Extraction of Bioactives from Cannery Waste

Greg White
SPC Ardmona Operations Limited

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HAL Project CF07006

Greg White

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Final Report on completion of HAL Project CF07006

Project Leader

Greg White
Research Scientist
SPC Ardmona Operations Ltd.
Andrew Fairley Ave.
Shepparton Victoria 3630
61 3 58333777
61 3 58332269
gwhite@spcardmona.com.au

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Purpose of the Report

This document is to communicate the non-confidential findings for public release of a Research Project to generate further value from Canning Fruit Wastes by extracting a Juice with a high natural nutrient content from Pear Peel and Core material.

Disclaimer

Non-confidential Report for Public Release

In 2008, SPC Ardmona (SPCA) commissioned a study by CSIRO Fopod and Nutrition Sciences, Werribee, Vic (then known as Food Science Australia) to survey the scientific and patent literature to determine what Bioactives may remain in SPCA fruit preparation wastes and the potential value of these bioactives on the international commodities market. This was thought to be one method of extracting further value from the deciduous fruit crops grown in the Goulburn and Murray Valleys and maximising returns to the canned fruits industry, ie. SPCA and the Canning Fruit Growers.

This survey found that there was a potential US$15M pa of bioactive products available for extraction from the 19,000 t of fruit preparation wastes generated annually currently going to stock feed-lots or composting. The majority of the bioactives were natural fruit dietary fibre and natural fruit antioxidants and the majority of the extractable fruit preparation wastes was pear peel and core material. In addition, SPCA deciduous fruit streams and fruit preparation waste streams were sampled and tested by the National Measurement Institute in order to determine the bioactives starting point and the residual levels of those bioactives being underutilised and wasted.

In order to extract these materials as purified commodities however, considerable capital expenditure on additional plant and equipment would have been required. In addition, the majority of the fruit preparation wastes being generated (pear peel and core) was already being transferred to SPCA fruit juice extraction plant for processing into juice prior to disposal of the resulting pomace. Therefore, it was determined that equal or greater value could be generated at lower cost by utilising the present juice plant in a modified process which would retain more of the natural nutrients in the juice so manufactured. This meant that the direction of the originaly planned 3-year Research Project CF07006 was changed by agreement between the stakeholders (SPCA and HAL) away from generating marketable bioactive isolates to modifying a present process to produce a more readily marketable product in which human nutrient content was preserved and enhanced.

CSIRO Food and Nutrition Science was contracted to examine the current SPCA fruit juice extraction process unit operation by unit operation to determine the levels of the bioactive nutrients of interest at each step and their fate, ie. retention, partial loss or total loss and the points at which retention or losses were occurring.

The next step was for CSIRO to assemble a laboratory-scale process which duplicated as far as possible the unit operations in the SPCA commercial juice process and which produced analogous retentions and losses of the nutrients of interest on a smaller, more readily manageable scale. This small-scale plant could then be subjected to multiple modifications and the effect on retention or losses of the bioactive nutrients of interest determined with a view to maximising their retention in the fruit juice generated. The points at which the nutrients were lost were identified and full or partial remedies for the losses determined and tested for efficacy.

Some uncertainties regarding nutrient analysis and the effects of modified process unit operations remained unanswered after this work. Also, insufficient sample quantities of material for retest were available to determine if the adequacy of the process or the analysis method chosen was the cause of the uncertainty.

In order to resolve the remaining questions above, SPCA researchers examined alternative juice extraction methods which may have been a more efficient at extracting the bioactives concerned. These methods were also designed to provide some clarity to the remaining uncertainties by proving if analysis methods were faulty or if indeed, process unit operations were excluding certain nutrients or not extracting them in the first place.

The result of this work was a combination of the modified current SPCA juice manufacturing process and an additional extractive step giving a fruit juice in which the natural bioactive nutrients were extracted from fruit preparation wastes efficiently at significantly higher levels than the standard process, giving a juice with enhanced natural fruit nutrient content.