test when they first start mashing or try a new type of mashing like decoction mashing or a multi-step mash regime. After becoming more experienced at mashing, however, many quit doing the iodine test.

PH METER

A pH meter measures how acidic or basic a solution is. Some meters are designed to sit on a benchtop, while others are handheld meters.

To measure pH, a small sample of the beer or wort is taken and cooled down. Some pH meters only give accurate readings at a single temp (often 60° F). Others automatically compensate for temperatures within a given range. Even with a temperature-compensating model, you should cool the wort down before taking a reading. The electrodes on pH meters burn out much faster if used at high temperatures. To save wear and tear on the electrode, cool down your wort before measuring pH.

To get the most out of your pH meter, you should keep your electrode clean and free from scratches. It should be stored in electrode storage solution. Whenever the pH meter is reading, the electrode should be immersed in liquid. And, before every reading, rinse the electrode in water and swirl it around in the solution to be tested for a few seconds before taking the reading.

There are many times during a brewing session when taking a pH measurement is valuable. The pH of the mash should be taken, to determine if it is in the optimal range (pH 5.2 to 5.4). If the pH is too high, it should be adjusted downward by adding acid or calcium sulfate. The

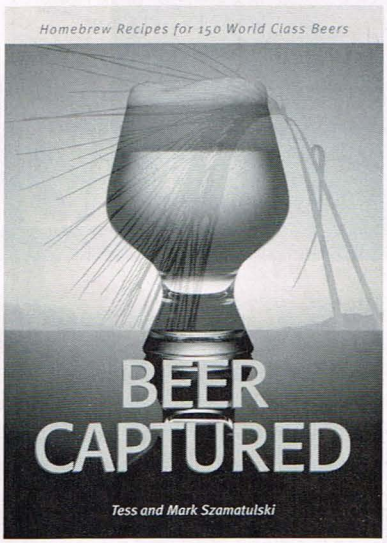
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pH of the final runnings can be taken; you should stop sparging before the pH exceeds 6.0 or you'll risk extracting tannins.

The pH of the wort should also be taken. Wort pH should be 5.0 to 5.5. This can be adjusted with acid if it is too high. There is usually never a problem with wort pH if the mash pH was O.K. unless the brewing water is very hard.

The pH of your finished beer should also be taken. Often, the pH of the final beer describes how "lively" a beer is. An otherwise well-brewed beer can taste lackluster if the pH is too high. And, high wort pH during boiling can cause a harsh hop bitterness. Most finished beers have a pH of 4.0 to 4.6.

To calibrate your pH meter, you will need two solutions of known pH. Buffers of pH 4, 7 and 10 are the most commonly used known solutions. Brewers should use pH 4 and pH 7 buffers to calibrate their pH meter. How exactly you calibrate the meter varies; the instructions to will tell you how to do this.

For all-grain brewers, a pH meter is very useful. This is especially true for all-grain brewers with hard water. When using hard water, the proper mash pH does not automatically establish itself. Therefore, pH adjustments must be made by adding acid or calcium sulfate (gypsum).

KITCHEN SCALE OR LAB BALANCE

There are a lot of different types of scales or balances available. Most hombrewers use a spring scale or an electronic kitchen scale. Some may own, or have access to, a laboratory balance.

To measure weight on a scale, weigh the empty container your ingredients will go in. Then weigh the ingredients and the container. Subtract the weight of the container to get the weight of the ingredients.

To measure weight on a balance, place the container that will hold your ingredients in the pan and press "on" or "tare." The balance should then read 0. Next, weigh out your ingredients; the scale will automatically subtract the weight of the container from the weight displayed on the screen.

If you have a scale, you can buy your brewing ingredients in bulk and weigh out as much as you need each time. You no longer need to rely on pre-weighed sacks of grain or hop additions from beer kits.

You should calibrate your scale using a known weight if at all possible. The scales available to homebrewers or cooks can be off as much as 20 percent.

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CIRCLE 32 ON READER SERVICE CARD

erful enough to see individual yeast cells. In fact, brewers can use a microscope to count yeast cells and bacteria in their wort or beer.

Counting yeast cells allows brewers to accurately determine their pitching rates. The optimal pitching rates are 1 million cells per milliliter per degree Plato (roughly four gravity points). In order to count yeast cells, a brewer must use a hemacytometer. A hemacytometer is a microscope slide that traps an exact amount of liquid under the cover slip. The slide itself is striated so that, when looking through the scope, the brewer sees a checkerboard arrangement. On top of each square of the checkerboard, a known volume of liquid is trapped.

A small amount of liquid from the yeast starter is diluted and a drop is put on the hemacytometer. By counting the number of cells in one square, the brewer determines how many yeast cells are in the small volume above that square. The brewer can then calculate the concentration of yeast in his starter from the number of yeast cells in the square, the dilution factor of the sample, and the volume of liquid enclosed in the square.

With the proper staining, yeast health can also be ascertained with the use of a microscope. Dead cells stain blue, while living cells remain colorless. By counting the number of clear cells and the number of dead blue cells, the brewer can determine the number of healthy cells. Usually, brewers want over 95% of the cells to be healthy. Otherwise, initial fermentation can be sluggish and the dead yeast can taint the wort with off flavors.

The key to viewing yeast cells, or any opaque objects, with a microscope is to limit the amount of light shining through your sample. Most microscopes have a dimmer to the light source. Most also have a diaphragm under the stage you can open or close to adjust the light level. If you keep the light levels low you will easily be able to see the yeast cells. They are clearly visible using a 40X objective. (This actually equals a 400x magnification, because the eyepiece has a 10X magnification).

AND IN CONCLUSION...

For me, part of the fun of brewing is taking a bunch of readings and manipulating brewing variables to produce good beer. But I try not to forget that brewing gadgets are just tools to use when crafting a beer, not an end to themselves. Don't let secondary measures of brewing success — like hitting the right pH — become your focus. Your palate will always be your most important brewing gadget. ■

Chris Colby is a frequent contributor to BYO. He lives in Texas.

