Biodegradable coating to help achieve food security

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Associate Professor David Leung's biodegradable coating can help achieve food security in an environmentally friendly and consumer-conscious way. Credit: University of Canterbury

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achieve food security in an environmentally friendly and consumer-conscious way.

Biotechnology Associate Professor David Leung, in Te Rāngai Pūtaiao College of Science, is working on a nontoxic, biodegradable coating to protect edible plants against diseases, pests and environmental hazards, including the effects of climate change.

The research could prove vital in protecting plant food without compromising consumer health. Because the coating is biodegradable, it would also provide an environmentally sustainable solution and avoid the negative impacts of agrochemicals commonly used to protect plants.

In addition to being ecofriendly, the coating is nontoxic, which Associate Professor Leung says is key to protecting the people consuming the end product.

"It is counterproductive to protect plants using toxic methods. Even though you may provide security for a food source, you are still missing the mark if you have contaminated the environment you are growing the plants in during the process and delivering a food product with toxic residues," says Associate Professor Leung.

"It's not just about the quantity of food that we care about; it is also about producing safe food that doesn't harm the surrounding environment."

Non-degradable pesticides, herbicides and biocides can damage the surrounding environment by contaminating soil, water, turf and other vegetation. Although they are effective in killing insects, they can be toxic to a host of other organisms, including humans.

"There is a demand for environmentally sustainable ways of doing things

and, in food production, it is important because we cannot continue using these chemicals without causing major, long-term harm to the planet," Associate Professor Leung says.

"We believe the public, the people consuming the food, will appreciate this option because it is safer and more environmentally friendly."

Producing a safe solution

Associate Professor Leung explains that if toxic chemicals are used to protect crops over a long period, those substances will destroy the surrounding elements, which are critical to supporting the plant's life process. Furthermore, toxic residues can accumulate in the local environment, resulting in long-term damage to the ecosystem.

"Copper sulfate is a classic case. For example, the avocado industry—without copper sulfate, there is no avocado industry."

Avocados are just one example of fruits and vegetables protected using chemicals such as copper sulfate. A variety of agrochemicals is used every day to harvest nearly all of the world's commercial produce.

"Right now, we have to use these undesirable substances or we simply would not be able to harvest enough food to support the world's needs. This is why we need to have another option—a safer and more sustainable option."

Potentially harmful substances are not only used during harvesting but also are applied to protect food being stored and shipped to overseas markets. The coating will also be adaptable to protect foods post-harvesting.

"This biodegradable coating can also be adapted to solve post-harvest

challenges, including storage and shipping."

Additionally, a large amount of food around the world is wasted due to improper storage, another problem that the biodegradable coating has the potential to address.

According to the Food and Agriculture Organization of the United Nations, "roughly one third of the food produced in the world for human consumption every year—approximately 1.3 billion tonnes—gets lost or wasted."

Associate Professor Leung agrees. "Food spoilage is a serious problem and this could potentially be used to combat that. This is another real-world impact we are thinking about."

The research began after Associate Professor Leung was awarded a Tech Jumpstart Award grant in 2017, as part of UC's annual competition that helps researchers turn their ideas into commercial reality. The project is funded until October 2019 and, while he has already created a useable solution, Associate Professor Leung hopes to acquire more funding to keep building on his current idea.

Associate Professor Leung is continuing to evolve the coating into one that will have broad use in the agricultural industry. In conjunction with the commercialization team, Associate Professor Leung is currently working on further improving the coating to make it as appealing to investors as possible, an important step in bringing his work to the public.

"We have already come up with a patentable formulation; however, we are continuing to work on enhancing it to ensure the most effective and impactful product is brought to market."

Provided by University of Canterbury