ALL-GRAIN WHEAT-MASH VODKA

Most home distillers make vodka from sugar and water fermented with turbo yeast. However, the majority of commercial vodka distilleries make their finest vodkas from Winter wheat.

By its broadest definition, "vodka" is simply pure alcohol diluted with pure water. However, in practice the alcohol is never completely pure, so there are always trace congeners present that impart subtle flavours to the vodka. The character of these flavours is determined by the feedstock used to make the vodka mash. Wheat as a vodka mash is world famous for making the finer vodkas because the trace congeners resulting from it are preferable to those of other feedstocks.

This text describes how home distillers can make 30L of wheat mash (approximately 20L to be distilled after straining) in a large pot on a kitchen stove. The yield will be between 3 and 4L of 40% abv vodka.

Mashing

Equipment

- 34-40L pot with lid
- a large plastic or wooden stirring spoon
- a floating dairy thermometer graduated from 0^{o}C to 110^{o}C (32^{o}F to 230^{o}F)
- pH meter; or, pH papers: ranges 2-12 & 5.0-6.5;
  or, *5.2 pH Adjuster*
- tincture of iodine
- measuring spoons
- eye dropper

Ingredients

- 23L of fairly soft municipal tap water. E.g. hardness level of 4; almost no iron; 100 ppm calcium; pH 8.5.
- 10-ml (2-tsp) Gypsum ($CaSO_4$)
- 95% sulphuric acid (H_2SO_4); or, citric or tartaric acid;
  or, 18 ml (1.2 tablespoons) *5.2 pH Adjuster*
- 8L (4K or 8.8 lbs) flaked wheat
- 1½ L (¾K or 1.65 lbs) of finely crushed wheat malt

Method

This method is one of the easiest and least time consuming methods of mashing, and it scales up to large mashing quantities very well.

The principle behind this method, which is a single infusion-mash method, is to use flaked wheat rather than undispersed hard wheat. This eliminates the need to perform a full boil to disperse the grain starches.

With flaked wheat, which is pre-gelatinized wheat that is hot-rolled the way rolled oats are made, the grain starches easily disperse in the 65.5^{o}C (150^{o}F) mash water without the need of boiling.

Prepare the mash water by placing 23L of tap water in the large pot on the stove. Thoroughly mix the 10-ml (2-tsp) of gypsum into the water, and measure the pH using the pH meter or the range 2-12 pH papers. Use this pH measurement to determine what pH adjustment the water requires.

Let's assume the pH, as with most municipal tap waters, is approximately 8 or 9. Begin adding 95% H_2SO_4 one drop at a time, mixing thoroughly, and measuring the pH with the pH meter or the range 5.0-6.5 pH papers between each drop until the pH is about 5.8 or 6.0.

If citric or tartaric acid is used, which are both powders, the additions should be 1¼ ml (¼ tsp), and will take about 10 ml (2 tsp) or so in total to achieve pH 5.8 to 6.0 from a source water of pH 8.5.

If you accidentally overshoot pH 5.8 with the acid, you can correct by simply making additions of 500 ml of source water (i.e. pH 8 or 9) and measuring the pH, until the target pH of 5.8 is achieved. Once this correction is complete, it will be necessary to remove a total equivalent volume of mash water as was added to do the correction and discard it, leaving 23L of mash water at pH 5.8 or 6.0.

Of course, if the pH of the source water were below 5.8, the water would require treating with calcium carbonate ($CaCO_3$) instead of acid. Similarly, an accidental overshoot can be corrected the same way with additions of the source water.

Now, if you will be using *5.2 pH Adjuster*, an additive available at homebrew shops and web sites, the pH adjustment is very easy. Simply add 18 ml (1.2 tablespoons) of *5.2 pH Adjuster* to 23L of mash water after the addition of the gypsum, and the pH of the water will be automatically buffered to pH 5.2 regardless of the starting pH of the source water. This happens because the product is a pH buffer that

compensates for the other factors that would influence the pH of the water. The reason the product is formulated for a pH of 5.2, the optimum pH for mashing, is because it will hold the pH of the mash water to 5.2 even after the grain is added and the effects of enzyme activity have taken place.

When adjusting the pH with acid it's adjusted to 5.8 instead of 5.2 because, unlike with the presence of a pH buffer, the pH will be further lowered by the addition of the grain and by the enzyme activity, which ultimately brings it down to about 5.2.

After the mash water is prepared, turn the stove on high, cover the pot, and let the water heat up to the conversion strike temperature, 74°C (165°F). You will have to periodically stir the water thoroughly and measure the temperature as the water heats up until the strike temperature is reached.

When the water is at the strike temperature, turn off the heat, and stir in the 8L of flaked wheat. The temperature should come to rest at about 68°C (155°F) or higher. Stir the mash for about five minutes while the starches disperse (i.e. gel into a thick porridge). It should take about 15 to 25 minutes for the temperature to cool to 66.5°C (152°F). The mash should be stirred every five minutes or so until it cools to that temperature. When the mash is at 66.5°C (152°F), stir in the 1½L of crushed wheat malt. The mash temperature should rest at 65°C (149°F).

