Turning winery waste into biofuels

September 23 2014, by Lea Kivivali

Researchers at Swinburne University of Technology have developed a technique for converting winery waste into compounds that could have potential value as biofuels or medicines.

Australia is the world's sixth largest wine producer, with around 1.75 million tonnes of grapes crushed for wine every year. After the final pressing, more than half of the grapes crushed end up as biomass waste comprised of skins, pulp, stalks and seeds.

Unlike other agricultural by-products, this waste has limited use as animal feed due to its poor nutrient value and digestibility. It is also not suitable as compost because it doesn't degrade. Thus a majority of this grape waste ends up as toxic landfill.

As part of his PhD research, Swinburne student Avinash Karpe has been investigating how to break down this woody material composed of cellulose, pectins and lignins into simpler compounds that can be used to create other things such as ethanol or other biofuels.

He performed a series of experiments to develop the best procedure for degrading winery biomass waste.

"Various fungi are known to degrade this waste by generating an array of enzymes," Mr Karpe said. "These enzymes convert the waste to soluble sugars which can then be converted into other products."

He discovered that a 30-minute heat activated pretreatment aided in the

breakdown of these biomolecules.

Using a 'cocktail' of four fungi – Trichoderma harzianum, Aspergillus niger, Penicillium chrysogenum and Penicillium citrinum, in a one litre bioreactor, Mr Karpe succeeded in breaking down the biomass, with noticeable increases in enzyme activity and lignin degradation.

This fermentation process takes one to three weeks and produced alcohols, acids and simple sugars of industrial and medicinal interest.

"We have demonstrated this technique in the laboratory, but this process can be scaled up to an industrial scale," Chair of Swinburne's Department of Chemistry and Biotechnology, Professor Enzo Palombo, said.

The Swinburne researchers worked with CSIRO on this research with material obtained from Australian Wine Research Institute in SA.

This research has been published in the *Journal of Chemical Technology and Biotechnology*.

More information: Karpe, A. V., Beale, D. J., Harding, I. H. and Palombo, E. A. (2014), "Optimization of degradation of winery-derived biomass waste by Ascomycetes." J. Chem. *Technol. Biotechnol.*. DOI: 10.1002/jctb.4486, Partly submitted: Annual Scientific Meeting and Exhibition, Australian Society for Microbiology, Melbourne, Australia. 6–9 July 2014

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