

## The Great Beer Experiment

By Bill Nevits

I've often felt there is too much hype in homebrewing. Whether it's sanitizing, fermenting or yeast, there always seems to be someone who wants to say something about it and with every article our simple art of brewing becomes more and more complex. So often I've heard how all grain brewing makes a better beer or only liquid yeast will do that I've begun to wonder. Personally I've always felt an all-grain brew made with liquid yeast leads to the best overall product and certainly much of today's literature seems to back this up. My father and brother-in-law, however, brew their own and they both exclusively brew with extracts and dry yeasts. And they've both made some decent beer. This got me thinking and wondering, what is the real difference between all grain and extract brews and how strong an impact does liquid yeast make?

I knew the family would be visiting over the Thanksgiving holiday and I knew I'd have to figure out a way to entertain them. That's when I decided to actually go forward with the Great Beer Experiment. The idea would be simple, we would brew two beers: one all-grain and one extract with specialty grains. Then we'd split each of the two batches in two and ferment them with both liquid and dry yeasts. This would give four distinct beers to sample over the Christmas holiday and would allow us to decide for ourselves how we feel about the various approaches to homebrewing.

To make the experiment as fair as possible, I wanted to brew the same beer using grains and extracts. Since I don't usually brew extracts and they don't usually brew all grain, I had to find a recipe for the same beer using both methods. A recent copy of [Brew Your Own](#) solved this problem when they published the recipe for Blue Last Porter. After a few tweaks to suit my brewing system, the test recipes were born:

	All-Grain	Extract with Specialty Grains
Pale Malt	11 lbs, 3 ozs	-
Light Malt Extract (liquid)	-	4 lbs
Light Malt Extract (dry)	-	3 lbs, 8 ozs
English Crystal Malt	1 lb	1 lb
Chocolate Malt	1 lb	12 ozs
Black Patent Malt	2 ozs	2 ozs
Northern Brewer Hops (8.2%)	1.1 oz (60 minutes)	1.1 oz (60 minutes)
Cascade Hops (5.5%)	1 oz (1 minute)	1 oz (1 minute)
Yeast	Wyeast 1098 &	Wyeast 1098 &
	Danstar Nottingham	Danstar Nottingham
Mash Time & Type	90 minutes (single infusion, 153 degrees)	30 minutes (steep, 155-175 degrees)
Boil Time	90 minutes	60 minutes
Predicted OG	1.054	10.54
Predicted FG	1.012	1.012
Predicted ABV	5.5%	5.5%
Predicted IBU	30.6	30.6
Predicted SRM	81.9	66.7

By Saturday the turkey had all been eaten and it was time to get to brewing. To get in the right frame of mind, we sent our wives to the mall and sent my brother-in-law Dave to get us each a glass of my Hillside Kolsch.

### **Brewing the extract beer**

First we started the extract brew. The cracked grains were placed in a muslin bag and steeped in 5 quarts of 155-175 degree water for thirty minutes. The grain tea and bag of grains were then strained into the brew kettle and the bag was "sparged" with two gallons of 176 degree water. Another two gallons of water and the malt extracts were added to the kettle. At the start of the boil, the Northern Brewer hops were placed in a muslin bag and added to the kettle. One minute before the end of the boil, the Cascade hops, also in a muslin bag, were added. After turning off the heat, the hop bags were removed and squeezed dry. Another two gallons of pre-boiled water were added to the kettle to reach the five and one-half gallon mark. The brew was then cooled to 75 degrees using an immersion chiller and collected into a single fermentation vessel where the OG was adjusted to 1055. The brew was then split between two plastic primary fermenters.

Observation: Cracked grains should be loosely packed when using muslin bags. During the extract brew, the muslin bag of cracked grains was very full. While steeping in 155 degree water, the temperature of the grains on the interior of bag remained constant at 140 degrees.

### **Brewing the all-grain beer**

Once the extract brew was started, we more or less moved in parallel with the all-grain beer. The cracked grains were added to my picnic cooler style mash tun with 13 quarts of water at a strike temperature of 170 degrees. This settled out to a 153 degree mash which was maintained for 90 minutes. The grains were then sparged with six and three-quarters gallons of 176 degree water. Thirty minutes into the boil, the Northern Brewer hops were added to the kettle. One minute before the end of the boil, the Cascade hops were added. Note, muslin bags were not used. After turning off the heat, the wort was cooled to 75 degrees using a counter flow wort chiller and collected into a single fermentation vessel where the OG was adjusted to 1057. The brew was then split between two glass primary fermenters.

Observation: Both chillers were easy to sanitize and use and both chillers were able to cool the wort to the desired temperature of 75 degrees. The immersion chiller took about 20 minutes and used about fifteen gallons of cold water. The counter flow chiller took about 30 minutes and used about eighteen gallons of cold water. Controlling the final temperature was much easier with the immersion chiller since it can be turned off when the desired temperature is reached while adjusting the cooling rate of the counter flow chiller to achieve the desired temperature took more effort.

### **Preparing and pitching the yeast**

One package of two-week old liquid yeast was obtained, so only one day in the smack pack was required. Twenty fours before the start of brewing, a yeast starter was made according to the package directions (1/3 cup malt boiled in 1 pint water for fifteen minutes and chilled). Twelve hours later, the starter size was doubled by a second feeding (1/3 cup of malt boiled in 1 pint water for fifteen minutes and chilled). After brewing, the yeast starter was shaken, split in two and added to one half batch of each the all-grain and extract beers.

Two packages of the dry yeast were used at the rate of one package per half batch of wort. Each package of yeast was prepared separately. The yeast was rehydrated into two ounces of cooled beer wort for fifteen minutes prior to pitching. The first package of yeast was added to the extract beer as soon as it was cooled.

