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MARCH-APRIL 2015, VOL.21, NO.2

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contents

MARCH-APRIL 2015, VOL. 21 NO. 2

40



features 36 10 TIPS FOR BETTER EXTRACT BEERS

Extract brewing saves time and equipment costs compared to all-grain, but don't think it's as easy as "just add water." Use these 10 tips to improve your next extract brew.
by Joseph Vella

40 AWARD-WINNING AMERICAN IPA
The American IPA is the king of the current craft beer market. Yet, there is great variety within the popular hop-centered style. Get tips on brewing American IPA as well as five award-winning American IPA homebrew recipes.
by Derek Dellinger

50 HOMEBREW HACKS

Homebrewers will stop at nothing to improve efficiency and ease in their brewing process. And it's not always about big, expensive builds. Here, we present you with a few of our favorite small, inexpensive, reader-submitted DIYs.
by Dawson Raspuzzi

58 OKTOBERFEST

As much as baseball is a sign of spring, Oktoberfest is an introduction to fall. However, you can't wait until the leaves change to brew this medieval German style.
by Nick Rodammer

66 HOP GROWING ROUNDTABLE

Spring is coming and if you plan to grow your own hops it's time to draw up your plans. But before you get started, consider these tips from four North American small-scale commercial hop growers.
by Betsy Parks

It's Brew Day!

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James' *Billy Cart*

In our neverending quest to discover how Ss Brewtech's gear is helping you brew better beer, we stumbled upon James' Instagram account. When we saw his 7 gal Chronical and a mobile brewing sculpture he dubbed "The Billy Cart", we knew we had to meet this brewer from Australia! James' intro into home brewing began like many home brewers. James' co-worker, Swanny, was brewing his own beer and James was more than willing to help consume his friend's delicious brews. While he was enjoying the free beer, he also became interested in the science behind brewing. Starting first with various 'brew in a bag' kits, he has now moved on to brewing farmhouse ales, sours, and is even now experimenting with some barrel aged beers!

Check out more of how they brew Down Under and find out why in the world James rides his brewery at - www.ItsBrewDay.beer -

SEE MORE OF JAMES' SET UP & SUBMIT YOURS AT:
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departments

- 8 MAIL**
Readers have lots of questions about electric homebrewing, and a question about brewing Heady Topper.
- 12 HOMEBREW NATION**
The Replicator comes to the rescue of a reader looking to clone Springfield Brewing Co.'s Aviator Doppelbock, and we offer ways to maximize your extract partial boil.
- 20 TIPS FROM THE PROS**
Spice up your homebrew with the addition of chili peppers. The brewers from Twisted Pine Brewery, Ska Brewing Co., and Six Rivers Brewing share their best advice.
- 23 MR. WIZARD**
The Wiz offers a way to stabilize fermentation temperatures in the desert, addresses the rare dilemma of adjusting pH up, and gives a new cidemaker tips for barrel aging.
- 30 STYLE PROFILE**
In his final "Style Profile" column, Jamil Zainasheff wraps up an 8-year writing assignment with the ancient style of Gose, a style that is returning to popularity.
- 72 TECHNIQUES**
Sweet stout is an ambivalent style brewed with lactose. Get tips, techniques, and a recipe to brew your own.
- 76 ADVANCED BREWING**
By pitching two different yeast strains it is possible to play to the strengths of both strains.
- 80 PROJECTS**
Grow your own hops? An oast is the best way to dry your hops quickly after harvest without taking up too much space or pulling the screens out of all your windows. Learn to build one here.
- 96 LAST CALL**
Paul Finney helped build a homebrewing culture in Canterbury, New Zealand by starting a Facebook group. Then he opened the first homebrew shop in the area.

where to find it

- 84** Backyard Hop Directory
85 Classifieds and Brewer's Marketplace
86 Reader Service
87 Homebrew Supplier Directory

RECIPE INDEX

Michigan Rye-PA	12
Springfield Brewing Co's Aviator Doppelbock clone	17
Gose	31
Riverwards IPA	43
Peachtree IPA	44
Simtra Mosalaxy IPA	45
American IPA	46
Klaus Brau's Kitchen Sink IPA	47
Märzenbier	61
Festbier	61
Sweet Stout I.	75
Nu Zuland Saison	78



RECIPE STANDARDIZATION

EXTRACT EFFICIENCY: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one US 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.

Gallons:
We use US gallons whenever gallons are mentioned.

30



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what's happening at BYO.COM

Historical "India" Pale Ale



We have a pretty good idea of what historical IPA was like when it left the docks of England bound for its long journey to India. But what did the beer taste like when it arrived after the ocean voyage?

<http://byo.com/story759>

Projects & Equipment Gallery



Is building homebrew equipment your thing? Get ideas for your next build by scouring our online Projects & Equipment Gallery with pages of reader-submitted homebrew setups and

do-it-yourself projects.

<http://byo.com/photos/gallery/4>

Grow Your Own Hops



It's that time of year to start your planning if backyard hops are in your future. After soaking in the advice given by the pros in the roundtable discussion beginning on page 66, refer back to this article from a couple of hop experts to get even more advice on growing your own hops this year.

<http://byo.com/story724>

20 Great Extract Recipes



We hope you are inspired by "10 Tips for Better Extract Beers" (beginning on page 36) and ready to put your new-found knowledge to the test.

You can't go wrong with any of these extract recipes, as submitted by retailers nationwide.

<http://byo.com/story31>

Brew

THE HOW-TO HOMEBREW BEER MAGAZINE

YOUR OWN

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ELECTRIC BREWING

A note from Editor Betsy Parks on the January-February 2015 cover story on building an electric brewing system: "We received many questions about Trent Neutgens' all-electric brewing system featured in the January-February issue over the past month. To help address the many questions, we had a live chat on the Brew Your Own Facebook page on January 21 with Trent, and also with Kal Wallner, the author of the website (and electric brewing resource) www.theelectricbrewery.com. For a transcript of that live chat, please visit <http://byo.com/story3217>. And if you have more questions, please send them in to betsy@byo.com, or post them to our Facebook page (<https://www.facebook.com/BrewYourOwn>) or reach us via Twitter @BrewYourOwn."

A BIG THANK YOU

I wrote in a few months ago to Ashton Lewis complimenting him on the Rauchbier at the Springfield Brewing Co. and asking for some pointers. I brewed an ale version of it using Kölsch yeast and it turned out great! I dare say as good as the original. Thank you so much for the help, the magazine, and the Springfield Brewing Co.

Dave Hixson • Manchester, Missouri

Brew Your Own Technical Editor Ashton Lewis replies: "Thank you, Dave! I'm glad to be of help. Just to blow Springfield Brewing Co.'s horn a little bit, since you and I discussed the rauchbier, Springfield went on to win a bronze medal with a rauch called "I Wanna Rauch!" in the Pro-Am Competition at the 2014 Great American Beer Festival with the beer we made with homebrewer Keith Wallis. Cheers!"

HEADY TOPPER HELP

I cloned the venerable Heady Topper from the Alchemist Brewery in Waterbury, Vermont last year with some success. This beer got



Derek Dellinger is a writer and brewer living in Beacon, New York. Derek blogs about brewing and fermentation at <http://bear-flavored.com>, and is the Brewmaster at Kent Falls Brewing Co., a new brewery and hop farm in Kent, Connecticut. In 2014, Derek lived for a full year consuming nothing but fermented foods and drinks, and is writing about his experience in an upcoming book titled *The Fermented Man*, out winter 2016. Follow him on Twitter @bearflavored.

Derek made his *Brew Your Own* writing debut in the May-June 2014 issue with an article about brewing IPA that is fermented entirely with *Brettanomyces*. In this issue, Derek continues to explore the identity of India pale ale with a story about brewing an award-winning American IPA. Check out Derek's story, plus five proven award-winning homebrew recipes, starting on page 40.



Joseph Vella, MD is a practicing physician living in Goshen, New York (near Rochester), and has been homebrewing for 15 years. He homebrews using extract, partial mash, and all-grain techniques depending on the situation and his mood, and when all-grain brewing he uses both the cooler mash tun and brew-in-a-bag methods. His favorite styles to brew are traditional English and Belgian-style beers, and he prefers simple recipes using properly sourced ingredients. His brewing philosophy is a combination of art, science, and culinary skill. He also enjoys cooking and the art of pairing beers with different dishes.

In this issue, starting on page 36, Joe puts on his extract brewing hat and makes his *Brew Your Own* writing debut with a rundown of his ten top tips for brewing great beers with dried and liquid malt extracts.



Michael Tonsmeire is an award-winning homebrewer, author of *American Sour Beers* (Brewers Publications 2014), certified beer judge, beer blogger (TheMadFermentationist.com), and has written articles for various magazines — including several for *Brew Your Own* — about brewing sour beers. He consults as "Flavor Developer" for Modern Times Beer (San Diego, California), for which he develops the recipes, process, and microbes to produce sour beers. He resides in Washington, D.C. where he works as an Economist. In this issue, on page 76, Mike makes his debut as *BYO's* new "Advanced Brewing" columnist.



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SPECIFICATIONS

Malt Type:
Base

Grain Origin:
Ireland

Wort Color:
1.7-2.3 °Lovibond

Protein:
8.0-10.0%

Moisture:
4.5% max.

Extract (dry):
82.0% min.

Diastatic Power:
80-90 °Lintner

Usage:
100% max.

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MAIL



me into the final round of the 2014 American Homebrewers Association National Homebrew Competition. Not too bad for my first attempt at an Imperial IPA and thanks to the "Vermont Cult Clones" article by Dave Green in the October 2013 issue of *Brew Your Own*. I based my clone on the recipe given in that article. However, I just read a review of Heady Topper in the book *Craft Beer World* by Mark Dredge that stated that Heady Topper is crafted using only European noble hops varieties and no "C" hops! What gives? I can't imagine how you can get all that wonderful citrus character from the likes of Saaz, Perle, and Styrian Goldings?

Bob Moody • via email

Brew Your Own Recipe Editor and "Vermont Cult Clones" author Dave Green responds: "Hi, Bob. Glad to hear that your first IIPA was such a success. That is a great accomplishment to get an IPA into the final round of the National Homebrew Competition. Unfortunately I don't have a copy of that book by Mark Dredge so I have not read it yet. To answer your question, to be honest we don't know the actual lineup of hops that *The Alchemist* adds into Heady Topper (*The Alchemist* Brewmaster, John Kimmich, prefers to

play his cards close to the vest when it comes to the oft-emulated Heady Topper) but John has stated in interviews that there are six hop varieties in the Heady recipe. I guess I could see brewing Heady Topper without any "C" hops, but to eliminate all American-bred hops... that I just can't see. Simcoe®, in particular, is a very distinct hop, as is Columbus and Chinook. At different times when drinking Heady Topper I have picked up strong hints of those three hops in particular, especially Simcoe®. My guess is that the *Craft Beer World* author perhaps got some wires crossed somewhere (the recipe does include English malts, for example), although I can't officially rule out the possibility that he is correct since we've never actually seen the recipe (and probably never will) – short of John posting his recipe on *The Alchemist* website and confirming what's truly in the brew, anything is possible! However, I will say that the recipe from my 2013 story in *Brew Your Own* was technically reviewed for accuracy by John Kimmich; and while he made some changes in my first draft with the hops, varieties were not among those changes, so I feel pretty confident about the recipe that ran. And it seems that the beer judges who tasted your beer at NHC agree! As for Mark's book – I'll have to check it out!" 

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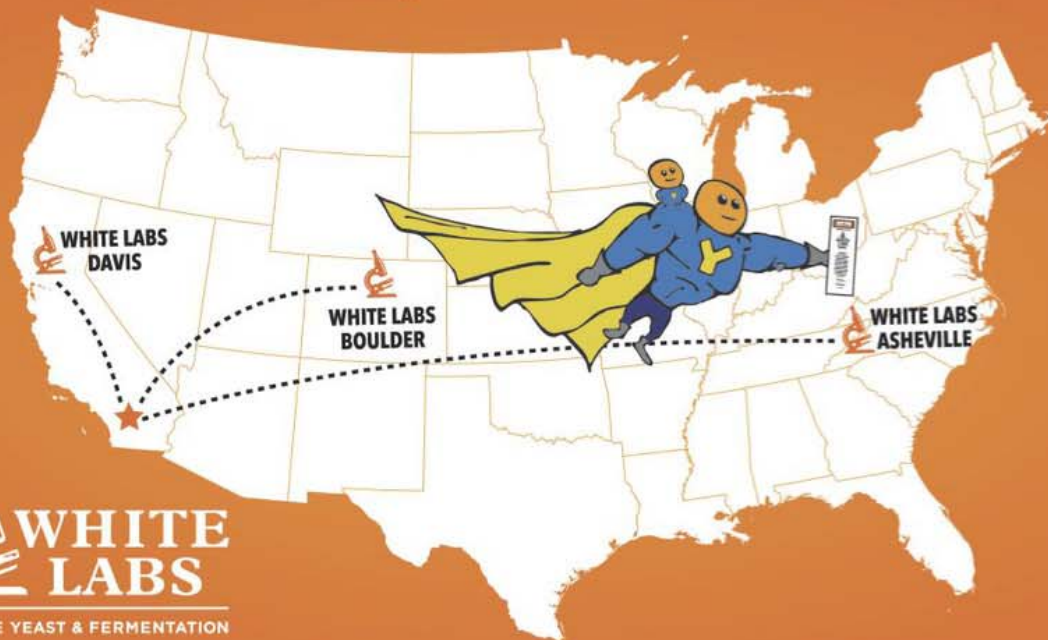


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malt

A Practical Guide from Field to Brewhouse

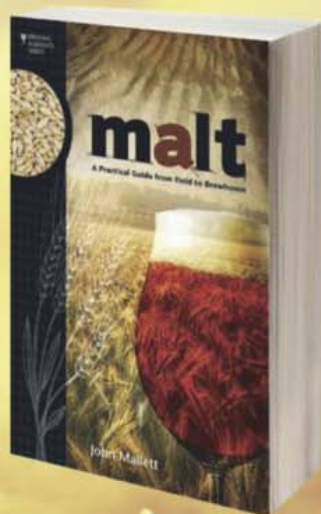
By John Mallett of Bell's Brewery, Inc.

Fourth in the Brewing Elements series, this book delves into the history, agricultural development and physiology of a key ingredient used in virtually all beers: malt.

With a comprehensive overview from the field through the malting process, *Malt* is of value to all brewers, both novice and experienced, who wish to learn more about the ingredient often called the soul of beer.

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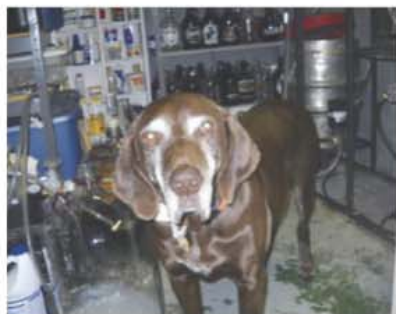
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BYO HOMEBREW NATION

READER PROFILE & RECIPE

**BREWER:**

Mike Firosz

HOMETOWN/STATE:

Allen Park, Michigan

YEARS BREWING:

48



I always brew with my helper (pictured here). He's a German shorthair named Brew, which is short for Brewtus. With every batch, Brew gets a ration of spent grains. He earns every nibble. We also make dog treats from spent grains and bake them in large batches.

I have been homebrewing since 1967, and over that time have brewed numerous award-winning

beers and gained a lot of brewing knowledge. I've also seen a lot of trends come and go. While I occasionally brew high gravity, I believe that it has become an unhealthy trend in craft and homebrewing to keep pushing up the ABV and shooting for ever higher IBUs. The best advice I've come to appreciate over nearly 50 years of brewing? Brew what pleases you and forget what anyone says about your beer. Kindred spirits will arrive to share your bounty in the form of new friends.

I currently have a variety of beers in my kegerator — Caramel Truffle Stout, Maple Märzen, Cream Ale and Centennial Amber, and I'm fermenting a clone of Timothy Taylor's Best Bitter. However, my favorite recipe currently (which took a silver medal in a recent state-wide beer competition) is called Michigan Rye-PA. The recipe is to the right. Enjoy!

**Michigan Rye-PA**

(5 gallons/19 L, all-grain)

OG = 1.060 FG = 1.010

IBU = 57 SRM = 7 ABV = 6.7%

INGREDIENTS

8.5 lbs. (3.9 kg) 2-row pale malt
3 lbs. (1.4 kg) German wheat malt
1 lb. (0.45 kg) rye malt
1 lb. (0.45 kg) flaked rye
4 oz. (113 g) crystal malt (60 °L)
2 oz. (57 g) Victory® malt
0.5 lb. (0.22 kg) rice hulls
10.5 AAU Magnum hops, pellets (60 min.) (0.75 oz./21 g at 14% alpha acids)
4.5 AAU Crystal hops, leaf (15 min.) (1 oz./28 g at 4.5% alpha acids)
13 AAU Chinook hops, leaf (1 min.) (1 oz./28 g at 13% alpha acids)
2 oz. (57 g) Cascade hops, leaf (dry hop)
1 oz. (28 g) East Kent Golding hops, pellets (dry hop)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Single infusion mash for 1 hour at 156 °F (69 °C). Batch sparge in two phases, collecting 7.75 gallons (29 L) of wort in your kettle. Boil vigorously for one hour, resulting in 5.5 gallons (21 L) of wort in the fermenter. Ferment at 65 °F (18 °C). Add dry hops after fermentation is complete. Wait one week to bottle or keg.

BYO.COM BREW POLLS

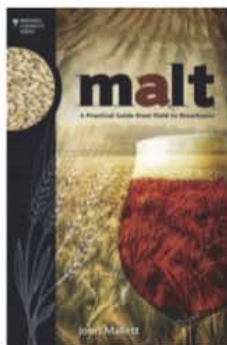
Which style of stout do you prefer to brew?



35% Oatmeal Stout
32% Imperial Stout
17% Milk Stout
16% Coffee Stout



MALT: A PRACTICAL GUIDE FROM FIELD TO BREWHOUSE



In the fourth installation in Brewers Publications' Brewing Elements series, *Malt: A Practical Guide from Field to Brewhouse* delves into the intricacies of this key ingredient used in virtually all beers. Written by John Mallett (Bell's Brewery, Inc.), *Malt* provides a comprehensive overview of malt, with a primary focus on barley, from the field through the malting process. With primers on history, agricultural development, and physiology of the barley kernel, Mallett leads readers through the enzymatic conversion that takes place during the malting process. A detailed discussion of enzymes, the Maillard reaction, and specialty malts follows. Quality and analysis, malt selection, and storage and handling are explained along

with much more. Available at homebrew suppliers, major booksellers, and BrewersPublications.com/Malt.

SQUARE YOUR BREW

Eugenio Ricca has dedicated his life to beer and a plan to open a microbrewery in Sicily, Italy. He designed Square Your Brew (SYB) to serve his own brewing, and now he is making the brewing software available to everyone, free of charge. Through SYB, you can calculate your malt bill, hops and IBUs, water profiles, beer color, attenuation, extraction efficiency, and more. It will also help keep track of times and temperatures of your mash and boil, fermentation and expenses. It is available in two languages and in both metric and imperial measurements. Check it out at www.squareyourbrew.com.



MASTERING HOMEBREW

Mastering Homebrew will have you thinking like a scientist, brewing like an artist, and enjoying your very own unbelievable handcrafted beer in record time. Internationally known brewing instructor, beer competition judge, author, and brewmaster, Randy Mosher covers everything that beginning to advanced brewers want to know, all in an easy-to-follow, fun-to-read format. Mosher covers everything from getting the most from your ingredients and formulating recipes to choosing equipment and understanding beer styles. Available at major booksellers.



CALENDAR

**MARCH 14
CHARLIE ORR MEMORIAL
CHICAGO CUP
CHALLENGE**

Chicago, Illinois

The Brewers of South Suburbia (BOSS) homebrewing club will hold the 24th Annual Charlie Orr Memorial Chicago Cup Challenge for homebrewers. This competition, held on March 28, is one of the Midwest's oldest and most prestigious competitions. The Chicago Cup is awarded to the homebrew club that accumulates the most points in the competition. They anticipate receiving 500 entries. This year, Larry Bell, Founder of Bell's Brewery, will be a judge and speak at the awards dinner. The entry fee is \$7 and deadline to enter is March 14. www.bossbeer.org/competition.html



**MARCH 21
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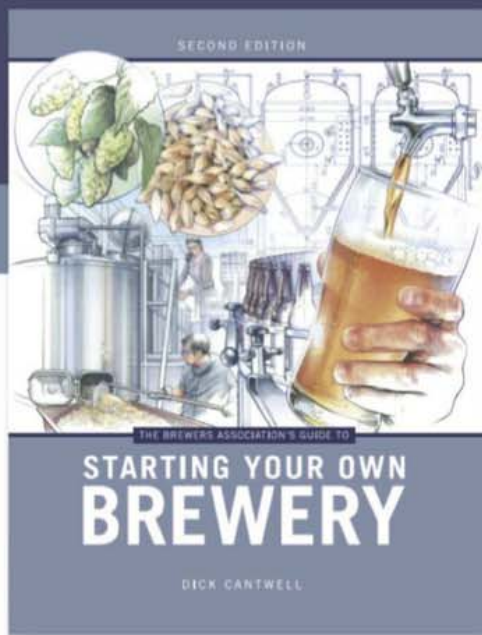
Held by the Iowa Brewers Union (IBU), entries to the IBU Open must be in by March 21 and judging of this BJCP/AHA sanctioned event will be on March 28. Medals will be awarded to 1st, 2nd and 3rd place in organized categories and a Best of Show medal will be awarded to the best of all the first place finishers. An awards ceremony will be held after the competition at Firetrucker Brewery. The cost to enter is \$7 for your first entry and \$5 for each entry thereafter. www.ibuopen.com



**APRIL 1
GREAT BASIN BREW-OFF**
Reno, Nevada

The Great Basin Brew-Off is Northern Nevada's qualifier for the Nevada State Homebrew Championship. The top three entries at each judging table/category will qualify for the NSHC. Put on by the Washoe Sephyr Zymurgists homebrew club, judging will be held from April 8-11. All entries must be received by April 1. The entry fee is \$7. www.washoezz.net/brewcomps





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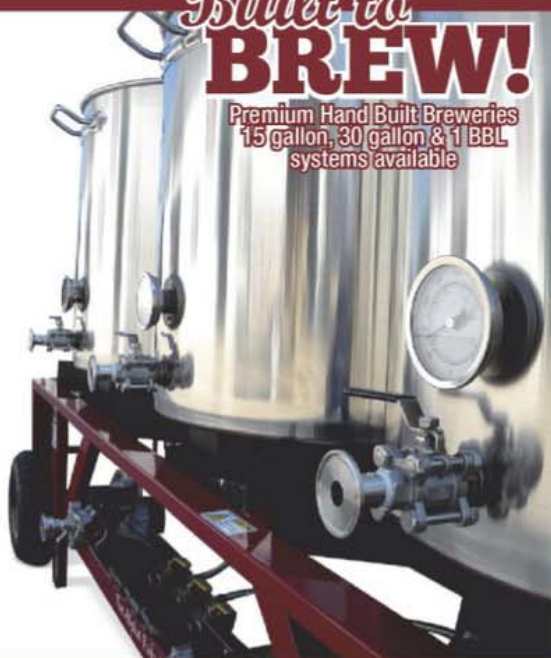
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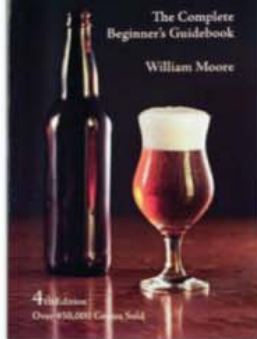
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MAXIMIZE YOUR PARTIAL BOIL

If you are an extract brewer, there is a good chance you will hear (if you haven't already) that you need to be doing full-wort boils (boiling your entire 5-gallon/19-L batch of beer). The recommendation isn't bad — a full-wort boil is ideal as it results in a higher hop utilization, ensures all of the ingredients are sterilized, and often results in a more predictable colored beer. However, if you don't own or want to invest in an 8-gallon (30-L) brew pot just yet, very good beer can still be brewed with a partial boil. Plus, time is on your side with a partial boil as it takes about half the time to heat it up and later cool it down.

A partial boil is when you boil only a portion of the wort (all of the malt, hops, and adjuncts you normally would, but with about half the water) and then dilute it with water in the fermenter to reach full volume.

When doing a partial boil, you'll want to boil from 2–3 gallons (7.5–11 L) of water for your wort (different recipes call for different amounts, but anywhere in this range will work). Let's say you are going to do a partial boil on a 5-gallon (19-L) batch with 2.5 gallons (9.5 L) of water in the kettle. This is half of the intended resulting beer, so the specific gravity (SG) during your boil will be twice as high if all of your extract is added to the boil. The higher gravity will in turn result in lower hop utilization, therefore lowering IBUs. You have two options to compensate for this: Add more hops or lower the SG.

As a beginner, it may be fun to play with your hop additions and experiment with just how much more hops need to be added to achieve the bitterness you desire. But if you want an estimate of what you are losing in a partial boil, refer to Glen Tenseth's hop utilization chart that estimates utilization as a function of time versus boil gravity. Using this chart, which is accessible through a quick Internet search, as long as you know your SG you can determine how much to tweak your

hop additions so the IBUs of your finished beer is equal to that of a full-wort boil. The drawbacks of increasing the hop additions are added cost (by a dollar or two) and additional hop debris left behind, which decreases your wort yield.

If that doesn't sound appealing to you, then there are two easy ways to lower the SG: Increase the amount of boiling water (which is only an option if your brew kettle is big enough) or wait to add a portion of the malt extract. Adding half of your malt extract at the start of a 2.5-gallon (9.5-L) boil will result in the same SG as adding all of your extract in a full-wort boil. Then with 10 to 15 minutes left in the boil add the rest of your extract, which will ensure that any potential contaminants in it will be killed off in the boil.