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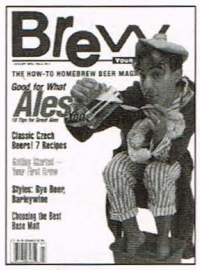


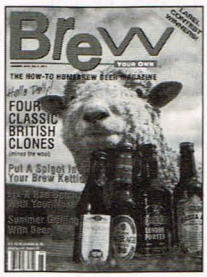
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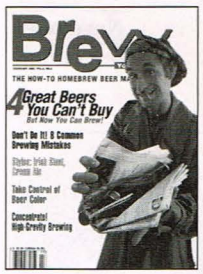
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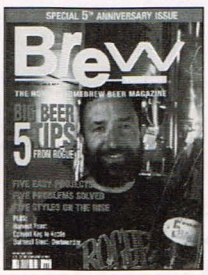
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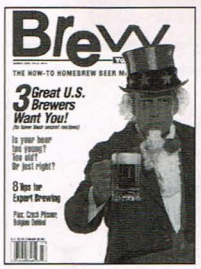
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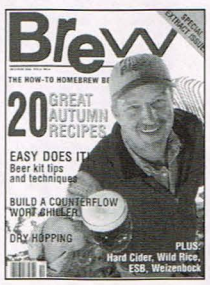


















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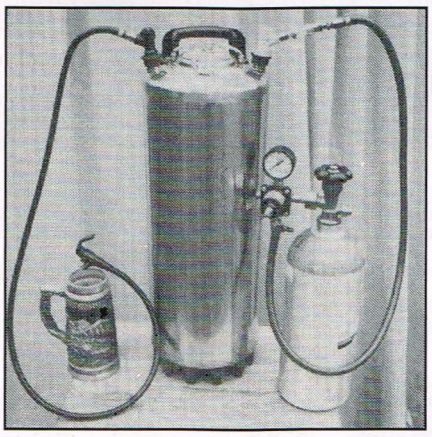
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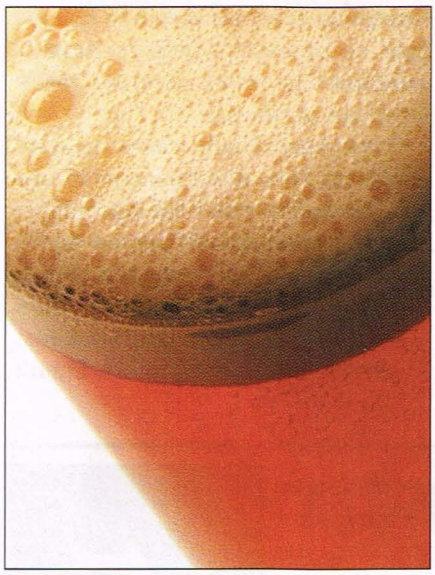
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CIRCLE 1 ON READER SERVICE CARD

Clear Your Beer

Cut through the haze and fine your way to maximum clarity

by Chris Colby



Historically speaking, clear beer is a recent invention. For most of its history, beer was a dark, cloudy beverage. In British pubs in the 1100s, patrons would pass around an earthenware bowl with lines marked on the inside. Each patron would "take it down a peg" for a penny and pass the bowl on. In those dark, smoky pubs the appearance of beer was basically irrelevant.

Attitudes towards the appearance of beer began to change with the widespread use of clear glass. Once beer drinkers could see their beer, they began favoring clearer beer. Today, bar patrons want crystal clear beer for their pennies.

For the homebrewer, clearing is both an aesthetic concern and a stability issue. Clear beer not only looks better, but it is more stable than cloudy beer. A beer with elevated levels of haze will have the tendency to deteriorate rapidly.

Types of Haze

There are different kinds of haze that form in beer. These include permanent haze, yeast haze and chill haze. Permanent haze is, as the name suggests, a haze that does not go away. The presence of permanent haze is evidence of a serious problem in the brewing process. Once formed, it cannot be eliminated without further damaging your beer.

Permanent haze can be due to biological contamination or an excess of starch in your wort. If the haze is biological, you need to pay closer attention to your cleaning and sanitizing procedures. If you have starch haze, you need to ensure you are getting complete conversion in your mash. Don't run your wort off until the iodine test gives a negative result. If you use good ingredients and your brewing procedures are fundamentally sound, it's not very likely that you will encounter this type of haze.

Yeast haze affects all beers unless something is done to counteract it. After fermentation, yeast can remain in suspension indefinitely. If you use flocculant yeast and store your beer cold, the amount of yeast haze in your beer will probably be minimal. However, if you want a beer that sparkles you will need to get rid of it.

Chill haze is a haze that forms when beer is cooled and disappears when the beer warms up. Repeated heating and cooling cycles can cause chill haze to turn permanent. Chill haze is formed when proteins in the beer bond weakly with polyphenols (also called tannins).

The level of chill haze in beer increases over time. There are three ways to minimize or reduce chill haze: reduce the amount of haze-forming proteins, reduce the amount of polyphenols and remove the protein-polyphenol complexes after they have formed. We'll go into this in further detail a bit later in the article.

Assessing Haze in Your Beer

To see how hazy your beer is with your current brewing procedures, try this test. Take two of your homebrews and one commercially brewed beer of the same style. Leave the beers at room temperature until the day before the test. The night before, put one bottle of homebrew in the fridge. Leave the other out at room temperature. You can chill the commercial beer or not, it doesn't matter.

Take three identical glasses and pour out the three beers. Be careful not to pour out any of the yeast sediment from the homebrews. Compare the commercial beer to the room temperature beer by holding both up to a window or light. Any difference in clarity will be due to yeast haze. The commercial beer should not have yeast haze and chill haze will not have formed in the room-temperature homebrew. Unfiltered homebrew will probably

be clear, but it will have a slight dullness when compared to the commercial beer.