The dry yeast prepared for the all-grain wort didn't look right during the rehydration process, so a quick trip to the store was made for a replacement package. The initial package was discarded and the replacement package was rehydrated in water as directed on the package. Since this required a trip to the store, this package of yeast wasn't added to the all-grain beer until one and one-half hours after chilling.

Observation: The liquid yeast appeared to be more reliable. One out of two of the dry yeasts was problematic. We're not completely sure it needed replacing but based on the way it smelled and looked, we didn't want to chance using it.

## Fermenting

Twelve and fifteen hours after pitching the yeast (it might have been sooner but we were sleeping), both extract and all-grain beer using the liquid yeast were showing signs of active fermentation. Neither of the dry yeast brews showed much activity of any kind.

Thirty to thirty-nine hours after pitching the yeast (again, we were sleeping), the extract beer using the dry yeast was showing signs of active fermentation. The all-grain beer using the dry yeast still didn't show much activity of any kind.

Forty-eight hours after pitching the yeast, the all-grain beer using the dry yeast was starting to show signs of active fermentation.

Observation: If we accept it is true that fermentation should begin as soon as possible after the yeast is pitched, the liquid yeast would be an obvious choice as both beers using the liquid yeast were actively fermenting over twenty-four hours before the dry yeasts.

Observation: A yeast starter was used for the liquid yeast but not for the dry yeast. Would we have seen signs of fermentation sooner with the dry yeasts if a starter had been used? I have never heard of this being advocated, but it would make for an interesting addition to the experiment.

Observation: In reality, two different dry yeast packages were used. A better controlled experiment would have been to mix the two dry yeast packages and then split them back in two before rehydrating. This would have ensured the same "mix" of dry yeast was used in both beers.

After five days in primary fermentation, three of the four half batches were racked into secondary fermenters. These were all but the all-grain dry yeast batch, which was racked into the secondary three days later. The all-grain dry yeast batch was delayed while waiting for the fermentation head to fall, which happened three days later than the other three beers. The all-grain beers were still in glass and the extract beers were still in plastic. At the time of transfer into the secondary on the fifth day, a blind tasting of the fermenting brews was conducted by myself and my wife, Darja. Interestingly enough, in separate tastings we both picked in the same order! The results of our tasting, along with the specific gravity at the time of transfer, are summarized below:

	All-Grain Liquid Yeast	All-Grain Dry Yeast	Extract Liquid Yeast	Extract Dry Yeast
SG	1027	1034	1027	1019
Rank	3	1	2	4

Total elapsed fermentation time between pitching the yeast and bottling was fourteen to sixteen days. All fermentation was conducted in my kitchen, where the temperature range varies between 60 and 68 degrees Fahrenheit.

## Bottling and Aging

Bottling was performed between fourteen and sixteen days after brewing (the differing bottling times was primarily due to time constraints on my part). Each beer was primed at the rate of 1/2 cup corn sugar per two and one half gallon batch. Prior to priming, the corn sugar was boiled in one cup water for approximately two minutes. Final gravities and other results are summarized below:

	All-Grain Liquid Yeast	All-Grain Dry Yeast	Extract Liquid Yeast	Extract Dry Yeast
OG	1057	1057	1055	1055

FG	1017	1018	1018	1017
ABV	5.25%	5.12%	4.86%	4.99%

### **The Tasting**

Based on all I've heard and read, as well as my own gut feelings, I would expect judging of the various beers to be as follows:

Gold	All-grain with liquid yeast
Silver	Either the all-grain with dry yeast or the extract with liquid yeast
Bronze	Whichever one doesn't get the silver
Honorable Mention	Extract with dry yeast

The tasting and evaluation was done by a variety of people - some who claim they know a lot about beer and some who don't! In total, twenty four opinions were collected from my family, friends and the WIZARDS home-brew club. In each tasting, the participants were asked to rank the beers, based on their personal preference, on a scale of 1 to 4, with 1 being the highest. Each beer was then scored using the average ranking it received. The following tables summarizes the results:

Overall Ranking	Raw Score	
Gold	1.9	All-grain with liquid yeast
Silver	2.1	Extract with liquid yeast
Bronze	2.7	Extract with dry yeast
Honorable Mention	3.3	All-grain with dry yeast

The overall rankings don't, however, show the complete picture nor do they show any indication as to the magnitude of the rankings. Based on the individual responses, the following observations can also be drawn:

- In the all-grain beer, liquid yeast was preferred by a factor of almost 4-1 over the dry yeast.
- In the extract beer, there was no clear-cut preference for liquid or dry yeast.
- For the two beers using liquid yeast, the all-grain beer was preferred by a factor of almost 2-1 over the extract beer.
- For the two beers using dry yeast, there was no clear-cut preference for liquid or dry yeast.

Now, what does this tell us?

### **Final Conclusions**

Based on this experiment, I have drawn the following conclusions:

- For the all-grain beer, liquid yeast was by far the best choice (note, this could, however, be hampered by the problems I had with the dry yeast in the all-grain beer).
- In the extract beers, there was only a slight preference for the liquid yeast (note, the dry yeast went fairly smoothly for this batch).
- A preference for all-grain or extract seems to be largely a personal preference which can't be explained by this experiment.
- Dry yeast is unreliable. I had problems in the beginning in the all-grain beer and this beer ranked the lowest in almost every tasting.

In summary, this experiment would seem to say if you're going to make beer, use a liquid yeast. It might also say dry yeast can be a close second to the liquid yeast, if you get a good batch of the dry yeast. As for using all-grain or extract, this experiment would seem to indicate the all-grain would be preferred.

Finally, if I were to ever repeat this experiment again, I would use a lighter beer such as an English pale ale. I think a lighter, more pale, beer might better accentuate the parameters of this test.