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THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2008, VOL.14, NO.4

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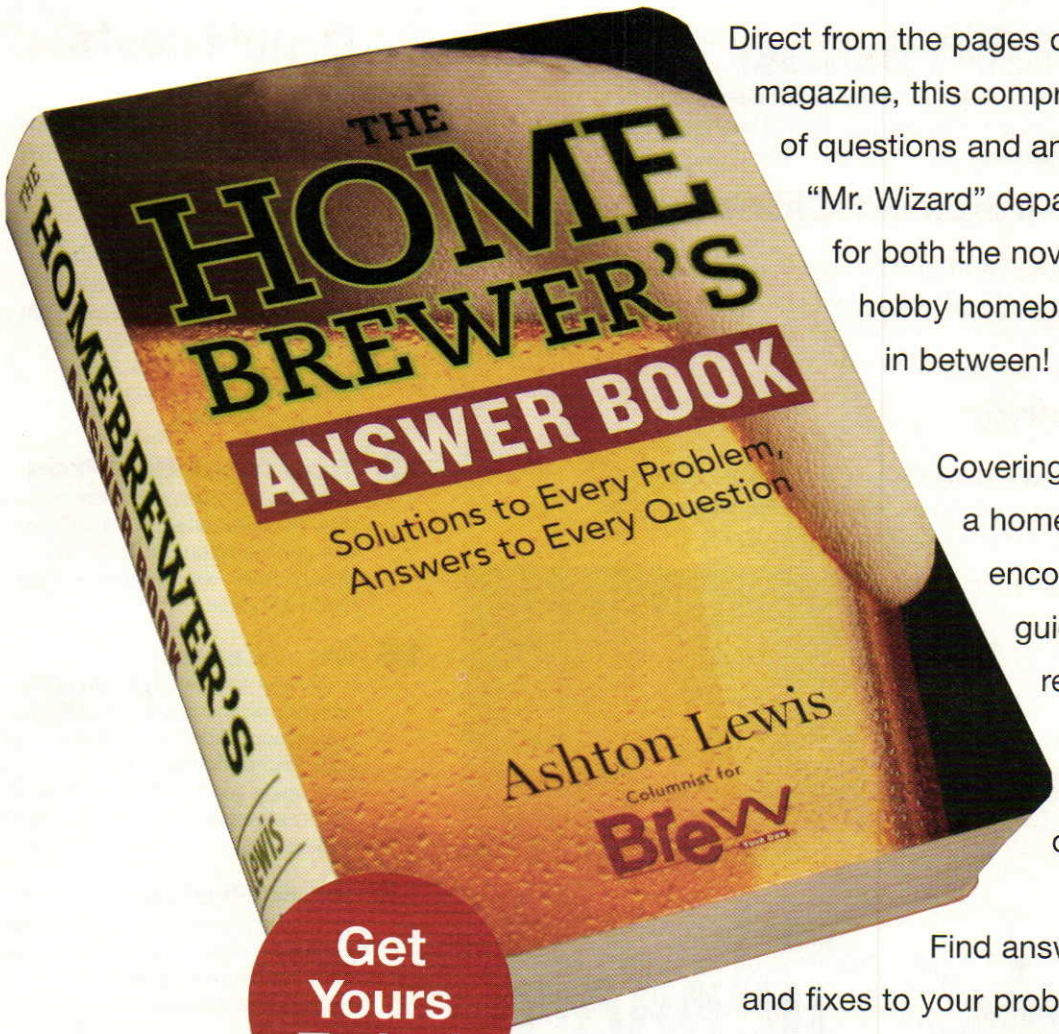

Direct from the pages of *Brew Your Own* magazine, this comprehensive collection of questions and answers from our popular "Mr. Wizard" department offers advice for both the novice and the advanced hobby homebrewer – and everyone in between!

Covering nearly every situation a homebrewer could encounter, this 432-page guide is the perfect reference for any amateur brewer. Fully indexed and organized by themes.

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THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2008
Volume 14 Number 4

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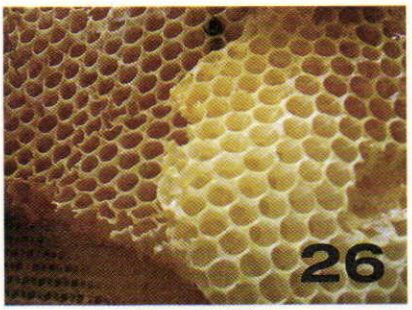
Features



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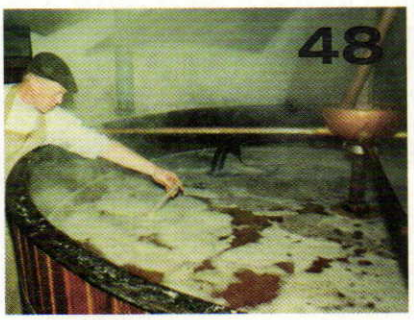

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RECIPE INDEX

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Extract efficiency: *65%*
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

Extract values for malt extract:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

Potential extract for grains:
2-row base malts = 1.037–1.038
wheat malt = 1.037
6-row base malts = 1.035
Munich malt = 1.035
Vienna malt = 1.035
crystal malts = 1.033–1.035
chocolate malts = 1.034
dark roasted grains = 1.024–1.026
flaked maize and rice = 1.037–1.038

Hops:
We calculate IBUs based on 25% hop utilization for a one hour boil of hop pellets at specific gravities less than 1.050.

Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

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Cover Photo: **Charles A. Parker**

MaiL

Oxygen Plus Oil?

I read with great interest the article on olive oil in the latest issue of BYO (John McKissack, "Olive Oil Aeration," May-June 2008). The results obtained when using olive oil alone are impressive, but what about adding both oxygen and olive oil together? It seems to me that this might be just the thing to get a real vigorous fermentation going, especially in big beers.

Eric Olson
Oakland, California

As the article discussed, brewing scientists have been researching the use of olive oil as a replacement for cold wort aeration. Although aeration allows the yeast to synthesize necessary elements for yeast growth (sterols and unsaturated fatty acids), it also reduces the flavor stablity of beer in the long term. Adding olive oil in addition to regular aeration has not been studied as this would defeat the original purpose — providing the benefits of aeration without the drawbacks.

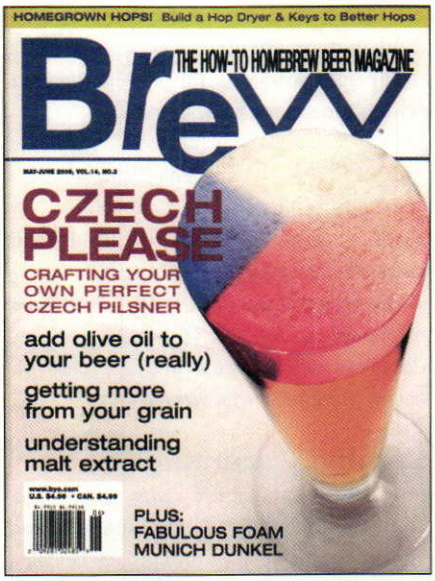
If chilled wort is aerated adequately and a proper amount of yeast is pitched, a fermentation of adequate vigor should ensue. Cranking up the yeast beyond what is required will not necessarily lead to better beer.

In the case of big beers, combining regular aeration and olive oil addition might make some sense. In beers that start at a very high gravity, multiple shots of aeration are sometimes employed. The wort will be aerated, as usual, right before pitching the yeast. However, addition shots of aeration may be added in the next 24 hours or so. Generally, the wort would not be aerated once the fermentation has reached high kräusen.

It makes sense, given the available research, that olive oil could be used for some or all of the aeration events, especially those after the initial one. This would hypothetically have the benefit of keeping yeast health and vigor high without the negative effects of aeration. However, this suggestion has not been tested and it's always possible that it would not work or have some negative side effects. Then again, it may work out great.

We would not recommend combining aeration and olive oil treatment in a "regular" beer simply to achieve a more vigorous fermentation. Combining the proper pitching rate, aeration level, fermentation temperature and yeast nutrition should ensure a quality beer fermentation.

In the case of fermentations that require heavy aeration or multiple instances of aeration, it is plausible using olive oil in conjunction with regular aeration might have some benefits. However,



this possibility has not been tested. (If any BYO readers have experimented with this, please email us and tell us about your experience.)

Boil the Olive Oil?

In the story on olive oil, the guy who wrote it added olive oil to his yeast starter after chilling it. I think I have found a better way of doing it. I never make yeast starters, so instead I added a drop of olive oil to the boil. The next day, my fermentation was so vigorous, I thought the lid was going to blow off the bucket. Boiling the olive oil should sterilize it, reducing the risk of a bad batch.

Steve Winter
High Point, North Carolina

The procedure you mention obviously worked, in that your beer was fermenting the next day. However, we would not recommend this approach for a couple reasons.

First off, in Grady Hull's experiments, the olive oil was added to the yeast in storage. For homebrewers, the nearest analogous point in the brewing process would be the yeast starter. In order to benefit from the olive oil, the yeast required a certain amount of contact time with it before pitching. In the case of adding olive oil to your main wort, the contact time would start when the yeast was pitched.

Secondly, heat breaks down oil. Oleic acid, the main fatty acid found in olive oil, has a smoking point well above the temperature of boiling wort. Still, oils do begin breaking down well below their smoking point. By heating the oil, you may be reducing the amount of oleic acid in the sample

Contributors

Glenn BurnSilver, is a freelance writer, backcountry adventurer, record collector and frequent contributor to *Brew Your Own*. He has authored several collections of homebrew clone recipes, including the "double" and "imperial" clone story in the December 2006 issue, as well as the GABF gold medal winning recipes in the September 2007 issue.

In this issue, Glenn tracked down five Belgian-inspired clone recipes from five US brewers. Read his story on page 40.

Dave Green, *Brew Your Own*'s multitalented Advertising Sales Coordinator, was first introduced to homebrewing at Colby College in Maine with buddies experimenting in the chemistry lab. After college he landed a job as Assistant Brewmaster at Brickhouse Brewery, a brewpub in Patchogue, New York. These days Dave lives in Dorset, Vermont with his wife and one-year-old son and tries to get as many brew days in as he can — at least when he's not chasing after the baby. In this issue Dave explores turbid mashing. Read more about it on page 48.

Curt Stock and his wife Kathy started homebrewing in 1996 and making their own mead since 2003. Curt and Kathy have been very active in homebrew competitions and they have won a few beer and mead Best of Shows including two AHA Mead Club Only Competitions as well as earning the 2005 AHA Meadmakers of the Year. On page 26 of this issue, Curt discusses melomels (fruit meads) and some sweet new meadmaking techniques.

and possibly adding unwanted flavor compounds from the heated oil.

That being said, your experience matches that of at least a few homebrewers who have written about their experiences in on-line forums. If practical experience demonstrates to you that this approach works, then there's really no reason to listen to theoretical objections.

The idea of adding olive oil to beer fermentations is new to the homebrewing community. We know from years of experience and extensive scientific study that proper aeration — coupled with the proper pitching rate and adequate yeast nutrition — yields good beer. A handful of studies, and the initial explorations of many homebrewers, indicate that olive oil may be a reasonable substitute for aeration. For the time being, we encourage homebrewers to weigh for themselves the benefits of tried and true methodologies versus newer experimental ideas. Whether you decide to go the route of traditional monk or mad scientist, you will have succeeded if you have fun and brew good beer.

Lowdown on Low pH

As an avid lager brewer, I enjoyed Horst Dornbusch's article on Czech Pilsner (May-June 2008). One piece of information, however, was new to me. I had never read anything before about the mash pH being lower than normal in this style of Pilsner. What's the source for this info?

Jim Bitford
Eau Claire, Wisconsin

Horst attended the 2007 Craft Brewers Conference in Austin, Texas and heard a talk by Thomas-Kraus Weyermann on the acidification of mash, wort and beer. The information in his article comes from that talk (and also from some information found in German brewing texts).

Lambic Paranoia

I tried my first lambic many years ago. Hated it. Recently, I tried another one and suddenly I'm very interested in brewing this style of beer. However, I've always been fastidious about my cleaning and sanitation and wonder if I should bring the "bugs" necessary to brew a lambic into my brewhouse.

Matt Carrington
Pittsburgh, Pennsylvania

Your fears are very common for first time lambic brewers. They will go away after you brew your first "normal" beer following your lambic fermentation. In general, to keep your brewery free of cross contamination, just follow your normal cleaning and sanitation procedures. For extra peace of mind, you can keep your lambic fermentations in a different room. Also, you might consider isolating any "soft" materials that contact your lambic wort (stoppers, tubing).

Questions, concerns, comments?

Contact us!

Brew Your Own — The How-To Homebrew Beer Magazine

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A Style Distinctly American.

In the mid-nineteenth century, German-American brewers perfected the crisp, refreshing beer style now called American Lager. It not only changed our choice of drink, it changed how and where we enjoyed it. This new lager helped change America into a country of beer lovers who came together in beer halls and beer gardens to celebrate life and its bounty.

Budweiser led the way in this Lager Revolution. By 1898, it was the number one beer in America. And it wasn't just because of advertising, stadium signs or sponsorships–it was the taste.

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We also lager Budweiser over beechwood chips for about three weeks. This second fermentation lets the yeast stay in contact with and naturally carbonate the beer. The result is our signature crisp and refreshing taste.

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reader PROJECT Mill-Right!

Steve Darnell • Ypsilanti, Michigan

I'm handy, though far from expert at mechanics or electronics. But, since the day I began all-grain brewing, I've understood the benefit of having a mechanized grain mill. It's one of those things that's always been on the to-do list.

Then, when a fellow brewer left town he gave away some motors, which I assumed he'd collected for this type of project, so I built my mill.

The pulleys, properly called sheaves, were bought online from granger.com and the belt came from my local hardware store. I ordered the smallest sheave available, 1.5", then an 8" one. My starting speed was 1,749 rpm. This ratio, 1:5.3 takes it down to 327 rpm, which grinds a pound in 6 seconds with my Schmidling mill. The blogs I looked into suggested that problems with the grind (size, consistency, grain flying all over) would begin around 500 rpm, so this is a good speed. The sheaves come in different belt depths, 3L and 4L are the most common. I went with the 4L since it's almost twice as deep and gives the belt better traction; and I didn't have to make it that tight. I haven't tried grinding unmalted wheat, but that should be the ultimate test. I'm guessing it won't be a problem since the motor came from a washing machine and has plenty of torque.

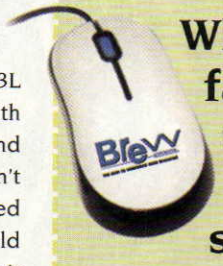
Steve made this motorized mill with a washing machine motor for less than $30.

My 12-year-old son, Ben, and I did the fabrication. The parts cost less than $25 and it took about four hours. We cut the base board to size then cut a hole for the grain to fall through. We mounted the mill directly to it using the existing holes in the block, then we mounted the motor with two "L" brackets. We attached a plastic electrical box with a standard light switch and face plate. The power wires were still on the motor and the power supply cord is just a standard extension cord.

The shaft of the motor was ½" but the grinder shaft is ⅜". The smallest sheave hole is ½" so we had to make a sleeve out of copper tubing to make up the difference in diameters. It's not perfect, but it allows the sheave to grip the shaft tightly. When grinding I just turn on the motor and dump the pre-measured grain from a bucket. It's a little wobbly, and far from elegant, but it gets the job done and in little time. There's very little to go wrong and it should last forever.

My setup has been slowly evolving from the extract brewing days. When I decided to go all-grain I knew the one indispensable piece of equipment I needed was a malt mill. For some time I've been thinking of increasing my batch size from five gallons to ten. And, just as before, this mill is the indispensable step in making that happen.

byo.com BREW POLL



What is your favorite type of brewing sugar?

Liquid Malt Extract: 19%

Dried Malt Extract: 18%

Honey: 17%

Corn Sugar: 11%

Belgian Candi Sugar: 8%

Brown Sugar: 7%

Sucrose: 5%

Molasses: 4%

Dextrose: 4%

Maple Syrup: 3%

Check out the latest poll question and vote today at byo.com

club PROFILE
The Edmonton Homebrewers Guild

Edmonton, Alberta

Located on the 53rd parallel, Edmonton is home to the Edmonton Homebrewers Guild, Canada's most northern homebrew club. To put things in perspective, Moscow's latitude is a mere two degrees north. The Guild was founded in 1986 and had approximately a dozen members. Today, we have over 50 members, of which about 15 are active, qualified BJCP judges.

Members of the Edmonton Homebrewers Guild in 2007, gathered around George Sample's '49 Merc.

Our club philosophy is based on two principles: excellent brewing and solid education. We follow the BJCP style guidelines and brew to style both for knowledge and consistency. However, there are those amongst us who also crave to push the envelope. These guys have no hesitation to go beyond the norm, brewing way out of style and coming up with something weird, wacky and wonderful, like a Belgian IPA or a Bohemian Dunkel Pils.

Everyone in the Guild is treated with respect no matter what level of brewing they are at. One of our senior members says, "We are not just a bunch of all-grain beer snobs, we are simply a bunch of beer snobs making the best brews possible by whatever means we choose."

In fact, one of our annual club competitions called Brewing Under Really Ridiculous Parameters (BURRP) is strictly "anything goes," but everyone must brew with one kind of malted barley, such as domestic 2-row, and everybody starts with exactly the same amount of malt, usually 10 lbs (4.5 kg). From there one can roast, toast, smoke, soak and bake any amount of the malt to create specialty malts. They make their own roast barley, Munich or crystal but it must be derived from the 10 lbs. (4.5 kg) of 2-row. Yeast and hop selection is up to the brewer and the rules change from year to year. Some of these beers have been legendary. Once participants had to use at least 1 lb. (0.45 kg) of a cold breakfast cereal as an adjunct, and a past president won an AHA club only competition with his Cocoa Puffs Porter. We've also had root vegetables (Beet Bitter anyone?) and historical themes like baked bread, as well as non-hop beers using herbs such as heather or spruce tips. In February '08 we introduced the One Gallon Fortified Beer Challenge to the BURRP competition. The above rules apply with a liqueur being added to the single gallon secondary, mini keg or bottle.

We are active participants in the AHA club only competitions and our annual competition, The Aurora Brewing Challenge (ABC), held every June is an MCAB qualifier. Last year we added the BURRP class to the ABC hoping to encourage any members from other clubs to go bold.

The Guild meets on the first Thursday of every month at Alley Kat Brewing Company in Edmonton. For more information on The Edmonton Homebrewers Guild and our competitions, visit our Web site at www.ehg.ca.

WE WANT YOU

Do you have a system or a homemade gadget that will make our readers drool? How about a killer recipe or tip? Want to profile your club? Email a description and photos to **edit@byo.com** and experience fame among 100,000+ homebrewers!

If we publish your article, recipe, photos, club news or tip in Homebrew Nation, you'll get a cool ½ Liter German Stein (courtesy of White Labs) and a *BYO* Euro sticker.

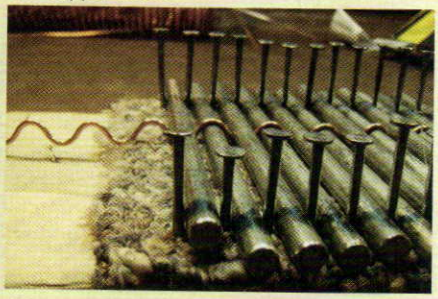
homebrew systems that make you DROOL

Jeff Hall, Adam Berg • Aurora, Colorado

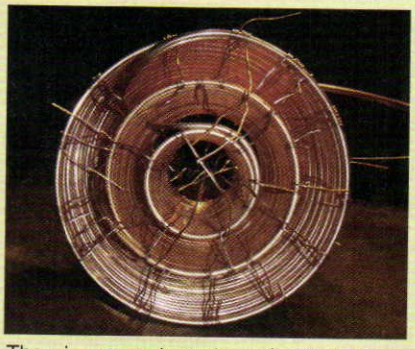
I (Jeff) noticed a wort cooler my friends were using, and I was surprised at the inefficient design. As a gift, I designed and built this 5-gal.(19-L) "Frankenchiller."

I used 1 faucet connect (1" diam. pipe fitting), 1 copper pipe (1" diam. by 3' long), 1 T-fitting (1" diam.), 2 elbow connectors (1" diam.), 2 reducers (1" to ½"), 2 copper pipes (½" diam. by 3' long), 1 12-g copper wire ~40', 6 ¼" by 20' copper tube.

Cardboard tubes were used to form the coils. For the 8" section, I formed each coil separately, then intertwined them by rotating one into the other while on the tubes.

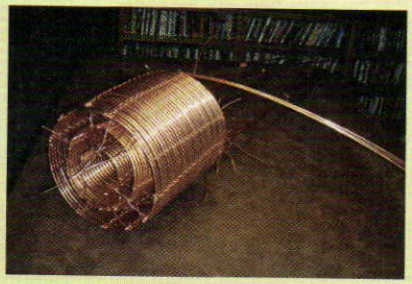


12-g wire was used to separate the coils. They are used to provide support and increase efficiency by maintaining a separation between the coil loops.

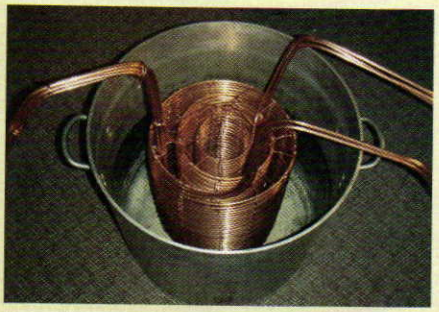


The wire support was turned onto the copper coils as the coils were removed from the cardboard tubes. For the 12" ring, I braced the loops and supports to prevent the copper pipe from being kinked.

To ensure a leak-free solder joint, each ½" pipe had half its length shaped to form a triangular pattern using three ¼" steel rods and a shaping hammer. Here is the ½" pipe prior to shaping.



I placed the 4" coil in the 8" coil assembly and used the extra lengths from the support wire to connect the two. Then I placed that inside the 12" coil the same way.



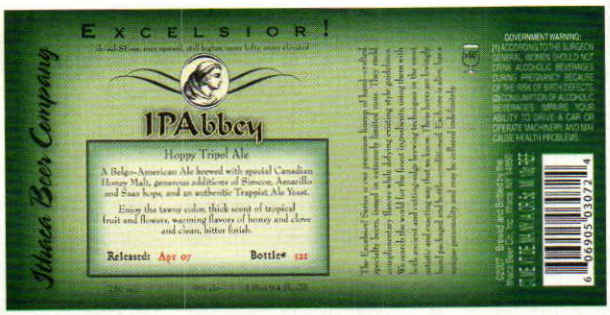
Based on tests performed in March, in Colorado, we were able to chill 5 gallons (19 L) from 200 °F (93 °C) to 70 °F (21 °C) in 3 minutes, 40 seconds.

replicator
by **Marc Martin**

Dear Replicator,

I recently attended a beer tasting at a friend's house in Austin, Texas and someone brought a bottle of Ithaca Beer Company's IPAbbey from Ithaca, New York. Although I found that it had more of an IPA quality than Abbey ale, it was one of the most interesting beers I have ever tasted. The label said that it had been brewed with Canadian honey malt and the hops consisted of Simcoe, Amarillo and Saaz. Based on the name and the flavor I assume that it must be brewed with a Belgian yeast strain. I would really appreciate your assistance in replicating this excellent beer since, to my knowledge, it is only available in New York state.

Corey J. Martin
Round Rock, Texas



While Corey and I are not related, there are some interesting Austin, Texas connections here. During the three years I lived in Austin he and I, together with some other key members, brought the Austin Zealots homebrew club back from the brink of extinction (BYO disclosure: Editor Chris Colby is also a Zealot). When I moved, Corey replaced me as the "Primary Fermenter."

There is also an Austin connection to the Ithaca Brewing Company. In 1997 the owner, Dan Mitchell, was searching for his first brewhouse equipment. He finally found a small system at a brewpub in Austin that was no longer brewing their own beer. Dan and Jeff O'Neil, the brewmaster, spent a year getting this system and the brewery ready for opening in December of 1998.

With great beers, growth at the brewery has been steady. These days, IBC's production occurs on a state-of-the-art 25-barrel system and distribution extends into New England, including Connecticut, Massachusetts and Rhode Island.

My call to the brewery was fielded by Jeff O'Neil and he was eager to discuss his IPAbbey. He related the interesting road that led him to become a brewmaster. He began homebrewing in 1995 during his college days in California as a psychology major. To pay the bills he worked in the kitchen at the now defunct Twenty Tank Brewery in San Francisco. He also worked at Drake's Brewery in San Leandro, and on the packaging line at Gordon Biersch. By then brewing had become his passion and he went on to graduate from the Siebel Institute. An interesting sidebar is that part of his homebrewing equipment included the first prototype conical fermenter from Beer, Beer and More Beer.

