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Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2014, VOL.20, NO.4

1 MALT + 1 HOP

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BYO RECIPE STANDARDIZATION

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. For post-boil hop stands, we calculate IBUs based on 10% hop utilization for 30-minute hop stands at specific gravities less than 1.050.

THE BASE MALT OF CHOICE FOR SOME OF THE BEST BEERS

Great beers are made with great malt. Rahr Malting Co. has been making great malt for the past 166 years. Owned and operated by the Rahr family, now in its 5th and 6th generations, Rahr Malting Co. produces some of the finest 2-Row, 6-Row and wheat malts in the world. That's why Rahr malt has been the base malt of choice for some of the best beers and breweries in America. Find out why craft brewers consider Rahr malt the "Malt of Reputation" by trusting your next batch to Rahr Malting Co.

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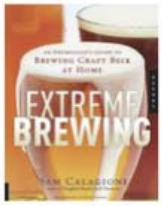
what's happening at BYO.COM

Extreme Brewing



He brought you continual hopping and the 60, 90 and 120 minute IPAs with his brewery, Dogfish Head Craft Brewery. In this excerpt of his book *Extreme Brewing*, Sam Calagione discusses breaking away from the norm and includes five recipes that do just that. http://byo.com/story618

Label Gallery

On page 38 of this issue we bring you the winners of this year's homebrew label contest. But don't forget that there is a gallery of all of the past years' winners you can peruse on the web. http://byo.com/photos/gallery/1

Fruit Beer Recipes

If you get a craving to brew a fruit beer, but haven't been able to decide upon a recipe, check out the "Fruit Beer" category on our "Recipes" tab. We've got everything from Blueberry Brown Ale, to Apricot Harvest Wit, to Lindeman's Lambic clones to Panthers Pee. http://byo.com/fruit-beer

Brewing Experiments: Advanced Brewing

Put your favorite homebrew argument to rest with an appropriate test and replace the hot air of opinion with cold, hard facts of science. It's time to experiment. http://byo.com/story284

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

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Cover Photo: **Charles A. Parker/Images Plus**

Grain mill clarification

The recent article in the May-June 2014 edition encouraged me to repurpose an old washing machine motor and fish tank stand I had lying around. The total cost was about $35, including shipping. The article was excellent. I did however have a slight problem determining the belt length. The part of the formula under step #2 "[(D-d)2]" looks like (D-d) is multiplied by 2 instead of squared "[(D-d)^2]". A little research on the web clarified the formula.

Stan Grass
Sandwich, Massachusetts

BYO *Editor Betsy Parks replies: "Hi Stan. Thanks for writing in, I'm glad you enjoyed the article and found some inspiration! Yes, you are correct — it looks like a number in the formula needed to be squared instead of multiplied. This was an oversight that came about at the editing stage. Thanks for the catch, and enjoy working with your new motorized mill!"*

Induction brewing

I enjoyed Joshua Weikert's article on induction brewing in the March-April 2014 issue of *BYO*, but I wanted to share a couple comments.

The 1800W induction element corresponds to the maximum output of a 120 volt / 15 A electrical circuit. This is the maximum rating for the circuit, and if you try to connect anything else you are likely to be tripping your breaker when the cooktop is at full power. In order to safely use the primary/secondary approach, you should be using separate electrical circuits for each.

At full power, the 1800W induction cooktop would consume the equivalent of 6,142 BTU/h. If all of that energy were transferred into the kettle water, then the best you could do is to raise the temperature by 12.4 °F (6.9 °C) per minute for each gallon in the kettle. Assuming you start with 60 °F (16 °C) water, for each gallon of strike water, you would need 8.3 minutes to bring this up to 162 °F (72 °C). For an 8-lb. grain bill mashing at 1.5 qt/lb, you need 25 minutes to get your

contributors

Brad Smith is the author of BeerSmith homebrewing software and host of the BeerSmith podcast on iTunes. Brad has been brewing for 26 years, is author of the book *Home Brewing with BeerSmith* and also created BrewWiki.com, the BeerXML beer recipe standard. Brad maintains a blog at BeerSmith.com which includes topics such as brewing tutorials, homebrewing techniques, product and book reviews, articles on brewing popular beer styles and brewing news. He also regularly speaks at beer-related events and writes on homebrewing.

In this issue, starting on page 56, Brad introduces us to Single Malt and Single Hop (SMaSH) brewing, which is a great way to scale down your homebrew recipes and develop your brewing ingredient palate.

Mika Laitinen is a homebrewer and industrial mathematician from Jyväskylä, Finland. Unlike most Finns, he does not bathe in a sauna weekly as his sauna is converted to a brewery. He is writing a book about a traditional Finnish beer style, sahti, and he is involved in a Finnish craft brewery, Olutverstas Oy, which is located in Helsinki.

In this issue Mika makes his *Brew Your Own* writing debut with a story about his favorite subject: Brewing sahti at home. Not your typical homebrew, sahti is traditionally brewed over a woodfired kettle with a variety of grains — malted and unmalted — and juniper, then fermented with baker's yeast. If you want to give this primitive beer a try, turn to page 28.

Dave Louw is a software development manager who channels his need to build things into his many hobbies including homebrewing. He enjoys experimenting with processes and ingredients and his homebrewery is constantly in a state of flux.

Dave is a founding member of the San Luis Obispo Brewers club and can be found the second Sunday of every month at his local homebrew shop sharing beers with friends. Dave has written stories for *BYO* in the past, including "Homebrewing Cask Ales" in the July-August 2012 issue, and "No Sparge Brewing" in the November 2011 issue. This time around, Dave shows us how to outfit a truck or van with a mobile draft system, which starts on page 66.

3 gallons (11 L) of strike water to temperature.

If the runnings come off the mash at 150 °F (66 °C), it will take approximately five minutes to bring each gallon of wort up to boil — nearly 25 minutes to get the full 5-gallon (19-L) volume from mash temperature up to a boil. Once you are boiling, the 1800W maximum corresponds to a boil-off rate of about 0.8 gal/hr. That's over 3 quarts (~3 L) of water that would go into the air in your room.

The numbers I used are assuming that all of the energy goes into heating the water in the kettle. But the induction unit will be less than 100% efficient, and of the heat that gets into the kettle, some of this has to heat up the kettle itself, and some will be lost from the outside of the kettle. You can minimize this with insulation, but generally you can expect that all heating times will be higher than the above values.

I am not against induction for brewing — I like to focus on smaller batch sizes, and the times are not unreasonable for the better convenience it offers. But I think that anyone trying to brew 5-gallon (19-L) batches should be aware of the limitations, and set their expectations appropriately.

Charles Simchick
via email

Story author Joshua Weikert replies: "Thanks for taking the time to read and respond to the article! As you correctly point out, 1800W is the max for a 120/15 circuit. The process described — although it does indicate the use of two induction heaters — never puts the total draw at more than 1800W. When both are in use, there's usually a 1200/600W split between the two, so as to avoid any circuit breaker trips.

As for the timing of heating strike/sparge water and bringing the wort to a boil, I'm sure your numbers are correct, but they rely on a couple of false assumptions. For one, the starting temps are much higher for the strike water. Generally speaking, my tap water on hot enters the pot at about 125–130 °F (52–54 °C), not 60 °F (16 °C), which cuts down the heating time significantly. For the heat up to the boil, you're right that 150 °F (66 °C) coming out of the mash tun would take about 25 minutes to reach a boil — but given the higher mash-out/sparge temp (my wort is usually at about 162 °F/72 °C when it drains) you're saving some time. Also, induction allows you to begin heating the wort immediately from the start of run-off, so the entire time you're draining the wort you're also starting to heat, which lets you double-dip the heating and draining time. If you factor in about ten minutes to drain the mash tun, you're already well on your way to the boil at that point." BYO

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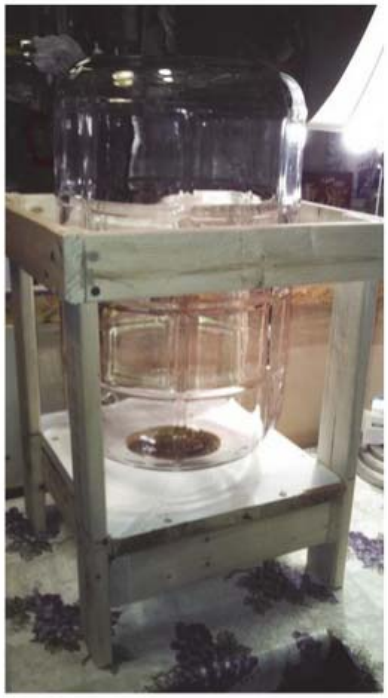
READER PROJECT: Carboy Drying Rack

Ted Smith • Lincoln, Rhode Island



Parts and Materials List:

(2) 8-foot (2.4 m) furring strips, cut into (4) 18-inch (46-cm) pieces and (4) 13.5-inch (34-cm) pieces
1 scrap piece of plywood cut to 10.5-inches by 13-inches (27-cm by 33-cm)
1¼-inch drywall screws
Drill/screw driver
Hole saw/jig saw

An ongoing source of irritation I have been dealing with during the last 15 years has been how to dry my cleaned carboys.

You can get a plastic tree for bottles almost anywhere, but you won't find anything for your carboys — at least I haven't found anything to satisfy my needs. I have tried rigging up things using a clothes drying rack as well as a tilted shelf with a strip of quarter-round toe-kick to hold the carboy in place, and one or two other questionable alternatives — one time costing me a carboy that slipped and shattered all over my cellar work space.

I had seen (or perhaps read somewhere) one attempt to address this need — a wooden plate or plank with a central wooden spindle over which you would place your carboy. But that meant dealing with a wet wood plate and a wet spindle extending up into your bottle — not to mention the opportunity for invasive spoilage beasties to get inside the carboy.

Finally, I created my own design and made an easy, inexpensive carboy holder. It looks like a small, crudely-built side table or coffee table with no top and with what might look like an upside down drawer screwed to the legs about ¾ the way down. There's a 5-inch (13-cm) hole in the center of the upside down drawer. Five inches (13 cm) is the largest hole-saw dimension that I have, but you could do a different size or use a jigsaw to tailor the hole size to your needs. You just need to find the center of the board by drawing lines through the middle of the length and width of the board

This will safely hold a carboy from 5-7 gallons (19-27 L) in size upside down and will allow it to drip dry. I used a discarded end piece of a plank for the drawer-like box frame and then cut my hole in the center, but you can use plywood or any similar scraps you may have lying around from that last project you did around the house.

I bought two furring strips because they are inexpensive, and then cut them into four pieces that are 18 inches (46 cm) for legs, four pieces that are 13.5 inches (34 cm) for braces for the top, and two 10-inch (25-cm) pieces and two 13-inch (33-cm) pieces for the arms. Then I used a scrap piece of wood that I cut to 10.5- by 13-inches (27- by 33-cm) for the shelf that sits 2.5 inches (6 cm) up from the bottom of the legs with a 5-inch (13-cm) hole in the center of it. I also made an inner box frame that the shelf sits on for added strength and I surrounded the top of the table with four braces for added support and handling. As easy as that, I now have a sturdy, reliable carboy drying rack.

byo.com brew polls

Have you ever brewed a SMaSH (single malt and single hop) beer?

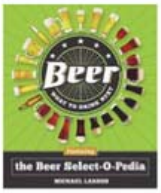
Not yet 46%

Yes, SMaSH brewing has a lot of benefits 45%

No, I prefer complexity 9%

what's new?

Beer: What to Drink Next



Beer: What to Drink Next, by Michael Larson, brings a whole new light to finding and selecting beer. The book includes over 96 beer styles and organizes them by key ingredients and country of origin. Accompanied by each style description is the beer's "atomic structure," a list of three similar beers worth testing, and suggested food pairings. This guide takes a simple, scientific approach to help drinkers discover new favorites and to enrich them with tasting notes and fun facts, making drinking beer that much more enjoyable. Available at major booksellers.

Beer Soap

Artisan soap maker Shelly Holbrook-Ebeling has combined her love for soap and beer. The family-owned Seattle Soap Shop has developed five beer soaps — Oatmeal Stout, Pumpkin Lager, Raspberry Porter, Real Guinness, and Spiced Honey Ale. Like craft beer, all of the handcrafted soaps are made in small batches. Each beer soap contains actual beer as an ingredient (but don't worry, they do not make you smell like beer). For more information, visit www.seattlesoapshop.com.

The GrOpener

Thanks to photographer and part-time inventor Mark Manger, two hands for your bottle opener is no longer a necessity. The GrOpener is a small, lightweight metal bottle opener to make opening a beer bottle a simple, one-handed maneuver that is fast and possible for everyone. Whether you're a righty or a lefty, just place your index and middle fingers on the GrOpener, grab your beer, and *voilà*! Consider your bottle opened! Not only is it quick, but the GrOpener also removes bottle caps without bending or scratching them, leaving any cap collectors happy. Learn more at www.grabopener.com.

Homebrew Beyond the Basics

Written by Mike Karnowski, the Head Brewer of specialty beers at Green Man Brewery in Asheville, North Carolina, *Homebrew Beyond the Basics* shows you how to brew all-grain, starting with a look at brewing equipment and the steps you'll go through on brew day. It tackles malts and different ways to mash, it goes in-depth on the topic of hops, and also explores yeast varieties and the important practices surrounding them. Sprinkled throughout the book are recipes for a variety of homebrews, including funky, sour, and wood-aged beers. It also explores a variety of nontraditional ingredients including fruits, herbs and spices that can be used to make beer. Available at major booksellers.

NATIONAL CAPITAL HOMEBREW COMPETITION

calendar

July 16
E.T. Barnette Homebrew Competition
Fox, Alaska
$500 will be awarded to the Best of Show at the 18th annual E.T. Barnette Homebrew Competition. Great prizes and custom medals will also be awarded to the 1st, 2nd, and 3rd place winners of each of the seven judged categories, which are bock, English pale ale, American ale, porter, stout, IPA, and fruit/spice/herb/vegetable beer. Entries for this AHA/BJCP-sanctioned event will be accepted June 23-July 16 and judged July 19.
Entry Fee: $5 per entry
Web: www.mosquitobytes.com/Den/Beer/Events/Events.html#ETB

July 17
National Capital Homebrew Competition
Ottawa, Ontario
This BJCP-sanctioned event coincides with the National Capital Craft Beer Festival. The submission deadline is July 17 and winners will be announced August 17. The Best of Show winner will receive the opportunity to brew their winning recipe with the brewer at Beau's All Natural Brewing Co. A special "Belgian IPA" category will also be judged and the winner will work with Cassel Brewery to brew it on a commercial scale.
Entry Fee: $6 per entry
Web: www.nationalcapitalhomebrew.tumblr.com

August 11
Washington State Fair Amateur Wine and Beer Competition
Puyallup, Washington
This is the state's largest event of its kind. Judging will take place August 24, but the deadline to receive mailed entries is August 11. Entries can also be dropped off in person on August 16. First, second, and third place finisher in each BJCP category will be awarded ribbons and rosettes, and $8 will also be awarded for first place entries and $6 will go to second place entries.
Entry Fee: $3.50 per entry
Web: www.thefair.com

homebrew drool systems

Brew Shed

Mike Taylor • Salem, Oregon

After brewing in the kitchen and then the garage, I decided to build a brewhouse. My son and I built my new brewing confines out back; a 10-foot by 16-foot (3x5 m) shed from a kit that was reasonably inexpensive and easy to build. And so became "Rock Creek Abbey Brewing Company." It is fully insulated and plumbed with a loft to store bottles and kegs. It has been a complete joy to my brewing and to some in my homebrew club — The Capital Brewers Club in Salem, Oregon.

The brewhouse has Cascade hops growing in whiskey barrels up and over the front entrance. Centennial hops are growing up the back of my house. It is a complete joy to get up early for a brew day and have this sight to begin the day. It is equipped with quick disconnect power and water, so no permit was needed.

My system is pretty simple, 15-gallon (57-L) pots, a March pump, two burners and a homemade counterflow chiller. On the right there are two homemade keg fermenters. Kegs are upside down with a clover clamp dump valve connected to the Sanke connector and a corny lid on the top, which used to be the bottom of the keg.

The March pump has been fitted with garden hose "Y" valves (no brass) to direct the wort. The top lines are out to the counterflow chiller and a racking cane on the other side. The bottom lines are inlets from the kettles. I fondly refer to this as the "Wort Flux Capacitor." All connections are quick disconnect for easy cleaning.

TAKING NOTES

by lauren keyes

Remember that gold medal beer you brewed last year? The one with the perfect amount of crispness, a head that made you salivate at first glance, and with that indescribable and unique flavor — the one that seems almost impossible to replicate? You'd do anything for just one more bottle of that exceptional brew. You tried to replicate the batch, but it just wasn't the same. Something was missing, and now, while your taste buds tickle your tongue with nostalgia of that delicious taste, you can't seem to remember what that damn recipe was. You sit, reminiscing for a while longer, until you realize, "Hey! I took notes on that!"

For homebrewers, taking notes is a crucial strategy for making a great beer. A good, well-organized brewing log can be utilized any time you're starting a new batch. Perhaps you want to repeat that perfect beer; if you took good notes the first time, making a second, equally successful batch will be that much easier.

When taking notes, it's crucial that you have a good file-building system. Keeping notes neat and organized is always helpful, and it's important to establish a format that works best for you from the get-go. Your notes should cover the obvious things such as what ingredients (and how much of those ingredients) you use, gravity readings, and procedures. Perhaps you added a ½ lb. (0.23 kg) of chocolate malt to your recipe; that stout would taste very different without that addition or with a different amount of it. Similarly, the hops you used in a brew one year could be very different from the hops you're using now, so noting alpha acids, aromas, and bitterness is a great way to ensure that you achieve the same results later on.

You should also make a record of your brewing and fermenting procedure; include each and every step, time, and temperature. Most importantly, take tasting notes frequently and update them as you go. An experienced brewer is able to recognize a good beer when he sees, smells, and, tastes it. (He should also love the sound and feeling of a cold one being poured!) Take advantage of your skillful senses. Record the different scents and flavors that you notice and whether they are what you were aiming for or if they are off. What is the source of that distinct pungency? If you find that your brew is too bitter, write that down.

A good brewing record can make your future in brewing a very enjoyable one. Detailed notes help when you're trying to identify mistakes in your beer. If you're wondering whether you're facing a recipe issue versus a procedural issue, looking through your notes will help determine that. If you've encountered, for example, a slight funkiness in your brew or bacterial contamination, something probably went wrong during your brewing (or sanitizing) procedure. Maybe your brew tastes fruitier than you wanted it to. Here, you're likely dealing with a recipe or fermentation issue. Looking back through your notes, retracing your steps, and comparing recipe logs will help you identify why your results aren't what you'd hoped they would be and help you to make the proper adjustments.

On the other hand, perhaps you made a beer that was too awesome not to return to. If you took notes on it, you can replicate it, share it with friends, and experiment with it by making slight modifications to the recipe. Who knows? Maybe your "too awesome" beer could be even more awesome with a couple of calculated tweaks.

Your brewing log can be your best friend if you're loyal to it. Take good notes, revisit them from time to time, and brew away!

by marc martin

DEAR REPLICATOR, MY BREWING PARTNER WENT ON A BEER TREK TO ASHEVILLE, NORTH CAROLINA, AND BROUGHT ME BACK A GROWLER OF RETICENT SAISON FROM WICKED WEED BREWING. IT WAS GREAT, PLUS MY WIFE WENT NUTS FOR IT. SHE WANTS ME TO DRIVE UP THERE TO BRING BACK MORE BUT I TOLD HER YOU COULD HELP ME FIGURE OUT HOW TO BREW IT AT HOME.

JIM DAVIDSON
ATLANTA, GEORGIA

In 1519, King Henry VIII declared, "hops are a wicked and pernicious weed destined to ruin beer." Obviously, that didn't thwart their use, but the declaration led to the naming of one of the most successful new brewery start-ups in Southeastern U.S., the Wicked Weed Brewing Company. Hops are abundantly used here and reside comfortably alongside Old-World Belgian styles.

Many homebrewers have a burning desire to brew their favorite recipes on a commercial scale. Brothers Walt and Luke Dickinson had those same dreams and found a way to make it a reality.

The older brother, Walt, began homebrewing in 2001. Wanting to share the hobby, he gave Luke a homebrewing kit for his 21st birthday in 2004. Luke took the hobby the furthest after getting a copy of Sam Calagione's book *Extreme Brewing*. His wife's family was from Milton, Delaware, and in order to get his foot in a breweries' door, Luke volunteered at Dogfish Head Brewery. After working in their merchandise and tour departments, Sam invited Luke to brew his first all-grain batch with him on their 5-barrel pilot system. It was then that Luke realized he wanted to make his hobby a vocation. In order to hone his skills he spent six weeks interning in Rossknecht Brewery in Ludwigsburg, Germany.

The brothers originally planned to open a business in Chattanooga, Tennessee, where the family of Walt's wife lived. However, around the same time the parents of a longtime friend, Ryan Guthy, were interested in opening a restaurant and bar in Asheville. After sampling some of the brothers' beers and learning of their desire to open a brewery, a business marriage was born.

They opened the doors in December 2012. Now they brew their recipes on a 15-barrel Specific Mechanical system that includes 15 fermenters and 5 bright beer tanks. Traditional Belgian styles are even fermented in a glycol-chilled, open fermenter in a special sealed room with HEPA filtration. In 2013, production was a very impressive 2,900 barrels and growth for this year is expected to hit about 4,000 barrels.

Reticent Saison is a great representation of this classic style. This beer pours a slightly hazy golden with a fine khaki colored head that laces the glass nicely. The combination of wheat, rye and flaked oats add to the body and the heading qualities. They report that the open fermentation coupled with a higher fermentation temperature accent the esters produced by the yeast. Those esters produce flavors of clove, pear, orange and green apple. Bittering is very subdued but the late addition hops produce a delicate floral and fruity hop nose.

Jim, you won't have drive to Asheville for a growler of Reticent Saison because now you can "Brew Your Own." For more in about Wicked Weed Brewing Co. visit www.wickedweedbrewing.com. BYO

Wicked Weed Brewing Company's Reticent Saison Clone

(5 gallons/19 L, extract with grains)

OG = 1.052 FG = 1.007 IBU = 26 SRM = 4 ABV = 6%

Ingredients

3.3 lbs. (1.5 kg) Muntons, extra light, unhopped, liquid malt extract
22 oz. (0.62 kg) light dried malt extract
1 lb. (0.45 kg) 2-row pale malt
10 oz. (0.28 kg) wheat malt
10 oz. (0.28 kg) rye malt
10 oz. (0.28 kg) flaked oats
4 oz. (0.11 kg) acidulated malt
3 oz. (85 g) honey malt
7.9 AAU Warrior® hop pellets (60 min.) (0.5 oz./14 g at 15.8% alpha acids)
0.6 oz. (17 g) Tettnang hop pellets (0 min.)
0.8 oz. (23 g) Mosiac™ hop pellets (0 min.)
0.6 oz. (17 g) U.S. Saaz hop pellets (0 min.)
½ tsp. Irish moss (30 min.)
½ tsp. yeast nutrient (15 min.)
White Labs WLP566 (Belgian Saison II) or Wyeast 3711 (French Saison) yeast
Priming sugar (if bottling)

Step by Step

Steep the crushed grain in 2.5 gallons (9.5 L) of water at 151 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (2 L) of hot water. Add the malt extract and boil 60 minutes. Add the hops, Irish moss and yeast nutrient as per the schedule. When done, 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 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Keep the beer at 68 °F (20 ° C) for 48 hours and then let it free rise until fermentation is complete. Condition 2 weeks and then bottle or keg.

