



Canadian Light Source
Centre canadien de rayonnement synchrotron



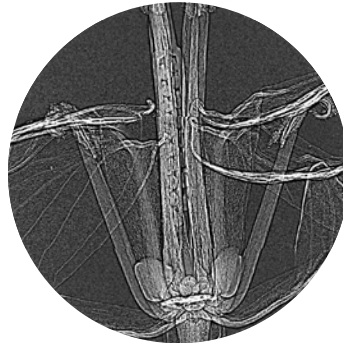
Bringing the power of synchrotron-based techniques to agriculture science and research.

www.lightsource.ca
agriculture.lightsource.ca



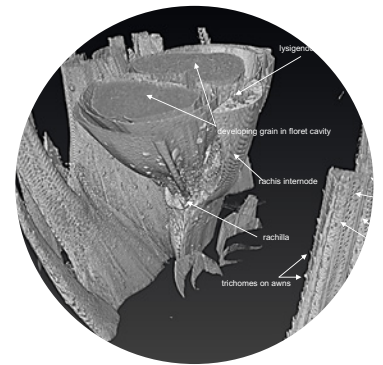
Crop Development:

Synchrotron-based techniques provide unique ways to assess plant chemophenotypes and support modern crop development. Imaging technologies and tools allow detailed analysis of physical tissue structures as well as localization of macro and micro nutrients to relate to the performance of new crop varieties and support plant phenotyping.



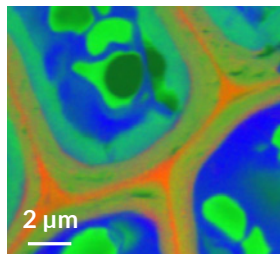
Crop Disease:

Highly sensitive synchrotron imaging allows the quantification and analysis of infected plant tissues before they are externally visible. The CLS also provides novel ways to assess the performance of new disease treatments and tolerance mechanisms of infection-resistant genotypes, saving significant time and effort in the development process.



Agri-Biproduct Characterization:

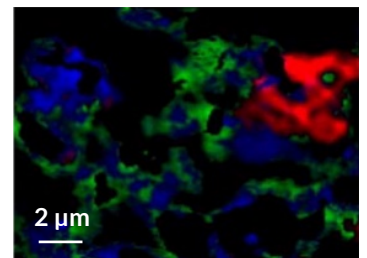
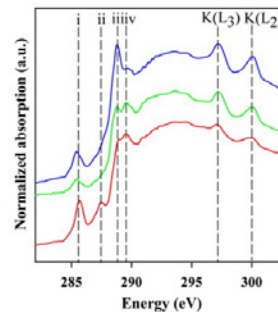
Synchrotron-based microstructure analysis and chemical imaging provide unique insights into a variety of agri-biproducts, everything from commercial food products to plant-based fibres to animal feeds and biofuels.



Lignin Cellulose Resin

Soils and Soil-Root Interaction:

A variety of synchrotron-based techniques allow detailed soil composition and mineralogy analysis for both agriculture and land use management.



Carbon spectromicroscopy of thin soil sample

The Canadian Light Source synchrotron is a national research facility located on the campus of the University of Saskatchewan that offers innovative and unique-in-Canada infrastructure and support for research. Synchrotron-based techniques help scientists probe the nature and structure of molecules and materials, making the CLS a valuable tool for both academic and commercial clients.

TECHNIQUES

Computed Tomography (CT) provides internal 3D structures of samples from micron to sub-micron scale resolution. Synchrotron CT is many times faster and more sensitive than lab-based CT, providing good contrast to soft tissues including plant materials.

Macromolecular crystallography (MX) is the most used technique by private-sector clients at the CLS. MX provides high-resolution structural models of proteins and other large biomolecules.

X-ray-absorption spectroscopy (XAS) and spectromicroscopy is an extremely powerful technique that provides detailed chemical information on specific elements (e.g. B, C, N, O, Na, Al, Si, P, S, K, Ca, Mn, Fe, Cu, Zn, Se, etc.) on bulk samples or localization of different elements or compounds on thin samples at micron to nanoscale spatial resolution.

Infrared spectroscopy and spectromicroscopy is sensitive to organic molecules (protein, lipid, fiber, starch, phytic acid, carotenoid, lignin, cellulose, hemi-cellulose, pectin, etc.) and can be used to determine the presence and localization of these molecules in bulk or on thin section samples at micron scale resolution.

SYNCHROTRON ADVANTAGES

- **Non-destructive analysis**
- **No sample manipulation or preparation before analysis**
- **Detection of low concentrations of elemental forms**
- **Fast and in-situ data collection for dynamics measurements**

SERVICES

Options are customized to meet the needs of clients, including project design, sample preparation, data collection, analysis and report writing.

Industry Access

The option for industry clients to purchase access offers quick and accurate solutions to proprietary questions. Scientists develop an experimental outline based on the client's needs and conduct all data collection and analysis, resulting in a detailed report with key answers to the client's questions.

Academic Access

Academic clients can submit proposals twice a year for peer review which, if successful, are granted beamtime. For rapid results, there is an option to purchase access to instruments and beamtime.



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The Canadian Light Source is a national research facility of the University of Saskatchewan.



CASE STUDY

Saskatchewan, the leading Canadian exporter of peas, was responsible for 37 per cent of the world's pea exports in 2012.

Heat stress, which can disrupt a plant's ability to reproduce, has become a major agricultural issue worldwide as average temperatures rise. A research team from the University of Saskatchewan and the CLS was able to identify traits related to heat tolerance in two pea varieties using infrared imaging, and found that heat stress negatively affected pollen germination, pollen tubes, pod length and seed number across both varieties.

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