Jeff reports that the IPAbbey ale was a 650-gallon (2,461-L) batch that was only brewed once. It was inspired by several Belgian brewers that had visited their brewery and gave favorable comments about the hoppy US IPAs. Further inspiration came from a couple of Jeff's favorite Belgian beers: Urthel Hop-It, and Piraat.

He developed the recipe by starting with a solid double IPA base coupled with Saaz hops. He wanted a very dry-finishing beer to accentuate the hop profile so a low mash temperature was used to increase fermentability. The somewhat unusual addition of dextrose helped to build body and create the extra dry finish. Aggressive dry hopping provided the finishing touch for aroma. Jeff also recommends a higher fermentation temperature to maximize the yeast attenuation and ester production.

The result is an excellent, unique beer that combines the bitterness and aroma profile of an American IPA with the spiciness of a Belgian strong ale.

Now Corey, you can "Brew Your Own" IPAbbey and win a ribbon or two for the Austin Zealots.

For further information about the brewery and their other fine beers visit the Web site www.ithacabeer.com or call them at 607-273-0766.

Ithaca Brewing Company "IPAbbey"
(5 Gallons/ 19 L, extract with grain)

OG = 1.072 FG = 1.008
IBUs = 76 SRM = 9 ABV = 8.3 %

Ingredients
6.6 lbs. (3 kg) Cooper's Pilsner unhopped malt extract
0.8 lbs. (0.36 kg) dried malt extract
2.2 lbs. (1 kg) Gambrinus honey malt (or substitute Munich dark malt)
1.6 lbs. (0.72 kg) powdered dextrose (last 30 min. of the boil)
13 AAU Simcoe pellet hops (90 min.) (1 oz./ 26 g of 13% alpha acid)
7.3 AAU Amarillo pellet hops (90 min.) (1 oz./ 26 g of 7.3% alpha acid)
3.5 AAU Saaz pellet hops (90 min.) (1 oz./ 26 g of 3.5% alpha acid)
4.9 AAU Saaz pellet hops (10 min.) (1.4 oz./ 40 g of 3.5% alpha acid)
18.2 AAU Simcoe pellet hops (5 min.) (1.4 oz./40 g of 13% alpha acid)
10 AAU Amarillo pellet hops (0 min.) (1 oz./28 g of 10% alpha acid)
1 oz. (28g) each of Simcoe, Amarillo, and Saaz whole leaf hops (dry hopping)
½ tsp. yeast nutrient (last 15 min.)
White Labs WLP530 (Abbey Ale) or Wyeast 3787 (Trappist High Gravity) yeast
¾ C. (150 g) corn sugar for priming (if bottling)

Step by Step
Steep the crushed grain in 2 gallons (7.6 L) of water at 149 °F (65 °C) for 30 minutes. Remove grains and rinse with 2 quarts (1.8 L) of hot water. Add the liquid and dried malt extracts and bring to a boil. While boiling, add the hops, powdered dextrose and yeast nutrient as per the schedule. Add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L). Cool the wort to 80 °F (27° C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 75 °F (24 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Add the dry hops and let the beer condition for 1 week. Strain the dry hops and then bottle or keg. Allow to carbonate, age two weeks.

All-grain option:
This is a single step infusion mash. Replace the malt syrup with 7.5 lbs. (3.4 kg) Pilsner malt and 3.5 lbs.(1.6 kg) 2-row pale malt. Mix the crushed grain with 3.5 gallons (15.9 L) of 170 °F (77° C) water to stabilize at 149 °F (65 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6.5 gallons (29.5 L) of wort runoff to boil for 90 minutes. Reduce the 90 minute hop addition to 0.9 oz. (26 g) to allow for the higher utilization factor of a full wort boil. Follow the remainder of the extract with grain recipe.

Homebrew CALENDAR

July 11–12
Indianapolis, Indiana
2008 Indiana Brewer's Cup Competition
The annual homebrewing competition held in conjunction with the Indiana State Fair. BJCP guidelines apply as well as a new category for unhopped beer. Entries will be accepted from June 14 through June 28. Visit http://www.brewerscup.org or http://www.indianastatefair.com for more information.

July 26
Huntington, West Virginia
2008 Mountain Brewer Open Homebrew Contest
Greater Huntington Homebrewers Association Brewfest
Entries for the homebrewing competition will be accepted July 10–July 20, 2008. The fee is $5/entry, two bottles per entry. The MBO will also include a label contest, and prizes will be awarded to the top three labels. The GHHA Brewfest will follow the contest. More information is available online at http://hbd.org/ghha/Meetings2008/July2008/MBOAnn2008.html.

August 15–17
Albuquerque, New Mexico
New Mexico State Fair Pro-Am Competititon
New Mexico's 20th state fair brewing competition. All BJCP styles are accepted. Pro and amateur entries are judged separately. Entry deadline is August 2. More information on the Web at http://www.dukesofale.com/statefair.html

August 13–September 17
Racine, Wisconsin
Entry Deadline: The Schooner Home Brew Championship
The yearly competition held during the Great Lakes Brew Fest (www.greatlakesbrewfest.com). Entry fee is $5. Events include a club challenge, brewer challenge and label contest. Ciders and meads will be judged as well. More details and information online at http://www.theschooner.org/.

BEGINNER'S block

Brewing With Fruit

by Betsy Parks

Lots of summer beer styles (wheat beers, IPAs, blonde ales) can be more fun and fresh with a little fruit flavor. Adding fruit to your next brew can be a fun experiment for any brewer but keep a few facts in mind before you begin.

What to brew

Try to choose a fruit/brew blend that makes sense. Many lighty-hopped styles brewed with clean, neutral yeasts, like wheat and blonde beers, lend themselves well to fruit flavors. Some darker brews like porters and even a few stouts can also benefit from fruit. The key is to make a beer that isn't too overpowering to drown out the fruit flavor, but not so neutral that it has no personality.

Brewers can use either fresh fruit or processed purees. Fresh fruit is good if you have access to quality produce. Fresh fruit, however, brings a risk of contamination from wild yeasts and bacteria.

Processed fruit puree is packaged sterile so there is no risk of contamination. Purees are also convenient because you just open the container and add them to the beer. Be sure the puree is 100% fruit as additives can cause negative effects in the finished beer.

As for how much fruit to add, if you're not following a specific recipe you'll need to experiment a little, possibly with a test batch or two. Try adding a half-pound (0.23 kg) of fruit per gallon (~4 L) and taste the beer every few days to see what you think. If the flavor isn't strong enough, add more in the next batch. If you are using concentrated puree, use less to achieve similar results as fresh fruit.

In the brew

Before adding fruit, keep in mind that the sugar in your fruit may affect the specific gravity if you're adding a large amount. Most ripe fruits contain between 10 and 15% sugar, depending on the variety, and comprise a combination of fructose, glucose and sucrose. If you want to know if adding fruit to your beer will throw off the gravity, use this equation: SG = [W x (P/100) x 45]V where W is the weight of the fruit, P is the percentage of sugar in the fruit (find the fruit's sugar content at www.nal.usda.gov/fnic/foodcomp/search/) 45 is the extract potential in gravity points of simple sugars and V is the volume of beer in gallons.

You can add fruit to hot wort or during secondary fermentation. If you're planning to steep in hot wort, contamination is less of a concern because of the high temperatures of the wort. The fruit can lose flavor or taste cooked, however, from being heated. Fresh fruit will also absorb some liquid, so you may need to use a little more water. Adding fruit before or during the boil can also cause an increase in pectin extraction, which can cause pectin hazes in the finished beer. For brewers who filter, pectin in beer can also cause major filtration problems. Avoid excessive pectin extraction by steeping the fruit around 160–170 °F (71–77 °C) after the boil.

Most brewers add fruit during secondary fermentation to avoid the heat. This raises the chances of contamination, but typically at this stage the pH and alcohol levels in the beer can fend off a reasonable amount of microorganisms. If you use a pasteurized and sterile-filled puree, don't worry about contamination.

Be sure if you're using fresh fruit to keep it submerged to prevent molding, and keep a tight seal on the fermenter to prevent any microorganisms from getting in.

Honey and Fruit

Expert advice for making fruit meads

by Betsy Parks

Summertime brings with it ample supplies of ripe, fresh fruit — likely pollinated by bees making honey. What better way to combine the two than in a fruit mead? This issue, three master meadmakers share advice for making melomels.

DAVID MYERS, Chairman of the Mead at Redstone Meadery in Boulder, Colorado. David opened Redstone Meadery in September 2000 and released Black Raspberry Nectar in July 2001. He attended the Siebel Institute in Chicago, and is also one of the founding board members of the International Mead Association.

The concept of making fruit mead versus traditional mead is pretty much the same, but you do have to ask yourself if you want the fruit to be the standout character or do you want the honey to be the standout character?

Honey selection can make a difference. Different honeys make different honey wines, just like grapes. Use a more neutral honey like clover if fruit is going to be the more dominant flavor.

As with any fermented product, yeast strain is definitely going to influence the outcome. For our Nectar line of meads, we use Narbonne (Lalvin 71B-1122), which is good for making young fruity wine. For our 12% non-carbonated meads we use Montrachet. I also often like to mix my yeasts. Like all things, you can use whatever you want to use, but use what you like.

You can have cloudiness issues with pectin. From a homebrewing standpoint, I'm not opposed to cloudy mead. But if you want more clarity, you can use a fruit pectin enzyme to clear it. But as a homebrewer I never did any of that — it's more about patience. If you are patient and do some transfers it will clear, although I wouldn't worry about the clarity.

Aging is going to depend on the strain of alcohol. If your mead is roughly 12% alcohol, on a homebrewing scale I would wait a year before bottling. It also depends on what you see. If it's a much heavier mead it could take a few years. The best thing is to taste your mead every now and then. If you don't like how it tastes, forget about it and come back to it later.

One of the problems that often happens in homebrewing is fermenting at too high a temperature. Try to keep it below 79 °F (26 °C). But if you do ferment too high and wind up creating ethanols, which can taste like jet fuel, leave it alone — those flavors will mellow over time.

MIKE FAUL, Founder and Meadmaker at Rabbit's Foot Meadery in Sunnyvale, California. Mike and his wife Maria founded Rabbit's Foot in 1995. He immigrated to the US from Ireland in 1980 and moved to Sunnyvale with Maria in 1991. After working for years as a Silicon Valley software engineer, he decided to make his meadmaking hobby a full-time venture.

Making traditional mead can be different from making fruit meads, depending on whether you are making something dry or sweet. The biggest factor is the quality of the fruit. If you're making a sweeter style, use fresh fruit that is quite ripe. Fruit that is a little underripe can be good for a style that isn't as sweet.

Honey comes from all kinds of flowers, and trying to match them in a mead with your fruit doesn't always make sense, for example, using raspberry honey with raspberries. What I look for is honey that is a better match in terms of sugar quality and acidity. At Rabbit's Foot, we use different honey for all of our meads for very different results. For fruit to be more prominent, I would choose a neutral honey like clover. For a more earthy flavor I would use a wildflower honey.

Selecting the right yeast is trial and error and experimentation will tell you what is best. Also important is temperature control. If you ferment too hot you can produce higher odor alcohols, too cold and your fermentation can get stuck.

To prevent cloudiness, which is important to consumers, we filter and fine with products like bentonite and gelatin. The concern with this, though, is taking out the flavor and color, so don't overdo it with filters that are too tight, or by using two fining agents before experimenting a little. You can also prevent cloudiness in fruit meads by adding pectic enzyme at the beginning of fermentation or freezing the fruit.

My advice to anyone interested in making fruit mead is to pick a good yeast and use twice as much as you think you need. Ferment as cool as you can, and definitely avoid fermenting too hot. If you can control the fermentation temperature you won't lose fruit character or develop higher odor alcohols.

My second piece of advice is to always pick quality fruit and honey — don't skimp. What you put into that mead is what you'll get out of it.

JON HAMILTON, owner and meadmaker at White Winter Winery in Iron River, Wisconsin. Jon and his wife Kim co-founded White Winter in 1996 with Mark and Nancy Rooney. Jon started the winery after Kim sat him down to tell him that his hobbies (homebrewing and beekeeping) were "getting out of control."

Balance is always key when making fruit meads. The aroma, the flavor, the acidity, the sweetness and the alcohol. I always suggest that people really think about what they want to end up with before beginning a new recipe. If you don't know where you want to end up it's hard to know where to start.

Many fruits will cover up the honey so it is important to use a heavier, more full-flavored honey to stand up to the type of fruit you are using. Some fruits may "like" a lighter, less forward honey while others demand it. Again, balance is the key.

A straight traditional mead must have yeast nutrient for a clean, robust fermentation because honey has virtually no nutrient value for the yeast. When fruit is added, it helps solve the problem somewhat, but nutrient additions are cheap insurance for problem-free fermentations.

Choosing a yeast depends, again, on the final outcome desired. This is where the art of the meadmaker comes into play and the chance to influence the final outcome by different yeast characteristics.

If there is cloudiness, proteinecious fining agents work well, but we still get caught sometimes. Fining with bentonite and filtering cold can help to eliminate the problem, but filtering alone will not remove proteins unless you use a very tight (and expensive) filter, which is not really within reach for most homebrewers.

We have found that fruit meads age very nicely over several years and do not seem to follow the "tannin" rule of grape wines, ie: the bigger the tannin the longer the aging, the lower the tannin the faster you should drink it. I do not think this should vary with small batches as opposed to larger batches. Aging can really help what may at first appear to be a harsh and undrinkable mead. I always tell people to just stick it under the basement stairs and forget it for a couple of years, then decide if you want to keep it or not. It is amazing what can happen over time.

My best advice is balance, balance, balance! Balance the alcohol with the acidity and residual sweetness. The sweeter the mead the higher the final total acids (TA) should be. The dryer the mead, the lower the acids should be. If you like rocket fuel, that's OK, just make sure it is balanced with the TA and residual sugar so it is drinkable. High alcohol and TA will burn all the way down. Low TA tastes like cough syrup. The acid test kit is the most valuable tool behind the hydrometer, and can be purchased for less than $10.

Nitro Knowledge

Kegerators, water ratios and beta glucans

"Help Me, Mr. Wizard"

by Ashton Lewis

Nitrogen nonsense?

I'd like your thoughts on beers dispensed with nitrogen. I get in frequent arguments with members of CAMRA (Campaign for Real Ale). The latest controversy is in regard to nitrogen. I quote, "Adding gas to a beer is unnatural and unnecessary. It does nothing for the taste and even less for the aroma if that matters to you. Carbon dioxide is bad enough, nitrogen is much worse." I've had some beers dispensed with nitrogen in the Pacific Northwest that I thought were fantastic. Dry hopped, probably not pasteurized. Is there a scientific explanation to why nitrogen removes aroma, flavor? Or, are these people just ill informed?

Kevin Keehn
Laguna Hills, California

Although I have been known to do my fair share of trash talking, I tend to avoid jabbing with groups that are vigorous in their support of brewing tradition. There is no doubt that an individual member of a group can tarnish an organization's image by acting like a knucklehead, but I don't think CAMRA is some radical group without a clear understanding of the facts about beer. I suggest a review of their Web site to balance your opinions http://www.camra.org.uk/. OK, so now that I have done my part to contribute to harmony in the beer community, let's get on with the question.

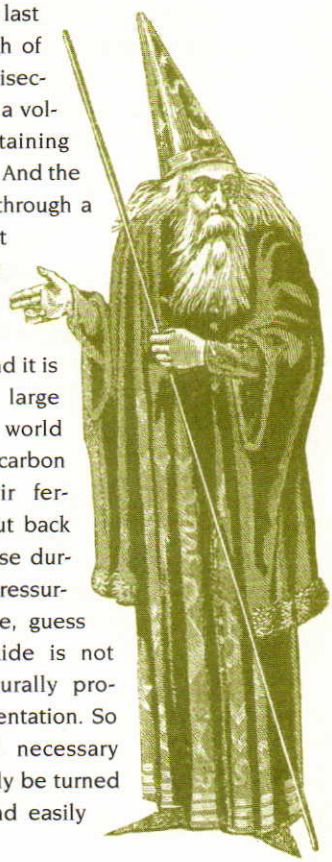
I must preface my answer with a confession. I really like nitro beers when they are done correctly and have a real appreciation for the ingenuity that went into developing this method of dispense. The Guinness brewery developed this technology in the 1950's to deal with oxidation and microbiological problems encountered with real ales, or beers naturally conditioned in the keg and dispensed using hand pumps. In order to create a similar beer using a closed system Guinness did extensive research on beer foam and wanted to know why cask ales had such a distinctive appearance and mouthfeel. Guinness researchers found that nitrogen is a key part of the head in cask ales and the nitrogen is introduced to the beer when air is mixed with beer upon dispense. The end of the story is that nitro ale, as we know it today, was born.

CAMRA does not promote beers dispensed with these non-traditional methods. They have a right to take this stand just like some wine purists think that wine should be unfiltered and fined with natural fining agents such as egg whites. Opinions about methods of production aside, there is truth in the statement that nitrogen alters beer flavor. I personally do not believe it strips flavor, rather it hides flavor. When a nitro beer is dispensed using a stout faucet, a very dense and creamy foam rises to the top. Unlike carbon dioxide foams, these foams are very stable and the nitrogen gas comprising the foam bubbles is not motivated by a large concentration gradient between the environment in the bubble and the environment outside of the bubble to leave. So how does this affect aroma?

Carbon dioxide is a very minor part of the atmosphere and when you serve a carbonated beverage there is movement of carbon dioxide out of the glass and into the environment. Aroma compounds move with the carbon dioxide and the carbonation level helps to enhance aroma. Of course aroma compounds move out of a glass without the help of carbon dioxide migration and other methods can be used to open up the aroma, for example swirling the glass and increasing the temperature. CAMRA also dislikes cold beer, and most folks sipping a pint of ale in a pub are not going to be swirling their pints like a wine enthusiast holding a Riedel Sommelier glass (those babies permit some serious swirling!). Try swirling your pint and not only are you likely to wear a portion of the contents but you erase the nice demarcations tracking your sips and risk attracting the attention of knuckleheads with thicker heads and much larger knuckles than any CAMRA member!

The other truth about carbon dioxide is that it stimulates the trigeminal nerve and contributes to the pain factor of beer. Spicy foods and phenols also stimulate this nerve. So if you are looking to quench the fire in your mouth caused by habanero salsa, a cold mug of highly carbonated beer will actually exacerbate the problem. Anyhow, it seems to me that carbonation enhances the perception of bitterness and nitro beers, by comparison, seem to dampen out bitterness.

Here is what I do. First, I ignore the argument about what is natural and necessary in brewing. Beer does not occur in nature and maltsters and brewers carefully manipulate natural ingredients to create beer. The last time I took a breath of air, a couple of milliseconds ago, I inhaled a volume of gas containing about 79% nitrogen. And the last time I walked through a brewery I could not help but smell the carbon dioxide wafting from fermentation tanks. And it is a fact that most large breweries in the world capture and reuse carbon dioxide from their fermenters to later put back in the beer or to use during packaging to pressurize bottles because, guess what, carbon dioxide is not cheap and is naturally produced during fermentation. So the "natural and necessary argument" can easily be turned into a Nerf ball and easily swatted down.



But the fundamental argument has merit and should not be discounted as merely rants by fanatics. When I brew nitro beers I formulate knowing that they will later be nitrogenated. I increase hopping, both first and late additions, to compensate for the effects that nitrogen has on aroma and bitterness. I also keep the

body in check because nitrogen adds body to beer. If you begin with a full-bodied beer and then nitrogenate it you can end up with too much. The nitrogen and method of dispense should be considered an ingredient and the beer formulation must take this into account. There is indeed a great variety of really nice nitrogenated beers on the market and you can brew these beers at home to add variety to your lineup of homebrews!

Holy kegerator

I have a kegerator with two taps on top. Inside I can easily fit two Cornelius kegs plus a 5-pound CO_2 cylinder. However, I recently started nitrogenating some of my beers, which requires another cylinder (slightly larger than the CO_2 cylinder). I also sometimes have three kegs of beer that I want to refrigerate, or perhaps two kegs and a carboy in secondary fermentation. I would like to drill a couple of holes in the side of my kegerator so that I can keep the gas cylinders outside the kegerator, leaving more space for beer inside. My wife is concerned that the kegerator will leak cold air, and thus increase our electricity consumption. What is the best way to accomplish this while satisfying my wife's concerns?

Mike Visser
Santa Rosa, California

There is something about homebrewing that seems to result in debates about the home. The most frequent seems to involve brewers commandeering the kitchen and leaving it a wreck. This, however, is the first dispute over BTUs and homebrewing that I have been sent for comment. This general topic is very fresh in my mind and later in this issue's column I discuss some of the talks given at the recent Craft Brewers Convention held in San Diego from April 16 to April 19.

Your wife has a valid concern since refrigerators contribute significantly to the monthly energy bill. Older refrigerators cost between $15 and $20 a month to operate, depending on local utility costs and how much heat load is put on the compressor. Heat load increases when you place warm items in the refrigerator or when you allow warm air to enter by either opening the door or by allowing it to enter through cracks in the seal or in your case holes around carbon dioxide lines.

The good news is that this is a really easy problem to properly address by choosing an appropriate installation method. One method is to drill a hole in the side of your kegerator with a hole saw and then cram a flexible hose with a slightly larger diameter than the hole into the side of the cooler. The hose will seal up the hole and air leaks will be kept to a minimum. Another method is to insert a rigid pipe through the hole and attach the gas hose to either end of the pipe. Some people prefer rigid pipe to hose because the hose can wear if wiggled around and the installation can appear messy, but with the pipe you have a decent conductor connecting the inside of the fridge to the ambient air temperature. If you choose pipe over hose you can insulate the pipe and this problem is solved.

We have a fairly large keg cooler we take to beer festivals and it has a single hose supplying carbon dioxide to a small valve block that is screwed to the inside wall. The valve block has little ball valves with hose barbs attached to them and makes it easy to turn the gas on and off to taps as needed. It also eliminates multiple hoses running into the side of the cooler, thereby reducing potential energy loss to the environment and making for a tidier installation.

This seems like a red herring argument. I don't think your wife is real thrilled about having your kegerator with some ugly carbon dioxide bottle sitting next to it messing up the house. Perhaps a more elegant design and a special brew for your wife will quell her objections to your kegerator improvement project.

Water ratio rationale

I have been brewing all-grain for about eight months now with a 10-gallon (38-L) setup made of used stainless steel kegs. My mash tun is outfitted with a ⅛ inch (0.32 cm) by 15 inch (38-cm) diameter false bottom that I made myself. It sits nearly four inches (10 cm) above the bottom of my vessel and allows a full 2.5 gallons (9.5 L) of brewing liquor to reside in the dead space below the grain bed. Should I compensate for this 2.5 gallons (9.5 L) by adding an extra 2.5 gallons (9.5 L) to my mash in order to have the full ratio of brewing liquor in contact with the grains at all times or should I just ignore the dead space and add water as if there were no void?

Serge Dubé
St-Jean-sur-Richelieu, Quebec

This is a good question and I have not seen it addressed often as it pertains to mash thickness. Most brewers using infusion mash tuns cover the false bottom prior to mashing in. They then meter water flow as grist is brought into the vessel during mash-in. So the water below the plates is really not considered to be part of the mash, as far as determining mash water volume is concerned. Most of the mash tuns used in commercial breweries are designed to minimize the distance between the plates and the true bottom and 4 inches (10 cm) would be considered too much of a gap by most brewers (1 to 2 inches/2.5 to 5 cm is more typical).

In the brewery where I work we have a mash mixer and a separate lauter tun. Lauter tuns can be used for infusion mashing if you simply mash-in to the lauter tun (in other words, mash tuns and lauter tuns have comparable features). Our lauter is 6 feet (1.8 m) in diameter and we have a 1 inch (2.5 cm) gap under our plates and cover the plates before filling. This requires less than 25 gallons (95 L) of water. A typical mash for a 12 °Plato brew requires 270 gallons (1,022 L) of mash water, so the water under the plates accounts for less than 5% of the total water. This value decreases as mash tun size increases, but at over 35% you really have a lot of water under your plates as a percentage of total water. You could reduce the volume to less than a gallon if your false bottom were one inch (2.5 cm) from the true bottom.

During mashing, wort will sink to the bottom of the mash tun since it is heavier than water and is indeed part of the mash since this volume of wort will contain enzymes, starch and sugar. I am stumped — whoa, did I just admit to being

stumped? And I really do not know how this affects what is occurring in the mash above the false bottom. Clearly the enzyme content is diluted and taken to extremes could cause problems with conversion, although with modern malts this is unlikely.