To assess the amount of chill haze in your beer, you will need to compare the room temperature homebrew to the chilled one. Any additional haziness in the cold beer will be due to chill haze. As you will see, it's chill haze that usually contributes more to the overall haze of your beer.

Finally, compare your cold homebrew to the commercial beer. After seeing your beer next to a crystal clear beer, do you want yours to look better? If you do, then you'll have to keep reading to get the lowdown on fining techniques.

Techniques for Clearing Your Beer

A well-made and properly-stored beer will naturally be somewhat clear. The techniques listed in this column can help polish such a beer to make it much clearer. They are not designed to "rescue" poorly made beers.

When deciding how to clarify your beer, you should consider two things: How important the look of your beer is and how long you are going to store it.

1. Removing yeast haze from beer

At the peak of fermentation, the concentration of yeast is about 50 million cells per milliliter. Most of the clearing happens without any interference from the brewer. Allowing the yeast to completely settle in secondary goes a long way towards eliminating yeast haze.

Proper beer storage also helps minimize yeast haze. Ideally, beer should be stored at 40° F after it has bottle conditioned at room temperature. Once it's ready, you should move it to a fridge or somewhere cold, and keep it there until you drink it.

Fining with Isinglass

Beer can be fined with isinglass to remove yeast cells. Isinglass is an extract from the swim bladders of sturgeon. Isinglass is rich in collagen, which binds to yeast cells in solution. The collagen-coated yeast drop out of solution.

Isinglass usually comes in powder form. New developments in isinglass powders allow for a simpler process. You can buy treated isinglass powders that simply dissolve in water. If you can't find the powder, here is the traditional way. It works well at clearing yeast, but it

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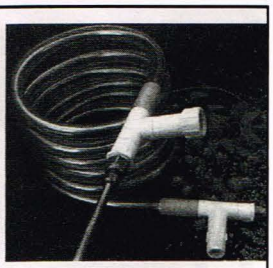
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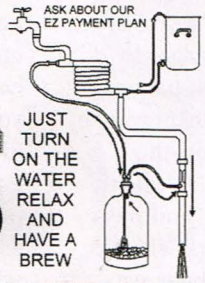
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CIRCLE 28 ON READER SERVICE CARD

does take some preparation time to use properly.

The isinglass solution must be made in advance and the pH must be adjusted. Finally, it needs to be stored cold to equilibrate. You should wait until the beer has settled as much as possible before adding isinglass. To fine your beer with isinglass, use the following procedure:

Step 1. Dissolve 30 to 60 mg/L in a volume of water equal to 1% of your batch size. For a 5-gallon batch, add 0.5 to 1.0 grams of isinglass to 200 mL of water. Use distilled water. For best results, gradually add water to the powder.

Step 2. Lower the pH to 2.5 to 3.0 with phosphoric acid. Add the phosphoric acid gradually and check the pH as you go. Be sure to stir thoroughly after each addition and wait a minute after stirring before you take a pH reading.

Step 3. Store the isinglass solution in the refrigerator for two to three days before use.

Step 4. Add to your beer. If you use a bucket, you may want to stir quietly with a sterilized spoon. If you ferment in a carboy, give it a little swirl to distribute the isinglass. In either case, try not to disturb the wort too much.

Step 5. Allow the isinglass to settle overnight.

Step 6. Bottle or keg your beer.

2. Removing haze-causing proteins from beer

Limiting the amount of haze-causing protein in your beer starts before you start brewing — before you even buy your ingredients, actually. Brewing strains of barley have been selected to be low in protein compared to feed strains. The choice of brewing ingredients can also affect beer clarity. Beers made with dark malts are usually clearer than paler beers.

Throughout the brewing process, there are opportunities to remove protein from your beer. For all-grain brewers, certain malts may require a protein rest. (Most modern malts are well-modified and don't require a protein rest.) When the wort is boiled, a "hot break" is formed. This break material, which is partially composed of proteins, should be left behind in the kettle when the beer is moved to the fermenter. Likewise, the cold break is left behind when a homebrewer moves his beer to the secondary. And finally, proper storage reduces the amount of chill haze in beer.

If stored cold, chill haze will form and settle out of your bottles in about a week. You can prove this to yourself by comparing a beer that has been in the refrigerator for a week with a beer that has been stored at room temperature and cooled overnight. (Whenever my wife complains that all the space in

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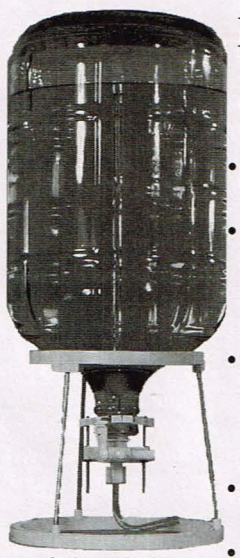
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the fridge is taken up by beer, I immediately launch into a lecture on "protein/polyphenol precipitation." It never helps, but I sure get a kick out of saying protein/polyphenol precipitation.)

Fining with Irish moss

Irish moss is a fining agent used during the boil. Irish moss is not a type of moss; it's really a kind of seaweed. At the pH of wort (typically 5.0 to 5.5), Irish moss carries a negative charge. At the same pH, haze forming proteins carry a positive charge. Adding Irish moss to your wort attracts haze-forming proteins to it. The "moss" settles out after the boil, taking the proteins with it. To use Irish moss, follow this procedure:

Step 1. Wet 0.04 to 0.125 g/L Irish moss with just enough water to cover it. For a 5-gallon batch, use approximately 1.0 to 2.5 grams of Irish moss. A gram of Irish moss is approximately one teaspoon.

Step 2. When there is 15 minutes left in your boil, add the Irish moss.

Step 3. Whirlpool your wort before siphoning to a fermenter. The trub should settle into the middle of the brew kettle.

Step 4. Siphon your wort to your fermenter. Minimize the amount of trub carried over from the kettle.

