A DARK STRAWBERRY MAY HOLD INCREASED HEALTH BENEFITS

A Queensland breeding program has identified a new "super" strawberry, which may not only offer benefits to consumers but also to farmers and processors through premium prices.

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A recent publication titled "High anthocyanin strawberries through cultivar selection" (*Journal of the Science of Food and Agriculture*) generated a significant level of media interest in the potential development of a so-called super strawberry.

The project came about through collaboration between research scientists from a range of disciplines including horticultural breeding and phytochemical analysis.

The Queensland Department of Agriculture, Fisheries and Forestry (DAFF) breeding program, supported by Horticulture Australia Ltd (HAL), Strawberries Australia Inc (SAI) and federal and Queensland governments, allows strawberry food producers to continue supplying delicious strawberries to the community.

However, consumer requirements and the production environments for strawberries are continually changing. As an analogy, the same situation happens with cars and electronic devices where changes in consumer and production environments result in new models being designed so that they match production and market. In the same way the DAFF breeding program continually develops new varieties (models) of strawberry to meet the changing production and market environments.

One exciting outcome of such breeding is that characteristics that were often previously hidden away in the genetic background become apparent. In our program, one such hidden treasure that has arrived is a darker fruited type.

The study

As members of the project team were examining other pigmented fruits and vegetables (including plums, sweetcorn and purple carrot), where colour was related to the content of specific pigments, these darker breeding lines were hypothesised to have higher pigment levels. Similar to plums, other berries and purple carrots, the major pigments in strawberries are anthocyanins.

The primary aim of the project was to compare the anthocyanin content in a dark breeding line (named BL 2006-221) with five commercial varieties and two other breeding lines. The content of vitamin C and specific phenolic acids was also measured together with the antioxidant capacity. The major finding of the project was that BL 2006-221 had an anthocyanin content of approximately 100mg/100g, which was nearly double that of the highest commercial varieties tested.

Recent publications indicate that consuming fresh or processed strawberries (e.g. as juice, drink, puree or powder) may exert beneficial health effects. Emerging evidence from epidemiologic and interventional studies indicate that anthocyanin/polyphenol rich strawberries and derived products may exert protection against inflammation, oxidative stress,

type 2 diabetes, cardiovascular disease, oesophageal cancer, and obesity in humans.

Furthermore, anthocyanins and other polyphenols from blueberries and strawberries may also contribute to the prevention of hypertension in men and women (as suggested by Cassidy and colleagues). There is growing evidence that the observed protective effects of dietary strawberries are correlated to their anthocyanin/polyphenol composition and content. Anthocyanins, one of the major polyphenol subclass, are quantitatively the most important polyphenols in strawberries and strawberry products.

Although more than 25 anthocyanin compounds have been identified in different strawberry cultivars to date, the most common are perlargonidin-3-glucoside (77¬–95 per cent of total anthocyanins) followed by pelargonidin-3-rutinoside and cyanidin-3-glucoside. These natural pigments are interesting not only because of their reported potential health benefits but also because of their characteristic colour attributes. The genotype, processing technology and storage conditions can all have a significant effect on the content of anthocyanins and other polyphenols in strawberries and derived products.

In the study, the colour (as defined by hue angle) of the strawberries was measured using a chromameter and correlated well (r2=0.69) with anthocyanin content for the strawberries studied. The use of a chromameter to screen out lower anthocyanin strawberries may enable faster evaluation of future breeding selections by avoiding the more time and cost intensive high performance liquid chromatography analysis.

In the current DAFF breeding program, crosses have been undertaken to develop high flavour in dark lines. This will continue in 2013. Anthocyanin analysis of these crosses will be concurrently undertaken with the field assessment and sensory analysis as the program develops.

Consumer testing will be a key element of the work to be done regarding the commercial potential for a high anthocyanin strawberry. The initial aims of this would be to examine attitudes of consumers to such a strawberry when the information about anthocyanin content and health profile is communicated. Additionally, potential communication strategies, trial product placement and information on pricing are all scheduled for investigation.

The darker strawberries would be visually different from existing commercial varieties. This could be beneficial in the development of a differentiated premium strawberry for those consumers who are willing to pay more for potentially increased health benefits from the higher anthocyanin content. For example, the Vital Vegetable range premium horticultural products from New Zealand charge a premium for their increased phytochemical content.

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Charissa Fredericks (University of Queensland) undertook most of the analysis at the Health and Food Sciences Precinct (a joint Queensland Health/DAFF/CSIRO facility located in Brisbane) as part of her university honours year. The other members of the research team were Mike Gidley (UQ), Kent Fanning (DAFF), Mark Herrington (DAFF), Michael Netzel (CSIRO Animal, Food and Health Sciences/DAFF/UQ), Gabriele Netzel (UQ) and Dimitrios Zabaras (CAFHS).