In breweries where mash mixers are used this is a non-issue since the mash is stirred and there is no physical barrier causing this separation. Let's assume that the relatively large volume of water beneath the plates does make this type of mash system different from a stirred mash. One thing to make the systems more similar is to mix the mash, but simply stirring the mash above the false bottom will not do much to mix the liquid beneath the false bottom. If you recirculated the liquid, as is done in the RIM method, you would prevent the wort beneath the false bottom from being segregated from the mash for the total duration of mashing.

In summary, you really do need to add more water to your mash tun to account for this void volume. If you did not add more water the mash would seem extremely thick and, in all likelihood, would actually be dry on the top if you used a mash thickness in the neighborhood of 3:1. My recommendation is to approach this from a design perspective and figure out how to get your false bottom closer to the bottom of the vessel so that 2.5 gallons (9.5 L) of water are not required to cover it. On the other hand, your question did not begin with, "my beers are horrible . . . " so you could always take the "if it ain't broke, don't fix it" approach.

Adding or reducing beta glucans?

I read your November 2007 column that suggested the beta glucan rest increased extraction of beta glucans into the wort. I think you'll find that the purpose of this rest is to reduce the beta glucans by degrading them. They increase viscosity and lower lautering rate, hence are problematic in beers, especially oat-rich beers. Thus, if you wanted to maximize your soluble fiber from oats, you should avoid this rest.

Sean O'Keefe
Radford, Virginia

When I wrote the bit about brewing a beer high in fiber I did not spot what may seem like backwards logic. I am well aware that the purpose of the beta-glucan rest is to reduce the size of large beta glucan molecules and to reduce wort viscosity. By doing this, the brewer increases the content of these compounds in the wort since these smaller molecules are less viscous and more easily separated from the mash. And because soluble gums like chopped up beta-glucan molecules are classified as dietary fiber, my recommendation increases the fiber content of the beer. In contrast, if a mash rich in grains with beta-glucans is mashed at temperatures too high for beta-glucanase activity a significant amount of beta glucan remains in the mash and is discarded as spent grain. I have brewed beers with so much of these viscous gums in the spent grain that

you could see and feel them by examining the spent grain.

I see now that this advice may seem counter-intuitive. My recommendation is based on the definition of dietary fiber. Beta-glucan molecules, small and large, are part of dietary fiber and reducing the size of these molecules will not change them into some other type of carbohydrate but will increase the concentration of total beta-glucan in wort.

A Quick Review of the Craft Brewers Conference in San Diego, California:

I traveled to San Diego, California in April for the annual CBC and enjoyed attending a variety of technical talks.

There were panel discussions focused on the current agronomic conditions surrounding the malt and hop markets. The supply of both of our key ingredients is being affected by global issues and the supply of these resources is not a simple problem. Competition with other cereal crops used for food and energy as well as a shrinking surplus of barley reserves have contributed to rising malt prices. The good news is that malting barley produces a very respectable financial return per acre and the very low prices for feed barley are being driven up by the rising price of corn. In the immediate future it appears that farmers will continue to grow barley and planted acreage should satisfy demand.

The hop situation is quite different and the current dilemma with hops has to do with the very poor 2007 European crop coupled with declining hop acreage and a reduction in the worldwide hop surplus. The hop panel was led by Ralph Olson of HopUnion and included growers and merchants. The take away message is that the price of hops has been kept low for many years due to a combination of low contract pricing and surplus acreage. The result of this long-time situation has been a 10-year decline in hop acreage. US hop growers are increasing acreage this year, primarily for high alpha hop varieties, but this increase will not immediately help the current deficit since it takes about three years for a hop yard to fully mature. If you live in an area that currently has or once had commercial hop yards, this may be the year to start growing your own.

Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last 12 years. A selection of his Wizard columns have been collected in "The Homebrewer's Answer Book," available online at brewyourownstore.com.
Do you have a homebrewing question for Ashton? Send inquiries to *Brew Your Own*, 5515 Main Street, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond personally. Sorry!

Belgian Pale Ale

The flavor of Antwerp

by Jamil Zainasheff

Nick, my bartender at the Monk's Kettle in San Francisco, serves me a De Koninck. He pours it in a traditional bowl-shaped De Koninck beer glass, called a bolleke once it is filled with beer. The beer is light copper in color with a rocky, white head. As I drink, the beer transports me back to Antwerp, Belgium, home of the De Koninck brewery. I had spent the day running around Antwerp and by the afternoon I was hot, tired, and thirsty. I eased into a bar and ordered a De Koninck, which is the everyday beer of the locals and perhaps the world's best commercial example of Belgian pale ale. A bolleke of this refreshing, easy-drinking beer quickly cooled me down, washing away the heat and exhaustion of my day and cementing itself as another treasured entry in my personal beer moment library.

Many brewers assume any Belgian beer is either high in alcohol or sour and funky, which isn't true. Belgian pale ales generally range from 4.8 to 5.5% ABV and are neither sour nor funky. They range in color from amber to copper and their bitterness ranges from 20 to 30 IBU. They are well balanced beers, with moderate alcohol levels and an even finish, making them a nice choice for whiling away a hot afternoon. De Koninck, like most Belgian pale ales, has an initial malt sweetness which trails off into an even or maybe slightly dry finish. The finish of a Belgian pale ale should be neither sweet nor overly dry. (If you're sampling these beers keep in mind that the balance of a bottled De Koninck is often a little bit sweeter after being shipped around the world.) This beer also has a malty character (grainy, bready, biscuity) and a pear and orange fruitiness that is clearly evident but not really bold.

BELGIAN PALE ALE by the numbers

OG:	1.048–1.054 (11.9–13.3 °P)
FG:	1.010–1.014 (2.6–3.6 °P)
SRM:	8–14
IBU:	20–30
ABV:	4.8–5.5%

Other examples of the style, like Speciale Palm, Dobble Palm, Russian River Perdition and Ginder Ale may or may not have the same pear and orange notes, but moderate fruitiness in both the aroma and flavor is required. While the fruitiness can be readily apparent, it shouldn't be as bold as some other Belgian beer styles and it should not be so prominent that it overshadows the malt character. Any spicy phenolic notes, when present, should not be more than a low background note; a tiny touch of clove-like spiciness is all it takes. These beers should also have a slight touch of caramel malt apparent, but don't assume that means it is a sweet character. We're talking about caramel flavor, independent of the caramel sweetness. This might come across to some as a rich toasty note instead. In either case, a background note is all it takes. Overall, this is an easy-drinking, everyday beer, and it is important to brew Belgian pale ale with that in mind. Many poor examples of this style have too bold a spicy character and way too sweet a finish. It is not uncommon for new brewers to mistakenly turn this into a big, alcoholic, very phenolic beer.

If there is a key to brewing this style,

Photo Courtesy of De Koninck

RECIPE

Antwerp Afternoon
(5 gallons/19 L, all-grain)

OG = 1.052 (12.8 °P)
FG = 1.012 (3.1 °P)
IBU = 27 SRM = 8 ABV = 5.3%

Ingredients

10.0 lb. (4.54 kg) Durst Pilsner or similar Belgian Pilsner malt (~1.6 °L)
10.0 oz. (284 g) Dingemans CaraMunich malt (~60 °L)
4.0 oz. (113 g) Dingemans Biscuit malt (25 °L)
5.5 AAU Kent Golding pellet hops (1.1 oz./31 g) 5% alpha acid (60 min.)
1.25 AAU Kent Golding pellet hops (0.25 oz./7 g) 5% alpha acid (0 min.)
White Labs WLP515 (Antwerp Ale) or Wyeast 3655 (Belgian Schelde) yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 152 °F (67 °C). Hold the mash at 152 °F (67 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting the wort until the pre-boil kettle volume is around 6.5 gallons (24.4 L) and the gravity is 1.040 (10.1 °P).

The total wort boil time is 90 minutes, which helps reduce the SMM present in the lightly kilned pilsner malt and results in less DMS in the finished beer. Add the bittering hops with 60 minutes

continued from page 19

remaining in the boil. Add Irish moss or other kettle finings with 15 minutes left in the boil and add the last hop addition just before shutting off the burner. Chill the wort rapidly to 66 °F (19 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

Ferment around 66 °F (19 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but don't rush it. The cooler than average ale fermentation temperature can extend the time it takes for the beer to attenuate fully. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.5 volumes.

Antwerp Afternoon, Extract

(5 gallons/19 L, extract plus grains)

OG = 1.053 (13.1 °P)
FG = 1.013 (3.2 °P)
IBU = 27 SRM = 8 ABV = 5.3%

Ingredients

7.0 lb. (3.17 kg) Pilsner liquid malt extract (2.3 °L)
10.0 oz. (284 g) Dingemans CaraMunich malt (~60 °L)
4.0 oz. (113 g) Dingemans Biscuit malt (25 °L)
5.5 AAU Kent Golding pellet hops (1.1 oz./31 g) 5% alpha acid (60 min.)
1.25 AAU Kent Golding pellet hops (0.25 oz./7 g) 5% alpha acid (0 min.)
White Labs WLP515 (Antwerp Ale) or Wyeast 3655 (Belgian Schelde) yeast

Step by Step

Mill or coarsely crack the specialty malts. Mix them well and place loosely in a grain bag. Steep the bag in ½ gallon (~2 liters) of 170 °F (77 °C) water for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle for a few minutes while you add the malt extract. Do not squeeze the bags. Add enough water to the steeping liquor and malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.045 (11.2 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

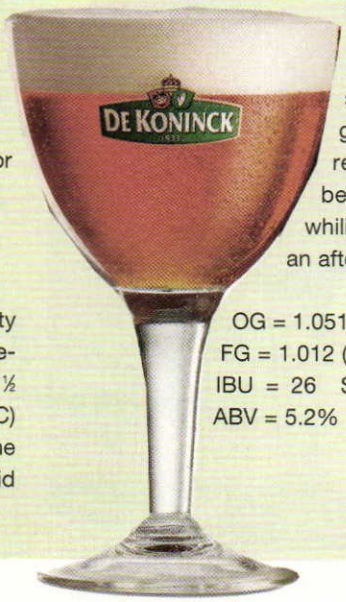
Once the wort is boiling, add the bittering hops. The total wort boil time is 1 hour after adding the bittering hops. Add the Irish moss or other kettle finings with 15 minutes left in the boil and add the last hop addition just before shutting off the burner. Chill the wort rapidly to 66 °F (19 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

Ferment around 66 °F (19 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but don't rush it. The cooler than average ale fermentation temperature can extend the time it takes for the beer to attenuate fully. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.5 volumes.

Hopping Through Antwerp

(5 gallons/19 L, all-grain)

The bold late hopping might push this beer out of style, but it is still a great, refreshing beer for whiling away an afternoon.



OG = 1.051 (12.7 °P)
FG = 1.012 (3.0 °P)
IBU = 26 SRM = 7
ABV = 5.2%

Ingredients

9.5 lb. (4.31 kg) Durst Pilsner or similar Belgian Pilsner Malt (~1.6 °L)
1.0 lb. (0.45 kg) Dingemans CaraVienne malt (~20 °L)
4.0 oz. (113 g) Dingemans Biscuit malt (~25 °L)
1.35 oz. (38 g) Saaz pellet hops, 4% alpha acid (60 min.)
1.0 oz. (28 g) Saaz pellet hops, 4% alpha acid (0 min.)
White Labs WLP515 (Antwerp Ale) or Wyeast 3655 (Belgian Schelde) yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 152 °F (67 °C). Hold the mash at 152 °F (67 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.4 L) and the gravity is 1.040 (9.9 °P).

Follow the boil, fermentation and packaging instructions from the Antwerp Afternoon all-grain version.

hop substitutions

Possible substitutions for Kent Golding hops include US Goldings and UK Progress.

Possible substitutions for Saaz hops include Sterling, US Saaz and Polish Lublin.

it is balance and restraint. This goes for ingredients and especially for fermentation character. While there are esters and phenols from fermentation, it is much more restrained than most Belgian-style beers. It can be tricky to get all of the factors aligned for an ideal result. De Koninck is reported to go through fermentation at 77 to 80 °F (25 to 27 °C), but the times I've tried fermenting that warm, it resulted in hotter alcohols and more fruitiness than I prefer. So, for my process I use a reduced fermentation temperature around 66 to 68 °F (19 to 20 °C) which seems to better mimic the profile of De Koninck and other examples. There are many factors that work in concert with fermentation temperature to create esters and phenols in a beer, such as yeast strain, yeast health, oxygen levels, wort composition, and fermenter geometry. You may find a higher or lower temperature gives you the ideal result, so don't be afraid to tweak the parameters until you get it right.

One would think that the perfect base grain for Belgian pale ale would be Belgian pale ale malt. This is two-row malt, kilned similar to British pale ale malt. However, the most often used base malt for this style is continental Pilsner malt. Pilsner malt lends a slightly sweet, grainy malt character to the beer, different from Belgian pale ale malt. If you can source it, Belgian Pilsner malt is ideal. If you can't, don't worry, even the Belgian brewers use other continental Pilsner malts. If you're an extract brewer, try to use an extract made from Pilsner malt.

A splash of caramel malt adds color and hints of caramel flavor. Don't add so much that the beer has a bold caramel flavor or the balance becomes sweet. I've used everything from CaraVienne (~20 °L) to CaraMunich (~40, 50 and 60 °L) with good results. I would not recommend using something lighter than 20 °L nor anything darker than 60 °L. The caramel character should be like caramel, not raisin or sweet candy. Too dark or too light a caramel malt will result in a different character for the beer; 4 to 10% caramel malt in the 20 to 60 °L range is about right.

One thing I love about some commercial examples of Belgian pale ale is the upfront grainy/bready malt character and to mimic it I like to add 1 to 3% of a spe-

Is it beer or a glass?

Sit down in nearly any pub in the city of Antwerp and order a bolleke and you'll get a bowl-shaped, stemmed glass of original De Koninck ale (5% ABV). The De Koninck brewery was established in 1833 by Joseph Henricus De Koninck, and is the only brewery in the city of Antwerp, Belgium.

Wim Van der Steen, public relations officer with De Koninck said in a recent interview with *Flanders Today* magazine that the bolleke has a conical shape, which allows you to "enjoy beer the easy way." Similar to the type of glasses used for serving Trappist or abbey beers, the bolleke glass is synonymous with the original De Koninck ale.

cialty grain, such as biscuit, aromatic, or Munich. You can experiment with other character grains, but remember this beer is all about balance and drinkability, so don't overwhelm the base flavors with specialty malts. A little goes a long way.

Belgian pale ale has a medium to medium-light body. For all-grain brewers, a mash temperature around 152 °F (67 °C) strikes a nice balance between fermentable and non-fermentable sugars. For extract brewers, most light colored extracts will get you fairly close. If not, you can make your extract-based wort more fermentable by replacing a portion of your extract with table or corn sugar. To build body in an extract-based beer, you can steep a specialty malt such as CaraPils to increase the non-fermentable sugars in the wort.

Bittering is also moderate, balancing any residual sweetness. Target a bitterness-to-starting gravity ratio (IBU divided by OG) between 0.4 and 0.6. The bulk of the hopping should be as a bittering addition at 60 minutes. Like the other aspects

"You can experiment with other grains, but remember this beer is all about balance and drinkability, so don't overwhelm the base flavors with specialty malts."

of this style, hop character is restrained. Because hop flavor and aroma is not much more than a background note, you can use almost any floral or spicy hop, such as Saaz, Kent Goldings, Hallertau, Tettnang, Mount Hood or Liberty. De Koninck uses Saaz hops, but again the overall result is very subtle, especially in the bottled product. While not to style or traditional, I think this is a style that can support more hop flavor and aroma than is common in commercial examples. It isn't to style, but in the past I've enjoyed this beer with an ounce or more of hops at flame out. Don't use citrusy or catty American-type hops, as they seem to clash with, rather than accentuate, the phenols and ester from fermentation. Stick with the floral or spicy varieties if you decide to experiment with bold hop character.

Two great yeasts for brewing this style are Wyeast 3655 Belgian Schelde or White Labs WLP515 Antwerp Ale. You can't go wrong with either product. If you can't get either of those yeasts, you might try Wyeast 3522 Belgian Ardennes or White Labs 550 Belgian Ale. When selecting yeast, try to pick one that produces minimal or no spicy phenols and moderate fruity esters. Whatever yeast you use, remember to work with it to keep the esters in check. You might change the pitch rate up or down and try fermentation temperatures on the cooler end of the yeasts' range. If you want to use dry yeast, your best choice is probably Fermentis Safbrew T-58.

Jamil Zainasheff writes "Style Profile" in every issue of Brew Your Own.

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melomel

by **Curt Stock**

YOU'VE LIKELY SEEN THE " . . . FOR DUMMIES" SERIES OF BOOKS. THESE SELF-HELP BOOKS ORIGINATED TO GUIDE NOVICE COMPUTER USERS THROUGH VARIOUS COMPUTER PROGRAMS AND PROGRAMMING LANGUAGES, BUT HAVE NOW EXPANDED TO COVER EVERYTHING FROM ART TO ZOOLOGY. IN THIS ARTICLE, I'LL EXPLAIN TO "EXPERIENCED DUMMIES" — THOSE HOME-BREWERS WHO ARE ALREADY FAMILIAR WITH MEADMAKING — HOW TO MAKE MELOMELS, OR FRUIT MEADS, USING A COUPLE TECHNIQUES OR VARIATIONS THAT MAY BE NEW TO SOME.

BELOW IS WHAT I BELIEVE TO BE THE MOST IMPORTANT THINGS TO REMEMBER WHEN MAKING MELOMELS:

1. THE PERSON YOU NEED TO MAKE HAPPY IS YOURSELF.

2. THERE ARE MANY DIFFERENT WAYS TO MAKE WONDERFUL MEAD — NO ONE INDIVIDUAL HAS ALL OF THE RIGHT ANSWERS OR TECHNIQUES.

3. BE CREATIVE — IF IT SOUNDS GOOD TO YOU, GIVE IT A TRY!

4. LISTEN TO PEOPLE WITH EXPERIENCE AND LEARN AS MUCH AS YOU CAN, THEN APPLY THE KNOWLEDGE YOU FIND VALUABLE TO YOUR MEADMAKING PROCESS.

5. MAKING BAD MEAD IS EASY — MAKING GREAT MEAD IS JUST AS EASY.

6. THE BEST WAY TO IMPROVE YOUR MEADMAKING IS PRACTICE

Fruit Meads for Experienced Dummies

recipes

Strawbana Cabana Mead (Strawberry Banana Melomel)

(5 gallons/19 L)

OG = 1.155 FG = 1.025–1.035
Est. ABV = 16.0%

Ingredients

22 lbs. (10 kg) wildflower honey
18 lbs. (8.2 kg) frozen strawberries
4.0 lbs. (1.8 kg) ripe bananas (about 8 bananas)
3.0 gallons (11 L) water
3 tsp. yeast energizer/nutrient blend (Fermaid-K and DAP)
10 g Lalvin Narbonne yeast (71B-1122)

Step by Step

Combine honey, water and strawberries and ferment at 65–70 °F (18–21 °C), following instructions in main article for nutrient additions and cap management. Fermentation will last two to four weeks. Once complete, rack to secondary fermenter. Now it's time to add the bananas. Purchase about 4.0 lbs. (1.8 kg) of ripe bananas. Trim off the stems that look moldy. Rinse the unpeeled bananas to remove molds and bacteria. Place a funnel in the carboy, peel and place the bananas in the funnel. Use a racking cane or other device to mash the bananas into the carboy. This should break the fruit up enough to extract the flavors and aromas.

In three to four weeks, rack mead to another carboy for aging and clarification. This mead is best at a final specific gravity between 1.025 and 1.035.

Triple Berry Mead (Triple Berry Melomel)

(5 gallons/19 L)

OG = 1.151 FG = 1.035–1.035
Est. ABV = 16.1%

Ingredients

20 lbs. (9.1 kg) wildflower honey
15 lbs. (6.8 kg) triple berry mix (blackberries, raspberries and blueberries)
3.0 gallons (11 L) water
3 tsp yeast energizer/nutrient blend (Fermaid-K and DAP)
10 g Lalvin Narbonne yeast (71B-1122)

Step by Step

Combine honey, water and fruit. Adjust pH to 4 and add rehydrated yeast. Ferment at 65–70 °F (18–21 °C). Punch cap down three or more times a day during primary fermentation. Add nutrients in four staggered additions. Rack to secondary and sweeten, if desired.

Super Berry Melomel (Multi-Berry Melomel)

(5 gallons/19 L)

OG = 1.158 FG = 1.030–1.040
Est. ABV = 15.8%

Ingredients

21 lbs. (9.5 kg) wildflower honey
12 lbs. (5.4 kg) triple berry mix (blackberries, raspberries and blueberries)
6.0 lbs. (2.7 kg) strawberries
96 oz. (2.8 L) black currant juice (free of preservatives)
2.3 gallons (8.7 L) water
3 tsp yeast energizer/nutrient blend (Fermaid-K and DAP)
10 g Lalvin Narbonne yeast (71B-1122)

Step by Step

Combine the honey, water and fruit i. Add yeast and ferment at 65–70 °F (18–21 °C). Punch cap down three or more times a day during primary fermentation. Add nutrients in four staggered additions. Rack to the secondary and sweeten, if desired.

Some varieties of melomel have specific names. For example, cyser is a mead made with apple cider. Pyment is mead with grape juice. In this article, I will focus on meads made from other fruits.

The Fruit

Type Choosing a fruit for your melomel is as simple as deciding what type of fruit you like. If you enjoy eating a particular variety of fruit, it will likely yield pleasant mead. My favorites include berries of any kind, including strawberries, raspberries, blackberries, blueberries and currants. Stone fruits such as cherries, plums, peaches and apricots also produce great mead. I've also tasted some great meads made with melons.

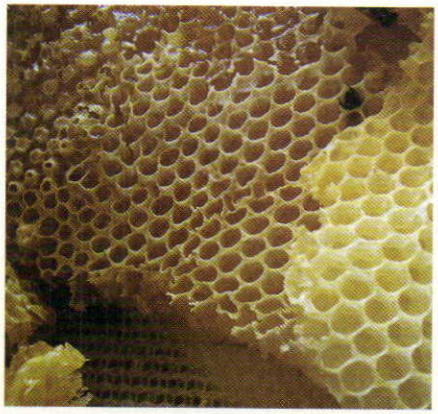
Basically, any fruit you have access to can be used in a melomel. Any combination of fruit that is pleasing to your palate will also do fine in a mead. Use your taste buds and your imagination and you will not be disappointed.

Amount The amount of fruit used can be varied depending on preference, sweetness level and type of fruit. I like sweeter meads, which allow the use of a lot of fruit. When using berries or stone fruits, I use a minimum of three pounds of fruit per gallon of mead (0.36 kg/L) — usually, more like 3.5 to 4 pounds (0.42–0.48 kg/L). The sweetness balances the acid content of the fruit and helps to bring out the actual fruit character in the finished mead. If you prefer a drier mead, I suggest reducing the fruit to 1 to 1.5 pounds per gallon (0.12–0.18 kg/L), as well as keeping the alcohol content below 10% alcohol by volume (ABV). This will reduce the harshness of the finished melomel.

Preparation Care should be taken when selecting and preparing fruit. If you are hand picking or buying from a local market, make sure to discard any poor quality or moldy fruit. If you wouldn't eat it, you shouldn't use it in your mead. Remove all stems and leafy material. Clean the fruit, then freeze it to help breakdown the cell walls. Stone fruits, with the exception of cherries, should be pitted and frozen. (Cherry pits lend a very nice character to melomels if removed within 4 weeks.) When using fruit in the primary fermentation, there is no need to puree it. Fermentation and other processes will sufficiently break up the fruit. Mash the bags of fruit with your hands just before you add it to the fermenter.

I have often used bags of frozen fruit from discount stores and supermarkets. Fruit from these sources works very well, and the fruit is already clean. Using pureed canned fruit will provide acceptable results, but be prepared for significant waste. Pureed fruit will settle to the bottom of the fermenter in a 2 to 4 inch (5.1–10 cm) layer that is virtually unrecoverable.

Fruit concentrates are a nice solution when whole fruit is not available. The resulting mead will likely be good, but lacking in real fruit character. A combination of concentrate and a few pounds of whole fruit will improve the quality. When using fruit concentrates, check the labels



Mead can be fermented, then later combined with fruit. However, adding fruit in the primary fermenter supplies the yeast with needed nutrients and helps manage the pH of the must.

"My favorite honey for melomels is high quality late summer or fall wildflower honey."

to make sure they do not contain preservatives that will inhibit the fermentation of your mead.

