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Studies of microbiological activities during thick juice storage

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Abstract:

This paper deals with investigations and measures relating to microbiological activities on the thick juice surface, as well as activities in the main bulk during storage. Whilst in the first case yearlong experiences on a technical scale exists, in the second case, results from laboratory and pilot trials are available.

In recent years it has been possible to store thick juice at the Tulln sugar factory, without the addition of formaldehyde, from January to September. During this time, the surface was protected by layering with NaOH. This was originally carried out by means of chains and floating devices and was subsequently changed to nozzle spraying. Additional improvements during interim storage, such as pasteurisation of the thick juice cooler and surface protection by spraying with NaOH has provided optimum storage conditions in 1999 and 2000. To detect surface microbial activity ethanol determination in the headspace was tested. This was possible via a NIR-probe, provided the activity had reached a certain level.

In a 500 m³ tank, partial success in inhibiting surface activity was achieved by spraying with a mixture of potassium sorbate and hop- β -acids. Earlier observations from laboratory trials, that the addition of hop- β -acids slows down microbiological activities, could be confirmed in pilot scale trials. Addition of 3 mg/kg hop- β -acids to thick juice at 60% DS considerably extended the time without invert sugar and acid formation, when compared to a blank. As a consequence of the addition of hop- β -acids during thick juice storage, their fate in crystallisation was investigated. Trials on a factory scale showed that hop- β -acids, added in different, sometimes excessive amounts, were recovered almost proportionally with the normal ash components on the surface as well as within the sugar crystals. An addition of 3 mg/kg of hop- β -acids yielded values of less than 0.1 mg/kg of sugar.

Microorganisms causing a pH value drop in stored thick juice could be propagated semi-continuously in the laboratory. These are cocci, occurring partially in clusters, which are able to degrade monosaccharides to lactic acid. As an immediate measure to counteract a pH value drop in the whole storage tank, spraying with NaOH solution having a higher density than thick juice (33%) was tested.

The complete text is available in English and German.