Fining with silica gel

Silica gel can be used to fine beer prior to packaging. Silica gel particles bind to proteins before dropping out of solution. To clarify your homebrew with silica gel, use the following procedure:

Step 1. Dissolve 0.3 to 0.5g/L silica gel in sterile water. For a 5-gallon batch, use approximately 6 to 10 grams of silica gel. Add just enough water to completely dissolve the solids, less than a cup. Add water to the powder or gel, not the solid to the liquid.

Step 2. Add gel to beer and stir or swirl lightly.

Step 3. Allow to settle overnight.

Removing all the proteins from your wort or beer is not advisable.

A beer without any proteins would be bland and lack a head. Just as there are haze-forming proteins, there are essential head-forming proteins. Even though Irish moss and silica gel preferentially remove haze forming proteins, they can also remove foam-active proteins. Any fining procedure needs to strike a balance between removing enough protein to reduce haze, without removing so much protein that foam stability and mouthfeel is affected.

The typical dosage for Irish moss quoted in most homebrew books is on the low side of the range listed above. If your beer has chill haze, but still has a decent head on it, increase the amount.

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3. Removing polyphenols (tannins) from your beer

Since "good" proteins can be removed along with "bad" proteins by protein fining agents, many brewers attack chill haze by reducing the amount of polyphenols.

Fining with Polyclar AT

The most popular polyphenol fining agent is "polyvinylpolypyrrolidine," or PVPP. PVPP goes by the name Polyclar AT and is widely available to homebrewers through local supply shops and mail-order outlets. For fining with Polyclar, just use the following procedure:

Step 1. Dissolve 0.3 to 0.5 grams of Polyclar per liter of beer in sterile water. For a 5-gallon batch you will need 6 to 10 grams (approximately 2 to 4 teaspoons) of Polyclar. This will completely dissolve in a few ounces of water. Slowly add water to powder and stir.

Step 2. Add mixture to beer and stir.

DON'T CLEAR THIS BEER!

HEFEWEIZEN IS A GERMAN style of wheat beer. They are usually pale-colored, highly-carbonated, bottle-conditioned ales with a distinct tartness that comes from the wheat.

The real signature of the style is the yeast. "Hefe," in fact, means yeast. The yeast contributes a phenolic, fruity, estery aroma and gives the beer one other prominent characteristic — yeast haze. Haze is not only accepted in these beers, it's expected. Many Germans feel that to properly drink a hefeweizen, you need roll the bottle to "relax" the yeast sediment. That way, when the beer is poured, it is sufficiently cloudy.

Strangely, in a beer that is supposed to be cloudy, chill haze is considered a fault. German brewers combat chill haze by boiling the hefeweizen wort longer than most beers.

Typical hefeweizen boils usually last from an hour and a half to two hours. This extended boil helps to ensure maximal hot-break production.

If you like the flavor of a hefeweizen but can't get past the appearance, try a kristallweisse. Kristallweisse is a filtered weissbier. It is, as the name implies, crystal clear.

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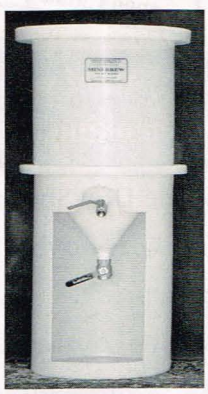
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Step 3. Allow to settle six hours.

Just as with protein fining agents, overfining with Polyclar can lead to problems. At high doses (higher than the quoted range), Polyclar can reduce the color and hop bitterness of beer.

4. Filtration

Another method to use in place of or in conjunction with fining is filtration. Almost all commercial breweries filter their beer for appearance and stability. Filtration strains out particles of haze, yeast and sometimes bacteria to give a level of clarity that is far superior to fining methods alone.

Beer to be filtered is often fined first. Too much yeast, for example, can clog a filter. Alternately, beer can be rough filtered first, followed by a polishing filtration. Filtered beer can potentially suffer from some of the same problems of over-ly-fined beers. Filters can remove desirable substances in your beer along with the yeast and chill-haze. The details of filtration vary depending on the filtration set up, but these are the basics:

The beer is chilled overnight in a keg so that chill haze is formed. The filtration system is set up so that pressure is applied to head of the unfiltered beer keg. The unfiltered beer keg is connected to the filter, which in turn is connected to the dipstick of the receiving keg. The beer will flow out of that keg, through the filter, and into the receiving keg. The receiving keg is not completely sealed so CO_2 can escape as the keg fills.

When deciding on how much effort to put into clarifying your beer, you should consider two things: How important the look of your beer is to you and how long you are going to store your beer. If you are giving some of your beer away or entering it in a contest, looks might be more important. If your beer is not going to be consumed quickly, clarifying it will keep it in good shape so you can enjoy it longer. The full treatment for clarifying a beer would include a yeast fining agent, a protein fining agent, and a polyphenol fining agent. Alternately, you could filter the beer for maximum clarity.

If your beer is going to be consumed rapidly and you don't mind a little haze, you might want to consider taking an easier route. Adding Irish moss to the kettle and Polyclar to the secondary fermenter before packaging takes almost no time. These two easy steps will significantly reduce the amount of chill haze in your beer. ■

Chris Colby is our featured contributor this month (see "Editors Note"). He is a science editor living in Bastrop, Texas.



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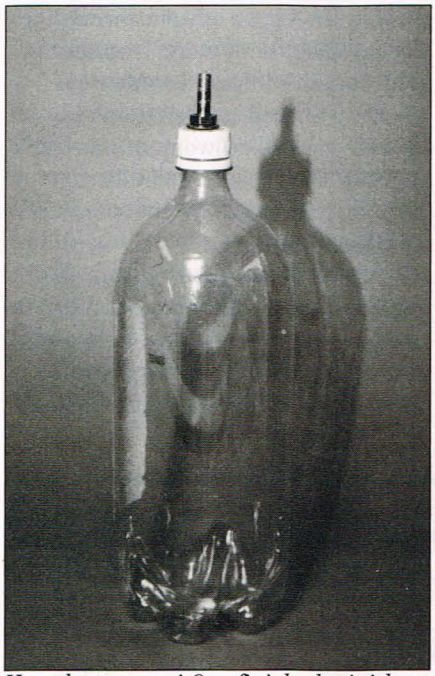


CIRCLE 25 ON READER SERVICE CARD

Two Simple Solutions

How to make a mini-keg and an in-line wort aerator

by Thom Cannell



PHOTOS BY THOM CANNELL

Homebrew to go! Our finished mini-keg assembled from a plastic soda bottle and a stainless-steel tire valve.