Fermentation There are two schools of thought — and plenty of debate — on when to add fruit to your mead. Many people believe that, to preserve the fruit character and aroma, fruit should be added to the secondary fermentation. This method works well, but can have a couple of drawbacks. The fruit will have to steep in the secondary fermenter for many weeks or months to extract all the goodness the fruit has to offer. In addition, considerable aging will be needed to have the fruit and honey meld together into a great beverage. Renewed fermentation could also result from the sugar in the fruit. If primary fermentation was completed in part by the alcohol content reaching the yeast's tolerance level, fruit added to the secondary will dilute the alcohol content (fruit is typically 70% water) allowing the yeast to reactivate.

After my first few batches, I started adding fruit in the primary fermentation (the "FPF" method). There are many benefits to this technique. Fruit will provide many of the nutrients needed by the yeast during fermentation and help to regulate the pH of the fermenting mead must. ("Must" refers to unfermented mead or wine.) Meads with fruit added to the primary will typically take much less time than traditional mead fermentations. (I've won awards for meads that were six weeks out of the primary with this method.) Fermentation of mead with an original specific gravity up to 1.145 should be complete in three to four weeks in most cases.

Adding the fruit to the primary fermenter will extract fruit character during fermentation, without expelling the aroma compounds. Only the most volatile aroma compounds will be lost, and these most volatile aroma compounds are usually lost during multiple rackings and aging. The fruit and honey components will be fully integrated after a month or two in secondary. If a fresh fruit character is desired, try adding a pound per gallon (0.12 kg/L) of fruit to the secondary, which adds another level of fruit character to your melomel.

The Honey

Honey choice in a big melomel is not that crucial. Varietal honey character will be overshadowed in most melomels by the strong fruit character. A couple common exceptions to this could be orange blossom or tupelo honey. With less assertive fruits (stone fruits in particular), these honeys can add a great complexity to the finished mead.

My favorite honey for melomels is high quality late summer or fall wildflower honey. Late season wildflower has more complexity and spicy character than early season wildflower. Early season nectar sources in my area of the country produce honey that is not as desirable for mead. Dandelion and basswood blossoms from northern climates produce honey that can be fairly harsh when fermented.

The Water, Nutrients, Yeast and Yeast Health

To make good mead, you need a good source of water. Using spring water or other water that is free of chlorine and bacteria is essential. Carbon-filtered, preboiled tap water will work fine, but if you have hard water, consider using bottled spring water.

A real advance in mead-making in recent years is called staggered nutrient additions — or SNA. Instead of adding all the nutrients at once, the same amount is staggered over several days. Staggered nutrient additions promote yeast health and help assure a fast, clean and healthy fermentation. One thing I like about using SNAs is that you can drink the mead sooner, because it doesn't require as much aging, depending on yeast choice.

Staggered nutrient additions were developed by the commercial wine industry as a way of supplying nutrients as the yeast needs it during the growth phase — a just-in-time delivery. Healthy yeast are essential for a clean fermentation with less chance of off-flavors or the production of higher alcohols (fusels) which can give mead a burning sensation on the back of the throat — the "rocket fuel" sensation.

I prefer to use Fermaid-K (yeast energizer) and diammonium phosphate (DAP) for adding the additional nutrient requirements of the yeast during fermentation. One teaspoon of Fermaid-K and two teaspoons DAP should be adequate for a 5-gallon (19-L) batch. You can mix them together for a stock blend and add them using the following schedule:

Add ¼ teaspoon yeast energizer or nutrient mix immediately after pitching yeast. Next, add ¼ teaspoon yeast energizer or nutrient mix 24 hours after fermentation begins. Then, add ¼ teaspoon yeast energizer or nutrient mix 48 hours after fermentation begins. And finally, add ¼ teaspoon yeast energizer/nutrient mix after 30% of the sugar has been depleted.

If your homebrew supply shop has a winemaking section, the Fermaid-K, DAP and yeasts described here (and in the recipes) will likely be found there.

Anyone who has ever stirred a fermenting beverage knows the foaming, triggered by the release of carbon dioxide (CO_2), can make one heck of a mess. To help minimize this, you should mix the

nutrient blend into ½ cup of must and add it back to the fermenter. Then begin to slowly stir the must to release the main portion of the CO_2 gas. After the foaming has subsided, you can begin to stir more vigorously. Mix the must well enough to introduce plenty of oxygen into the fermenting must. Oxygen is needed by the yeast throughout the growth phase. Oxidation is not a huge concern until you get past 50 percent sugar depletion.

Staggered nutrient additions aid yeast health in a variety of ways. Abundant CO_2 is toxic to yeast, so mixing while adding the nutrients will release the gas. Vigorous mixing also introduces oxygen, which is needed by growing yeast.

The mixing that accompanies nutrient addition also disturbs the fruit cap. (The cap is the layer of floating fruit solids on top of the fermenting must.) Punching down the cap should be done at least three times a day during the period of vigorous fermentation.

Cap management is important for many reasons, especially, for releasing toxic CO_2 and preventing temperature buildup below the cap. For every 1 degree reduction of Brix in the must, there is approximately a 2 °F (~1 °C) increase in temperature. (Brix is the measure of sugar content used by most winemakers; one degree Brix is approximately equal to 4 "specific gravity points.") Unmanaged, the temperature can increase to the point of killing your yeast in the heat zone below the cap, potentially driving off the floral fruity character of your fruit. This is less of a concern in the 5-gallon (19-L) homebrew scenario, but could still be a potential problem. If the cap is not pressed down into the must, it can dry out. Then, if oxygen is introduced, spoilage organisms can grow and produce off flavors.

The pH of the mead must is important for healthy fermentation. The pH of the must will drop during fermentation. Yeast can adapt to the lower pH environment to a point, but an extreme drop in pH could result in a stuck fermentation. Some fruit contains enough potassium to buffer the pH and keep it in an acceptable range. But it is good to adjust the pH of the must to 4.0 prior to starting fermentation.

Potassium carbonate works well for adjusting pH and provides potassium, which aids in keeping your yeast healthy. But be careful. Using too much carbonate will reduce the total acidity of the must and cause acid balance issues in the final mead. Excess carbonate can also impart a metallic or soapy note in the flavor. I wouldn't use more than 5 grams of potassium carbonate per 5 gallons (19 L) when adjusting pH of the must. For measuring the pH of the must, use a good quality calibrated pH meter instead of pH test paper.

Seem like a lot of messing around? Remember rule number 5 from the beginning of the article — you only get out of it what you are willing to put into it! You need to keep these little sugar-eating alcohol-excreting beasties healthy and happy because they are doing all the work. There are billions of them; you don't want them pissed off!

The Equipment

A large wine fermentation pail (7.9 gallon/30 L) works well for melomels due to the extra head space. Extra space is needed for the fruit cap, stirring and degassing. A hydrometer or refractometer should be used for original gravity (OG) and determining the sugar depletion for the final SNA. (Note that bigger meads can have an OG that exceeds the upper limit of most wine refractometers.) A 5-gallon (19-L) glass carboy for secondary fermentation and aging works best. A wine-degasser — a folding propeller on a stick — is a handy tool to use with an electric drill.

The Process

Submerse the honey containers in hot water to loosen the honey, which will make it easier to dissolve. Partially or totally thaw the fruit. This should be obvious, but needs to be stated: sanitize all equipment used for making your mead. Mash the bagged fruit with your hands. If you prefer, put all the fruit into the pail and mash with a potato masher or similar tool. If using fruit with thick skins (currants, cranberries, etc.) break as many of the berries as possible to release the juices.

Use enough honey and water to get a total volume of 4.5 to 5 gallons (17–19 L), excluding fruit. Honey weighs approximately 12 pounds per gallon (1.4 kg/L). Put all the fruit into the 7.9-gallon (30-L) fermenting pail. You will want the temperature of the mead must to be 65 to 70 °F (18–21 °C). If the fruit is still very cold, you should heat the water enough to bring the temperature of the must into that range. Add the honey and water to the pail. Use a drill-mounted wine degasser to mix the must and completely dissolve the honey.

After the honey is dissolved, stir vigorously for a few minutes to aerate the must. I do not heat the must to pasteurize the honey or fruit. I've made at least 50 batches of mead with the no-heat method and have not experienced a contamination problem.

Prepare your yeast by re-hydrating, following the instructions on the packets. The use of a re-hydration nutrient such as Go-Ferm is highly recommended. This will prepare the yeast for the strenuous journey ahead of them. Pitch the yeast, add the first nutrient addition and mix well. Fermentation should begin in about 12 to

24 hours. When signs of fermentation are noticed, start managing the fruit cap and begin the SNA schedule. With some luck, fermentation will be complete in two to four weeks. Once half of the sugar is depleted, continue to punch the cap at least twice a day, but refrain from introducing oxygen into the must. Allow the mead to stay in primary for 4 weeks. At that point, transfer to the secondary carboy for clarifying. Taste the mead for sweetness level. If you desire more sweetness, now is the time to adjust it.

To sweeten mead, start with a cup of the mead and add honey to a level sweeter than you want. Then blend the dry mead with the sweetened sample to get three samples that vary by 10 gravity points ranging from too sweet to not sweet enough. Taste and blend the samples until you get the level of sweetness you want. Get some help with this as your palate may get fatigued. In my opinion, women have better palates for tasting mead than men. So, I rely on my wife, Kathy, for help.

Take a gravity reading of the sample you chose. Determine the specific gravity difference between the mead and the sample. Now you can figure out how much honey you will need to sweeten the entire batch to the desired level. One pound (0.45 kg) of honey will raise one gallon (3.8 L) of mead approximately 34 gravity points. If you have 5 gallons (19 L) of mead, each pound (0.45 kg) of honey will raise the batch about 6 to 7 points.

Once you determine how much honey you need to add to the batch, use 1 cup of boiled water per pound (0.45 kg) of honey to dilute the honey. Pour the mixture into the carboy and mix until evenly dispersed. Take a sample and see if further adjustment is needed. Take caution to keep from over-sweetening the batch. It's much harder to make it drier! Given the high alcohol and low pH of finished mead, and the fact that it has been racked off the lees (yeast and other sediment), adding honey should not restart fermentation.

After a month or two, if the mead is not clear, transfer again and use a two-stage clarifier such as Super-Kleer. You can also use relatively inexpensive plastic filters with filter pads, pumping the mead from one keg, through the filter to a second keg. You will be amazed by the amount of fruit debris and insect parts on the filter pads, but your mead should be sparkling clear.

One word of caution when filtering, pectin will clog a filter very quickly. You can use pectic enzyme to help remove the pectin. Two stage clarifiers do not remove pectin. Once you are completely sure there is no fermentation and the mead is clear, you can bottle. For sparkling mead, I suggest kegging and force carbonating. Bottle-conditioning sweet mead can be difficult, and there is a potential for exploding bottles.

That's what I know, I hope it helps. Good luck!

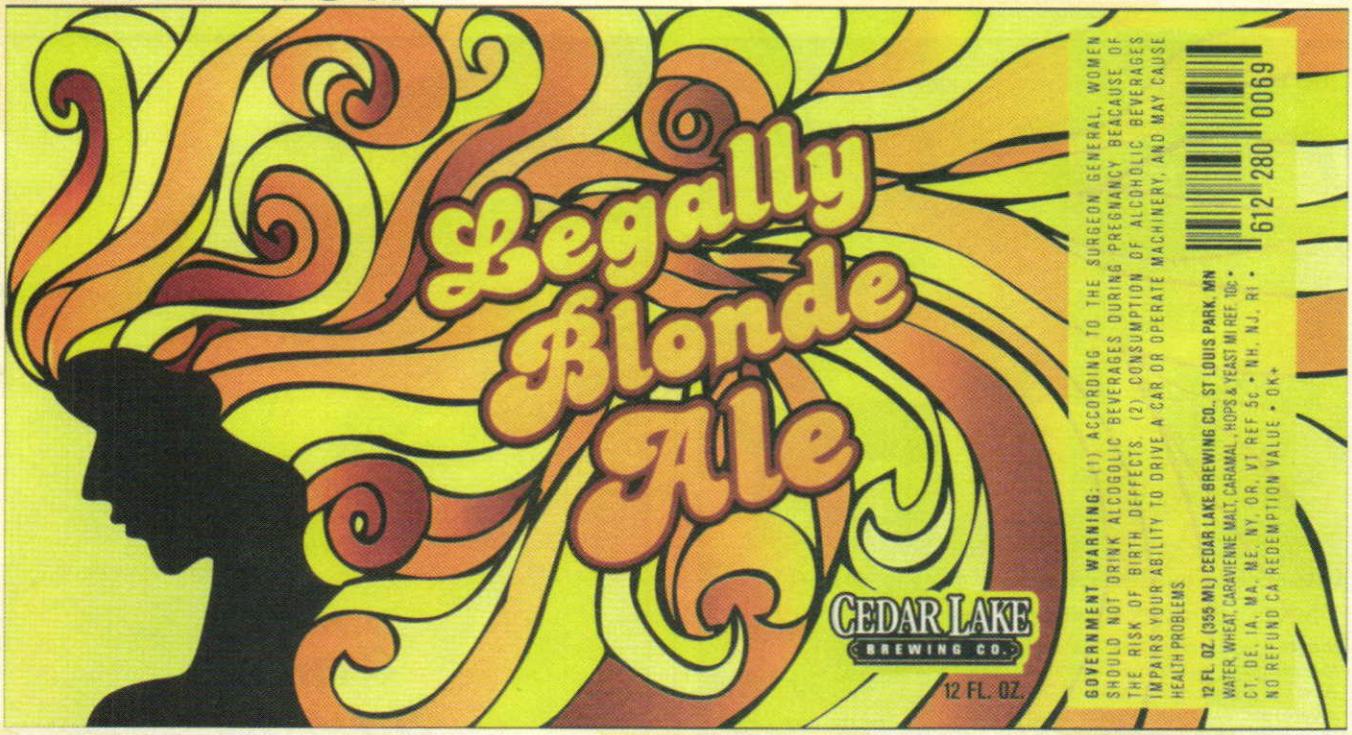
Curt Stock and his wife Kathy were the 2005 AHA NHC *meadmakers of the year.*

2008 label winners CONTEST

GRAND CHAMPION

We love beer labels, we really do. Because we know that a plain old bottle can never express the greatness of the homebrew it contains. Sure, you know what's inside, but a good label tells the world that your beer deserves respect. And if that's true, judging by the many hundreds of entries we received this year for our annual label contest, there's quite a few good homebrews out there (and hey, if they're actually not tasty at least they look good!).

This year's competition was another tough one, especially with so many great entries to judge. We examined. We pondered. We agonized. And finally we came to a few agreements: being blonde is grand (if you're a beer), being lucky is golden, being cranky is actually good (silver medal good) and being nimble is bronze-worthy. Ladies and gentlemen, raise your pint glasses to the winner's of *Brew Your Own*'s 2008 Annual Label Contest. Congratulations to the winners, and thank you to everyone who entered!



Eric Lichtenberg • St. Louis Park, Minnesota

The inspiration for this label didn't come from the Reese Witherspoon movie. Instead its, er, roots stem from psychedelic rock. "It came from a 1967 poster of Bob Dylan designed by the famous graphic design studio Pushpin Studios," Eric said. Most of the label was designed on a computer, and the wavy blonde hair was hand drawn, then scanned in and colored. "The beer and label were a huge hit with family and friends."

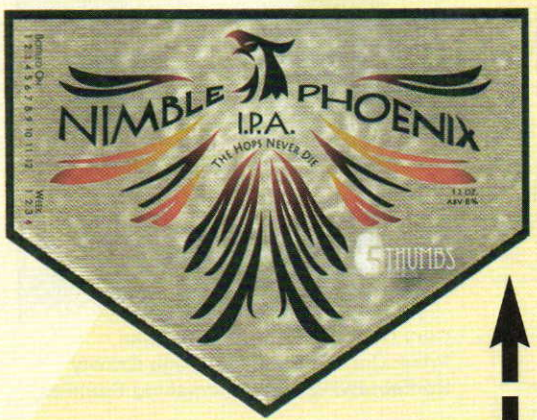
Prizes: Gift certificate from **Midwest Homebrewing & Winemaking Supplies**; 20-quart brew kettle from **Polar Ware Company**; Refractometer from **Homebrew Depot**; Gift certificate from **North Coast Brewing Co.**; Organic beer kit from **BrewOrganic.com**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **MoreBeer!**

GOLD PRIZE

Ryan Lynd • Snoqualmie, Washington
Why glue a label on a bottle when you can etch it? That's what Ryan thought when he borrowed a friend's laser engraver to create the look of his Lucky's 1919 XX Stout. Brewed just in time for a St. Paddy's party, this was Ryan's first all-grain batch, which was based on the original proportions and gravity of Guinness from 1919. "I even added back 3% of pasteurized soured Guinness for authenticity. Man does that stink when you boil it!"

Prizes: Gift certificate from **Midwest Homebrewing & Winemaking Supplies**; Gift certificate from **North Coast Brewing Co.**; Digital pH meter from **Homebrew Depot**; Fleece jacket from **Muntons p.l.c.**; Organic beer kit from **BrewOrganic.com**; Gift certificate from **Valley Vintner & Brewer;** Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **MoreBeer!**

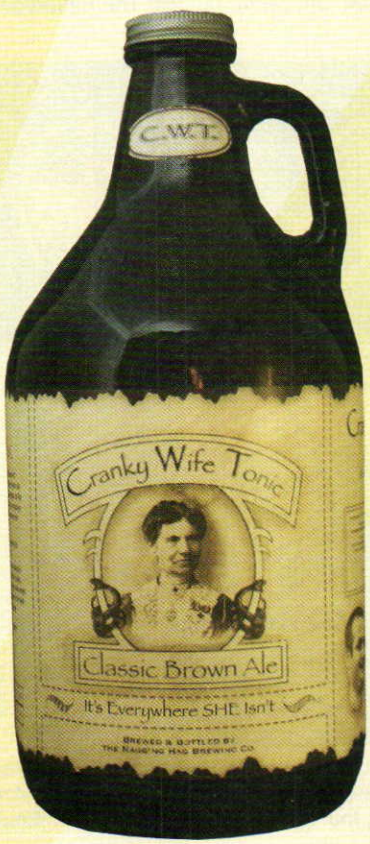
BRONZE PRIZE



Rob Enzweiler • Amelia, Ohio
Inspired by the Phoenix hops Rob used to brew his IPA, this label takes its cues from Greek mythology of a new phoenix rising from the flames of a fire. "With this brew, the pleasant spicy hop flavor lingers on the palate from start to finish. The colors used are reminiscent of the flames and the bird's association to the sun god."

Prizes: 24" Thermometer from **Hobby Beverage Equipment**; Fleece jacket from **Muntons p.l.c.**; 8 oz. of Cascade hops from **Home Brew Shop (Chico, CA)**; Organic beer kit from **BrewOrganic.com**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Party Pig set-up package from **Quoin Industrial**

SILVER PRIZE



Ryan Lockard • Aston, Pennsylvania
A mere photograph can't show the 360° detail of this entry, whose concept Ryan said was, "too big" for a vessel as small as a 12-oz bottle, so he and his brewing buddy stepped it up to a growler. The design is an "homage to the snake oil merchants of the 19th century, and what better style to match to the rustic American theme but an American brown ale?"

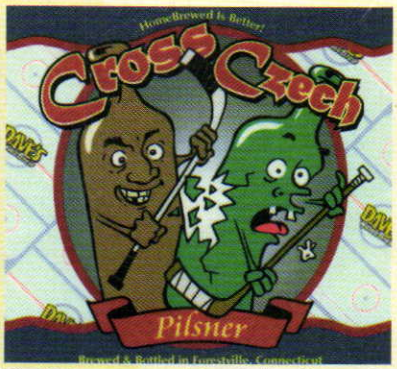
Prizes: Gift certificate from **North Coast Brewing Co.**; 24" Thermometer from **Hobby Beverage Equipment**; Fleece jacket from **Muntons p.l.c.**; 8 oz. of Sterling hops from **Home Brew Shop (Chico, CA)**; Organic beer kit from **BrewOrganic.com**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **MoreBeer!**

label winners CONTEST

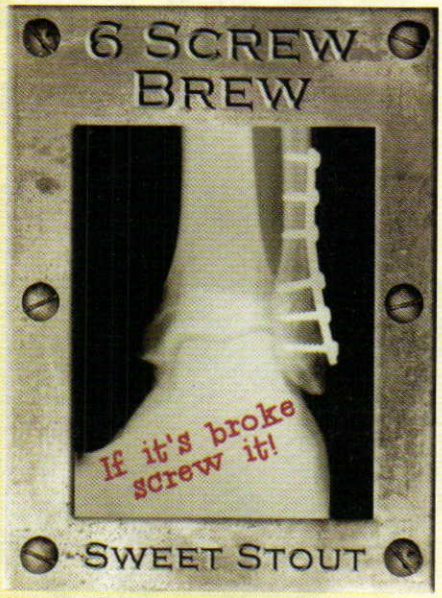
Label Winners Contest

HONORABLE MENTION

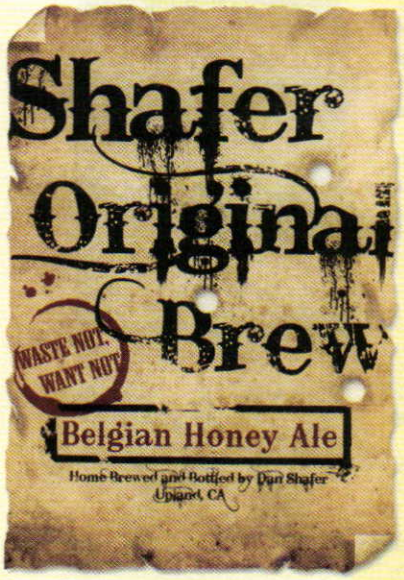
Alan Guidera • Rochester, New York
Prize: Polo shirt from **Otter Creek Brewing**



David Levesque • Forestville, Connecticut
Prizes: Two vouchers to the Vermont Brewers Fest from the **Vermont Brewers Association**; Pint glass from **Magic Hat Brewing Co.**

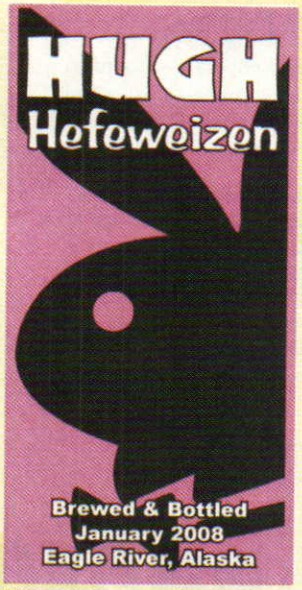


Gary Bentrup • Lincoln, Nebraska
Prize: Gift certificate from **High Gravity Homebrewing and Winemaking Supplies**



Dan Shafer • Upland, California
Prize: Gift certificate from **The Beverage People**

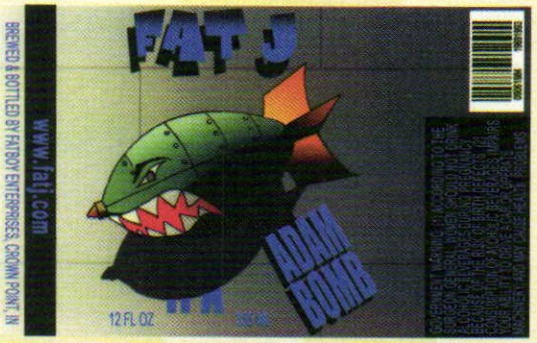
Jeff Adelsberger • Severn, Maryland
Prize: Polo shirt from **Otter Creek Brewing**



Mike Johnson • Eagle River, Alaska
Prize: Hat and T-shirt from **Alaskan Brewing Co.**

Joseph Dauner • Atlanta, Georgia
Prize: Organic beer kit from **BrewOrganic.com**

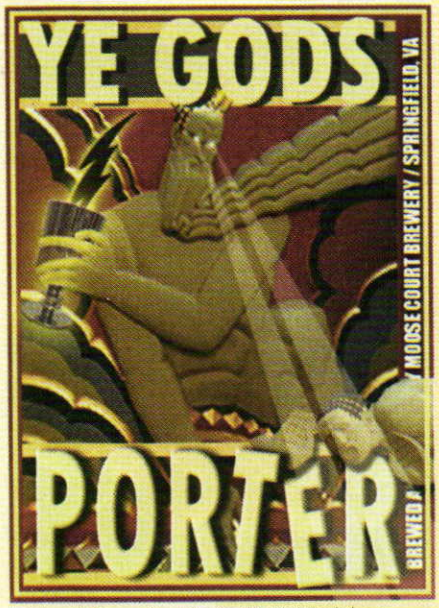
Dominique Javet • Cormagens, Switzerland
Prizes: T-shirt from **Alaskan Brewing Co.**; Stein from **White Labs, Inc.** and **Brew Your Own**