All-grain option:

This is a single step infusion mash using an additional 2 lbs. 2 oz. (0.96 kg) 2-row pale malt and 5.5 lbs. (2.5 kg) Pilsner malt to replace the liquid and dried malt extract. Mix all of the crushed grains with 3.5 gallons (13 L) of 170 °F (77 °C) water to stabilize at 151 °F (66 °C) for 60 minutes. Slowly sparge with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the Warrior® hop addition to 0.4 oz./11 g (6.3 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe is the same as the extract with grains recipe.

Pushing Style Limits

tips from the pros
by Dawson Raspuzzi

Swimming against the current

THE CRAFT BEER INDUSTRY IS CONSTANTLY EVOLVING. BREWERS ARE ALWAYS ON THE LOOKOUT FOR NEW, UNIQUE INGREDIENTS, WAYS TO PUMP UP IBUs AND ABVs, AND PEERING BEYOND TRADITION FOR OTHER STYLISTIC BOUNDARIES THAT CAN BE PUSHED.

Any style is open to interpretation — if you vary a specification of a stylistic guideline by one iota, then that is your interpretation. While I am known for not brewing to style, there are certain classic styles I respect and try to emulate like Oktoberfest Märzen and Altbiers.

As a brewer, I believe it is up to you to brew what you like and introduce customers or your friends to new tastes. I brewed a Cascadian dark ale and a session IPA 10+ years ago if that tells you anything! When guidelines of a style are pushed, you have to decide whether it should be labeled as an entirely new style. I believe Cascadian dark ale (or black IPA) deserves to be its own style because it is completely unique. Double IPAs are above and beyond most American and definitely English IPAs, so they had to call it something!

Of course, it takes real consideration to design a new recipe that breaks away from the ordinary, not just making changes for the sake of it. I've tasted a few commercial beers that went too far – annoyingly cloying hop flavors with no framework or just really odd ingredients.

When it comes to designing a recipe that strays away from convention, just as in culinary arts, you look for ingredients that complement and contrast certain flavors and/or an inspiration comes to you.

John Maier has been the Brewmaster at Rogue Ales in Newport, Oregon, since their start in 1989 and has won over 1,000 awards for his brews. After a career as an electronic technician, John graduated from the Siebel Institute in 1986 and has been brewing ever since.

We have always been internally driven and very passionate about creating new and unique beers; not only to introduce customers to new tastes, but to enjoy them ourselves too!

I feel every style is open to interpretation, as long as the brewer explains to the consumer exactly what the intention is. For example, if you're going to make a beer that is technically a German Pilsner, but use American hops instead of Noble hops, tell people the reason you chose American hops. Don't try to pass it off as a "classic" German Pilsner.

Brewing to style is like learning the basics of any art form; it's a good way to measure your skill level and accuracy. I don't often attempt to brew strictly to style, but when I do, I think it's important to keep the classic styles true to the original form in order to preserve tradition.

Whether you can push too far is subjective, but yes, a brewer can go too far. I have done it, and I have tasted beer from others who have done it. I think it is more common to go too extreme now. There are a lot of new brewers popping up that may not have mastered the basics first, and instead jumped right into the crazy beers to gain recognition.

When designing a style-pushing recipe the thought process is a little different each time for me, depending on the inspiration. Usually it starts with isolating conventional ingredients and characteristics that will enhance or complement the new idea in order to make it work. Once I have the base of the beer and the conventional ingredients sketched out, I move on to figuring out the best way to introduce the non-conventional ingredient or technique into the brew. Then, it's time for trial and error.

If you're nervous about messing up a full-sized batch, scale your recipe down to 1 gallon (4 L) and try that first. An advantage homebrewers have is that it is cheaper if you fail, and it's easier to keep it a secret!

Tony Hansen started brewing at Michigan's Short's Brewing Co. in 2006 and became the Head Brewer in 2009. Tony manages production operations in the Elk Rapids production brewery, oversees pub production along with R&D brewing, and designs the beer, the branding, and the names for many of Short's brews.

Matt Brophy got his first job in the industry as an Assistant Brewer at Flying Fish Brewing Company in 1997. After graduating from the Siebel Institute, Matt moved to Denver to work at Great Divide and quickly became Head Brewer. From there, Matt became Head Brewer at Flying Dog in 2003 — moving just a few blocks down the street in Denver and later across the country to Flying Dog's new facility in Frederick, Maryland. He has since become Brewmaster and Chief Operating Officer at Flying Dog.

We're continually experimenting in the brewery with new ideas. Barrel aging, experimental firkins, and pilot brews — it's these programs that introduce us to beers we love.

There is nothing wrong with brewing to style if there is a specific style you're looking to replicate. At the same time, if you want to push the limits, you can get creative with any style. But do just that; be creative. Just bumping alcohol and slapping "Imperial" in front of a traditional style is not the pinnacle of creativity.

"Styles" are good reference points to aid the conversation surrounding a new beer concept. Don't look at it as pushing the limits, as the creative process should not be limited. Reverse-engineer the concept. Start with the vision of the finished beer then work backwards. If then the beer lends itself to certain style descriptions, then great. If not, describe what it is and call it what you want. A brief description of the beer should provide the customer with what they need to know to make an informed decision.

When it comes to homebrewers, the stakes are lower when brewing 5, 10, or 20 gallons (19, 38, 76 L) of wort. Losing 50 barrels (~1,600 gallons) of wort or beer can be a big deal. Flying Dog is currently in the process of moving from a 1 bbl pilot brewery to a professionally fabricated, complete 15 bbl brewery. This will allow us to experiment without tying up the resources of our 50 bbl production brewery and limiting our risk if a recipe or concept does not play out the way we were planning.

The craft beer industry would not be where it is today without homebrewers who have pushed the limits. If you don't have an experimental beer go awry now and then, you're not trying hard enough. But remember, it's more of a challenge to truly innovate than it is to throw some crazy process or ingredient in a recipe. BYO

To Rehydrate Dry Yeast

Bottle bombs, fading hops

help me
mr. wizard
by Ashton Lewis

Q BEING NEW TO HOMEBREWING, I AM READING AS MANY BOOKS AND MAGAZINES AS I CAN, REVIEWING SITES LIKE BYO.COM AND PORING OVER THE MESSAGE BOARDS. THE REHYDRATE/DON'T REHYDRATE DRIED YEAST DEBATE HAS GOT ME CONFUSED. SO FAR I'VE ONLY USED SAFALE US-05 AND PITCHED IT DRY IN THE WORT FOR BOTH OF MY BATCHES. THE BEER WAS GOOD IN THE FIRST BATCH, AND THE JURY IS STILL OUT ON THE SECOND SINCE IT'S STILL FERMENTING. IS THERE A FINAL VERDICT YOU CAN OFFER ME? OR SHOULD I JUST START STRICTLY USING LIQUID YEAST? I PREFER HOPPY IPAS AND BEERS WITH A GOOD HOP CHARACTER AND PLAN TO BREW THOSE EXCLUSIVELY VERY SOON.

JUSTIN COOKE
YUMA, ARIZONA

A It has been a while since I have used dried yeast and did a little reading before answering this question. All good references I found on this topic did not leave any doubt in my mind about what is best for the yeast cell, and that is to rehydrate dried yeast with water prior to pitching into wort (or must for any winemakers out there in the audience).

The basic reason behind this practice is that cell membranes serve a variety of important functions for the cell and these functions all require membranes that are fluid. And when dried yeast cells are hydrated in a liquid other than water, like brewer's wort, there is a short timeframe when compounds that ordinarily do not pass across the cell wall do indeed cross the cell wall. This leads to a reduction in cell viability in comparison to yeast that has been hydrated in warm water. While the optimum rehydration temperature seems to be strain-dependent, the range cited is usually 95–105 °F (35–41 °C). As the rehydration temperature decreases, viability following rehydration also decreases; rehydrating in water warmer than 105 °F (41 °C) also decreases viability.

The likely cause for this on-going debate is that rehydrating in wort does not result in total failure. So the argument follows that rehydrating in wort works, therefore arguments about rehydration in water and improved viability are simply textbook. In practice, commercial breweries place yeast viability and vitality towards the top of yeast topics that clearly influence beer quality. I believe in the "put your money where your mouth is" gauge. Based on what is said and done *vis-à-vis* equipment investments in pursuit of yeast viability and vitality, the logical conclusion is that this is indeed a worthwhile pursuit.

> "In practice, commercial breweries place yeast viability and vitality towards the top of yeast topics that clearly influence beer quality."

My recommendation to new homebrewers is to add different techniques as the basics are mastered and when new and more advanced brewing methods are an avenue to either better beer or something of practical interest. I certainly would not suggest jumping from dried yeast to liquid yeast simply because there are two arguments about yeast hydration. You can certainly brew excellent tasting beer using dried yeast and the basic science suggests that hydrating in warm water prior to pitching is the best way to handle this type of yeast.

Photo by Les Jörgensen

Q I HAVE BEEN BOTTLING IN BOMBERS FOR THREE YEARS WITHOUT ISSUES. FOLLOWING MY NORMAL PROCESS I HAVE HAD FOUR DETONATIONS AND EVERYTHING HAS BEEN A FOAM FOUNTAIN FOR MY LAST THREE BATCHES. WHAT COULD HAVE CHANGED TO CAUSE THIS?

MARK CONNER
VANCOUVER, WASHINGTON

A Bottle bombs are really scary because glass shrapnel can cause severe injuries. The first question that always comes to my mind when hearing about this problem is "how old is your glass?" Some brewers re-use bottles over and over again and eventually the bottles begin to fatigue and fail. Breweries using returnable glass bottles have glass inspection systems to help spot glass with fractures and remove suspect bottles prior to filling. However, I don't think this is your problem because of the foam fountains you mention.

If you were a new brewer I would suggest that you get control of your bottle conditioning, but my gut tells me that you have bottle conditioning figured out and you are not simply adding too much priming sugar. I think your problem is with super-attenuation. This happens when something in your bottle is able to convert unfermentable dextrins into fermentable sugars. And the most common critter that causes this to occur is *Brettanomyces*. Considered a wild yeast by most breweries, *Brettanomyces,* or simply *Brett*, is increasingly being welcomed through the front door of many a brewery.

The problem with *Brett* is that this yeast is hard to kill and is a whole lot like garlic, in that a little bit goes a very long way! A few viable *Brett* cells in a beer bottle will slowly find food from sources unusable by "normal" yeast. Over time, *Brett* will cause bottles to become highly carbonated and turn them into the occasional grenade. I personally like *Brett* when I want certain aromas and flavors. But when unwelcome, this yeast is a real problem and I have a hunch that this may be the source of your problems.

If you have not been dabbling with *Brett*, I suggest verifying that the beers you package are indeed done fermenting prior to packaging (research "forced fermentation"), double-checking your dosing procedures and checking the glass you are using.

Q I'VE BEEN HAVING THE SAME ISSUE FOR THE LAST SIX BATCHES OF IMPERIAL IPAS. I MAKE A CLONE OF RUSSIAN RIVER BREWING'S PLINY THE ELDER THAT GOES FROM SPOT ON IN THE SECONDARY TO ROSE-FLAVORED MALTINESS THAT LOSES ALL ITS CITRUS/PINEY CHARACTER TWO DAYS AFTER KEGGING. I'M VERY CAREFUL WITH SANITATION AND NO COMMON STRAINS OF WILD YEAST OR BACTERIA WERE PRESENT WHEN I HAD THE BEER ANALYZED. WHEN I'VE ASKED RUSSIAN RIVER BREWER VINNIE CILURZO AND OTHERS, THEY SUGGEST IT MUST BE OXIDATION SINCE THE BEER CHANGES SO RAPIDLY. I'VE TRIED TO ADJUST MY KEGGING PROCESS AND USED A LONGER SIPHON TUBE TO MAKE SURE IT REACHES TO THE BOTTOM OF THE KEG AND PURGED THE KEG WITH CO_2 PRIOR TO THE SIPHON. I COLD CRASH IN A REFRIGERATOR AND THE AIRLOCK REVERSES FLOW WHILE THE BEER CHILLS DOWN, BUT I FILL THE AIRLOCK WITH BACARDI 151 TO KILL ANYTHING IN THE REVERSE AIRFLOW. CAN THE SMALL AMOUNT OF AIR THAT WOULD ENTER DURING THE REVERSE FLOW IN COLD CRASHING CAUSE A SIGNIFICANT OXIDATION ISSUE? OR COULD MY PROBLEM HAVE SOMETHING TO DO WITH MY HOPS OR BAD CO_2?

JEFFREY GICK
LEESBURG, VIRGINIA

A I think the most difficult thing about trying to troubleshoot brewing problems in my column is not being able to taste the beers that I am being asked about. I sometimes flash to hearing car owners attempt to describe the sounds their cars make to Click and Clack on *Car Talk*. I just happen to be down the street from Monk's Café in Philly and did have a pint of Pliny to help me imagine what may be happening! Based on your description, I think you either have an oxidation issue and/or hops that are not the best quality. Low-quality carbon dioxide is a possibility, but I would rank that pretty low on the scale. Another thing that may be happening is headspace scrubbing from the O-ring in your Corny keg, but this is another low odds explanation in my opinion.

So let's talk about oxidation a little bit. These super hoppy beers do have aromas that are very sensitive to oxygen and the fresh hop aroma can quickly fade when these beers sit in a serving tank/keg for relatively short time periods when oxygen is present. While a small amount of oxygen may enter an airlock during cooling, the volume of gas sucked into the headspace is relatively small.

You did bring up this topic and it is something worth discussing. I personally have never liked the practice of allowing liquid in an airlock to suck into a fermenter when the fermenter is cooled because it simply seems inexact and it does not do anything constructive. Assuming the headspace volume is 1 quart (1 L) and the fermenter is cooled from 68 °F to 32 °F (20 °C to 0 °C), the ideal gas law tells us that 68 mL of gas must flow into the headspace to maintain a constant pressure. This means that there is a vacuum created in the headspace that must be balanced by 68 mL of gas being pulled into the airlock from the atmosphere and that the alcohol you put in the airlock will always be sucked

into the carboy to allow gas to flow.

I would rather plug the top with cotton and simply allow the gas to enter without adding a shot of booze to my beer. The cotton ball plug is something that has a long history of use in microbiology labs and does present a handy alternate use if you really are worried about oxygen from cooling. You could insert a small hose in the headspace of your carboy, stuff in the cotton plug and very, very slowly flow carbon dioxide into the headspace during cooling. This would create a flow of gas out of the carboy and preserve the integrity of the headspace. I do not believe that this is going to solve your issues, however because this is not much gas.

The bigger possibility is within your secondary vessel. When a keg is flushed with carbon dioxide the contents of the keg still contain oxygen. A common misnomer with gas purging is that carbon dioxide displaces air as it "pistons" up the keg from the bottom; this argument looks good on paper but is not how things really happen in a keg. Temperature differential in the keg and gas flow into the keg both cause gas mixing to occur and this ends in a dilution effect versus what many envision as a blanket pushing up from the bottom of the keg.

And depending on how long the keg is flushed the oxygen content is likely to be high enough to pose significant oxidation risks; especially if the keg is shaken to speed up the carbonation process because this will also speed up the dissolution of oxygen. Brewers who have measured the oxygen content of gas flowing out of vessels being purged with carbon dioxide know that it can take a long time to achieve very low levels of oxygen in the tank. A much easier way to purge a vessel is to fill it up with water and then displace the water with carbon dioxide. Not only is this method fairly rapid, but it also consumes less carbon dioxide than prolonged purging. I do not like the effects of oxygen on beer and at Springfield Brewing Company we use several techniques to minimize oxygen pick-up. Filling our bright tanks with water and blowing them down with carbon dioxide is one and it is a very effective technique.

This was a long segment about keg flushing, but I think there are many brewers who think they are doing everything they can to reduce oxidation, when in fact they are barely scratching the surface of this topic. If you do everything possible to reduce oxygen in your beer and are convinced that you have oxidation issues, then looking at your carbon dioxide quality is something to consider.

If you ask your supplier for a carbon dioxide specification and they either do not understand the question or cannot get the information from their supplier, you may be using a low-grade supply. Many suppliers sell gas that is at least 99.95% and believe it is really pure carbon dioxide. The way I look at this is that the gas may contain

help me mr. wizard

0.05% oxygen and this is enough oxygen to cause beer oxidation, especially if beer is force-carbonated with gas of this quality.

Hop quality is extremely important for brewers who are making the best hop bombs. These brewers are really serious about hop selection and doing everything possible to preserve hop freshness from field to the brewery and into their beer. I wrote about the Hop Quality Group in 2012 following a talk given by John Mallett (Bell's Brewery) at the Craft Brewer's Conference in San Diego. This group works with hop breeding programs, growers and processors to help their brewery-members further hop quality. Not all hops are created equally. Hops of the same variety differ based on numerous factors including where they are grown, the crop year (climate), when the hops are harvested, how the hops are kilned, die temperature during the pelletizing process, gas barrier properties of the package and hop storage temperature.

It is very difficult for small commercial brewers and homebrewers to select our ingredients because the likely truth is that the selection was done by others before the hops were processed and packaged. I am not at all suggesting that small brewers do not have access to good hops. It's just that some of the really great hop bombs have been brewed with hops specifically selected for use in these beers and this selection goes way beyond knowing the hop variety.

One other thing that may be happening to your hop aroma is scalping by elastomers exposed to the beer. The liners on bottle caps are well known to adsorb hop aroma compounds and result in a decline in hop aroma during bottle storage. The same thing is possible with the large O-ring used to seal a Corny keg, although I have not read or heard any reports of this actually happening. There is no doubt that some aroma compounds are adsorbed by these gaskets because they smell hoppy. Good luck with trying to put the hop Genie back into your brew! BYO

Specialty IPAs

Black, red, white, and Belgian IPAs

style profile
by Jamil Zainasheff

When I started brewing, there was only one style category for India pale ale. Just a single category, no subcategories. Several years later, people had begun talking about the differences between English and American IPA, and eventually imperial IPA entered the mix. It stayed that way for quite some time. Years went by and people began making hoppier and hoppier versions of red ales, brown ales, Belgian ales, and stouts, but we talked about them as being "American" or "West Coast" variants of those styles. Eventually, those hoppier brews kept climbing up the hoppy ladder. They left the "it's too hoppy for style" world and at some point we started calling them black IPA or red IPA or white IPA or something else that is descriptive but also oxymoronic. After all, how is it possible to have black pale ale? That did not matter to us brewers. In fact, this new style of IPA became so popular that the Great American Beer Festival added an "American Black Ale" category to handle it. Of course, that does not make a lot of sense either, as it leaves all of the other IPA-ish ales and even IPA lagers out in the cold. So what do we call it then? I thought of calling them New World IPAs, but even that might not be inclusive enough. The Beer Judge Certification Program (BJCP) is going to add a new category called "Specialty IPA" in an upcoming revision to the style guide, and while not a very sexy name, it certainly is inclusive. The key thing to know about this new category is that IPA does not literally mean India pale ale, but rather is a descriptor, meaning a hop-forward, firmly bitter beer, with a relatively dry finish. With that in mind, black IPA does not seem so silly.

The question is how do you know you have brewed a great specialty IPA? There is a lot of room for interpretation. For example, the bitterness may be balanced with other flavors, a little more malty, like an English style IPA, or it could be much sharper, with just a light background hint of malt sweetness to balance, more like a West Coast IPA. Regardless, a good example needs firm bittering and the same goes for the hop character. A good example should have more hop character than other non-IPA styles, but balance is still critical even in a hoppy beer. For example, when making a Belgian-style IPA, the flavors of the hops cannot completely overwhelm any perception of the Belgian yeast character. Likewise, when making a red IPA, there should be some crystal malt flavors present through the hoppiness. If you cannot perceive those other flavors, then the beer has lost its balance. Another balance to think about when brewing a great specialty IPA is the finish. An IPA should never finish sweet and heavy. That is more American barleywine than it is IPA. It is okay to have some sweetness, but you want to keep it in check; you want enough attenuation and a dry enough finish to allow the hops to be a signature item in the beer.

> "... IPA does not literally mean India pale ale, but rather is a descriptor, meaning a hop-forward, firmly bitter beer, with a relatively dry finish."

Regardless, when you envision a specialty IPA you want to think about how the key elements of the IPA style work alongside any other character you are introducing into the beer. For example, at Heretic Brewing Company, we have a red IPA called Evil Twin. The concept I came up with was to have tropical fruit, melon, and citrus hop notes balanced against a caramel malt flavor. I did not want to focus on the piney, cat urine, resiny types of hops in Evil Twin, because I felt it would overwhelm the caramel

Continued on page 23

Specialty IPA by the numbers

OG, FG, SRM, IBU, ABV will vary. The BJCP is currently considering three strength categories:

Session: .....3.0–5.0 ABV
Standard:.....5.0–7.5% ABV
Double:.....7.5–9.5% ABV

Photo by Charles A. Parker/Images Plus

Double Black IPA
(5 gallons/19 L, all-grain)

OG = 1.085 FG = 1.018
IBU = 100+ SRM = 37 ABV = 9.3%

Ingredients

13.2 lbs. (6 kg) North American pale malt (2 °L)
1.1 lbs. (0.46 kg) crystal malt (40 °L)
14.1 oz. (0.4 kg) huskless black malt (500 °L)
1.7 lbs. (0.75 kg) dextrose (5 min.)
34 AAU Columbus pellet hops (60 min.) (2 oz./57 g at 17% alpha acids)
1 oz. (28 g) Columbus pellet hops (0 min.)
1 oz. (28 g) Amarillo® pellet hops (0 min.)
1 oz. (28 g) Simcoe® pellet hops (0 min.)
2 oz. (57 g) Amarillo® pellet hops (dry hop)
2 oz. (57 g) Simcoe® pellet hops (dry hop)
Irish moss (15 min.)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale)

Step by Step

My base pale malt and crystal malt comes from Great Western. I use Briess Blackprinz® when I need huskless black malt. Feel free to substitute any high quality malt of a similar flavor and color from a different supplier. My hops are in pellet form and come from Hop Union, Hopsteiner, or Crosby Hop Farm depending on the variety.