WHEN ENGINEERS FIND A solution that is simple, they call it "elegant." For this month, we offer you some holiday elegance. Not just one, but two easy and insightful projects that serve as a welcome solution to common homebrewing problems.

The Soda-Bottle Mini-Keg

The first project is an answer to a typical homebrewer statement this time of year: "How do I bring my new holiday stout to the Christmas party?" Or, in my case, "How do I enter an Oktoberfest competition with a beer that needs another two weeks of conditioning before it's carbonated?"

If you just transfer your beer from a keg to a soda bottle, it's guaranteed to go flat almost instantly. And if you wanted to naturally condition the beer in a two-liter soda bottle, it would take the usual two-plus weeks that it always does. By then you'd be late for the party.

The solution is a mini-keg. One you could fill from a fermenter or regular keg, pressurize with CO_2 and dispense like soda by simply removing the screw-on cap.

The first step is purchasing stainless-steel tire valves at any large auto parts store. It's crucial that you buy stainless steel and not rubber. Tire valves consist of valve stem, inner valve core, securing nut, and upper and lower rubber gaskets. You might want to substitute O-rings because the rubber typically used in tire valve gaskets is that stinky rubber found under "off flavors" on the beer flavor wheel.

Drill a 1/8-inch pilot hole in the center of the soda bottle cap, then increasingly larger holes. In our photo, you'll see that one of our holes is imperfectly centered. Can you guess which one did not have a pilot hole?

Unless you have very large drills you'll have to file the hole to size. A coarse file is best for plastic. If you chose to use the supplied rubber gasket, the hole will be even larger. Be patient and get a good snug fit.

Disassemble the valve, leaving the core intact. Slip the gasket or O-ring over the stem, insert into the cap, put another gasket or O-ring on top, then the washer and nut. Tighten it and you're done.

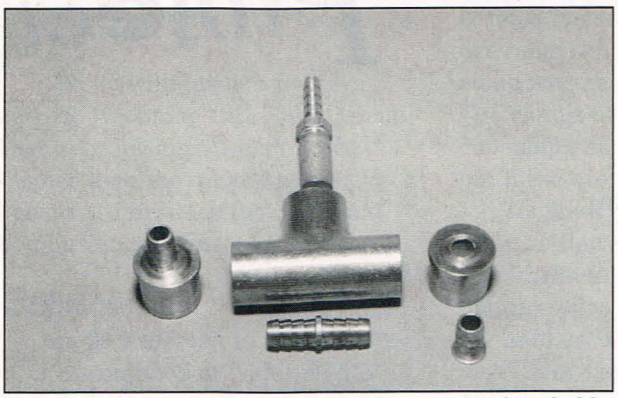
To pressurize the mini-keg you'll need a tire chuck attached to your keg's CO_2 line. A tire chuck is the attachment on the end of an airhose that attaches to the valve stem of a tire. Instead of filling a tire, you will pressurize your mini-keg with CO_2 just like you would pressurize a regular keg. Chucks are available at any auto parts store.

If you have a keg handy, simply remove the connection at the CO_2 "in" side of your keg and replace it with a tire chuck. If you don't keg, you will need a CO_2 cylinder, pressure regulator, regulator connector, hose and a tire chuck. (For complete pressurizing instructions see "Pressurize Your PET" on page 59.)

A commercial version called "The Carbonater" is available in homebrew catalogs and shops. Price is $10 to $13 and it uses a male ball lock valve coupling for filling, so tire tools are not necessary.



Here's where it all starts. An exploded view of a valve, gasket cap, gasket or O-ring, washer and nut.



Bits and pieces. The copper fitting large enough to hold an air stone, double barbed connectors and plugs.

In-line Aeration System

Since becoming a homebrewer, I've frequently managed to arrive at the Blue Coyote Brewing Company or Lansing Brewing Company just in time to shovel wet grain from the mash tun. I usually get a free beer out of it, not to mention yeast, good brewing tips and sore shoulders. The real reason I volunteer is to get a sense of how the real brewers go about their business — how they mash, sparge, whirlpool and cool their wort.

The question of cooling has always intrigued me the most. Once their mash is finished, the sparging is complete, the wort has been-boiled and then whirlpooled, it's ready to transfer to a vertical fermenter and receive its yeast. Or is it? How do commercial microbrewers solve the problem of wort aeration?

As the freshly cooled wort exits the heat exchanger it goes through a commercial aeration system. It's basically a sight-glass and T-fitting, supplied with pure oxygen or filtered air. Wort goes in one side and comes out another. Between the base of the T, a sintered stainless steel air stone dispenses oxygen under pressure. Chilled wort enters and bubbling bright oxygenated wort exits.

At home I chill my wort in the kettle with an immersion chiller. (Now that we've built a counterflow chiller I use that.) Then I sanitize an aquarium stone or other oxygenating device and connect it to an aquarium pump or pure oxygen and bubble the air or oxygen through a carboy filled with wort. I wondered why couldn't I do as commercial brewers do and oxygenate as I moved the chilled wort into the fermenter. Why couldn't I build my own "commercial" in-line wort aeration system?

