FIET Project: Creamed Pomace – a smooth-textured dietary fibre product from apple pomace

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We first reported on the Pomace Creaming FIET project in the June/July 2018 issue. Here is an update – we are in the commercialisation phase now.

Introduction

"Eat more fibre" remains a powerful message. It's not surprising, since for most of us, fibre can reduce the risk of coronary heart disease, stroke, hypertension, diabetes, obesity, and gastrointestinal diseases [1].

And "give me a good fibre ingredient" also seems to be a powerful message within the industry. Food manufacturers want fibre lighting up the label, but they also want an ingredient to be affordable and to perform. A baker may want water-holding capacity, a juice-maker may want a stable dispersion. Most want a smooth texture without the sharp edges that apple tissue can carry.

We started in FIET, four years ago, to look for a simple, robust process to take pomace such as from apple through to a stable food ingredient for sale. Early discussions with potential end users steered us toward a smooth, almost fat-mimetic texture and toward water-holding capacity in baked goods. And of course we wanted to deliver fibre both soluble and insoluble. New Zealand's 10,000 – 15,000 MT of apple pomace made it the prime target to start with.

Scope of research

Under the FIET programme, our research team from Massey University and Plant & Food Research has developed a very effective process and resulting product with a creamy texture and neutral flavour. It comes in powder form and is nicely hot-water soluble. We have run the process successfully at pilot scale with the heat treatment in batch mode and now are ready to run the process continuously.

We have done one trial to prove that we can make a light fawn coloured product (not dark brown which we can also achieve by paying little heed to enzymatic browning). And we did one trial which proved the powdered product to be nice and dispersible in hot water.

Part of the work was to investigate how much wet milling the product needs in order to be smooth on the mouth and what the impact of pectin chain length is. This showed, as we expected, that finer particles (within reason, because round, unbroken whole cells are good) and longer pectin chains, give a smoother result – or so say the 84 volunteer taste panellists.

Process

The process is relatively simple, provided you know how. We need to catch the pomace just as soon as it is generated and strip out stalks, pips and labels. We mill it just enough to make it pumpable and then give it an in-line heat treatment. By tweaking temperature and time, we have a flexible and versatile process, able to be tuned to various raw materials and end products.

The research team, l-r, Richard Archer, John Bronlund, Florencia Yedro, Marzieh Eblaghi, Erin O'Donoghue and Lee Huffman

The hydrothermal treatment has several jobs: killing microorganisms, deactivating enzymes, solubilising pectins, softening the cell wall and "ungluing" cells from each other. But too much heat for too long can have undesirable effects on the appearance, flavour, colour, and nutritional value. The sweet spot is not large and depends on the product desired.

After heat treatment we can concentrate the pomace a little by flash evaporation and then dry it to a powder.

We proved all this process - one step at a time – in the lab. That gave us the kinetics of each of the desirable and undesirable reactions. We then scaled it up about 100 fold and proved to ourselves at pilot scale that the kinetics are right and that each step works. We think we know the process well enough for it to be largely a matter of engineering from now on.

Commercialisation

The engineering and technical company, Aurecon and particularly Aurecon's Brent Dingle, are taking on the process to provide full-scale plants to juicing companies with a pomace problem and potential ingredient markets. Brent presented the process to the assembled food engineers of the world at ICEF13 Melbourne in September. But before supplying to the world, we have several New Zealand juicing companies (not all New Zealand owned I must admit) keen to see a plant built and to understand its economics.

The next step is to feed the continuous pilot plant enough pomace to generate enough powdered product for applications work. One key application is to use the creamed pomace as a drying aid and encapsulant for spray drying juice or honey - this is being developed

One option: pilot concentrating creamed pomace to a paste …

… and another option: pilot drying creamed pomace for milling to a powder

under FIET Project 8. The buying public is getting nervous about "maltodextrin" (which surely must be a synthetic and nasty additive) as a drying aid for sticky materials. We are backing creamed pomace as a natural, label-friendly alternative.

Future perspective

The process is largely optimised, at least at small scale. We need now to generate some engineering data to support design and building of the first units. And we need to move on to applications work to support the first purchaser of a plant.

References

1. Anderson, J.W., P. Baird, RH Jr Davis, S. Ferreri, M. Knudtson, A. Koraym, V. Waters, C. L. Williams. 2009. Health benefits of dietary fiber. *Nutrition Reviews.* 67(4), 188-205.

FIET Food Industry Enabling Technologies

Food Industry Enabling Technologies (FIET) is funded by the Ministry for Business, Innovation and Employment and its purpose is to support new process developments that have the potential to add significant value to our national economy. The programme has six partners, Massey University (the host), Riddet Institute, University of Auckland, University of Otago, Plant and Food and AgResearch. Funding is $18m over six years (2015-2021) and targets pre-commercialisation activities. If you are interested in more information, then please contact either Ross Holland (R.Holland1@massey.ac.nz) or Professor Richard Archer, Chief Technologist, (R.H.Archer@massey.ac.nz).