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 149 °F (65 °C). Hold the mash at 149 °F (65 °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 (25 L) and the gravity is 1.055.

The total wort boil time is 90 minutes. The first hop addition comes with 60 minutes remaining in the boil. Add Irish moss or other kettle finings and the dextrose as per the schedule. Add the second hop additions at flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 3 packages of liquid yeast or 1 package of liquid yeast in a 4.5-liter (1-gallon) starter.

Ferment at 67 °F (19 °C) until the yeast drops clear. At this temperature and with healthy yeast, fermentation should be complete in about one week. Allow the lees to settle and add the dry hops. You can first transfer the beer to a second vessel, if you prefer, but the dry hopping should be carried out at around 60-65 °F (16-18 °C) for about a week. Then 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.

Double Black IPA
(5 gallons/19 L, extract with grains)

OG = 1.085 FG = 1.018
IBU = 100+ SRM = 36 ABV = 9.3%

Ingredients

8.75 lbs. (4 kg) pale liquid malt extract (2 °L)
1.1 lbs. (0.46 kg) crystal malt (40 °L)
14.1 oz. (0.4 kg) huskless black malt (500 °L)
1.7 lbs. (0.75 kg) dextrose (5 min.)
8.5 AAU Columbus pellet hops (60 min.) (2 oz./57 g at 17% alpha acids)
1 oz. (28 g) Columbus pellet hops (0 min.)
1 oz. (28 g) Amarillo® pellet hops (0 min.)
1 oz. (28 g) Simcoe® pellet hops (0 min.)
2 oz. (57 g) Amarillo® pellet hops (dry hop)
2 oz. (57 g) Simcoe® pellet hops (dry hop)
Irish moss (15 min.)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale)

Step by Step

For most extract beers, I use ultra-light extract made by Alexander's (California Concentrate Company), but any fresh, high quality light color extract will work well. Always choose the freshest extract that fits the beer style. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dried malt extract instead. My crystal malt comes from Great Western. I use Briess Blackprinz® when I need huskless black malt. Feel free to substitute any high quality malt of a similar flavor and color from a different supplier. My hops are in pellet form and come from Hop Union, Hopsteiner, or Crosby Hop Farm depending on the variety.

Mill or coarsely crack the specialty malt and place loosely in a grain bag. Avoid packing the grains too tightly in the bag, using more bags if needed. Steep the bag in about 1.5 gallons (~6 liters) of water at 165 °F (74 °C). After about 30 to 60 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 1.060. Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 60 minutes. Add the first hop addition once the wort starts boiling. Add Irish moss or other kettle finings and the dextrose as per the schedule. Add the second hop additions at flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 3 packages of liquid yeast or 1 package of liquid yeast in a 4.5-liter (1-gallon) starter. Follow the fermentation and packaging instructions for the all-grain version.

malt flavor. If I tried to increase the caramel malt flavor enough to balance those types of hops, the beer would become too heavy and full to finish IPA-like. I had a vision in mind and worked toward that balanced vision in the ingredients we used.

I think the overall concept of specialty IPA is still wide open, but I do doubt certain things will work well. For example, would smoked malt work well with a bold West Coast style IPA? I do not think so. The bold hop character full of pine and citrus would clash with the smoke creating a harsh finish. Of course, I said the same thing about Belgian-style beers being very hoppy. I claimed that the phenolic character of the yeast would clash with the hop character. Well, I was right in that it can clash horribly, but I was wrong in thinking that some great brewers would not eventually figure out the balance and the types of hops needed to make it work beautifully. So, perhaps you should ignore what I say about limits.

Black IPA

There have been all sorts of suggestions for other names for this category. Rather than go into all that, I am just sticking with the label the BJCP plans to use. When brewing a black IPA it is important to avoid just making a very hoppy American stout, but that does not mean a complete lack of roast character. My good friend Travis, who really loves this style, likes to push the boundaries of the roast level in his black IPA. That can be fine, but the more roast character you include, the more you want to avoid too much of the dry, acrid, bitterness that is part of stout. The key is to use huskless/debittered black malt to develop color without too harsh of a roasty flavor. One of my new favorites is Briess Blackprinz®. It is made from huskless barley and even in larger quantities it provides a mild roast character without the harsh bite of traditional black malt. Debittered roast malts still contribute some roast flavors and will give a beer a distinct chocolate/coffee flavor if you use enough. Generally, about 5% of the grist will give a dark color without too much roast flavor. You can add other character malts to build interesting background notes that might be biscuit- or bread-like. Crystal malt is a good addition in black IPA because it adds a balancing sweetness to the dryness that is created by the roast malt. Again, about 5% is a good ballpark measure.

Hop selection is wide open, but I would stick with hops that have more American-type character. Look for hops with citrus, piney, resin, fruity, or melon characteristics. I would avoid using too large an addition of hops that have a spicy note to them. Spicy/clove notes and dark malt character do not always blend well. If you are going for competition, select those hops with persistent aromatic qualities, but always look for balance.

Sometimes all it takes is adding more hops, but sometimes less is more. If you overload your beer with too much vegetal matter, it can mask some of that great hop character you are trying to achieve.

When selecting yeast, I steer towards those that make great stouts. These tend to be either a clean American-style yeast or a British-style yeast. Avoid highly phenolic or extremely funky yeasts that would clash with the dark malt character.

Red IPA

Many assume there is already a category in the style guide for red IPA. They will point to American amber, which is nowhere near a red IPA. The style guide for the Great American Beer Festival includes a red ale and imperial red ale category, but they seem to include everything but red IPA in the description. Red IPA, while being hop-forward, needs to have some malt balance yet still finish dry, like an IPA. The problem with the imperial red category is that it relies on a much bigger, heavier beer, too malty-rich to be an IPA. The amber category is a lighter beer, not big enough or hoppy enough to be an IPA. Between those two styles is where red IPA lives.

Every red beer needs some crystal malt not only for color, but for the expected flavor. The trick is to have enough crystal malt to produce the color and caramel flavor you want, but a dry enough finish for an IPA. There are a couple tricks to achieving the right finish. One method is to go with a low mash temperature, perhaps some dextrose added, and have the beer attenuate out as dry as possible. The remaining (mostly unfermentable) caramel malt character is the balancing sweetness left. This can work well, but there is another technique to consider — adding highly kilned malts. As in the black IPA, highly kilned malts always add some dryness to a beer. In a red IPA, you can add a little roasted barley or huskless roasted barley. This will add both color and a touch of dryness that helps balance the sweetness from the caramel malt.

The hop selection is similar to black IPA, but try to balance the hop character with the malt character. Choose hops that complement and add focus to the caramel and other malt flavors rather than just blasting away with any hops. Try to achieve a hop-forward beer, but with balance. Imagine your beer is like a painting. You have painted this lovely landscape with malt, but when it comes time to add hops, do not pour a bucket of green paint over the top. Instead, use a brush and paint with thought and purpose. Use more than one shade of green to enhance your painting, not overwhelm it.

When selecting yeast, keep in mind the balance of hops and malt.

Some yeasts, such as White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) are popular because they tend to allow both the hops and malt to come through, although the balance tends to favor hop character. There are other yeasts that might work equally well or better, but they will have a different effect on the hop/malt balance. Some will be much more malt-forward and others can be much more hop-forward. That does not mean they are bad choices, but you will need to account for the effect of your chosen strain when trying to balance the malt and hops in your recipe.

White IPA

Half of the people I talk to about white IPA think of it as a Belgian-style witbier that is hoppy and brewed to a higher ABV. Then the other half believes a white IPA is an IPA made with wheat. I am going to stick with the former definition for purposes of this article. In a Belgian-style white beer, you need to focus not only on the malt character, but also on the yeast character and some spicing.

Your malt choice should be a 50/50 blend of unmalted wheat and continental Pilsner malt. You can add in some other grains, such as oats, to add to mouthfeel, but overall this is a simple recipe. Where it starts getting funky is the yeast and spicing. I would go with witbier yeast, as any other yeast really will not provide the proper fermentation character of a witbier. For spicing, I would stick with the standards of coriander and orange peel. If you are feeling bold, perhaps chamomile flowers as well. Keep in mind that your goal is a balance of the malt, the spices, the yeast character, and finally the hops. The hops should be evident, but you need to be careful not to overwhelm the other characteristics of the beer. I would focus on hops with floral, citrus, and melon character for this style.

Belgian IPA

The most certain path to success on Belgian-style IPA is to use a light color base beer. The grist should be mostly continental pilsner malt, perhaps a little bit of other light color specialty malt, and possibly some simple sugar. Think blond, tripel or golden strong as a base. Keep in mind you want a drier finish in an IPA, so do not create wort that will have lots of residual sweetness. For yeast selection, you will want to select a Belgian strain that attenuates well but does not produce a large amount of phenols, such as White Labs WLP530 (Abbey Ale). A large amount of spicy, clove-like phenols can make the beer more difficult to balance. For the hop selection, steer away from hops that have a similar spicy character. Go more toward the floral/citrus and less toward the spicy, piney, and resin. BYO

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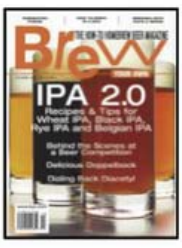

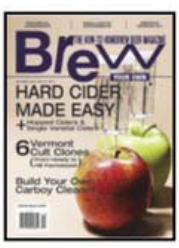

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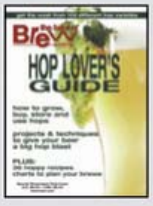

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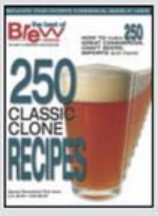

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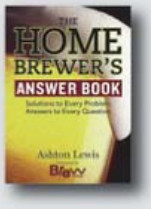

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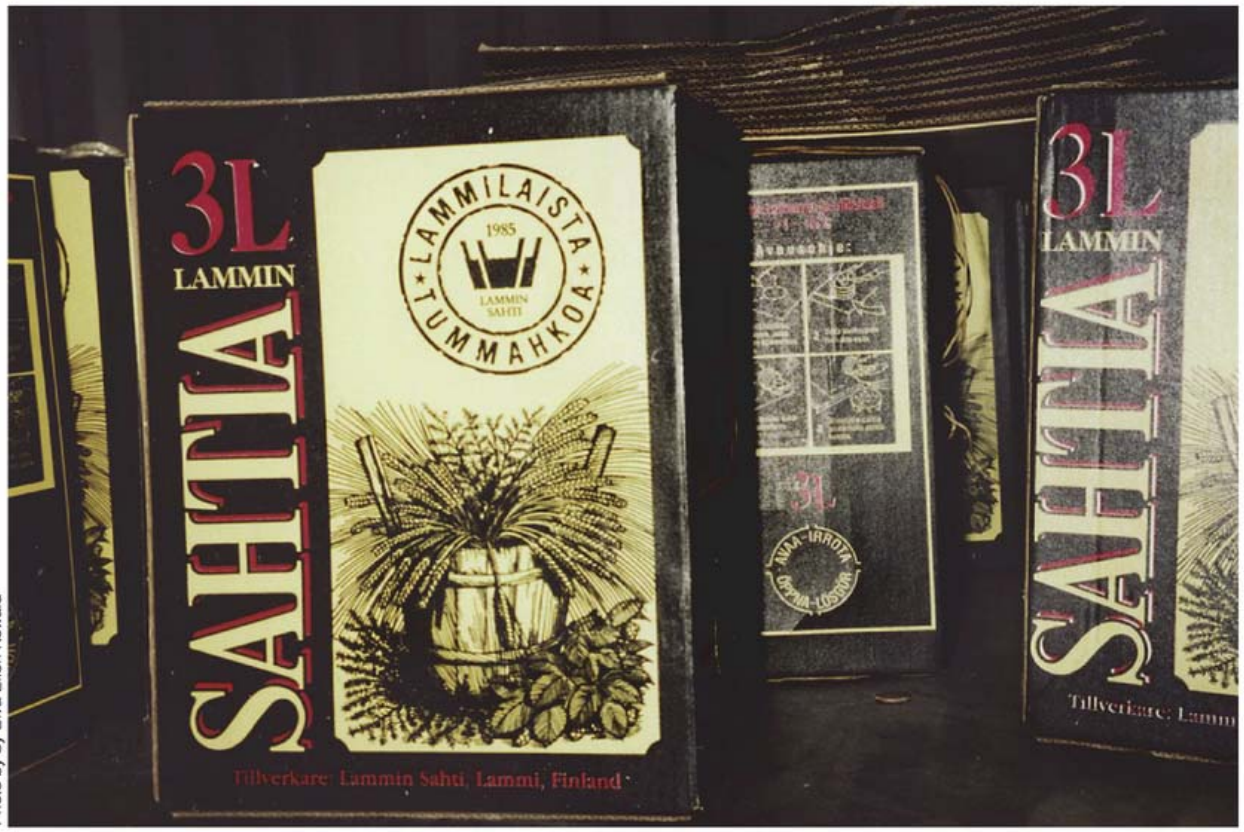


Photo by by Elva Ellen Kowald

by **Mika Laitinen**

Sahti is an ancient Finnish farmhouse beer that is still brewed much the same way as it was hundreds of years ago. Assured written evidence about sahti goes back only to the 18th century when the value of Finnish folklore was recognized, but from the way it is brewed it is obvious that the tradition is much older. As beer writer Michael Jackson puts it, "Sahti is the only primitive beer to survive in Western Europe."

The tradition has survived best in the "sahti belt" comprising about 40 towns or villages within two hundred miles radius north of Finland's capital, Helsinki. In these places sahti is typically a farmhouse homebrew, a craft that has been passed on from generation to generation. Sahti is usually brewed for feasts like weddings, harvest celebrations or even funerals. Every August sahti enthusiasts gather at a yearly national sahti competition, which is organized by The Sahti Society of Finland. There are also relative indigenous beers in Baltic and Nordic countries, such as Koduõlu in Estonia and Gotlandsdricka in Sweden.

In the sahti belt there are also a few commercial brewers specializing in sahti, notably Lammin Sahti (shown in the photo above), Finlandia Sahti and Hollolan Hirvi. Several other Finnish commercial breweries produce sahti occasionally. Because sahti is meant to be consumed within a few weeks from packaging and needs to be stored cold all the time it is rarely exported but with the directions given in this story you can easily brew your own.

Sahti is an ancient Finnish farmhouse beer that is still brewed as it was hundreds of years ago. It survives today in the "Sahti Belt" of Finland.

Photo courtesy of Visit Finland

Sahti as a Beer Style

Sahti tradition stems from facilities and ingredients of an ancient farmhouse. In the old times sahti was brewed in wooden vessels from homegrown and home-malted grains. Hot water, antiseptic wild herbs like juniper and cold storage were used to prevent souring. No brewer's yeast or stainless steel was available for brewing. The style guidelines for sahti are best phrased in the European Union Traditional Specialities Guaranteed (TSG) specification: "Sahti is traditionally prepared from raw materials including, in addition to malted barley, other cereal malt and cereals (rye, barley, wheat and oats) and usually hops, fermented using baker's yeast or harvested yeast."

This appellation regulates what can be called sahti in the European Union, but it does not limit where sahti is made, only how it is produced. The appellation also specifies that the original gravity of sahti should be at least 1.0785 S.G. (19 °Plato) with extract coming only from malted and unmalted grains. Alcohol content should be 6–12% ABV. "Traditionally prepared" means that sahti is neither pasteurized nor filtered. Commercial baker's yeast has been produced since the mid 19th century and during the last hundred years it has been the most common yeast to ferment sahti. Before commercial baker's yeast, each farmhouse had its own house culture for brewing originating from who knows where. It was often harvested from the fermenter and stored for the next brew. The term "harvested yeast" in the appellation reflects this house culture tradition. German weizen yeast yields similar aromas and flavors as Finnish compressed baker's yeast, but it is not quite the same, and brewer's yeast is considered unauthentic for sahti.

Besides the appellation, sahti afficionados have many expectations of what sahti should look and taste like. The appearance of sahti is usually hazy and viscous, still with no head, color typically varying from pale amber to dark brown. Yellow examples exist but many devotees expect darker color. In the aroma and flavor spicy phenols and fruity esters range from low to strong and usually at least some banana is expected. Some tartness maybe associated with fruitiness, somewhat similar to German weizens. Maltiness is sweet and fresh with grainy, bready, worty and porridge-like notes often including notes of dark rye bread. Depending on the brewer, either malt or spicy-fruity yeast character lead the aroma and flavor. Woody, herbal and needle-like juniper character vary from none to pronounced. Traces of herbal hops may be present. Alcohol content is usually 7–9 % ABV. Alcohol warmth is appropriate, but sharp boozy taste is not valued. In some sahti regions slight lactic or acetic sourness is tolerated but usually it is considered a flaw. The body is usually full, often with a smooth viscous milkshake-like palate.

Carbonation should be very low, and signs of carbon dioxide usually indicates that sahti is still unintentionally fermenting. A hint of astringency may be present either from juniper twigs, malt husks or yeast. Some yeast may be suspended but obvious sensation of yeastiness is a flaw. The overall impression is fresh, sweet, malty and nourishing with no sharp edges. Some sahtis can be cloying and the appropriate level of sweetness is a common debate among sahti enthusiasts.

Ingredients

Much of the rustic character of sahti comes from baker's yeast, which is a strain of *Saccharomyces cerevisiae* species like brewer's yeast, but it has not been trained for brewing.

Baker's yeast need not be as pure as brewer's yeast and most sahtis will eventually turn sour, regardless of the sanitation practices. In fact, Lallemand's Baking Update newsletter (Volume 1/Number 9) on yeast pro-

Bottom left: After mashing, most brewers scoop the mash into a separate lauter tun called a *kuurna*.

Bottom: A traditional wooden mash tun used for sahti.

Bottom right: In the old times straw and juniper twigs were laid on the bottom of the *kuurna* to act as a false bottom.

Photos by Mika Laitinin

duction states that in the production of baker's yeast lactic acid bacteria and non-*Saccharomyces cerevisiae* yeast are always present in minor quantities. Most sahti brewers prefer Finnish compressed baker's yeast (Rajamäki brand, now owned by Lallemand) but there is little information available on how similar it is to baker's yeasts from other countries. Besides Finnish compressed yeast, I have used dry baker's yeast produced in France for Finnish markets and at least this dry yeast produced authentic sahti, though it attenuated further than Finnish compressed yeast. I suspect that many traits of Finnish baker's yeast are common to baker's yeasts in general, like phenolic and fruity tastes, low flocculation, explosive fermentation and traces of souring bacteria.

In sahti substantial maltiness is required, and even gravities below 1.083 S.G. (20 °Plato) can feel lacking. To guarantee rich maltiness and thick mouthfeel I target a gravity range of 1.092–1.101 S.G. (22–24 °Plato). As a base malt, most sahti brewers use Finnish Sahti Malt Blend from Viking Malt. The composition of this blend is proprietary, but a common conception is that this blend is principally Pilsner malt supplemented with pale caramel and diastatic malts. Pilsner malt clearly produces similar results. On the other hand, in the old times farmhouses kilned their malt in wood fired drying barns or saunas, and I wonder if Pilsner malt really mimics rustic farmhouse malt. It is purely my own speculation that Vienna malt or a blend of Vienna and Pilsner would do a better job in this respect. The toastiness and breadiness of Vienna malt certainly fit well in sahti. Either way, both Pilsner and Vienna malts make a good sahti well within modern expectations of taste. Interestingly though, in traditional Finnish drying barns and saunas smoke was an inherent part of the kilning and the malt was certainly at least slightly smoky, but offering a smoky sahti to purists can raise eyebrows. Replacing some of the base malt with smoked malt makes an exquisite sahti but it is a specialty within modern sahtis.

Usually the malt bill contains some rye but it is not a requirement. Most sahti brewers use Finnish *kaljamallas* (table beer malt), a dark brown rye malt intended for brewing low-alcohol table beer (0–2% ABV) typically served in traditional Finnish canteens and households. This malt imparts a unique soft dark bread taste and it is difficult to substitute. It has a dark

A traditional wood-fire-heated kettle, which is used for making authentic Finnish sahti.

brown color somewhat similar to pale chocolate malt but it is barely roasty and the actual color it imparts to beer is closer to dark caramel malts with color around 200 EBC (70-80 °L). Weyermann has a chocolate rye malt, but it is much darker at 500-800 EBC (188–300 °L) and I suspect that it is too roasty. Roasted malts seem to give an inappropriate roasty edge to sahti, which clashes with the spiciness of the baker's yeast and does not smooth out during the short life of sahti. In the recipe on page 35 I have substituted Weyermann Cararye®, a dark caramel rye malt with 150–200 EBC (57–76 °L) for *kaljamallas*. I would not say these two malts are similar, but Cararye® does impart some dark rye bread flavors typical for sahti. *Kaljamallas* is usually used for 5–10% of the grist and this range is good for Cararye too. This amount also adjusts the color to the typical brownish range.

There are brewers who think that *kaljamallas* gives too dry and tart of a taste and use pale rye malt instead. It is also a matter of balance; sweeter sahti can hold more dark rye malt. I like to include both dark and pale rye malts, altogether around 15% of the grist, which gives a pronounced taste of rye and an oily mouthfeel. Color and dark rye bread taste come from dark rye malt and then more rye backbone and mouthfeel come from pale rye malt. My decision to use 15% rye is perhaps more than on average, but there are some sahti regions where sahti can contain more than 40% rye malt. Such a high percentage of rye gives a grainy and sourish edge to sahti; it is an exotic but acquired taste.

Smaller amounts of other grains besides base malt and rye are often used for fine tuning. Use of unmalted rye, barley, oats or wheat is fairly common. The included recipe contains 6% of melanoidin malt to enhance bready maltiness and account for the less intensive mash schedule.

Sahti need not contain any juniper, but most brewers want to have a faint juniper aroma and taste. The traditional method is to infuse juniper twigs in hot water, which is then used to clean wooden vessels and sometimes as mash and sparge water. People must have noticed long ago the antiseptic qualities of juniper. Another source of juniper taste derives from the traditional lauter tun "*kuurna*" where juniper branches and straw are used to make a false bottom. An easy way to mimic these old practices is to add juniper twigs to the mash. Restraint should be used as too much juniper will give a tart, solventy and woody taste with low drinkability. 0.28 oz. (8 g) of twigs to mash for a 5-gallon (19-L) batch gives a delicate but perceivable juniper taste. I prefer the youngest, less woody, top twigs (see photo on page 30). There are several distinct juniper species around the world, the species used in Finland is *Juniperus communis*. Juniper berries can also replace juniper twigs although the dif-

ference is distinguishable, berries giving more peppery and less needle-like flavor. Berries are best added to hot wort or to the fermenter as "dry juniper." A good starting point is 0.18 oz. (5 g) for 5 gallons (19 L). A fine sahti can be made without any juniper and it is often perceived in sahti even when not actually used, baker's yeast can give a similar spicy twist.