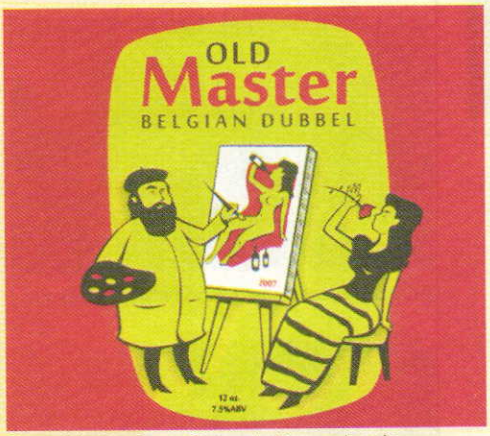
Adam Halon • Crown Point, Indiana
Prizes: BrewMometer from **Blichmann Engineering, LLC**; T-shirt from **Homebrew Depot**

Matt Franck • Fredonia, Wisconsin
Prizes: BrewMometer from **Blichmann Engineering, LLC**; T-shirt from **Homebrew Depot**

Brian Myers • Spring Hill, Tennessee
Prizes: Fleece vest from **Alaskan Brewing Co.**; Gift certificate from **Homebrewers Outpost & Mail Order**



Robert Sherrill • Springfield, Virginia
Prize: T-shirt from **Magic Hat Brewing Co.**

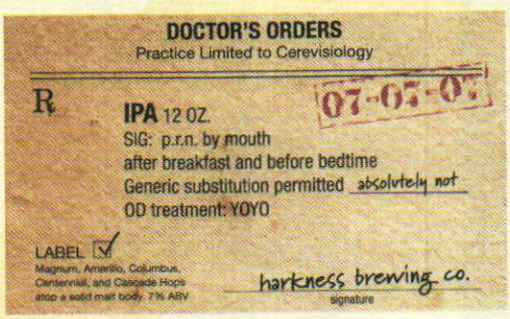


Sean McCauley • Seward, Pennsylvania
Prize: Gift certificate from **Country Wines**

Forest Jones • Portland, Oregon
Prizes: New Zealand hops from **BrewCraftUSA**; Pint glass from **Magic Hat Brewing Co.**

Carolyn Greener • Nampa, Idaho
Prizes: Beach Blonde brewing kit from **O'Shea Brewing Company**; T-shirt from **Homebrew Depot**

Frank Norton • Springfield, Missouri
Prizes: Gift certificate to Pete's Place Restaurant from **Kreb's Brewing Co.**; T-shirt from **Magic Hat Brewing Co.**



Andy Melchers • Cincinnati, Ohio
Prize: Gift certificate from **South Hills Brewing Supply**

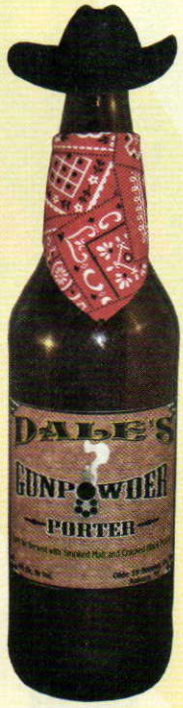
Tom Nelson • De Pere, Wisconsin
Prize: Extract plus grains homebrew kit from **Briess Malt and Ingredients Co.**

HONORABLE MENTION

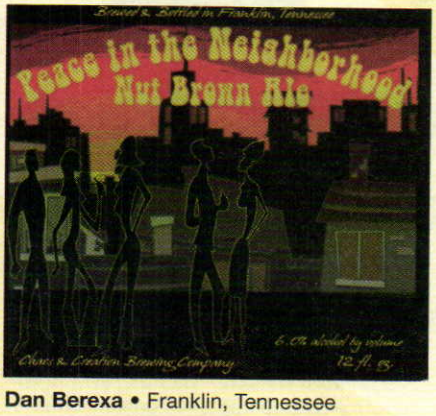
Label Winners Contest

EDITOR'S CHOICE

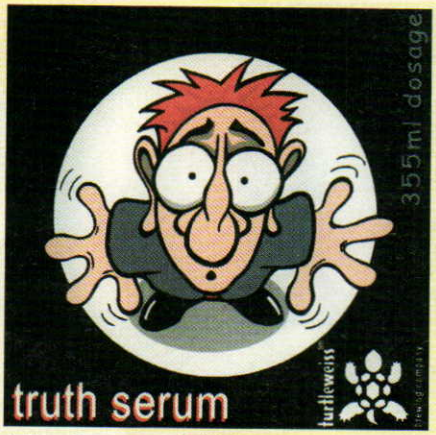
Adam Crockett • West Babylon, New York



Dale Elster • Auburn, New York

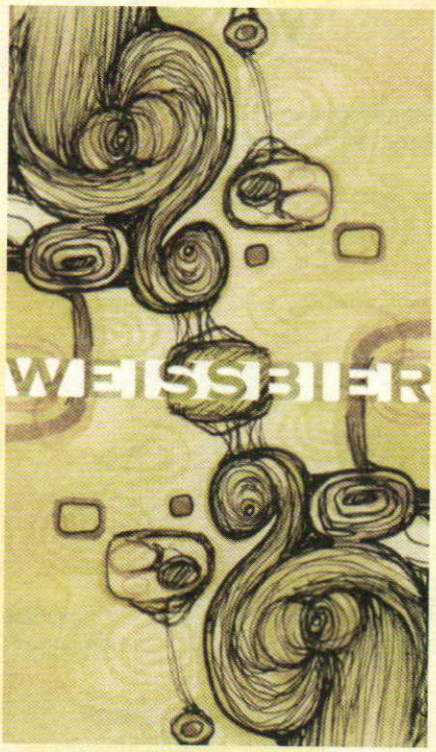


Dan Berexa • Franklin, Tennessee



Adam Draeger • Pella, Iowa

Andrew Altschuler • Knoxville, Tennessee



Benjamin Siegl • Bradenton, Florida

Kirk Oberlander • Lindley, New York

Goeffrey Haas • St. Paul, Minnesota

J.P. Hric • Hastings, Minnesota

Joe Mentele • Shoreling, Washington

John Lynch • Longmont, Colorado

Stephen Singleton • Indianapolis, Indiana

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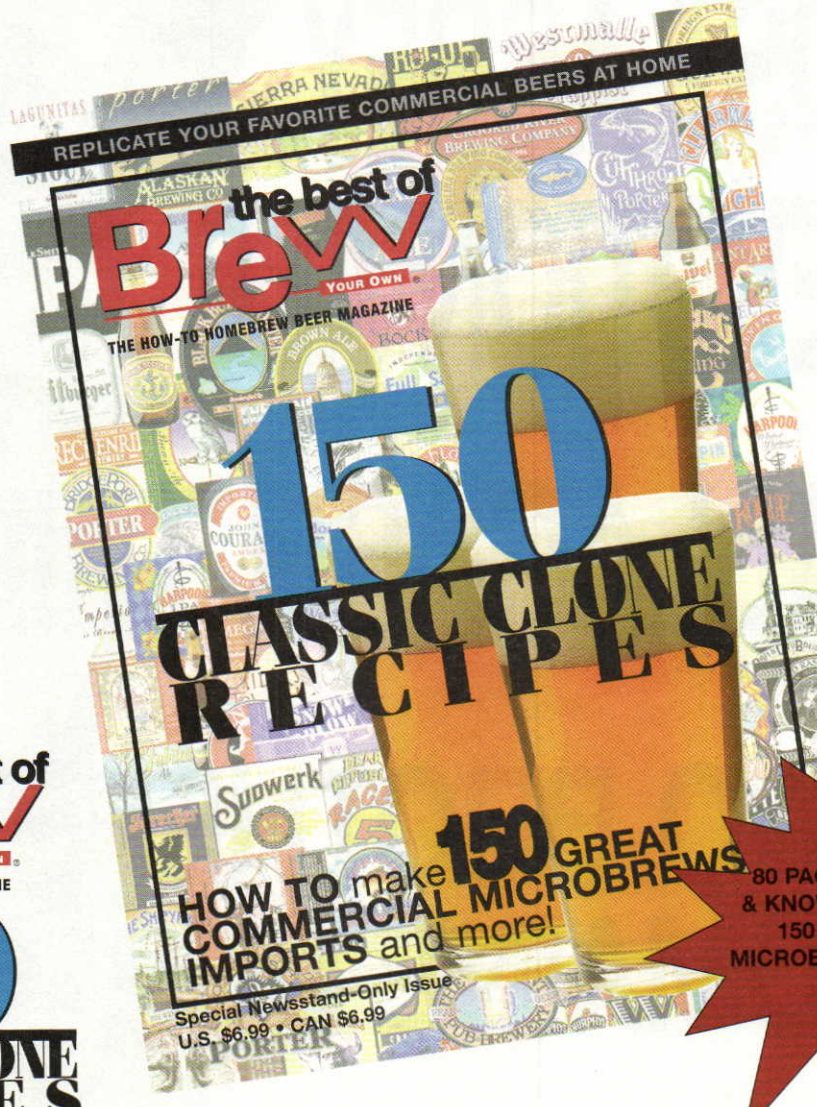

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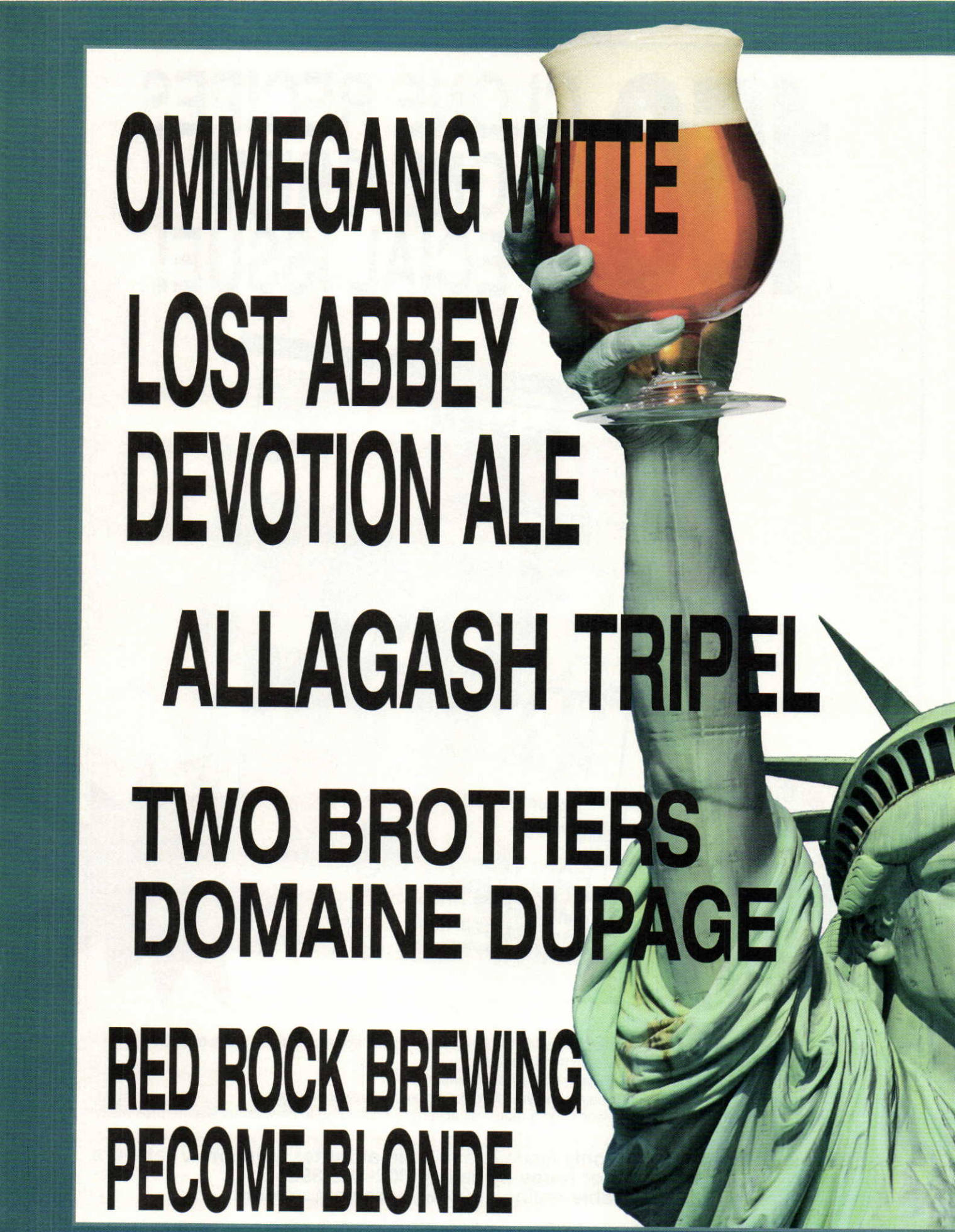

OMMEGANG WITTE
LOST ABBEY
DEVOTION ALE
ALLAGASH TRIPEL
TWO BROTHERS
DOMAINE DUPAGE
RED ROCK BREWING
PECOME BLONDE

Photo by Charles A. Parker/Images Plus

FIVE BELGIAN-INSPIRED CLONES from american brewers

by Glenn BurnSilver

"I think the most essential ingredient to make a high quality Belgian-style ale is a willingness to break from conventionality," says Tomme Arthur, Owner and Director of Brewery Operations at Port Brewing and The Lost Abbey.

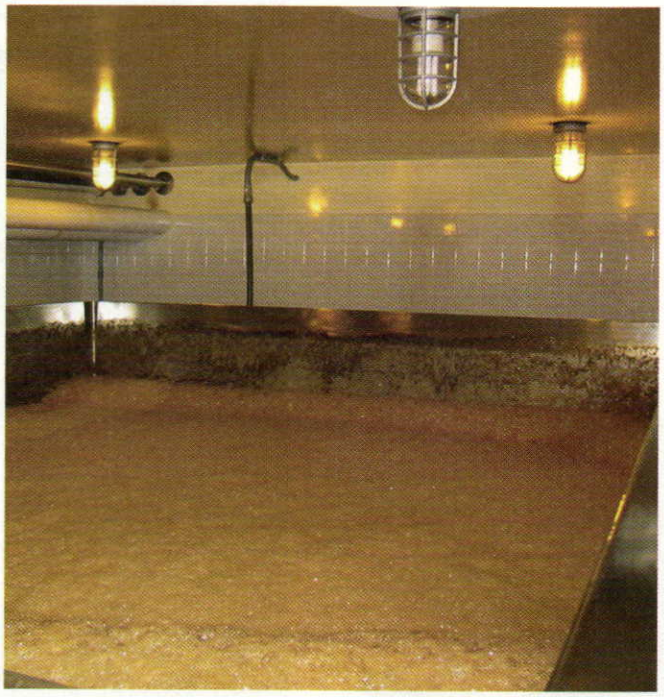
"As a brewing nation, I think Belgium brewers embrace traditions and conventions of brewing that many breweries no longer concern themselves with. As such the depths of flavors in Belgian brewing are quite varied."

Maybe it's that dual personality — the rule-breaking attitude coupled with a refusal to give up the old ways — that feeds the steadily increasing interest in Belgian-inspired beers in North America. Brewers on this side of the pond certainly show both faces in their beers.

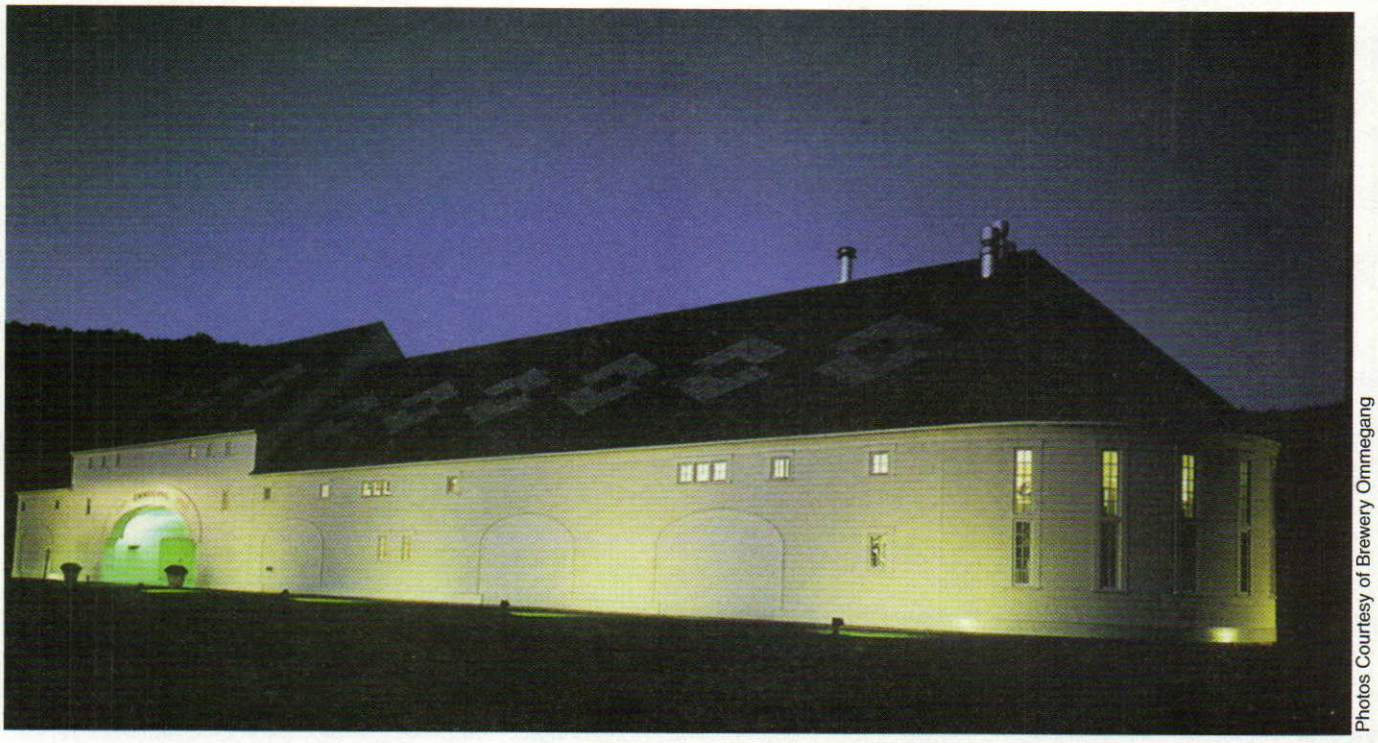
Some North American breweries produce excellent renditions of well-known Belgian styles, such as witbiers or tripels, often using traditional production methods, including open fermentation and/or bottle conditioning. Others take their inspiration from Belgium, but couple it with the innovative spirit of North American brewers to produce unique brews. Sometimes, these beers incorporate experimental methods that were almost unthinkable 20 years ago — for example, fermenting a beer using only *Brettanomyces*. Many do both. (And, if you haven't noticed, inspiration doesn't just flow out of Belgium. Many Belgian breweries are responding to the rise of hoppy beers in America with their own "up-hopped" beers.)

Tripels are a good example of a Belgian style of beer directly emulated by many American breweries. These beers are at once flavorful and bold, yet dry and quaffable.

"Tripels have a rare combination of a significant warming character with true drinkability," explains Allagash Brewing Brewmaster Jason Perkins, who provides his brewery's recipe for their Tripel. "The alcohol warms the throat and belly, while the dry finish leaves the drinker yearning for more."



Right: A beer ferments in an open fermenter at Brewery Ommegang, Cooperstown, New York. **Below:** The brewery exterior. Open fermentation can be performed in your home brewery. For best results, rack wort to a bucket and seal it with a fermentation lock. Once fermentation begins, open the lid and let ferment. Rack to secondary promptly when the kräusen falls.



Photos Courtesy of Brewery Ommegang

Lost Abbey's Devotion Ale would be an example of a Belgian-inspired beer, as opposed to a Belgian-style beer. This light dry ale is given a nice level of hoppiness. (Arthur actually uses a CO_2 extract of hops for his bittering, but says that homebrewers could use Columbus or Warrior hops as a substitute.)

To add to the confusion among actual Belgian beers, Belgian-style beers, Belgian-inspired beers, experimental North American beers that somehow still get labelled "Belgian" and American-influenced Belgian beers, some French beers also get merged into the Belgian "nebula" in the minds of many beer-drinkers. Two Brothers Brewery's Domaine DuPage is a beer inspired by a style traditionally brewed by French farmers.

One thing shared among almost all beers that are somehow "Belgian-y" is a flavorful yeast strain. The first important factor in creating Belgian-inspired beers is yeast. Belgian beer yeast more often than not imparts a spicy flavor profile. Sometimes the spicy character is bold and up front. At other times it is more subtle. But even the "gentlest" Belgian beer will tingle the taste buds. Most Belgian-style yeast work well with higher alcohol beers, and many of these strains create their best flavors when fermented warmer than most ales. Pitching a yeast starter with just enough yeast to do the job also helps.

"Without a doubt, you cannot make great Belgian beers without healthy yeast," Arthur says. "This goes for all types of brewing, but without healthy yeast, the flavors will not resonate."

"A true Belgian-Style yeast is an absolute must for the production of a beer with true Belgian-style character," Perkins concurs. "Esters contribute much of the profile of a Belgian-Style beer, whether it comes across as fruity, spicy, phenolic or otherwise."

While many breweries use proprietary yeast strains, both Wyeast and White Labs offer a variety of Belgian strains to match most styles. (And, since many Belgian-inspired beers are bottle conditioned, you may have the opportunity to culture your own favorite strain if it is not available commercially.)

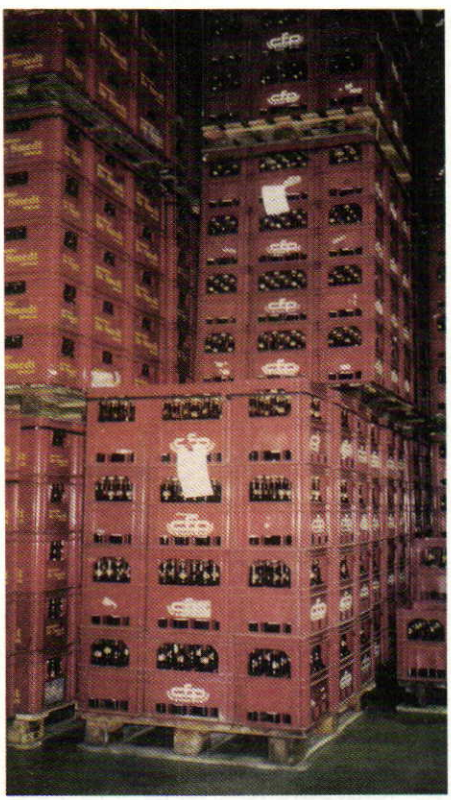
Many Belgian beers also add "real" spices such as orange peel, coriander, peppercorn, cumin, grains of paradise, cardamom or cloves. In these beers, the spices work in conjunction with the yeast to produce wonderful flavors and aromas.

"The quality of the spice aroma is critical," says Brewery Ommegang Brewmaster Phil Leinhart, when discussing his Ommegang Witte, which relies on orange peels for a subtle fragrance. "Not all sweet orange peels have the same quality of aroma."

The options are endless. But whatever Belgian style suits your fancy; Arthur offers one final comment, that should not scare off potential Belgian-style beer brewers, but encourage them.

"One of the biggest challenges is paying tribute to the great beers of Belgium without seeking to recreate exacting recipes and beers," Arthur concludes. "We think there is so much room for expression. . . . At the end of the day, it always comes down to the beer."

With that in mind, enjoy the five clone recipes presented here. Are they Belgian-style? Belgian-inspired? Belgian-mislabelled? Who cares? They're beers. Have fun brewing and enjoying them!



Many commercial Belgian-style beers are bottle conditioned just like most homebrews. Brewery Ommegang holds their bottles in a "warm room" to ensure proper carbonation before shipment.

RECIPES

Ommegang Witte clone

(5 gallons/19 L, all-grain)

OG = 1.047 FG = 1.008
IBU = 10 SRM = 3 ABV = 5.1%

BREWERY OMMEGANG

Ingredients

5.8 lbs. (2.6 kg) Pilsen malt
2.4 lbs. (1.1 kg) white wheat malt
1.1 lbs. (0.48 kg) unmalted wheat flakes
0.39 lbs. (0.18 kg) pregelatinized oat flakes
2.5 AAU Styrian Goldings hops (90 mins) (0.5 oz./14 g of 5% alpha acids)
0.35 oz. (10 g) coriander seed (crushed)
1.2 oz. (34 g) sweet orange peel
Belgian Ale yeast (Ommegang uses a proprietary strain; at home, try Wyeast 3944 (Belgian Witbier) or White Labs WLP400 (Belgian Wit Ale) yeast)

Step by Step

Mash for 5 minutes at 113 °F (45 °C); 35 minutes at 144 °F (62 °C); 20 minutes at 154 °F (68 °C). Mash-off at 165 °F (74 °C). Boil 90 minutes, adding hops at beginning of boil and spices for final 10 minutes. Pitch yeast at 70 °F (21 °C); let temperature rise but not above 79 °F (26 ° C). Carbonate to 2.7 volumes of CO_2.

