PoC Project: Crop by-product processing into nanomaterials incorporating bioactives for targeted release and shelf life extension

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The Challenge
Some food processing by-products are often considered to be waste, however, they have the potential to generate income, rather than being a cost-burden. In this project we wanted to find out if we could manufacture nano-materials from crop by products and incorporate them into a film, with anti-microbial and anti-oxidant properties, that can be used to extend shelf life of food products.

Project Goals
Our short term goal was to evaluate materials derived from agri-food wastes for non-fossil fuel derived active food packaging and smart labels. We also need to investigate the films’ safety, performance (shelf life) and consumer acceptance when used for food packaging.

In the longer term, we are working towards the exploitation of agri-food by-products as a source of valuable biomaterials and to replace current packaging based on oil-derived polymers. This is part of a wider project to demonstrate that safe, biodegradable or compostable commercial products can be manufactured from these sources that provide comparable performance and shelf life. Ultimately, this will reduce environmental impact and enable progression towards the circular bioeconomy.

Conclusions
• We were able to use agri-food by-products to produce nanofiber films with packaging applications.
• The films exhibited anti-microbial activity which would aid control of spoilage-microorganisms or food pathogens.
• Some anti-oxidant activity was observed that would slow the deterioration of food.
• Encapsulation of a range of substances by the nanofiber films could be exploited to extend the range of applications beyond bio-based active food or feed packaging.

Project outputs
• We are currently preparing a publication.
• We obtained internal funding to extend the initial work of this project and evaluate effect on the shelf life of food.
• We obtained PhD funding (industry/academia partnership) to characterise materials derived from agri-food partnership and explore their packaging applications.
• We were also awarded a Commonwealth Scholarship to develop bio-based packaging.
• The project has helped catalyse multi-disciplinary collaborations within the University and interaction with businesses. Further collaboration to explore the potential of new agri-food waste streams is in progress.

We have established a novel trans-disciplinary collaboration with a diverse scientific and technical skill-set and with industry input. This has accelerated the research required for exploitation of agri-food by-products for food packaging and provided a broad range of insights into the strategies required for successful commercial exploitation.

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