RESEARCH ADDS VALUE TO CANE BY-PRODUCTS

The global demand for probiotics for human consumption is growing rapidly on the back of an increasing understanding of their contribution to health.

At the same time, the use of probiotics in livestock production is experiencing growth and has been predicted by some analysts to reach a value of US$7 billion by 2025, up from about US$4.6 billion currently. This growth follows recognition and understanding of the role they can have in improving feed conversion.

Recognising this potential market opportunity, research has been underway for the last three years looking at the creation of feed additives from agricultural by-products, including molasses and bagasse. Readers of *Milling Matters* may be familiar with this research into identifying probiotics that can be generated from sugarcane by-products.

However, the research team at QUT are taking a further step with this research activity in their quest to understand the best possible animal feed that could be created from cane by-products.

QUT PhD student Ms Most Sheauly Khatun is working on research under the supervision of Dr Zhanying Zhang to identify products called prebiotics that could be created by using sugarcane by-products. Prebiotics are compounds that can create an environment to promote the growth of beneficial bacteria including probiotics, thus improving feed digestion and animal health.

The research is another way of further upgrading the feed value of a product such as molasses.

Ms Khatun's work is investigating the use of microbial enzymes for converting molasses to a mixture of compounds called fructo-oligosaccharides (FOS) which are already understood as prebiotic compounds for human consumption.

"Molasses as a feed product is quite low value. But if we can upgrade it to a more functional feed additive, this would increase the value significantly," she said.

The research is also looking at how to produce the enzymes using the molasses based-medium through fermentation as well as how the prebiotics (FOS) promote the growth of potential feed probiotics.

"There is already an understanding of the benefits of prebiotics. We are providing more evidence specific to our industries within the project, and determining an economic process for delivering the product."

Prior to taking on the PhD at QUT, Ms Khatun worked at the Department of Chemical Engineering at Jessore University of Science Technology in Bangladesh. ■

(Above) *Ms Most Sheauly Khatun is working within the Biorefineries for Profit project.* ***Picture by Anthony Waite, QUT.***

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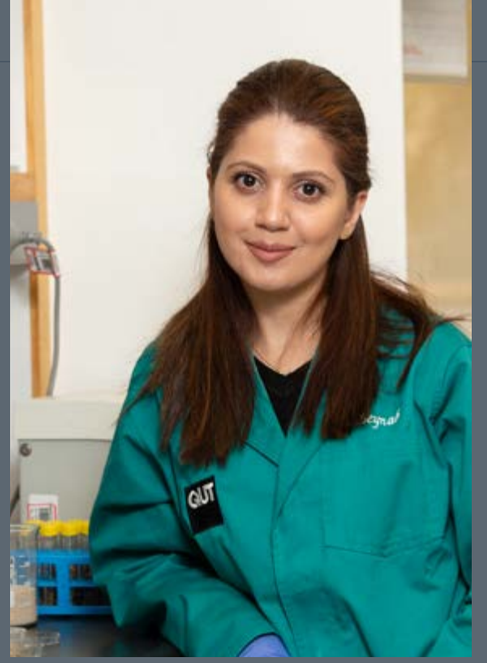
The *Biorefineries for Profit* project is funded by SRA and the Australian Government Department of Agriculture through the Rural R&D for Profit Program.

Australian Government
Department of Agriculture

RESEARCH LOOKS TO PUT SOME NUTRITIONAL PUNCH INTO BAGASSE



When it comes to feeding livestock, bagasse isn't much better than cardboard.

Sure, livestock can eat it, but it contains a very high proportion of fibre and not much else, so it can only make up a small part of a complete feed ration.

But what if there were ways to make bagasse more digestible and nutritious for livestock?

For the last three years, researchers at QUT have been working to convert sugarcane bagasse into higher-value products including animal feed, feed supplements, aviation fuel, and chemicals as part of the *Biorefineries for Profit* project.

Ms Zeynab Amini is completing a PhD in the *Biorefineries for Profit* project on the conversion of bagasse into a more nutritious and digestible animal feed.

Pre-treated bagasse has higher digestibility but, even after it's been pre-treated, it isn't a complete animal feed and protein is needed to make pre-treated bagasse a complete feed.

"There are two main issues with bagasse," Ms Amini explained. "The first is low digestibility. And the second is nutrition, especially protein content."

"Pre-treatment improves the digestibility. My work is aimed at understanding how to increase the protein content."

Through her work, she has tested how well micro-organisms use the carbohydrates in the bagasse to grow and what that does to the overall nutritional content.

Readers of *Milling Matters* would appreciate that plenty of micro-organisms are happy to grow on bagasse piles – especially in the wet tropics. Of course, none of these is suitable for animal feed. The micro-organisms that Ms Amini is using were carefully chosen to be completely safe for consumption.

Her work began with 16 different filamentous fungi and yeast, all of which can be safely eaten by livestock, and testing their growth in the laboratory in liquid culture.

As the micro-organisms grew, they produced protein. "We tried to add more value by adding low-cost nitrogen sources like ammonium-sulphate or urea. That way, the micro-organisms used both the carbohydrates and the nitrogen, and they grew much better."

Ms Amini and the research team made a careful assessment of how the micro-organisms grew, what they grew on, how they grew over time, and how productive they were.

This led to the identification of the two micro-organisms which had the highest capacity to increase the protein content of bagasse-based feed.

Following the submerged fermentation tests, the work progressed to solid-state culture, which involved growing the two best micro-organisms directly on pre-treated bagasse and is a step closer toward understanding the adoption of the technology at a broader scale.

Dr Mark Harrison at QUT is one of the lead researchers on the *Biorefineries for Profit* project and is working closely with Ms Amini. He said the research was creating exciting opportunities for the industry.

"Zeynab has worked very hard and been very thorough, and we can confidently say that we have identified the best micro-organisms," Dr Harrison said. "We know that we can't extrapolate results from a test tube in the lab to a factory, so we are transitioning into solid state fermentation and from there it is a relatively quick transition to pilot-scale experiments."

"This work has the potential to change how we look at bagasse. A lot of Australia is still in drought and farmers are looking for livestock feed wherever they can get it, and that means looking for feed from unconventional sources like bagasse."

"As a feed, untreated bagasse is pretty poor, but with a few tweaks and after fermentation, we can make it into an almost complete feed at a time when it is really needed." ■

(Above) Ms Zeynab Amini is completing her PhD at the Queensland University of Technology working within *Biorefineries for Profit* project. ***Picture by Anthony Waite, QUT.***

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