Holding off on adding some of your extract will also help with color. The reason the color in partial boils is often darker than desired is because non-enzymatic browning, also known as the Maillard reaction, is more pronounced during high gravity wort boiling. This isn't a big problem if you are brewing a stout, but if you are going for a more delicately colored blond ale, you definitely don't want your intended light golden hue to be closer to copper.



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DEAR REPLICATOR,

On a recent road trip from Kansas City to southeastern Missouri I made a stop at Springfield Brewing Company. I had a couple of their beers, one being the Aviator Doppelbock. I have brewed a doppelbock a couple of times but have never gotten the fantastic malt flavor that Aviator has.

As this beer is not marketed in the Kansas City-area, is there any chance of getting Brew Master Ashton Lewis (and *BYO's* Mr. Wizard) to share the recipe with those of us who are not fortunate enough to live in Springfield?

Steve Fry
Kansas City, Missouri

There are several ways to become successful in the brewing industry. Without a doubt one of the best ways is to own your own brewery equipment fabrication company. That is exactly what ensured that the Springfield Brewing Company got off to a strong start.

One of the most well respected manufacturers of complete brew houses in the U.S. is the Paul Mueller Co. The company was founded in Springfield, Missouri in 1940, mainly building sanitary equipment for the dairy industry. They began building brewery kettles and tanks in the early 1990s to supply the rapidly growing craft brewing industry. Mueller decided that the best way to showcase the high quality equipment would be to open their own brewery.

The idea was to find a facility that would allow them to easily display all of the vessels in a large, easy to view area. A historic brick building that dates back to 1900 was located in the heart of downtown. For 40 years it had been the Missouri Farmers Association headquarters and seemed to be perfect for a brewpub. They started by removing a wood façade to expose the brick. Then several months were spent restoring the building back to its original glory. Large glass walls looking into the brewery were fabricated to fit with the style of the 100-year-old building. A complete 15-barrel, state-of-the-art system was installed and on December 18, 1997 Mueller opened the doors of Springfield Brewing Company to a welcoming local public.

The brewpub and keg sales were good and grew steadily. The facility became an excellent showroom for visit-

ing prospective customers wanting to start new breweries. As an experiment they began hand bottling 22-ounce (650-mL) bottles. This proved to be popular and in 2000 they installed a four head bottling line. This supplied their take out sales and a few small, local accounts.

A big change occurred in 2011 when a group of local supporters of the brewery including the Brew Master (and *BYO's* own Technical Editor and "Mr. Wizard" columnist) Ashton Lewis talked Mueller into selling the brewery to them. Since then sales have grown rapidly.

2013 saw production reach their highest level of 1,400 barrels. Now they are planning for total production to hit 2,000 barrels in 2015. During the last three years distribution has been to just seven surrounding counties. 2015 will see that market area expanded to all of southwest Missouri.

Ashton, like the majority of craft brewers in the United States, began his brewing career by homebrewing in the kitchen. He started homebrewing in 1986 while he was still in high school. He and his best friend, Tommy Flores, borrowed a homebrew kit and brewed their first batch in Tommy's mother's kitchen. Ashton's father worked as a scientist for the U.S. Department of Agriculture and knew that breweries posted jobs for food science college graduates.

In 1987 Ashton entered college pursuing a food science major and continued homebrewing. For Christmas in 1989, Ashton found a copy of the *New Brewer* magazine in his stocking. It had an article discussing how to obtain professional brewing education. This led him to pack up and head to Califor-

nia to enroll in UC-Davis. After graduating, he stayed on to assist teaching brewing classes through their University Extension program. While there, Ashton picked up another side job with a new magazine and has been writing his column and fact checking every article in *Brew Your Own* in the 20 years since. He began his association with Springfield Brewing in 1996 as a consultant and was hired to be their Brew Master in 1997.

Ashton reports that Aviator is their take on a traditional German doppelbock. It has been their seasonal release since the winter of 1998. Part of the name is sourced from the fact that doppelbock names always end in "ator." The rest is from Mueller owning a King Air 90 plane since commercial service to Springfield was spotty. It is sometimes said that drinking a couple Aviators may make you feel like you are flying.

Ashton's idea for this recipe was to feature the rich malts without creating an overly sweet finishing beer. Just enough hops are used to balance that sweetness. The longer boil helps to concentrate the flavors. The result is a medium-bodied, light brown beer with a tight white head that is perfect for any season. Ashton recommends very good aeration and pitching plenty of healthy yeast to achieve full, clean fermentation.

Steve, you won't have to take another road trip to Springfield for your favorite doppelbock because now you can "Brew Your Own." For more information about Springfield Brewing Company and their other fine beers, visit them on the web at www.springfieldbrewingco.com or call the brewery at 417-832-8277.

**SPRINGFIELD BREWING CO.'S
AVIATOR DOPPELBOCK CLONE**
(5 gallons/19 L, all-grain)

OG = 1.078 FG = 1.018
IBU = 25 SRM = 18 ABV = 7.8%



INGREDIENTS

- 11.6 lbs. (5.3 kg) Weyermann pale ale malt
- 2.8 lbs. (1.27 kg) Weyermann Munich I malt (6 °L)
- 1.6 lbs. (0.72 kg) Weyermann Munich II malt (9 °L)
- 2.5 oz. (71 g) chocolate malt (350 °L)
- 2 oz. (57 g) Weyermann Carafa® Special III (dehusked) malt (525 °L)
- 8 AAU Perle hop pellets (60 min.) (1 oz./28 g at 8% alpha acids)
- 0.5 oz. (14 g) German Tradition hop pellets (0 min.)
- ½ tsp. Irish moss (30 min.)
- ½ tsp. yeast nutrient (15 min.)
- White Labs WLP830 (German Lager) or Wyeast 2206 (Bavarian Lager) yeast or Saflager 34/70 (or Saflager S-189 if available)
- ¾ cup corn sugar (if priming)

STEP BY STEP

This is a single step infusion mash. Mix all of the crushed grains with 6 gallons (23 L) of 172 °F (78 °C) water to stabilize at 154 °F (68 °C). This is a medium-thin mash using 1.4 quarts (1.3 L) of strike water per pound (0.45 kg) of grain. A medium mash temperature serves to create a slightly less fermentable wort. Mash for 60 minutes then slowly sparge with 175 °F (79 °C) water.

Collect approximately 6.3 gallons (23.8 L) of wort runoff to boil for 90 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. During the boil, use this time to thoroughly sanitize your fermentation equipment.

After the boil is complete, cool the wort to 60 °F (16 °C) and transfer it to your fermenter. Pitch the yeast and aerate the wort heavily. Allow the beer to cool to 50 °F (10 °C). Hold at that tempera-



ture until fermentation is complete. Gently transfer to a carboy, avoiding any splashing to prevent aerating the beer. Chill to almost freezing temperature and allow the beer to condition for an additional week. Prime and bottle condition or keg and force carbonate to 2.1 volumes CO₂. Allow the beer to age for four more weeks to fully develop the flavors and enjoy your Aviator Doppelbock clone.

**SPRINGFIELD BREWING CO.'S
AVIATOR DOPPELBOCK CLONE**
(5 gallons/19 L, partial mash)

OG = 1.078 FG = 1.019
IBU = 25 SRM = 18 ABV = 7.8%



INGREDIENTS

- 6.6 lbs. (3 kg) Briess light, unhopped liquid malt extract
- 1 lb. (0.45 kg) light dried malt extract
- 2.8 lbs. (1.27 kg) Weyermann Munich I malt (6 °L)
- 1.6 lbs. (0.72 kg) Weyermann Munich II malt (9 °L)
- 2.5 oz. (71 g) chocolate malt (350 °L)
- 2 oz. (57 g) Weyermann Carafa® Special III (dehusked) malt (525 °L)
- 10 AAU Perle hop pellets (60 min.) (1.25 oz./35 g at 8% alpha acids)
- 0.5 oz. (14 g) German Tradition hop pellets (0 min.)
- ½ tsp. Irish moss (30 min.)
- ½ tsp. yeast nutrient (15 min.)
- White Labs WLP830 (German Lager) or Wyeast 2206 (Bavarian Lager) yeast or Saflager 34/70

(or Saflager S-189 if available)
¾ cup corn sugar (if priming)

STEP BY STEP

Mash the milled grain in 2.5 gallons (9.5 L) of water at 154 °F (68 °C) for 30 minutes. Remove grains from the wort and rinse with 4 quarts (3.8 L) of hot water. Boil for 30 minutes. Add the liquid malt extract and dried malt extract and first hop addition, then boil for 60 more minutes. While boiling, add the Irish moss and yeast nutrient as per the schedule. During the boil, use this time to thoroughly sanitize your fermentation equipment. When the boil is complete, add the last addition of hops after turning off the heat. 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 60 °F (16 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 50 °F (10 °C). Hold at that temperature until fermentation is complete. Gently transfer to a carboy, avoiding any splashing to prevent aerating the beer. Chill to almost freezing temperature and allow the beer to condition for an additional week. Prime and bottle condition or keg and force carbonate to 2.1 volumes CO₂. Allow the beer to age for four more weeks to fully develop the flavors and enjoy your Aviator Doppelbock clone.

BYO HOMEBREW DROOL SYSTEMS

CARL GURAL • SPRINGBORO, OHIO



My son, Eric, and I are both avid homebrewers. I am a retired Quality Services Manager with a major brewing company for 32 years and a graduate of the International Brewing Science and Technology Course under the auspices of The Institute of Brewing in London, England and a member of the Master Brewers Association.

My son, who is an application engineer for a digital cutting board table company, found his passion for craft beer and homebrewing while working in San Diego for a printing company. I tend to like brewing hefeweizens, saisons and, during the holiday seasons, pumpkin and Christmas ales. My son is more of a hop-forward kind of guy and enjoys brewing traditional, double and rye IPAs. Our system allows us the flexibility we need to brew all styles of beer.

Our homemade brewing system is an all-grain, two-tier recirculating infusion mash system (RIMS) design utilizing modified kegs that has an elevated hot liquor tank, a combination mash/lauder tun and a brew kettle. The brew sculpture is fabricated from old bed frames welded together by a friend of my son, set on heavy-duty casters. Heat is provided by three 10 tip natural gas jet burners (60,000 BTU) with a 3/4-inch natural gas line provided from the house. Wort is moved around using a March pump (polysulphone pump head) that is hard plumbed using 3/8-inch copper pipe and a series of valves to regulate flow and direction. Wort cooling is accomplished using a stainless steel immersion chiller and during the warmer months we utilize a copper immersion pre-chiller. Calculated brewhouse efficiencies average 81.2% with this design.

The pump is under the mash tun and is hard plumbed using 3/8-inch copper tubing. The design allows for both mash recirculation and the ability to transfer to the kettle after vorlauf. Each vessel has its own 60,000

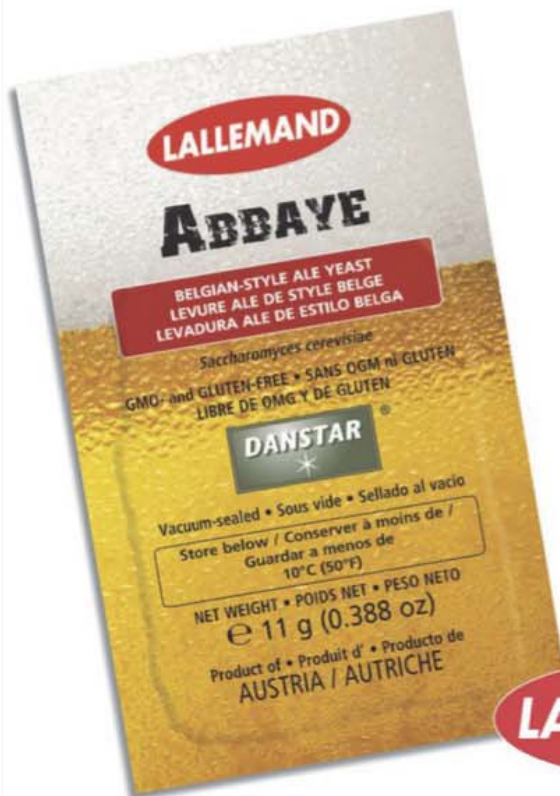
BTU 10-nozzle jet burner to allow for maximum flexibility while brewing.

Fermentations take place in a 7-cubic foot temperature-controlled chest freezer closet using a Johnson Control controller. Converted corny kegs with modified tops with hard pipe blow-offs serve as fermentation vessels. They are easy to clean and we like using stainless steel vs. glass or plastic. This setup allows us to control fermentation temperatures, cold crash and condition easily. The fermentation closet sits on a platform with a set of casters to facilitate ease of movement.

A Cereal Killer grain mill with a 7-lb. (3.2-kg) hopper is used for milling using a hand drill. Using some scrap plywood, we built a cabinet to house a 5-gallon (19-L) pail with the mill mounted on top. Grains are stored using food-grade 5-gallon (19-L) pails fitted with Gamma Seal lids.

Our homebrew is proudly served in the bar area of the rec room. I designed and built the bar area. We keg all our beers, which are served from a Danby dual faucet kegerator with Perlick faucets.





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TIPS FROM THE PROS

BY DAWSON RASPUZZI

BREWING WITH CHILI PEPPERS

Turn up the heat in your homebrew

When it comes to chili beer, the options are endless. What base beer style do you want as the backbone? What chili varieties will you use? When should you add them, and how many should you add? Roast them first, or add them fresh? Subtle spiciness, or a heat wave in your mouth? We've rounded up three pros known for their chili beers, and while their answers vary widely on these questions, their advice should help your planning as you design your own chili beer.

You want to make sure you don't pack in the peppers too tight so that the beer can reach all the pores of the peppers and pick up the flavor.



Nick Wilson is the Brewery Manager at Twisted Pine Brewing Company in Boulder, Colorado. The brewery is home to the multi-award winning Billy's Chilies and the brutally spicy Ghost Face Killah. Wilson began homebrewing avidly in college, eventually transitioning to the professional environment as an Assistant Brewer at Twisted Pine. He quickly transitioned to Brewer and then became the Brewery Manager in 2013 where he oversees daily operations and works closely with his brewers to make new brews each week.

We use a pretty simple wheat beer as a base for Billy's Chilies and Ghost

Face Killah. We get a subtle sweetness and nuttiness from the wheat that adds some balance to the pepper flavor and the hops mimic the fresh cut veggie notes. We want to keep Billy's pretty simple, yet give it some complexity so you can sip on it and enjoy the great aroma and flavor without a ton of heat. Ghost Face, on the other hand, is a different animal; we want to make it almost as hot as possible, but we still want a nice smoky pepper flavor to be in the finish. If you can somehow get past the heat, Ghost Face has a lot of flavor going on.

We add our chilies in the brite tank. We slice them up with a food processor and place them in a nylon bag before we transfer our wheat beer on top of them. You want to make sure you don't pack in the peppers too tight so that the beer can reach all the pores of the peppers and pick up the flavor. The peppers sit on the beer for 5 to 10 days depending on how hot the peppers are. The flavor profile goes through three stages: 1. "Not even close" A scientific term meaning that it tastes like wheat beer and some chilies. 2. "Green tasting" The beer has some heat but tastes like

green plants or chlorophyll still. 3. "On point" The chili flavor is very present and the wheat beer flavor only supports the chilies.

Unless you are adding say, dried poblanos to a stout, I think there needs to be multiple peppers in a beer to get some roundness of flavor and to make it interesting. We use five pepper varieties that give the beer lots of different flavor profiles and makes it more complex. Fresno are slightly sweet, Anaheim add some green chili flavor, serrano add a mild spiciness, jalapeños add some heat and some green flavor, and habaneros mainly add heat.

As a homebrewer trying to replicate this, I would brew a 5-gallon (19-L) wheat beer. We use classic, mild hops with our chili beers. I would say to go for noble or earthy, grassy, herbal hops to complement a chili beer. The same goes for yeast in regards to complexity; we use California Ale to get a nice, clean beer without any yeast flavor to compete with the chilies. During secondary, slice and add 1 oz. (28 g) serrano, 9.5 oz. (0.27 kg) Anaheim, 2.5 oz. (71 g) Fresno, 1 oz. (28 g) habanero, and 1.5 oz. (43 g) jalapeño to a nylon bag and add them to the beer. Monitor the flavor over the next ten days. Remove the chilies when it tastes right to you and carbonate the beer.



Thomas Larsen is the Head Brewer at Ska Brewing Co. in Durango, Colorado, however he more often goes by the title "Exalted Zymurgist." Thomas has been brewing for 16 years – 6 of which have been with Ska Brewing. In those six years, he's been trying to grow his hipster beard, but since he's not a hipster, he can't seem to grow more than a little scruffy stubble. Oh well, it can't be tight jeans and ironic t-shirts all the time. Good thing for Ska, he brews beer much better than he can grow a beard. And good thing for you, he doesn't wear tight pants!



Carlos Sanchez began as an Assistant Brewer in 1990 with Humboldt Brewery. Two years later he attended the Siebel Institute studying microbiology and microscopy. For the past 18 years he has been the Brewmaster at Six Rivers Brewing in McKinleyville, California where many of his beers have won awards, including his Chili Spicy Pepper Ale.

think chili peppers can go in any spiced beer but I always try to make sure there is enough body to work with the spices. If your beer is really light bodied the chilies can overpower and leave you with something resembling chili juice.

When we first started talking about our Seasonal Stout program we knew a chili version would be in there. I had made chili beers using a blonde as the base with green chili peppers and always wanted to make a stout version. I looked up a few molé recipes and tailored the spices to make a combination I thought would work well with a sweet stout. I like a little heat in a chili beer but not enough to make you sweat and I didn't want the spices to make you forget you're drinking a beer.

We use hatch green chilies along with guajillo and ancho peppers, which pair well together. In a stout with

spices you probably aren't going to pick up the subtleties of a particular chili but they do add nuances. Green chilies are used at 1 pound per barrel and the guajillo and anchos are $\frac{1}{2}$ pound each per barrel. For a 5-gallon (19-L) batch that would be around 3–3.5 oz. (85–100 g) of the green chili and 1.5–1.75 oz. (43–50 g) of each dried pepper.

We add all the chilies and spices into the brite tank and filter the beer onto the top of them. We let it sit on the spices for 5 days before we recirculate it to ensure consistent flavor throughout the tank.


I have made a few one-offs of our IPAs Decadent and Modus with habaneros and extra citrusy hops and they have turned out well. I could see earthy hops with certain chilies and I think tropical/citrusy hops are an easy combination. One word of warning, chili oils will kill your head retention!

Chili beers are a love-hate type of beer. They are something unique, appreciated by true chili pepper lovers. I have found chili beers work well when you start with a light bodied beer such as a lager or wheat ale. I make mine hot because that's the way people want it. I use four varieties of peppers that I roast before adding to my brew – habanero, jalapeño, serrano, and a mild pepper such as Anaheim or anchos. I use 1 lb. of each variety per barrel (~2.5 oz./70 g per 5-gallon/19-L batch) and roast them to bring out a sweetness and aroma I am looking for.

After roasting, I run the peppers through a food processor and add them to the kettle, seeds and all. I add them later in the boil, usually after 60 minutes along with my second hop addition. I have also tried adding them in steeping bags and placing them in the brite tank for a few days, but have

found it is far better and more consistent to add them to the boil. There is also less chance of an infection.

For hop pairing, I like Hallertau or any Hallertau-type such as Mt. Hood or Liberty. These have a sort of spiciness that goes well with the beer. I've made chili IPA too, but that's a whole different animal. Some people like to blend my chili with traditional wheat beer to cool it down, and people have also combined it with IPA or even my raspberry lambic style ale. The possibilities are endless. When it comes to yeast, I recommend a nice, clean finishing ale yeast like the ever popular Wyeast 1056 (American Ale). Yeast flavors should not be too prominent.

If you are planning your first chili beer, err on the side of caution. You can always make a hotter batch later or increase the heat by dry peppering in the keg or secondary. Whatever you do, don't get it in your eye! 

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STABILIZING TEMPERATURES

Barrel-aged cider, adjusting pH

Q AFTER BREWING FOR A LONG TIME IN SEATTLE, WASHINGTON I NOW FIND MYSELF IN EXTREME SOUTHEAST ARIZONA. SEATTLE WAS A KITCHEN BREWERY BUT HERE I HAVE A SHED DEDICATED TO BREWING GOOD BEER. LAST WEEK AT 2:30 P.M., THE TEMPERATURE WAS 96 °F (36 °C) AND DOWN TO 50 °F (10 °C) AT NIGHT. LAST NIGHT WAS 58 °F (14 °C) AND BACK UP TO 85 °F (29 °C) AT 2:30 P.M. I HAVE A 5-GALLON (19-L) BATCH OF CALIFORNIA CREAM ALE FERMENTING. ON THE ADVICE OF A BREWER FROM ONE OF THE SUPPLIERS, I PITCHED A CULTURED BATCH OF TURBO YEAST HIGH HEAT AT 81 °F (27 °C). THE FERMENTATION SEEMS TO SLOW AND STOPS ACCORDING TO THE TEMPERATURE. AFTER TWO DAYS OF ROBUST ACTION IT'S SETTLED INTO AN UP-DOWN ROUTINE. TOMORROW IS TWO WEEKS AND KEGGING DAY. MY QUESTION IS, DO YOU HAVE ANY IDEAS OR THOUGHTS ON HIGH HEAT BREWING? MY POTENTIAL ALCOHOL LOOKS LIKE 6.3% AS OPPOSED TO THE 4.3% CALLED FOR IN THE RECIPE AND I'M INFORMED THAT TURBO YEAST HIGH HEAT MAKES A LOT OF ALCOHOL.

BILL MAYBERRY
COCHISE COUNTY, ARIZONA

A There are a couple of separate issues raised in your question. The first has to do with effectively stabilizing your fermentation temperature to prevent the yo-yo effect you describe. I recently described using water as a temperature buffer to address the very problem you describe, only that in the question I answered the brewer was in a pretty nice climate for brewing ... your former home of Seattle. The desert climate is much more volatile and you are clearly seeing a fermentation pattern that really needs to be stabilized to help you produce clean beers that do your brewing shed justice.

The good news is that your average temperature is pretty normal and if you determined the normal temperature over an extended period of time, for example by allowing an insulated water cooler to sit in your shed for a week and measuring the temperature, you probably would find that that temperature is somewhere in the upper 70s °F (~25 °C). Maybe a bit warm for brewing some ales, but certainly not too high for a wide range of beers.

A cheap and easy way to dampen the changes in your fermenter temperatures is to place your fermenter in a plastic trashcan and to drill an overflow near the normal beer level in a full fermenter. The basic method is to fill the trashcan with water and immerse the fermenter. The water acts as

The basic method is to fill the trashcan with water and immerse the fermenter. The water acts as a temperature buffer because of its mass . . .



HELP ME, MR. WIZARD

a temperature buffer because of its mass (this is one of those times where size really does matter) and relatively high specific heat. In plain terms these properties make bodies of water relatively slow to heat and cool in comparison to something like air. If the normal temperature is not too warm for fermentation, or a few degrees cooler than your target temperature, the only thing that may be required is to fill the trash can up to the overflow level and leave it alone during fermentation.

Chances are that this alone may not work for you in Arizona and that your fermentation will be a little too warm. If this proves to be the case, you can add a water supply line to the bottom of the trashcan and displace some of the warm water. Consider using a needle valve to very slowly and continuously add water or manually turning the water on and off daily as required. This will only work if your ground water is cool enough.

I have never used "Turbo Yeast" but from what I can find online these strains are marketed for fermenting "wash" for distillation. The key traits that these yeast strains have are their tolerance for alcohol, high attenuation rates and rapid

fermentation rates. These are not necessarily the things that make for the best brewing strains.

The higher than expected alcohol in your brews is likely due to the high attenuation rate of your chosen strain. But keep in mind that mash temperature really sets the stage for wort fermentability and that it truly takes two to tango when producing high-alcohol beers. If you have poor wort fermentability and a yeast strain that is described as highly attenuative, you may still end up with a high-finish gravity because the wort is simply not very fermentable. If the yeast strain secretes starch-degrading enzymes, like "super attenuators," things will be different.

My advice about yeast strain is to select yeast strains that produce good beer flavor in the normal temperature range of your brewing shed. For the sake of discussion, assume that your normal temperature is 76 °F (24 °C). With that knowledge in hand, go look for strains that are described for working well at this temperature. You can further refine your search by nailing down the style of beer you want to brew and looking for a strain that works for the style and your temperature norm.

Q AFTER READING SOME PREVIOUS ARTICLES ON MAKING CIDER, I'VE DECIDED I'D LIKE TO GIVE IT A TRY. BUT I HAVE A COUPLE OF QUESTIONS: 1. I AM GOING TO TRY AGING IN 5 QUART (5 L) BARRELS I FOUND AND I LOVE THE IDEA OF USING THE MALOLACTIC BACTERIA (ML) CULTURE TO ROUND OUT THE FLAVOR – DO I HAVE TO USE A REGULAR WHITE WINE YEAST AND THEN ADD THE MALOLACTIC BACTERIA LATER IN THE BARREL OR CAN I USE ONLY THE ML?

2. I WANT A GREATER DEPTH IN FLAVOR IN MY CIDER (HENCE TRYING TO USE A BARREL TO IMPART A VANILLA/ TOASTED OAK FLAVOR TO THE CIDER). A

SECOND IDEA I HAD WAS TO AGE BOURBON/ WHISKEY IN THE BARREL FOR 4-6 WEEKS (ALMOST AS AN EXTENDED CONDITIONER FOR THE BARREL), THEN RINSE CLEAN AND AGE THE CIDER IN THE BARREL AFTER THAT. ANY THOUGHTS AS TO THE FLAVOR THE WHISKEY SOAKED BARREL WILL ADD TO THE CIDER AND/OR DAMAGE THAT WILL CAUSE TO THE FERMENTING PROCESS?

