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POTENTIAL OF NIRS FOR SUPPORTING BREEDING AND CULTIVATION OF MEDICINAL AND SPICE PLANTS

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Whereas NIR spectroscopy has been applied in agriculture for more than 20 years, few studies refer to those plant substances occurring only in smaller amounts. Nevertheless there is a growing interest today to support efficiently activities in the production of high-quality medicinal and spice plants by this fast and non-invasive method. Therefore, it was the aim of this study to develop new NIR methods for the reliable prediction of secondary metabolites found as valuable substances in various plant species.

First, sophisticated NIR methods were established to perform fast quality analyses of intact fennel, caraway and dill fruits deriving from single-plants [1]. Later on, a characterization of several leaf drugs and the corresponding fresh material has been successfully performed. In this context robust calibrations have been developed for dried peppermint, rosemary and sage leaves for the determination of their individual essential oil content and composition [2]. A specially adopted NIR method has been developed also for the analysis of carnosic acid in the leaves of numerous rosemary and sage gene bank accessions. Carnosic acid is an antioxidative substance for which several health promoting properties including cancer preservation are assumed. Also some other calibrations have been developed for non-volatile substances such as aspalathin (in unfermented rooibos leaves), catechins (in green tea) and echinacoside (in different Echinacea species) [3]. Some NIR analyses have also been successfully performed on fresh material, too. In spite of the fact that these measurements showed less accuracy in comparison to dried samples, the calibration equations are precise enough to register the individual plant ontogenesis and genetic background. Based on the information received, the farmers and breeders are able to determine the right harvest time (when the valuable components have reached their optimum profile) and to select high-quality genotypes during breeding experiments, respectively. First promising attempts have also been made to introduce mobile diode array spectrometers to collect the spectral data directly on the field or in the individual natural habitats.

Since the development of reliable NIRS methods in this special field of application is very time-consuming and needs continuous maintenance of the calibration equations over a longer period, it is convenient to supply the corresponding calibration data to interested user via NIRS network. The present status of all activities, preformed in this context during the last three years, will be presented in detail.

1. H. Schulz, R. Quilitzsch, H. -H. Drews, H. Krüger: Estimation of minor components in caraway, fennel and carrots by NIRS - comparison of results from dispersive and fourier-transform instruments. *Int. Agrophyscs* 14, 249-253 (200).
2. H. Schulz, H. -H. Drews, H. Krüger: Rapid NIRS determination of quality parameters in leaves and isolated essential oils of mentha species. J. Essent. *Oil Res.* 11, 185-190 (1999).
3. H. Schulz, U. E. Engelhardt, A. Wegent, H. -H. Drews, L. Lapczynski: Application of near-infrared reflectance spectroscopy to the simultaneous prediction of alkaloids and phenolic substances in green tea leaves. *J. Agric. Food Chem.* 47, 5064-5067 (1999).