Ommegang Witte clone

(5 gallons/19 L, countertop partial mash)

OG = 1.047 FG = 1.008
IBU = 10 SRM = 3 ABV = 5.1%

Ingredients

2.1 oz. (59 g) Pilsen malt
2.4 lbs. (1.1 kg) wheat malt
1.1 lbs. (0.48 kg) unmalted wheat flakes

HOP SUBSTITUTIONS

These days, the number of hop varieties available to homebrewers is somewhat limited due to the worldwide shortage. (See the January-February 2008 issue of *BYO* for information on the causes of the problem.) Many Belgian-style beer recipes call for Styrian Goldings hops, which may be hard to find. The usual substitutes for Styrian Goldings are Fuggles or Willamette, but these varieties are in short supply also. If you can't find Styrian Goldings or any of the the usual substitutes, look for Glacier hops, a new variety profiled in the March-April 2008 issue of *BYO*. If you can't find Glacier, pick any neutral hop — Belgian-style beers typically aren't very hoppy and the substitution should not affect the beer's flavor too much.

Sometimes, Belgian-style beer recipes call for German noble hops. Because hops are not the focus of most of these brews, the brewer simply uses a hop variety with a "clean" character. If a recipe calls for one variety of noble hop and you can't find it, see if any other variety of noble hops is available. The Amercian variety Mt. Hood is also a clean variety. A new variety, Vanguard, is a good substitute for Hallertau. Santiam, a new variety with a somewhat "spicy" character is a good substitute for Tettnanger. Sterling is often said to be a good replacement for Saaz, but also does well standing in for Tettnanger. (Vanguard, Santiam and Sterling are also profiled in the March-April 2008 issue of *BYO*.)

For general information on hop substitutions, see the hop chart in the March-April 2008 issue of *BYO* or online at byo.com. If you can't find the particular variety you want, just experiment. Belgian-inspired brewing sometimes calls for taking a chance. And, in a couple years all (or at least most) of our old favorite hop varieties will return.

0.39 lbs. (0.18 kg) pregelatinized oat flakes
4.0 lbs. (1.8 kg) Weyermann Pilsner malt extract (late addition)
2.75 AAU Styrian Goldings hops (60 mins) (0.55 oz./16 g of 5% alpha acids)
0.35 oz. (10 g) coriander seed (crushed)
1.2 oz. (34 g) sweet orange peel
Belgian Ale yeast (Ommegang uses a proprietary strain; at home, try Wyeast 3944 (Belgian Witbier) or White Labs WLP400 (Belgian Wit Ale) yeast)

Step by Step

In a 2-gallon (7.6-L) beverage cooler, mash crushed grains in 5.5 qts. (5.2 L) of water for 45 minutes at 150 °F (66 °C). While mash is resting, heat 1.0 gallon (3.8 L) of water to a boil in your brewpot and another 5.5 qts. (5.2 L) of sparge water to around 180 °F (82 °C). Recirculate wort then run off to brewpot. Stir sparge water into grains. Recirculate and run off again. Boil 60 minutes, adding hops at times indicated and liquid malt extract with 15 minutes left in boil. Pitch yeast at 70 °F (21 °C) and let temperature rise, although not above 79 °F (26 °C). Carbonate to 2.7 volumes of CO_2.

Lost Abbey Devotion Ale clone

(5 gallons/19 L, all-grain)

OG = 1.052 FG = 1.006
IBU = 35 SRM = 4 ABV = 5.9%

Ingredients

7.24 lbs. (3.3 kg) Pilsner malt
0.54 lbs. (0.24 kg) Crisp crystal malt (15 °L)
1.48 lbs. (0.67 kg) dextrose
6.25 AAU Columbus or Warrior hops (90 mins) (0.39 oz./11 g of 16% alpha acids)
1.95 AAU Brewers Gold hops (45 mins) (0.32 oz./9.2 g of 6% alpha acids)
1.9 AAU Brewers Gold hops (15 mins) (0.31 oz./8.9 g of 6% alpha acids)
0.81 oz. (23 g) German Tettnang hops (whirlpool)
White Labs WLP530 (Abbey Ale) yeast

Step by Step

Mash at 146 °F (63 °C). Boil for 90 minutes, adding hops at times indicated and sugar for final 15 minutes. (Add whirlpool hops at end of boil.) Ferment starting at 66 °F (19 °C), but allow the temperature to rise without control.

Lost Abbey Devotion Ale clone

(5 gallons/19 L, extract w/ grains)

OG = 1.052 FG = 1.006
IBU = 35 SRM = 4 ABV = 5.9%

Ingredients

1.46 lbs. (0.66 kg) Pilsner malt
0.54 lbs. (0.24 kg) Crisp crystal malt (15 °L)
1.48 lbs. (0.67 kg) dextrose
4.33 lbs. (2.0 kg) Weyermann Pilsner malt extract (late addition)
6.75 AAU Columbus or Warrior hops (60 mins) (0.42 oz./12 g of 16% alpha acids)
1.95 AAU Brewers Gold hops (45 mins) (0.32 oz./9.2 g of 6% alpha acids)
1.9 AAU Brewers Gold hops (15 mins) (0.31 oz./8.9 g of 6% alpha acids)
0.81 oz. (23 g) German Tettnang hops (whirlpool)
White Labs WLP530 (Abbey Ale) yeast

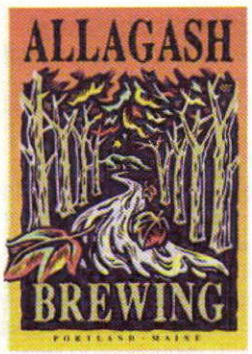
Step by Step

Steep crushed malts in 3 qts. (~3 L) of water at 146 °F (63 °C) for 45 minutes. Combine "grain tea" with enough water in brewpot to make 3.0 gallons (11 L) of wort. Boil 60 minutes, adding hops at times indicated and sugar and liquid malt extract for final 15 minutes. (Add whirlpool hops at end of boil.) Ferment starting at

66 °F (19 °C), but allow the temperature to rise without control.

Allagash Tripel clone

(5 gallons/19 L, all-grain)
OG = 1.078 FG = 1.009
IBU = 28 SRM = 6.6 ABV = 9.0%



Ingredients

12.8 lbs. (5.8 kg) Pilsner malt
1.6 lbs. (0.73 kg) sucrose
8 AAU German Tettnang hops (60 mins) (2.0 oz./57 g of 4% alpha acids)
0.4 oz. (11 g) Hallertau Mittelfrüh hops (whirlpool)
Belgian Ale yeast (Allagash uses a proprietary strain; at home, try Wyeast 1762 (Belgian Abbey Ale II) and Wyeast 3787 (Trappist High Gravity) or White Labs WLP510 (Belgian Bastogne Ale) yeast)

Step by Step

Single infusion mash at 153 °F (67 °C). Boil wort for 90 minutes, adding hops at times indicated. Add sugar for final 15 minutes. Add whirlpol hops at end of boil. Ferment at high end of yeast strain's recommended range.

Allagash Tripel clone

(5 gallons/19 L, extract w/ grains)
OG = 1.078 FG = 1.009
IBU = 28 SRM = 6.6 ABV = 9.0%

Ingredients

2.0 lbs. (0.91 kg) Pilsner malt
1.6 lbs. (0.73 kg) sucrose
1.75 lbs. (0.79 kg) Briess light dried malt extract
5.75 lbs. (2.6 kg) Briess Pilsen Light malt extract

(late addition)
8 AAU German Tettnang hops (60 mins)
(2.0 oz./57 g of 4% alpha acids)
0.4 oz. (11 g) Hallertau Mittelfrüh hops (0 mins)
Belgian Ale yeast
(Allagash uses a proprietary strain; at home, try Wyeast 1762 (Belgian Abbey Ale II) and Wyeast 3787 (Trappist High Gravity) or White Labs WLP510 (Belgian Bastogne Ale) yeast)

Step by Step

Steep crushed malts in 3 qts. (~3 L) of water at 153 °F (67 °C) for 45 minutes. Combine "grain tea" with dried malt extract and enough water in brewpot to make 3.0 gallons (11 L) of wort. Boil 60 minutes, adding hops at times indicated and sugar and liquid malt extract for final 15 minutes. Cool wort before transferring to fermenter. Ferment at the high end of your yeast strain's recommended range.

Two Brothers Domaine DuPage clone

(5 gallons/19 L, all-grain)

OG = 1.068 FG = 1.019
IBU = 21 SRM = 14 ABV = 6.4%

Ingredients

7.25 lbs. (3.3 kg) pale ale malt
4.0 lbs. (1.8 kg) Vienna malt
2.0 lbs. (0.91 kg) Munich malt
0.75 lbs. (0.34 kg) Weyermann CaraWheat® malt
0.25 lbs. (0.11 kg) Weyermann CaraMunich® malt
0.25 lbs. (0.11 kg) melanoidin malt
1.75 AAU Northern Brewer hops (60 mins)
(0.19 oz./5.5 g of 9% alpha acids)
3.3 AAU Mt. Hood hops (25 mins)
(0.66 oz./18 g of 5% alpha acids)
4.4 AAU Mt. Hood hops (10 mins)
(0.88 oz./25 g of 5% alpha acids)
White Labs WLP550 (Belgian Ale) yeast

Step by Step

Add 1 tsp gypsum and enough acid to lower pH of mash water to 6.5 prior to mash-in. Mash 15 minutes at 155 °F (68 °C) then raise to 168 °F (76 °C) for mash-out for 10 minutes. Sparge with 164 °F (73 °C) water. Collect 6.5 gallons (25 L). Boil 120 minutes. Add Northern Brewer at 60 minutes left in the boil. Add first Mt. Hood at 25 minutes left in the boil. Add last Mt. Hood at 10 minutes left in the boil. Ferment your beer at 66 °F (19 °C).

Red Rock Brewing Pecome Blonde clone

(5 gallons/19 L, all-grain)

OG = 1.042 FG = 1.011
IBU = 33 SRM = 9 ABV = 3.9%

Ingredients

6.9 lbs. (3.1 kg) Weyermann Pilsner malt
0.68 lbs. (0.31 kg) Caramel Pils
0.27 lbs.(0.12 kg) Briess crystal malt (40 °L)
0.68 lbs. (0.31 kg) Gambrinus Munich (10 °L)
6.65 AAU Tettnanger hops (60 mins) (1.9 oz./54 g of 3.5% alpha acids)
4.5 AAU Czech Saaz hops (15 mins) (1.5 oz./43 g of 3% alpha acids)
2.0 oz. (57 g) German Perle hops (0 mins)
Wyeast 3787 (Trappist High Gravity) yeast

Step by Step

Mash at 150 °F (66 °C). Boil for 90 minutes. The fermentation tempertature is 70 °F (21 C). Condition for 14 days at 38 °F (3.3 °C). Carbonate to 2.9 volumes CO_2.

Red Rock Brewing Pecome Blonde clone

(5 gallons/19 L, extract w/ grains)

OG = 1.042 FG = 1.011
IBU = 33 SRM = 9 ABV = 3.9%

Ingredients

0.37 lbs. (0.17 kg) Weyermann Pilsner malt
0.68 lbs. (0.31 kg) Caramel Pils
0.27 lbs.(0.12 kg) Briess crystal malt (40 °L)
0.68 lbs. (0.31 kg) Gambrinus Munich (10 °L)
1.25 lbs. (0.57 kg) Briess light dried malt extract
3.3 lbs. (1.5 kg) Cooper Light liquid malt extract (unhopped)
6.65 AAU Tettnanger hops (60 mins) (1.9 oz./54 g of 3.5% alpha acids)
4.5 AAU Czech Saaz hops (15 mins) (1.5 oz./43 g of 3% alpha acids)
2.0 oz. (57 g) German Perle hops (0 mins)
Wyeast 3787 (Trappist High Gravity) yeast

Step by Step

Steep the crushed malts in 3 qts. (~3 L) of water at 150 °F (66 °C) for 45 minutes. Combine the "grain tea" with dried malt extract and enough water in brewpot to make 3.0 gallons (11 L) of wort. Boil 60 minutes, adding hops at times indicated and liquid malt extract (LME) for final 15 minutes. (Turn off the heat as you stir the LME in.) Cool the wort until the brewpot is cool to the touch. Transfer to a fermenter, top up to 5 gallons (19 L) with water and aerate well. Pitch yeast and ferment at 70 °F (21 °C). Carbonate to 2.9 volumes CO_2.

Photo Courtesy of Lindemanns

turbid MASHING

As Belgian-inspired beers grow in popularity and continue to nudge their way into North American beer culture, the desire to brew better, more adventurous, creations pushes brewers forward to find the next best ingredient or yeast for the style. Sometimes, though, it may benefit the brewer to look backwards, to see how some beers were brewed historically. Turbid mashing is a method that is still practiced in a few smaller lambic breweries in Belgium, such as Cantillon and Boon. If you have interest in brewing lambic-styled beers, wit beers, low-gravity or small session beers — or you just want to try an experiment — then utilizing a turbid mash may push your Belgian-inspired beer to the next level.

Few homebrewers have ever performed a turbid mash. Many, perhaps most, have never even heard of turbid mashing. References to the technique pop up here and there, but it remains an avenue largely unexplored by most homebrewers. As our knowledge of mixing various brewing styles, like a Belgian yeast strain with an American IPA hop-bill, grows and with the trend towards barrel (oak) aging, perhaps the turbid mash may find a new home in the homebrew crowd.

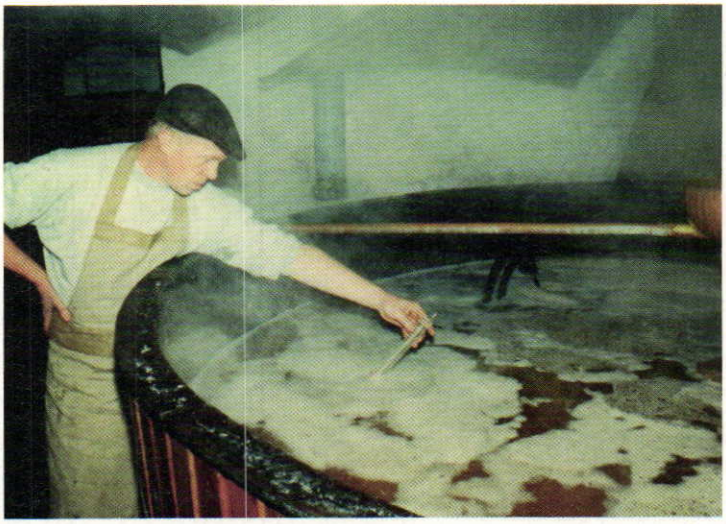
The Enigma

Turbid [adj.] (1) *not clear or transparent; clouded; opaque.* (2) *confused; muddled; disturbed.*

Both definitions of the word "turbid" have some relevance to the process of turbid mashing. The wort produced from this style

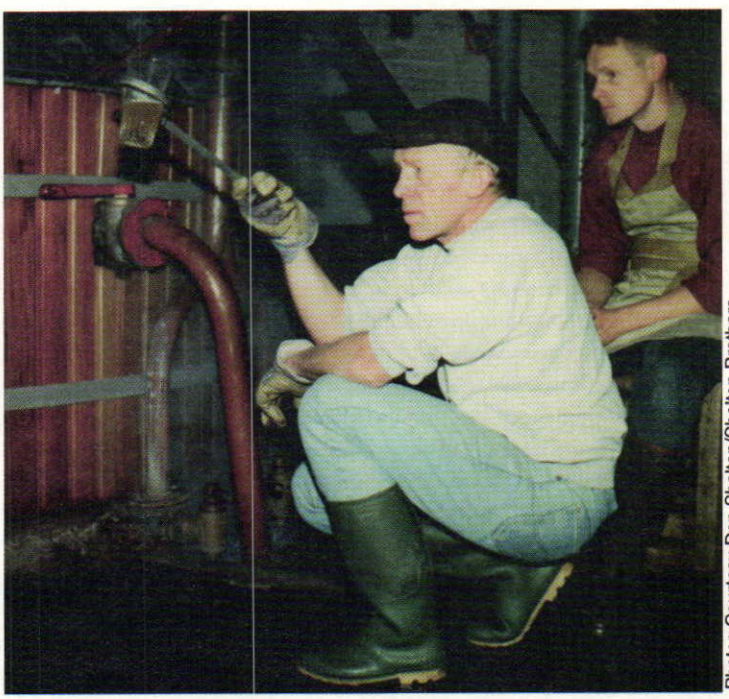
By **Dave Green**

A **style of mashing** often associated with **brewing lambic-styled beers** these days, but at **one time** the **turbid mash** was the **prevalent form** of **mashing grains** in **Belgium.** Learn how to **re-create** this **mashing style** in your **brewhouse.**



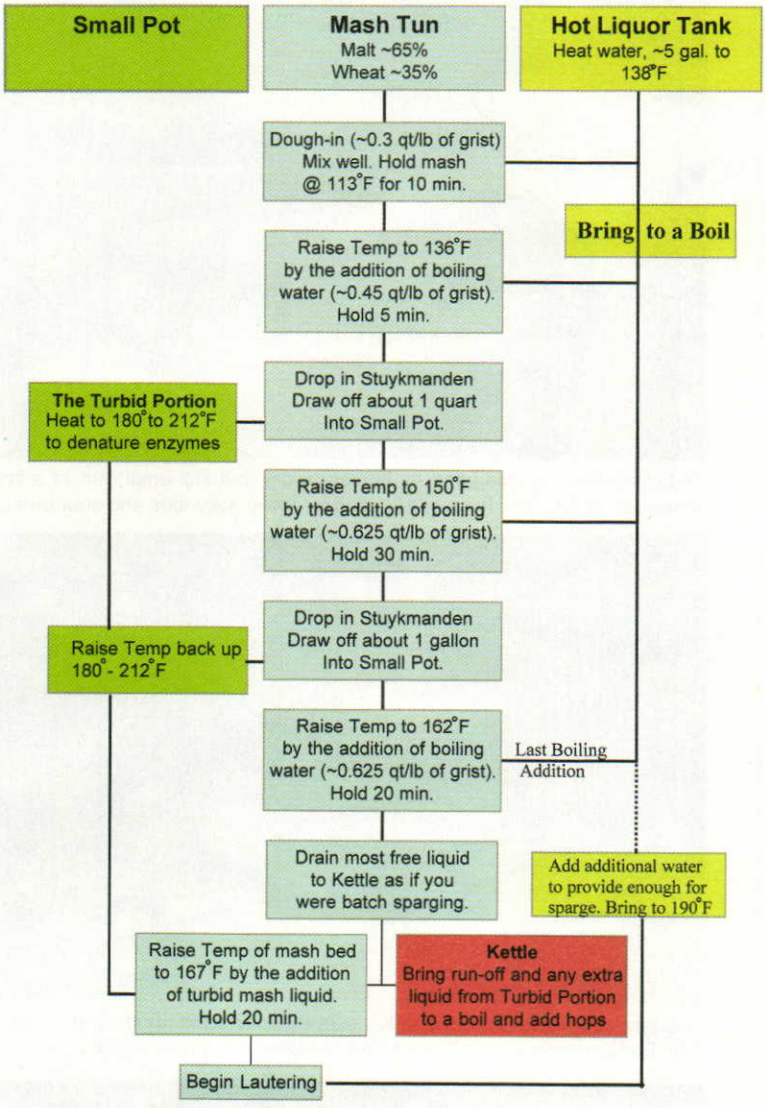
Turbid mashing is little-used by homebrewers, but still employed at a few breweries in Belgium. It is usually used for low-gravity ales and sour beers.

The apparatus in a turbid mash tun stirs the mash and doubles as a manifold. Earlier versions of turbid mashing employed a wicker basket.



Photos Courtesy Dan Shelton/Shelton Brothers

J.P. Van Roy examines the cloudy wort pulled from a turbid mash. The starches in this wort will slowly feed the souring microorganisms in a lambic.



An outline of the turbid mashing process. The defining element is the removal and heating of some cloudy wort early in the process. The temperature steps can be adjusted, as they can with any step mash, to alter the qualities (fermentability, glucan content, etc.) of the wort.

of mashing will come out with a very cloudy, translucent white appearance when performed properly. On the other hand, all-grain brewers who have never heard of turbid mashing have been known to quickly become confused, muddled and may be downright disturbed by the turbid mashing process. Certainly, many aspects of turbid mashing fly in the face of what we now think of as solid procedures for producing wort.

History

The style of mashing that has come to be known as a turbid mashing today started to take shape in Belgium, in 1822, when breweries started getting taxed based on the size of their mash tun. Brewers were therefore pushed towards very thick mashes. An additional constraint was that many of these brewers utilized large proportions of wheat in their mash. To properly deal with this, a step mash was required. And, because raw wheat was also often used, the mash regime also needed to deal with this adjunct.

Taking wheat through a glucan rest of 115–145 °F (46–63 °C) can help prevent a stuck sparge. Mash tuns back then were not directly heated, so the brewers had to add boiling water to raise the temperature of the mash through the glucan rest. Brewers responded by pulling liquid out of the mash in order to fit the boiling water and raise the total temperature of the mash. After the main mash had run its course, all the liquid that had been pulled was pumped back into the mash tun and the grains were sparged. This allowed brewers to make brews with lots of wheat malt, and frequently some unmalted wheat as well, in very small mash tuns. The final twist to the turbid mash came when brewers started heating the pulled turbid portion, effectively denaturing the diastatic enzymes.

The tax lasted all the way until 1885, at which time the mash tun tax was revoked and a new set of regulations was put into place. But since most of the brewers had invested in the small mash tuns, and honed their skills on them, the practice did not disappear overnight. And, because the techniques of turbid mashing are thought by some to produce lambics and wits superior to infusion mashed brews, turbid mashing did not completely vanish. During World War II, turbid mashing proved to be an effective technique due to the food rationing of the era. Many British soldiers stationed in the region were amazed at the complexity and body found in the glasses of "small" Belgian table beers — beers with original gravities in the 1.020-1.030 range. The high concentration of unfermentables left in the wort (coupled with low attenuation during fermentation) allowed these beers to retain lots of body and mouthfeel during the beer's short lifetime.

The Mash Tun

The mash tuns themselves evolved over time into fairly complex devices. Through a series of steps, the turbid mash tun went from a simple vessel to a complex machine, complete with multiple branching hollow arms or rakes that acted to both stir the mash and drain any available liquid found within the mash. These rakes rotated around the mash tun powered by a gear system, assuring the brewer that the thick mash was well mixed and was not allowed to set.

The original turbid mash tuns were nothing out of the ordinary apart from the fact that brewers used an oversized wicker basket, known as a brewer's basket or *stuykmanden*, which was lowered onto the top of the mash. As the basket was pushed down, liquid would seep through the pores of the wicker weave and pool in the basket. The mash these brewers were

dealing with was quite thick, in the 0.6 qt./lb. range (~1.2 L/kg). Therefore this was the best option for removing the turbid portion from the mash tun during the first goopy liquid pulling. The brewer could now siphon the pooled liquid from the basket into a kettle to be heated. Eventually brewers found that a copper version of the basket achieved their goal with improved efficacy. The copper basket then evolved into UFO-shaped discs, concave circular discs with tiny holes for liquid to diffuse through. The discs were attached to arms that came out from the center of the tun. The whole contraption faintly resembled a disc plow when in use. Multi-branching arms which extend out from the main arms finally replaced the concave discs in the most modern turbid mash tuns to rake the grains. Just like the discs, these branching arms acted like a rototiller, stirring the mash while allowing liquid to drain through piping in the arms' interior.

The foundation of the turbid mash is built around extracting liquid from a wet grain bed that was more reminiscent of spackle then the typical thin oatmeal appearance of an infusion mash with well-modified grains. The grain bed would quickly stick if the brewer attempted to draw first runnings down through the false bottoms. The brewers also knew that keeping the first runnings from the later temperature steps of the mash, improved the base or body of the final beer. So the *stuykmanden* was employed to withdraw the vital turbid portion. The turbid portion was then warmed enough so that the enzymes, most importantly the diastatic enzymes, denatured. The heating also allowed the white starch granules floating in the turbid liquid to dissociate in the liquid, making the starch a solute but not allowing them to convert into simple sugars. The exact technique Belgian brewers utilized to achieve this goal changed from brewery to brewery and over time, but that basic foundation remained constant.

Why Turbid Mash?

Turbid mashing is time-consuming, requires some specialized equipment and produces cloudy, starchy wort — something we homebrewers generally strive to avoid as starch causes haze and may lead to biological instability in our beers. So why would anyone want to try this in their homebrewery? A few of the reasons include:

Authenticity Traditionally the lambic family, wit-styled beers and low-gravity ales from Belgium were brewed utilizing a turbid mash. If you are interested in producing these beers as they were in the past, you may be interested in turbid mashing.