3. I LOVE CLEAN CRISP CIDERS, BUT ON OCCASION, A MORE MALTY MOUTH FINISH IS WONDERFUL. HOW CAN I IMPART SUCH A FINISH ON A CIDER?

TALOR MIGLIACCIO
COLORADO SPRINGS, COLORADO

A Cider certainly has become quite popular in recent years and with the popularity has come many very nice ciders on the market. In my opinion this is all the more reason to make cider at home to share with friends and family and to play around with ways to further explore the complexity and nuances of this great beverage. The questions that you ask about are certainly good things to consider.

Apples contain a fair amount of malic acid and this acid

provides tartness to apples and other fruits. In fact, the name malic acid comes from the Latin root "malum," which is both the root for apple and evil. That opens up some interesting naming ideas! Since ciders, like grape wines, have the tendency, depending on yeast strain and fermentation method, of fermenting out very dry they can become very tart.

The tartness in dry ciders can border on the extreme, especially when the juice blend contains a lot of tart varieties

or is from a single, tart variety like Granny Smith. The use of so-called malolactic strains of bacteria, such as *Leuconostoc oenos*, is a nice way of rounding out these tart ciders. During the malolactic fermentation, often referred to as "ML fermentation" or "MLF" by the cool kids, malic acid is converted to lactic acid. Since lactic acid has a much softer acidity than malic acid, the result of the MLF is a rounder cider. These bacteria also produce diacetyl and ciders and wines that have undergone MLF often have a pronounced buttery nose and silky palate. I personally like the flavors and aromas associated with MLF and believe that the process adds complexity.

OK, so a few pointers. The ML culture does not replace yeast. You will still need to use a winemaking or brewing yeast strain for the primary fermentation. You can add the ML culture to your must along with the yeast, or you can add the ML culture after the primary fermentation has completed. This is a weighty topic and there is a lot of information written about MLF in the wine literature. There are many different types of bacteria that can be used and different strategies on when to add them and how to control the MLF. This is definitely something worth playing with!

Oak aging is another thing worth playing with. Cider is wine and the same basic techniques used to make grape wine can be applied to making cider. I have aged ciders in new American oak barrels and the results have been pretty exciting; almost like low alcohol white wine. I think the thing you need to be careful about is imparting too much oak flavor, and this is especially true if you are using new barrels. Oak spirals can also be used, and one of the benefits to spirals is the ability to reduce the oak area to cider volume ratio. Another way to accom-

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plish the same thing is by blending cider aged in oak with cider aged in glass or stainless steel. This is a matter of taste.

I do like the idea of aging cider in whiskey barrels and think you will be happy with the flavor contribution. One thing to consider is that whiskey barrels have an interior char that makes the wood like a sponge. This is why aging beer or cider in a wet whiskey barrel increases the alcohol content. Wine barrels have a much smoother interior finish and the wood is not charred. Although wine barrels do retain liquid when they are hydrated, the flavor transfer will not be anywhere as intense as when using a whiskey barrel. The barrel flavor itself will also be much different and a wine barrel is likely to primarily impart vanilla and toasted oak flavors, whereas a whiskey barrel, especially a wet whiskey barrel, is going to give these flavors plus others like coconut, leather, tobacco and, of course, whiskey.

The thing about aging cider in a wet barrel is that the process adds alcohol to the cider. Since, in the US, this process is controlled by the alcohol tax regulators most commercial ciders do not use such methods. But making cider at home opens the door to a lot more process freedom. If the primary purpose of the barrel aging is to impart whiskey/bourbon flavors and you are able to use a whiskey barrel, you do not need to wait very long for the flavor transfer to occur. Many excellent whiskey barrel-aged beers spend 4-6 weeks in the barrel prior to packaging. Just to be clear with my basic advice, you should be adding fermented cider to the barrel for aging and top the barrel up as much as possible to minimize the headspace.

And your last cider question is about adding maltiness to the finish.



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The most direct way of addressing this desire would be to add some wort to your apple juice before fermentation. In fact many ciders on the market contain some fermentables from malt so that they are taxed as beer and not wine. One of the challenges with cider-making is having some residual sweetness and using wort, especially wort with a fair bit of crystal malt, is one way of boosting the finish gravity of the cider and contributing that maltiness that you seek. As with brewing, you do want to boil the wort to kill bacteria but unlike beer brewing you don't want to add hops.

Another way of increasing body and making cider that tastes more like apple juice is to stop the fermentation before it comes to completion. Many commercial operations use pasteurization for this, some stop fermentation by rapid chilling and others add preservatives such as sulfites and sorbates. Another method is to ferment the cider dry, back-sweeten with unfermented juice and then pasteurize. If I were looking to make a sweet cider I would want to use pasteurization because that is really the most reliable method.

Q I AM MAKING THE SWITCH TO ALL-GRAIN AND GOT CURIOUS ABOUT THE pH OF OUR WELL WATER HERE. SO I GOT SOME STRIPS FROM MY LOCAL SHOP JUST TO GET A ROUGH IDEA OF OUR WATER pH. WELL IT CAME IN AT ABOUT 4.6. A FRIEND CAME BY WITH SOME BUFFER (HIS pH TESTER WAS ON THE FRITZ) AND SURE ENOUGH THE STRIPS DID NOT LIE. SO HOW AND WHAT DO I USE TO GET THE WATER UP WHERE I NEED IT? JUST ABOUT EVERYTHING I READ IS ABOUT ADJUSTING DOWN, NOT UP.
STEVE SOKOLOFF
SWEET HOME, OREGON

Matt Weide Best In Show Winner NHC 2014



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A This is a question that I have never been asked and did a little digging. The reason for the digging is the very low pH of your well water. Most well water ranges in pH from about 6.0 to 8.5, and the EPA has published guidelines indicating that the pH of well water should fall between 6.5 and 8.5 because when the pH of water is out of this range it is due to something that may be of concern from a health and safety viewpoint. You really should contact your local water district, even if you are not on a municipal water supply and ask about what is normal in your area.

One real problem with acidic water is plumbing corrosion. The pH of groundwater varies based on the minerals present in the earth and low pH water is not necessarily an indication of a big problem. In fact many regions of the country have low pH and municipal water utilities adjust water pH by adding alkaline solutions, such as sodium hy-

When brewing water is rich in carbonates the mash pH can be lowered by adding calcium in the form of calcium sulfate and/or calcium chloride to water.

droxide, to increase the pH to about 8.5. The reason for doing this is to prevent corrosion of pipes caused by acidic water. If your home well water is consistently low your pipes will be damaged over time.

So onto your question about water pH and mashing. The first thing to note about water is its buffering capacity, or its resistance to pH change. All buffers are considered weak acids where an acid component and a base component that are in equilibrium; these two components essentially remove hydrogen and hydroxide ions that are added to a solution and by doing so stabilize changes to pH that would ordinarily be observed when these compounds are added to a poorly buffered solution. The most common buffering system in water is dissolved carbonates and water that contains carbonates will resist changes in pH more than water that has essentially no buffering capacity, for example distilled water.


The second thing to note about pH and brewing is that malt is rich in compounds that are buffers. The two most significant buffering systems added to the mash from malt

are phosphates and proteins/polypeptides/amino acids (collectively called "protein"). The buffering capacity of mash is usually much, much higher than water. This means that mash water with a relatively high or relatively low pH may have very little effect on mash pH if the water is poorly buffered. But if the water has a high buffering capacity, as is the case with water high in carbonate, mash pH may end up being higher than desired (high mash is the result of carbonate water).

When brewing water is rich in carbonates the mash pH can be lowered by adding calcium in the form of calcium sulfate and/or calcium chloride to water. When brewing water needs to be adjusted for mash pH control, it is almost always because of carbonates. There are times, however, when the mash pH is too low and needs to be increased. In these cases carbonates are added to water. Calcium carbonate and sodium bicarbonate are two common salts used to increase mash pH, and an example of when these salts may be required are when brewing beers with a high percentage of roasted malts that tend to lower mash pH. Historically, this is why dark beers were brewed in regions with carbonate waters.

Note that in the discussion above I state that calcium salts can be added to mash water to lower mash pH and that carbonates can be added to increase mash pH. It's the mash pH that is important and in the case of calcium additions the water pH is not altered by the addition because the acidifying effect on mash pH only occurs when calcium reacts with the malt buffer systems.

You need to confirm that you indeed have acidic water, and this may or may not be a concern for your home use. If your water is safe, you should also determine what happens when you use this water for mashing. The simplest and cheapest thing to do is to conduct a small test with about a quarter pound of malt. Just make yourself a small test mash in a pot and measure the pH. It may be that the mash pH is not affected by the water and all will be fine.

If your mash pH is lower than 5.2 and you want to increase your mash pH, you should consider adding sodium bicarbonate (baking soda) or calcium carbonate to your brewing water. These compounds will increase water pH so don't be surprised if you are measuring water pH as part of your experimentation. 

Related Link:

There is more to most water than two molecules of hydrogen and a molecule of oxygen. The pros offer advice on adjusting water for your brew: <http://byo.com/story310>



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STYLE PROFILE

BY JAMIL ZAINASHEFF

SHAKE IT UP WITH A LITTLE SALT

The ancient German style of Gose

While not sweet on its own, salt counteracts the bitterness in beer, which helps with the overall balance of this beer style.

GOSE BY THE NUMBERS

OG:	1.036–1.052
FG:	1.006–1.012
SRM:	3–6
IBU:	5–12
ABV:	3.9–4.9



Photo by Charles A. Parker/Images Plus

I know it was more than a decade ago when I first heard of Gose (pronounced goes-uh), a 1,000-year-old German beer style made with wheat, coriander and salt. I do not remember who first told me about it, but a good guess would be Randy Mosher or Ray Daniels. Both are always pulling odd historical beers out of nowhere. At the time, commercial examples of Gose were extremely limited. A local homebrewer brought some back from Germany, so we had a few ounces of experience with the style before trying to brew one. Still, it was a challenge judging this newfound style. Was that too much coriander? Too little salt? Was the souring right?

I count myself very lucky that professional brewer Jeff Griffith contacted me about Gose around the same time. Griffith was experimenting with making the perfect Gose and we discussed those questions everyone seems to have about salt, coriander and sourness. I think it was in 2007 when I got the opportunity to try many of Griffith's commercial beers, including his Gose. I thought at the time that his Gose was a solid example, but Griffith is a perfectionist when it comes to brewing and he was determined to have the best Gose possible. Every time I saw Griffith after that, we would talk about Gose and he would have me try the latest iteration. Sure enough, it was not long before Griffith was making the best example of Gose I have ever tasted.

A great Gose, like any beer style, is

about balance. In Gose, it is a balance between the tart lactic acid, the sweetening effect of the salt, the peppery coriander, and the breadiness of the malt. None of these characteristics should overwhelm the others. The tartness is a light lactic sourness, not nearly as strong as would be found in Berliner weisse or lambic. Instead, it adds a tart counterbalance to the breadiness of the malt and sweetening effect of the salt. (While not sweet on its own, salt counteracts the bitterness in beer, which helps with the overall balance of this beer style.) The salt is just a background character, providing balance and a subtle hint of salt, not an outright saltiness. The coriander provides a peppery, floral, citrus note, similar to witbier. The overall aroma is clean, with hints of coriander and lactic sourness that can come across as citrusy. Hop aroma, as well as hop flavor, should be non-existent. Hop bittering is just a balancing note in this style. Overall, the beer is crisp, dry to semi-dry, and refreshing. It should have a medium body and high carbonation. Color ranges from straw to gold, with clarity that ranges from slightly hazy to cloudy. One word of warning if you want to brew a great classic example of this style and count on examples brewed in the United States: Most brewers in the USA make their Gose far too sour.

Griffith is now head brewer at FATE Brewing Company in Boulder, Colorado, where he continues to exercise his quest for flawless beer, including Gose. At FATE, his delicious Uror Gose



GOSE

(5 gallons/19 L, all-grain)
OG = 1.044 FG = 1.010
IBU = 9 SRM = 4 ABV = 4.5%



INGREDIENTS

3.7 lbs. (1.7 kg) wheat malt (4 °L)
2.6 lbs. (1.2 kg) continental Pilsner malt (2 °L)
14.1 oz. (0.4 kg) flaked oats (2 °L)
14.1 oz. (0.4 kg) flaked wheat (2 °L)
7.1 oz. (0.2 kg) Munich malt (8 °L)
5.3 oz. (0.15 kg) acidulated malt (2 °L) (added once temperature is below 120 °F/49 °C)
1.8 AAU Magnum hop pellets (60 min.) (0.14 oz./4 g at 13% alpha acids)
½ tsp. (1.8 g) sea salt crystals (0 min.)
0.43 oz. (12 g) crushed coriander (0 min.)
White Labs WLP029 (German Ale/Kölsch) or Wyeast 2565 (Kölsch) yeast
1 cup corn sugar (if priming)

STEP BY STEP

I currently use Best Malz Pilsen, Munich, and acidulated malt. My wheat malt, flaked oats, and flaked wheat are from Great Western, but feel free to substitute any high quality malt of the same type and color from a different supplier. My hops are in pellet form and come from Hop Union, Crosby Hop Farm, or Hopsteiner depending on the variety.

Mill the grains (keeping the acidulated malt separate) and dough-in targeting a mash of around 1.25 quarts of water to 1 pound of grain and a temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °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). Add in 1 quart (1 L) of ice cubes and stir in the mash thoroughly. Check the mash temperature. Keep adding ice and stirring until the mash temperature drops within a few degrees of 120 °F (49 °C). Sprinkle the crushed acidulated malt across the surface of the mash. Seal off the top of the mash vessel with plastic wrap and then slowly fill the headspace of the mash vessel with CO₂ or argon gas. Insulate the outside of the mash vessel with blankets or other insulation. Check the pH of the mash every 12 hours. When it reaches the low 4 pH range, you can begin sparging. 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 1.034.

The total wort boil time is 90 minutes, which helps reduce the S-Methyl Methionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl Sulfide (DMS) in the finished beer. Add the hop addition with 60 minutes remaining in the boil. Add the sea salt and coriander at the end of the boil. Chill the wort to 65 °F (18 °C) and aerate thoroughly. The proper pitch rate is about 150 billion cells. You can get by with pitching a fresh vial or smack pack, but the safe bet is to use 1 package of yeast in a 1-liter starter to be certain you have a healthy pitch of enough yeast for proper fermentation.

Ferment around 65 °F (18 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but do not rush it. If desired, perform a diacetyl rest during the last few days of active fermentation. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle in heavy weight bottles. Target a carbonation level of 3 to 4 volumes.

GOSE

(5 gallons/19 L, partial mash)
OG = 1.044 FG = 1.010
IBU = 9 SRM = 4 ABV = 4.5%



INGREDIENTS

3.9 lbs. (1.8 kg) wheat liquid malt extract (8 °L)
1.1 lbs. (0.5 kg) continental Pilsner malt (2 °L)
14.1 oz. (0.4 kg) flaked oats (2 °L)
14.1 oz. (0.4 kg) flaked wheat (2 °L)
7.1 oz. (0.2 kg) Munich malt (8 °L)
1.8 AAU Magnum hop pellets (60 min.) (0.14 oz./4 g at 13% alpha acids)
½ tsp. (1.8 g) sea salt crystals (0 min.)
0.43 oz. (12 g) crushed coriander (0 min.)
Lactic acid to taste (post fermentation)
White Labs WLP029 (German Ale/Kölsch) or Wyeast 2565 (Kölsch) yeast
1 cup corn sugar (if priming)

STEP BY STEP

I use a wheat extract blend from my local homebrew shop. Always choose the freshest extract that fits the beer style. If you cannot get fresh liquid malt extract, use an appropriate amount of dried malt extract instead. Using fresh extract is very important to make great beer. I currently use Best Malz Pilsen and Munich malt. My wheat malt, flaked oats, and flaked wheat are from Great Western, but feel free to substitute any

high quality malt of the same type and color from a different supplier. My hops are in pellet form and come from Hop Union, Crosby Hop Farm, or Hopsteiner depending on the variety.

Mill or coarsely crack the Pilsner and Munich malt and place loosely in a grain bag with the flaked oats and flaked wheat. Avoid packing the grains too tightly in the bag, using more bags if needed. Place the bag in about 1.5 gallons (~6 liters) of water at 160 °F (71 °C). The idea is that your temperature, once you add the grain, is in the malt conversion range and will convert the starch from the grains. After 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 malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.038. Stir thoroughly to help dissolve the extract and bring to a boil.

Once the wort is boiling, add the bittering hops. The total wort boil time is 1 hour after adding the first hops. Add the sea salt and coriander at the end of the boil. Chill the wort to 65 °F (18 °C) and aerate thoroughly. The proper pitch rate is about 150 billion cells. You can get by with pitching a fresh vial or smack pack, but the safe bet is to use 1 package of yeast in a 1-liter starter to be certain you have a healthy pitch of enough yeast for proper fermentation.

Ferment around 65 °F (18 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but do not rush it. If desired, perform a diacetyl rest during the last few days of active fermentation. Once fermentation is complete, add lactic acid in small doses until the beer has a slight tart edge to it. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle in heavy weight bottles. Target a carbonation level of 3 to 4 volumes.

WEB EXTRA:



Want to change things up a bit? Read up on mash hopping, which could be a good fit for brewing your Gose: <http://byo.com/story2958>

STYLE PROFILE

is even available aged in tequila barrels. I asked Griffith to provide his latest recipe and to offer tips for brewing the perfect Gose. Probably his most critical tip, "Less is more with this beer. Nothing is worse than an over-salted beer."

The basic grist for an authentic traditional Gose would be 60% wheat malt and 40% Pilsner malt. Griffith's

recipe goes further. While he has 40% wheat malt, 30% Pilsner malt, he also includes a substantial portion (11% each) of flaked oats and flaked wheat, which add head and body forming proteins. Flaked oats, especially, can add to the mouthfeel of the beer.

He also adds a small portion of Munich malt (5%) and acid malt (3%). The Munich malt can assist in develop-

ing that bread-like malt character and the acid malt can help with mash pH. It is possible to derive all of your souring from just acid malt or from the addition of lactic acid, but in this case, Griffith uses the acid malt to provide his starting culture in a sour mash. Since his recipe uses a substantial amount of huskless grain, Griffith also adds rice hulls to aid in lautering his mash. Generally, adding about 0.5–1 lb. (0.25–0.5 kg) of rice hulls to a 5-gallon (19-L) batch provides enough husk material to avoid a stuck mash.

You can use other base malts, such as Vienna, but the light, grainy and bready taste of high quality Pilsner and wheat malt is right on target for this style. You can add some melanoidin-rich malts such as aromatic or melanoidin, but as Griffith says, less is more. Other than the use of Munich and acidulated malt, avoid overloading the beer with too many other specialty malts, keeping it to no more than 5% of the grist and do not include any crystal/caramel malts. Bready notes are nice, but you are shooting for a crisp, refreshing, light-colored beer.

Extract brewers can use wheat malt extract, either 100% or blended, but will need to do a partial mash if they want the effect of the flaked oats and flaked wheat that Griffith uses.

Griffith employs a triple decoction to develop the bready maltiness and then follows it up with a sour mash technique to develop the needed acidity for this beer.

GRIFFITH GOSE DECOCTION MASH SCHEDULE

1. Mash in at 95 °F (35 °C). Rest 20 minutes.
2. Pull $\frac{1}{4}$ of mash to a separate pot. Raise to 152 °F (67 °C). Hold for 30 minutes. Raise to boil. Boil for 30 minutes. Return to main mash for a



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target mash temperature of 122 °F (50 °C).

3. Pull ¼ of mash to a separate pot. Raise to 152 °F (67 °C). Hold for 30 minutes. Raise to boil. Boil for 30 minutes. Return to main mash for a target mash temperature of 148 °F (64 °C).
4. Pull ¼ of mash to a separate pot. Raise to boil. Boil for 30 minutes. Return to main mash for a target mash out temperature of 168 °F (76 °C).
5. Allow mash to cool below 130 °F (54 °C). Add some additional crushed malt (Griffith uses about 0.25 lb./0.11 kg acidulated malt) to the surface of the mash. The bacteria present on the grain will begin to sour the mash. When the mash reaches the proper pH range, lauter, sparge, and boil as normal.

Those who know me know I like to avoid the work of decoction whenever possible. Griffith suggests lazy people like me can use a single infusion at 150 °F (66 °C). The sour mash, on the other hand, might seem like a lot of work at first, but it is really just more of a waiting game. All brewing grains have bacteria on them. When added to the mash at temperatures where they will thrive, the bacteria will quickly sour the mash. The more grain you add, the more bacteria you are adding and the quicker the souring will occur.

About 0.25–0.5 lb. (0.11–0.23 kg) is right. The best way to monitor progress is to check the pH of the mash. In this case, a pH around the low 4 pH range is about right depending on other aspects of your recipe. This will take around 12 to 24 hours at 100–120 °F (38–49 °C), but more or less time is possible. The longer you leave the mash, the more sour it will become.

It is possible to leave it too long, ending up with an overly sour Gose.

There are a couple of other tricks to a great sour mash. You want sour, but not funky. The first tip is to make sure your mash is 4.5 pH or lower before you start. You might need to add acid malt or even lactic acid to your mash to reach this pH, but it will greatly reduce the funk. Another trick is

to seal off the mash tun, perhaps with plastic wrap and then flush the surface of the mash with CO₂ or argon gas to minimize oxygen pick-up.

Although I have never tried it, I see no reason not to try something similar in extract brewing. Just add some crushed grain to the wort and then treat as if it were a mash. It should sour in a similar manner to the all-

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STYLE PROFILE

grain mash. Once soured, separate the wort from the grain and boil as normal.

Griffith adds about 1/8 tsp. (1.8 g) sea salt crystals and 0.43 oz. (12 g) crushed coriander to a 5-gallon (19-L) batch at flameout. As in any spice addition, you may find your preference for the coriander and salt differs.

Choose a salt that does not have iodine added. One thing to be aware of when dealing in salt measurements is that different forms (flake, fine, large crystal) and different brands will have different weights for a given volume. It is best to measure your salt by weight if you can. If not, try about 1/4 tsp. for a 5-gallon (19-L) batch. You can always add more salt once the beer is fermented (but do it before carbonation to avoid a foamy mess).

At most, hop character is just a slight background note in Gose, but I still prefer German-grown hops when making German beers. Magnum is my favorite, but other hops will work well. You want to avoid very low alpha acid hops so that you do not need to add so much that the flavor comes through. The same goes for very high pungency hops, with lots of pine, catty or other American-hop characteristics. The bitterness to starting gravity ratio (IBU divided by the decimal portion of the specific gravity) ranges from 0.1 to 0.3, but I like to target around 0.2 in one 60 minute addition. The more acidic you go the less bittering you need. Griffith targets 9.5 IBU versus a starting gravity of 1.045.

You can ferment with any ale yeast that has a restrained ester profile. You might even be able to use lager yeast. Griffith uses White Labs WLP001 (California Ale), which is a solid choice. You can also use the similar Wyeast 1056 (American Ale). Other solid choices with a touch more character would be Kölsch or Alt yeast strains or perhaps European ale yeast. You will



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find that different yeast strains will emphasize different aspects of the beer. A fermentation temperature in the 65–68 °F (18–20 °C) range for most ale yeasts or a few degrees cooler for the Kölsch or Alt yeast strains should yield decent results.

If you decide to sour the beer by the addition of *Lactobacillus*, it is probably best to add it after primary fermentation is complete. One vial or smack pack should do fine. You do not want a lot of souring, so limiting the food for the bacteria will keep souring in check. If it seems like souring might be going further than desired, keeping the beer under refrigeration, below 40 °F (4 °C), should mostly halt the bacterial activity.

The high level of carbonation in this style helps add a dryness and acidity to the beer. Target a carbonation level of 3 to 4 volumes. If you are going to bottle this beer, be very careful. High carbonation and glass bottles can result in severe injury or death.

Similar to Berliner weisse, Gose can be served “mit schuss” or “with syrup.” A small dollop of raspberry (himbeer) or woodruff (waldmeister) syrup helps counter the tartness and adds another dimension to the beer. You can buy the authentic German syrups at many German food stores or read the article *BYO* ran on making syrups in the May-June 2014 issue and experiment with a wide variety of flavors. 

Author's Note: This is my last “Style Profile” column. As much as I have enjoyed writing this column the past eight years, the demands of running Heretic Brewing Company have made it impossible to continue. I have learned a great deal from writing this column and even more from meeting and talking with many of you. If you ever see me somewhere, be sure to say hello. I'd love to have a beer with each and every one of you.



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Take your extract homebrews to the next level with a few easy upgrades

Extract brewing is a great technique for brewing fantastic beers in less time and with less equipment than is generally necessary for brewing all-grain beer. Even for those who usually brew all-grain, the occasional extract brew session can be a great way to brew up a quick batch when the time for an all-grain brew day simply isn't available. I've found that although basic extract brewing is a fairly straightforward process, there are a few common pitfalls that can hold extract brewers back. The tips that I'm going to outline here will help you avoid some of these common problems and, together with the great variety of high quality fresh malt extracts available, will allow you to bring out the full potential of your extract beers.



10 TIPS FOR BETTER EXTRACT BEERS

by Joseph Vella

1. USE FRESH EXTRACT

This may seem like an obvious tip, however, one of the biggest contributors to the sometimes bad reputation that haunts extract brewing is the use of extracts that are not as fresh as they could be. This is especially true with liquid malt extract (LME), which has a shorter shelf life than dried malt extract (DME) and tends to darken in color and taste stale over time. Try to find a retailer that moves their product and always has fresh inventory. Liquid malt extract is only good for a couple of months once it's been

opened. Dried malt extract lasts longer, but don't use it if it's more than a year old. Brewing with fresh extract will help you avoid the infamous "extract twang."

