Agricultural waste could be used as biofuel

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Straw-powered cars could be a thing of the future thanks to new research from the University of East Anglia (UEA).

A new study pinpoints five strains of yeast capable of turning agricultural by-products, such as straw, sawdust and corncobs, into bioethanol - a well-known alcohol-based biofuel.

It is estimated that more than 400 billion litres of bioethanol could be produced each year from crop wastage.

The research team say that their findings could help to create biofuel which is more environmentally friendly and ethically sound than other sources because it would make use of waste products.

Processes to generate bioethanol from straw and other by-products are currently complex and inefficient.

This is because high temperatures and acid conditions are necessary in the glucose-release process. But this treatment process causes the waste to breakdown into compounds which are toxic to yeast (furfural and hydroxymethylfurfural) – making fermentation difficult.

One way to avoid these problems is to use genetically modified yeasts, but this new research has found five strains of naturally occurring yeasts which could be used successfully in the fermentation process.

Lead researcher Dr Tom Clarke, from UEA's School of Biological

Sciences, said: "Dwindling oil reserves and the need to develop motor fuels with a smaller carbon footprint has led to the explosion of research into sustainable fuels.

"Bioethanol is a very attractive biofuel to the automotive industry as it mixes well with petrol and can be used in lower concentration blends in vehicles with no modifications. In Brazil, vehicles which run purely on bioethanol have been on the roads since 1979.

"Breaking down agricultural waste has previously been difficult because many strains of yeast necessary for fermentation are inhibited by compounds in the straw. Their toxic effects lead to reduced ethanol production."

The research team investigated more than 70 strains of yeast to find the most tolerant. They found five strains which were resistant to the toxic compound furfural, and which produced the highest ethanol yield.

Of the five furfural tolerant strains S. cerevisiae NCYC 3451 displayed the greatest furfural resistance. The genomic lineage of this strain links it to yeast used in the production of the Japanese rice wine Sake.

"These strains represent good candidates for further research, development and use in bioethanol production," added Dr Clarke.

The research was carried out in collaboration with the Institute of Food Research (IFR) and the National Collection of Yeast Cultures, which is based at the IFR. It was funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and the Department for Environment, Food & Rural Affairs (Defra).

'Identification of furfural resistant strains of Saccharomyces cerevisiae and Saccharomyces paradoxus from a collection of environmental and

industrial isolates' is published in the journal *Biotechnology for Biofuels*.

More information: "Identification of furfural resistant strains of Saccharomyces cerevisiae and Saccharomyces paradoxus from a collection of environmental and industrial isolates" *Biotechnology for Biofuels* 2015, 8:33. DOI: 10.1186/s13068-015-0217-z

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