High Adjunct Proportions Some lambic and wit beer recipes call for unmalted wheat in high proportion in the mash, and in some cases oats or rye. While the use of unmalted wheat may not be necessary, I often hear the opinion that unmalted wheat adds more character to a beer than the malted variety. Ungelatinized raw wheat needs special treatment such as boiling or a glucan rest to be sure the lautering process proceeds smoothly. Turbid mashing should sufficiently breakdown the sticky glucans and large proteins

KNOW YOUR WHEAT

For homebrewers with limited experience using unmalted wheat, there are a few questions you need to answer if you are planning on adding some in your next recipe. The first question is, "what variety of wheat should I buy?"

You may find several varieties of wheat if you go to a natural food store. Often times it is offered in whole grain form as soft wheat or hard wheat or durum wheat (bulgur wheat). Soft wheat is exactly what it sounds like, a softer variety. This may sound easier to work with, but it is more likely to squish and roll instead of crack and grind. On the other hand, soft wheat contains lower protein levels making it a smarter choice in brewing. The hard variety you should find to be at least slightly more friable when trying to crush the grain. Durum wheat is commonly used to make pasta and spaghetti. I have only found durum wheat in the form of bulgur wheat in grain form. Bulgur wheat has been pre-boiled (gelatinized) and cracked. Both the durum wheat and the hard variety contain higher protein levels, which may have some detrimental effects on your final product.

You may also have the choice of selecting white or red wheat. Red wheat contains higher tannin and other phenolic compounds making it a good choice for lambics while the white variety will probably be your wheat of choice for wit or other delicate wheat beers. Other choices abound in the form of wheat flour, rolled, flaked, torrified and malted wheats. Both the rolled, torrified and flaked forms are pre-boiled like the bulgar wheat, which may help assist you in avoiding a stuck sparge.

The second question asks; "how should wheat be crushed?"

Crushing raw wheat requires more patience than the malted variety. Raw wheat should be pulverized by the time you are finished which may require some muscle power on your part. Jim Liddil suggests utilizing a Corona-style mill in his article in *Brewing Techniques*. If your rollers are adjustable, you are going to want to start with the rollers at a standard gap for the grain. After the wheat grain is run through once, close the gap a notch and run the wheat through two maybe three times more trying to close the gap slightly each time until the wheat is reduced to grits.

found in the unmalted wheat, but leave the protein haze characteristic of wit-beers.

Likewise, if you ever thought about brewing an experimental beer with some unmalted grain from your local supermarket, or grains you're growing yourself, this style of mashing is a good candidate to handle unmalted adjuncts (provided you don't expect to fully degrade their starches). See the sidebar for further information on using unmalted wheat.

Starch for Souring If you are ready to delve into the world of lambic-style brews, or brew any kind of experimental sour beer, one key to getting a lot of sour character is to be sure there is still some unconverted starch left in the final wort. The starch will provide fodder for the microorganims in a sour beer to work on after the brewers yeast consumes all the simple sugars, such as maltose. Turbid mashing should leave a good concentration of unconverted starch in the wort. There are easier ways to do this, of course — including just adding a small amount of

starch in the boil — but the easiest way is not always the best way.

Experimentation A turbid mash will produce a cloudy, dextrinous wort that has great potential to add an interesting twist to many beer styles.

Equipment

The basic turbid mash — originally presented to North American brewers by Martin Lohdal from information gathered by brewers at the Brouwerij Cantillon and later brought down to homebrew scale by Jim Liddil — can be performed with one large (10 gallon/38 L) hot liquor tank (HLT), a smaller (~2 gallon/7.6 L) pot, a dedicated mash tun, the *stuykmanden* (see below) and a good mash paddle. You will also need another vessel, preferably the kettle, to hold the liquid first drained from the mash tun after the saccharification step has finished in the main mash.

A basic device to emulate the action of the *stuykmanden* is a colander. By pushing the colander down onto the top of the grain bed, free liquid from the mash will seep in to the center bowl, which then can be siphoned out. Try to find a small, but deep colander which will fit in the top of your mash tun. Also be sure that any extended temperature probes in the mash tun will not interfere with the colander sinking into the mash. If you are more dedicated and want to make your own *stuykmanden*, you may try to recreate the traditional wicker basket. The weave needs to be pretty tight and the wicker should be fairly stout in order to withstand the compression when it is pushed into the mash.

In The Brewhouse

Below is a suggested turbid mash protocol. The overall procedure is fairly complicated, even compared to a decoction mash, so it pays to familiarize yourself with the schedule before jumping in. The first time you try this, focus on hitting the temperature marks first, and volumes and mash thicknesses second. The temperatures follow the basic steps found in many step infusion or decoction mashes, so feel free to substitute your favorite series of rests for those suggested below. Because most homebrew mash tuns have more than enough volume to hold the grains for a 5-gallon (19-L) batch, you will have plenty of space to thin the mash if the thickness becomes unmanageable. A willingness to "wing it" and the diligence to take good notes will let you learn from your first turbid mash and be able to perform subsequent mashes more easily. The flow chart on page 50 outlines the process.

Your turbid mash begins in a manner similar to a regular infusion step mash, albeit much thicker. Dough in to 113 °F (45 °C). Your liquor to grist ratio at this point will be around 0.3 qt./lb. (~0.7 L/kg). Bring the water in the hot liquor tank (HLT) to a boil and, after the mash has rested 10 minutes, raise the temperature to 138 °F (59 °C) by stirring in boiling water. This should bring the mash to an overall thickness around 0.45 qt./lb. (~1 L/kg). Hold for 5 minutes at this rest.

At this point, the unusual aspects of the turbid mash begin. Draw off about

1 qt. (1 L) of turbid wort (if brewing a 5-gallon/19-L batch of beer). Do this by sinking your colander into the mash and scooping or siphoning off the wort. An auto-siphon comes in handy for this. Do not collect any grain solids in this volume. (Skim them out with a strainer, if your colander lets some solid bits through.)

Place the turbid wort in your small pot and heat it. An easy way to do this is to float the small pot in the boiling water in your hot liquor tank. You want the turbid portion to reach at least 180 °F (82 °C).

Now, stir in more boiling water to raise the temperature to 150 °F (66 °C). Hold at this temperature for 30 minutes, stirring often. The mash will still be thick, so you'll have to work fairly hard at this.

Next, it's time to use the colander again. This time, the mash is a bit thinner — although still thicker than a normal mash — and you will collect about a gallon (3.8 L) of wort (again assuming you are brewing 5-gallons/19-L). Combine the wort you draw off with the first turbid wort in the small pot. Heat this portion as before, aiming to raise it to at least 180 °F (82 °C). For the final mash rest, stir in boiling water to raise the temperature to 162 °F (72 °C) and rest for 20 minutes. While waiting to lauter, add water or otherwise cool the water in the HLT to 190 °F (88 °C).

Collecting the wort involves some unusual steps compared with normal wort collection procedures. First drain off some of the wort to the kettle — roughly the same volume that you have contained in your small pot. Replace the wort you ran off with the wort in the small pot. This should bring the mash temperature to 167 °F (75 °C). Hold for 20 minutes, then vorlauf and run off the rest of the wort, sparging with 190 °F (88 °C) water from the hot liquor tank.

From my experience with utilizing a turbid mash there are a few pointers to keep in mind to assure success when following the procedure laid out:

1. Before starting, make sure your *stuykmanden* (colander) fits in the mash tun
2. Make sure that, by pressing down with the colander, you won't be bending any temperature probes or crushing any screens or manifolds.
3. Adding 0.5–1 lb. (0.23–0.45 kg) of rice hulls to the mash during the saccharification rest is a smart choice when using unmalted wheat. This is an added buffer to assure against a stuck sparge.

My research into making an authentic kriek led me into the realm of the turbid mash and eventually into this article. Hopefully it will lead some brewers — especialy those who are "Belgian-inspired" — to try this interesting and authentic method of mashing.

Dave Green is the Advertising Sales Coordinator for Brew Your Own *magazine.*

Web extra:

See the online version of this story for three recipe ideas

http://byo.com/feature/1758.html

Clouds and Haze

Finding the best fining method for your brew

by Jon Stika

Clear beer has been important to beer drinkers and brewers ever since folks began pouring their brew in a glass. Although glass beer steins first became available in the 1700s, they were not readily available and affordable to most beer drinkers until the early 1800s. It was at this time in history that beer was truly on display and clarity became an important issue.

In this installment of "Techniques" we'll examine the art and science of fining your beer to make it clear. But before we make things perfectly clear, remember that there are several styles of beer in which cloudiness is an asset rather than a liability. Some styles of beer (German hefeweizen and Belgian wit to name a few) are hazy by design, with yeast, protein or other compounds suspended in the brew. These elements of turbidity contribute greatly to the flavor and texture of these special beers and any attempt at fining would be senseless. But if you desire your batch of beer to be clear, there are a number of things you can do to make it so.

Prevention

I think it is prudent to touch on a few basic points of the brewing process that can help avoid hazy beer before it happens. First, conduct a vigorous boil to promote the formation of hot break material, which could otherwise contribute to haze in the finished beer. Second, uncover and cool the wort quickly and separate the wort from the cold break material (trub) to minimize the amount of protein-tannin complexes getting into the fermenter. Third, use a flocculent yeast that will readily settle out and can be left behind in the fermenter during racking into a secondary fermenter, bottling bucket or keg. Finally, consider the ingredients in your brew. Unmalted grains that are not part of a cereal/adjunct mash or an excessive amount of hops can set the stage for haze-promoting compounds.

The science

The definition of fining is "something added to beer or wine to make it clear by precipitating or binding compounds that impair clarity." Compounds used as fining agents typically have large, rigid molecular structures that maintain a positive charge at a pH typically found in beer. Since most of the haze causing material in beer is negatively charged, finings act as molecular Swiffers® attracting and removing offending haze-causing material from our beer. Among the primary perpetrators of haze in beer are yeast still in suspension, stray protein (primarily from malt or other grains), and polyphenols (from both malt and hops). Luckily, each of these typically carries a negative charge and thus are attracted to positively charged finings, creating clumps that settle to the bottom of the fermenter. Not all beer finings attract the same compounds; some target proteins, others polyphenols and some a combination of these compounds and yeast. See the table on the next page for a list of various fining materials and the type of compounds they address.

In researching the topic of finings I found a vast array of compounds used for fining beer and wine, however, only finings best suited to use in beer will be discussed from this point forward.

When to fine

There are two opportunities that brewers have to introduce finings to their beer: during the boil and in the fermenter. Carrageenan-based products such as Irish Moss are added to the boil and often referred to as kettle, or copper, finings. These products work to promote the coagulation and resulting precipitation of proteins near the end of the boil. The table shows the method and relative effectiveness of utilizing Irish Moss and Whirlfloc. The coagulation process known as hot break happens naturally in the boil, but the addition of Irish Moss or Whirlfloc provides starting points for proteins to aggregate and form larger clumps. These clumps of proteinaceous material then settle to the bottom of the brew kettle in what we collectively refer to as trub. This process of precipitation gets potential haze-causing proteins out of the way before the beer reaches the fermenter. If you do not typically achieve a good hot break during the boil, Irish Moss or Whirlfloc are good for helping the hot break formation process along.

The second opportunity to employ finings in your beer is in the fermenter after primary fermentation has subsided. Fermenter finings can be added once the yeast has completed its tasks of primary fermentation, cleaning up diacetyl, and otherwise conditioning the beer. Adding finings too soon during fermentation may not only render the finings ineffective, but could cause the yeast to precipitate prematurely before it has a chance to completely ferment and condition the beer. It is for these reasons that you should not be in a hurry to add finings to the fermenter. You want the yeast to have enough opportunity to finish its work before it gets pushed down and out of the way.

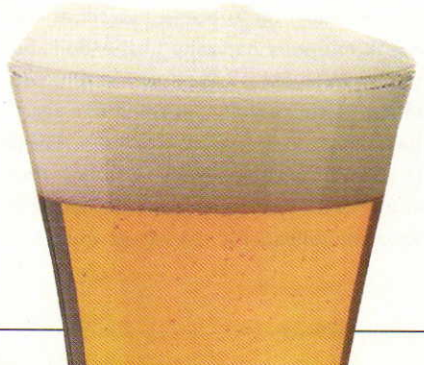
When the time has come, and the yeast is done, products such as Chill Guard, unflavored gelatin, Isinglass, Polyclar®, or good old-fashioned patience can be employed to remove any excess yeast, proteins, and polyphenols from your beer. The simplest, most natural approach to fining beer is patience. Simply holding the beer at or slightly above freezing (32 °F/0 °C) will promote the formation of haze-causing compounds. Allowing the beer to sit undisturbed at cold temperatures will give the yeast and other haze compounds a chance to settle out on their own.

Fining products that can be added to beer in the fermenter are dissolved or suspended in warm water before adding them to the beer. The table shows various fermenter finings, their method of use, and relative effectiveness.

It is important to note that the various fermenter finings are not created equal. While each product will do its electrostatic job of removing yeast, protein and polyphenols, some finings are more or less effective at removing each type of

Fining Use and Effectiveness

Fining	Active Ingredient	Point In Brewing Process	Method	Primary Effectiveness: Suspended Yeast	Primary Effectiveness: Protein	Primary Effectiveness: Polyphenois
Irish Moss	Carrageenan from seaweed	Boil	Add 1 tsp. per 5 gallons (19 L) during the last 15 min. of the boil.		x	
Whirlfloc	Irish Moss + additional purified carrageenan	Boil	Add 1 tablet per 5 gallons (19 L) with 10 min. left boil.		x	
Chillguard	Silica gel	Fermenter	Dissolve ½ tsp. Chillguard into ½ cup of hot water (do not boil) and add to 5 gallons (19 L) beer. Wait a few days then rack.		x	
Gelatin	Collagen derived from hoofed animals	Fermenter	Dissolve 1 tsp. unflavored Gelatin into 1 cup of hot water (do not boil) and add to 5 gallons (19 L) beer. Wait a few days then rack.		x	x
Isinglass	Collagen derived from fish swim bladders	Fermenter	Dissolve ½ tsp. instant Isinglass into 1 cup of hot water (do not boil), mix with a whisk, let stand for 15 min., then whisk again and add to 5 gallons (19 L) beer. Wait 4 days then rack.	x	x	x
Patience	Tme and cold temperatures	Secondary Fermenter	Hold beer at 38 to 32 °F (3 to 0 °C) for at least a week.	x	x	
Polyclar®	polyvinylpolpyrrolidone (PVPP)	Fermenter	Mix 2 Tb. (5 g) in one cup warm water and gently stir into 5 gallons (19 L) beer. Let stand for a few days then filter.			x



haze-causing compound. It is also possible to use too much of certain finings, which could possibly remove some desirable flavor and color compounds from your beer. Exceeding the recommended dosage of Polyclar or gelatin may strip beer of some of its body, flavor and color that you do not want sacrificed, including melanoidins and other Maillard compounds and their intermediates. As with many practices in brewing, more is not necessarily better, so be careful to follow the manufacturer's recommendations or those shown in the table.

Here are some details to keep in mind when using finings in beer:

- Boiling carrageenan products (Irish Moss or Whirlfloc®) for an extended period of time can actually degrade them. Once degraded, they are no longer large charged molecules, and thus ineffective at attracting and removing negatively charged proteins. Irish Moss or Whirlfloc® should not be boiled more than 15 minutes to avoid degrading the carrageenan.
- Gelatin and isinglass should never be boiled. Boiling can cause the collagen they contain to become denatured and ineffective. Gelatin and Isinglass should be dissolved in hot (150 °F/66 °C) water but not boiled.
- Isinglass must be dissolved in an acid to be effective. Many commercial preparations of Isinglass supplied by homebrew shops are "instant" and are blended with the acid necessary for their preparation. If you have some old-fashioned Isinglass, be aware that it will need to be prepared by dissolving and stabilizing it in an organic acid (tartaric, citric, ascorbic, malic, etc.) near a pH of 2.5 to be effective. Also, Isinglass should be dissolved by using stirring or gentle whisking so as not to damage its large molecular structure. Do not use a blender or beater.
- Use caution when adding any type of finings to the fermenter, particularly Polyclar®, as those molecules that attract and remove haze can also serve as excellent nucleation sites for carbon dioxide to come out of solution. Translation: the carbon dioxide that is dissolved in beer immediately following fermentation can foam like crazy when you dump finings in the fermenter. Add the finings (or finings mixed with a little water) slowly!
- Even after the proper application of finings there will still be a sufficient population of yeast to consume priming sugar if you bottle or keg condition your beer. Finings, when properly administered, will not remove all of the yeast from your beer.
- There is one form of haze that finings may not be able to address if you do not practice proper sanitation (and if this is the case the beer won't be improved with finings!). This is a biologic haze (from some microorganism other than brewing yeast). If biologic contamination should occur, take a careful look at your cleaning and sanitizing procedures to eliminate the source of contamination from infecting future batches of brew.

Jon Stika is an avid homebrewer from Dickinson, North Dakota where he is a member of the Heart River Homebrewers. He writes "Techniques" for every issue of Brew Your Own.

Advanced Brewing

Pitching Rate

For quality, consistent fermentations

by John Palmer

Photo Courtesy of Seven Bridges Cooperative

I recently attended this year's Craft Brewing Conference in San Diego, and one of the talks, "Yeast/Brewer Cooperation" by Dr. Michael Lewis, meshed nicely with this article. I had been planning on discussing pitching rates, how many billions of cells to pitch per liter of wort for light ales, strong ales, light lagers and strong lagers, but his presentation really helped define the big picture.

Yeast do not want to make beer. They want to grow. The yeast do not care what kind of beer you want to make. They simply take stock of the food resources, and environment, and set out to grow as much as they can before the resources run out. To grow, yeast cells need oxygen to synthesize sterols, which governs the number of times the cell can bud to produce daughter cells. The growth cycle produces three things: metabolic building blocks, catabolic waste and daughter cells. The yeast produce lots of metabolic building blocks in preparation for growth, such as esters, aldehydes, and fatty acids — usually producing more than they actually need, and these are key flavor compounds in beer. The waste products are alcohols and carbon dioxide.

Yeast do not care about making beer any more than sheep care about making sweaters. Left to themselves, sheep would simply eat everything in sight, grow lots of wool and make more sheep. The wool would probably be dirty, snarled, and poorly suited for making sweaters. A rancher manages the production of sweaters by managing the sheep. The rancher controls the number of sheep with respect to the environment and food resources to ensure that one doesn't overwhelm the other. Yeast are the same way, they only produce three things: metabolic byproducts, waste and more yeast. The beer that brewers want is the direct result of this activity, and the three aspects are directly related by mass balance. The more yeast you make, the more flavor compounds, carbon dioxide (CO_2) and alcohol you make. Manage the yeast and you manage the beer.

It is up to us as brewers to control the resources and environment so that the yeast produce the quality of sweaters, er, I mean beer, we want. Dr. Lewis noted that a professional brewer has two options when he ferments an ongoing beer product. Lewis said (paraphrasing): the brewer can produce the same beer, or he can produce a different beer. How does a professional brewer consistently produce the same beer batch after batch? By producing consistent fermentations. How does a professional brewer produce consistent fermentations? By consistently managing the yeast so that each fermentation produces the same rate of yeast growth and the same total amount of growth. If you reproduce the same fermentation with the same ingredients, you will reproduce the same beer with the same flavors. This is the big picture and it helps us put yeast pitching rates in context.

Pitching rates

The pitching rate most commonly mentioned in the homebrewing literature is 1 million cells per milliliter of wort per degree Plato. For the mathematically challenged, I want to point out that 1 million per milliliter is the same as saying 1 billion per liter, and that there are typically 100 billion cells per liquid yeast package. So, one package could ferment 10 liters of 10 °Plato wort. Furthermore, if you consider that specific gravity is about four times the °Plato, and that there are roughly 4 liters in a gallon, then this example roughly equates to one package being capable of fermenting 2.5 gallons of 1.040 wort.

What is often not mentioned is that this recommendation is for re-pitched yeast — such as you would get from the bottom of the fermenter from a previous batch. That yeast is not at peak vitality (i.e., health) and viability (i.e., % alive), depending on age in the fermenter, previous original gravity, etc. For pitching rates when using yeast harvested from a previous fermentation, see the chart at right.

Fresh yeast from a well-prepared starter is at the peak of viability and vitality and only 50–75% as many fresh yeast are needed to do the same job as re-pitched yeast.

Going back to our example above, this means that one fresh package of liquid yeast is capable of fermenting 5 gallons (19 L) of SG 1.040 (10 °Plato) wort, and this is the basis of the common claim that today's liquid yeast packages are ready-to-pitch, and don't need a starter for a typica five-gallon (19-L) batch. But this singular example is only the tip of the iceberg when it comes to pitching rates.

As in all processes, there is a minimum and maximum operating window that is necessary for the process to run. The operating window for both ale and lager for a good fermentation using re-pitched yeast is roughly 0.5–2 million per mL per degree Plato. One yeast cell pitched to a 5-gallon (19-L) batch is not going to make a good beer, no matter how much you aerate it. Likewise, filling a fermenter half full of yeast slurry from previous batches and topping up with wort is

not going to make a good beer either. Yeast, like other herd animals, are constrained by their environment. If you put 100 sheep in a 1 acre pasture, very little reproduction will occur in the time that it takes to eat 1 acre of grass. On the other hand, if you put 100 sheep on 10 acres, the resources will last longer and more reproduction will occur in that time.

This comparison illustrates two aspects of fermentation and yeast starters. The first is that small yeast starters do not generate much growth. There is simply not enough nutrients in a small starter to support much growth by the time those nutrients are consumed. Specifically, pitching a typical liquid yeast package to a 1-quart (1-L) starter will only result in about 1.7X growth, but pitching to a 2-quart (2-L) starter will generate about 2.3X growth and a 4-quart (4-L) starter will generate about 3X growth. Using a stir plate to maintain oxygen levels will help with the total growth, but growth will not occur in the absence of sugar.

The second aspect is that the amount of growth dictates the amount of flavor compounds generated. Lower pitching rates within the operating window will result in more growth before the resources are consumed compared to higher pitching rates. In other words, lower pitching rates tend to result in more yeast character in the beer (more esters, etc), while higher pitching rates tend to result in less yeast character, i.e., a "cleaner" fermentation. There is a limit of course, and extreme over-pitching tends to result in the production of unused metabolic building blocks, starvation, yeast death and the subsequent release of those compounds into the beer.

"The pitching rate most commonly mentioned in the homebrewing literature is 1 million cells per milliliter of wort per degree Plato."

When Jamil Zainasheff and I wrote *Brewing Classic Styles*, we included specific pitching rates for all the recipes, something no other recipe book has done. (And to clarify, the term "pitching rate" typically refers to the number of yeast pitched per unit volume of wort, i.e. millions of cells per milliliter. In homebrewing, this is understood to be the initial quantity of yeast, ex. 1 package, because we are typically talking about 5-gallon/19-L batches.)

The reason we specified pitching rate is because it is the starting point for predicting total yeast growth. The rate of yeast growth is most dependent on temperature, and the total amount of growth is limited by the aeration and wort nutrients. By controlling the starting point, the available nutrients, and the rate, you control the outcome — the flavor of the beer. The idea of yeast growth management to ensure batch-to-batch consistency also applies to successfully duplicating an award winning beer from a recipe — match the fermentation to match the beer.

Pitching rates for ales

Ale styles that are noted for their yeast character, like English ales and Belgian sour ales, should be pitched to the low end of the window, 0.375–0.5 billion cells per liter with fresh yeast. Ale styles that are regarded as having a more

REPITCHED PITCHING RATES AND QUANTITIES (billions of cells per liter of wort)

OG		Rate in Billions per Liter			
SG	Plato	0.5	1.0	1.5	2.0
1.020	5.1	2.5	5.1	7.6	10.2
1.025	6.3	3.2	6.3	9.5	12.6
1.030	7.6	3.8	7.6	11.3	15.1
1.035	8.8	4.4	8.8	13.2	17.6
1.040	10.0	5.0	10.0	15.0	20.0
1.045	11.2	5.6	11.2	16.8	22.4
1.050	12.4	6.2	12.4	18.6	24.8
1.055	13.6	6.8	13.6	20.4	27.1
1.060	14.7	7.4	14.7	22.1	29.5
1.065	15.9	8.0	15.9	23.9	31.8
1.070	17.1	8.5	17.1	25.6	34.1
1.075	18.2	9.1	18.2	27.3	36.4
1.080	19.3	9.7	19.3	29.0	38.7
1.085	20.5	10.2	20.5	30.7	40.9
1.090	21.6	10.8	21.6	32.4	43.1
1.095	22.7	11.3	22.7	34.0	45.3
1.100	23.8	11.9	23.8	35.7	47.5
1.105	24.9	12.4	24.9	37.3	49.7
1.110	25.9	13.0	25.9	38.9	51.9

balanced or light yeast character, such as Southern English brown ale, dry stout and extra strong bitter should be pitched more to the middle at 0.50–75 billion cells per liter. Ales that are considered to have a very clean character, like American pale ale, blonde ale and Northern English brown ale should be pitched at the 0.75–1.0 billion cells per liter. Of course, some yeast strains have a very assertive character all on their own, and therefore the pitching rates for these yeasts tend to be on the upper end in order to prevent the fermentation going hog-wild and funky. Examples include weissbier, saison and witbier.

