

DETECTION OF PHYSIOLOGICAL PROCESSES IN WHEAT BY NIR

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Fast and dynamic biochemical, enzymatic and morphological changes occur during the so-called generative development and during the vegetative processes in seeds.

The most characteristic biochemical and compositional changes of this period are the formation and decline of storage components or their precursors, the change of their degree in polymerisation and an extensive change in water content.

The aim of the present study was to detect the maturation processes in seed nondestructively and to verify the applicability of near infrared spectroscopic methods in the measurement of physiological, chemical and biochemical changes in wheat seed.

The amount and variation of different water "species" has been changed intensively during maturation.

Characteristic changes of three water absorption bands (1920, 1420 and 1150 nm) during maturation were analysed. It was concluded that the free/bound transition of water molecules could be followed sensitively in different region of NIR spectra.

Kinetic changes of carbohydrate reserves were characteristic during maturation. An intensive formation and decline of carbohydrate reserves were observed during early stage of maturation (0 -13 days, high energy demand). An accelerated formation of storage carbohydrates (starch) was detected in the second phase of maturation. Five characteristic absorption bands were analysed which were sensitive indicators the changes of carbohydrates occurred during maturation.

Precursors of protein synthesis and the synthesis of reserve proteins and their kinetic changes during maturation were followed from NIR spectra qualitative and quantitatively. Dynamic formation of amino acids and the changes of N forms were detected by spectroscopic, chromatographic and by capillary electrophoresis methods.

Calibration equations were developed and validated in order to measure the optimal maturation time protein and moisture content of developing wheat seeds.

The spectroscopic methods are offering chance and measurement potential in order to detect fine details of physiological processes. The spectra have many hidden details, which can help to understand the biochemical background of processes.