There is one good reason: the potential for contamination. Any thingamabob or doohickey that has lots of fittings, angles, exits and tubes has dreaded bacteria-harbor-

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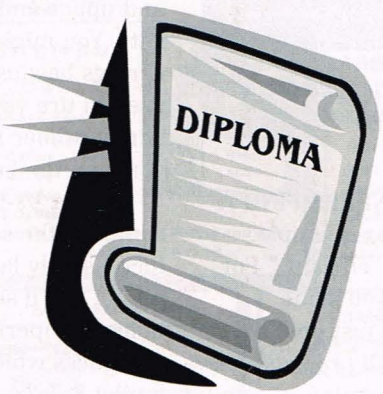
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ing crevices. So it's crucial that any such device is made of materials that can be sanitized by boiling or heating to 250° F, plus liquid sanitizers. That means materials made from metal, not plastic.

The first requirement is getting wort in and out of whatever housing contained the air stone. This involves some barbed fittings plus another port of entry for the air or oxygen and the air stone, which implies a T-fitting that is large enough to hold the air stone. A 3/4-inch-copper T would do just fine.

I purchased a copper T and a double barbed connector and three plugs at Home Depot. The barbed connector was perfect, just twice the size needed. I sawed it in half and filed the rough edges flat. Then I drilled a 1/4-inch hole in two plugs and silver brazed the halved fitting to the plug.

There are several alternatives. You could purchase threaded barbed fittings and drill larger holes, then thread the plugs to size. Or you can drill larger holes and secure a nut from beneath the plug.

Now it's time for the airstone. I've seen several and chose one from St. Patrick's of Texas in Austin (www.stpats.com; 512-989-9727). It is inexpensive ($9.75) and threaded internally. The internal threading allows for more assembly options.



Boil it or bake it! Heat-rated, silicone-adhesive sealant from Permatex is available in 3-ounce tubes.

For the air stone port, I used another plug and drilled a hole to fit the correct size threaded barbed fitting. Then I silver brazed it into the plug. Silver solder will also work just as well.

The next step involved putting both plugs into the T and soldering them in. The air stone port requires a different solution. I wanted to be sure that I could remove it and disassemble all the parts for easy inspection and cleaning.

Instead of soldering or brazing, I used a silicone adhesive sealant. Some of these are heat rated to 450° F and can be boiled or baked without fear. They are not NSF rated, but are USDA authorized "for

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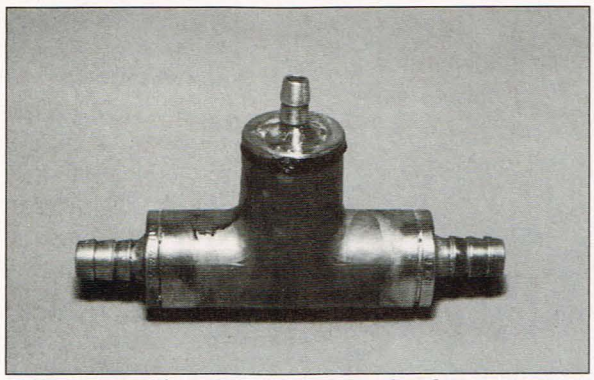
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The moment of truth. The completed in-line oxygenation system, ready for sanitizing and testing.

use in federally inspected meat and poultry plants," according to a materials safety data sheet from Permatex. Those are Permatex 16B/81158 Black, 82517 White, or 66B/80636 Clear in 3-ounce tubes. I used black.

I screwed the sintered metal air stone onto the fitting and gave it a test. After I hooked it up to my trusty aquarium pump, very little happened — no bubbles. As I was informed at St. Patrick's, it takes about 4 pounds per square inch (psi) of pressure to push through a sintered stainless steel air stone. It was obvious that I wasn't getting that kind of pressure from my inexpensive pump, so I hooked it up to my regulated oxygen line and voila — tiny bubbles.

The air stone worked well and I was eager to test it out. The hookup was simple. I cut a short piece of tubing to connect the the aeration device to the output of the counterflow wort chiller. It would work the same if you were connecting it to the output of your kettle after using an immersion chiller.

Before I used my new gadget, I sanitized it in 170° F water for ten minutes, then resanitized it with Star San and connected the inlet from the kettle/counterflow chiller and outlet tube to the fermenter.

With everything in place, I connected the oxygen/air inlet to pure oxygen at 4 to 8 psi and started the wort flow. It worked perfectly.

In retrospect, I might have looked for a slightly different solution — a way to assemble the air stone port with threaded fasteners. Since I used adhesive, I still have the option to do this. And I'll look for a way to use those cheap throw-away plastic air stones. Maybe by using a soldered-in barb fitting, a bit of plastic tubing and the plastic air stone. The cheaper stones are more permeable and don't require a more expensive pump.

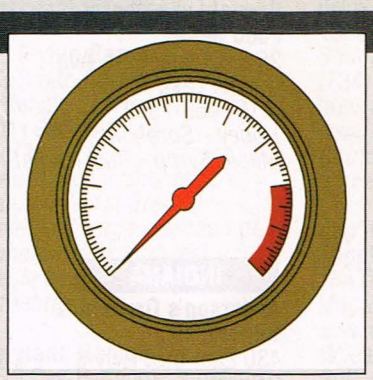
Another option is to use an in-line filter between the aquarium pump and the stone. You can buy a stainless steel stone for $29.90 and membrane filter for $8.90 from Williams Brewing Supply in California (800-759-6025; www.williamsbrewing.com) and use it with an inexpensive aquarium pump. There's always a better way. ■

Thom Cannell is a homebrewer and writer in Lansing, Michigan.

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PRESSURIZE YOUR PET

THE LIVELY BUBBLES that hiss and pop as the CO_2 leaves your beer provide much pleasure to the human palate. But when the bubbles have all left, your beer will be flat and no longer pleasurable to drink.

If you transfer your beer from a keg to a plastic soda (PET) bottle, you will lose a lot of CO_2. PET is an abbreviation for polyethylene, which is the plastic that most of these containers are made from.

