Guide to Brew In A Bag (BIAB) Mashing

The following guide is one way of mashing. Like skinning cats, there are various methods, procedures and guides. This is but one. See also: http://www.youtube.com/watch?v=s53Q3X0Yjlg

1. Let us advise you on the grain required for your brew – BIAB is different and standard recipes will need an adjustment. You will then need to either mill it yourself, or get us to mill it for you.

2. Heat up your mash water. There needs to be enough liquid to account for your grain absorption, your sparge water and your boil evaporation. 27.5 litres will produce approximately 20 litres of beer.

3. Check your temperature. You need to be approximately 4°C above your desired mash-in temperature.

4. Once you've hit your target temperature, turn off your heat source and put your bag into your boiler.

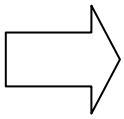
5. With your bag over the rim of your mash/boiler, add your grain slowly stirring in thoroughly and ensuring there are no dough balls (dry clumps of grain).

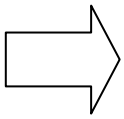
6. Check your temperature. If it's not hot enough, turn on the element. Gently move the mash and the bag with your paddle. Place your lid on boiler to retain heat.

7. Apply some insulation to your mash tun/boiler. Your mash will last between 60 – 90 minutes. If you have large drops in temperature, you may have to apply more heat. Temperatures should drop no more than 3 degrees. In general, mash ales at 67 – 70°C and lagers at 62 – 65°C

8. Give the mash a thorough stir every 20 minutes or so. This is also a good time to monitor the temperature. (An optional step would be to conduct an iodine test to check for full saccharification – no change in the yellow colour indicates the mash is complete.) A suitable time would be 60 minutes for ales and 90 minutes for lagers.

9. Securely tie your bag to a rope. Use the rope and pulley to pull the bag out of the boiler so it hangs above allowing the grains to drain. Please ensure the bag is securely tied and your bag is strong enough to hold the weight of your wet grain as you don't want the heavy bag splashing into your hot wort.





10. Turn on your heating source and bring your sweet wort to the boil. Use cold water, blowing or turning off the heat if required to stop a boilover. A 60 – 90 minute boil is standard, longer will give more caramelisation.

11. As soon as the wort is boiling, dip in a cup and take a sample of approximately 100mL for a hydrometer testing. This will allow you to adjust with liquid or dry malt to hit your SG.

12. Weigh out and add your hops at pre-determined times. You can choose to put them in a hop bag (like in the photo), or you can throw them in loose. Bagging them will reduce the amount of sediment at the end of the boil; however, you will achieve a lower level of bitterness.

13. In the last 10 – 15 minutes of the boil, add one teaspoon of Irish Moss – this will coagulate excess proteins which will drop to the bottom of the kettle on cooling. Depending on your recipe, you may also want to add any extra fermentables (e.g., malt extract, sugar), spices, herbs or aroma hops at the end of the boil.

14. At the end of the boil, take a hydrometer reading, then turn off the heat source and wait for the movement in the wort to slow. You will then need to employ a whirlpool using your clean paddle, which is stirring the wort vigorously for several minutes.

15. Sanitise your cube and transfer hose. Slowly run your wort into the cube. Use a fuel line clamp (see right) to control the flow.

16. If your whirlpool was successful, your sediment should collect at the bottom of kettle in a cone. Towards the end of the transfer, you may need to tilt the kettle to collect the last of the wort.

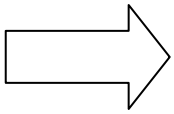
17. Once you have filled your cube, you have the optional step of pushing the air out. Do this by placing the cube against a wall, a towel on the cube (so you don't burn your knee) and your knee against the towel. Push the cube until all the air is out, then put the lid on.

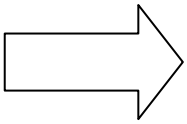
18. Lay the cube on its side so that all the walls are sterilized on the inside.

19. Allow the wort to cool to yeast pitching temperature. You can speed this process up by utilizing pools, tubs of water, etc, or by just leaving it cool overnight. If using a dry yeast like 514, you may need to re-warm to 37 – 40°C

20. If you have a cooling coil, you can forget about points 15 – 19. Simply put your coil into the boiler for the last 15 minutes of the boil to sanitise it and run water through it at the end of the boil to coil your wort.