Hops are occasionally used in sahti, although usually in marginal quantities. A common description of the amount is "a handful of hops" which has hardly any impact in typical farmhouse batch sizes of 13 gallons (50 L) or more. I use hops occasionally, in which case I add hops to the mash together with juniper twigs with delicate herbal hop varieties preferred. For example, 0.88 oz. (25 g) mash hops for a 5-gallon (19-L) batch gives a delicate background hop note which is still within style expectations, but that is more than most sahti brewers use. Sahti brewers will often also use old, oxidized hops rather than fresh hops.

Other spices besides juniper and hops have probably been used in the past, but these practices have been forgotten several generations ago. For this reason, spices other than juniper and hops are often considered untraditional, although likely some brewers in the past have seasoned their sahti for example with wild rosemary (considered toxic nowadays) or spruce tips.

Process

Most brewers have traditional brewing equipment dedicated for sahti but standard beer brewing equipment also works well. The photos on page 30 show the very traditional gear of sahti master Hannu Siren from Hartola, Finland who has brewed sahti with this kind of setup for 40 years. It is worth mentioning that traditional brewers do not necessarily use hydrometers or thermometers. The temperature and gravity ranges that follow are based mostly on my own experience.

Although most brewers today use commercial malts, mashing times are still typically long — four to six hours — reflecting the old times with less than ideal homemade malts. Often these long mashes are done in several ascending temperature steps, either with water infusions in wooden mash tuns or in kettles, which in the farmhouses are often woodfire heated. After mashing, most brewers scoop the mash into a separate lauter tun called a *kuurna*. The *kuurna* is shaped like a long split cylinder and is traditionally made of wood or nowadays also of stainless steel. In the old times straw and juniper twigs were laid on the bottom of the *kuurna* to act as a false bottom, but stainless steel mesh is often used instead nowadays. The *kuurna* is then sparged with hot water but sahti is mostly formed from high gravity initial runnings. The later runnings may be collected for a lower strength beer, either to make so-called "ladies' sahti," which is still of considerable gravity but only partly fermented, or to make a

low-gravity, low-alcohol table beer.

One of the primitive features of sahti is that the wort is not boiled at all or it is just boiled briefly before cooling. Concentrating wort by boiling is not typical. To sanitize wort, some brewers heat or boil the wort for awhile whereas some brewers heat or even boil the whole mash before transferring the mash to the *kuurna*, which can be done also in a wooden mash tun by adding heated stones to the mash. Ancient brewers must have noticed that when mash or wort was heated close to boiling temperature sahti stored better. From a perspective of modern brewing one might think that these practices would result in a taste of cooked vegetables (DMS) or starch, but these off-flavors will be largely masked by bolder flavors, fresh malt, fruity esters and phenols.

A six-hour mash surely contributes to color and flavor, but with modern malts a shorter mash schedule will also work. I usually mash at 154 °F (68 °C) for one hour and then raise the temperature to mash out at 172 °F (78 °C) for five minutes. Since in sahti wort will not be concentrated by boiling, it takes some practice to hit the desired target gravity. First, the water to grist ratio in the mash needs be low, around 1.105-1.2 qt./lb. (2.2-2.5 L/kg). Second, raising the mash temperature before lautering increases efficiency and wort gravity. This is the reason for the mash out, and even with that I get 70% efficiency at best. Without mash out the efficiency is likely less than 60%. If your mash tun is heated with water infusions, consider raising the final mash temperature with a decoction step (read more about decoction mashing at http://byo.com/story537). Third, lautering and sparging have to be done so as not to dilute the wort below target gravity. Contrary to standard sparging techniques, only a small sparge water volume is used but water temperature can be higher, say 176–185 °F (80–85 °C). Higher sparge water temperature can leach some tannins from the malt, but in a sweet sahti tannins can be a desirable balancing factor. I collect wort until target gravity is reached. Before cooling I heat the wort to 194 °F (90 °C) for ten minutes, which is enough for sanitation. I feel that boiling the wort creates a more beery sahti and detracts from the milkshake-like mouthfeel. Part of the character of sahti is certainly its thick protein-rich texture.

The wort is then cooled and transferred to fermenters. There is no need for a trub separation, and aeration is usually also omitted. In farmhouses, cooling is often done in 10.6 gallon (40 L) aluminum milk cans, which are immersed in a cold water bath, much like how milk was treated before refrigeration. These traditional milk cans are often used as fermenters as well.

With baker's yeast success depends on finding conditions which favor wanted behavior and suppress unwanted behavior. The main targets are appropriate attenuation, suppression of souring bacteria and sufficient yeast flocculation. Of course, the levels of esters, phenols and alcohols are important as well.

Sahti's fermentability is largely determined by pitching temperature, fermentation temperature, and timing of transfer to cold conditioning. Typical apparent attenuation range of sahti is 62–72%. At the lower end sahti can feel overly sweet and worty, and at the higher end it can feel boozy, unpleasantly tart and watery. For the recipe on the next page the sweet spot is around 65%.

Many sahti brewers start fermentation at room temperature, around 64–77 °F (18-25 °C), let sahti ferment about 24 hours and then move the fermenter to a cooler place to retard further attenuation.

At temperatures below 55 °F (13 °C), sahti will continue to ferment slowly and usually finish at higher gravity. In my opinion this method is hard to do consistently as at room temperatures baker's yeast will ferment explosively and can finish dry in less than two days. Another downside of this practice is that unpredictable fermentation may occur in the final containers. Important safety note: If you are a homebrewer who uses bottles rather than kegs you must make sure your sahti is fermented to the finish or risk

Sahti Recipe

Photo by Mika Laitinen

Sahti
(5 gallons/19 L, all-grain)

OG = 1.097 FG = 1.034
IBU = 0 SRM = 18 ABV = 9.2%

Ingredients

8.8 lbs. (4 kg) Pilsner malt
8.8 lbs. (4 kg) Vienna malt
1.76 lbs. (0.8 kg) Weyermann rye malt
1.32 lbs. (0.6 kg) Weyermann Cararye® malt
1.32 lbs. (0.6 kg) Weyermann melanoidin malt
0.28 oz. (8 g) juniper twigs (added to the mash)
1.1 oz. (31 g) fresh compressed baking yeast or 0.46 oz. (13 g) dry baking yeast

Step by Step

Dough-in at 154 °F (68 °C) using around 1.15 qts. of water to one pound of grain (2.4 L/kg). Add juniper twigs to mash. Hold at this temperature for one hour. If using a heated mash tun, raise temperature to 172 °F (78 °C) for 5 minutes. Sparge slowly with 180 °F (82 °C) water, collecting wort into the kettle until a target gravity of 1.097 is reached. Since the wort will not be concentrated by boiling, be careful not to dilute the wort below the target gravity. Heat the wort in the kettle to 194 °F (90 °C) and hold for 10 minutes. Chill the wort to 63 °F (17 °C). Transfer the entire wort to the fermenter. Because the wort is not boiled there is no trub. If you are using dry baking yeast, hydrate the yeast in 104 °F (40 °C) water, as you would do with dry brewing yeast. If you are using fresh compressed yeast, liquefy the yeast in a small amount of 63 °F (17 °C) water. No aeration is needed.

Ferment at 64 °F (18 °C) until fermentation is complete. This should take about three days. Keep the temperature steady for an extra day and then chill the fermenter to 32–55 °F (0–13 °C), the cooler the better. After two days of cold conditioning, rack your sahti to a secondary fermenter. Cold condition for another week before racking into containers.

Sahti
(5 gallons/19 L, partial mash)

OG = 1.097 FG = 1.034
IBU = 0 SRM = 16 ABV = 9.2%

Ingredients

6 lbs. (2.7 kg) rye liquid malt extract
6.6 lbs. (3 kg) Pilsen liquid malt extract
1.32 lbs. (0.6 kg) Vienna malt
1.32 lbs. (0.6 kg) Weyermann melanoidin malt
0.28 oz. (8 g) juniper twigs (added to the mash)
1.1 oz. (31 g) fresh compressed baking yeast or 0.46 oz. (13 g) dry baking yeast

Step by Step

Heat 1 gallon (~4 L) of water to achieve a mash temperature of 154 °F (68 °C). Add juniper twigs to the mash. Hold at this temperature for one hour. Sparge slowly with 1 gallon (~4 L) of 180 °F (82 °C) water. Add hot water and liquid malt extract, adding water into the kettle until a target gravity of 1.097 is reached. Heat the wort in the kettle to 194 °F (90 °C) and hold for 10 minutes. Chill the wort to 63 °F (17 °C). Transfer the entire wort to fermenter. Because wort is not boiled there is no trub. If using dry baking yeast, hydrate it in 104 °F (40 °C) water, as you would do with dry brewing yeast. If you are using fresh compressed yeast, liquefy the yeast in a small amount of 63 °F (17 °C) water. No aeration is needed.

Ferment at 64 °F (18 °C) until fermentation is complete. This should take about three days. Keep the temperature steady for an extra day and then chill the fermenter to 32–55 °F (0–13 °C), the cooler the better. After two days of cold conditioning, rack your sahti to a secondary fermenter. Cold condition for another week before racking into containers.

Tips for Success:

Juniper tips were traditionally used for more than flavor when making sahti. The twigs were laid on the bottom of the *kuuma* to act as a false bottom. You can recreate this method at home by laying juniper twigs in your mash tun. Use restraint, however. Too much juniper flavor in your sahti gives a tart, solventy and woody taste.

exploding bottles. Remember, when we prime regular beer we control the new fermentable that we add, and thus the pressure that is created. With this sahti we don't know how many fermentables are left at bottling time.

I prefer to start fermentation at 61–63 °F (16–17 °C) and ferment to finish at 61–66 °F (16–19 °C). These temperatures restrain fermentation and seem to prevent too high attenuation. The lower end of this temperature range gives a cleaner taste usually with lower attenuation and at the higher end fruitiness becomes pronounced. A target of 64 °F (18 °C) seems to be a sweet spot, at least for Finnish compressed yeast.

The fermentation takes about three days but I keep the temperature steady for an extra day or two. Allowing the yeast to finish before cold conditioning results in faster flocculation and avoids problems with fermentation in the final containers. On the other hand, sahti should be cooled as soon as possible, as warmer temperatures favor souring bacteria. If these colder fermentation temperatures result in lower attenuation than desired, I recommend adding a short aeration step next time, about one third of the standard beer aeration.

After initial fermentation, sahti is cold conditioned for at least a week, traditionally in a ground cellar or cold storage room. To suppress souring bacteria, conditioning should be done at least below 51 °F (11 °C) with 32–41 °F (0–5 °C) preferred. This is because *Lactobacillus* needs a minimum working temperature of 51 °F (11 °C); below that temperature it will die. If you are bottling, keep the temperature well below 51 °F (11 °C) to be safe. Baker's yeast is a poor flocculator and dropping out the bulk of the yeast is the primary reason for cold conditioning. To further avoid yeastiness, I recommend racking your sahti to a secondary fermenter after initial fermentation.

After cold conditioning, the sahti is racked to containers. Sahti is not purposely carbonated but sometimes baking yeast can re-ferment and build pressure in the containers. For this reason, containers where you can easily release pressure are preferred. Sahti can also be kegged and pushed out with CO_2, but avoid storing sahti under pressure. Store sahti cold all the time and plan to consume it within few weeks. Storage below 41 °F (5 °C) can substantially extend the lifetime of your sahti and, conversely, even half a day at room temperature can kick off sour fermentation. In any case, sahti often turns sour within a month or two from packaging.

Sahti is usually served at cold storage temperatures and at temperatures below 46 °F (8 °C) sahti often feels more balanced and refreshing. But well-made sahti is tasty over a wide range of temperatures and is devilishly drinkable, hence the saying, "sahti knocks the unwary off his feet." Don't be afraid to experiment! BYO

2014 LABEL CONTEST WINNERS

Homebrew labels came from every region of the United States. They came from all over Canada. And they even came from far away lands including Argentina, Norway, and Poland. Some were made to commemorate weddings, anniversaries, graduations, and births; others to remember fallen soldiers, lost family members, and pets; and, of course, others were just made to immortalize and decorate their brewing creations.

Labels filled the office in recent weeks and left the staff at *BYO* with the daunting task of selecting our favorites. The labels were judged on creativity, style, color schemes, neatness, humor, how the labels would look on bottles, and any other attributes we came up with as we went along to argue for our favorites. We quickly realized the opinions among us were as diverse as the labels in front of us. Debates were loud and allegiances were formed as our selections were finally condensed down to four finalists. Then the real fun began and even mad scientist Doc Brown would have had trouble concocting an algorithm to choose a winner (or maybe we were just pushing off the return to our desks). In the end, we kept going back to Mike Lanzafame's "1.21 GigaHops" label, awarding him the Grand Champion and bragging rights for the next 12 months.

Even if your label didn't receive recognition, we hope the beer inside your bottles is reward enough and will help console you until next year's label contest when we start back at square one. Of course, we couldn't do this contest without our sponsors and the incredible prizes they contribute, so a big thanks goes out to all of them. Also, a big thanks to all of you who shared your creativity with us.

GRAND

MIKE LANZAFAME
Maplewood, New Jersey

Mike says his Achilles heel with brewing has always been the India pale ale style — a real tragedy for a hophead like him. But after lots of trial and error, Mike finally brewed an IPA to be proud of, and with it he needed an equally crafted label. Chance would have it that Mike was watching the 80s classic Back to the Future when he first tasted the beer. When Doc Brown uttered the phrase, "1.21 Gigawatts," like a flash of lightening the name for his homebrew hit him — "1.21 GigaHops." The label includes a couple of Back to the Future references. See if you can find them.

Prizes: BeerGun from **Blichmann Engineering**; 6-gal. carboy from **Better-Bottle®**; Gift certificate from **BrewerShirts.com**; 50-lb. sack of Rahr Pale Ale malt from **BSG HandCraft**; Gift certificate from **High Gravity**; Gift certificate from **Love2Brew.com**; Digital scale from **Murietta Homebrew Emporium**; Gift certificate from **Northern Brewer**; Gift certificate from **Bader Beer & Wine Supply**; Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Evermine**; 8 lbs. PBW & 32 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

GOLD

ED COFFEY
Philadelphia, Pennsylvania

The label for Farmer in the Rye was designed by Ed's wife, Marcy Coffey. The rye saison and label were made for an event last summer that raised money for organ donation awareness. The typography for the label was inspired by vintage signage and the illustration was custom hand-drawn and then digitized with an overlaid texture to give it a warn/distressed look.

Prizes: UNI-STAT II-G temperature controller from **BH Enterprises**; 6-gal. carboy from **Better-Bottle®**; Weldless fixed BrewMometer from **Blichmann Engineering**; Gift certificate from **BrewerShirts.com**; 50-lb. sack of Weyermann® Pilsner malt from **BSG HandCraft**; Gift certificate from **How Do You Brew?**; Gift certificate from **Love2Brew.com**; Gift certificate from **Northern Brewer**; Gift certificate from **Bader Beer & Wine Supply**; Gift certificate from **Quality Wine and Ale Supply**; 8 lbs. PBW & 32 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

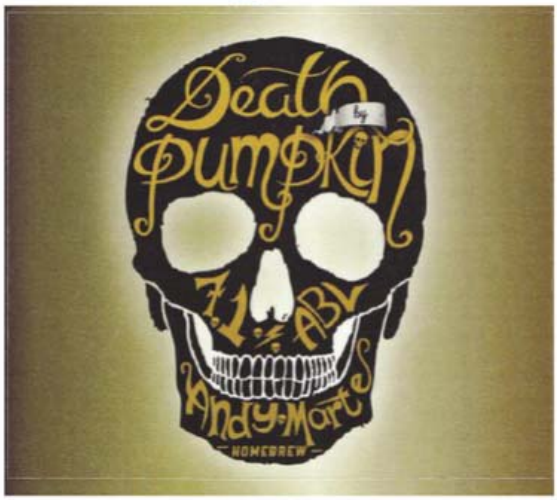
SILVER

MATT ELLIS
Silver Spring, Maryland

Matt is on active duty in the U.S. Navy and his Squid Ink label for this black IPA goes along with the underwater sea theme from other labels he sent us (which included LionFish Amber Ale and Puffer Fish Porter). Matt began brewing in 1995. His career in the Navy has put a hindrance on his homebrewing, but he says his current tour has allowed him to begin brewing more regularly again. The brother of his supportive bride owns a sign shop and helped bring his label design ideas to life.

Prizes: Gift certificate from **Maryland Homebrew**; 6-gal. carboy from **Better-Bottle®**; Pair of Brewing Gloves from **Blichmann Engineering**; Gift certificate from **BrewerShirts.com**; 1-lb. Chinook hop pellets from **Hop Tech Home Brewing Supplies**; Gift certificate from **Northern Brewer**; Gift certificate from **Quality Wine and Ale Supply**; 8 lbs. PBW & 32 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

BRONZE



ANDERSON MARTE
Whitestone, New York

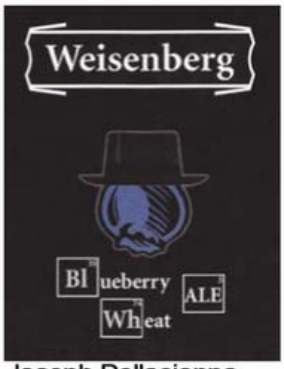
Anderson, who is a graphic designer, wanted something "dark and metal" for his Death by Pumpkin label, and said the "skull just made sense." The writing on this label was done by hand and was then scanned and edited in Illustrator. Death by Pumpkin is an annual brew made with real roasted pumpkins and is one of his wife's favorites.

Prizes: 50-lb. bag of Pilsen malt from **Briess Malt and Ingredients Co.**; 6-gal. carboy from **Better-Bottle®**; Pair of Brewing Gloves from **Blichmann Engineering**; Gift certificate from **BrewerShirts.com**; 1-lb. Chinook hop pellets from **Hop Tech Home Brewing Supplies**; Gift certificate from **Bader Beer & Wine Supply**; Gift certificate from **Quality Wine and Ale Supply**; 8 lbs. PBW & 32 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

HONORABLE MENTION

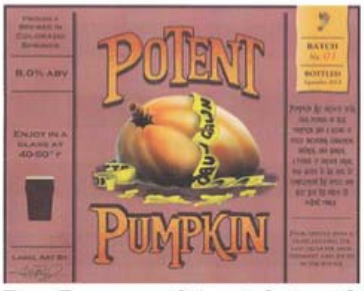
Aaron Steiner • Columbus, Ohio
Prizes: Brew-in-a-Bag kit from **Brewer's Best®**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Chris Siegman
Cincinnati, Ohio
Prizes: Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**



Joseph Dellacioppa
Fullerton, California
Prizes: 1-lb. Chinook hop pellets from **Hop Tech Home Brewing Supplies**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

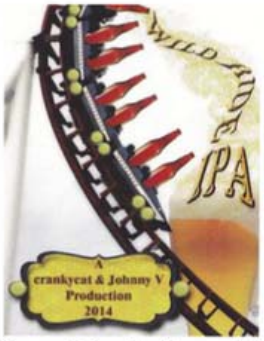
Ben Theis • Elkins Park, Pennsylvania
Prizes: Gift certificate from **Homebrew4Less.com**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**



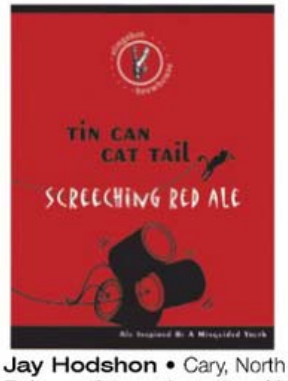
Dan Deveau • Colorado Springs, Colorado
Prizes: Gift certificate from **High Gravity**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Carlos Romero Jr.
Roy, Utah
Prizes: Gift certificate from **HomeBrewStuff.com**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Caleb Dann
Indianapolis, Indiana
Prizes: Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**



Gera Exire LaTour • Minneapolis, Minnesota
Prizes: Gift certificate from **Northern Brewer**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**



Jay Hodshon • Cary, North Carolina
Prizes: Gift certificate from **Wine and Cake Hobbies, Inc.**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

HONORABLE MENTION

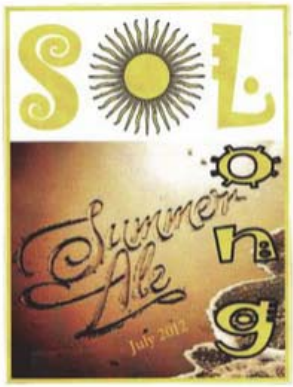
Keith Hartman • Columbia, Pennsylvania
Prizes: Gift certificate from **Simply Homebrew**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Robert Connolly & Anneliese Ronda
Phoenix, Oregon
Prizes: Gift certificate from **Falling Sky Brewshop**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Mark Lubeski • Barnegat, New Jersey
Prizes: Gift certificate from **The Brewer's Apprentice**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

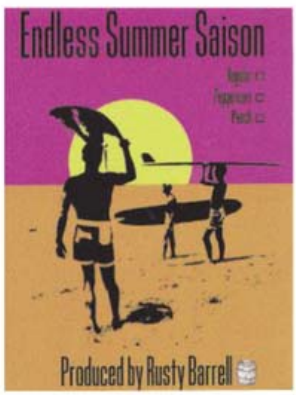
Steven Franks
The Colony, Texas
Prizes: Gift certificate from **HomeWetBar.com**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Tim Schafer • Denver, Colorado
Prizes: Gift certificate from **HomeBrewStuff.com**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**



Maryann Stoorvogel
Clinton Corners, New York
Prizes: Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Lukasz Szala • Glogowek, Poland
Prizes: Assorted **BYO special issues**



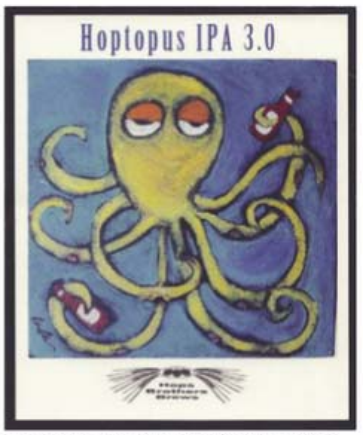
Robert Burrell • Washington, DC
Prizes: Two homebrew T-Shirts from **Wine and Cake Hobbies, Inc.**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

Ron Campbell
Stanfield, North Carolina
Prizes: Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Evermine**; 1 lb. PBW & 8 oz. Star San from **Five Star Chemicals & Supply, Inc.**; Gift certificate from **GrogTag**

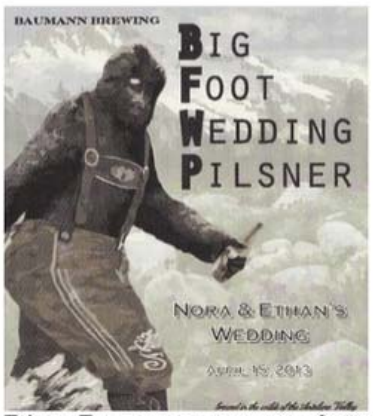
EDITORS' CHOICE

Adam Holden-Bache
Charlotte, North Carolina

Keith Ciani • Denver, Colorado



Russ Brunner • Tamarac, Florida



Ethan Baumann • Lancaster, California

Shawn McGovern • Parlin, New Jersey

Mat Kelly
Portsmouth, Virginia

Mike Person, Sean Ryan, Nick Agosto & Chris Rivera
Elgin, Illinois

Photo by Charles A. Parker/Images Plus

experimental

The umbrella of "experimental brewing" covers several semi-related approaches to recipe design. When brewers initially move beyond prepackaged kits, experimentation can be as simple as changing the aroma hop variety in a pale ale recipe. Some conservative brewers, taking the scientific method to heart, manipulate a single variable at a time to investigate the impact of small process and ingredient changes on the final product. For more adventurous brewers, exploration includes adding ingredients that have no sensible place in beer (sometimes with delicious results!).

