APPLICATION OF NIR TECHNOLOGY TO PREDICT MINOR COMPONENTS IN RAW AND PROCESSED POTATOES

I. Smit1, U. Demirel2, M. Caliskan2, B. Truberg3, K. Muders3, K. Vosmann1 and N. U. Haase1

1Max Rubner-Institut, Department of Safety and Quality of Cereals, Detmold, Germany
2Niğde Ömer Halisdemir University, Department of Agricultural Genetic Engineering, Turkey
3NORIKA Nordring – Kartoffelzucht- und Vermehrungs- GmbH Groß Lüsewitz

E-mail: inga.smit@mri.bund.de

Potato cultivars for French fries processing usually contain high amounts of starch while reducing sugars in the raw tuber should be low with respect to low acrylamide concentration in the end product [1]. Good predictions of dry matter and starch content were established by measuring the raw ground tuber using NIRS [2]. NIRS-based predictions of acrylamide precursors (reducing sugars and asparagine) in the raw material would be an advantage in quality control of industrial French fries processing [2]. Acceptable predictions for such minor components are hardly reachable [2,3]. Nonetheless, in the potato breeding process less exact predictions could be a useful complementation in the phenotyping of new breeding lines. Within a current project having been started March 2017 we try to develop a NIR-s-model as a valid screening tool in identifying potato genotypes with a low acrylamide potential. To perform the trial, a set of 185 genotypes from German and Turkish breeding programs was grown in both countries. Yet, a subset of 96 samples is analyzed, while at the project’s end the total sample number will reach 1600. As a basic requirement for model development, the quality parameters that were used as reference values show a high variation within the data set. Taking into account the size of the sample set a cross validation was performed. Besides, using non-treated spectra that seem to be well suited for the dry matter content (R² of calibration and prediction of 0.97 and 0.96, respectively), the first and second derivatives were used to model the prediction of the minor components. Mathematical pre-treatments were able to improve the model indices: for glucose the R² of calibration and prediction were 0.85 and 0.59 (1st derivative) and for acrylamide the R² of calibration and prediction were 0.91 and 0.41 (2nd derivative). The small data set indicates capabilities of NIR technique as a screening tool for breeding purposes. Satisfactory information should be taken from a larger data set by the project’s end in 2020.

References

Acknowledgement
We thank the Federal Ministry of Education and Research (project funding reference number 01DL17001A) and the Scientific and Technological Research Council of Turkey for the financial support.