Cover the mash pot and leave it for 90 minutes for the starches to convert to sugars. It's helpful to stir the mash every 15 minutes or so during the 90-minute conversion rest. The mash can even be left for eight or ten hours (e.g. overnight) to cool to fermentation temperature (i.e. under 29.5°C (85°F)). Or, an immersion chiller can be used to force cool the mash to fermentation temperature after the 90-minute conversion rest is complete.

After the conversion rest, the starches should be completely converted to sugars. This can be tested for by an iodine starch test.

Fermentation

Ingredients

- 30L wheat mash
- 1 package of low-volatile Vodka Yeast with AG

Equipment

- 2 30^{+}L primary fermenters with at least one lid
  Or
  1 30^{+}L primary fermenter with lid, and an aquarium pump with an aeration stone
- 1 standard winemaking hydrometer and cylinder
- 1 floating dairy thermometer graduated from 0^{o}C-110^{o}C (32^{o}F-230^{o}F)

Method

Initially, the mash will be in the pot on the stove with the lid on. The mash should have been left to settle for at least 90 minutes, possibly as long as overnight, and cooled to below 29.5^{o}C (85^{o}F). The mash solids will have settled out, and there should be 7 or 8 cm (3″) of clear liquid on top of the mash.

Carefully take a sample of the clear liquid and measure its Originating Gravity (OG) using the hydrometer. Be sure to make the necessary temperature correction for the hydrometer reading.

The OG should be in the range 1.060-1.070, but a deviation of .010 from that is not a problem. The mash produced by the above recipe is most likely to fall into that range.

Next, the mash needs to be transferred to a clean 30^{+}L fermenter. The temperature should have cooled to below 29.5^{o}C (85^{o}F) before it is transferred. For the 30L batch, the mash can be left to cool until the temperature is below 29.5^{o}C (85^{o}F). For larger batch sizes, it will be necessary to employ an immersion chiller to force cool the mash.

Once the mash has cooled to below 29.5^{o}C (85^{o}F) it can be transferred. This can be done by pouring the entire mash, grain and liquid together, from the mash pot to a clean 30^{+}L fermenter. If the full mash pot is too heavy or too awkward to pick up and pour, the mash can be ladled with a one or two litre measuring cup into the fermenter until the volume is down to a manageable level.

For larger batch sizes, a grain pump can be used to make all transfers.

The mash is now ready for aerating (i.e. providing dissolved oxygen). For the 30L batch, you can vigorously pour the mash from one

fermenter to another four to six times. This works extremely well. You can also use an aquarium pump to pump air through an aeration stone placed in the mash. The aeration stone should be left to bubble in the mash for about 30 minutes. The yeast and AG can be added while the aeration stone is still bubbling in the mash.

On the larger scale, bubbling with an aeration stone can be done, perhaps using a larger pump and larger stone. Also, mechanically rousing the mash in a manner that causes splashing for 20 or 30 minutes will work well.

After the mash has been aerated, the yeast can be pitched (i.e. added to the mash) and stirred in if it hasn't already been added during the aeration stage. Just make sure the mash temperature is below 29.5^{o}C (85^{o}F) before adding the yeast. Place the fermenter where it's going to sit undisturbed for the next three days, and ensure the ambient temperature is between 21 and 29.5^{o}C (70 and 85^{o}F).

After 30 minutes the yeast will have hydrated in the liquid and can be thoroughly stirred in.

Within 60 minutes of pitching the yeast, vigorous fermentation will be evident (i.e. vigorous bubbling). The bubbling will continually rouse the mash throughout the fermentation, keeping the mash mixed. Leave the mash for 72 hours from when the yeast was pitched. It's helpful to stir the mash thoroughly every 24 hours, but not necessary.

After 72 hours the fermentation will either be complete and the activity will have diminished to a slow spurious bubbling, or the fermentation will still be active and only have slowed down slightly. If the latter is the case, monitor it every six hours or so until the fermentation is very slow and therefore, finished. Fermentation shouldn't take more than 84 hours.

When the fermentation is complete, it's important that the mash be strained, placed in the still, and heated to above 52^{o}C (125^{o}F) within 24 hours or off-flavours may develop.

After the fermentation is complete the mash is ready to be strained. For the 30L of wheat mash, it can be strained by hand using a large straining bag, available at most homebrew shops. Larger volumes will require mechanical solids-separating equipment.

After straining, the volume of liquid retrieved will be about 70% of the entire-mash volume. If the mash were mechanically pressed, the volume of liquid retrieved would be closer to 80% of the entire-mash volume. In the case of the 30L of wheat mash strained by hand, between 20 and 22L of liquid will be retrieved.

After the mash is strained and has settled for 30 to 60 minutes, a fairly clear sample of the mash liquid can be collected from the surface, and the Terminating Gravity (TG) can be measured.

With the OG and the TG, the alcohol percentage can be calculated using the following formula:

$$(OG - TG) \times 1000 / 7.4 = \% \text{ abv.}$$

Before transferring to the still, the mash should be allowed to settle for up to twelve hours so the fine particles can settle out and the clear liquid siphoned off. This avoids transferring too much suspended solids to the still, which could burn or crust up in the still boiler.

After the completion of this fermentation step, you will have about 20L of fermented and strained wheat mash at about 8.5% abv, and you will be ready to proceed to the distillation steps. From this point, the distillation process is exactly the same as for any other vodka mash formulation.

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