While I'm all in favor of every homebrewer at least occasionally reaching beyond classic styles and commercial clones, I do not endorse tossing whatever ingredients strike your momentary fancy into the boil. A standard 5-gallon (19-L) batch yields two cases of bottles and that's a lot of a failed experiment to stomach! On the other hand, don't plan for months and months trying to perfect a recipe without a single test brew. Find a sensible approach and give it a shot, but be prepared to adjust and re-brew.

I recommend waiting to begin the more advanced types of experimentation until after you have dialed in your process to the point where you consistently produce palatable beers. If your brewing is highly variable, it can be difficult to trust the results of an experiment, and the last thing a new brewer needs is another layer of complexity and variability. Hopefully this article will provide valuable strategies for researching and conducting brewing experiments, enabling better results on your first attempt, and allowing you to achieve your flavor target in fewer batches.

HOMEBREWING

by MICHAEL TONSMEIRE

APPROACH UNCONVENTIONAL BEERS WITH CONFIDENCE

Research

The first step in any experiment should be to learn everything about the experimental variable. If representative commercial beers exist, get your hands on them. Read about the ingredient or technique in question. I admit the Internet is usually where I check first, but don't skip over the many terrific homebrewing books. For brewing with weird ingredients it is hard to beat Randy Mosher's *Radical Brewing: Recipes, Tales and World-Altering Meditations in a Glass* (Brewers Publications, 2004).

While the experiences of other brewers are valuable, look into the non-traditional ingredients themselves; can the culinary or scientific communities enlighten or inspire you? Here are a few examples:

I've read a dozen ways to infuse chocolate into stouts (and probably tried half of them). I'd always liked the idea of using cocoa powder because its low fat content minimized head disruption, but the fluffy powder is tricky to mix into cold beer and the flavor often comes across chalky and flat. I happened upon an *America's Test Kitchen* brownie recipe that gave instructions for "blooming" the cocoa powder in boiling water to hydrate it before combining with the rest of the ingredients. This approach allows the cocoa powder to incorporate more readily into fermented beer and produces a richer chocolate flavor.

Another example was when thinking about how to impart coffee into Modern Times' Black House oatmeal stout. I considered using different timings and temperatures, and eventually we settled on steeping whole coffee beans directly in the fermented beer. While the concept is similar to blending with cold brewed coffee, I find "dry-beaning" produces a longer-lasting coffee aroma. Leaving the beans whole slows extraction, providing a wider window before over-extraction, and makes removing the beans from

> "Look into the non-traditional ingredients themselves; can the culinary or scientific communities enlighten or inspire you?"

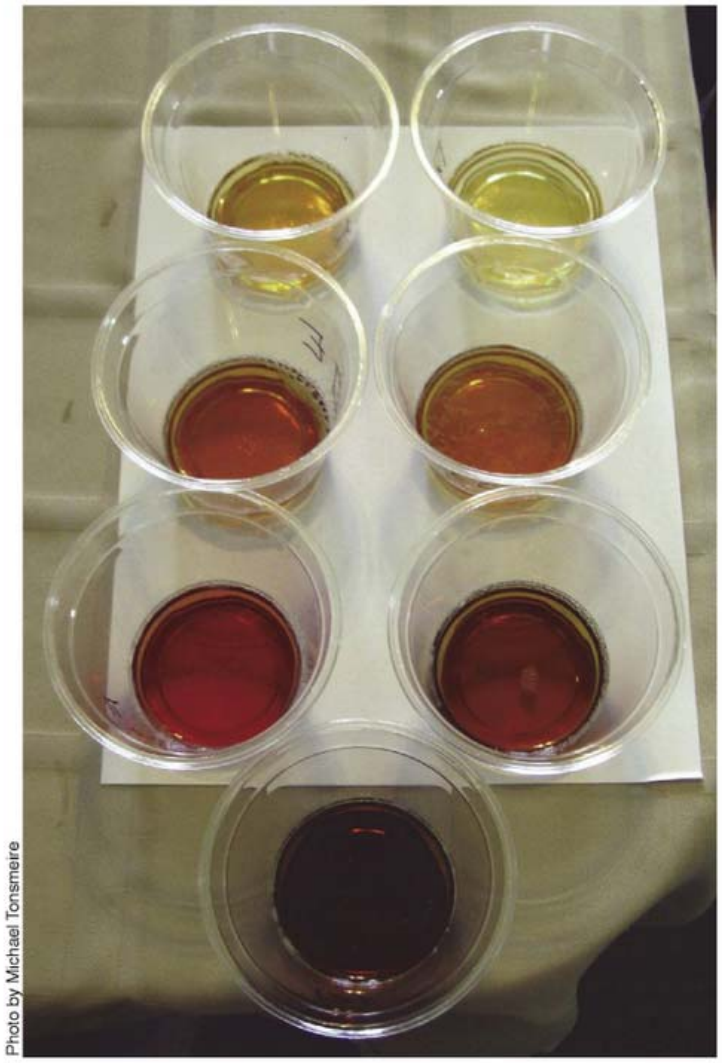


Photo by Michael Tonsmeire

Experimental brewing can be as simple as brewing the same recipe over and over — or performing a split batch — with a few different tweaks. Here, a batch of beer was split seven ways to see the difference between specialty malts.

> "Farmer's markets, spice shops, and ethnic groceries are often superb sources for offbeat brewing ingredients."

the beer easier. Green (unroasted) beans are shelf-stable for years, but coffee starts going downhill almost immediately once roasted. Rather than rely on a commercial coffee roaster, Modern Times roasts its own coffee in-brewery. You can do something similar at home with a popcorn air-popper if you don't want to invest in a purpose-built roaster. This method requires less than 2 ounces of beans in a 5-gallon (60 g in a 19-L) batch.

A few other culinary tips that I've applied to homebrewing with good results: Toasting and then grinding whole spices and dried chilies immediately before using to amplify both their potency and complexity. Like coffee, the essential oils are volatile and diminish quickly. To add citrus flavor to a beer, add the zest immediately but consider waiting a few hours after squeezing the fruit before adding the juice to give oxidation a chance to improve its flavor (www.cookingissues.com/2010/10/01/fresh-lime-juice-wtf/). This is just one of many tips I've gleaned from the rise of craft cocktails. The wide range of bitters now available is another fun way to play with flavors in the glass. (I'm especially fond of Bittermens' Hopped Grapefruit Bitters in IPAs.)

In general I look at the most natural product as the first option. Fresh fruit possesses a more interesting range of flavors than pasteurized purees or juices, which in turn are more exciting than artificial flavorings. However, in cases where the raw product is either tricky to work with or isn't concentrated enough, adding a small dose of natural concentrate or even artificial extract to taste can be an acceptable way to boost the character. Coconut is a great example; while toasted unsweetened coconut flakes provide a great base flavor, a few drops of coconut extract brings the aroma people expect. Liquors, flavored/herbal teas, and powdered citrus juices can all be added to beers with delicious results.

A few things to consider when experimenting:

- What varieties and processing types

are available?
- Is it seasonal?
- What affects the quality?
- What influence do timing and temperature have?

For example, while you might enjoy eating a banana with a touch of green on the peel, this is long before a banana is best suited for baking (or brewing). As fruits ripen their aromatics and sugars increase. Consider brewing with fruits that are a couple of days (or more) beyond the point you'd want to eat them out of hand (but before they begin to rot or mold).

Acquisition and Evaluation of Ingredients

While the Internet has pretty much everything, I try to shop for unique ingredients where I can taste or at least smell things and inspect them before buying. Farmer's markets, spice shops, and ethnic groceries are often superb sources for offbeat brewing ingredients. If you are using anything that isn't sold as food, ensure it is food grade (wood can be tricky — if it is sold for smoking it is a safe bet, while the lumber section of a hardware store may not be).

As with malt and hops, evaluate every ingredient before brewing. What does it smell and taste like? Steep it in hot water; how does that change its attributes? Dose some of this flavorful liquid into a glass of beer; how does the character of the beer change? It is always a good idea to compare these initial notes to the flavor of the finished beer, learning which flavors and aromas carry through best.

Avoid Gimmicks

One of my pet peeves is gimmicky beers. I love weird beers, but what I am talking about here specifically are beers that are brewed for a reason that sounds fun in the description, but doesn't improve the result when the beer is sampled blind. This includes things like wacky ingredients (e.g., book pages), formulas (e.g., "We add one more hop variety each year"), and record breaking (e.g., "The sourest beer in the history of the world!"). The goal of brewing should be to cre-

Photo by Michael Tonsmeire

In this experiment, above, the same beer was brewed with six different kinds of brewing sugar to compare the flavor and color differences in the finished beer. Rather than brew 5 gallons (19 L) of each, the wort was split into six separate factions.

ate the most enjoyable beer in the glass, not to tell the best story about how or why that beer was brewed. Ultimately though, if these qualities are among the types of beers you enjoy, go ahead and brew whatever you want to drink — it hasn't, for example, stopped Scotland's Brew Dogs, who have brewed with such ingredients as condensed San Francisco fog and San Diego kelp for their TV show.

Matching Flavors

One resource that has sparked numerous recipe concepts for me is *The Flavor Bible: The Essential Guide to Culinary Creativity, Based on the Wisdom of America's Most Imaginative Chefs* (Little, Brown and Company, 2008). This book catalogues ingredients that talented chefs pair together. Think of a prominent flavor in the base beer and find the corresponding ingredient in the book. See if any of the suggested ingredients or combinations appeal to you. For example:

- The "malt" of a brown ale with banana or caramel.
- The "grapefruit" of an American IPA with pomegranate or ginger.
- The "coffee" of a stout with cinnamon, clove, and orange.
- The "black pepper" of a saison with lemon or lime.
- The "lemon" of a gueuze with hazelnuts or honey.

You can also reference flavors that you might infuse via blending or barrel-aging from a specific wine or spirit. The "beer" entry itself has some common pairings for cooking with our favorite beverage, but they probably wouldn't translate well to the glass (e.g., pork and sauerkraut) — of course there are exceptions such as commercial breweries that have brewed with Rocky Mountain oysters (Colorado's Wynkoop Brewing Company), smoked goat brains (Philadelphia's Dock Street Brewery), and many dozens of other seemingly unappetizing ingredients.

When determining how much of an ingredient to add, it is always best to either aim low or reserve plain beer for eventual blending. If you are flavoring with spices, use the smallest reasonable amount initially — you can always dose with spice-tea at bottling/kegging to taste. If you are adding fruit, you might choose to over-fruit a portion of the beer (5 lbs. per gallon —

Experimental Beer Commercial Examples

Dock Street Walker
Dock Street Brewery
Philadelphia, Pennsylvania
www.dockstreetbeer.com

Imperial Biscotti Break Natale
Evil Twin Brewing
Copenhagen, Denmark
www.eviltwin.dk

Maple Bacon Coffee Porter
Funky Buddah Brewery
Oakland Park, Florida
www.funkybuddhabrewery.com

Pangaea
Dogfish Head Craft Brewery
Milton, Delaware
www.dogfish.com

Ris A La M'ale
Mikkeller
Copenhagen, Denmark
www.mikkeller.dk

Rocky Mountain Oyster Stout
Wynkoop Brewing Co.
Denver, Colorado
www.wynkoop.com

Short's PB & J
Short's Brewing Co.
Bellaire, Michigan
www.shortsbrewing.com

Sobrehumano Palena 'Ole
Jolly Pumpkin Artisan Ales and Maui Brewing Co.
Dexter, Michigan and Lahaina, Hawaii
www.jollypumpkin.com and www.mauibrewingco.com

Voodoo Doughnut Chocolate, Banana & Peanut Butter Ale!
Rogue Ales
Newport, Oregon
www.rogue.com

Wells Banana Bread Beer
Wells and Young's Brewing Co.
Bedford, United Kingdom
www.wellsandyoungs.co.uk

0.6 kg/L), retaining the rest of the batch to mellow the fruit once the fermentation is complete (for more info about brewing fruit beers, turn to page 73 of this issue).

Another trick is to add a small amount of a second ingredient to boost the flavor and complexity of the star ingredient. For example vanilla, coffee, or unrefined sugar can enhance the presence of chocolate without being immediately apparent.

Culinary Beers

As brewers (and humans) most of us are interested in food, so the culinary world is a frequent source of inspiration. However, just because a combination tastes good on a plate, doesn't guarantee it will translate agreeably to beer. While I may love a slice of pizza or carrot cake, their flavors infused into

Photo by Michael Tonsmeire

When you experiment with new ingredients, such as this grapefruit zest and dry hops, take careful notes of how much you use each time you brew so that you can recreate the same flavors next time or improve the next batch.

beer do not work for my palate. When we eat we get variation from bite to bite, we experience the ingredients somewhat separately. Think about culinary beers as sauces. What works without texture (like the recent wave of chile-chocolate Mexican mole-inspired imperial stouts, e.g., Cigar City Hunahpu's, Perennial Abraxas, Prairie Bomb! etc.) is different than what works as an entire entrée.

For some ingredients texture is more important than flavor; really analyze why you enjoy an ingredient before adding it to a batch. Hold your nose while tasting an additive to block the aroma; if there isn't much change in your perception, texture is the dominant character. Flavor intensity needs to be adequately robust to sense, but not so overpowering to be annoying by the end of a glass.

Split Batches

One of the best ways to experiment is to split a batch of wort into multiple finished beers. For example, I turned three 5-gallon (19-L) batches of Belgian blonde ale into 15 different variations by adding sugars (everything from table sugar to agave, muscovado, and various candi sugars). It is best to keep the basic recipe simple if your ultimate goal is to evaluate the various ingredients, but making a bland base beer may not give you an accurate representation of how those flavors will fare in the context of a more interesting recipe.

> "For some ingredients texture is more important than flavor; really analyze why you enjoy an ingredient before adding it to a batch."

If you are brewing 5-gallon (19-L) batches, it is helpful to own smaller fermenters to hold split batches. I have several 3-gallon (11-L) fermenters in my homebrewery that I use primarily to separate batches in half for fruit variants. I also have 1-gallon (3.8-L) jugs that are perfect for splitting batches five ways (while writing this story they were filled with a pale sour with five obscure varietal honeys). Being able to split one wort into multiple finished beers saves time and effort, and distributes risk (nine bottles each of five experimental beers are less risky than 45 bottles of a single beer).

If you rely on an auto-siphon to transfer beer, ensure that yours is sized to fit through the mouth of the smaller fermenters. All other equipment (bottling bucket etc.) should work fine, although some brewers opt to bypass bulk priming preferring to prime in the bottle. You can even perform single bottle experiments, adding a few whole hop cones, wood cubes, coffee beans etc. (just be prepared for gushing when you pop the cap, thanks to the additional nucleation sites they provide for carbon dioxide bubbles to form).

Your experimental ingredient adding process will determine the timing of when one batch should become several. In general, the later you split a batch, the less effort is required.

Splitting Ingredient Recommendations

In the Bottling Bucket: Spice/herb teas and tinctures, extracts, and salts (avoid incorporating anything fermentable unless taking into account the impact on priming)
Secondary Fermenter: Sugars, fruits, dry hops, and wood
Primary Fermenter: Yeast strains
Boil: Boil hops
Mash: Malts, mashing process, pre-boil hops

Rather than splitting a wort/beer five ways some brewers leave most of the batch as is and draw off 1 gallon (3.8 L) to alter. This is especially valuable for new brewers who have a "great" idea. An entire batch is too much to risk on an unproven flavor profile (like my second batch, a vanilla cream ale . . .).

Experimental Brewing Resources

Here is a short selection of resources for more information about brewing experimental beers or using experimental brewing techniques. For links to related stories in Brew Your Own, *turn to page 55.*

Books:

American Sour Beer, Michael Tonsmeire, (Brewers Publications, 2014)

Extreme Brewing: An Enthusiast's Guide to Brewing Craft Beer at Home, Sam Calagione, (Crestline Books, 2012)

Experimental Homebrewing: Mad Science in the Pursuit of Great Beer, Drew Beecham and Denny Conn (Voyageur Press, November 2014),

Radical Brewing: Recipes, Tales and World-Altering Meditations in a Glass, Randy Mosher (Brewers Publications, 2004)

Radio/Podcasts

Fuhmentaboudit! (Heritage Radio Network, Brooklyn, NY), www.fuhmentaboudit.com/

Brew Strong (The Brewing Network, Martinez, California), www.thebrewingnetwork.com/

Basic Brewing Radio (Active Voicing™, Prairie Grove, Arkansas), www.basicbrewing.com

Websites/Blogs

Experimental Homebrewing: www.experimentalbrew.com

Brew Science: www.sciencebrewer.com

The Mad Fermentationist: www.themadfermentationist.com

Science and Homebrews: www.byo.com/blogs/science-and-homebrews

Bear Flavored: www.bear-flavored.com

If you find that the initial trial is enjoyable, then you can tweak the recipe and re-brew a full batch.

Evaluation of Results

Take notes not only on your process, but on the final results. Evaluate for yourself, but don't stop there. Experiments are a fun excuse to get your friends or homebrew club involved! We're all sensitive to aromatic and flavor-active molecules at different concentrations. Set up a blind tasting to learn how your opinion compares to a group consensus.

Blind taste tests are helpful, as are silent ballots. Triangle tests are a standard method at commercial breweries for evaluating whether two beers are perceptibly different. Do this at home (or at your next homebrew club meeting) by giving each taster two glasses

Experimental Brewing Recipes

Dessert Stout
(5 gallons/19 L, all-grain)

OG = 1.054 FG = 1.015
IBU = 21 SRM = 35 ABV = 5.1%

This is the perfect not-too-roasty stout to try out all of your favorite dessert flavor combinations: coconut, coffee, chocolate, jammy fruit, hazelnuts etc.

Ingredients

8.5 lbs. (3.9 kg) Golden Promise pale ale malt
13 oz. (0.37 kg) flaked oats
8 oz. (0.23 kg) Weyermann Carafa® I special malt (350 °L)
8 oz. (0.23 kg) pale chocolate malt (225 °L)
8 oz. (0.23 kg) Weyermann Caramunich® III malt (55 °L)
5 oz. (0.14 kg) black malt
5.5 AAU Nugget whole hops (60 min) (0.5 oz./14 g of 11% alpha acid)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or Fermentis Safale US-05
Priming sugar (if bottling)

Step by Step

Heat 15 qts. (14 L) of water to achieve a mash temperature of 153 °F (67 °C). Hold at this temperature for 60 minutes or until conversion is complete. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.6 L).

Boil the wort for 75 minutes adding hops with 60 minutes left in the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, aerate the wort with filtered air or pure O_2 and pitch yeast.

Ferment at 68 °F (20 °C). After fermentation is complete, transfer the beer to five 1-gallon (3.8-L) jugs and flavor as desired with Frangelico (hazelnut liquor), 100% raspberry jam, "bloomed" cocoa powder and vanilla bean, coffee beans, maple syrup, ancho peppers, etc. Once you're certain the final gravity is stable, bottle or keg each aiming for 2.2 volumes of CO_2. Use the priming chart at http://byo.com/resources/carbonation to determine your priming sugar needs.

Dessert Stout
(5 gallons/19 L, partial mash)

OG = 1.054 FG = 1.015
IBU = 21 SRM = 35 ABV = 5.1%

Ingredients

3.3 lbs. (1.5 kg) Maris Otter liquid malt extract
4 lbs. (1.8 kg) Golden Promise pale ale malt
13 oz. (0.37 kg) flaked oats
8 oz. (0.23 kg) Weyermann Carafa® I special malt (350 °L)
8 oz. (0.23 kg) pale chocolate malt (225 °L)
8 oz. (0.23 kg) Weyermann Caramunich® III malt (55 °L)
5 oz. (0.14 kg) black malt
5.5 AAU Nugget whole hops (60 min) (0.5 oz./14 g of 11% alpha acid)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or Fermentis Safale US-05
Priming sugar (if bottling)

Step by Step

Separate out the dark roasted grains. Mash the pale ale malt, oats and Caramunich® at 153 °F (67 °C) for 30 minutes. Stir in the dark roasted grains and continue to mash for 30 more minutes. Raise the temperature to mash out at 168 °F (76 °C) and begin the lauter phase (see all-grain recipe, left). Bring the wort to a boil and add the liquid malt extract off heat. Stir until the malt extract is dissolved and return to a boil. Boil 75 minutes adding the hops with 60 minutes left in the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, aerate the wort with filtered air or pure O_2 and pitch yeast.

Ferment at 68 °F (20 °C). After fermentation is complete, transfer to five 1-gallon (3.8-L) jugs and flavor as desired with Frangelico (hazelnut liquor), 100% raspberry jam, "bloomed" cocoa powder and vanilla bean, coffee beans, maple syrup, ancho peppers, etc. Once you're certain the final gravity is stable, bottle or keg each aiming for 2.2 volumes of CO_2. Use the priming chart at http://byo.com/resources/carbonation to determine your priming sugar needs.

Sucro-licious Belgian
(5 gallons/19 L, all-grain)

OG = 1.051 (1.060-1.063, with sugar)
FG = 1.006
IBU = 21 SRM = 6+ (sugar dependent)
ABV = 7.4%

Sugar selection can completely change the impression of a Belgian beer. Some dubbels are little more than Belgian blondes with dark candi syrup instead of pure sucrose.

Ingredients

7.5 lbs. (3.4 kg) European Pilsner malt
2.75 lbs. (1.25 kg) Belgian pale malt
0.25 lbs. (0.11 kg) melanoidin malt
6 AAU Hallertau whole hops (60 min) (1.5 oz./43 g of 4% alpha acid)
White Labs WLP530 (Abbey Ale), Wyeast 3787 (Trappist High Gravity), or Fermentis Safbrew T-58
Priming sugar (if bottling)

Step by Step

Heat 15 qts. (14 L) of water to achieve a mash temperature of 153 °F (67 °C). Mash at 153 °F (67 °C) for 60 minutes. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.6 L).