With the modified bottle top described in the article, it's a simple matter to attach your CO_2 supply to the filled bottle, and raise the gas pressure in the headspace again so the carbonation level in the beer will be maintained for transport to your destination. Once you place the modified cap on the bottle, just attach the chuck to the valve stem. Open the regulator and CO_2 will flow into the vessel. Shut it off and remove the chuck.

Don't expect a PET bottle to sustain the same pressure that a steel keg will. When the bottle gets very hard, stop the CO_2 flow. 5 to 10 pounds per square inch (psi), or slightly higher, should be about right.

— Craig Hartinger

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Last Call

High Hops

A vine grows in the inner city



by Jill Walker Boogren
Minneapolis, Minnesota

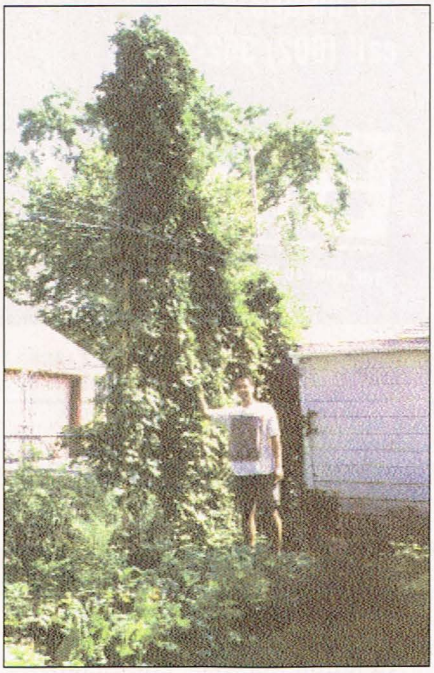


PHOTO COURTESY OF JILL WALKER BOOGREN

An aromatic "hedge" that won't make the neighbors bitter. Jill's husband stands dwarfed by his towering hops.

I HAD HIGH HOPES FOR THAT space in our backyard, I really did. Living where we do, which is to say, on a piece of land the size of a postage stamp in the inner city of Minneapolis, Minnesota, every foot of that real estate, and how you use that space, is critical to your personal comfort and happiness. When noticing your neighbor's new living room sofa through your own kitchen window is the norm, you have to make a choice: a) get used to opening yourselves up to your neighbors; or b) build a fortress.

Well, I happen to like our neighbors, so option "b," with its implied 8-foot fence and frothing guard dogs posted at each corner, seemed a little excessive. But with the knowledge that option "a" might reveal a little too much of ourselves to our neighbors, we needed to find a third option.

My husband and I both came up with solutions. My great plan was to plant a sunny garden. A garden which included a honeysuckle or other fragrant, shapely, spring-blossoming tree or shrub that creates height in the back corner (and blocks out the ugly driveway next door), but isn't so tall as to compete with our towering ash. The picture I had in mind was something cozy, but not forbidding.

My husband, on the other hand, had his own idea in mind. "Let's plant a garden. Let's plant something useful. Let's plant hops."

If you haven't guessed, my husband is a homebrewer. Like many good homebrewers, he is rising up the brewing ranks in the same way karate enthusiasts advance from belt to belt or girl scouts collect and sew patches onto their uniforms to display their accomplishments. My husband is graduating from extracts to partial-mash to all-grain and now to growing and using his own hops. There was no saying no to his idea. Now we've got high hops!

What I didn't know was that he would grow hops that would eventually climb 16-foot poles and tower far above the roofline of our one-car garage. To stand under them looking up, you find yourself wondering whether there is indeed a giant at the top. And what's with those magic beans and golden goose?

Nor did I imagine that those hops would grow dangerously close to all of our electrical wires, and whip and lash about sideways in stormy weather, keeping our eyes wide open and glued to our bedroom window some nights. Luckily they haven't electrocuted us yet.

Those hops are now a permanent fixture in our backyard. Though nothing but a bare spot through fall, winter and spring, it's a vibrant, living, green, very tall "hedge" in the summer months. Those vines are beautiful. And they are perennial, asking only for a big stick to climb each spring.

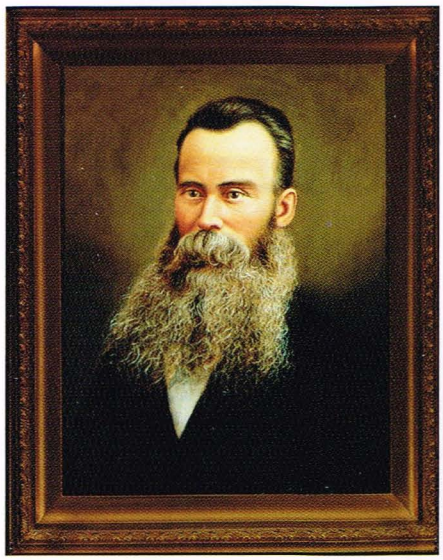
I've grown accustomed to the aroma of hops, our freezer full of hops, and even to the hop leaves, hop vines and hop cones that get tracked all through our house during harvest week.

I like our high hops. I have grown accustomed to our unique summer hop fence, to the aroma of hops, our freezer full of hops, and even to the hop leaves, hop vines and hop cones that get tracked through our house during harvest week. What I have not yet grown accustomed to is the space left behind when their season is done. But I can rest assured they will be back again next year. ■

Excellent chef and gardener, Jill Walker Boogren lives in Minnesota.

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Thomas Cooper

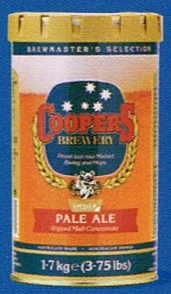
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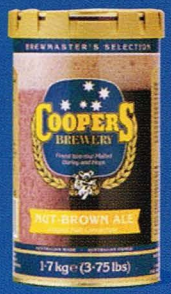
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India Pale Ale?	British IPA Yeast!

Dynamic. And Simple. Isn't that what you expect from the only beer kit made by a company that actually makes beer?