21. Once the wort is at pitching temperature, sanitise your fermenter, ensure the tap is CLOSED, pitch half of our wort (from a great height), pitch your yeast, then pitch the remainder of your wort.





22. An optional step at this point would be to add pure oxygen to the ferment through an oxygen stone. This is particularly worthwhile if you are using a lager yeast. Close the lid, then allow to ferment (remembering temperature control).

Why?

Mill?

Milling is crushing the barley kernels to expose the contents (starch). Why mill?:

- Water needs to be able to permeate the kernel to soak the starch. This isn't possible unless the kernel is in pieces.
- We want the grits (the white starch) to be as exposed as possible to encourage maximum enzyme activity in the mash.

Mash?

Mashing is soaking the malted barley in hot water for a period of time maintaining a particular temperature/s. For infusion mashing (single temperature mash), the amylase enzymes (α-amylase and β-amylase) work in tandem to break down the starch into more simple sugars. α-amylase works best closer to 70°C and breaks the starch into smaller dextrins while -amylase works best closer to 60°C and breaks the starch into the highly fermentable maltose. A loose rule of thumb is to mash between 62 – 65°C lagers (more fermentability) and to mash between 67 - 70°C for ales (more dextrins). Why mash?:

- Hydrates the malt
- Gelatinizes/softens the starches
- Activates natural enzymes (from the malt) which
    - Convert complex unfermentable sugars (starch) to simple fermentable sugar
    - Convert complex proteins to amino acids (yeast food)

Boil?

Boil the wort for 60 – 90 minutes. Why boil?:

- Boiling destroys any enzymatic activity
- Sterilizes the wort
- Isomerizes/extracts hop resins (bitterness)
- Drives off volatile aromas
- Coagulates allowing precipitation after the boil of unstable proteins
- Evaporates excess water
- Lowers the pH (required for yeast)
- Darkens/caramelizes the wort

Recipe Design

Mashing allows the brewer to tinker with ingredients. Whether you are trying to nail a particular style of beer or you are creating something new and just want to make something to please your taste buds, recipe design is important. Consider each of your ingredients and how they'll affect your beer.

Water

Water is the most abundant ingredient in beer making, generally making up 90% of the recipe. Townsville's water is very soft (very low in mineral content), but it does contain a lot of chlorine. Be sure to use filtered water at all times. If you want to change the mineral content there are a range of mineral salt treatments which are generally added at the start of the mash. The following table was copied and adapted from Noonan's "New Brewing Lager Beer" (1996).

Mineral Salt	Description
Calcium Sulphate (Gypsum)	Increases calcium content and lower pH. Improves the quality of hop bitterness, gives drier and full flavour.
Magnesium Sulphate (Epsom Salts)	Increases magnesium content.
Calcium Carbonate Sodium Chloride	Strongly buffers mash acidity – really not required in Townsville Accentuates bitterness and enhances flavour and fullness of beer.
(kosher, white sea salt)	Promotes diastatic enzyme activity and release of acid malt phosphates.

Calcium Chloride Adds calcium, sweetness and saltiness.

Yeast

Brewers have the choice of either liquid or dry yeasts. You need to choose an appropriate yeast based on the yeast's behavior (flocculation, temperature range, alcohol tolerance) and characteristics (flavour and aroma). See our yeast handouts for more information.

Malts and other fermentable sugars.

Malt is the second most abundant ingredient. When choosing malt, we need to consider our choices will affect things like the appearance, aroma, flavour, mouthfeel, alcohol and fermentability.

BIAB and Mashing Considerations

There are several choices you can make to enhance your mash. A small portion (2 – 4%) of acid malt will greatly assist in lowering your mash pH. BIABs high water to grist ratio creates a more alkaline pH. A small amount of acid malt will correct this. Base malts or light kilned malt make up most good grain bills. Don't overuse amounts of specialty grain or adjuncts. The specialty malts and adjuncts do not have enough diastatic power (enzyme power) alone to break down the starch in malt.

Mash Efficiency

In many books and websites you will see people discuss 'efficiency' – this alludes to how effectively the sugar has been mashed and extracted from the grain during the mash and helps us predict what our specific gravity will be. This is generally expressed in a percentage (e.g., 75%) and compared to what can be achieved in the lab (in the lab is 100%). While this can be useful, figuring out efficiency in this way can be arduous and difficult to adapt recipes.