Pitching rates for lagers

Pitching rates are typically doubled for lager styles, so the corresponding rates for estery lagers such as Kölsch and California common are 1.0–1.125 billion cells per liter. More typical lagers having a clean or low yeast character like Dortmunder export, Munich dunkel, and American lager have rates of 1.125–1.5 billion cells per liter. Very clean styles like Munich helles, Vienna lager, Bohemian and German Pilsner can use even higher rates, 1.5–1.75 billion cells per liter to produce the best results.

It may be surprising to note that strong beers like old ale, Russian imperial stout, Baltic porter and barleywine use relatively middling to high pitching rates. You may think that these beers have a lot of flavor, and they do, but the flavors are typically clean, estery flavors, rather than funky off-flavors. Strong beers need clean fermentations to prevent the off-flavors from overwhelming the beer.

Of course, most homebrewers do not actually count their cells. (This requires a microscope and a hemacytometer. See the December 2003 issue of BYO for more information.) Instead, we rely on estimates of how many cells should be in a given volume of starter wort. For example, according to the pitching rate calculator at mrmalty.com, a 2-quart (2-L) yeast starter, pitched with one pack of yeast and given a single shot of oxygen, should yield roughly 230 billion cells. In practice, estimating cell counts from starter volume yields good beer, but brewers should be aware that it does leave room for considerable variation in the actual cell count.

To consistently brew good beer of any style, the brewer needs to understand yeast behavior, and manage that behavior to his purpose. No single pitching rate is right for every style of beer. The pitching rate is just the tip of the iceberg. The rest of the 'berg is the yeast health, the nutrient resources and the fermentation environment.

John Palmer is Brew Your Own's *"Advanced Brewing" columnist.*

Web extra:

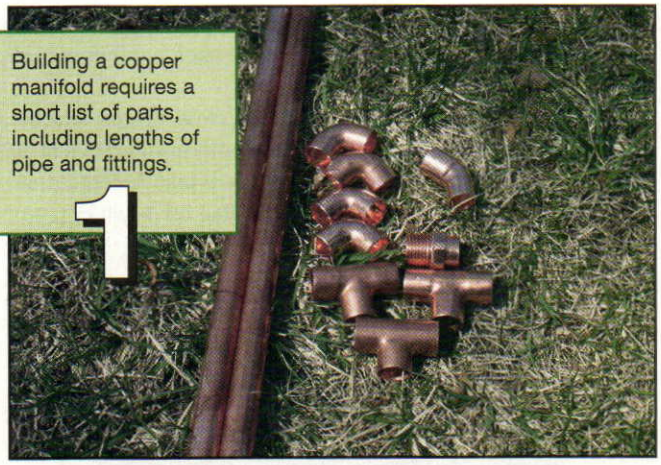
An online chart of pitching rates for fresh yeast, available at:

http://byo.com/departments/1757.html

Copper Collector

Build a manifold for batch sparging

Story and photos by Forrest Whitesides



Building a copper manifold requires a short list of parts, including lengths of pipe and fittings. 1

There are several methods to separate the sweet wort from grain bed in your mash tun, including using a false bottom or a stainless steel braided hose (commercially available for brewing under the name Bazooka Screen, or as a DIY project using braided water supply line). Homebrew great and batch sparging pioneer Denny Conn has a tutorial for making a simple braided hose-based mash tun on the Web at www.hbd.org/cascade/dennybrew/.

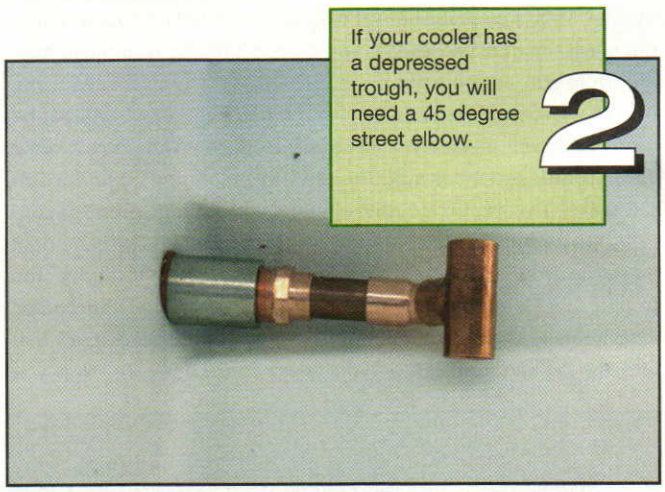
Another option is to use a manifold, which is an array of perforated piping that sits at the bottom of the mash tun and allows the wort to runoff while leaving the grains behind. (Although homebrewers have been using manifolds in their brewing setups for years, the design was appropriated from Anheuser Busch's patented Strainmaster vessel, which had a similar series of perforated pipes through which the wort was drawn.) You can use either hard copper pipe and fittings or CPVC, but for general sturdiness and long-term stability, I highly recommend copper. Despite the skyrocketing cost of copper over the past few years, you can make a copper sparging manifold for about $15. And because there isn't significant pressure put on the pipes (like in a home or industrial water distribution system), there is no need to solder the joints together. This project is both cheap and highly effective. You can have a new manifold with about an hour of construction time. And since it isn't soldered together, it can easily be broken down for cleaning and storage after each use.

Parts-wise, this is a simple project. You can get everything you need with a single trip to the hardware store. And you won't need to go to a big-box hardware store, as the parts are ubiquitous enough that even the smallest mom-and-pop hardware store should carry them (Figure 1).

My mash tun required approximately 60" (152 cm) of pipe to make a manifold that covered most of the interior. The total length of pipe you'll need will depend on the size of your mash tun. My local hardware store sells copper pipe in pre-cut lengths of 24" (61 cm), and I found this to be an ideal size for my own manifold fabrication.

PARTS LIST

- **Approximately 5 feet (1.5 m) of ½-inch hard copper pipe (type M or type L)**
- **(4) ½-inch 90-degree copper elbow fittings**
- **(3) ½-inch "T" copper fittings**
- **(1) ½-inch 45-degree copper street elbow fitting**
- **(1) ½-inch copper male pipe thread adapter**

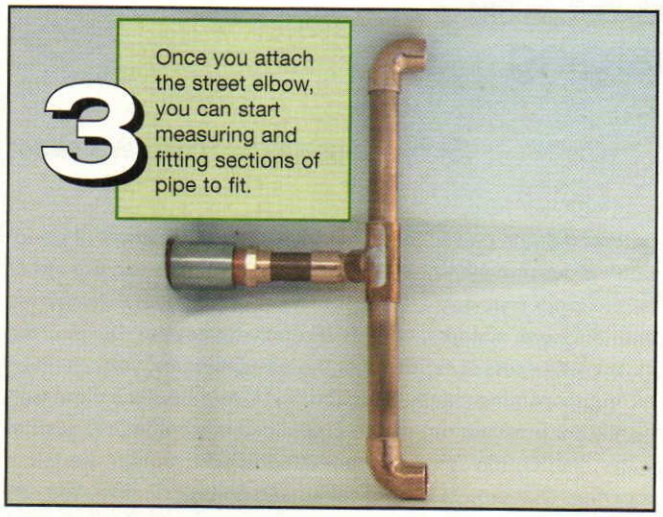


If your cooler has a depressed trough, you will need a 45 degree street elbow. 2

Measure twice, cut once (or maybe twice)

Cutting the copper pipe is fairly straightforward. A common hacksaw is probably the best tool for the job, although you can also use a rotary tool with large metal cutoff wheels (Dremel part number EZ456) with satisfactory results.

The tricky part here is accounting for the length of pipe that is "lost" inside each pipe fitting, which on average is about half an inch. Since all of the pipe sections in the project will be attached to two pipe fittings, you should add approximately 1 inch (2.5 cm) to each length to be cut to compensate. It's best to err on the long



side of each cut, and then shorten each piece a little as needed.

Fitting it together / design ideas

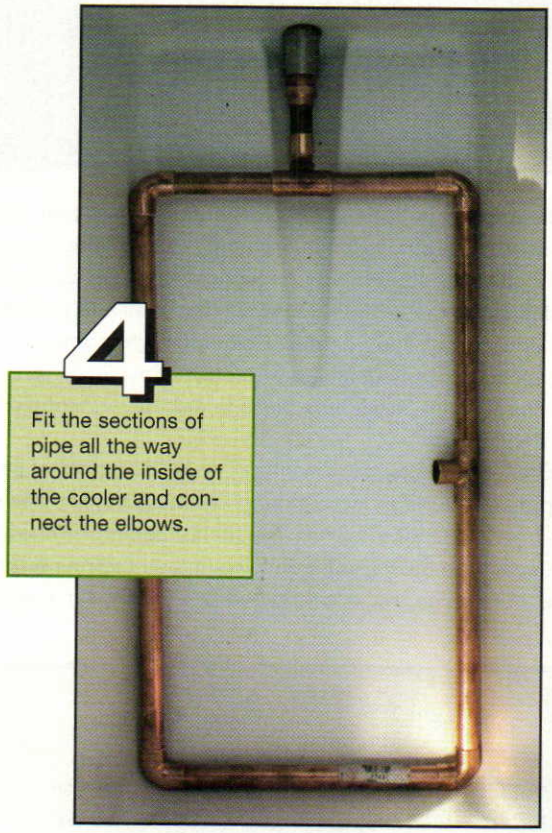
The idea is to run the pipe around all areas of the mash tun to minimize "dead spots" (from which wort is difficult or impossible to collect), and also to reduce "channeling" of the grain. Channeling is mostly an issue for homebrewers in fly (continuous) sparging since in batch sparging the grain is stirred, but pulling the wort from all areas of the mash tun simultaneously is never a bad thing. And a manifold is ideal if you want to fly sparge in a square mash tun (like an Igloo IceCube cooler, for example) where a false bottom will not work.

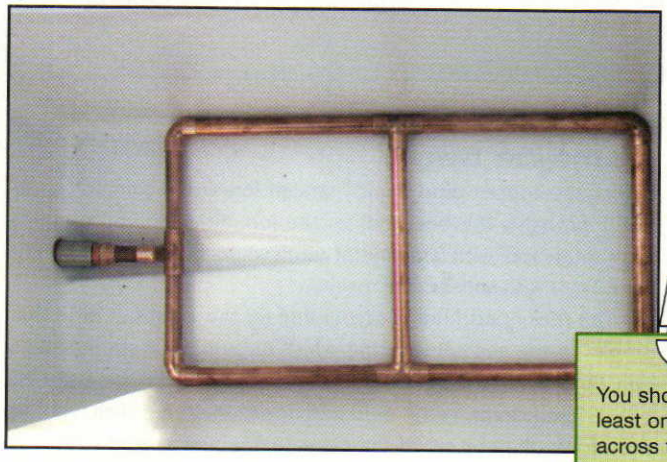
It is important that the manifold sit flush with the bottom of the tun. This is so that as much wort as possible is recovered from the mash tun and also so that you won't hit it with your mash paddle while stirring the grain.

The 45-degree street elbow in the parts list above will not be required for all mash tuns. Mine is based on a Coleman Xtreme 52-qt. cooler and it has a depressed trough leading up to the output valve. The 45-degree elbow, along with a short piece of copper pipe and attached to one of the "T" fittings, was just the right angle, length, and height to elevate the manifold above the trough level and make it flush with the bottom of the cooler. Attach this to the ½-inch male pipe thread adapter and screw that into the bulkhead fitting on your mash tun (Figure 2). Now you can begin measuring and fitting the sections of pipe and fittings. Start from the first "T" fitting and work your way towards the opposite end of the cooler (Figures 3 and 4).

For effective lautering, the manifold should be more than just a ring around the inner edges of the mash tun. You should include at least one section of pipe across the center of the tun (Figure 5). How many cross pieces you include in your design is up to you, but more than two probably won't yield any performance improvements. For each cross piece, you'll need another section of pipe and two "T" fittings.

I made two manifolds: one with two cross pieces and the other with just a single cross piece. They both resulted in similar mash efficiencies, but the double cross piece manifold did drain a little bit faster. One cross piece is just fine for 5-gallon (19-L) batch sizes.





Hacking for better beer

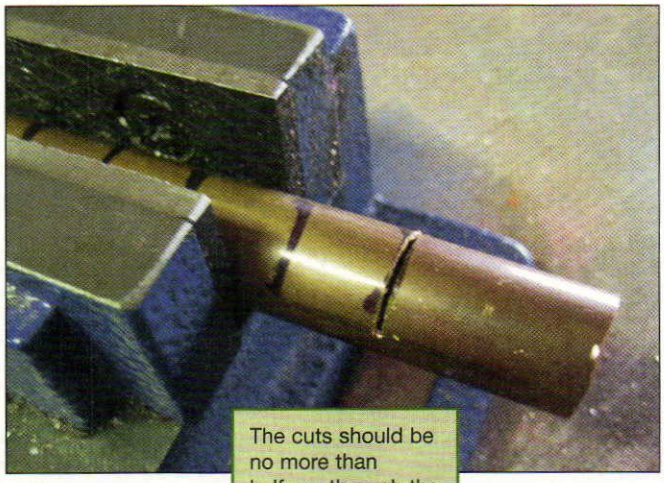
Now that you have your manifold cut to fit your mash tun, all that's left to do is to add some holes to allow the wort to flow through the pipes and out through the ball valve. You can use a drill with a small bit (⅛-inch is a good starting point), but I highly recommend going back to the trusty hacksaw for this task. It's faster and easier than drilling.

On each section of pipe (the straight pieces, not the elbows and other fittings), you should make a cut with the saw about every half inch (Figure 6). You can space the cuts closer together than this if you prefer, but it's not necessary to do so, and I don't recommend going any closer together than quarter-inch spacing. Each cut should be no deeper than a little less

than halfway through the pipe (Figure 7).

Once all the cuts are made, wash all of the pipe sections and fittings in a mild detergent solution. Now reassemble the manifold and it's ready for your next all-grain brew session. If you find that any of the joints don't fit snugly, or that they loosen over time and repeated use, you can manually crimp the loose fittings with pliers to tighten them up.

6 With a hacksaw, make cuts on the straight parts of the pipes every half inch (1 cm).



The cuts should be no more than halfway through the pipe.

7

When he's not brewing beer or writing "Projects" for BYO, *Forrest Whitesides enjoys building his own guitar effects pedals.*

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brewer's log

Briess Malt & Ingredients Company has launched a new Web site dedicated solely to brewers—www.brewingwithbriess.com. The new site includes new features like news, events, a photo gallery and services. Another new section, Create-A-Brew, invites brewers to submit recipes using Briess malts. Brewers submitting recipes are eligible for a drawing to win a bag of Briess malted milk balls. The Web site also has a form to sign up for electronic delivery of the Brewing With Briess newsletter, published quarterly.

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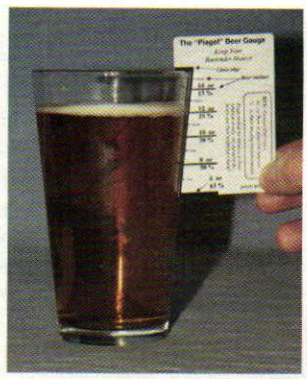

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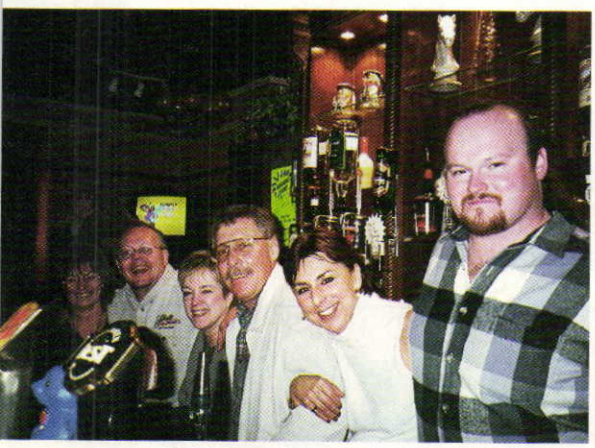
What Ales You?

A brewer finds inspiration at the pharmacy

Rich Rosen • Andover, Connecticut

I first started brewing beer while I was going to school to become a pharmacist. Today I'm a clinical pharmacist and still love to brew. After I graduated from pharmacy school, I became a pharmacist at a local community hospital and have been there for more than 25 years. I started brewing way back in the mid 1970's and about a decade or so later a friend of mine and I started brewing together. My friend, Sam, was also a carpenter and together we constructed an outbuilding on my property that was supposed to be a garage with some additional storage space. Instead it soon was turned into a "Brew House" and we started a homebrew club named the Hop River Brewers, named for the river that runs behind our brewhouse.



Rich Rosen (center) recently brewed a batch of beer with a prescription probiotic.

Being a hospital clinical pharmacist, the doctors, nurses and patients often rely on my professional skills for information and advice concerning administration of medications. Recently, I combined both my pharmacy professional skills and my experienced brewing skills.

One of the gastroenterologists at the hospital where I work requested that the pharmacy obtain a medication named Florastor® for his patients with severe gastrointestinal disorders such as irritable bowel disease, colitis and other gastrointestinal (GI) problems.

I did some research into Florastor® and discovered some interesting facts. The medication he requested is classified as a probiotic drug. Probiotics are names given to a class of medications which are designed to help replenish the bodies natural gut flora which by doing so may be able to reverse or prevent many severe gastrointestinal problems. For years the probiotics *lactobacillus* and *acidophilus*, active strains of live bacteria, often found in yogurt have also been used to treat these conditions. The probiotic our doctor requested (Florastor®) was the name given by its manufacturer, Biocodex, Inc., to its capsules, which contained a strain of live freeze-dried brewers yeast called *Saccharomyces boulardii*.

The history of the origin of this strain of yeast is as follows: Sometime in the 1920s a French microbiologist named Henri Boulard had traveled to Indochina. By chance he happened to observe some of the native population using a tea brewed from the fruit skins of a berry from a tree with the name *Litchi chinensis* to combat diarrhea during a cholera epidemic. He was intrigued, and being a microbiologist he eventually managed to isolate a strain of yeast that may have been responsible for this health benefit. This strain of yeast was later named *Saccharomyces boulardii* after this French man and in time became commercialized, first in Europe after World War II, and more recently in the US. It has been studied for many decades and has shown very good results for a variety of GI conditions.

I've known this doctor for many years and after researching the benefits of this medication the pharmacy elected to obtain some capsules of this *Saccharomyces boulardii* for his patients that may present with these gastrointestinal disorders. The drug was somewhat expensive and I jokingly told him that I have plenty of *Saccharomyces* at home, especially after brewing a batch of beer. He laughed but told me that the research was done using this strain of yeast.

Some of my research revealed that other strains of *Saccharomyces* may have similar benefits. As a pharmacist and a brewer I was quite curious to see if this strain of brewers yeast could produce a decent beer and thus I decided to make an experimental brew using this *Saccharomyces boulardii* strain of yeast. I didn't go overboard, and after opening the capsules to make a starter with some dry malt that started fermenting within 24 hours I decided to make a simple brown ale using a basic beer kit as I had done in my early days of homebrewing.

The beer fermented well and tasted fairly right for its simple style. There was a hint of clove or banana flavor which might indicate that this strain of *Saccharomyces* isolated by the French man Boulardii might be more in line with a wheat yeast strain. And some notes in the literature I read did mention that this yeast survived higher temperatures than some other strains of yeast. So, perhaps the next batch of beer I brew using this yeast should be either a German hefeweizen wheat or Belgium wit brew.

Anyway, I ended up bottling the beer and giving a couple of six-packs to the gastroenterologist that asked the pharmacy to obtain this probiotic. I was going to label the beer "Poop Brown Ale" but decided to be more appropriate (and politically correct) and named it "**G**ee **I** Want a Beer." It was big hit and a few weeks later I was invited to a lecture on probiotics at a local restaurant and asked to bring some of my beer.

The question that remains is, can any unfiltered, unpasteurized brew be helpful with these GI problems? The answer is probably yes, although few studies have been done using beer or other strains of brewers yeast to treat these GI conditions. These days, yogurt, *acidophilus* and other probiotics are becoming quite popular and are available at many pharmacies and health stores. Would wheat beers offer more value than lagers or ales? Who knows, but slugging that last remnant of cloudy yeast at the bottom of beer bottles may end up being a cure or preventative for many GI problems.

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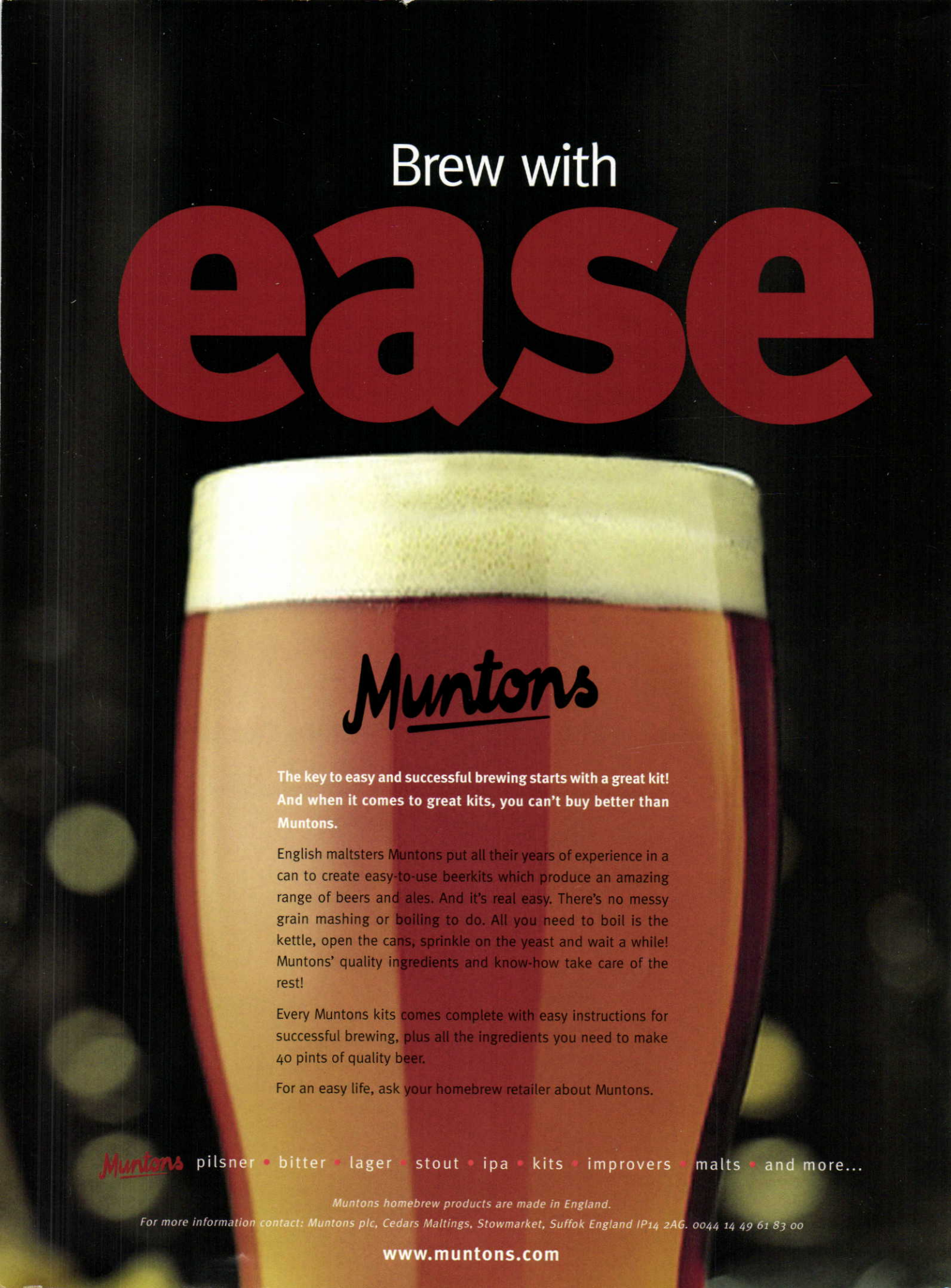
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