Source tracking of food spoilage moulds and yeasts by FTIR spectroscopy

V. Shapaval[a], T. Møretrø[a], H.P. Suso[b], A. Wold Åsli[a], U. Böcker[a], J. Schmitt[d], A. Kohler[c,a]

[a]Nofima, Osloveien 1, 1430 Ås, Norway
[b]Elopak AS, Spikkestad, Norway
[c]CIGENE – Center for Integrative Genetics, Department of Mathematical Sciences and Technology (IMT), Norwegian University of Life Sciences, 1432 Ås, Norway
[d]Synthon GmbH, Heidelberg, Germany

Food industry is continuously on the look-out for new techniques for yeast and mould identification and source tracking. In particular, mould identification is difficult with current technologies, which mainly rely on visual identification. There are certain disadvantages involved in identification by visual identification: First of all, it results in a quite unspecific identification of moulds, secondly, it requires experienced staff and finally it is time-consuming. Genetic methods do not represent good alternatives since they cannot be applied to a broad spectrum of mould strains as they appear in juice production or in the food industry in general.

FTIR Spectroscopy has a clear potential to overcome the drawbacks of conventional technologies. We have during recent years developed high-throughput cultivation and sample preparation protocols for rapid FT-IR identification of yeasts and moulds [1] . The protocols are based on (1) micro-cultivation of 200 samples in parallel, (2) a partially automized liquid handling step and (3) subsequent high-throughput FTIR measurements. The aim of the present study was to test and validate the developed FT-IR high-throughput protocols for the identification of food spoilage moulds and yeasts. Spectral libraries have been built for strain collections covering food spoilage yeasts and moulds containing 59 strains of in total 11 fungal species and 97 strains of in total 22 yeasts species. All these strains were isolated from different trouble shooting incidents in the food production.

Artificial neural networks (ANNs) were used to identify the strains on both species and genus level. The ANN-based FTIR identification models were validated based on two independent experiments, performed by two different operators. The high-throughput protocols for yeasts and moulds show a high discrimination power on species and genus level.

Another asset of the developed protocols is that they allow cultivation on concerted liquid media. In order to validate the potential of an increase in discrimination power by the use of different media, the study on yeasts was performed on 5 different cultivation media and the discrimination power of each of the media was tested.

References

[1] Shapaval, V., T. Møretrø, H.-P. Suso, A. Wold Asli, J. Schmitt, D. Lillehaug, H. Martens, U. Böcker and A. Kohler, *Journal of Biophotonics* 3 (8-9), 512-521 (2010).