2. HEAT WITH CARE

When brewing with extracts, take great care not to scorch the extract in the brew kettle as this will create an instantly recognizable burnt or acrid off flavor. When using liquid extract, which sinks to the bottom, remove the kettle from the heat source when you add the extract, and be certain

that the extract is completely dissolved before returning the kettle to the heat.

3. DO A FULL WORT BOIL

There has been some debate about this topic, but in my opinion if you're doing concentrated boils you're never going to produce flawless beers. If you're brewing 5 gallons (19 L) of beer, then you should start with at least 6 gallons (23 L) of wort, and this is particularly true for very pale-colored and/or very hoppy beers.

A concentrated boil can work against you in a number of ways. One result of a concentrated boil is increased melanoidin formation via the Maillard reaction (often incorrectly referred to as "kettle caramelization"), which produces a darker colored beer and may also change the flavor profile in undesirable ways. A

concentrated boil will also decrease hop utilization, which can leave you with an under bittered, unbalanced beer if lower hop utilization is not considered. If you can't fit all of your wort into one kettle, or can't get it all to boil over one burner, split it into two kettles (aka the "Texas two-step" method). If you must do a concentrated boil, consider utilizing a late extract addition (reserving a portion of your extract and adding it at the end of the boil), which can help combat some of the problems that arise with a concentrated boil.

4. FORMULATE RECIPES LIKE AN ALL-GRAIN BREWER

When an all-grain brewer builds a recipe, they start with a pale base malt and then add specialty grains and/or adjuncts as necessary, even for the darkest beers, and a great extract brewer should do the same. The problem with many malt extracts is that you don't always know what's in them. Say, for example, that you're making a stout and you decide to start with a can or jug of "dark" extract — well, what exactly is in that extract, and in what proportions? Does it contain roasted barley? Black patent malt? Who knows. And now you're going to add your own specialty grains on top of what is already in the extract and you're basically taking a shot in the dark (pun intended).

Many extract brewers who pay attention to their attenuation find that they have problems getting the wort down to their desired final gravity. This is due to the fact that extracts containing a lot of specialty grains tend to be less fermentable than either all-grain wort or lighter extracts with simpler formulations. In order to avoid these problems, use extract in a recipe the same way that

an all-grain brewer uses a base malt. Every extract beer, regardless of the style, should be based on either extra light or Pilsen extract. Extra light extract is generally nothing but good quality 2-row base malt, plus or minus a touch of Carapils®, while Pilsen extract is generally nothing but Pilsner malt, again plus or minus a touch of Carapils®.

5. USE SPECIALTY GRAINS APPROPRIATELY

Extract brewers have a tendency to overuse specialty grains in my experience. Care should be taken to use specialty grains in instances where they are appropriate, and in the appropriate quantities, and to not use them where they are not called for. Crystal (aka caramel or cara) malts in particular seem to be overused. Crystal malts can be useful additions in many styles of beer, and when used judiciously can improve head retention, body, mouthfeel, color, and balance of flavor. However, crystal malts are not appropriate in every style of beer. Even when they are appropriate, too much crystal malt can overwhelm the beer, leading to high final gravities and/or throwing off the balance.

Additionally, not every specialty grain is appropriate for steeping. Technically, the only grains that can and should be steeped are those that have already had their starches converted by the action of enzymes and/or heat. This includes the crystal/caramel/cara malts, and roasted grains like chocolate malt, black patent malt, Carafa® malt, and roasted barley; everything else really needs to be mashed. Trying to steep grains like oatmeal or Munich malt will add unconverted starch to your beer, which is not doing it any favors. Unconverted starch can make it more difficult to

produce a brilliantly clear beer, in addition to decreasing the beer's shelf stability and increasing the risk of an infection taking hold. If you want to include grains in your extract beer, aside from the ones listed, do a mini mash or a partial mash.

6. USE PARTIAL MASHES

Partial or mini mashes are techniques that intimidate many extract brewers and they absolutely should not. A lot of extract brewers love steeping grains, but the word "mash" sends them running for the hills; in reality doing a small mash is no more difficult than steeping. Employing a mini mash or partial mash opens up a whole new world of ingredients to the extract brewer, which can significantly increase the range of styles they can successfully brew as well as improve the overall quality of their beer. A few pounds or kilograms of grain can easily be mashed on the stovetop in a muslin or nylon strainer bag (the so-called "brew-in-a-bag" method that is becoming ever more popular with the all-grain crowd). This really takes no more effort than performing a steep and is basically the same procedure, aside from the fact that you need to pay more attention to your water volume and temperature in order to make sure you are achieving the proper enzymatic conversion. For example, say you want to add a pound (0.45 kg) of oatmeal to your stout, a simple mini mash procedure would be as follows: Place one pound (0.45 kg) of crushed 2-row base malt (a source of diastatic enzymes to convert the starch in the oatmeal) and your pound of oatmeal into a strainer bag, and steep it in 1.5–2 quarts (~1.5–2 L) of water per pound of grain (so 3–4 quarts/L of water total) at 150–155 °F (66–68 °C)

for 45–60 minutes. You can then remove the bag, let it drain, and add the resulting wort to your brew kettle with the rest of your water before adding your extract.

7. USE DME INSTEAD OF LME WHEN POSSIBLE

I touched on this earlier, but this is important enough to warrant a full tip. I also acknowledge that this tip may not always be possible to follow, as some types of extract are only available in liquid form. That said, I generally prefer DME to LME for a number of reasons. Because it doesn't sink like LME, DME is less prone to scorching in the kettle, which will protect the flavor and color of your beer. Dried malt extracts are also more shelf stable than liquid malt extracts; they tend to stay lighter in color, and fresher tasting far longer, and they are less susceptible to the effects of suboptimal storage conditions. Even under ideal conditions, pale or light liquid extracts will never be able to produce beers that are as light in color as those made with extra light or Pilsen DME. And while this will not apply to everyone, to those who like to purchase ingredients in bulk, large packages of DME can be purchased, measured out for recipes, resealed and stored longer and with less mess than liquid extracts (I used to do this with 55-pound/25-kg boxes of extra light DME). For those who homebrew often, this can be both more convenient and more economical than buying extract in smaller quantities. It should be noted that DME is extremely hygroscopic (i.e., it absorbs water from the environment), so if exposed to air for any length of time it will become sticky and clumped. However, if kept tightly sealed in plastic and stored in a cool,

dry place, it will remain fresh and easy to work with for months. Liquid extract, on the other hand, will darken in color, and once opened can become moldy, rendering it unusable.

8. USE GOOD WATER


Extract brewing, in general, is more forgiving than all-grain brewing in regards to water chemistry. However, it should be obvious that in order to brew great tasting beer, you need to start with great tasting water. Municipal tap water, in many instances, is perfectly acceptable for brewing extract beer. However, if your water smells or tastes off then you need to consider either treating it in some way to remove the offensive characteristics, or find an alternative water source. Many municipalities use chlorine to treat their water, which is easily removed by boiling; however, many use chloramine, which is more stable and cannot be removed by boiling. You can, however, remove chloramine in tap water using Campden tablets (potassium or sodium metabisulfite). Add them to your brewing water at a dosage of one tablet for every 20 gallons (76 L) of water. Carbon filtering is also a great way to remove chloramine and other unwanted chemicals from your water. Alternatively, any good bottled drinking water would be perfectly fine to use in extract brewing.

9. CONSIDER UPGRADES

I've heard it countless times — homebrewers who switched from extract brewing to all-grain brewing who saw an improvement in their beer, and proclaimed "I knew it, the extract was holding me back." If you start asking questions, however, what you'll often find is that all-grain isn't the only

reason their beers improved. Often these homebrewers not only switched from extract to all-grain, but they also improved their overall brewing, fermenting, and packaging processes at the same time. For example, they switched from a concentrated boil to a full wort boil and perhaps got a more powerful burner. They may have also started oxygenating their wort better, chilling their wort faster, controlling their fermentation temperatures, making yeast starters, and so on. They may have even switched from bottling to kegging, which can decrease oxygen exposure at packaging (one of the most pervasive flaws in homebrewed beer). Any of these changes can lead to significant improvements in the overall quality and presentation of your beer. In other words, if someone were to change some or all of these variables and come to the conclusion that the improvement they saw was due to going all-grain, they would be seriously misguided. All of the general concepts that apply to brewing great beer are just as true whether you're brewing extract or all-grain. If you're not already giving serious consideration to these issues, then now is the time to start.

10. RESPECT EXTRACT

Extract brewing can get less respect than all-grain because the mashing is essentially already done for you. This stigma can extend to believing that extract brewing is a shortcut to brewing and that it's ok to cut corners — not so. Yes, a batch of extract homebrew takes less time than an all-grain brew day, but that doesn't mean you should skip over getting your gravities right or paying attention to time and temperatures. Take extract brew days seriously and be a stickler for details and better beers will result. 

AWARD- WINNING AMERICAN IPA

by Derek Dellinger



America's favorite style of craft beer of late is pretty easy to name: IPA. Those three letters can sell almost anything, market analysis tells us year after year. Over time, the IPA category has splintered further into a dozen sub-styles: Every color, every strength, every possible combination of yeast strains. Beyond hoppy, drinkers and brewers can seem to change their mind about what they want the style to be year after year. While this riffing on a common theme is far from new in beer, it can seem to affect IPAs far more than other styles. Maybe that's because India Pale Ale has always had a hazy identity, full of twists and turns right from the start.

IN THE BEGINNING

The common story that IPA was invented to survive the long ocean voyage is actually a bit of a distortion of the truth; hoppy pale ales existed before the style was defined, and independent of the India route. Little realized, too, is that historic English IPAs resembled American hop-bombs closer than their contemporary English cousins. Brewed with only the lightest malt on the market to be as pale and dry as possible, they were nonetheless in-

Photos by Charles A. Parker/Images Plus

tensely hopped, using up to three or four ounces per gallon. But the powerful forces of taste and taxes changed much over time, and the English IPA of the mid-1900s emerged as a quite different beer from those of the mid-1800s. Half a century ago, the IPAs of England barely resembled their historic predecessors.

American brewers, of course, took a run at it from there. Early on in the US there was the legendary Ballantine IPA, a standard bearer of American IPA for decades, but which mutated and changed many times itself over the years, until, by the 1970s, changes in ownership had warped Ballantine into a ghost of the beer it'd once been. It would take innovative brewers on the West Coast of the United States to rekindle the public's taste for hoppy beers. Soon, of course, this thirst would spread across the country.

In *IPA: Brewing Techniques, Recipes and the Evolution of India Pale Ale*, author (and Stone Brewing Co. Brewmaster) Mitch Steele describes the conception of the beer that would form the blueprint for hoppy American ales for years to come: Anchor Liberty Ale. Hopped entirely with Cascade, it was a massively bitter beer for its time, at 40 plus IBUs. Steele calls it, "The first American IPA in every sense since Ballantine." Liberty Ale would inspire many more beers, and Cascade would from then on practically define an era of American craft beer. Sierra Nevada based their game-changing pale ale around Liberty. In the east, Boston's Harpoon IPA soon emerged as one of the first year-round IPAs anywhere in the country — and it too showcased America's favorite new hop. In Oregon, the trend-setting, super-bitter-for-its-time Bombay Bomber IPA from Steelhead Brewing Co. in Portland furthered the trend of

focusing on new, citrusy American hops like Chinook.

But as more and more (and more) breweries opened, these American commonalities were shuffled off into a new era of regionalism. If you're an IPA fan, you're almost certainly familiar with the distinction of East Coast IPA and West Coast IPA. Or the perceived distinction, anyway — it stands to reason that the lines would begin to blur over time, that not every last brewery would stick to its geographical inheritance. But let's step back twenty or so years ago, to when American IPA was in a different phase, when regionalism was much more of a thing.

As "schools of thought," the geographical categorization of East Coast IPA and West Coast IPA was never meant to encapsulate every single brewery on either coast, but rather the prevailing trends and techniques that many brewers in the various regions favored. The East Coast took its cues from contemporary brewing trends in England, with ample crystal malt providing contrast to hop bitterness. West Coast brewers dug in on paler concoctions with unashamed bitterness, in some ways closer to English IPAs of an earlier era. These days, the same rules don't necessarily apply.

"Brewers are fairly transient," said John Trogner, Co-Founder and Brewmaster at Tröegs Brewing Co. in Hershey, Pennsylvania, who got his start brewing in Colorado before moving back to central Pennsylvania to open Tröegs with his brother. "They're learning in one place and picking up and moving to another. Just like America, it's the melting pot. We've traveled all over and soaked up what we've liked and molded each of our beers to have their own tastes and aromas."

Mitch Steele agrees. "It's blurring across the country," Steele said of the American IPA style. "Some of the best 'West Coast' IPAs are being brewed by Fat Heads, just outside of Cleveland, Ohio, and Wicked Weed in Asheville, North Carolina, among many others. Brewers tend to share so much information, regional differences are going away."

THE NEW APPROACH

As trends change, balance is often the big riddle for American IPA brewers and drinkers alike. It seems to mean something different to everyone, and no one can even seem to agree whether an IPA needs to be balanced — again, depending on what you even mean by the term. But for years, the distinction in terms of coastal IPAs at least had some consensus: When brewing in the East, use more caramel malt; when brewing for Californians, just bitter that sucker to oblivion, and don't forget the gypsum.

"Balance is so subjective," Steele said. "I think every beer needs to have some malt — it can't be a hop tea and be successful. That said, I do think some brewers are too nervous about going for the gusto with their hop additions. Using a skillful blend of hops in very large quantities can result in a wonderful balance too."

Across all the brewers I've talked to, both for this article and in general conversation recently, I was shocked how unanimous this impression was. All IPA brewers seem to be zeroing in on a shift in the palate of IPA drinkers, who seem to have a thirst for drier, aromatic, and more drinkable IPAs.

"I think many brewers across the country right now are focusing their IPA recipes to have huge hop aroma and flavor, and very little malt sweetness," said Steele.

"I think brewers across the US are continuing to move in a common direction in regard to the overall objectives in IPA brewing: A pale ale that is delicate on the palate and oozing with hop flavor and aroma," said Dan Suarez, former Assistant Brewer for Hill Farmstead Brewery in Greensboro Bend, Vermont. Dan is currently working to open Suarez Family Brewery in Germantown, New York.

For Suarez, balance is relatively straightforward. "I think balance simply refers to an IPA that is pleasant to drink. This is what beer drinkers and brewers want nowadays. The IBU arms race is over, and people just want a drinkable beer."

While plenty of hopheads have developed a definite love of bitterness, there's a large portion of the market that will likely never share that same taste. Jean Broillet IV, Brewmaster at Tired Hands in Ardmore, Pennsylvania, points out that humans are wired to avoid bitterness, even if it becomes an acquired taste for some. Brewers across the country have now caught on to the fact that dense, vibrant hop flavors can be packed into a beer that will appeal to hopheads and bitterness-fearers alike. This, in fact, may be the new front of IPA education: Separating "hoppiness" and "bitterness" in the lexicon of the average beer drinker's mind.

BREWING AMERICAN IPA

While hops may be the sexiest ingredient of your American IPA, in some ways, they're also the easiest. Throw some Citra® and Amarillo® in for late additions and you probably won't go wrong. Whirlpool hopping might be the standout trend in this new school of thought regarding IPAs. Broillet, Trogner, and others recommend shifting the majority of the hop bill to the whirlpool stage (for many home-

brewers, this takes the form of a long "hop stand" after finishing your boil) and to the dry hop. But all the brewers I talked to agreed: Don't neglect the other components, because they can actually be the toughest to nail. (For more on whirlpool hopping, visit <http://byo.com/story2808>)

The most important ingredient of all, however, when crafting the perfect IPA is water.

"Insanely hoppy IPAs that you want to be perfectly dry but not bitter . . . there's a big difference even if you have a slight salt change," said Trogner.

Trogner describes the "two general ways" of tweaking a beer's character through water, beyond basic utilitarian adjustments like analyzing your water hardness and carefully dialing in mash pH (for dry and bright IPAs, target a mash pH on the low end, around 5.3). To round out the mouthfeel of a beer, Trogner says, add calcium chloride (CaCl₂). To sharpen it, gypsum (calcium sulfate) will accentuate the bitterness and perception of dryness in the beer, and remains a classic element in the West Coast IPA flavor profile.

As for yeast, Broillet, like many of the brewers I talked to, relies on an English ale strain. "A nice soft ester profile jibes really well with our hop selection," he said. While English strains are generally less attenuative than American strains like Chico, Broillet engineers his IPAs to finish extremely dry by manipulating other variables, like mash temperature and grain bill.

HOMEBREWING AMERICAN IPA

Of course, the trends in commercial American IPA have resonated with homebrewers. For example, Philadelphia-area homebrewer Ed Coffey has devoted a lot of thought (and a lot of

test batches) parsing the secrets behind Broillet's beers, along with occasional tips gleaned from the brewer himself. It's paid off: Coffey won the 2014 Philly Homebrew Cup with an IPA inspired by Broillet's hoppy creations, and for his prize, went on to brew his Riverwards IPA recipe at 2nd Story Brewing in downtown Philadelphia. (Check out Coffey's recipe, along with four other award-winning IPA homebrew recipes, starting on page 43). Through his repeated experiments and research, Coffey sees these new-wave IPAs as simple beers that come together through expert technique and process management.

"From hopping techniques to water treatment and expressive yeast strains, every component is expertly calculated and plays an important role," Coffey said of the modern American IPA. "Drinkability is what sets it apart, since most of these new IPAs are not overly bitter while being exceedingly hoppy, and more complex and impressive than their forefathers."

Buffalo, New York's Brad Robbins, first-place winner in the IPA category at the 2014 Amber Waves of Grain for his Simtra Mosalaxy IPA (recipe on page 45) goes for a similar approach.

"My goal with this IPA, and most that I brew, was to emphasize hop flavor and aroma over bitterness. Even though it clocks in at 81 IBU, the fuller body keeps the bitterness in check and allows the intense aromas and flavors of American/Down Under hops to shine, while the first wort hopping lends a deceptively smooth bitterness and long-lasting flavor. In addition to a heavy hop load at flameout, I utilized a hopstand to extract further flavor and aroma without adding bitterness. There is a range of temperatures that can be used for hop stands, but I chose the relatively low temperature of

AWARD-WINNING IPA RECIPES



RIVERWARDS IPA

(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.012
IBU = 42 SRM = 4 ABV = 6.4%

by Ed Coffey • Philadelphia, Pennsylvania
Winner, 2014 Philly Homebrew Cup

INGREDIENTS

11 lbs. (5 kg) 2-row pale malt
1.4 lbs. (0.64 kg) white wheat malt
1.4 lbs. (0.64 kg) flaked oats
4.3 AAU CTZ (Columbus/Tomahawk®/Zeus) hops (first wort hop)
(0.25 oz./7 g at 17% alpha acid)
11.1 AAU Amarillo® hops (5 min.)
(1.25 oz./35 g at 8.9% alpha acid)
18.1 AAU Citra® hops (5 min.)
(1.25 oz./35 g at 14.5% alpha acid)
1.25 oz. (35 g) Amarillo® hops
(hop stand)
1.25 oz. (35 g) Citra® hops
(hop stand)
2.5 oz. (71 g) Amarillo® hops
(dry hop)
2.5 oz. (71 g) Citra® hops (dry hop)
1 oz. (28 g) Simcoe® hops (dry hop)
½ tsp. yeast nutrient (15 min.)

1 tsp. Irish moss (15 min.)
The Yeast Bay (Vermont Ale) or
GigaYeast GY054 (Vermont IPA) or
East Coast Yeast ECY29 (North
East Ale) yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

Mill the grains and dough-in with 17.25 quarts (16.3 L) of strike water, for a mash ratio of about 1.25 quarts per pound of grain (2.6 L/kg). Target a mash temperature of 150 °F (66 °C) and hold for 60 minutes. Sparge with 170 °F (77 °C) water. While the runnings are being collected, add your first wort hop addition. Collect approximately 7 gallons (26.4 L) of wort runoff and bring to a boil. The goal is to get 5.5 gallons (21 L) into the fermenter. Add the Irish moss with 15 minutes left in the boil. Add the first charge of Amarillo® and Citra® hops with 5 minutes left in the boil.

After the 60-minute boil, chill the entire wort down to 185 °F (85 °C) and add the whirlpool/hop stand addition of hops and let the wort rest for 45 minutes with the lid on. Once the whirlpool/hop stand is complete, chill your wort to yeast pitching temperature.

Pitch your yeast as a 1.5-L yeast starter and ferment at 64–70 °F (18–21 °C). Fermentation should take 10–14 days. Following fermentation, dry hop for five days before bottling or transferring to keg. Prime to 2.3 volumes of CO₂.

RIVERWARDS IPA

(5 gallons/19 L, extract only)
OG = 1.060 FG = 1.012
IBU = 42 SRM = 4 ABV = 6.4%

INGREDIENTS

5.5 lbs. (2.5 kg) golden light dried malt extract
1 lb. (0.45 kg) wheat dried malt extract

1 lb. (0.45 kg) corn sugar (dextrose)
4.3 AAU CTZ (Columbus/Tomahawk®/Zeus) hops (first wort hop)
(0.25 oz./7 g at 17% alpha acid)
11.1 AAU Amarillo® hops (5 min.)
(1.25 oz./35 g at 8.9% alpha acid)
18.1 AAU Citra® hops (5 min.)
(1.25 oz./35 g at 14.5% alpha acid)
1.25 oz. (35 g) Amarillo® hops
(hop stand)
1.25 oz. (35 g) Citra® hops
(hop stand)
2.5 oz. (71 g) Amarillo® hops
(dry hop)
2.5 oz. (71 g) Citra® hops (dry hop)
1 oz. (28 g) Simcoe® hops (dry hop)
½ tsp. yeast nutrient (15 min.)
1 tsp. Irish moss (15 min.)
The Yeast Bay (Vermont Ale) or
GigaYeast GY054 (Vermont IPA) or
East Coast Yeast ECY29 (North
East Ale) yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

Add the water to reach a total of 3 gallons (11.3 L), then bring to a boil. Turn off the heat, add the malt extract and corn sugar, and stir until completely dissolved. Return to heat and add first hop addition. Add the Irish moss with 15 minutes left in the boil. Add the first charge of Amarillo® and Citra® hops with 5 minutes left in the boil. Boil for a total of 60 minutes, then top off with cold, filtered water until the temperature of the wort drops to 185 °F (85 °C). Add whirlpool/hop stand additions and let rest for 45 minutes with the lid on. Once the whirlpool/hop stand is complete, top off with cold, filtered water to reach a total volume of 5.5 gallons (21 L), then continue to chill wort to yeast pitching temperatures.

Pitch the yeast as a 1.5-L yeast starter and ferment at 64–70 °F (18–21 °C). Fermentation should take 10–14 days. Following fermentation, dry hop for 5 days before bottling or transferring to keg. Prime to 2.3 volumes of CO₂.

AWARD-WINNING IPA RECIPES



PEACHTREE IPA

(5 gallons/19 L, all-grain)
OG = 1.063 FG = 1.012
IBU = 66 SRM = 9 ABV = 6.7%

by Josh Weikert • Philadelphia, Pennsylvania
Winner 1st Place IPA at 2013 War of the Worts

INGREDIENTS

11.75 lbs. (5.3 kg) US 2-row pale malt
1.4 lbs. (0.64 kg) Munich malt (9 °L)
13 oz. (0.36 kg) crystal malt (20 °L)
9 oz. (0.25 kg) crystal malt (40 °L)
16.3 AAU Nugget hops (60 min.)
(1.25 oz./35 g at 13% alpha acid)
16.3 AAU Simcoe® hops (5 min.)
(1.25 oz./35 g at 13% alpha acid)
1.25 oz. (35 g) Amarillo® hops (0 min.)
1.25 oz. (35 g) Citra® hops (dry hop)
½ tsp. yeast nutrient (15 min.)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis US-05 yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

This is a single infusion mash. Heat 4.5 gallons (17 L) of strike water for a mash ratio of about 1.25 quarts per pound of grain (2.6 L/kg). Target a mash temperature of 154 °F (68 °C) and hold for 60 minutes. Batch sparge with enough water to collect approximately 7 gallons (26.4 L) of wort runoff and bring to a boil. The goal is to get 5.5 gallons (21 L) of wort into the fermenter.

Boil the wort for 60 minutes adding the Nugget hops at the beginning, the yeast nutrients with 15 minutes left in the boil, and the Simcoe® hop addition with five minutes remaining in the boil. After turning off the heat, add the Amarillo® hops, then chill the wort to 68 °F (20 °C) and pitch the yeast, preferably as a 1.5-L yeast starter if pitching liquid yeast. Hold at this temperature for the duration of primary fermentation. Fermentation should take 10–14 days. Following fermentation, dry hop with Citra® hops for five days before bottling or transferring to keg. Prime to 2.4 volumes of CO₂.

PEACHTREE IPA

(5 gallons/19 L, extract with grains)
OG = 1.063 FG = 1.012
IBU = 66 SRM = 9 ABV = 6.7%

INGREDIENTS

4.75 lbs. (2.15 kg) extra light dried malt extract
3.3 lbs. (1.5 kg) Munich liquid malt extract
8 oz. (0.23 kg) crystal malt (20 °L)
8 oz. (0.23 kg) crystal malt (40 °L)
16.3 AAU Nugget hops (60 min.)
(1.25 oz./35 g at 13% alpha acid)
16.3 AAU Simcoe® hops (5 min.)
(1.25 oz./35 g at 13% alpha acid)
1.25 oz. (35 g) Amarillo® hops (0 min.)
1.25 oz. (35 g) Citra® hops (dry hop)
½ tsp. yeast nutrient (15 min.)

Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis US-05 yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

Steep the crushed grain in 2 gallons (7.6 L) of water as it warms until a temperature of about 170 °F (77 °C) is reached, or approximately 20 minutes. Remove the grains from the wort and rinse with 4 quarts (3.7 L) of hot water. Add the liquid to reach a total of 3 gallons (11.3 L) in the brew pot and bring the wort to a boil. Turn off the heat, add the liquid malt extract, and stir until completely dissolved. Return to heat and add the Nugget hops. With 15 minutes remaining in the boil, add the dried malt extract and yeast nutrients. Add the Simcoe® hop addition with five minutes remaining in the boil. After turning off the heat, add the Amarillo® hops and then rapidly chill the wort to room temperature. Transfer to a fermenter and top off to 5.5 gallons (21 L).

Pitch the yeast when the temperature of the wort is about 68 °F (20 °C). Preferably pitch the yeast as a 1.5-L starter if pitching liquid yeast. Hold the wort at this temperature for the duration of primary fermentation. Fermentation should take 10–14 days. Following fermentation, dry hop for 5 days before bottling or transferring to keg. Prime to 2.4 volumes of CO₂.

TIPS FOR SUCCESS

This recipe is designed to be simple and easy. The dry hop is up to the brewer's preference. I originally used Amarillo® when first developing this recipe, but I have switched it up to Citra® to brighten the aroma. Whatever American aroma hops you prefer would be appropriate here.

AWARD-WINNING IPA RECIPES



SIMTRA MOSALAXY IPA

(5 gallons/19 L, all-grain)

OG = 1.067 FG = 1.016

IBU = 80+ SRM = 14 ABV = 7%

by Brad Robbins • Buffalo, New York
Winner 1st Place IPA at 2014 Amber
Waves of Grain

INGREDIENTS

- 13.5 lbs. (6.1 kg) Muntons Maris Otter malt blend
- 8 oz. (0.22 kg) Fawcett dark crystal malt (120 °L)
- 8 oz. (0.22 kg) Muntons crystal malt (60 °L)
- 8 oz. (0.22 kg) Weyermann Caraamber® malt (28 °L)
- 13.8 AAU Citra® hops, leaf (first wort hop) (1 oz./28 g at 13.8% alpha acids)
- 14.1 AAU Simcoe® hops, leaf (first wort hop) (1 oz./28 g at 14.1% alpha acids)
- 12.4 AAU Mosaic™ hops, pellets (15 min.) (1 oz./28 g at 12.4% alpha acids)
- 13.8 AAU Citra® hops, leaf (10 min.) (1 oz./28 g at 13.8% alpha acids)
- 16 AAU Galaxy hops, pellets (5 min.) (1 oz./28 g at 16% alpha acids)

- 1 oz. (28 g) AU Topaz hops, pellets (hop stand)
- 1 oz. (28 g) Mosaic™ hops, pellets (hop stand)
- 1 oz. (28 g) Galaxy hops, pellets (hop stand)
- 1 oz. (28 g) Citra® hops, leaf (hop stand)
- 1 oz. (28 g) Simcoe® hops, leaf (hop stand)
- 1 oz. (28 g) Galaxy hops, pellets (dry hop)
- 1 oz. (28 g) Citra® hops, leaf (dry hop)
- 1 oz. (28 g) Simcoe® hops, leaf (dry hop)
- 1 oz. (28 g) Mosaic™ hops, pellets (dry hop)
- Fermentis US-05 or White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) yeast
- ¾ cup corn sugar (if priming)

STEP BY STEP

Mash the grains with strike water to achieve 155 °F (68 °C). Rest for 60 minutes until conversion is complete. Sparge with enough water to collect 7.5 gallons (28.4 L) in the kettle. Add the first wort hop additions during the sparge. Boil for 90 minutes adding kettle hops at the times indicated. Chill the wort to 150 °F (66 °C), then add the hop stands. After 50 minutes chill to 68 °F (20 °C). Pitch the yeast, then aerate. Ferment at 68 °F (20 °C). Transfer the beer onto the dry hops in a secondary vessel. Dry hop for two weeks. Prime to 2.5 volumes of CO₂.

SIMTRA MOSALAXY IPA

(5 gallons/19 L, extract with grains)

OG = 1.067 FG = 1.016

IBU = 80+ SRM = 15 ABV = 7%

INGREDIENTS

- 9.5 lbs. (4.3 kg) Maris Otter liquid malt extract
- 8 oz. (0.22 kg) Fawcett dark crystal malt (120 °L)

- 8 oz. (0.22 kg) Muntons crystal malt (60 °L)
- 8 oz. (0.22 kg) Weyermann Caraamber® malt (28 °L)
- 13.8 AAU Citra® hops, leaf (first wort hop) (1 oz./28 g at 13.8% alpha acids)
- 14.1 AAU Simcoe® hops, leaf (first wort hop) (1 oz./28 g at 14.1% alpha acids)
- 12.4 AAU Mosaic™ hops, pellets (15 min.) (1 oz./28 g at 12.4% alpha acids)
- 13.8 AAU Citra® hops, leaf (10 min.) (1 oz./28 g at 13.8% alpha acids)
- 16 AAU Galaxy hops, pellets (5 min.) (1 oz./28 g at 16% alpha acids)
- 1 oz. (28 g) AU Topaz hops, pellets (hop stand)
- 1 oz. (28 g) Mosaic™ hops, pellets (hop stand)
- 1 oz. (28 g) Galaxy hops, pellets (hop stand)
- 1 oz. (28 g) Citra® hops, leaf (hop stand)
- 1 oz. (28 g) Simcoe® hops, leaf (hop stand)
- 1 oz. (28 g) Galaxy hops, pellets (dry hop)
- 1 oz. (28 g) Citra® hops, leaf (dry hop)
- 1 oz. (28 g) Simcoe® hops, leaf (dry hop)
- 1 oz. (28 g) Mosaic™ hops, pellets (dry hop)
- Fermentis US-05 or White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) yeast
- ¾ cup corn sugar (if priming)

STEP BY STEP

Place your crushed grains in a bag and soak in one gallon (4 L) 160 °F (71 °C) water for 20 minutes. Rinse the grains with 2 qts. (2 L) hot water. Add water until there is about 7.5 gallons (28.4 L) in the kettle. Bring to a boil, remove the kettle from heat and stir in the malt extract. Add the first wort hop additions and return the wort to heat. Follow the remainder of the all-grain recipe.

AWARD-WINNING IPA RECIPES



AMERICAN IPA

(5 gallons/19 L, all-grain)
OG = 1.070 FG = 1.016
IBU = 100+ SRM = 8 ABV = 7.1%

by Chris Woolston • Beacon,
New York

2013 National Homebrew Competition Round 1 New York City Region First Place

INGREDIENTS

13.5 lbs. (6.1 kg) 2-row pale malt
1.4 lbs. (0.64 kg) Carapils® malt
1.4 lbs. (0.64 kg) crystal malt (40 °L)
13 AAU Simcoe® hops (90 min.)
(1 oz./28 g at 13% alpha acids)
6.5 AAU Simcoe® hops (30 min.)
(0.5 oz./14 g at 13% alpha acids)
7.8 AAU CTZ (Columbus/Tomahawk®/Zeus) hops (30 min.)
(0.5 oz./14 g at 15.5% alpha acids)
9.8 AAU Simcoe® hops (15 min.)
(0.75 oz./21g at 13% alpha acids)
11.6 AAU CTZ (Columbus/Tomahawk®/Zeus) hops
(15 min.) (0.75 oz./21 g at 15.5% alpha acids)
5.5 AAU Cascade hops (10 min.)

(1 oz./28 g at 5.5% alpha acids)
0.5 oz. (14 g) Simcoe® hops (0 min.)
0.5 oz. (14 g) CTZ (Columbus/Tomahawk®/Zeus) hops
(0 min.)
0.5 oz. (14 g) Amarillo® (dry hop)
0.5 oz. (14 g) Centennial (dry hop)
0.5 oz. (14 g) CTZ (Columbus/Tomahawk®/Zeus) hops
(dry hop)
0.5 oz. (14 g) Simcoe® (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis US-05
¾ cup corn sugar (if priming)

STEP BY STEP

A day or two before brew day make a yeast starter if using a liquid strain. On brew day, dough-in with 20.4 quarts (19.3 L) of water, for a mash ratio of about 1.25 quarts per pound of grain. Target a mash temperature of 152 °F (67 °C) and hold for 60 minutes. Sparge with 170 °F (77 °C) water. Collect approximately 7 gallons (26.4 L) of wort runoff and bring to a boil, then add first hop addition. Boil for 90 minutes, adding hops at times indicated. At the end of the boil, add the final hop addition, then chill the wort to 64 °F (18 °C).

Pitch your yeast starter and ferment at 64–70 °F (18–21 °C). Following primary fermentation (about two weeks), dry hop for five days before bottling or transferring to keg. Prime to 2.3 volumes of CO₂.

AMERICAN IPA

(5 gallons/19 L, extract with grains)
OG = 1.070 FG = 1.016
IBU = 100+ SRM = 10 ABV = 7.1%

INGREDIENTS

8 lbs (3.6 kg) golden light dried malt extract
0.5 lb. (227 g) Carapils® malt
0.5 lb (227 g) crystal malt (40 °L)
13 AAU Simcoe® hops (90 min.)
(1 oz./28 g at 13% alpha acids)

6.5 AAU Simcoe® hops (30 min.)
(0.5 oz./14 g at 13% alpha acids)
7.8 AAU CTZ (Columbus/Tomahawk®/Zeus) hops (30 min.)
(0.5 oz./14 g at 15.5% alpha acids)
9.8 AAU Simcoe® hops (15 min.)
(0.75 oz./21g at 13% alpha acids)
11.6 AAU CTZ (Columbus/Tomahawk®/Zeus) hops
(15 min.) (0.75 oz./21 g at 15.5% alpha acids)
5.5 AAU Cascade hops (10 min.)
(1 oz./28 g at 5.5% alpha acids)
0.5 oz. (14 g) Simcoe® hops (0 min.)
0.5 oz. (14 g) CTZ (Columbus/Tomahawk®/Zeus) hops (0 min.)
0.5 oz. (14 g) Amarillo® (dry hop)
0.5 oz. (14 g) Centennial (dry hop)
0.5 oz. (14 g) CTZ (Columbus/Tomahawk®/Zeus) hops (dry hop)
0.5 oz. (14 g) Simcoe® (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis US-05
¾ cup corn sugar (if priming)

STEP BY STEP

A day or two before brew day make a yeast starter if using a liquid strain. On brew day, steep the crushed grain in 2 gallons (7.6 L) of water as it warms to reach 150 °F (65.5 °C), approximately 20 minutes. Remove grains from the wort and rinse with 4 quarts (3.8 L) of hot water. Add the liquid to reach a total of 3 gallons (11.3 L) and bring to a boil. If you can do a full volume (5.5-gal./21-L) boil, it is recommended. Turn off heat, add malt extract, and stir until completely dissolved. Return to heat and add first hop addition. Continue to add hop additions at intervals per ingredients list. Cool the wort to room temperature, then top off with cold, filtered water to reach 5.5 gallons (21 L).

Pitch yeast starter and ferment at 64–70 °F (18–21 °C). Now follow the remaining instructions from the all-grain recipe.

AWARD-WINNING IPA RECIPES



KLAUS BRAU'S KITCHEN SINK IPA

(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.013
IBU = 67 SRM = 8 ABV = 6.2%

by Matt Klausner • Aurora, Illinois
- 1st place at the 2009 Schooner Brew
- 1st place at the 2010 Babble BrewOff
- 1st place at the 2010 Drunk Monk Challenge and 2nd Best Of Show (617 entries)
- 3rd place 2011 MCAB (Masters Championship of Amateur Brewing)

INGREDIENTS

7 lbs. (3.18 kg) 2-row pale malt
3.5 lbs. (1.59 kg) Optic pale ale malt
2.9 lbs. (1.32 kg) Vienna malt
0.6 lb. (0.27 kg) crystal malt (40 °L)
14 AAU Magnum hops (60 min.)
(1 oz./28 g at 14% alpha acids)
5 AAU Centennial hops (30 min.)
(0.5 oz./14 g at 10% alpha acids)
5 AAU Centennial hops (15 min.)
(0.5 oz./14 g at 10% alpha acids)
3.5 AAU Cascade hops (5 min.)
(0.5 oz./14 g at 7% alpha acids)
0.5 oz. (14 g) Centennial hops
(0 min.)

0.5 oz. (14 g) Cascade hops (0 min.)
0.5 oz. (14 g) Amarillo® hops
(dry hop)
1 oz. (28 g) Simcoe® hops (dry hop)
0.5 oz. (14 g) Centennial hops
(dry hop)
0.5 oz. (14 g) Cascade hops (dry hop)
White Labs WLP001 (California Ale)
or Wyeast 1056 (American Ale) or
Fermentis US-05 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

A day or two before brew day make a yeast starter if using a liquid strain. On brew day perform a single infusion mash. Mash in at 152 °F (67 °C) in 4.4 gallons (16.6 L) of water. Hold this temperature for 60 minutes. Sparge with 180 °F (82 °C) water to collect 7 gallons (26.5 L) of wort. Boil for 60 minutes, adding hops at times indicated. The goal is to get 5.5 gallons (21 L) into your fermenter. Chill the wort to 64 °F (18 °C). Ferment between 64–68 °F (18–20 °C). Transfer to a secondary vessel after primary fermentation is complete. Dry hop for one week with 0.5 oz. (14 g) Amarillo®, 0.5 oz. (14 g) Simcoe®, and 0.5 oz. (14 g) Centennial hops. After one week dry hop again with 0.5 oz. (14 g) Simcoe® and 0.5 oz. (14 g) Cascade hops. Prime to 2.3 volumes of CO₂.

KLAUS BRAU'S KITCHEN SINK IPA

(5 gallons/19 L, extract with grains)
OG = 1.060 FG = 1.013
IBU = 67 SRM = 8 ABV = 6.2%

INGREDIENTS

7 lbs. (3.2 kg) golden light dried malt extract
0.5 lb. (0.23 kg) Vienna malt
0.5 lb. (0.23 kg) crystal malt (40 °L)
14 AAU Magnum hops (60 min.)
(1 oz./28 g at 14% alpha acids)
5 AAU Centennial hops (30 min.)
(0.5 oz./14 g at 10% alpha acids)

5 AAU Centennial hops (15 min.)
(0.5 oz./14 g at 10% alpha acids)
3.5 AAU Cascade hops (5 min.)
(0.5 oz./14 g at 7% alpha acids)
0.5 oz. (14 g) Centennial hops
(0 min.)
0.5 oz. (14 g) Cascade hops (0 min.)
0.5 oz. (14 g) Amarillo® hops
(dry hop)
1 oz. (28 g) Simcoe® hops (dry hop)
0.5 oz. (14 g) Centennial hops
(dry hop)
0.5 oz. (14 g) Cascade hops (dry hop)
White Labs WLP001 (California Ale)
or Wyeast 1056 (American Ale) or
Fermentis US-05 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

A day or two before brew day make a yeast starter if using a liquid strain. On brew day, steep the crushed grain in 2 gallons (7.6 L) of water as it warms until a temperature of about 150 °F (65.5 °C) is reached, or approximately 20 minutes. Remove grains from the wort and rinse with 4 quarts (3.7 L) of hot water. Add the liquid to reach a total of 3 gallons (11.3 L) and bring to a boil. If you can do a full volume boil, 5.5 gallon (21 L), it is recommended. Turn off the heat, add the malt extract, and stir until completely dissolved. Return to heat and add first hop addition. Continue to add hop additions at intervals per ingredients list. Cool the wort to room temperature, then top off with cold, filtered water to reach 5.5 gallons (21 L). Pitch yeast starter. Ferment between 64–68 °F (18–20 °C). Transfer to a secondary vessel after primary fermentation is complete. Dry hop for one week with 0.5 oz. (14 g) Amarillo®, 0.5 oz. (14 g) Simcoe®, and 0.5 oz. (14 g) Centennial hops. After one week dry hop again with 0.5 oz. (14 g) Simcoe® and 0.5 oz. (14 g) Cascade hops. Prime to 2.3 volumes of CO₂.

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150 °F (66 °C) paired with a longer hold of 50 minutes to achieve maximum flavor/aroma and minimum bitterness. To achieve this, you can simply chill your wort immediately after flame out, stopping when it reaches your desired temperature and allowing it to rest there for 20 minutes to an hour, depending on your patience and desired level of flavor/aroma extraction.”

Matt Klausner, an Aurora, Illinois homebrewer who has won many awards for his Klaus Brau’s Kitchen Sink IPA (recipe on page 47) emphasizes keeping the beer as “clean” as possible. He swears by using a secondary fermenter for his IPAs.

“There is a lot of discussion on whether or not to use a secondary fermenter,” said Klausner. “I believe they are a useful tool in making better beer. Especially with a heavily-hopped IPA, the beer should be as clean as possible. When you’re ready to rack off the hops, cold crashing will help drop the hops to the bottom so you can hold a siphon above the hops to transfer. With enough practice you won’t suck up any hop material.”

FIND YOUR PERSPECTIVE

Whether the beer is commercial or homebrew, West Coast, East Coast, or whatever brewers will decide to call this new approach to IPA, Trogner feels that there will always be one definitive factor that can be relied upon to categorize an IPA.

“The number one thing is the brewer’s perspective,” Trogner says. “Whoever is creating that recipe, his or her point of view obviously affects the whole freaking thing. If you agree with their brewing philosophy you’re going to dig it, if you don’t . . . they can use the best ingredients, but it’s probably not going to match up to your taste buds.” 

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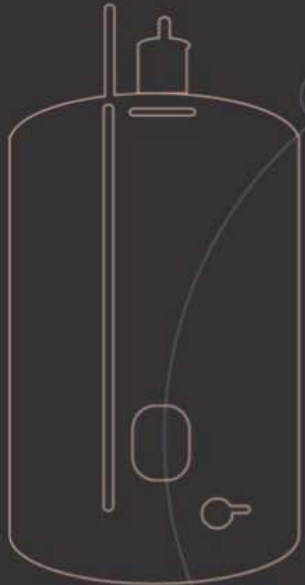
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by Dawson Raspuzzi

HOMEBREW HACKS

The answer to your latest homebrewing dilemma may be right under your nose — and possibly in your junk drawer!

IT IS NOT JUST THE QUEST FOR BEER — or even the quest for really, really good beer — that has made the hobby of homebrewing so popular. It is also the ability homebrewers have to determine the outcome of what they make, a desire to do something well and then tinker and improve upon it, the intrigue of using your hands and conducting experiments, and the opportunity to create something uniquely “theirs.” And with that mindset, it’s no surprise that beer isn’t the only thing homebrewers create — these same “do it yourself” aspirations have led to nearly every invention and advancement in the history of mankind.

Now a self-aerating racking hose might not be on the same platform as the inventions of Henry Ford or Thomas Edison, but when was the last time a phonograph helped you brew a batch of beer?

Homebrewers often go big with the DIY builds — from designing and engineering completely automatic electric brewing systems or bar rooms with 10-tap, tricked out keezers — but these builds can be luxuries. If you are on a budget, there is a whole other range of projects homebrewers can create to make life and brewing simpler and, therefore, more enjoyable. We call these homebrew hacks. They take imagination, creativity, a little time, scrap materials often found tucked away in a garage, and usually just a few dollars to build. Here I share some of the *BYO* editors’ favorite hacks, scoured from social media, emails and numerous homebrewing bulletin boards and threads. Have you got a hack of your own? Send it to us at edit@byo.com with the title “Homebrew Hacks.”



Illustration by Chris Champagne

AERATING HOSE

James Bryanton
Regina, Saskatchewan

Proper oxygenation of your wort is one of the key components of healthy beer fermentation. There are many methods to aerate your wort, each with their own pros and cons. Most either require purchasing equipment (aquarium pumps, aeration stones, oxygen tanks, etc.), or require some heavy lifting and time (splashing back and forth between buckets, shaking your fermenter).

My preferred method is extremely cheap (free in my case), and is a simple DIY in-line addition to the tubing that I use to transfer from the boil kettle to the fermenter.

Here's how to do it:

1. Cut the Cane

Cut a piece of racking cane about 3-inches (~8-cm) long. I found that a tube cutter with a fresh, sharp wheel in it (commonly used for cutting copper pipe) worked well. Just be careful — almost no pressure is needed to cut it, and it's very easy to crack it and not get a clean cut.



Cut the racking cane with a tube cutter or other sharp instrument. Use little to no pressure as the cane can crack.

2. Pierce Holes

Find a very thin piece of metal, such as a finishing nail or a heavy staple. Hold it with a pair of pliers, and heat it up with a lighter or torch. Use this heated metal to melt a couple of small holes into the piece of racking cane (try to make these as small as possible).

3. Splice

Finally, cut a piece of your transfer tubing about 12–18 inches (30–45 cm) from the end that goes into your fermenting pail, and use the piece of racking cane to splice the two ends back together, being careful not to cover your holes.

Use the tubing just like normal, keeping the added piece out of the liquid.

The racking cane has a smaller inside diameter than your transfer tubing. This, combined with the holes in the cane, creates a Venturi effect, which causes it to draw air into the liquid as it flows past the holes. The result is that you have nicely aerated wort, while adding literally no additional time to your brew day, and no heavy lifting.



Poke small holes in your cut length of cane with a small, sharp object such as a finishing nail.



Attach your aerator with a small piece of transfer tubing and rack your homebrew as usual.

BOTTLE DRYING RACK

James Bryanton

Regina, Saskatchewan

For any homebrewer who bottles regularly, some method of allowing your bottles to drain and dry properly after washing and sanitizing is a must. This DIY bottle drying rack is both inexpensive and easy to make using some items you may have kicking around your garage already.

Materials:

- (24) 3.5-inch (9-cm) stainless steel nails
- (8) 2.75-inch (7-cm) wood screws
- (4) 7-inch (18-cm) length of 2x4 lumber
- (1) 2-foot (0.6 m) length of 2x2 lumber
- 6 feet (1.8 m) of $\frac{1}{8}$ -inch vinyl tubing

1. Cut and Prepare Tubing

Cut the tubing into sections 3 inches (8 cm) long, with a 45-degree cut at one end, keeping the other end cut straight. Insert your nails through the tubing pieces, with the straight cuts stopping against the nail heads.

2. Mark Nail Points

Mark a center line down the length of the 2x2. Choose an end of the board that will be the bottom. Mark a point along your center line

4.75 inches (12 cm) from the bottom end on one of the long faces, then points every 3.75 inches (9.5 cm) up from there, for a total of six points. Repeat this on each side of the board.

3. Drive the Nails and Cover

Drive a nail in at each marked point, at a 45-degree angle. You are looking to sink each nail about $\frac{3}{4}$ of an inch (2 cm). Your tubing pieces will compress slightly, ensuring a tight fit at both ends. After the first two sides, you will encounter a slight problem — the existing nails will get in the way of laying the board flat. You can support the board between the pieces of 2x4, with the nails sitting in between them. Note: If you cannot find stainless steel nails locally, a box of 25 can be purchased from McMaster-Carr online for about \$7. If you do not want to spend that money, or have regular nails handy instead, what I actually did was use regular nails and painted clear nail polish on the exposed heads to prevent them from rusting.

4. Assemble the Tree

The 2x4 pieces will now form the legs of the rack. Use two screws in each piece to fix it to the 2x2, following the pattern shown. Make sure they fit flush with, or even slightly lower than, the bottom of the length of 2x2.



The "arms" of the tree are simply stainless steel nails covered with vinyl tubing.



The base of the bottle tree is made with 2x2 and 2x4 lengths of lumber.

FERMENTATION TEMPERATURE CONTROL

Jarod Evenson

Somerville, Massachusetts

As a homebrewer, the worst part of living in a small apartment is not having space for a proper fermentation chamber. I've found a good way to solve this space dilemma, however, by combining an STC-1000 temperature controller and a water bath.

I have this set up in my back hallway where there's no heat and the ambient temperature is about 50 °F (10 °C). I have successfully fermented beer in temperatures in the lower- to mid-60s °F (16–18 °C) and am able to bring the temperature up to the lower 70s °F (22–23 °C) to finish off and help the yeast to fully attenuate in the beer.

While this may not be as great as having a fully functional fermentation chamber, it's only a step behind and works really well for me.

Materials:

- Cooler (or other water-holding container large enough for your fermenter)
- Aquarium pump
- Aquarium heater
- Temperature control box (STC-1000 with sensor, project box, outlet, extension cord)

1. Put the Pump in the Cooler

Place the pump in the cooler with the heater in front of it so that the pump will move water directly across the heater. I like to plug the pump into an outlet that is always powered so the water is always circulating.

2. Plug in the Heater

Plug the heater into the heating side of the STC-1000 box. When your wort is ready and the yeast is pitched, figure out how much of your temperature sensor will be inside of your fermenter. Clean that section of the temperature sensor wire and give it a good spray with some StarSan (or other non-rinse sanitizer). Stick the sensor into the wort and close the fermenter with your stopper and airlock.

3. Set the Temperature

Set the temperature for whatever you like and walk away. The aquarium heater will heat the water to warm the fermenter, and when it needs to cool down the ambient cold temperature brings it back down.

As always, there's a chance of contaminating your beer if you don't get the temperature probe cleaned and sanitized. If you don't want to place the probe directly in the fermenter, you can put it in the water to regulate the temperature, but the fermentation temperature will not be quite as accurate.



Set the temperature controller to whatever temperature you want and it will turn the heater on if the water is too cold, and off if it gets too warm.

A cooler, water bath, aquarium heater, and a temperature controller can make an inexpensive temperature control setup.

