APPLICATION OF MICROSPECTROSCOPY TECHNICS TO CEREAL CHEMISTRY *in situ*

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Abstract

Microspectroscopy is a technique which combines the microscope with the spectroscope. During the last 15 years, the use and capabilities of NMR, UV and FTIR microspectroscopy in biology and material science have increased, including applications to plant and cereal science. UV microspectroscopy covers the range 160 to 400 nm of light spectrum and Mid-infrared spectroscopy covers the range of electromagnetic spectrum from ~25,000 – 2,500 cm^{-1}, and is associated with the rotational-vibrational structure of molecules. We apply UV microspectroscopy to localize/map isoflavones, β-glucans, proteins in cereal grains (fig.1).Using synchrotron powered FTIR microspectroscopy, we have mapped/localized *in situ* some of the major chemical components (proteins, lipids and carbohydrates) in different tissues of cereal grains and mature soybean seeds. Improvements in FTIR microscopy have increased the spatial resolution, such that a single cell can be mapped, and even take a spectrum from not obstructed cell wall. The protein secondary structure of soluble and storage proteins and their distribution within tissues will be discussed [1]. FTIR microspectroscopy has also been applied to study gluten formation during dough mixing and correlated with farinograph data. Combination of NMR microimaging and FTIR microspectroscopy data (fig.2) allows us to explain the pattern of water movement during imbibition processes in soybean seeds.

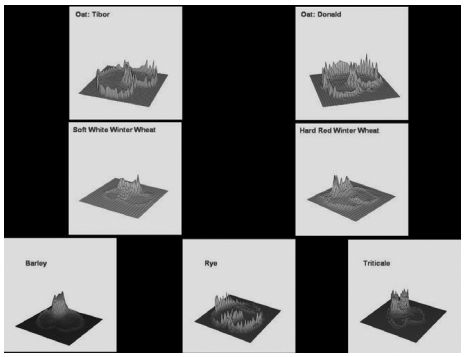

Fig1. Distribution of flavonoids in some cereals

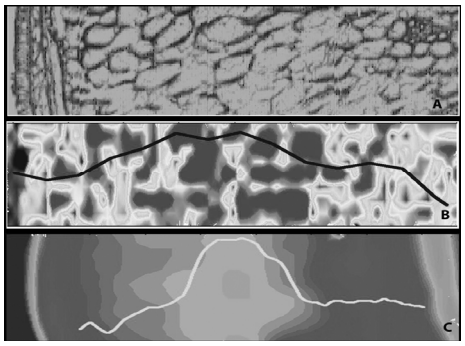

Fig2. Distribution of proteins (FTIR @1655cm^{-1}) – B; water (NMR) – C in soybean cotyledon (bright field image) - A

References:

[1]. L.N. Pietrzak, S.S. Miller, "Microchemical structure of soybean seeds revealed *in situ* by spatially resolved synchrotron FTIR microspectroscopy", *J. Agric. Food Chem...* **53,** 9304-9311, (2005)