

MONITORING THE PURITY OF INDUSTRIAL STARTER CULTURES USING MALDI-TOF MS

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A starter culture consists of one or more microorganisms that are added to the raw material (i.e. milk, minced meat, wort, vegetable, etc.) to produce a fermented food product (i.e. yoghurt, sausage, sourdough, cheese, beer, pickles, etc.). During fermentation, starter cultures metabolize several compounds to speed up and steer this process in the desired direction. This way, added starter cultures contribute to the microbial safety, the improvement of the organoleptic properties, extending shelf life of the fermented product and providing health beneficiary components. Nowadays it is extremely important for the fermentation industry that these starter cultures are strictly monitored in order to conserve the process, to guarantee safety of the final product and to exclude drawbacks concerning industrial economics. Indeed, contamination of these starter cultures with wild-type microorganisms could be detrimental for the end product.

During this research the applicability of Matrix-Assisted Laser Desorption/Ionization Time-Of-Flight Mass Spectrometry (MALDI-TOF MS) was evaluated for monitoring the brewing yeast starter culture during fermentation. Pure starter culture-specific MALDI-TOF MS-profiles were generated and compared with those from possibly contaminated starter cultures. Abnormalities in peak patterns resulted in a different set of spectral profiles for both types of starter cultures, thereby confirming or rejecting the possible contamination. For example, one sample taken from a brewing yeast culture that showed a negative deviation during fermentation was analysed. This negative deviation could be due to contamination of the pitched brewing yeast with a wild-type yeast or bacteria. This presumption was confirmed by the presence of additional peaks in the spectral profile generated from the brewing yeast culture compared to the profile of the pure yeast culture. Additionally, the sample was microscopically checked and cultured on a general yeast and beer spoilage bacterial medium, and two different yeast types were found based on different cell and colony morphology. MALDI-TOF MS profiles of both yeast types were run separately and again compared to the profile of the pure yeast culture, again confirming the contamination. This proves the applicability of MALDI-TOF MS and implementation of this technique in the fermentation industry could thus provide a fast authenticity check for each type of industrial starter culture.