VEGGIE STEAMER FALSE BOTTOM

Jarod Evenson

Somerville, Massachusetts

I primarily brew smaller batches, 2.25 gallons (8.5-L), with the brew-in-a-bag (BIAB) method. Keeping a steady mash temperature means having to periodically turn the heat on for a minute or two. I have read horror stories in the past about people accidentally burning a hole in their grain bags, which can, at best, leave all the grain behind when the bag was pulled out, or at worst, ruin the wort.

To avoid this, I wanted to keep the bag off the bottom of the pot when turning the heat back on. My original method was lifting the bag up and holding it while the burner was on. There were two real pitfalls in this strategy. First, with the lid off, heat would escape so it took longer to heat up the mash. Second, my arm would get tired holding the bag.

I knew there had to be a way to make this process a little more efficient, or at least make it easier for myself, so I came up with a quick fix. I found that our vegetable steamer was about the perfect height to keep things off the bottom of the pot. When I looked closer, I saw that the middle post was only screwed in and could be detached from the main unit. I unscrewed it and placed it in my boil

kettle. My brew kettle holds 4 gallons (15 L) and the basket fits perfectly in my brew pot with only about a quarter-inch (~half-cm) gap.

1. Measure your brew pot

If you want to use this method, make sure your pot and steamer fit together and that the bag doesn't droop over the edge of the steamer too much when you put it in the pot if your pot is a little bigger than the steamer. You don't want the bag to touch the bottom of the pot.

2. Place and Boil

Place your steamer in the bottom of the pot, add the bag with grains and brew as normal.

3. Troubleshoot

If you try this and have a large gap, the steamer should still keep the bag off the bottom as long as your bag can be pulled over and wrapped around the edge of the pot. Using the steamer means I can turn the heat on full blast whenever I need without worrying about burning a hole in my bag or taking the lid off the kettle. Best of all, now I can sit back and hold onto a homebrew instead of a bag of grain during the mash.



Unscrew the center post of the steamer, place it in the bottom of your brew pot, and it's ready for your brew-in-a-bag (BIAB) homebrewing!



A simple vegetable steamer, commonly found in most kitchens, can become a false bottom when the middle post is removed.

FERMENTATION BUCKET LINERS

Eric Strauss

Fishers, Indiana

I think it's a pain to clean and sanitize a carboy/bucket/conical after fermentation is complete. All that yeast residue, hop matter, etc? This is my method for cutting down on all that work using a trash bag liner. This technique has served me quite well the last two years and makes cleaning a piece of (yeast) cake. The bags are also great to store your milled grain the night before brew day. Then re-use the bags for trash or spent grain. When I say "bucket" in these instructions, I also mean carboy, conical, trash can, etc.

First you need to get some food-safe bag liners. I personally use the S-13572 Clear Trash Liners from U-Line, but it is up to you to determine what you agree is safe. Disclaimer: The trash bag liners I use are "FDA compliant," the details of which are fully discussed on my homebrew blog post: www.fermware.com/fermentation-bucket-liners/. The bottom line is that they are, "approved for containing or packaging of non-contained beverages." I think, they would have to be specifically tested with beer, but the generic "beverages" designation is good enough for me and has passed muster with BYO's Technical Editor Ashton Lewis. Here's how it works:

1. Get the Bag and Bucket Ready

2. Place the Bag

If you shake to oxygenate your wort, or you will be opening the lid before starting the fermentation, you need to leave some excess bag material in the fer-

menter. My point is, when you put the lid on, it does stretch the bag material and sometimes could put a hole in the bag and if you need to open the lid and re-seal before starting fermentation, you may not get a good seal the next time. By leaving more bag in the bucket, after you open the lid, you can pull more fresh bag out and have a brand new seal.

3. Pour the Cooled Wort

Pour your cooled wort into the vessel and when you are ready to pitch your yeast and close the lid for the final time, grab the bag and pull up on it. Do not yank hard enough to pull it out of the bucket, but just enough to pull the slack out of it and hopefully get rid of any potential air pockets between the bag and the walls of the bucket.

4. Keep it Tidy

If you want, you can tie up the excess bag to keep it tidy, then ferment your homebrew in the same way that you normally would.

5. Rack

After fermentation, rack the beer from the fermenter as you normally would and you'll be left with your yeast, trub, etc.

6. Remove

Simply pull the bag out, tie it shut and place it in the trash. If I decide to re-use the yeast cake, I do start with a new bag and transfer the yeast. The lid and air-lock will still need cleaning, but no more soaking and scrubbing!



A food-safe plastic trash liner in your fermenter saves time.



After you rack the beer, simply discard the trub inside the liner.



Keep the bag from slipping into the bucket by pulling it tight and tying the ends as you would with any typical can liner.

SANITIZATION BUCKET

Lucas Brady


Jacksonville, Illinois

I have found an easy way to sanitize my small homebrewing equipment (such as my airlock, hydrometer, thermometer, etc.) by using two 5-gallon (19-L) buckets, one with many holes drilled in the bottom for draining (and the other can be your fermenter if you use a bucket). Since the buckets are designed to fit inside each other for stacking and storing, I figured out a simple design: I place the bucket with holes inside the other bucket and fill them with 4–5 gallons (15–19 L) of my favorite sanitizing solution. Then I put all of the items that need to be sanitized inside the bucket and attach a Gamma Seal lid. When all of the items have soaked for the allotted time, I just grab the handle and raise the top bucket up, allowing the sanitizer to drain into the bottom bucket.

This nifty contraption allows me to sanitize all the required items for my brew day and gives me a convenient way to keep them sanitized and out of the way until I need them. The airtight Gamma Lid allows me to save and reuse the sanitizing solution for a later date if I wanted as well.

All you need for this simple project are two 5-gallon (19-L) buckets, a power drill, a 1/2-inch drill bit, and a lid (optional).

1. Drill and Go

It couldn't be easier to make this setup. Simply drill about 35 holes, evenly spaced, through the bottom of one bucket so that the sanitizing solution can easily and quickly drain from the bucket. Put that bucket in the other and fill it with sanitizing solution. And that's it, you're done. If using a no-rinse sanitizer, you can just hang your bucket with the equipment up and allow everything inside to dry. 

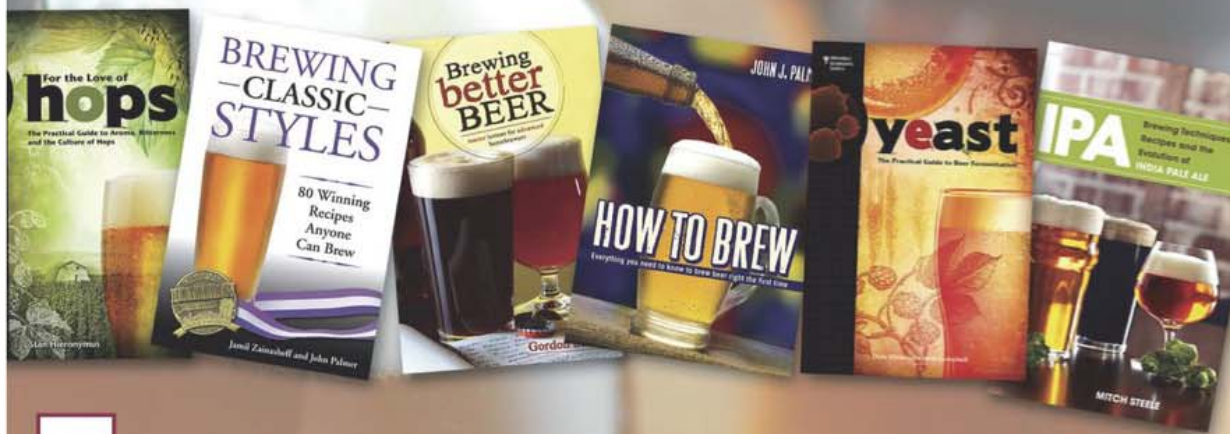


This easy sanitizing bucket setup requires only two 5-gallon (19-L) buckets and a hand drill.



Simply place the bucket with the holes inside of the other bucket and fill it with sanitizer. When you're ready, pull the interior bucket out and let it drain into the bottom bucket.

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by Nick Rodammer

OKTOBER- FEST

BREW NOW, CELEBRATE LATER



Revelers inside the Löwenbräu tent at Germany's annual Oktoberfest celebration in Munich. The Munich Oktoberfest, the largest folk festival in the world, has its origin in the wedding ceremony of Crown Prince Ludwig – later King Ludwig I of Bavaria – with Princess Therese of Sachsen-Hildburghausen in the year 1810.

Photos courtesy of German Tourist Board



Often, the beer we enjoy shifts with the change in seasons. The winter brings rich beers such as stouts, porters, winter warmers, and bocks. As the weather warms, the beers often lighten in both color and body, to match the heat of the late spring and summer months. Autumn, too, has a set of beers that fit the season, as pumpkin beers and brown ales populate the shelves. For me however, nothing defines the fall season more than Märzen and Oktoberfest style beers. One of the purveyors in my favorite bottle shop and homebrew store once described his favorite Märzen to me as “fall in a glass.” I couldn’t agree more with that sentiment, and Märzen, along with its more contemporary counterpart, the modern German Oktoberfestbier, both are favorite styles of mine. Märzen has a long, rich history as a style, one steeped in both tradition and change. And traditionally, the time to brew is now!

The Name Game

The term Märzen, which translated means March in German, can be traced back to the early 1500s, when it was decreed that Bavarian brewers must cease beer production from the end of March until September. This was purely out of necessity, as brewers of the time had little means to control beer quality during the hot summer months, due to a lack of refrigeration, and a lack of understanding of the role of yeast, bacteria and other microbes on beer fermentation and spoilage. Instead, they brewed overtime during the late winter months and stored Märzenbier, which was brewed to a higher strength to help it resist spoilage, in cool caves over the summer. Once the summer months ended and fall came, the Märzenbier was brought back out, and the barrels were tapped. Märzen's now famous association with Munich's annual Oktoberfest can be most prominently traced back to 1872, when the first Märzen style beer was served at Oktoberfest, brewed by Gabriel Sedlmayr of the Spaten Brewery.

To accurately talk about Märzen

and Oktoberfestbier, it is important to understand how these terms are used both in America, and in Germany. In America, the term Oktoberfest has often become synonymous with a beer style, that being a malt-forward amber lager generally between 5–7% ABV. However, in Germany, Oktoberfest is generally not used to describe a beer style. The only real use of the term is reserved for Oktoberfestbier, which is a legally protected name that describes, in very literal terms, the beer served at Oktoberfest in Munich, and can only be used by the six Munich brewers who participate in the annual festival, including Augustiner, Hacker-Pschorr, Hofbräu, Löwenbräu, Paulaner, and Spaten. While Oktoberfestbiers are all very similar in style, being malt-forward pale lagers with an ABV of around 6%, the term is an identifier more than a style designation. Märzen on the other hand, is often used interchangeably with the name Oktoberfest in the US to describe the same style of amber lager, and is the name reserved for this style of beer by the Beer Judge Certification Program (BJCP).

The BJCP, in its 2014 update to the style guidelines, added a new category called Festbier, with the goal being to define the modern day German Oktoberfestbier as a style. Festbier is a term commonly used in Germany, but, as you can probably guess, isn't used to describe a beer style. In Bavaria, the term Festbier is often used by brewers both large and small to describe a beer made for the festival season, for occasions such as *Kirchweih*, a common village fair type celebration that originated as an anniversary of a church's consecration. These Festbiers are often, but not always, brewed to Märzen strength, have a wide color range from pale to deep amber or brown, and are nearly always a lager. The new BJCP category however describes a beer more narrow in scope, with many well-known examples being those versions made by the Munich brewers for Oktoberfest. In choosing a name for this style, Gordon Strong, the President of the BJCP, noted that the term "Festbier" can have a more generic meaning, but in the guidelines, it is used in a very specific way. "The BJCP doesn't use the name Oktoberfestbier since it has a very specific meaning in Germany, including where it is made, and where and how it is served," said Strong. It should be noted that there is precedent in using the terms Märzen and Festbier to identify these styles, as the European Beer Star, a beer competition that is held in Germany, also uses them as style identifiers.

So, how did the modern day Oktoberfestbier come to be? For decades, the amber colored Märzen was the drink of choice at the annual Oktoberfest in Munich, and to this day, continues to be brewed by some of the Munich brewers, some of which is exported to America. Fred Schumacher, a native German and President of Hof-



On the first Sunday of Oktoberfest, a procession of folklore and marksmen (and barrels of beer) works its way along a seven-kilometer route (about four miles) through the streets of Munich.

OKTOBERFEST RECIPES

Editor's note: These recipes are designed to yield 6 gallons (23 L) in the kettle at flameout, 5.5 gal. (21 L) in the fermenter, and 5 gal. (19 L) of finished beer.

MÄRZENBIER

(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.011
IBU = 24 SRM = 8 ABV = 5.8%



INGREDIENTS

9.75 lbs. (4.4 kg) German Vienna malt (3.5 °L)
2 lbs. (0.91 kg) Weyermann Munich II malt (9 °L)
1.25 lbs. (0.57 kg) Weyermann Munich I malt (6 °L)
7 AAU German Magnum hops (80 min.) (0.5 oz./14g at 14% alpha acids)
White Labs WLP833 (German Bock Lager) or Wyeast 2487-PC (Hella Bock) yeast
5 oz. corn sugar (if priming)

STEP BY STEP

This is a traditional Hochkurz double decoction mash. Heat 5.5 gallons (21 L) of water to 155 °F (68 °C) and mash in to rest at 145 °F (63 °C). Hold at this temperature for 45–60 minutes. The first decoction is a thick decoction, which should be composed mostly of grain, with just enough liquid to keep the mash from scorching. Pull 12 qts. (11.3 L) of decoction to a separate pot, and slowly heat until boiling, stirring frequently. Boil for 20–30 minutes, while continuing to stir. After boiling is complete, add the decoction back to the main mash to rest at 158 °F (70 °C). If the mash rests at a lower temperature after adding the decoction back, add a boiling water infusion or direct heat to the mash. Rest at this temperature for 20 minutes. Pull 2.75 gallons (10.4 L) of thin mash, composed of the liquid, and heat to boiling. Add back to the main mash to rest at 168 °F (76 °C). Begin to runoff mash, and sparge with 3.5 gallons (13.2 L) of water to reach a pre-boil volume of 7.25 gallons (27 L) at an estimated O.G. of 1.042, assuming a boil-off rate of 10% per hour. Boil for 90 minutes, adding the hop addition after 10 minutes. Following the boil, chill the wort rapidly to 44–46 °F (7–8 °C), and transfer 5.5 gallons (21 L) to the fermentation vessel. Aerate and pitch approximately 425 billion cells of yeast. Allow wort to slowly rise to 50 °F (10 °C) during the first two days of fermentation, and hold until reaching 80% of the target attenuation. Let rise again to 60 °F (16 °C) until fermentation is complete. Transfer off the trub and lower the temperature to 30–32 °F (-1–0 °C), and lager for 6–8 weeks. Carbonate to 2.6 volumes.

MÄRZENBIER

(5 gallons/19 L, extract only)
OG = 1.055 FG = 1.011
IBU = 24 SRM = 8 ABV = 5.8%



INGREDIENTS

5 lbs. (2.3 kg) Munich liquid malt extract
3 lbs. (1.36 kg) Pilsen dried malt extract
9.8 AAU German Magnum hops (60 min.) (0.75 oz./21 g at 14% alpha acids)
White Labs WLP833 (German Bock Lager) or Wyeast 2487-PC (Hella Bock) yeast
5 oz. corn sugar (if priming)

STEP BY STEP

At this time there are no extract equivalents for Vienna malt so this is a mix of a Munich malt extract with a Pilsen extract. Add 2.5 gallons (9.5 L) to your brew pot and heat the water up to a boil. Remove the brewpot from heat and add the liquid and dried malt extract. Stir until all the extract has dissolved then add the hops. Return the wort to heat, top off to 3 gallons (11.4 L) and boil for 60 minutes. Following the boil, chill the wort rapidly to room temperature. Transfer the wort to a sanitized fermenter and top off with cold water to 5.5 gallons (21 L). Now follow the all-grain recipe (left).

FESTBIER

(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.010
IBU = 25 SRM = 5 ABV = 6.0%



INGREDIENTS

10.2 lbs. (4.6 kg) German Pilsner malt (1.5 °L)
2.7 lbs. (1.2 kg) German Vienna malt (3.5 °L)
4.9 AAU German Magnum hops (80 min.) (0.35 oz./10 g at 14% alpha acids)
2 AAU Hallertauer Mittelfrüh hops (30 min.) (0.5 oz./14 g at 4% alpha acids)
2 AAU Hallertauer Mittelfrüh hops (10 min.) (0.5 oz./14 g at 4% alpha acids)
White Labs WLP830 (German Lager) or Wyeast 2124 (Bohemian Lager) yeast
5 oz. corn sugar (if priming)

STEP BY STEP

This is a traditional Hochkurz step mash. If using boiling water infusion for step mashing, heat 4.5 gallons (17 L) of water to 157 °F (69 °C) and mash in to rest at 145 °F (63 °C), or if using direct heat to step mash, heat 5.75 gallons (21.7 L) of water to 155 °F (68 °C) and mash in. Hold at this temperature for 45–60 minutes. Use direct heat or a boiling water infusion of 1.25 gallons (4.7 L) to raise the mash temperature to 158 °F (70 °C), and

rest for 20 minutes. Optionally, raise the mash temperature to 168 °F (76 °C) to mash out, and begin to run off. Sparge with 3.5 gallons (13.2 L) of water to reach a pre-boil volume of 7.25 gallons (27 L) at an estimated O.G. of 1.043. Boil for 90 minutes, adding each of the three hops additions at the noted times. Following the boil, chill the wort rapidly to 44–46 °F (7–8 °C), and transfer 5.5 gallons (21 L) to the fermentation vessel. Aerate thoroughly, and pitch approximately 435 billion cells of yeast. Now follow the remainder of the Märzenbier recipe (left).

FESTBIER

(5 gallons/19 L, partial mash)
OG = 1.056 FG = 1.010
IBU = 25 SRM = 6 ABV = 6.0%



INGREDIENTS

4.5 lbs. (2 kg) Pilsen dried malt extract
2 lbs. (0.91 kg) German Pilsner malt (1.5 °L)
2.7 lbs. (1.2 kg) German Vienna malt (3.5 °L)
4.9 AAU German Magnum hops (80 min.) (0.35 oz./10 g at 14% alpha acids)
2 AAU Hallertauer Mittelfrüh hops (30 min.) (0.5 oz./14 g at 4% alpha acids)
2 AAU Hallertauer Mittelfrüh hops (10 min.) (0.5 oz./14 g at 4% alpha acids)
White Labs WLP830 (German Lager) or Wyeast 2124 (Bohemian Lager) yeast
5 oz. corn sugar (if priming)

STEP BY STEP

Place the crushed grains in a bag or small mash tun. If using boiling water infusion for step mashing, heat 1.75 gallons (6.7 L) of water to 157 °F (69 °C) and mash in to rest at 145 °F (63 °C), or if using direct heat to step mash, heat 2 gallons (7.8 L) of water to 155 °F (68 °C) and mash in. Hold at this temperature for 45–60 minutes. Use direct heat or a boiling water infusion of 0.5 gallons (1.9 L) to raise the mash temperature to 158 °F (70 °C), and rest for 20 minutes. Optionally, raise the mash temperature to 168 °F (76 °C) to mash out, and begin to run off. Sparge with 1 gallon (3.8 L) of hot water. Add the DME and top off the brewpot with water to reach a pre-boil volume of 7.25 gallons (27 L) at an estimated OG of 1.043. Boil for 90 minutes, adding the hops additions at the noted times. Following the boil, chill the wort rapidly to 44–46 °F (7–8 °C), and transfer 5.5 gallons (21 L) to the fermentation vessel. Aerate thoroughly, and pitch approximately 435 billion cells of yeast using a yeast starter. Now follow the remainder of the Märzenbier recipe (left).

bräuhaus of America, the US affiliate of the German brewer, says that the change in style was a conscious decision. The change from the traditional Märzen occurred about 20 years ago. The Munich brewers do not individually determine what beer to serve at the Oktoberfest, as this is decided by a committee made up of staffers from the six breweries. At some point this committee determined that the color should be lighter.

It's probably impossible to know why exactly the committee made this change without asking them directly, but it can be strongly inferred that one good reason for the change was to increase the beer's drinkability and mass appeal. Since beer is served in liters at Oktoberfest, serving a lighter-colored lager would certainly suit the festival's masses over a richer beer that would be harder to drink in such large quantities.

So, to recap, the terms Oktoberfest, Märzen and Festbier all have a different meaning depending on whether you are in Germany or elsewhere, and the term Oktoberfestbier is very specific to the big brewers in Munich. Despite the variance in how terminology is used, both Märzen and Festbier are used as style descriptors by the BJCP, and for the purpose of homebrewing, do serve a purpose in distinguishing two types of lagers that certainly have stylistic differences. For the rest of this article, I'll stick with using these terms as style descriptors, in line with the BJCP style guidelines.

Brewing Techniques

Märzen, as was discussed earlier, is an amber lager with an OG typically ranging from 1.054–1.060, and an ABV ranging from 5.5% to just over 6%. At its core, a Märzen is all about maximizing flavor and aroma from high

quality malts. The choice of hops is of course important, but the soul of this beer is a rich malt character that isn't sweet or cloying. Festbiers, which should have a deep yellow to golden color, have a similar starting gravity, typically between 1.054–1.057, and usually the same range of ABV%. This style is similarly malt forward, but the focus is on lighter, less kilned malts than in a Märzen. Hop character is a bit higher in this style, but like Märzen, a rich malt character is still the focus.

When brewing a BJCP Märzen or Festbier, the type of malt that is chosen is the most important ingredient choice. Seek out high quality continental malts for either style, preferably from a German maltster.

There are a number of different grists that can produce a very high quality Märzen. In general, the majority, if not all, of the malt bill should be comprised of some combination of Vienna, Munich or Pilsner malt. No matter what ratio of each malt is chosen, what is most important is that they match the appropriate flavor profile for a Märzen, creating a maltiness that is pleasant but not cloying or sweet. My personal preference is to build the grist on a healthy portion of Vienna malt, with a good range being between 60–90% of the malt bill. Vienna malt is kilned at a level between Pilsner and Munich malt, which helps give it a nice toasty malt flavor. Munich malt is another key element to making a great Märzen. Munich malts have a very wide range, and can be as light as 6 °L, to as dark as 20 °L. Assuming a high quality continental Munich malt is chosen, both light and dark Munich malts can be used to create a great Märzen. However, exercise caution here as higher percentages of Munich, especially when using darker varieties, can contribute too much of a

deep, sweet maltiness that is out of style, and better suited for a bock beer.

Specialty grains can have a place in a well-made Märzen, though they aren't necessary to create a great example of the style if you choose the right base malts. If you do elect to use specialty grains, keep it to 10% or less of the grist. Like the base malt, the appropriate choice of specialty grain is important to add the right character to the beer, and should complement the character of the base malts, not overpower them. Avoid domestic caramel-style malts, and instead consider German specialty malts such as Melanoiden or CaraMunich®. For a recipe that uses specialty grains, try Jamil Zainasheff's Oktoberfest recipe in the October 2014 issue of *BYO*.

The grain bill for a Festbier relies more heavily on a base of German Pilsner malt. Festbiers are sometimes described as being somewhere between a Helles and Helles Bock, two styles that rely on large quantities of Pilsner malt in the grist. When designing a malt bill for a Festbier per the BJCP, Strong, who was one of those responsible for designing the guidelines for the new style, suggests that a minimum of 60% Pilsner malt should be used in the grist. The remainder of the grist can consist of Vienna malt, a light Munich malt, such as Weyermann's Munich I malt, which is kilned to 5–7 °L, or a combination of both. The flavor obtained from the Pilsner malt should provide the basis for the malt character of this beer, but proper use of Vienna and Light Munich help contribute a bread quality to the aroma and flavor that complement the characteristics of the Pilsner malt well. When choosing the level of Vienna or Munich malt in the grist, keep in mind that you don't want to use too much and push your beer beyond a yellow to light golden color, or

it will fall out of style.

When mashing a Märzen or Festbier, an important factor is mashing for high levels of fermentability, so the end result is a well-attenuated lager. When looking at the characteristics of many commonly available German-made examples, it can be seen that most exhibit very high levels of attenuation, an important aspect to aid their drinkability. If the appropriate high quality malts are chosen, single infusion, step mash, or decoction mash regimens can all be used to produce a great beer. In fact, since 2006, six different brewers won a gold medal in the National Homebrew Competition brewing a Märzen. Three used a decoction mash, and three used a single infusion, proving that with the appropriate choice of malt, either technique can create a wonderful example of the style. If using a single

infusion, I'd suggest targeting a temperature of 150–152 °F (66–67 °C) to ensure a fermentable wort that still leaves some body in the beer.

If you do choose to try a more advanced mashing regimen, a step mash can be used to help produce a highly fermentable wort that will give the yeast the best chance to attain high attenuation. A good choice for either a Festbier or a Märzen is what is referred to as a *Hochkurz* (high-short) style step mash, a common technique used by German brewers. The initial infusion rest, often called the maltose rest, is held at 144–146 °F (62–63 °C) for 20 to 60 minutes. The length of this rest is meant to control the fermentability of the wort, with a longer rest generating more maltose, a highly fermentable sugar in beer wort created in large part by the enzyme beta amylase, which is highly active at

this temperature. A second rest called the dextrinization rest, which can be achieved using either direct heat or a hot water infusion, raises the mash temperature to between 158–162 °F (70–72 °C), and can be held for 15 to 45 minutes. At this temperature, any remaining starch in the wort should be converted relatively quickly by the enzyme alpha amylase, which creates higher levels of unfermentable dextrins that give the beer added body. Optionally, a mashout can be used, in which the temperature would be raised again to around 168 °F (76 °C), which will deactivate the enzymes in the mash and stop conversion.

