

NIRS-based detection of pyrrolizidine alkaloid containing weeds in crop plants after harvest – PA-NIRSort

Nanina Tron¹, Georg Maier², Henning Schulte² and Andrea Krähmer¹

¹ Julius Kühn Institute, Institute for Ecological Chemistry, Plant Analysis and Stored Product Protection, Berlin

² Fraunhofer-Institut for Optronics, System Technologies und Image Exploitation (IOSB), Karlsruhe

E-mail of corresponding author: nanina.tron@julius-kuehn.de

The general objective of the project is the development of an efficient sorting system based on hyperspectral near-infrared spectroscopy (NIR) for the detection and separation of impurities by pyrrolizidine alkaloid (PA)-containing plant derived contaminations in cultural plants, e.g. medicinal and aromatic plants. PAs are liver-toxic secondary metabolites in plant defense and are known for causing seneciose in grazing animals. By now, the German Federal Institute for Drugs and Medical Devices (BfArM) has published strict PA maximum contents for phytopharmaceutical products as eg. Teas which can be contaminated with PA-containing weeds such as various types of ragwort, groundsels, common viper's head, common comfrey, common dog's tongue, water-east or borage and thus potentially endanger consumers. Due to these strict limits, four to five PA-containing plants of the species *Senecio vulgaris* may be sufficient to destroy one ton of medicinal drug.

The planned process will analyze fresh and dried plant material on a flat conveyer using hyperspectral NIR spectroscopy to detect impurities in the crop. After identification, contaminants should be removed by a sorting technique, e.g. using compressed air pulses.

Similar systems have already been established in plastic waste sorting and quality control, for example for grapes. The aim is to achieve a high throughput of up to five tons of harvested crop within three to four hours. With such an automated sorting technology, the health risks posed by PA-contaminated medicinal plant products could be reduced ecologically and economically efficient for cultivation and processing of medicinal plants. This would also mean safeguarding high-quality and competitive plant derived drug production in Germany.

First results show that a classification of target plant species and contaminating *Senecio* using NIR spectroscopy is generally possible. In order to be able to carry out such image analyses in real time, the amount of data to be processed will be reduced to the decisive factors by means of multifactorial data analysis.

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