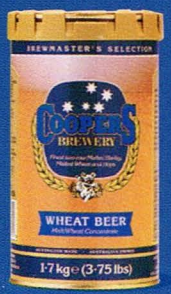
Originated at Burton-on-Trent to be shipped out to India, Africa and the Colonies. The full-strength flavor of this beer is the result of traditional, prolonged mashing time. Its balancing hop bite and malty fullness give it a special zest!

100% malt
Bitterness (IBU): 22.9
Color (SRM): 12.2



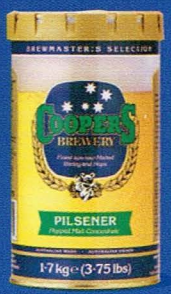
Traditional two-row malted barley, choice hops and soft water combine in this Old English style dark ale to produce a nutty Northern character; soft, rich, full-bodied with a medium-sweet, malt-driven palate.

100% malt
Bitterness (IBU): 31.0
Color (SRM): 23.0



A light and refreshing German style Wiesse beer, with a quenching tartness. Made predominantly from the finest malted wheat and our own special strain of yeast.

100% malt
Bitterness (IBU): 17.5
Color (SRM): 3.6



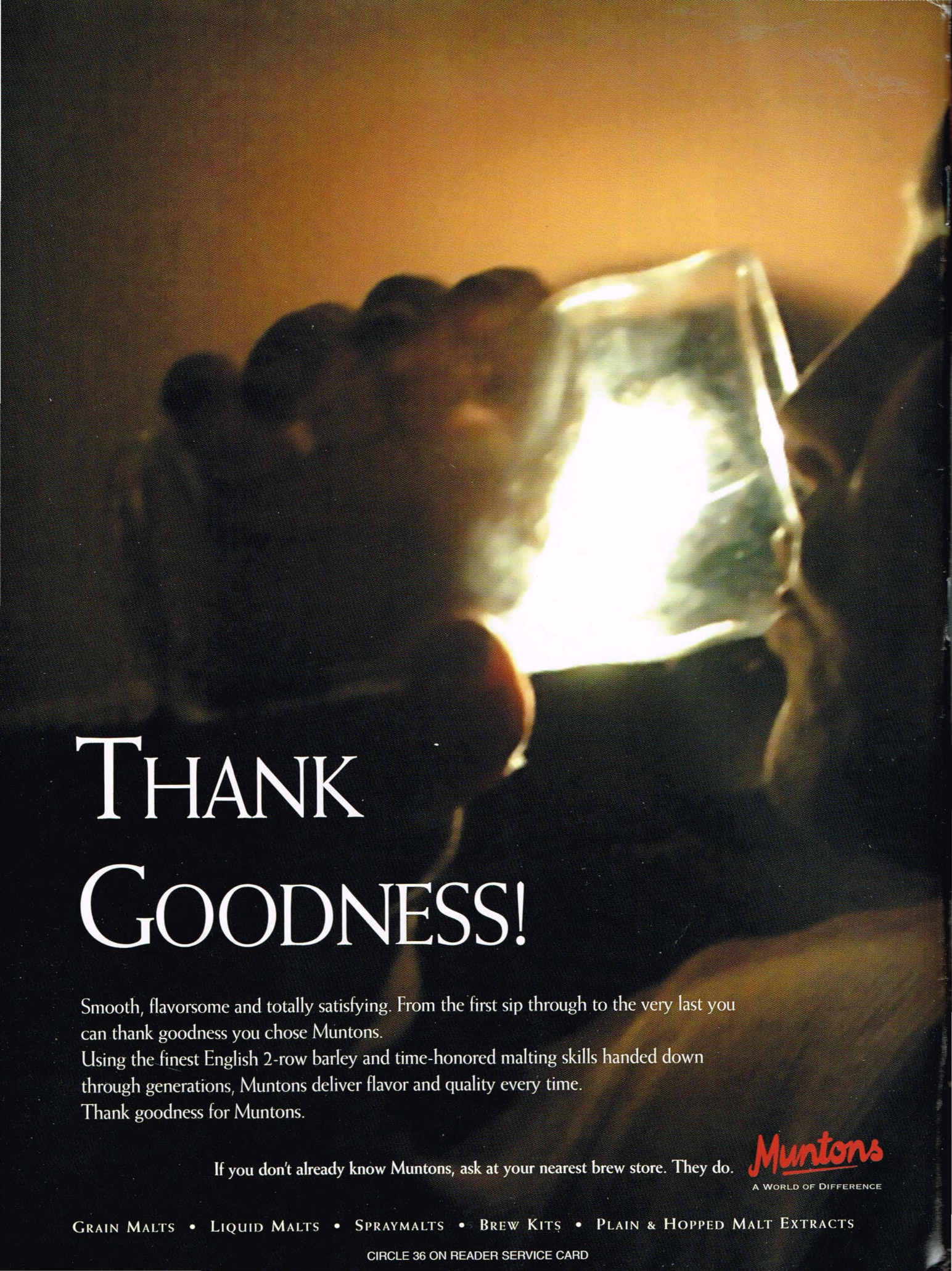
Bohemia's brewing gift to the world, adapted to produce a historically golden, clean, crisp brew. With a sharp hop aroma, a bright, clear color and a typical lager malt character, Coopers Pilsener is a real palate pleaser.

100% malt
Bitterness (IBU): 22.6
Color (SRM): 3.6

CASCADIA IMPORTERS

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CIRCLE 11 ON READER SERVICE CARD


THANK
GOODNESS!
Smooth, flavorsome and totally satisfying. From the first sip through to the very last you can thank goodness you chose Muntons.
Using the finest English 2-row barley and time-honored malting skills handed down through generations, Muntons deliver flavor and quality every time.
Thank goodness for Muntons.
If you don't already know Muntons, ask at your nearest brew store. They do.
Muntons
A WORLD OF DIFFERENCE
GRAIN MALTS • LIQUID MALTS • SPRAYMALTS • BREW KITS • PLAIN & HOPPED MALT EXTRACTS
CIRCLE 36 ON READER SERVICE CARD