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Pentose sugars as a fermentation substrate: From waste to plate

Megan H Hargreaves
Queensland University of Technology, Australia

Lignocellulosic materials, such as sugar cane bagasse, a waste product of the sugarcane processing industry, agricultural residues and herbaceous crops, may serve as an abundant and comparatively cheap feedstock for large-scale industrial fermentation, resulting in the production of marketable end-products. However, the complex structure of lignocellulosic materials, the presence of various hexose and pentose sugars in the hemicellulose component, and the presence of various compounds that inhibit the organisms selected for the fermentation process, all constitute barriers that add to the production costs and make full scale industrial production economically less feasible. Our study was conducted in order to screen naturally occurring microorganisms for their ability to utilize pentose sugars such as those present in sugar mill industrial waste. A large number of individual bacterial strains were screened from hemi-cellulose rich material collected at the Proserpine and Maryborough sugar mills (Queensland, Australia), notably soil samples from the mill sites. Several strains of bacteria from the actinomycetes group were found to be pentose-capable. Pentose degrading microbes are very rare in the environment, so this was a significant discovery. Previous research indicated that microbes could degrade pentose after genetic modification but the microbes discovered in this research were able to naturally utilize pentose. Using high performance liquid chromatography (HPLC), it was found that all of the organisms produced arginine and cysteine after utilization of the pentose substrates alone. In addition, one strain produced alanine and glycine.

Biography

Megan H Hargreaves graduated from the University of Queensland in 1974 with first class honors in a Bachelor of Science degree, majoring in Microbiology. She immediately embarked on an Academic career with special interest in the teaching of Science, both full time and part time for some years. Her specialist teaching area was that of Infection Control in the Health Professions such as Medicine, Dentistry, and Pharmacy. She joined the Queensland University of Technology in 1993 and adopted the QUT corporate identity as a "University for the Real World" in both her teaching and research interests. She undertook doctoral studies in Higher Education, gaining a PhD in 2000. Since 2000, she has expanded her research interests to include a strong focus based on her earlier interest in infection control, now directed towards environmental microbiology and food quality control. The latter has appropriately included an interest in food manufacturing and fermentation technology. Her publications have covered the gamut of these areas, and include a continuing interest in teaching quality. These publications demonstrate a focus on quality control, with special interest in the Microbiological aspects of QC. Further, previously unpublished work includes cutting edge studies on production of food additives using previously unrecognized micro-organisms isolated from the environment. Outside of the Academic arena, she continues to act as a senior Technical Assessor for NATA (the National Association of Testing Authorities) in Australia, with specialty areas of focus in food and water quality.

m.hargreaves@qut.edu.au