

# Science captures the essence of fruit

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New research designed to build scientific understanding of fruit genes could revolutionise the way foods, cosmetics and perfumes are created.

Researchers at New Zealand-based life sciences company HortResearch say they have fine-tuned the science of gene discovery to such a degree that they can now accurately determine which genes create the individual flavours and fragrances found in fruits and flowers.

Combined with traditional biofermentation techniques – the same process that helps bread rise or grape juice to become wine - this means that it should be possible for the natural tastes and aromas of fruit to be recreated.

According to HortResearch Industrial Biotechnology scientist Dr Richard Newcomb, that's exciting news for the world's food, perfume and cosmetic producers, who have for years sought synthetic solutions to mimic nature's flavours and fragrances in products ranging from ice cream to shampoo.

"While manufacturers have largely been successful in copying natural tastes and scents, they generally do so either through a chemical synthesis process or extraction from harvested raw ingredients.

"Neither approach is ideal. Chemical synthesis requires heat and pressure, so is reliant on increasingly expensive and polluting fossil fuels for energy. What's more, chemical synthesis can never truly recreate nature; the flavour or fragrance will typically be slightly different to that found naturally in fruits and flowers.

"Extraction is expensive and produces only limited quantities of product, reducing the number of commercially viable options for the extract," says Dr Newcomb.

Biofermentation however can produce large amounts of a desired compound at a low cost and

with little environmental impact. And because biofermentation uses the actual genes that plants use in the wild, the resulting flavour or fragrance compound has exactly the same molecular make-up. It is, as the scientists say; "Nature Identical".

While the possibility of 'fermenting' genes to produce compounds has been well understood for many years, science has generally lagged behind in identifying which genes are needed to produce the desired outcome. HortResearch has now overcome this issue by using research initially intended to speed up the process of fruit breeding, says Dr Newcomb.

"Through decades of fruit breeding research HortResearch has developed extensive fruit gene and compound databases. Now we have developed techniques that help determine which genes create each compound, and how those compounds combine to create a flavour or fragrance. It's a complicated and time-consuming process – some fruit flavours for example may be comprised of over thirty different compounds, each in a precise volume.

"Much of this information is fed back into the breeding programme, allowing naturally-bred new fruit varieties with desired traits to be quickly recognised amongst young breeding populations that frequently number in the tens of thousands.

"However, it is also possible for us to isolate genes that produce desirable flavour and fragrance compounds for use in industrial biotechnology applications."

HortResearch has proven the bioproduction concept can be used to produce fruit flavours and fragrances by perfectly recreating a fruit compound called alpha-farnesene, responsible for the distinctive aroma of green apples.

The company has filed international patent applications on the use of the applicable gene in creating the fragrance, and for another plant gene

responsible for making a compound that smells like the heady scent of red roses.

Dr Newcomb says HortResearch scientists are continuing to seek new gene/compound combinations which they believe will find ready demand in the marketplace.

"Alongside colour, flavour and fragrance rank as some of the most important guides to the natural world. The ability for manufacturers to recreate them exactly as they occur in nature will open new opportunities for high-quality, novel products and foods."

While many biofermented compounds will undoubtedly end up in non-food consumer products such as make-up or household cleaners, Dr Newcomb is confident they will also play a role in the expanding health food market.

"Researchers are finding ever greater numbers of foods and food compounds that can enhance human health and wellbeing. The trouble is, they don't always taste very good – and until they do it will be difficult to encourage consumers to make them part of their regular diet," he says.

"Adding synthetic flavours destroys the credibility of any health food, so natural flavours produced through bioproduction would be a huge advantage to the health industry."

Source: Kureczka/Martin Associates

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