# Fruit Flours

<https://www.ruraldelivery.net.nz/stories/Fruit-Flours>

Non-wheat flours or functional flours are predicted to be a big global growth area. The market is driven by the rise in consumption of processed and packaged food, the intensification of food production and the consumer demand for healthy food.

Auckland University researchers have found an elegant solution to extracting value from fruit and vegetable pomace (the by-product from juicing, which includes fruit pulp, skin and seeds). Using a fermentation process and the addition of a microbe, they’ve managed to turn 100% of these by-products into a high protein, low calorie food source. They’re now setting up infrastructure to scale up and entice potential investors.

Some years back, Associate Professor Silas Granato Villas-Boas was looking into potential uses for fruit pomace for animal feed. Tonnes of this by-product are regularly sent to waste, with only a small amount utilized for stock feed.

"We started searching for a way to improve these by-products for animal feed to give to cows, because if the cows eat too much of the fruit by-product, it ferments in the cow’s rumen, producing a lot of ethanol, or alcohol, and they get intoxicated," Villas-Boas says.

They applied a fermentation process to reduce sugar levels but keep fibre content and increase protein. The process was too costly for stock feed, but it got Silas thinking about the possibilities for people. The critical part would be to take the pomace direct from the juice plant while it was still part of the food safety chain, in order to make a product suitable for human consumption. Silas secured funding from the Callaghan Innovation collaboration, through the Bioresource Processing Alliance, and PhD student Ninna Granucci was brought in to further explore possibilities.

Initial trials were on apple pomace, as it is abundant in New Zealand, year-round. Apple pomace is presently supplied free of charge to the researchers by Turners & Growers, who are equally keen to find solutions to their waste streams.

Ninna has also looked into possibilities around carrots, grapes (pinot noir and sauvignon blanc), oranges, apples and kiwifruit. They’ve come up with an ingenious solution that involves a microbe and fermentation. This zero-waste process turns 100% of the pomace into a useable product – with only water evaporated off. One kilo of wet pomace produces approximately 200 grams of dry flour.

The fermentation process improves the nutritional profile of the base ingredient and its shelf life. Sugars are transformed into protein, resulting in a high protein, high fibre, low calorie product. The researchers are confident this will appeal in a market that is seeking solutions to obesity, diabetes and other health-related issues. Silas says, “You can still make pastries and pasta, but they will not have as many calories as those made with wheat flour.”

Further, the fermentation process results in flours rich in beta-glucan, a probiotic that Silas says has been clinically shown to have immune boosting properties.

Silas agrees the term ‘flour’ is a little misleading as, while some of the flours have the potential to replace wheat-based flour, some are very high in protein and therefore more closely mimic the properties of egg-white when used in baking. Trials have been undertaken with a local baking company that show some flours have better water-binding properties than others. Many have been identified as potential replacements for ingredients such as egg whites or soy-based flours.

Each flour has a flavour profile that differs from the source fruit or vegetable. For example, orange flour has a floral/honey flavour profile making it ideal for sweet goods. Apple flour is tart and carrot is bland. Early indications are that apple, orange and carrot flours show the most potential as ingredient substitutes.

A news item on their work was reported worldwide and translated into French, German, Italian, Spanish, etc. The pair were surprised by the global interest. “Supermarkets want to stock it. Vegans and gluten-intolerant people want to buy it. Cafes want to partner to make new products. Apple processing companies, who often have to pay to send the pomace to landfill, want to supply pomace. Investors want a piece of the pie.”

Silas and Ninna have set up a company, Green Spot Technologies, to commercialize the science. They are presently setting up a pilot plant in East Tamaki to confirm the scalability of the science and ability to produce consistent product.

In the future they want to team up with manufacturers to sell their science, ideally with juice companies who produce the pomace. Silas envisages a future where fruit and vegetable juices become the by-product of high protein low calorie fruit and vegetable pomace flours.