Boil the wort for 75 minutes adding the hops with 60 minutes left in the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, aerate the wort with filtered air or pure O_2 and pitch yeast.

Ferment at 72 °F (22 °C). After fermentation is complete, transfer the beer into five jugs with 4 oz. per gallon (120 g per 4 L) of agave, gur, date sugar, candi sugar/syrup, homemade caramel, golden syrup, or unrefined cane sugars (e.g., turbinado, demerara, muscovado). Once the final gravity is stable, bottle or keg each aiming for 2.2 volumes of CO_2. Use the priming chart at http://byo.com/resources/carbonation to determine the priming sugar needs.

Sucro-licious Belgian
(5 gallons/19 L, partial mash)

OG = 1.051 (1.060-1.063, with sugar)
FG = 1.006
IBU = 21 SRM = 6+ (sugar dependent)
ABV = 7.4%

Ingredients

4.1 lbs. (1.86 kg) Pilsen dried malt extract
2.75 lbs. (1.25 kg) Belgian pale malt
0.25 lbs. (0.11 kg) melanoidin malt
6 AAU Hallertau whole hops (60 min) (1.5 oz./43 g of 4% alpha acid)
White Labs WLP530 (Abbey Ale), Wyeast 3787 (Trappist High Gravity), or Fermentis Safbrew T-58
Priming sugar (if bottling)

Step by Step

Heat 6 qts. (5.7 L) of water to achieve a mash temperature of 153 °F (67 °C). Mash the grains at 153 °F (67 °C) for 60 minutes. Raise the temperature to mash out at 168 °F (76 °C) and begin the lauter phase (see all-grain recipe, left).

Bring the wort to a boil and add the dried malt extract off heat. Stir until the extract is dissolved and return to a boil.

Boil the wort for 75 minutes adding the hops with 60 minutes left in the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, aerate the wort with filtered air or pure O_2 and pitch yeast.

Ferment at 72 °F (22 °C). After you are certain that fermentation is complete, transfer the beer into five 1-gallon (3.8-L) jugs with 4 oz. per gallon (120 g per 4 L) each of agave, gur, date sugar, candi sugar/syrup, homemade caramel, golden syrup, or unrefined cane sugars (e.g., turbinado, demerara, muscovado).

Once the final gravity is stable, bottle or keg the beer, each aiming for 2.2 volumes of CO_2. Use the priming chart at http://byo.com/resources/carbonation to determine your priming sugar needs.

of one beer and one of another then have them pick the two that match. Although you need a statistically significant number of samples for validation, you can simply repeat the test a couple of times with the same volunteers if you are short on subjects. Tables are widely available online, but to be 95% confident there is a difference you'll need four out of five subjects/trials to select the correct pair.

The most important step after tasting notes and statistics have been examined is to form what you've learned into actionable ideas. If you tried a split batch with five new hop varieties, document which other hops, malts, yeasts, and styles would complement each. If you determine that a decoction mash doesn't produce a beer that tastes any different than an infusion mash, make a note of that.

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This will allow you to reference your notes quickly rather than pouring over pages of descriptors when designing a new recipe.

Explore and Experiment

If you are interested in making experimental beers, rather than mimicking a favorite commercial beer, take an occasional batch of homebrew to explore. Use your small production volume and lack of commercial business and regulatory oversight to brew the way many craft brewers wish they could: Put the beer first without concern for cost, ingredient scarcity, marketability, legality, or time constraints. Go out of your way to procure the highest-quality ingredients available. Think like a chef, but remember that the way flavors work in beer is different than food. Try one of the recipes provided on page 52 and 53 as a jumping off point into your own experimental batch, or concoct your own from scratch! BYO

Related Links:

• One of the challenges of trying new ingredients and gadgets in your homebrewery all the time is determining what exactly made your beer better or worse than the last. Was it the different hops, the extra crystal malt, the new yeast strain, or the shorter cooling time? Read about performing some simple homebrew science experiments to brew better experimental homebrews:
http://byo.com/story830

• Put your favorite homebrew argument to rest with an appropriate test. Try performing an advanced brewing experiment on your next homebrew ingredient test subject:
http://byo.com/story248

• Despite names like Fat Spider Ale, Turkey Stout and Black Kitty Brown, only a few *BYO* recipes have ever featured animals as an ingredient — including one of our favorites, Black Pearl Oyster Stout. We've been lucky enough to taste this beer, brewed by Joe Walton and Jim Michalk, and it is delicious. Try brewing it yourself!
http://byo.com/story2295

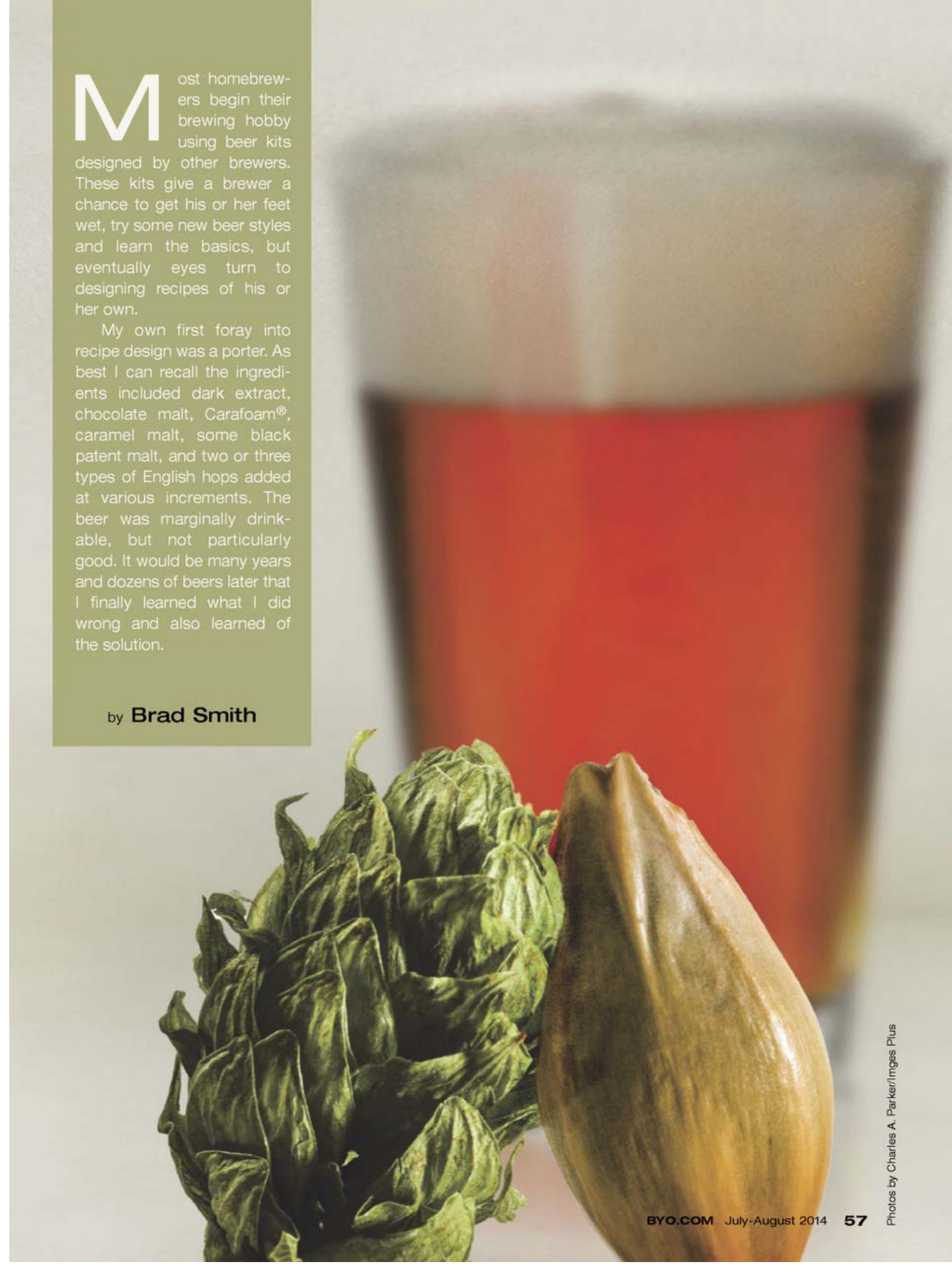
SMaSH

Single Malt and Single Hop

Most homebrewers begin their brewing hobby using beer kits designed by other brewers. These kits give a brewer a chance to get his or her feet wet, try some new beer styles and learn the basics, but eventually eyes turn to designing recipes of his or her own.

My own first foray into recipe design was a porter. As best I can recall the ingredients included dark extract, chocolate malt, Carafoam®, caramel malt, some black patent malt, and two or three types of English hops added at various increments. The beer was marginally drinkable, but not particularly good. It would be many years and dozens of beers later that I finally learned what I did wrong and also learned of the solution.

by **Brad Smith**



Photos by Charles A. Parker/Imges Plus

Kitchen Sink Syndrome

The problem with my first porter, as well as many of my self designed beers that followed was what I now call "the kitchen sink syndrome." With a poor understanding of what ingredients are used in a porter, and an even weaker understanding of what each ingredient contributes to the beer, many brewers dive in with both feet and simply put everything but the kitchen sink into their beer.

That thinking goes something like this: "If two malts make a great pale ale, then surely five or six different malts will make a better one!" or, "Why stop with just one or two hop additions when I can add hops every five minutes instead?" or "I'm sure this Bavarian weisse would be even better if I dry hopped it for a few weeks with some Northern Brewer hops."

This approach is equivalent to maximizing speed but in the wrong direction. Driving 100 miles an hour won't help if you made a wrong turn way back in Albuquerque. When I suffered from kitchen sink syndrome, I was filled with good intention, but lacked a defined goal or the knowledge to follow through on it.

Why Simplicity Matters

With age and experience comes wisdom, though I was admittedly a slow learner. Over time as I studied some of my favorite beer styles, and looked at award-winning recipes I came to realize that the best recipes used fewer, and not more ingredients. Even more important, I realized that the ingredients that were included in each recipe are tied to a specific purpose. They were not just tossed in casually as an afterthought — but each ingredient was added to achieve a flavor or effect in the finished beer.

Many commercial and craft beers best reflect this philosophy. For a commercial brewer, using extraneous ingredients or processes is costly to the bottom line. Aside from being poor for business there is also the practical consideration of how many varieties of grains or hops a small brewery can reasonably stock.

So if you look at most craft brew-

eries, they typically create a wide variety of beers from a relatively small stock of ingredients. They may use the same pale malt stock for almost every beer, and use a small number of popular specialty malts (caramel malt, chocolate malt, etc.) and hop varieties to brew their stock beers. To take advantage of bulk pricing as well as maximize use of their limited storage space, they can't afford to stock the wide variety of yeasts or malts you might find in a typical homebrew store.

This is where homebrewers have an advantage. We have easy access to most any malt, hop or yeast variety, and can create beers that may not be affordable or commercially viable. But easy access is a double edge sword — as having access to everything also means we may never be forced to make the tough decisions to simplify when simplicity matters most.

Simplicity to the Extreme

So if many homebrewers go too far in their quest to use every ingredient, and commercial brewers make great beer with relatively few ingredients, how does one determine where the sweet spot is in beer design?

Enter SMaSH brewing. SMaSH stands for Single Malt and Single Hop recipe design. SMaSH takes the idea of simplicity in brewing to its logical extreme — by limiting the brewer to one malt, one hop variety, and one yeast strain. It's a great technique for brewers looking to simplify their beer, and move beyond the kitchen sink syndrome.

The Advantages of SMaSH Brewing

I don't advocate SMaSH as necessarily the best method for creating your next blue-ribbon award-winning beer (although there are definitely some award-winners made this way). SMaSH is, however, an important step on the path to understanding how isolated ingredients impact your finished beer. Some of the advantages of SMaSH include:

• Understanding what a single hop variety tastes like in isolation, and what it brings to your beer.

SMaSH RECIPES

Citra SMaSH India Pale Ale

(5 gallons/19 L, all-grain)

OG = 1.060 FG = 1.012
IBU = 45 SRM = 5 ABV = 6.4%

Ingredients

12 lbs. (5.4 kg) Maris Otter pale ale malt
12 AAU Citra® hops (60 min.)
(1 oz./28 g of 12% alpha acid)
1 oz. (28 g) Citra® hops (0 min.)
1 oz. (28 g) Citra® hops (dry hop)
0.25 tsp. Irish moss (10 min.)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step

Heat 15 qts. (14 L) of water to 165 °F (74 °C) to achieve a mash temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) for 60 minutes, or until conversion is complete. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.6 L).

Boil the wort for 75 minutes. Add the first hop addition at 60 minutes left in the boil. Add the second addition of hops at the end of the boil.

Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 68 °F (20 °C). After primary fermentation has died down, add the dry hop addition. After two days of dry hopping, rack the finished beer off the dry hops and bottle or keg. If priming, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Citra SMaSH India Pale Ale

(5 gallons/19 L, extract only)

OG = 1.060 FG = 1.012
IBU = 45 SRM = 5 ABV = 6.4%

Ingredients

8.5 lbs. (3.9 kg) Maris Otter liquid malt extract
12 AAU Citra® hops (60 min.)
(1 oz./28 g of 12% alpha acid)
1 oz. (28 g) Citra® hops (0 min.)
1 oz. (28 g) Citra® hops (dry hop)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step

Heat 5 gallons (19 L) of brewing water to boil. Remove the brewpot from the heat to add the liquid malt extract. Stir the wort until the extract is fully dissolved, then return to a boil. Watch the pot and continue to stir to avoid scorching.

Boil the wort for 60 minutes. Add the first hop addition at 60 minutes left in the boil. Add the second addition of hops at the end of the boil.

Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 68 °F (20 °C). After primary fermentation has died down, add the dry hop addition. After two days of dry hopping, rack the finished beer off the dry hops and bottle or keg. If priming, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

SMaSH Cream Ale

(5 gallons/19 L, all-grain)

OG = 1.047 FG = 1.012
IBU = 18 SRM = 3 ABV = 5.1%

Ingredients

10 lbs. (4.5 kg) US 2-row pale malt
5 AAU Saaz hops (60 min.)
(1.25 oz./35 g of 4% alpha acid)
White Labs WLP080 (Cream Ale) yeast blend
Priming sugar (if bottling)

Step by Step

Heat 12.5 qts. (11.8 L) of water to 165 °F (74 °C) to achieve a mash temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) for 60 minutes, or until conversion is complete. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.6 L).

Boil the wort 75 minutes. Add the bittering hops addition at 60 minutes left in the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 68 °F (20 °C). After primary fermentation is over, bottle or keg. Visit http://byo.com/resources/carbonation to determine your priming sugar needs.

SMaSH RECIPES

SMaSH Cream Ale
(5 gallons/19 L, extract only)

OG = 1.047 FG = 1.012
IBU = 18 SRM = 3 ABV = 5.1%

Ingredients
5.25 lbs. (2.4 kg) extra light dried malt extract
5 AAU Saaz hops (60 min.) (1.25 oz./35 g of 4% alpha acid)
White Labs WLP080 (Cream Ale) yeast blend
Priming sugar (if bottling)

Step by Step
Heat 5 gallons (19 L) of brewing water to boil. Remove the brewpot from the heat to add the dried malt extract. Stir the wort until the extract is fully dissolved, then return to a boil. Watch the pot and continue to stir to avoid scorching.

Boil the wort for 60 minutes. Add the hops at the beginning of the boil.

Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 68 °F (20 °C). After primary fermentation is over, bottle or keg. If priming, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Tips for Success
Cream ale was historically brewed with ale yeast and subjected to cellaring conditions to give it a lager-like profile. This is because ale breweries tended to not be set up for cold fermentation, so it was probably brewed warm regardless of yeast type, at least until Prohibition. But in modern times cream ale can be brewed with either ale or lager yeast. *BYO*'s Jamil Zainasheff recommends experimenting with yeast strains such as White Labs WLP001 (California Ale), Wyeast 1056 (American Ale), Fermentis Safale US-05 dry "Chico" ale yeast and White Labs WLP810 (San Francisco Lager) yeast. Try to stick to a fermentation temperature of 65–70 °F (18–21 °C) and a conditioning temperature of approximately 40 °F (5 °C). For more about cream ale, visit http://byo.com/story130.

SMaSH Saison
(5 gallons/19 L, all-grain)

OG = 1.052 FG = 1.010
IBU = 22 SRM = 4 ABV = 5.6%

Ingredients
10.5 lbs. (4.8 kg) US 2-row pale malt
6.8 AAU Saaz hops (60 min.) (1.5 oz./43 g of 4.5% alpha acid)
White Labs WLP566 (Belgian Saison II) yeast or Lallemand Belle Saison yeast
Priming sugar (if bottling)

Step by Step
Heat 13 qts. (12.4 L) of water to 165 °F (74 °C) to achieve a mash temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) for 60 minutes, or until conversion is complete. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.6 L).

Boil the wort 75 minutes. Add the bittering hops addition at 60 minutes left in the boil.

Chill the wort to 72 °F (22 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 75 °F (24 °C). After primary fermentation is over, bottle or keg. Visit http://byo.com/resources/carbonation to determine how much priming sugar you will need.

SMaSH Saison
(5 gallons/19 L, extract only)

OG = 1.052 FG = 1.010
IBU = 22 SRM = 4 ABV = 5.6%

Ingredients
7.5 lbs. (3.4 kg) pale liquid malt extract
6.8 AAU Saaz hops (60 min.) (1.5 oz./43 g of 4.5% alpha acid)
White Labs WLP566 (Belgian Saison II) yeast or Lallemand Belle Saison yeast
Priming sugar (if bottling)

Step by Step
Heat 3 gallons (11.4 L) water in a large pot to boil. Remove from heat and stir in the liquid malt extract. Stir until the extract is fully dissolved then return the pot to a boil. Watch the pot and continue to stir to avoid scorching.

Add the hops and boil the wort for 60 minutes. Add water during the boil to keep the total wort volume near 3 gallons (11.4 L).

Chill the wort to 72 °F (22 °C), let the break material settle, rack to the fermenter and top off to 5 gallons (19 L). Ferment at 75 °F (24 °C). After primary fermentation is over, bottle or keg. Visit http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Tips for Success
To hit the standard CO_2 level for a typical Belgian beer (about 8 grams per liter or 4 volumes of CO_2), this recipe may require a little bit more priming sugar than the typical ¾ cup suggested in most homebrew recipes. If bottling, the thicker Belgian-style bottles are recommended due to the higher CO_2 volume inside the bottle. Traditional Belgian yeast requires higher temperatures to condition efficiently, so be sure to bottle condition in a spot that is consistently around 78 °F (25 °C), which is above room temperature.

DMaSH RECIPE

Dual-Malt Porter
(5 gallons/19 L, all-grain)

OG = 1.046 FG = 1.012
IBU = 22 SRM = 20 ABV = 4.5%

Ingredients

6 lbs. (2.7 kg) Maris Otter pale ale malt
3.5 lbs. (1.6 kg) brown malt (65 °L)
6.3 AAU East Kent Golding hops (60 min.) (1.25 oz./35 g of 5% alpha acid)
White Labs WLP002 (English Ale) or Wyeast 1968 (London ESB) or Lallemand Windsor Ale yeast
Priming sugar (if bottling)

Step by Step

Heat 11.25 qts. (10.6 L) of water to 165 °F (74 °C) to achieve a mash temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) for 75 minutes. Sparge with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6 gallons (23 L). Boil the wort for 60 minutes, adding the hops at the beginning of the boil. Chill the wort to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Ferment at 66 °F (19 °C). After primary fermentation is over, bottle or keg. Visit http://byo.com/resources/carbonation to determine priming sugar needs.

- Understanding how different base malts impact the flavor of your finished beer.
- Highlighting the differences between yeast strains.
- Getting the brewer to think seriously about brewing techniques and what they bring to the beer — including mash techniques, hop additions and timing, water additions, fermentation schedules and finishing your beer.
- Moving towards a philosophy that emphasizes using ingredients and techniques to achieve a specific flavor or effect in the finished beer, and away from the kitchen sink approach to brewing.
- Understanding what flavors you like in your beer, and which ones you don't.

SMaSH Styles

I know a lot of you reading this are probably thinking, "What kind of beer can I possibly create with just one malt and one hop?" Well, it turns out the list of possible styles is pretty extensive. Here are some of the popular beer styles you can create with just a single hop and single malt: Light lagers, Pilsners of all types, saison, India pale ale, American pale ale, American IPA, Belgian blonde ale, cream ale, tripel, Belgian golden strong ale, old ale, English bitters and milds, barleywine, Oktoberfest, Vienna, altbier, Helles, and Grodziskie.

The key to making all of these different styles is simply using the right selections for your base malt, hop variety and yeast, along with applying the correct techniques and timing.

Selecting your Grains

Different grains from different maltsters and areas of the world can have their own distinct flavors. By carefully selecting your base grain to go with your beer style, hop and yeast variety you can achieve some unique effects. I encourage you to sample some of the malt by lightly chewing it — to get an idea of its flavor before brewing.

Extract brewers can join the SMaSH bandwagon here. Select one variety of liquid or dried malt extract that matches your beer style, and brew with that. Obviously your selections are more limited than an all-grain brewer, but you still have options. In addition to the obvious pale malt, many stores offer liquid Munich malt, wheat malts, and other specialty extracts to try.

For all-grain brewers, many of us are familiar with American or British 2-row pale malt, but have not tried 6-row malts. Six-row barley, while it has a slightly lower (2%) overall potential, has more enzymes than 2-row, and higher protein levels that will provide body in the final beer.

Maris Otter, an English 2-row barley has long been a favorite of SMaSH brewers. It imparts a complex, unique flavor particularly to many English styles that has long been favored by home and commercial brewers alike. For example you can make a great SMaSH IPA with just Maris Otter malt or malt extract.

Moving away from pale malts, two other popular SMaSH malts are Munich and Vienna malts. Beers made with 100% Munich develop a strong malty sweetness as well as distinct red-copper color. Lighter Munich varieties work best, provided you balance the maltiness with hops or use it in a malty continental style.

Vienna malt is slightly lighter in color and sweeter than Munich, making it a great base malt for Munich, Oktoberfest or other malty styles.

Beer made from 100% wheat malt is an option. You need to select a wheat malt that has sufficient diastatic power, but most light wheat malts are self-converting. A good example would be Briess' White Wheat, which has a high diastatic power of 160. When working with 100% wheat you are going to get a thick mash so using a high water/grain ratio or brewing via brew-in-a-bag or with rice hulls might be needed to avoid a stuck mash.

Finally you can consider lightly smoked malts. Using 100% smoked malt requires carefully selecting your malt, so you don't overwhelm the beer with smoked flavor. An example would be the Polish beer style Grodziskie, which is made from 100% wheat malt smoked over oak. Lightly smoked pale malt can also be used as a base.