Another mashing technique that can be used is a decoction mash. There is much debate among homebrewers of the merits, advantages or disadvantages of doing a decoction. Rather than wade into the debate, however, I

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Liters of beer are traditionally served at Oktoberfest by waitresses wearing Dirndl dresses. Here a waitress holds mugs of Hacker-Pschorr, one of the six breweries that serve beer at the fest.

suggest visiting <http://byo.com/story537> and deciding about decoction for yourself. One tip, however, if you decoct a Festbier: Shorten the boil time to avoid excessive darkening of the wort, which could push the color out of style.

For extract brewers, as with my advice on base malts, stick to German-made Munich or Pilsner varieties and be sure to get them as fresh as possible (there are no Vienna malt extracts that I know of at the time of writing this story). Weyermann, in particular, has some high quality and easily-sourced extracts. From there you can build your beers with specialty malts as any all-grain brewer would.

Hops are not the focus of either of these beers, but that doesn't mean they are not important. For a Märzen, pick a noble hop such as Hallertauer, or a higher alpha derivative of it such as Perle or Magnum for bittering. Shoot for around 20–25 IBUs total

from this addition. Late hopping isn't necessary in this style, but if you choose to, use a noble hop and practice restraint. For a Festbier, similar practice should be used for the bittering addition, though more late hop character is acceptable.


For both Märzen and Festbier, use a lager yeast strain that originates from Germany, preferably Bavaria. A strain that puts the focus on the malt and has low sulfur production is preferable, as a clean, crisp maltiness is desirable. One of the keys to achieving the right flavor profile for both a Märzen and a Festbier is to ensure your lager is well attenuated, since you want a prominent maltiness but also a beer that has a fairly crisp finish. My personal favorite for a Märzen is White Labs WLP833 (German Bock Lager). For a Festbier, White Labs WLP830 (German Lager) or Wyeast 2124 (Bohemian Lager) both work well, as both are well known as

highly-attenuative strains that still produce a malt-forward flavor profile. Other choices are White Labs WLP838 (Southern German Lager), Wyeast 2633 (Oktoberfest Lager Blend), Wyeast 2487 (Hella-Bock) and Wyeast 2308 (Munich Lager). I also highly recommend using a yeast starter to achieve an appropriate pitching rate.

There are multiple methods for lager fermentation, but I recommend pitching your yeast on the cold side and allowing them to rise in temperature during fermentation. Try pitching at 44–46 °F (6–7 °C) and slowly let the temperature rise to 48–52 °F (8–11 °C) during the first 48 hours of fermentation. Once your fermentation is roughly 75% to the expected final gravity, raise the temperature to anywhere from 58–65 °F (14–18 °C) to allow the yeast to ferment out completely and clean up any diacetyl that may be present in the beer. For the lagering phase, I use a general rule of cold aging for one week for every 4 original gravity points, but going longer is fine. I lager as cold as possible, and target 30 °F (–1 °C).

Both these styles can be brewed well with most types of water, assuming it is not too hard or highly carbonate. No matter what water you use, most important is ensuring your mash pH is at a satisfactory point. A range of 5.3 to 5.5 pH measured at room temperature tends to be a good target for most beer styles, both Märzen and Festbier included.

Carbonation in German-style lagers is generally moderate to moderately high, and in both these styles, shoot for target of 2.4–2.7 volumes.

As for when to brew? As I said earlier, traditionally in Germany Märzen was brewed in March and stored until the fall. However, modern brewing means we are free to brew when we want. I often brew mine in June! 

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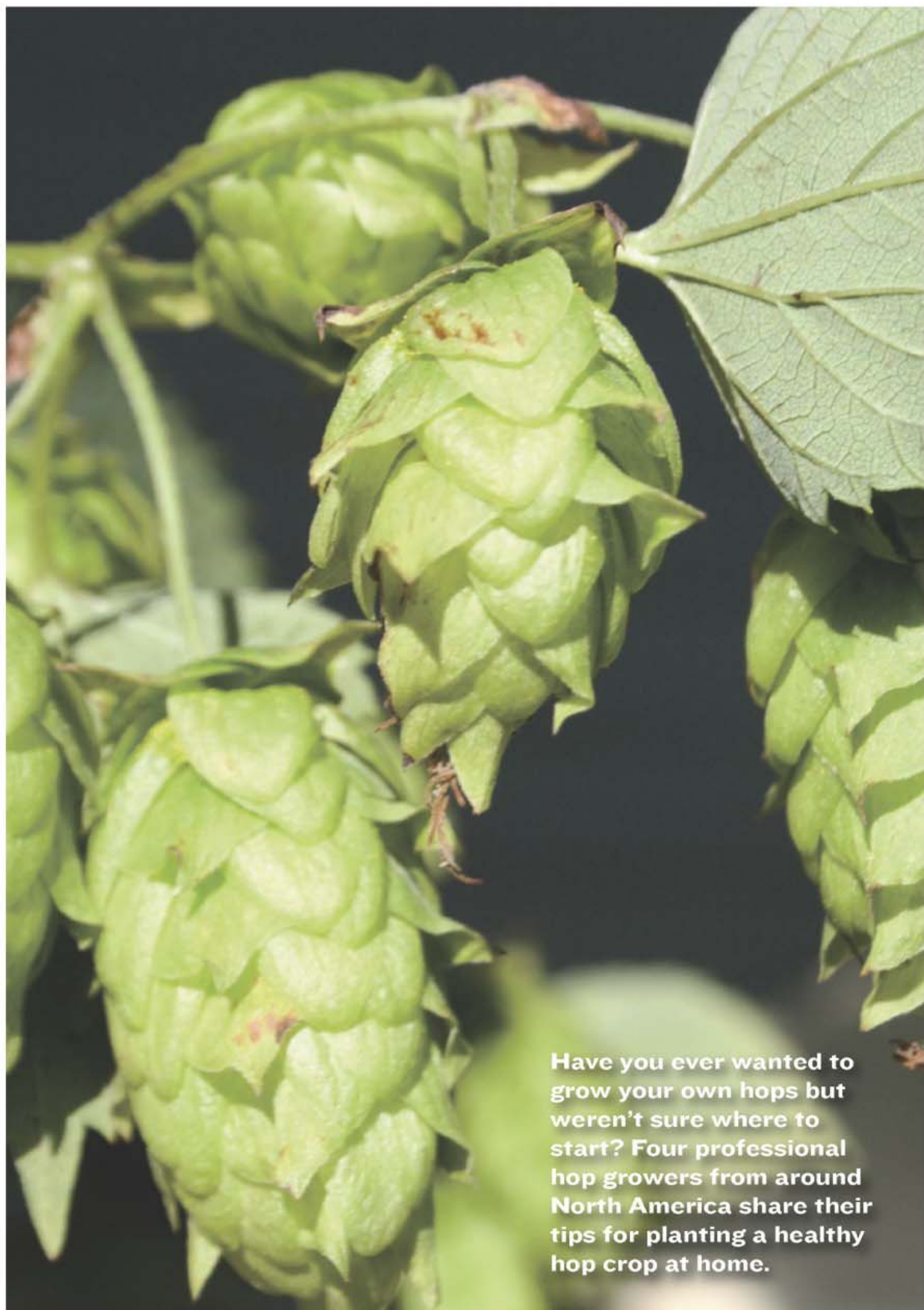
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Have you ever wanted to grow your own hops but weren't sure where to start? Four professional hop growers from around North America share their tips for planting a healthy hop crop at home.

HOP GROWING ROUNDTABLE

by Betsy Parks

W

HERE IS YOUR HOPYARD LOCATED, HOW BIG IS IT AND WHY DID YOU CHOOSE THIS PLACE TO GROW YOUR HOPS?

REBECCA KNEEN: The hopyard is at our brewery (we are Canada's oldest on-farm organic microbrewery) on Shuswap Lake in BC's southern interior region. We have two 1/2-acre yards. We chose the location because we could put the brewery there, the soil was good, there was plenty of water and good sun exposure.

LYNN KEMME: Great Lakes Hops is not a hopyard per se; we are one of the nation's largest propagators of hop transplants. We are in Zeeland, Michigan and produce over 1.5 million transplants annually at our facilities.

COLIN CLARK: We are located just east of Fort Collins, Colorado. Currently we have a 1,500-plant greenhouse on just over a 1/10 of an acre. We chose to grow here based on access to so many craft breweries and acceptable amounts of sunshine.

ALEXANDRA GRAY: Our farm is located along Sugar Creek in Boone County, Indiana. We are currently growing five acres of hops with room to expand to around 40 acres. Sugar Creek Hops was started on our family farm, which produces nearly 2,000 acres of corn and soybeans, as well as a small dwarf fruit orchard.

WHAT VARIETIES OF HOPS DO YOU GROW? HAS THIS SELECTION CHANGED OVER TIME?

REBECCA KNEEN: We currently grow 15 varieties of hops, including our own Sockeye (indigenous) hops. We grow Golding, Fuggle, Nugget, Mt. Hood, Willamette, Cascade, Challenger, Northern Brewer, Brewer's Gold, Sterling, Zeus, Magnum, Galena, and Chinook. We used to also grow Centennial and Bullion, but they didn't like it here.



Photo courtesy of Great Lakes Hops

PROS:



ALEXANDRA GRAY
SUGAR CREEK HOPS
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Trevor Gray, Spencer Gray, Alexandra, and Matt Baxter founded Sugar Creek Hops, LLC in 2013.



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REBECCA KNEEN
LEFT FIELDS HOPS
SORRENTO, BRITISH COLUMBIA

Rebecca Kneen and Brian MacIsaac started the certified organic Left Fields Hops in 1999 and a farmhouse brewery in 2000.



LYNN KEMME
GREAT LAKES HOPS
ZEELAND, MICHIGAN

Head hop grower Lynn and his team grow more than 90 varieties of hops for transplant.

LYNN KEMME: We produce and maintain more than 65 varieties of hops, as well as maintain a large hops breeding program to provide new cultivars in the future. Cascade, Centennial, Chinook, and Columbus are the most popular, but aroma hops with higher aroma and oil profiles are gaining in interest.

COLIN CLARK: We grow Cascade, Nugget, Columbus, Magnum, Chinook, Northern Brewer, Galena, and Centennial.

ALEXANDRA GRAY: We grow two acres of Cascade, two acres of Centennial, and one acre of Chinook, along with 13 varieties of experimental field trials. We are also propagating an exciting wild hop that we found on our farm.

WHAT ARE SOME OF THE CHALLENGES YOU'VE FACED PLANTING HOPS AT YOUR LOCATION? HOW DO YOU COMBAT THEM?

REBECCA KNEEN: The main issue we have experienced has been lack of information or government research and support for growing hops in our region. This is slowly changing as we help more hops growers get established, with considerable research being done in Nova Scotia on hops production. BC's research is pretty non-existent, however. We rely on US research, which is limited.

LYNN KEMME: Combating different hop pests and diseases, along with variable weather are our biggest challenges.

COLIN CLARK: Our biggest challenge was constructing a state-of-the-art hydroponic greenhouse during a frozen Colorado winter.

ALEXANDRA GRAY: Our hopyard is located in a former prairie, which meant the seedbed gave us never-ending weed problems throughout our first growing season. We are also always aware of the challenges we face due to our higher humidity compared to the Pacific Northwest. In order to combat this, we are constantly monitoring our plants and watching for any sign of downy and powdery mildew.

DO YOU FERTILIZE? IF SO, WITH WHAT AND HOW OFTEN?

REBECCA KNEEN: We use green manures planted between the beds — various combinations of peas/oats/vetch, clover, rye, and buckwheat, depending on soil needs and weed issues. We also add kelp meal and compost twice a year, as well as grazing sheep in the yards for direct application of manure and pruning.

LYNN KEMME: We think a combined fertilization program that uses both granular and water-soluble formulations at different times works the best. We like to also use an organic-based fertilizer at least once per season to help the soil microbes thrive. The typical fertilizers we use have less phosphorus (hops don't respond well to high phosphorus levels) — 12-5-15 would be a common formulation. Fertilizers are also tweaked per variety as to whether they prefer an acidic or more basic pH formulation. Hops from different parts of the world have different preferred pH ranges and soil types. They don't all grow the same . . . they tend to be quite regional.

COLIN CLARK: Fertilizing is what sets us apart from all other hop yards

period. We have worked diligently for years formulating a high quality hydroponic nutrient recipe specific for our hops. This formula is what allows us to produce oil profiles that are off the charts in a first year rhizome. We fertilize our plants based on “real time” solar energy accumulation. Our hops get fed exactly what they need and only when they need it most, nothing is wasted. We also change our fertilizer recipe up during the different phases of growth to further maximize oil content and overall production based on how the plants are responding to conditions.

ALEXANDRA GRAY: We fertilize with poop . . . lots of poop. We spread it in the hopyard with a manure spreader and also fertigate (fertilize and irrigate at the same time) with UAN-28 (urea ammonium nitrate).

HOW FREQUENTLY DO YOU WATER?

REBECCA KNEEN: Established plants in our yards need very little water, as we are sub-irrigated. The drier hop yard gets irrigated prior to cone maturity only, mostly during late July and August.

LYNN KEMME: Watering varies by cultivar as well as by stage of growth and time of the season. Some varieties such as Hallertauer won't tolerate wet, compacted soils. Plants should never be allowed to dry to wilt point at any time during the season and may require as much as 3 gallons (11 L) of water per day when they are forming cones.

COLIN CLARK: Along with our fertilizer we also water our plants based on solar energy accumulation and this schedule will vary from hour to hour, day to day. On average, hydroponic

production uses $\frac{1}{10}$ the amount of water than traditional soil production. We have zero water waste due to soil absorption and relatively low evapotranspiration rates due to our controlled environment. We also have the ability to recycle any runoff water from our plants.

Plants should never be allowed to dry to wilt point at any time during the season . . .

ALEXANDRA GRAY: We get much more rainfall than the Pacific Northwest, so our watering schedule is dependent on the weather. Hops require A LOT of water.

DO YOU EXPERIENCE MUCH PEST AND DISEASE PRESSURE?

REBECCA KNEEN: When the plants are not water stressed we have very few pest issues, as we also grow a wide variety of host plants for predatory insects alongside the hopyards. Our biggest current issue is excessive water in one yard, as a spring has suddenly appeared in the middle of that yard. Our brewer is witching that water and moving it away from the yard and to a location where we can make a pond to use for controlled (!) irrigation. The excess of water has created mildew problems, which we handle by maintaining plant cleanliness and judicious applications of copper spray. In

addition, grazing sheep in the hopyard keeps the plants well pruned and clean.

LYNN KEMME: Bugs: Aphids and spider mites are the most problematic, but there are lots of other pests, like Japanese beetles and caterpillars, that can cause a lot of damage, too. Both powdery and downy mildews are very common diseases on plants throughout the growing season. Others like *Botrytis*, *Fusarium*, and anthracnose can appear and damage cones prior to harvest. Frequent scouting in the hopyard and prompt treatments are key to keep things under control. For example, downy mildews can infect in as little as eight hours.

COLIN CLARK: Being inside a controlled environment (the greenhouse) we have a huge advantage in being able to keep pests and disease out, however we get the occasional aphid or spider mite appearance. We never use pesticides and never will. We rely on the help of beneficial predators and parasites to naturally keep pest levels down. Keeping a clean greenhouse and controlling humidity levels also helps control disease.

ALEXANDRA GRAY: Luckily, with our adjacent prairie we have a lot of predators that take care of a lot of our pest problems. Last year, we had issues with leafhoppers, which luckily didn't get to a point where we had to spray.

HOW DO YOU DECIDE WHEN IT'S TIME TO HARVEST?

REBECCA KNEEN: We check moisture (by hand, not using a meter), smell and make teas almost every day as the season gets close.

LYNN KEMME: Moisture testing green



cones gives a good rough estimate, and we like to see yellow lupulin formation and a stickiness to the cones when they are crushed in your hands. We want to pick them before it's possible to knock the lupulin out of the cones (which would mean lost alphas and aromas). Each variety has its own specific harvest dates that fluctuate with the seasons weather patterns.

COLIN CLARK: The color and squeeze method does not cut it for us. We differ from many growers in our harvest technique. Aside from being all hand-picked, we chose to harvest our hops when each cone has become fully ripe. This often results in generously browning cones with a very strong aroma and oil content. Our cones are harvested near "shatter."

ALEXANDRA GRAY: This is probably the hardest part of growing hops. Part of it is a feeling, but what we usually go off of is a dry matter test. Once the hops hit an ideal water-to-dry-matter ratio we know it is time to pick. If the hops are picked too early, they can have a very green taste and the aroma is somewhat un-

derdeveloped. If you wait too long, your hops can rot. We usually have a picking window of one to two weeks for some varieties.

WHAT ARE SOME OF THE MOST IMPORTANT TIPS FOR HOP GROWING?


REBECCA KNEEN: The most common question is, "Which hop should I grow?" To which my usual answer is, "What type of beer do you want to make?" The most common mistake made by homebrewers is to grow only Cascades. Aroma hops are great, but if you grow only Cascades you'll only ever make West Coast IPAs, which is pretty limiting (no matter how much we love them!). Basic tips are to feed the plant with compost or other slow release fertilizers so that you don't get too much nitrogen and make the plants vulnerable to pests. Also, water well but let the soil surface dry out between waterings. Don't expect a crop in the first year and give them way more room than seems reasonable. The most common mistakes I've seen are overwatering and planting in small pots in hot spaces. Also, don't use Roundup to "clean up" around your hops. Roundup is a systemic herbicide for broad-leafed plants and will kill your hops even if you don't mean to.

LYNN KEMME: The most common mistake that homebrewers make is the failure to realize how hop plants grow compared to "normal" plants. Hops are not normal. They are the second fastest growing plant in the world (bamboo is #1). When they are growing at a foot per day they require fertilizer and lots of water to move it up the bines. Failure to anticipate this results in the hop plant stripping the nutrients out of the lower leaves. The lower leaves all turn yellow and

drop off when the plant has pulled all the usable nutrients out of them and the plant stunts and forms small quantities of little cones. All of this happens at a pace ten times faster than most typical plants; so hops can be rather unforgiving if they are not cared for properly.

COLIN CLARK: More often than not new growers just apply too much "love" to their young plants and whether it's too much water or too much nutrients the plant often becomes victim to an overzealous grower. Find a nice warm sunny spot around your house, apply good soil amendments, set up a water timer, and leave it be.

ALEXANDRA GRAY: If you're just starting out, try to use planted starts instead of rhizomes when possible, as you get better growth and they are disease and virus free.

If you are already growing a lot of hops and thinking about starting a commercial hop operation, one important thing to keep in mind is that growing hops is a more complicated agricultural process than most. Putting up a trellis and growing plants is just the beginning. Cultivating, picking, harvesting, and drying equipment are all required . . . none of which is cheap. Hops also take three or four years to fully mature, so don't expect to be able to make money selling your hops any time soon. If you are an existing farm that grows crops that allows you to have some preexisting equipment, land, and access to labor, and you are located in a region that allows hops to flourish, that makes it a lot easier. 

If you are interested in growing your own hops, visit the BYO Backyard Hop Directory in this issue on page 84.

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BY TERRY FOSTER

HOW SWEET IT IS

Brewing sweet stout with lactose

I like to think of lactose as giving the beer a lot of fullness on the palate rather than just sweetness.

Photo by Charles A. Parker/images Plus



Last issue I wrote about a beer not brewed to any style, but simply designed to showcase dark brown muscovado sugar. Now I want to write about another beer as a showcase for a particular sugar. The sugar is lactose and the beer is sweet or cream stout, which is of course a style of its own. This ought to be in the style column, not here you might say, and in that sense you would be right. But I wanted to do it here because of the sugar aspect, and because it is such an ambivalent style I shall deal with only one version of it.

Ambivalent? Why? Because unlike many styles it has a quite specific origin, and for the better part of the 20th century only one version from one English brewer almost completely dominated the market for this type of beer. That beer, Mackeson Stout, although still around, declined in popularity and the style might have disappeared completely, as did porter in Britain at one time. But, then of course, along came American craft brewers with their desire to give new life to old established styles and to take them to extremes (as with double IPAs, imperial stouts and so on). With so few commercial versions available to them, many of these brewers brewed sweet stout in just the way they thought it should be, paying no attention of brewing to a formal style. So as a modern beer sweet stout is quite an elusive style, I can talk about it in this column without worrying about style guidelines too much.

But first a little history. Milk stout, as it was then known, was first brewed in 1907 by Mackeson's Brewery in Kent, England. The name, of course, came from the fact that lactose is a sugar derived from milk. Since this sugar is not fermented by yeast this is something of a sweet brew (but see later under the discussion of the effect of lactose on beer's flavor). So it seems to be an oddity that this brew originated in Kent, the great English hop growing county. But brewers at the time were in the habit of pushing their beers as being healthful and even as a good tonic for whatever might ail the drinker. Stouts in particular were being pushed as "good for you," so one based on "milk" fitted nicely into that scenario. In fact, if I remember correctly, Mackeson used the milk connection to promote the beer as suitable for nursing mothers.

Mackeson's Brewery passed through the hands of a couple of small breweries before being bought out by Whitbread in 1925. This company soon promoted it on a national basis, and although other brewers produced their own version of milk stout, Whitbread pretty much pushed them all to being niche beers. In fact, Whitbread, one of England's biggest brewers, was producing some 560,000 barrels of Mackeson by 1960, which represented somewhat above half of their total production. By that time the authorities had banned the use of the word milk in the name of these beers, on the grounds that it was misleading to consumers. After that, sweet or cream stout production

fell away as British consumers moved more and more towards drinking pale beer and lagers. Whitbread too fell away and sold out its brewing interests in 2001 to Interbrew, now Anheuser-Busch InBev, who still brew Mackeson Stout on a much smaller scale.


Sweet stout has enjoyed something of a small revival in this country with versions being brewed by a number of craft brewers. Whitbread's Mackeson was a low-alcohol beer at 3% ABV, but many of the new U.S. versions are considerably stronger. I am, in fact, drinking a version from Keegan Ales in Kingston, New York as I write this (the sort of multi-tasking I like best). It is actually contract-brewed in Stratford, Connecticut (where I live) and weighs in at 6.7% ABV, very high for the style but a very satisfying drink. Other U.S. versions are often less alcoholic, although Southern Tier Brewing Co. in Lakewood, New York brews an imperial milk stout at 9.6% ABV called Crème Brûlée. As I said, it is an elusive style!

WHAT MAKES A SWEET STOUT?

I think I have made it clear that I do not want to give formal style guidelines for this beer. Nevertheless, if it is to be regarded as a beer separate from all others we have to talk about what sort of characteristics it should have. It is going


to have some sweetness, but lactose is much less sweet, weight for weight, than sugars such as sucrose or glucose. In fact, I like to think of lactose as giving the beer a lot of fullness on the palate rather than just sweetness. It helps to balance the sweetness with some roast character, which is best achieved by the use of some chocolate malt at around 0.25 lb. (113 g) in 5 gallons (19 L). But many brewers prefer black malt or roasted barley to give the beer a slightly harsh note and balance the sweetness; in general, limit the amounts of these to about 1½ oz. (43 g) per 5 gallons (19 L) so as not to overdo the harshness (but see the recipe on page 75 for a contradiction!). For my money, a combination of chocolate and de-bittered (de-husked) black malt works well here. As to other malts, brown malt can usefully be employed in place of chocolate, and adding in higher colored caramel malts, Victory® malt, or Special B will all give this beer a little more complexity. But you can also make a very simple version starting with only a dark malt extract and lactose. This would give you something similar to the original Mackeson Stout, but could be easily improved by using some chocolate or black malt grains and steeping them before adding to the extract.

This is not a beer about hops, and they are generally



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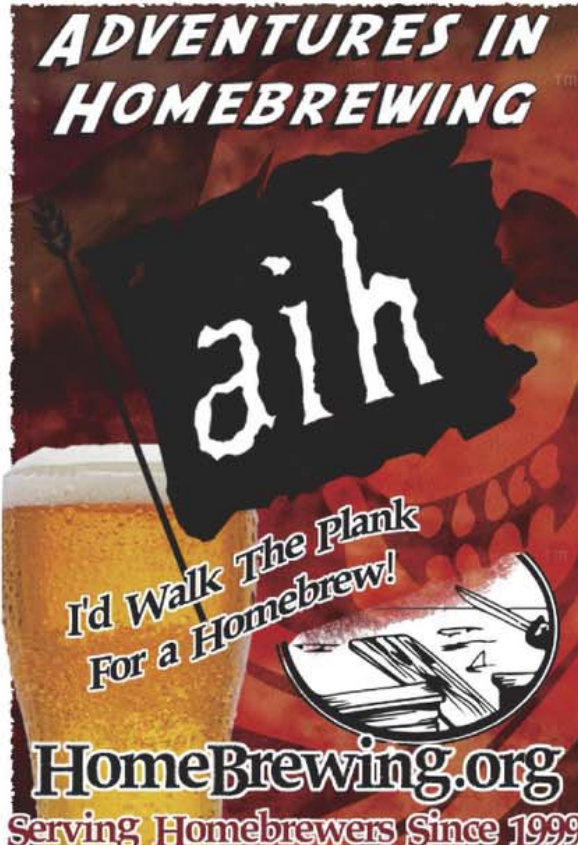
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used only for bittering (although I wouldn't discourage you from using some aroma hops through a late boil addition). And the bittering should not be overdone or it will spoil the balance of the beer. I would recommend targeting 15–35 IBU, depending on the alcohol level and the malt selection used. Go for the lower end of the range if you have used a combination of, say, black malt and roasted barley and the beer is at 3–4% ABV. Stronger versions and milder malts will allow you to go to the higher end of the IBU range. Almost any variety will do, although I like lower alpha acid types such as Mt. Hood, or more traditionally East Kent Goldings.

