GLOBAL FOOD SECURITY

PEELING BACK THE (ONION) LAYERS ON DROUGHT & DISEASE

University of Saskatchewan researchers used synchrotron light to literally peel back the cell walls of onions to help plants better withstand the stresses caused by climate change and disease. By studying onions, the team could easily peel away a single layer of cells and see the changes in the cell wall– a plant structure key to protecting against stresses of various kinds. Their project explored how calcium and boron play a beneficial role in strengthening plant cell walls, helping reduce the dehydration that comes with freezing and drought and increasing resistance to pathogens.

DOI: 10.3390/plants11060885.

ADDRESSING HIDDEN HUNGER IN DEVELOPING COUNTRIES

Millet, the grain, packs a bigger nutritional punch than grains like rice, wheat, and corn, it's easier to grow, and it's more tolerant of increasingly common drought conditions. Using the CLS, researchers from Agriculture and Agri-Food Canada – with partners in India – explored why millet is so efficient at taking up micronutrients from the soil. They looked at what millet's genes are doing at different stages – from when it first sprouts to when it makes seeds, then compared this data with genetic information from other grains. What they learned could help develop forms of other crops such as barley and wheat.

DOI: 10.1111/tpj.16749

FASTER-COOKING PULSE CROPS

According to Pulse Canada, Canada is one of the world's largest pulse producers, and the largest exporter, as over 80 per cent of the pulses grown are shipped internationally. Researchers from the University of Manitoba have developed a simple technique to reduce cooking time for lentils and chickpeas by exposing the to microwaves during the drying process. Exports of these crops are growing, as appetite for lentils, peas, and chickpeas increase in places like India, where they are an important source of dietary protein. Using advanced imaging techniques, the team could pinpoint how proteins, carbohydrates, and fats shifted due to treatment, indicating exactly how faster cooking times could be achieved to make pulses easier to cook with.

DOI: 10.1080/10942912.2016.1163578

USING CHICKEN MANURE AS FERTILIZER

An international collaboration between researchers from Brazil and the United States has identified a process for turning poultry waste into a soil additive for agriculture. The scientists heated the poultry manure to convert it to biochar, a carbon-rich substance that is used as a soil additive to replenish critical nutrients like phosphorus. Poultry manure is full of calcium and requires higher temperature treatments to turn the waste into biochar, however, these higher temperatures reduce the amount of phosphorus available. To protect the phosphorus and ensure the resulting biochar contained sufficient phosphorus in a soluble form, the researchers enriched it with another mineral, magnesium. The team used CLS beamlines to visualize the connection between phosphorus and magnesium. While phosphorus reserves are found across the globe, the nutrient is a finite resource.

DOI: 10.1016/j.chemosphere.2023.138759

TAKING THE STRESS OUT OF GROWING CORN

Global warming is bringing longer growing seasons, allowing producers to expand the types of crops they cultivate. While this can be a benefit, a longer growing season increases the risk of environmental stressors, like frost and cool overnight temperatures. Researchers from the University of Saskatchewan investigated how the first frost impacts corn varieties, in the hopes of finding new ways to maximize crop yields. The team was particularly interested in the cuticular layer of the plant, a defensive barrier that acts like the plant's skin. They found that the cool temperatures preceding the first frost influence the composition and quantity of the plant's cuticle layer, making it more susceptible to freezing temperatures.

DOI: 10.1111/ppl.13902

MORE SUSTAINABLE RICE CROPS

Rice farmers depend on phosphorous fertilizers to maximize their yields of this major staple food, which helps nourish more than half of the world's population. However, there is a finite supply of the nutrient available to be mined. Researchers examined soil samples from paddies in China to better understand how and why silicon and phosphorus bond to soil. They found silicon-based fertilizers can reduce the need for phosphorus in rice farming, making the industry more sustainable.

DOI: 10.1038/s41598-022-26865-4