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Brennereitechnologie

Attention - acrolein!

Acrolein is a mucous membrane-irritating, very harmful liquid with a boiling point of 52°C. It is chemically formed when glycerine is heated to at least 200°C by splitting off water. Glycerine is a component of vegetable fats, oils and waxes. This explains the presence of acrolein in candle smoke, biodiesel or overheated frying fat. In fermenting musts and mashes, acrolein can also be formed biochemically from glycerine, a metabolic product of fermenting yeast, due to the metabolic activity of certain lactic acid bacteria. This can occur in wines made from low-acid fruit as well as in insufficiently acidified distillery mashes made from pome fruit or starchy raw materials ("malfermentation").

During the distillation of such spoiled mashes and wines, acrolein is noticeable in that it fills the distillation chamber with a tear-inducing gas because it is only partially condensed in the cooler. The distillates obtained are also extremely pungent in the middle run, often irritating to the mucous membranes and scratchy in taste. Such distillates contaminated with acrolein are neither marketable nor repairable.

Accordingly, quality-conscious and responsible distillers strive to avoid the formation of acrolein caused by bacteria during fermentation with the help of proper mash preparation and fermentation management and the following objectives:

- Reduction in the number of acrolein-producing bacteria during mashing
- Prevention of metabolic activity and the proliferation of remaining acrolein formers

In detail, this results in clear recommendations for simple practical measures:

Fruit and Jerusalem artichoke mashing

- Remove trimmings (leaves, branches, stalks) and dirt (dust, soil, algae) from fruit and tubers as thoroughly as possible before wrapping, but without damaging the fruit or losing juice. Soft-fleshed fruit should be carefully rinsed or immersed in clean water; hard-fleshed fruit can be brushed by hand or washed mechanically; Jerusalem artichoke tubers must be sprayed with a high-pressure cleaner and possibly even disinfected with a chemical mixture.
- Add a little must lactic acid or DL malic acid to naturally low-acid juices and musts for fruit wine production (i.e. "acidify" to 7-9g total acid per liter).
- Acidify fruit mashes with a suitable acid (acid combination "MS" (mash protection) or PM acid) to a pH value of 3-3.3 - measured with a pH meter or pH test stick.

Incidentally, citric or sulphuric acid are unsuitable for this purpose; citric acid only offers brief acid protection due to its easy biodegradability, even by bacteria and yeasts, and sulphuric acid often causes a so-called sulphur dioxide sting in the distillate).

- Acidify naturally low-acid juices and musts for fortified wine production as well as fruit mashes to pH 3-3.3.
- Add or stir in rehydrated pure yeast (OPTI fruit plus, AROMA plus or LT 8 plus for fruit; TOPIFERM for Jerusalem artichokes) and pectin enzyme (ULTRA-fruit or pectin lyase for fruit, TOPIZYM for Jerusalem artichokes) to ensure thin liquid, homogeneous distribution of acid and yeast and thus rapid fermentation.

Grain and potato mashing

Cereal grains cannot be washed at all; potatoes, depending on their size, shape and state of health or soil conditions, can also only be washed insufficiently.

Mashes made from raw materials containing starch may only be acidified after the starch liquefaction rest and then only to a maximum pH of 4.5 (not below!), as otherwise the enzymatic degradation of the starch and the release of fermentable sugars would be delayed.

The way out is to keep the raw material and malt hot for a sufficiently long time, during which most of the bacteria introduced with the raw material are killed, in conjunction with subsequent acidification to pH 4.5.

In our decades of experience, the following recommendations have proven to be effective:

- Use microbial enzyme preparations **VF** or **VF potato** and **VZ**; do not regard malt as a source of enzymes, but as a starchy raw material and mash together with the unmalted grain.
- Heat the mash of raw cereals and malt or potatoes slightly above the gelatinization temperature of the raw material starch and keep it there for 30 minutes.
- Acidify to **pH 4.5** with **sulphuric** or **PM acid** during the subsequent cooling to saccharification temperature.
- After further cooling to pitching temperature, it is essential to ferment the mash with a fermenting pure yeast (**Whiskey select** or **Kornbrand premium**). As no "wild" yeast survives the liquefaction rest, a grain or potato mash cannot ferment "spontaneously", i.e. without the addition of a pure yeast, cleanly and alcoholically, but can only spoil bacterially with lactic or buttery sourness.

A freshly prepared sugared mash made from starchy raw materials is easy to ferment, but it is also a rich substrate for mash spoiling bacteria. If bacteria subsequently re-enter the clean, cooled mash, there is a risk of infection, which is known as "tipping" or souring and manifests itself in a butter, vinegar or lactic acid sting.

This makes special hygiene all the more important when pumping the fresh mash from the mash tun into the fermentation tank. This fermentation tank as well as the hoses, pump and fittings must not contain any residues of fermented or spoiled mash or other dirt! A residue of sour mash in an eccentric screw pump is enough to infect a clean sweet mash with bacteria when pumping it over.

For this reason, mashes ferment more cleanly directly in the mash tun because the risk of subsequent infection of the mash is significantly lower.

Notes on other of our processing recommendations:

„Alternatives to the use of formalin" in the processing of raw materials containing starch"
„Instructions for the production of fruit brandies“
„Instructions for producing alcohol from grain“
„Instructions for making alcohol from potatoes“
„Instructions for making alcohol from Jerusalem artichokes“