A simpler method is to use our our "grams required per litre per point" or our GLP figure. To figure this out, we take the grams of grain used, divide it by the litres we brewed, and divide that by our original gravity. For example:

4000 grams of grain 20 litres of wort 37 (1037 original gravity) = 5.40 GLP

Therefore, 5.40 grams is required per point of specific gravity per litre. So after one trial you know your GLP approximately 5.40 and this will allow you to calculate the grams of grain required to hit targets of your next brew. Here's an example using Lucy's first brew.

<u>Example 1 – figuring out your GLP</u>
Lucy makes herself a mid-strength pale ale. She uses 4000g of grain to yield an original gravity of 1037 in a 20 litre batch. What is her GLP?

GLP = Grain / Litres / OG

⇩

GLP = 4000 / 20 / 37

⇩

GLP = 5.40

<u>Example 2 – figuring out your volume for high alcohol beers</u>
Stephen wants to make an award winning weizenbock (strong, dark wheat beer). He's aiming for an original gravity of 1090 and he wants to use no more than 6000g of grain in the bag (for safety reasons). His GLP is 5.54. How many litres will the recipe be?

Litres = Grain / OG / GLP

⇩

Litres = 6000 / 90 / 5.54

⇩

Litres = 12.03

Example 3 – figuring out your grain bill

Greg wants to make an American Pale Ale. He wants to use 88% Pale Malt, 10% Crystal 145, and 2% Acidulated Malt. The recipe will make 20 litres. He's aiming for an original gravity of 1055. His GLP is 5.30. How much grain will he require?

Grain required = litres x OG x GLP

⇩

Grain required = 20 x 55 x 5.30

⇩

Grain required = 5830 grams

⇩

5830 x 88% = 5130g Pale Malt
5830 x 10% = 583g Crystal 145
5830 x 2% = 117g Acidulated

Example 4 – figuring out your OG because you forgot to check

Bob the Bogan is drinking while he is brewing. He adds the full 6000 grams of grain for a 20 litre batch but in his relaxed state he forgets to take gravity readings. His GLP is normally 4.4. What would his original gravity likely to have been?

OG = Grain / Litres / GLP

⇩

OG = 6000 / 20 / 4.4

OG = 68.18 (or 1068.18)

⇩

Hops

Hops provide the bitterness to balance the malt, as well as flavour and aroma in beer. They also act as a natural preservative. Aroma hops are normally boiled for 0 – 5 minutes, flavour hops 5 – 20 minutes, and bittering hops for up to an hour. There is really no point in boiling for longer than an hour as the bittering potential plateaus and bitterness can become harsh. Choose hops which are appropriate for the style, and to your palate.

IBU Calculations

There are various methods of predicting bitterness with many tables, equations and spreadsheets available. The following chart and the magic number was developed by Greg from the work done by Byron Burch and utilisation figures averaged from Papazian and Noonan. The chart assumes a starting gravity of around 50 and close to sea level. The magic number 203.1 allows the calculations to be made in grams. Checks against recipes containing enough detail have confirmed accuracy.

A range of parameters will affect hop utilization including: high gravity worts (negatively), hop bags (negatively), being above sea level (positively the higher you go), a more vigorous boil (positively), as well as several others.

Boiling Time (minutes)	Pellet Utilization	Flower & Plug Utilization
0 – 5	5%	4.1%
6 – 10	6%	5%
11 – 15	8%	6.6%
16 – 20	10.1%	8.4%
21 – 25	12.1%	10.1%
26 – 30	15.3%	12.7%
31 – 35	18.8%	15.6%
36 – 40	22.8%	19%
41 – 45	26.9%	22.4%
46 – 50	28.1%	23. 4%
51 – 60	30%	25%

To calculate IBUs –

Multiply grams of hops by AAU% by utilization. For example, 36 grams of East Kent Goldings with an AAU% of 4.9 boiled for 60 minutes would be:

36 x 4.9 x 30 = 5292.
Divide this figure by 203.1 = 26.05

This is your IBUs in 18.9 litres (or 5 US gallons).

To recalculate for a different volume (e.g., 22 litres), multiply your IBU figure (26.05) by 18.9, then divide by your batch size (22).

26.05 x 18.9 = 492.34
492 / 22 = 22.37 IBUs

Notes