HELPING FARMERS

UNDERSTANDING SENSITIVE SOILS TO IMPROVE WATER QUALITY

Researchers from the Swedish University of Agricultural Sciences used the SXRMB beamline at the CLS to study the impact of phosphorous on sensitive soils and local aquatic systems. Phosphorous runoff increases nutrients within aquatic systems that feed algal blooms. Algal blooms can impact human health and wildlife as well as the economies of affected communities reliant on fishing and tourism. Synchrotron imaging enabled the researchers to identify important compounds that govern phosphorus absorption or release. The study could lead to better agricultural practices, ensuring that special attention is given to phosphorous use, especially on sensitive soils.

DOI: 10.1007/s10192-023-10290-6

BETTER VACCINES FOR PORK PRODUCERS

Porcine reproductive and respiratory syndrome virus (PRRSV) causes severe disease in pigs, leading to significant economic losses for pork producers across the globe. It's estimated that PRRSV costs the Canadian pork industry $130M annually. Using the CMCF beamline, researchers from the University of Manitoba and the Leiden University Medical Centre (Netherlands) were able to see the structure of the PRRSV protease, a type of protein the pathogen uses to suppress a host's immune system. The vital information they uncovered can be used to develop new vaccines against PRRSV and could also help inform development of vaccines against emerging human viruses.

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FIGHTING FOOD WASTE

Spoiled grain represents a huge pool of potential food that could help feed a growing global population. Researchers from the University of Manitoba used the CLS to peer inside the grains of different varieties of hard durum wheat, to identify signs of spoilage and resistance. The synchrotron enabled them to study not only the external markers of spoilage, but also internal changes in structure and nutritional value. Their work will help plant breeders develop better varieties that resist spoilage and maintain nutritional content longer, and help farmers and storage managers maintain the longevity of harvested wheat.

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FINETUNING FERTILIZERS

Worldwide, many agricultural soils are deficient in the nutrient zinc – despite the fact that farmers use fertilizers enriched with the element. This limits crop yields and reduces food quality. Researchers from the University of Adelaide discovered that lowering a fertilizer's pH by spraying the granules with an acid solution increases the solubility and availability of zinc. They also found that adding a barrier coating to fertilizer granules, to separate the zinc from the phosphate, increased plants' uptake of zinc. The Mosaic Company, which funded this research, has already patented both of these new technologies in conjunction with the Fertilizer Technology Research Centre.

DOI: 10.1002/agj2.20994

OUTSMARTING CROP-MUNCHING PESTS

Worldwide, farmers lose up to 40% of their crops to insects. Researchers from Agriculture and Agri-Food Canada are exploring how to use nanotechnology to target only the "bad" bugs without harming other helpful insects. Their goal is to replace pesticide sprays with precise treatments based on each pest's DNA. The scientists used the CLS to create highly detailed X-ray images of cutworms and lygus bugs to see how pesticides get into their body and where they accumulate. This innovative approach could help boost Canada's $142 billion farm business while protecting beneficial bugs and the environment.

DOI: 10.1139/cjp-2024-0246

DEVELOPING CRAVE-WORTHY VEGAN MEATS

Plant-based meat substitutes have grown in popularity. However, they are still knocked for becoming dried out when cooked and lacking the mouthfeel of real meat. Researchers from the University of Guelph used synchrotron light to develop two new approaches for ensuring these alternatives retain oil during cooking and have the texture we associate with ground beef. One method involved freeze-drying small pieces of vegetables to remove moisture, then filling the empty pores with oil. The second used a gel made of pea starch, chickpea flour and oil; adding this gel to plant-based products provided the chew and oil retention of ground beef.

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SUSHI FOR COWS

Climate change is forcing producers to rethink long-held assumptions about livestock nutrition. Researchers from Agriculture and Agri-Food Canada discovered that cows can digest a very non-traditional food for them – seaweed. They found the animals have special microbes that activate when they eat new foods. While seaweed is too expensive to replace regular feed, it could potentially be used in small amounts as a supplement, to help keep cows healthier. This research also suggests that farmers could in time transition to unconventional – but more sustainable – feed sources that take advantage of the natural abilities already inside animals' digestive systems.

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