Selecting your Hops

Hops have a huge impact on beer flavor, and SMaSH is a great method for isolating and identifying the hops that you prefer most.

When selecting hops, you may want to smell, rub and even lightly sample the hops. With experience you can get a good idea of some of the flavors and aromas a hop brings to beer. Use a hop variety that matches your target style. If brewing a continental beer, use a noble hop variety. For English ales, I like to stick with varieties like East Kent Goldings, and Fuggles. Some great American ales can be brewed from the distinct American hop styles.

Beyond the style specific choices, SMaSH is a good way to experiment with new varieties. Try a hop you've never used before, or one with unique flavors like some of the fruity or piney Pacific flavors. Try some of the new varieties from New Zealand or Australia, or cutting edge varieties developed in the last few years. You may find one you really like.

Selecting a Yeast Strain

One way to increase the complexity of a SMaSH beer is by choice of yeast strain. Select a yeast strain that either adds its own complexity to your finished beer, or one that highlights your selection of malt and yeast.

English ale strains, for example, add esters, bready complexity and malty sweetness. Bavarian wheat yeast can add the distinctive banana-clove flavor to a plain, lightly hopped beer. Other yeasts, like Kölsch will highlight the hop flavor in a light ale. Pacific ale yeast can highlight maltiness, fruity esters as well as hops in beers like IPAs.

At the other end of the spectrum you can select a yeast that is neutral in flavor. American ale yeasts ferment clean, highlighting the flavor and finish of your malt and hop selections. Cream ale yeast leaves a clean lager-like finish with a hint of fruity esters.

SMaSH Brewing Techniques

Just because you are limiting yourself to one hop and one malt does not mean

> By adding a second malt variety to your recipe you can cover almost every single style of beer.

you can't use the full range of brewing techniques. It's hard to cover all of the possibilities in limited space, but I'll provide a few examples.

If you are brewing all-grain, you definitely want to adjust the mash temperature to match the desired body of your beer. Mashing at a higher temperature like 156 °F (69 °C) will result in a more malty beer and an increase in body and final gravity. Mashing at a low temperature around 148 °F (64 °C) results in a cleaner, drier finish to the beer with a lower final gravity.

For a hoppy beer like an IPA, you can use multiple boil additions, whirlpool/steeped hops and dry hopping to maximize your hoppy flavor. For less hoppy beers, I like to use a first wort hop addition, where you add hops to the boiler as you are lautering, and leave them in for the entire boil. First wort hopping results in a smoother hop perception, an effect that is preferred by most beer drinkers for beers that are not hop-forward.

Adjusting your fermentation temperature and conditions can also have a large impact on your beer. Fermenting a bit cooler can give you a cleaner finish, while fermenting warm can result in extra esters, and in extreme cases fusel alcohol.

Two Malts or Hops

If you find the dozen or so styles encompassed by SMaSH too limiting, you can consider expanding your horizons to Dual Malt and Single Hops (DMaSH). By adding a second malt variety to your recipe you can cover almost every single style of beer.

For example, with two malts you can easily create porters, all of the major stouts, Belgian ales, abbey ales, all of the wheat beers, rauchbier, all of the bocks, Flanders and many more. Like SMaSH, creating a dual-malt recipe helps you boil a beer style down to its fundamentals. Let's take the example of a dual-malt stout. For a dry Irish stout I might choose a Maris Otter base to provide some body and complexity and then add roast barley as the second malt. This combination will provide the dry roasted flavor we desire while maintaining good body and complexity in the finished beer.

Contrast this with an English porter. Again, Maris Otter might be a good base malt choice, but the brewer is faced with several possibilities for the second malt. Some options include black patent, chocolate and brown malt. Black patent would provide a more roasted, coffee-like finish, closer to a stout, and chocolate can be a bit bitter in large quantities. I would go with brown malt, which was originally used for porter as it is smooth and clean even in larger quantities.

More importantly, selecting the right proportion of malts, hops, and yeast and then brewing and sampling the beer provides a great education in understanding ingredients. Perfecting your SMaSH or dual-malt recipe through several iterations will give you the equivalent of a graduate education in malt and hop flavors.

You can consider expanding to two hop varieties as well. For example you might want to use one variety for bittering and a second for whirlpool/aroma hops. Isolating the boil from the finishing aroma hops can help distinguish the finished bittering flavor, and provide interesting combinations.

Start SMaSH-ing

SMaSH and dual-malt (or dual-hop) brewing are great tools for expanding your brewing horizons. Simplifying your beer lets you understand what individual malt and hop combinations bring to the beer. This will move you away from the kitchen sink approach to brewing towards a real understanding of ingredients.

I used the bad weather last winter to experiment with some mini-brew-in-a-bag and mini-extract batches on the stovetop, and found it to be a great educational experience. These mini SMaSH or dual-malt batches can be brewed quickly, and you will learn something from every batch, even if the beer is not perfect every time.

I encourage you to give SMaSH or dual-malt brewing a try — it will significantly enhance your understanding of malt, hops and yeast and ultimately improve your brewing experience. BYO

TAPS on your TRUCK

by **Dave Louw**

Photos courtesy of Dave Louw

build a mobile draft system

There's nothing quite like pulling into your campsite and pouring a nice cold draft homebrew before you've even pitched your tent. It certainly helps foster domestic tranquility and makes you the envy of your fellow campers. In fact the only downside I've found is that it can be hard to get any camp setup done as people begin to flock and ask questions.

Just about any vehicle is suitable for adding a mobile draft system, but you'll want to consider how much to risk your resale value. I've made this upgrade to a full-size truck with a contractor body as well as to my current weekend toy, a 1988 Volkswagen Vanagon Westfalia camper (see photo to left). When I sold the truck it wasn't an issue as I simply used some bolts and washers to seal the holes on the back. For the Westy I strategically placed the shank hole behind a vent cover so it's out of sight. If you plan to keep the vehicle indefinitely, however, you can modify at will!

Faucet Location

The single most important decision to make when modifying your vehicle is where you want to locate the faucets. An ideal location will be a perfectly flat surface with access to ample storage space inside the vehicle, and where drips from the faucets won't make too much of a mess. Some good options include:

- Straight through the tailgate for pickup trucks and Jeeps, though consider how drips might hit the bumper
- Take over one of the entire rear tool boxes on a contractor body pickup truck
- Through the rear quarter panel on vans or SUVs

Whatever you decide, make sure you're going to be able to drill a hole through the body and have adequate access to install the shank on the inside. You're not going to get multiple chances so make sure to plan adequately and double check that your desired location will work.

Beer Storage

Once you've chosen where your faucets will go you'll want to think about how you're going to keep your beer cold on the go. You've got a few options.

Insulated Section

In some cases you might have a box of some sort that's part of the vehicle. This was how my first installation worked as I was able to lay claim to an entire rear tool cabinet in the contractor body on my pickup truck. Other specialty vehicles may have similar spaces that can be used.

If you are lucky enough to dedicate a space like this for your keg what you need to consider is how you'll keep the beer cold and how you'll deal with the inevitable moisture. I have had good luck with using a spray adhesive and carefully cut pieces of reflective bubble wrap insulation. Expanding spray foam might work as well but you'll want to make sure whatever you use for a lining won't get

waterlogged or trap any moisture against the vehicle's metalwork.

The most likely way you'll be cooling the beer is with bags of ice or ice packs of some sort. As these melt, or just through condensation, you'll quickly find that you're dealing with a lot of moisture. You need to make sure there's a good way for that moisture to either be safely contained for your trip or that there is a way for it to drain out.

Cooler/Insulated Container

A good flexible approach that works for any vehicle is to put your keg into a cooler or a custom insulated container. This works especially well with smaller kegs, such as 2.5 gallons (9.5 L), which easily fit into larger coolers.

If space is at a premium you can build your own cooler with some foam and a 5-gallon (19-L) bucket. I was able to find a styrofoam liner for a 5-gallon (19-L) bucket at a big box home improvement store and just needed to carve away a little bit to make everything fit.

Jockey Box

Of course a tried and true approach is to allow the keg to be closer to room temperature and then use a jockey box to cool the beer on its way to the faucets.

Build

I've provided several options for keeping the beer cool, but I'll walk you through how I built out my chosen path on my Westy.

You'll need the following parts:

- Shank just long enough to go through bulkhead
- Faucet
- Tailpiece and nut
- Beer line
- Beer quick disconnect

You'll need the following tools:

- 1-inch drill bit for cutting bulkhead hole for shank. Either a hole saw or quality step drill bit will work
- Automatic center punch for mark-

To install a basic draft system on your vehicle, you will need: a shank long enough to go through your bulkhead, a faucet, a tailpiece and nut, a beer line and a beer quick disconnect.

Left: Assemble your parts and then install a tailpiece on the inside of the shank and attach beer line and a beer quick disconnect. Right: Fill your small keg from your home supply.

Left: A styrofoam liner for a 5-gallon (19-L) plastic bucket. Right: Insert the insulated liner in the bucket and then place your traveling keg in the bottom of the bucket to make sure it fits.

Attach the beer line, regulator and CO_2 supply as you would on a regular setup.

You can easily modify the foam lining and bucket lid to accommodate the beer line.

When you are on the road, simply cover the keg and lines with ice to cool the homebrew.

Now you are ready to transport your homebrew to your next tailgate party, barbecue or campsite!

As with your home kegging setup, keep your beer lines clean and sanitized. Rinse them with sanitizer after each use.

ing the hole location and preventing the bit from walking

- Adjustable wrenches for tightening up the shank nuts
- Faucet wrench for tightening faucet to the shank

Start by marking the location where you want to drill the shank hole with a permanent marker. Use the automatic center punch to create a divot that will guide the drill bit so it doesn't wander. Drill the hole carefully and then install the shank. It's honestly as simple as that.

The rest of the build is just like any other keg installation. Install a tailpiece on the inside of the shank and attach beer line and a beer quick disconnect. Attach the faucet to the outside of the shank and snug it up with the faucet wrench.

Those are the only modifications to the vehicle. The keg and CO_2 setup are just like you'd use on any other kegerator and in fact you can borrow them from your home setup when needed.

Transport

It should go without saying that when you are transporting your beer you need to be careful. While there is a patchwork of state and local laws relating to all aspects of alcohol, it's pretty safe to say that you should ensure that nobody can operate the draft system while the vehicle is in motion on public roads. I've gotten some pretty strange looks from other motorists as I'm cruising down the freeway with faucets and tap handles on the back of my truck so these days I just entirely disconnected the faucets to discourage unwanted attention.

Beyond that there's nothing worse than getting to your destination and discovering that the carbonation on your homebrew is out of whack or that your precious beer has leaked out. The agitation of driving will rapidly cause your beer to reach its carbonation equilibrium for the pressure and temperature much like shaking a keg at home.

Given all those risks the best approach is to simply disconnect the keg from the gas and beer lines for the drive.

Serving

Regardless of how you store your kegs you obviously need to provide gas. There are numerous options on the market from 5-lb. CO_2 tanks with full regulators to paintball setups to CO_2 injectors that use disposable cartridges. All work so it's a matter of your budget, preferences, and avail-

able space. You can even borrow your CO_2 setup from a kegerator you have at home.

Hooking it up

Before leaving home I like to put some sanitizer in the beer lines so that when I get to the campsite I'm just about ready to go. A few sprays with some sanitizer in a spray bottle on the keg posts and quick disconnects and then I can hook everything up and start serving within minutes. There really aren't any tricks to this step.

Cleaning

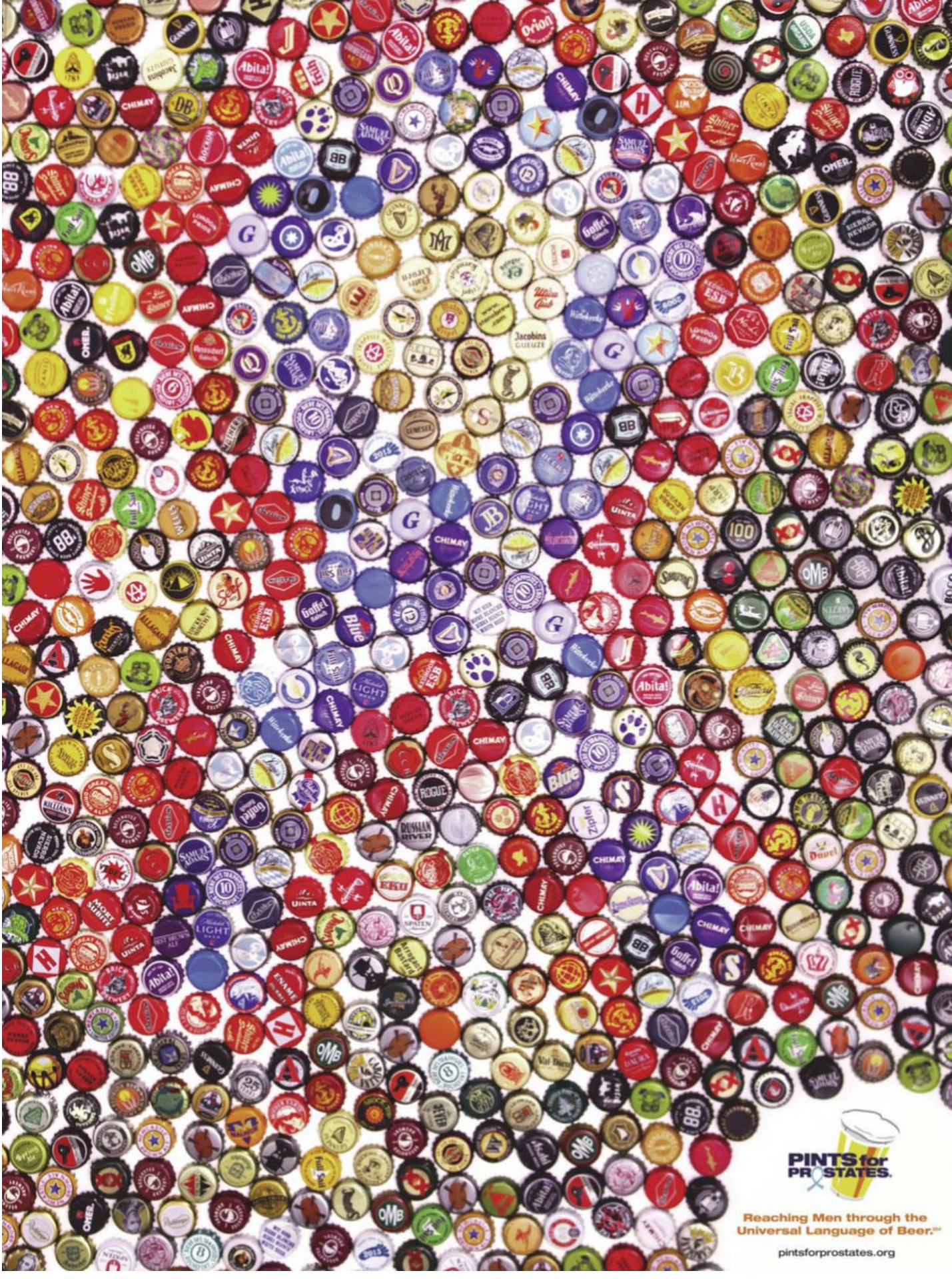
For a short weekend trip one of the nice things is you don't have to worry too much about the cleanup. At the end of the trip I disconnect the keg and drain the lines and run a bit of sanitizer from a spray bottle through them.

When I get home after pouring beer remotely I have a keg of sanitizer that I use to rinse out lines. Since the beer doesn't spend much time in the lines when you're traveling you don't have to deal with the buildup that can often be a challenge in more permanent installations. Just make sure to let everything dry out after you clean the lines before you put it all into storage.

Go Forth and Pour

While one can tuck an entire draft setup in a large cooler, it lacks the epicness of committing to putting taps on your ride. It's a great conversation starter and when done right it can make for a really clean way to share your homebrew. I've gotten a lot of positive comments and even built up some long lasting friendships as a result.

If you've upgraded your vehicle in the past, or if this article inspires you, send *BYO* a picture of your rig via edit@byo.com, post to our Facebook page (www.facebook.com/BrewYourOwn.) or find us on Twitter at https://twitter.com/BrewYourOwn). We'd love to see how readers tap into this trend! BYO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Brewing Fruit Beers

The when, how and why

by Terry Foster

I drank my first fruit beer around 1980. It was a Belgian kriek (that is cherry flavored), which I came across in South Africa. The fruit flavor was somewhat muted, but the sour edge of the beer made it quite refreshing on what was a very hot day. I must confess that I have been disappointed by fruit beers ever since then. Too many of those I have tried, from both craft and homebrewers, have fallen short — either tasting only of fruit and nothing else, or worse, just bland and muddy. Some, indeed, are little better than lightly flavored alcoholic drinks — what the Brits disparagingly call "alcopops."

It is interesting that there is no fruit beer tradition in either Germany or Britain, despite the fact that in the latter there is a long tradition of making "country wines" based on various fruits. In fact, my first attempts at making fermented beverages were with such country wines. It was only in Belgium that fruit beers were produced, until American home and craft brewers powered onto the scene in the 1970s and 1980s onward. There is a sound reason for this and that is that Belgian brewers were adding fruit to already soured beers, and some acidity is essential to preserving fruit flavor in beer, as I shall discuss later.

The above may sound discouraging, but I don't mean to put you off making fruit beer at all. Done properly, such beers can be quite rewarding and well worth making. But they must be done properly, with careful thought as to the effects you want to achieve. Just chucking a fruit you like into your favorite beer will result in something in which the best parts of both ingredients are lost. You need to have the right kind of fruit in the right kind of beer, and some fruits and some beers just will not fit together. Above all, your fruit beer should still be a beer and nothing else.

A good approach to fruit beer brewing is as follows:

1. Ask yourself what you are really trying to achieve.
2. Select the fruit on the basis of that first point.
3. Match the beer to the fruit you have selected.
4. Limit the use of hops.

Aims

The first point should be obvious; after all, if you don't know what you are aiming at you'll never know whether you hit it or not. So decide whether you are making a light, refreshing summer beer to be drunk quickly, or something stronger that might be kept for months or more. Or perhaps you just want something to take to a party that is suited to those drinkers who aren't interested in flavorful, craft-oriented beers. Perhaps you are a bit jaded with hoppy, bitter, or roasted flavors and want to try something else for a new experience. Whatever you are after, just be clear about it; if you are not there's the well-established fallback position of tasting a few commercial samples and deciding which one you like best. In fact, if you have never tried a fruit beer I strongly recommend that you do so before going to the effort of making your own.

> "Done properly, such beers can be quite rewarding and well worth making."

The fruit

I have given priority to the choice of fruit here partly because that might be dictated for you by what is available in stores or your own garden. But partly also because your choice will determine the kind of base beer you need, since the intensity of fruit flavor varies greatly. For example, cherries and raspberries go well with strong or even

> "The choice of where to add fruit is limited because adding before or during the boil is likely to harm the very qualities you are trying to add."

dark beers, but can mask the delicate flavors of a light wheat beer. Conversely, peaches are very mild in flavor and will only work well with very light and gentle beers. You should be aware that fruit flavor may be quite different in a beer than in the fresh fruit itself. That is because the sugar in the fruit is part of its flavor profile, and most fruits also have a significant acid component. In a beer the sugar will be fermented out during brewing, and beer is relatively low in acidity in comparison to fruits, so the "fruit" flavor in beer may not at all be what you would expect from eating the fruit itself. For this reason, some brewers like to add some acid, such as citric, tartaric, malic, or a blend of these, all of which are available from wine-making suppliers.

In choosing the fruit, you also must decide in what form you will use the fruit — fresh-picked, fresh store-bought, frozen, canned and so on. Or are you going to take the easy way out and use a concentrated fruit flavor? The latter is much simpler to use as the flavoring can be added just prior to kegging or bottling and need not be directly involved in the brewing process. These concentrates can give a very intense flavor so just be careful to check the addition rate by adding a few drops (count them!) to a small sample of the beer, and scaling it up to the full volume of the brew. Personally, I find fruit beers that are flavored in this manner are somewhat disappointing and lack the appeal of beers brewed with actual fruit. Such concentrates do not add any acid to the brew, the absence of which, as discussed earlier, adversely affects fruit flavor. However, these concentrates should not be dismissed entirely, for they may work well as a "flavor adjuster" in a full-fruit brew if you are not quite satisfied with the result. If you are entering your beer in a competition, such topping-up may well be worth doing in order to give your entry some final polish.

An advantage of using concentrates is that it has no effect on original gravity, so your base beer will not change in its malt/alcohol balance, which makes design of the latter more straightforward.

If you use actual fruit you will be adding fermentable sugars, and will end up with a beer containing alcohol over and above that derived from the malt sugars. That means that it is easy to finish up with a beer that is too thin to balance the fruit flavor, so you need to take this into account when formulating your base beer. Most fruits contain 10–15% sugar, depending upon ripeness, and the amount added usually varies from 0.5–4 lbs. (0.23–1.8 kg) for a 5-gallon (19-L) brew. You probably won't know the exact sugar content of your fruit, so you will have to make an educated guess. If you use 1 lb. (0.45 kg) of fruit at 10% sugar you will add about 1 gravity point (that is 1.001), which is no big deal. But if your fruit contains 15% sugar and you want to add 6 lbs. (2.7 kg) of it, you will be adding about 8 gravity points. That would mean that if the malt-derived gravity was 1.040 (10 °P), your "real" original gravity (OG) would be 1.048 (11.9 °P), which is quite a big increase and could easily result in a thin beer, as all that extra sugar will be fermented out. All I can say here is "if in doubt, use a bit less."

The fruits that seem to find most favor with brewers are cherries, raspberries, blackberries, blueberries, apricots and watermelon. Apples, plums, pears and many others give only a mild flavor to beer, as do peaches and strawberries whose flavor in any case tends to fade very quickly. Pumpkin beers of course are very popular, and the pumpkin is a fruit, but to me it has so little flavor that everything comes from the added spices, not from the fruit.

The chosen fruit has to be prepared in some way for use, and making a puree is often a good option. Many winemakers opt to remove pits from those fruits that have them, such as cherries, since they can contain hydrogen cyanide, although probably not in amounts significant enough to result in poisoning of the drinker. Some brewers prefer to use frozen fruit, since freezing tends to break down the fruit cells, thus making it easy to pulp the fruit and extract its flavors and sugars. I'll give a recipe for watermelon beer showing one way to handle fresh fruit at the end of this article.

The choice of where to add fruit is limited because adding before or during the boil is likely to harm the very qualities you are trying to add. So brewers generally add it to the fermenter after the primary stage has subsided, when the yeast is still active. There is a possibility of introducing infections this way, although most brewers do not find it to be a problem, unless the pulp or fruit is allowed to form a cap sitting on top of the liquid. Some commercial brewers pasteurize their fruit, but that is not really practical for the amateur homebrewer. When fruit is added to the latter stages of the primary there often occurs a rapid, even explosive fermentation so you should make sure you have enough headspace to accommodate this and to prevent the pulp blocking things like fermentation airlocks and blow-off tubes.