The biggest question is how strong you are going to make the beer. I like to go for 4–5%, which still keeps it in the session range but is a little more satisfying to drink than Mackeson at 3%. Of course, there is nothing to stop you from making your beer at, say, 6–7% ABV.

You will notice that I have talked in terms only of ABV, which is because original gravity (OG) does not have the same meaning with this type of beer as it does others. This is because the lactose will increase the OG but its contribution to FG is the same, as it is unfermentable. It is generally added at the rate of 1–3% of the wort, so that in

5 gallons (19 L) that means 1–1.5 lbs. (0.45–0.68 kg). Now, 1 lb. in 5 gallons (0.45 kg in 19 L) is about 2.2% of total wort extract (assuming an OG of 1.045) and 1% of sugar is close to 1.004 specific gravity (SG), so 2.2% will add just under 1.009 to the beer's OG and FG. That means that if the beer had an OG of 1.045, its fermentable OG is 1.036, so that it will finish with about 3.4–3.6% ABV. If you wanted, say, 5% ABV you would need to get around 1.050 from fermentable extract, but the OG you would measure on the finished wort would be 1.059 with 1 lb. lactose added. Do note that I have used some approximations here in order to keep things simple and clear.

As to what yeast to use, almost any of the standard British ale strains can be used, as can California Ale if you want to emphasize the sugar flavor. I prefer White Labs WLP013 (London Ale) or Wyeast 1028 (London Ale) as these give some fruitiness to the beers and help the malt flavors to come through, which I find nicely balances the palate fullness from the lactose.

Here is a sweet stout recipe I like, and another is available at <http://byo.com/story3213> to show just how versatile this beer can be.



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SWEET STOUT I

(5 gallons/19 L, all-grain)

OG = 1.064 FG = 1.014

IBU = 25 SRM = 28 ABV = 6.8%

INGREDIENTS:

10 lbs. (4.5 kg) 2-row pale malt
0.5 lb. (0.23 kg) caramel malt (80 °L)
0.5 lb. (0.23 kg) Crisp chocolate malt
4 oz. (113 g) Briess Blackprinz® malt
1.25 lbs. (0.57 kg) lactose sugar
6.75 AAU East Kent Goldings hop pellets (90 min.)
(1.5 oz./43 g at 4.5% alpha acids)
White Labs WLP013 (London Ale) or Wyeast 1028
(London Ale) yeast
3/4 cup corn sugar (if priming)

STEP BY STEP


Mash grains at 152–154 °F (67–68 °C) with 14 qts. (13 L) water and let rest 1 hour. Run off and sparge with hot water at 160–170 °F (71–77 °C) to collect around 6 gallons (23 L) of wort. Once at a boil, add hops and boil for 90 minutes. Turn off heat and add lactose, stirring well to dissolve. Rack

from trub, cool to 65–70 °F (18–21 °C) and pitch yeast, preferably as a 1 qt. (1 L) starter. Ferment at same temperature for 5–7 days before racking to secondary. Leave for 1–3 weeks before bottling or kegging in the usual manner.

EXTRACT WITH GRAINS OPTION:

Replace all the 2-row pale malt with 6.6 lbs. (3 kg) golden liquid malt extract (LME). Steep the crushed grains in 2 gallons (7.6 L) water at 160 °F (71 °C) for 20 minutes. Rinse with 2 qts. (2 L) hot water and top off to 6 gallons (23 L). Once at a boil, turn off the heat and stir in the LME. The remainder of this recipe is the same as the all-grain version.

TAIL END

If you keg this beer and have the appropriate equipment you can serve it with mixed nitrogen/carbon dioxide gas. In any case, it is a very pleasant drink, not complex perhaps, but with enough body and hint of roast so it tastes very full and chewy but not cloyingly sweet. As an elusive style, you can consider the above recipe and the additional Sweet Stout II recipe online as merely stepping-stones to formulating your own unique sweet stout. 

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COLLABORATIVE FERMENTATIONS

Blending brewer's yeast strains

The most common reason to blend two or more yeast strains is to increase attenuation . . .



Using a combination of yeast strains rather than just one cultured strain can help you overcome some strain's shortcomings and make interesting beers.

With collaborative beers so popular in craft brewing, why aren't there more collaborative fermentations? For thousands of years all beer fermentations were mixed-fermentations. That changed when brewing scientists (most notably Pasteur and Hansen) discovered the true identity of the tan goop left at the bottom of the fermenter and developed pure culturing techniques. Cultures grown from a single-cell ferment more reliably and exhibit cleaner more consistent flavor profiles. Today, costing only a few dollars, brewing yeast cultures are available from more than a dozen labs. Why then would any homebrewer want to mix together brewer's yeast strains?

IMPROVING FERMENTATION DYNAMICS

The most common reason to blend two or more yeast strains is to increase attenuation when using a strain with a desired flavor profile but lackluster logistics. For example, the classic Belgian saison strain is known for sloth towards the end of fermentation. By combining it with a small amount of a more aggressive and attenuative strain you can achieve that classic saison flavor without the wait! This is our approach at Modern Times Beer (in San Diego, California) for our year-round saison, Lomaland. The Saison Dupont strain (e.g., WY3724, WLP565) won our taste trials but took too long to make

economic-sense in a commercial setting. After our test blend with French saison (e.g., WY3711) and American ale (e.g., WY1056, WLP001) provided lackluster results, we happened to read Nathan Watkins' "Multiple Personalities: Successfully Blending Yeast Strains" (*Zymurgy* May/June 2013) which suggested pairing it with Westmalle's Trappist ale strain (e.g., WY3787, WLP530). The 95% Dupont, 5% Westmalle blend that we now pitch produces a beautifully peppery aroma from a fermentation that lasts just a few days.

The same basic technique with a different ratio can be applied to soften the varietal character of certain yeasts. Hefeweizens are off-putting to some drinkers due to their intense banana (isoamyl acetate) and clove (4-vinylguaiacol) aromatics. While altering the fermentation temperature can reduce ester (banana) production, this approach often causes the phenols (clove) to stand out even more. To soften both aromatics, try fermenting with a blend of hefeweizen and American, English, or Kölsch yeast. I would suggest starting with at least 40% of the neutral strain, but it may still take multiple iterations to dial in the respective pitching rates to achieve the desired balance.

Another practical reason to pitch more than one yeast strain is to increase alcohol tolerance. Many yeasts start to falter once they produce 10–12% ABV. If you are attempting to brew a souped-up barleywine or

imperial stout, a highly tolerant strain can be pitched once attenuation slows. White Labs WLP099 (Super High Gravity Ale Yeast) is a great choice, Champagne and other wine strains not so much. Strains that evolved to ferment fruit juice can withstand high concentrations of alcohol, but are usually ill-equipped enzymatically to ferment the more complex sugars (e.g., maltotriose) remaining in a partially-fermented beer. The exception is when bottle conditioning, due to the simpler glucose and sucrose priming sugars.

WINE YEAST FOR FLAVOR

Wine yeasts can actually produce some fantastic flavors in a beer if pitched early in the fermentations and then an ale or lager yeast can be added later to complete attenuation. Be careful to select a wine strain that does not produce a toxin deadly to brewer's yeast. How do homebrewers know if a strain produces these toxins? This topic should be briefly explained. Lalvin 71B-1122 (Narbonne White Wine Yeast), is a particularly popular choice. Front Street Brewery's (Wilmington, North Carolina) Mosaic Saison has proven wonderfully fruity and saison-like fermented with this strain. Rather than pitch brewer's yeast, Front Street added enzymes to increase the wort's fermentability.

I pitched a red wine yeast, Lallemand BM45 (Brunello), for primary fermentation of a Flemish red with wonderfully cherry-plummy results. However, I made the mistake of pitching a souring blend that contained brewer's yeast at the same time as this killer wine strain (i.e., one that produces a competitive factor). The result was sulfury for more than a year before the *Brettanomyces* eventually cleaned up (luckily *Brett* is not susceptible to these toxins). Lalvin Bourgorouge RC212 is a good option for a non-killer red wine strain.

THINGS TO CONSIDER

No matter your goal, select strains that perform well under similar conditions if they are to be pitched together. For example, a mixture of a saison strain that excels at temperatures in the 70s and 80s °F (21–32 °C) with a lager yeast that performs best around 50 °F (10 °C) would likely result in a less than ideal beer. Either the saison yeast will stall at the temperature the lager yeast prefers, or the lager yeast will produce harsh flavors if the fermentation is warm enough for the saison.

Once you have selected your yeast strains, propagate them separately. Attempting to grow a mixed culture will lead to a population shift. You can estimate the relative

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RECIPE

NU ZULAND SAISON

(5 gallons/19 L, all-grain)

OG = 1.062 FG = 1.007

IBU = 38 SRM = 3 ABV = 7.25% pre-wine

(7.4-7.6% post-wine)



"One of the two Brettanomyces strains I used in this beer was obtained from homebrewer Jason Rodriguez, who isolated it from a bottle of Brasserie Cantillon. Jason termed the strain CB2. Read about it at: <http://www.themadfermentationist.com/2012/08/bottle-conditioning-with-brett-belgian.html>. It has some similarities to the strains listed in the recipe.

INGREDIENTS

8.3 lbs. (3.76 kg) Pilsner malt

4.2 lbs. (1.91 kg) wheat malt

11 AAU Rakau hop pellets (30 min.)

(1 oz./28 g of 11% alpha acid)

14 AAU Motueka hop pellets (0 min.)

(2 oz./56 g of 7% alpha acid)

24 AAU Nelson Sauvignon hop pellets

(0 min.) (2 oz./56 g of 12% alpha acid)

2 oz. (56 g) Motueka hop pellets

(dry hop)

2 oz. (56 g) Nelson Sauvignon hop pellets

(dry hop)

½ tsp. yeast nutrient (15 min.)

½ Whirlfloc tablet (5 min.)

The Yeast Bay Saison Blend yeast

White Labs WLP644 (*Brettanomyces*

bruxellensis trois) yeast

Wyeast 5112 (*Brettanomyces bruxellensis*)

or White Labs WLP650 (*Brettanomyces*

bruxellensis) yeast *

Wyeast 5223-PC (*Lactobacillus brevis*) or

White Labs WLP672 (*Lactobacillus*

brevis) bacteria

0.75-1.5 L Sauvignon Blanc white wine

from New Zealand

1 cup corn sugar (if priming)

STEP BY STEP

Heat 15 qts. (14 L) of water to achieve a mash temperature of 148 °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 the first hop addition with 30 minutes left in the boil and the second hops addition as you turn off the heat. Give the wort a long whirlpool stir and let settle for 30 minutes prior to chilling. After 30 minutes, 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 O₂, and pitch all yeast and bacteria. Ferment at 75 °F (24 °C). Once

the gravity is stable, add the dry hops. After two weeks add the wine to taste in the bottling bucket. Bottle or keg each aiming for 2.9 volumes of CO₂. Use the priming chart at <http://byo.com/resources/carbonation> to determine your priming sugar needs. I prefer keg conditioning for hoppy beers with *Brettanomyces* because it allows me to serve them younger. The pressure of the secondary fermentation also seems to increase the speed with which the *Brettanomyces* produces its signature character.

NU ZULAND SAISON

(5 gallons/19 L, extract only)

OG = 1.062 FG = 1.007

IBU = 38 SRM = 5 ABV = 7.25% pre-wine

(7.4-7.6% post-wine)



INGREDIENTS

4 lbs. (1.8 kg) Pilsen dried malt extract

2.9 lbs. (1.32 kg) wheat dried malt

extract

11 AAU Rakau hop pellets (30 min.)

(1 oz./28 g of 11% alpha acid)

14 AAU Motueka hop pellets (0 min.)

(2 oz./56 g of 7% alpha acid)

24 AAU Nelson Sauvignon hop pellets

(0 min.) (2 oz./56 g of 12% alpha acid)

2 oz. (56 g) Motueka hop pellets

(dry hop)

2 oz. (56 g) Nelson Sauvignon hop pellets

(dry hop)

½ tsp. yeast nutrient (15 min.)

½ Whirlfloc tablet (5 min.)

The Yeast Bay Saison Blend yeast

White Labs WLP644 (*Brettanomyces*

bruxellensis trois) yeast

Wyeast 5112 (*Brettanomyces bruxellensis*)

or White Labs WLP650 (*Brettanomyces*

bruxellensis) yeast *

Wyeast 5223-PC (*Lactobacillus brevis*) or

White Labs WLP672 (*Lactobacillus*

brevis) bacteria

0.75-1.5 L Sauvignon Blanc white wine

from New Zealand

1 cup corn sugar (if priming)

STEP BY STEP

Heat 5 gallons (21 L) in your brewpot. When the water starts to boil, remove from heat and add in all the DME. Stir until all the extract is dissolved then return the pot to heat and return to a boil. Boil the wort for 30 minutes adding the first hop addition once the boil is achieved and the second hops addition as you turn off the heat. Give the wort a long whirlpool stir and let settle for 30 minutes prior to chilling. Follow the remainder of the all-grain recipe.

density of the cultures by allowing them to settle out after growth is complete. Start with a 50-50 blend if you want roughly equal activity, or something more lopsided if you want the flavor of one strain to be more expressive. If you can't be bothered or don't have the time, just pitch directly from the package by volume. Use a yeast calculator to estimate the viability of each culture based on the manufacturing date. You can also use the calculator to determine the ideal total pitching rate and ensure you introduce enough cells. If this seems like more effort and expense than you are willing to devote to dialing in a blended culture, many yeast labs sell pre-mixed liquid cultures for the same price as their pure cultures.

A common issue for commercial breweries that repitch mixed cultures is that populations shift from batch-to-batch. One strain may reproduce more rapidly than the other, or flocculate more rapidly, making that strain more likely to be harvested and repitched. This is less of an issue for homebrewers who tend to buy fresh yeast more often. In one test, White Labs found that a 50-50 blend (WLP001 and a customer's malty house ale strain) had drifted to 85-15 after just four batches, although the brewery was still happy with the results ("A Guide to Blending Yeast Strains NHC 2014" by Kara Taylor). At Modern Times Beer, we usually purchase a fresh pitch of saison blend for every five batches of Lomaland. To get the most out of a pitch, a brewery might consider pitching the blend into a different beer towards the end of the yeast's usability, a beer expected to complement the drifting yeast character.

It can be especially fun to produce a series of connected beers by repitching a yeast blend. I'm in the middle of a series of saisons brewed

with hops and other ingredients from given regions. For example, Motueka and Nelson Sauvignon hops and a bottle of Sauvignon Blanc all from New Zealand (talk about citrusy terroir!). When each batch is complete I harvest the yeast slurry for the next batch. If the blend seems lacking in a particular attribute I'll pitch the slurry along with an additional strain into the next batch. My blend includes several *Brettanomyces* strains and now *Lactobacillus* in addition to The Yeast Bay's Saison Blend.


If you are using a blend with only *Saccharomyces*, sanitation has to be a priority because a lapse in any of the brews will doom all future batches brewed with the blend.

HYBRID STRAINS

While population shifts are an inevitable part of repitching blended cultures, there is an alternative that can combine the best attributes of two strains with the reliability of a pure culture. *Saccharomyces* usually produce asexually by budding offspring that have only subtle genetic differences. Under the right conditions though, two cells can mate to create hybrid daughter cells. Those descendants exhibit a blend of genotype and sometimes phenotype (observable

traits) from the two parents.

Omega Yeast in Chicago was the first lab to release a hybrid brewer's yeast, Saisonstein's Monster OYL-500. The hybrid was created by stimulating the parent cells (a classic Belgian saison and a highly attenuative French saison) to form spores. These spores each have a single set of chromosomes (haploid) allowing them to combine to form a cell with a full set (diploid). Eight of the resulting hybrids were propagated and then evaluated in split fermentations with the best strains advancing to larger trials. The eventual winner displays much of the peppery flavor profile of a classic saison, but with more fruit and attenuation speed similar to the French saison.

While there are now hundreds of brewing yeast isolates available, it is still worth exploring the potential that blended cultures hold. Whether your goal is to increase attenuation, raise alcohol tolerance, or produce a unique flavor profile, a mixture of strains may be the answer. It can be delicious and inspiring to collaborate on a batch with another homebrewer, each of you bringing talents, techniques, and sharing the work. Do the same for your yeast, get them a friend. 

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If you have a green thumb, want the freshest hops, and want to know where the hops came from, the best thing you can do is grow your own. Having your own hopyard adds another element of control within your brewing process and adds even more personality and uniqueness to your homebrewed concoctions.

Unless you plan to use all of your harvested hops in a wet hop beer, then after harvest you need to dry the hops before packaging and freezing them. The best way to dry your freshly picked hops in order to preserve all of those wonderful flavor-boosting oils, acids, and compounds is with a hop oast.

My drying method when I first began growing hops was removing and laying my screen door flat on sawhorses, dumping the whole batch on it, and letting them sit in the warm garage with a box fan blowing over the top of the hops. I was limited by the use of the screen door, and often had more hops than screen, which led

me to search for and borrow other screens from around the house. In 2014, August temperatures were pleasant and the family was enjoying cross ventilation through the house with the windows open. Of course, this required screens in the windows and limited my drying capacity. I used this as my reasoning to build yet another piece of brewing equipment.

When designing the oast, I wanted to limit the amount of heat that was applied to dry the hops since certain oils begin to evaporate at higher temperatures, changing the flavors that are imparted in the beer. The intent was to keep as many of the oils as possible intact to maximize the flavors in my beers. I needed a lot of drying space as I was anticipating several pounds of dried hops at harvest time. I also did not want this to take up a lot of real estate, as it was going to be a part of my limited garage brewing space. I drew inspiration from a box design that fit all of my needs on Instructables.com, which was adapted from *The Homebrewer's Garden: How to Easily Grow, Prepare, and Use Your Own Hops, Malts, Brewing Herbs* by Dennis and Joe Fisher.

This project took roughly four hours to complete. However, the benefit of this build allows me to get nearly 20 pounds of wet hops to their dry storage weight in little time without using heat to potentially drive off those wonderful aroma and flavor compounds that make hops the earmark of certain brewing styles.



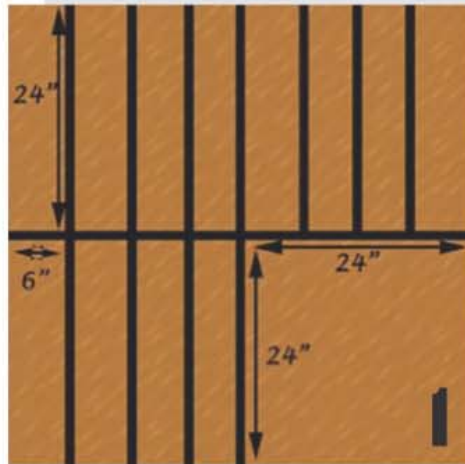
Photos by Candice Haymond

MATERIALS & TOOLS

- ½-inch sanded plywood panel cut in half width-wise
- 2x6 board (8 feet/2.4 m long)
- 4-foot (1.2 m) wide aluminum reinforced screen (25 ft/7.5 m long)
- 3-inch wood screws
- (2) 1-ft x 1-ft furring strips (8 inches/20 cm long)
- Brad nailer and 1¼-inch brad nails
- Staple gun and staples
- Hole saw
- Box fan (square 20-inch/51-cm)

1. MEASURE & CUT THE SIDES OF EACH TRAY

Measure the lengths for the sidewalls of the trays and mark your cuts on the plywood. I made my oast six levels (one of which holds the box fan), so I measured 24 sidewalls that are 24 inches long by 6 inches tall (61 cm long by 15 cm tall). I found the most efficient use of the plywood was to cut it in half and cut 12 sidewalls as shown in this figure. The leftover 24-inch by 24-inch squares (61-cm by 61-cm) will be the base that holds the box fan and the top lid of the oast. Once measured, make your cuts.



2. CUT & ASSEMBLE THE BASE

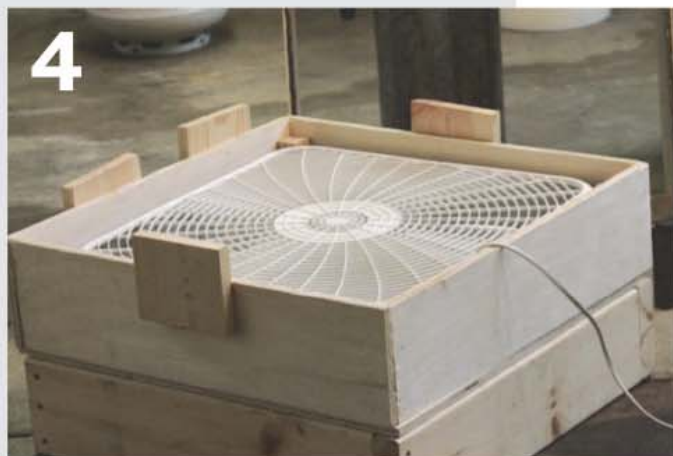
Measure out 24 5-inch (13-cm) segments on the furring strips. These strips will help to strengthen each of the trays in the corners. Measure out four 22½-inch (57-cm) sections on the 2x6 board. This will become the sturdy base of the oast. Now assemble the base by taking the four 22½-inch (57-cm) planks and screwing them together as a box using 3-inch (8-cm) screws. This should make a perfect 24-inch (61-cm) square for your base panel and will be a solid foundation for all of the trays to rest on top of. I nailed the base panel to the 2x6 base using brads, and drilled nine 2-inch (5-cm) holes on the plywood base panel and one in the back. This is to allow air into the oast to be circulated by the fan.



3. ASSEMBLE THE WALLS

Using the brad nailer (or 1½-inch/4-cm wood screws if you don't have one) fit the oast walls together with the 24-inch by 6-inch (61-by 15-cm) tray walls, 5-inch (13-cm) shanks, and the right angle. If you are using screws, you can screw three screws into each end of the tray walls and the 5-inch shank (13-cm). This will make six oast sections, but one will house the box fan. If you choose, you can forego the box fan housing and make a sixth tray.





4

4. INSTALL BOX FAN AND ADD SCREENS

The box fan will fit snugly onto the base. Alternatively, an option is to place the housing with the box fan at the top of the oast and blow the air down through the hops. Then cut 2-foot (61-cm) square sections of the screen and staple the screen to the bottom of each oast tray. Take a hammer and tap in all of the staples so that they are nice and even.



5


5. FINISH ASSEMBLING OAST STRUCTURE

Stack each of the oast sections on top of the base. I used some leftover scrap wood to create guides for the trays and affixed them using the brad nailer. This will hold them in place as I adjust the trays. Lastly, put the 24-inch (61-cm) square lid over the top oast section.



6

6. REAP THE REWARDS

I harvested in two rounds based on my feel of the Zeus and Nugget cones. This oast dried over 17 lbs. (8.6 kg) of wet Chinook, Cascade, Nugget, and Zeus to just over four dry lbs. (1.8 kg) of hops. Without using any heat, my first round of hops – about 5 wet lbs. (2.3 kg) – were in the dry range (20-25% of the original weight) in two days. The second round of hops – about 12 wet lbs. (5.4 kg) – were in the dry range in three days. For this drying, I reversed the draft to pull air through the hops from top to bottom by flipping my box fan over, as opposed to pushing air up through the bottom layers of hops. Both ways worked well. One suggestion I have is rotating the drying racks to minimize a gradient from bottom to top, or top to bottom, depending on the fan location and orientation. Now I have a freezer full of hops that I have to begin brewing with! 



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Homebrewing is taking off in New Zealand, where our homebrew club Christchurch Homebrew Group, meet and brew regularly.

My homebrew story started with an earthquake. On September 4, 2010 at 4:35 a.m. Canterbury, New Zealand awoke to a 7.1 magnitude earthquake. Thankfully there were no fatalities and damage was minimal, however the ongoing aftershocks for the weeks and months that followed made it difficult to get a full night's sleep. So, my wife and I escaped for a weekend to a small town called Oamaru. The hostel we stayed at in Oamaru was next door to the local homebrew shop. As Christmas was coming I managed to convince my wife to get me the starter kit.

My first brew was an English bitter kit that turned out OK. After a few more tries I really wanted to start learning more so I bought a partial mash kit and from that point there was no looking back. However, I quickly became frustrated that the homebrew scene was underground in Christchurch, and I didn't know anyone doing all-grain. To help me find these people I started the Christchurch Homebrew Group on Facebook in July 2012. At the time of writing this, the group has more than 450 members and we meet every month (thankfully not everyone turns up!) to talk brewing and sample our brews. Competitions are held quarterly and the standard is very high – everyone wants to win the Golden Tankard!

During the time since I started the group there was a growing sense of "this is getting bigger" and I could see the homebrew scene in Christchurch

was missing something ... a dedicated all-grain brewshop, someplace where those new to brewing could go and get information and set out on the right track towards all-grain brewing. What was I to do? Quit my job as a business analyst and start a brewshop of course! So Finney's Homebrew Emporium was started and we opened the doors on August 12, 2013. Initially we started in a dentist office as renovations were done to our current building, but now we are settled in a larger shop with a brewing room and classes.

Part of the fun of owning your own brewshop is making beer during the day. Very early on I started making 1-imperial gallon (4.5-L) batches. It was mainly to try new hops, malt combinations, styles, etc. But one day I asked our Facebook followers what ingredient they wanted me to use. Since then it has sort of taken a mind of its own. The first Monday of each month is the special ingredient brew day. The preceding week our Facebook followers put forward ideas, and the one with the most "likes" wins. So far I have brewed a chocolate and beetroot porter (very drinkable), bacon brown ale (drinkable in its own way), Cadbury creme egg wheat beer (creme eggs should never be used to brew!), KFC ale (affectionately known as the Cock Ale of which you can see me drinking on my YouTube channel FinneyHB) and many more. One of the best was the chili & curry leaf American wheat, which is included in the online version of this article at <http://byo.com/story3214>.

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