The beer

You want something light and relatively neutral so the fruit flavor can come through. Aggressive hop flavors are undesirable as they will mask the fruit. But beware of making this beer so bland that only fruit flavors can be tasted. Some hop bitterness is good, as this makes a nice balance when it comes on the back of the palate after the taste of the fruit. But this should be fairly modest, 15–20 IBU at a

maximum, all from hops added at the start of the boil. If you want character from late hops as well that's okay, so long as it is just a trace, preferably of a citrusy hop.

Many brewers opt for a wheat beer as the base, and the wheat flavor does match well with some fruits, notably raspberries. But I often find that these are far too bland to match the fruit, and I like a base with a little more body. For the more delicate flavored fruits I would go for adding some Munich or Vienna malt along with 2-row pale and mashing at a relatively high temperature, say 151–153 °F (66–67 °C). For stronger flavored fruits I would go with a similar mix, but with some added lighter caramel malt, at say 20–40 °L. However, do not think that only pale beers are suited to this purpose, for many brewers have found raspberries, cherries, and even blackberries to work well with porters and even stouts.

The combinations are endless, more than I can cover here. One good approach is to think of a simple beer you like and then try to assess what fruit might go with that. You can also check the web for recipes, of course. A good source on fruit beers in general can be found in the two-part "Techniques" columns from the July-August 2002 and September 2002 issues of *BYO*, which are avaliable online at http://byo.com/story319 and http://byo.com/story679 respectively.

A recipe

Following is the recipe for Watermelon Ale, a seasonal beer that we brew at BrüRm@BAR in New Haven, Connecticut. We brew this seasonal beer just once a year, for we only use fresh fruit and it is quite a hard and messy job to cut up, take out and puree the flesh of some thirty or more watermelons.

The base beer is quite simple, but does incorporate some of the suggestions I have made earlier with regard to malt body. The end product really does taste like a beer, but is overlaid with that wonderfully refreshing taste of watermelon juice, just perfect for late spring/early summer drinking. It may just be our most popular special, and is usually gone long before you have a chance to say, "I'll have another one of those!" Note that the extract recipe is very simple but you should find it just as tasty as the all-grain version.

Watermelon Ale

(5 gallons/19 L, all-grain)

OG = 1.045 FG = 1.012

IBU = 15 SRM = 7 ABV = 4.1%

Make sure to leave enough headspace in your fermenter to accommodate the watermelon pulp. The original gravity of this recipe is calculated without the watermelon pulp while the ABV is calculated with watermelon.

Ingredients

4 lbs. (1.8 kg) 2-row pale malt
3 lbs. (1.4 kg) Crisp Maris Otter pale ale malt
1.5 lbs. (0.68 kg) Munich malt (10 °L)
1 lb. (0.45 kg) Carapils® malt
3.5 AAU Willamette pellet hops (90 min.) (0.7 oz./20 g at 5% alpha acids)
0.25 oz. (7 g) Amarillo® pellet hops (0 min.)
White Labs WLP002 (English Ale) or Wyeast 1968 (London ESB) yeast
0.5 gallon (2 L) pureed pulp of ripe watermelons
Priming sugar (if bottling)

Step by Step

Mash grains for 90 minutes at 151–153 °F (66–67 °C) using 11 qts (10 L) water. Run off and sparge with hot water to collect 5.5–6 gallons (21-23 L) of wort and then boil 90 minutes with the Willamette hops added at the start. Turn off heat, add Amarillo® hops and cool to 65–70 °F (18–21 °C). Pitch yeast, preferably as a 1-qt. (1-L) starter. By day five, the primary fermentation should have subsided; take melon(s) and scrape the pulp from the rind into a blender to get about 0.5 gallon (2 L) of pulp. Puree the pulp for about 30 seconds then add it to the fermenter, which should have a good headspace above the liquid. Fermentation of the fruit sugars should be complete within 1–3 days and the beer can be transferred to the secondary. In a week or so siphon the beer off the pulp and bottle or keg in the usual way.

Watermelon Ale

(5 gallons/19 L, extract only)

OG = 1.045 FG = 1.012

IBU = 15 SRM = ~10 ABV = 4.1%

Ingredients

6.2 lbs. (2.8 kg) amber liquid malt extract
3.5 AAU Willamette pellet hops (90 min.) (0.7 oz./20 g at 5% alpha acids)
0.25 oz. (7 g) Amarillo® pellet hops (0 min.)
White Labs WLP002 (English Ale) or Wyeast 1968 (London ESB) yeast
0.5 gallon (2 L) pureed pulp of ripe watermelons
Priming sugar (if bottling)

Step by Step

Try to find an amber malt extract made with a significant proportion of Munich malt. Dissolve the extract in 3 gallons (11 L) of hot water, then bring it up to 5 gallons (19 L) with hot water and boil 60 minutes, adding the Willamette hops at the start. Turn off heat, add Amarillo® hops and cool to 65–70 °F (18–21 °C). Pitch yeast, preferably as a 1-qt. (1-L) starter. By day five, the primary fermentation should have subsided; take melon(s) and scrape the pulp from the rind into a blender to get about 0.5 gallon (2 L) of pulp. Puree the pulp for about 30 seconds then add it to the fermenter, which should have a good headspace above the liquid. Fermentation of the fruit sugars should be complete within 1–3 days and the beer can be transferred to the secondary. In a week or so siphon the beer off the pulp and bottle or keg in the usual way.

Brewing Adjuncts

What they are and what they do

An adjunct is defined as any grain other than malted barley that is added to beer as a source of fermentable sugars. This definition is often stretched to include any fermentable substance that either contains starch that can be converted to sugars through the actions of enzymes, or something that already contains sugar in a form that is able to be consumed by yeast. A substance that contains starch that is convertible to sugars via the action of enzymes is called a cereal adjunct. A substance that already contains sugar in a form able to be consumed by yeast is called a sugar adjunct.

The most common cereal adjuncts are corn, oats, rice, sorghum, barley, rye, and wheat. The corn and rice adjuncts are often used to produce light lager styles, while raw wheat is a key ingredient in Belgian white and lambic beers.

Sugar and syrup adjuncts include corn sugar, table sugar, invert sugar, brown sugar, maple syrup, molasses, Belgian candi sugar, honey, lactose, licorice, and maltodextrin. Syrups and sugars are most frequently used when brewing British and Belgian-style beers.

Uses of adjuncts

Adjuncts are used by commercial craft brewers and homebrewers to enhance the flavor, aroma and organoleptic properties of their beer rather than as a cheap barley substitute.

Adjuncts affect beer in many different ways. Adjunct use can result in beers with interesting flavors, enhanced physical stability, superior chill-proof qualities, greater brilliancy, improved head retention and enhanced mouthfeel. Rice has a very neutral aroma and taste and can lighten the flavor of beer without adding taste. Corn can impart a fuller flavor to beer. Wheat can impart a dryness to beer and enhances stability and head retention. Semi-refined and refined sugars add flavor to ales in ways that correspond to their specific molecular composition and coloration. Sugars and syrups that can add color, flavor and fermentables include molasses, maple syrup and many others. Adjuncts will also alter the carbohydrate and nitrogen ratio of the wort, thereby affecting the formation of byproducts, such as esters and higher alcohols.

Adjuncts are often used to alter the fermentability of wort. Brewers may add sugars or syrups directly to the kettle as a way of adjusting fermentability as a simpler alternative to altering mash rest times and temperatures.

> "Adjuncts are often used to alter the fermentability of wort."

Techniques for using cereal adjuncts depend upon the form. Flaked adjuncts are processed using heated rollers, which crush the grain and help burst the starch granules. This allows them to be used without milling. Unmalted, non-crushed grains should be milled before use, and then added to the mash.

How adjuncts affect beer flavor and aroma

There are many, many different substances that fit the definition of "adjunct." The following is a description of how specific adjuncts can affect the flavor and aroma of beer, and in which beer styles the adjunct might be appropriate.

Barley, Flaked: Barley flakes produce a richness and fullness to mouthfeel and will contribute protein that improves head retention, creaminess, and body. Flaked barley may be used in amounts of up to 40% of grist total, and is well-suited for use in porters and stouts.

Flaked Wheat

Flaked Rice

Photos by Ian Mackenzie

Barley, Raw Unmalted: Raw, unmalted barley can be used to increase beer body, but proper use requires very fine milling and also decoction or multi-stage mashing. It works best when used in small quantities in combination with modified grains.

Belgian Candi Syrup: Belgian candi syrup is a byproduct of the candi sugar-making process. Belgian candi syrup has a more intense and complex flavor than rock candi sugar, and also is darker in color.

Brown Sugar (Dark or Light): Brown sugar adds fermentable sucrose and other flavors. It imparts a rich, sweet flavor that can work well in Scottish ales, old ales, specialty porters and holiday beers.

Candi Sugar (Amber, Clear or Dark): Candi sugar adds fermentable sugar and other flavors and may contribute a smoother character than ordinary sucrose. It increases fermentable content of the wort without adding malt character. Candi sugars are commonly used in Belgian and holiday ales. Amber candi sugar works especially well in Belgian dubbels. Clear candi sugar, as you may suspect, works especially well in the lighter colored Belgian tripels. Dark candi sugar works well in brown ales and Belgian strong dark ales.

Corn (Maize), Flaked: Flaked corn produces a fairly neutral flavor, and can be used to reduce maltiness of beer and produce beer with a milder, less malt-forward flavor. Flaked corn can also provide depth of character to lighter beers when used in moderate quantities. Flaked corn can be used in light Bohemian and Pilsner lagers, British bitters and mild ales.

Corn Grits: Corn grits can produce a slight corny/grain taste in beer. Corn grits may be used in American lagers. It is important to mention that grits must be cooked to gelatinize (not true with flakes).

Corn Sugar (Glucose or Dextrose): Used to add fermentables without increasing body or flavor. Yeast will preferentially consume monosaccharide simple sugars like glucose before consuming disaccharides like maltose in the wort, so the amount of simple sugars used in wort should be limited. Glucose is commonly used as priming sugar to carbonate beer.

Golden Syrup: Golden syrup is a liquid form of invert sugar. Golden syrup is primarily an aqueous solution of invert sugar and water. As with invert sugar, golden syrup adds fermentables to the wort without increasing body or flavor.

Honey: Honey imparts a sweet, dry taste that is more complex than the flavor that is usually derived from simple sugars. Honey is a common adjunct in specialty beers, and although it contributes some aromatics, the high sugar content tends to make a beer thinner-bodied than an all-malt beer (this is also true of any simple sugar adjunct). Use honey in honey-ales, brown ales or specialty ales.

Invert Sugar: Invert sugar is sucrose that has been converted by hydrolysis to its monosaccharide constituents, glucose and fructose. Invert sugar is used to add fermentables without increasing body or flavor, and can work well in some Belgian and English ales.

Lactose ("milk sugar"): Lactose adds body to beer without increasing the fermentability of wort (yeast cannot metabolize lactose). Lactose can be used in sweet stouts and milk stouts.

Maltodextrin: Maltodextrin increases wort viscosity, and adds smoothness, body and fuller mouthfeel to beers. Maltodextrin is not fermentable, so it does not increase the alcohol content of beer. Maltodextrin can be used in any beer in which a fuller body is desired.

Maple Syrup: Maple syrup adds fermentables to the wort and can produce a dry, woodsy flavor if used in the boil. If used when bottling, it can produce a smooth residual sweetness and maple taste. Maple syrup, which is most commonly used where it is made in New England and Canada, works well in specialty beers, brown ales and porters.

Molasses: Molasses adds fermentables to wort and can produce very strong, burnt-sugar, sweet flavors. Molasses can work well in stouts and porters.

Oats, Flaked: Oat flakes will add a distinct flavor and create a smooth, silky, full-bodied and creamy texture in beer. An especially tasty roasty-oat flavor is produced when oats are lightly toasted prior to use. Oats will also improve head retention. Use in Belgian white ale, oatmeal stouts and other specialty beers, or in small quantities to any beer in which fuller body is desired.

Rice, (Flaked, Raw or Syrup): Rice is used to add fermentables without increasing body or flavor. Using rice to add fermentables can result in a milder, less grainy tasting beer. Rice can also help to provide a light, crisp, dry finish to your beer. Rice flakes can be used in all light lagers including Australian lagers, Asian lagers, American lagers, Bohemian lagers, and Pilsners. Like grits, raw rice must be cooked to gelatinize.

Rye, (Flaked or Raw): Rye flakes will impart a dry, crisp character and a strong rye flavor to beer. Rye flavor is often described as grainy and spicy, often having a hearty flavor similar to pumpernickel bread. Raw rye will contribute glyco-proteins to beer that can enhance foam stability and improve head retention. Use in German roggenbier, other rye beers and specialty beers.

Table Sugar (Sucrose or White Sugar): Table sugar is common household sugar. As with any of the other forms of disaccharide or monosaccharide sugars, table sugar is used to add fermentables to wort without increasing body or flavor. Table sugar will lighten the flavor and body of beer.

Treacle: Treacle is a usually-British-derived mixture of molasses, invert sugar and golden syrup. Treacle can produce an intense, sweet flavor, and is good for use in dark English ales.

Wheat, (Flaked, Raw or Torrified): Wheat flakes add lots of protein to beer. This will improve head retention and body, but can also produce a permanent haze in the beer if wheat is used as a large fraction of the grain bill. Wheat flakes work well in Belgian white ales, specialty beers, American wheat beers, and Bavarian weisse (however, unmalted grains are strictly prohibited for use by Bavarian brewers and weissebiers do not normally contain unmalted wheat — at least not those made commercially). Wheat is also essential to Belgian lambic and wit beers. Flaked wheat adds more wheat flavor "sharpness" than malted wheat. Raw wheat contributes glyco-proteins to enhance foam stability and improves head retention. Torrified wheat also improves head retention and increases mouthfeel of beer. Wheat works well in many different beer styles.

Conclusion and key takeaway

A brewer who understands how adjuncts affect the finished beer, and how to properly use them, will be able to produce delicious beers in a wide variety of styles. Mastering the use of adjuncts is one step on the road to mastering the art and science of brewing! BYO

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Etching Stainless Steel

Add volume markers to your brew kettle

projects
by Chris Denny

If you've ever tried to figure out your mash efficiency, monitor your evaporation rate, or compare your boil volumes to what your recipe estimated, you very quickly find a need to measure your brew kettle volumes at various stages during the brew day. Unfortunately, a lot of brew kettle manufacturers do not include volume markers.

Some brewers install an expensive sight glass into their kettle to monitor volumes. Some brewers dip a homemade measuring stick into the wort. I used to use a measuring stick, but I got sick of relying on an extra tool during brew day and the added risk of contamination.

While researching metal etching, I came across a technique commonly used by knife manufacturers to leave their brand on their knives. This technique involves electrolytic acid etching. It sounds complicated, but I've adapted it to require nothing but cheap household materials.

In this technique, we are going to use vinegar for our acid. To facilitate this process, the vinegar must be conductive. In order to make the vinegar conductive, we simply add an electrolyte, in this case, salt.

The power source should be around 9 to 12 volts. Batteries work great. If you have a spare DC wall adapter lying around, that would work perfectly in place of a battery. Running DC power (like from a battery) or a DC adapter will leave a frosty white mark. If you run AC power, it will burn in a darker black mark. Both marks will be permanent.

To apply the acid and the current, you'll construct an etching tool from a Q-tip. The cotton head of the Q-tip will hold the vinegar solution, and a wire running from a battery will transfer the current to the vinegar-soaked cotton.

This method is not limited to kettles or volume markings. You could add a logo to nearly any piece of metal equipment (both aluminum and stainless steel). Imagine your custom logo all over your homebrewery!

So how's it work? Here's the science behind it: In the vinegar, the salt dissolves into positively charged sodium ions and negatively charged chloride ions. This allows current to travel through the solution. In the presence of acid (vinegar), the electrical current causes the ions in the metal to dissolve so they can travel in the direction of the current, which, in this case, is away from the metal. This permanently removes metal from the surface, which changes its texture. The different texture reflects light differently — making the markings permanently visible. The reaction also produces carbon dioxide, which causes the fizzing. This is the opposite process to electroplating, which would be the result of reversing the polarity.

> "This technique involves electrolytic acid etching."

The first question I always get is about corrosion risks. Stainless steel and aluminum both naturally form oxidized coatings on their surfaces when exposed to oxygen. This oxidized layer is what protects them from rust and corrosion. A few seconds after etching, the surface of the etched areas will oxidize again and will be the same as the rest of the brew kettle, thereby protecting it.

Materials Needed:

Brew kettle
White vinegar with 5% acidity
Salt
9-volt battery or power source
Electrical wire
Electrical tape
Q-tip
Stencils

1. TAPE THE KETTLE

Fill the kettle with water in increments that you wish to have marked on your kettle and tape it off as you go (make sure you trust the container you are basing your measurements on). For me, I poured one gallon (3.8 L) of water at a time. You'll want to use tape that won't lift off while under water. If your container has straight walls, you can measure the gap between two water levels and repeat the measurement up the wall of the kettle. Alternative to tape, you could use a wax or grease pencil. Make sure the kettle is level before doing this. An uneven surface will cause the water level to be off.

2. APPLY STENCILS

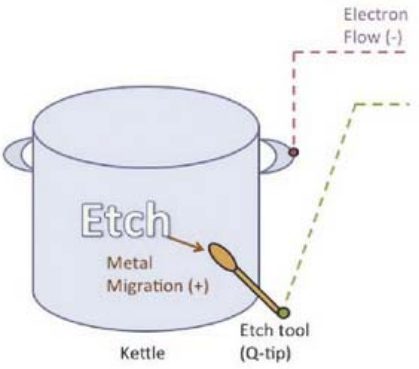
These should be available at the nearest craft store. Adhesive stencils are the best type for this project since they will stay put and do the best job controlling the vinegar during the etch. Make sure they are stuck down very firmly and are in place exactly where you want them. Getting the stencils just right before you begin etching makes the project less stressful.

3. MIX YOUR ACID SOLUTION

Combine your vinegar and salt. The ratio isn't that important, you just need enough salt to allow current to pass through. I used ¼ teaspoon salt in ¼ cup of vinegar. Then give the solution a good shake or stir to dissolve the salt.

4. HOOK UP THE KETTLE

It is very important that you hook the positive lead to your kettle. There is nothing fancy about this connection. You can simply tape the bare electrical wire directly to any part of the kettle. This connection will essentially electrify your entire kettle with a very low voltage, preparing it to be etched at any location on its surface. Don't worry; the current is so low that you can safely handle the kettle without any danger, similar to touching both ends of the battery itself.



5. PREPARE ETCHING TOOL

With another wire, attach the negative lead to the Q-tip. The wire will need to be in direct contact with the vinegar solution, so make sure it is wrapped around the cotton head of the Q-tip. Give it a good tight twist so it will stay on as long as you want it to. I found that the wire will actually dig into the cotton so you don't need any tape for this step.

6. ETCH

Before etching your expensive brew kettle, I strongly recommend testing this process on another piece of metal that you don't care as much about or a very inconspicuous area of your kettle such as the inside of the lid. You don't want any surprises.

Dip the Q-tip in your vinegar solution and touch it to the kettle. If you hear some sizzling or see some bubbling, it is working. It only takes a few seconds of contact to permanently dissolve some metal. Keep the Q-tip moving. If it stays in one spot too long, it will make uneven marks. As you etch, your Q-tip will absorb byproducts of this reaction and start to change color. In my experience, this did not affect the etching. Remember, anywhere you touch the etching tool to the brew kettle will be permanently modified, so be sure to take your time.

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last call
by Clint Cherepa

Finding a Way
Homebrewing in Nicaragua

How can a person justify spending a dollar for a can of beer they don't even like? I can't.

And here starts my search for brewing on a budget in a developing country. I am living in Nicaragua, regretting every penny spent on the national beers. I do the math. Here, a six-pack runs about $6. With the money to buy four or five six-packs I could make a batch of decent homebrew. But . . . homebrewing in the United States is a lot simpler and cheaper than in Nicaragua — a country that has no homebrew supplier.

> "". . . homebrewing in the United States is a lot simpler and cheaper than in Nicaragua — a country that has no homebrew supplier.""

Admittedly, I am not an expert homebrewer. I grew up with a homebrewing father, and then I took it on myself as a hobby during our snowed-in Midwest winters. I took time off from brewing when I started to work at a brewpub and was rewarded with shift beers and half price growlers. I love a great beer, but I am content with one or two, so making beer while working at the pub was unnecessary.

Things have changed and making beer has become necessary, but seemingly impossible, unless I give in and drop wads of cash on shipping. I wrote to American homebrew suppliers to find out about their international shipping standards and rates. The results knocked the pint glass out of my hand as they were grim and expensive.

Nicaragua does have a neighboring country that is getting into the homebrew scene — Costa Rica. They even have two microbreweries (Volcano Brewing Company and Craft Brewing Company). With a taste for good beer, the Costa Rican homebrew scene has been bursting with homebrewing zealots. In 2011, Ticobirra, Costa Rica's first homebrew supplier, was born out of necessity. I finally saw the light at the end of the pallid beer row — I could order my supplies from the neighboring land of Costa Rica. My excitement was short-lived as I learned that the only homebrew supply shop within thousands of miles was unable to ship to Nicaragua. Back to square one.

I talked with Luis Arce, owner of Ticobirra, who himself used to spend more than $150 in taxes and shipping just to order a $35 beer kit. He says about Costa Rican homebrewers, "I think since the economic crisis the news media have played a great role in creating consciousness of how we use our money. Homebrewers are not the exception. Certainly we do see a good number of our customers trying to budget by building their own wort chillers, buying grain in bulk or making beer with friends to distribute the cost." Taking these measures in a country with limited or no hombrewing supplies are vital.

First, I need the homebrewing basics: A fermenter, airlock, bottles and bottle caps. The ingredients would be the tricky part. Shipping these from the U.S. was out of the equation. So, the only way to get them would be bringing them back after visiting home or taking the 10-hour bus ride to Costa Rica.

To brew thrift, Luis recommended using local ingredients as substitutes or complements in recipes. For example, in Costa Rica, there is a vast diversity of very cheap, high-quality fruits that can be part of the fermentable bill. He also suggested the parti-gyle method in which you can make two beers from one grain bill. Other options I am looking into are growing my own hops, cultivating yeast and even trying my hand at growing barley and wheat. One rule of homebrewing seems to ring clear no matter where the brewer lives: Do what you can with what you have.

As homebrewers, we take the role of chemists, idealists and inventors. So, I've decided to embrace the road to brewing thrift, learning on the way. Because, what would brewing the good stuff be, without the learning curve? BYO

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