Fact Sheet – Bio~active compounds

What is the product?

With sanitation and good health care, few people in the richer parts of the world die from infectious diseases. Instead, the leading causes of death are cardiovascular disease, stroke, cancer, respiratory diseases and complications from diabetes. In addition, osteoporosis, cataract, macular degeneration, Alzheimers disease and many other diseases reduce the quality of lives.

Hundreds of studies have shown that those who eat the most vegetables are least likely to suffer from these disorders. Many of the special benefits that come from eating vegetables are due to the chemical compounds they contain. These include sulfur compounds, phenolics, betalains and carotenoids.

Although only 10% of women and 7% of men eat the recommended serves of vegetables per day this does not mean Australians are not concerned about their health. The 1996 Australian National Nutrition Survey reported that 26% of women and 15% of men regularly took a nutritional supplement.

There appear to be opportunities, therefore, for either developing new supplements / nutraceuticals based on bio-active compounds extracted from vegetables ***or*** replacing compounds in existing products.

(see over for specific compound information)

1 in 5 Australians regularly takes some kind of dietary supplement...

What is the benefit to vegetable growers?

Processing vegetables to extract compounds potentially beneficial to human health would appear to have a number of particular advantages:

★ Some target compounds are found most abundantly in peel, stems and leaves; parts of the vegetable that are discarded during trimming and processing, eg carrot peel can contain 20mg/100g β-carotene, nearly 2x that of the core.

★ New varieties of vegetables have been bred to have increased concentrations of bio-active compounds. Although developed for the fresh market, many would also be suitable for processing.

★ Extraction of bio-active compounds would require a regular supply of raw materials. While this would reduce the potential for ad-hoc supply of excess / rejected materials, it could provide a steady income stream for suitable products.

★ Bio-active extraction could be combined with other processing. Beetroot and carrot pomace left over from juice production contain 14.4mg/100g betalains and 4.0mg/100g carotenoids. Pomace can easily be turned into powder.

Economic viability

Supply of bio-active compounds takes place in an international marketplace. Many are sourced from countries such as China or India, where they may be manufactured by industrial means or extracted from non-food sources. For example:

★ Zeaxanthin is extracted from marigold petals grown in India.

★ β-carotene is extracted from seaweed.

★ Resveratrol is now more commonly made from Japanese knotweed than grape skins.

★ Vitamins are usually manufactured in laboratories, not extracted from natural sources.

However, there is a growing market for whole-plant extracts for use in different foods. These are based on the idea that it is the combination of different bio-active compounds found in many plants that give them their important properties for enhancing human health.

Although other countries manufacture a range of vegetable powders, in this case Australia's reputation as a clean, green and reliable supplier can be used to advantage.

Prices for whole vegetable powders and concentrates range from $15 - $25 kg depending on quality. Quoted prices for Chinese vegetable extracts include:

★ Carrot - $15/kg

★ Celery - $19/kg

★ Broccoli - $17.50/kg

Given that most vegetables are 85 - 95% water, this suggests a gross return of $1.50 - $2.50 / kg. Viability will depend on power costs as well as the cost of equipment for macerating, drying and then grinding the vegetables.

In summary, this is an area that is continuing to develop. While opportunities may be currently limited, they are likely to develop over time. Moreover, plant extracts developed for other purposes – such as dietary fibre – that also contain bio-active compounds, are likely to find ready use in manufactured 'nutraceutical' products.

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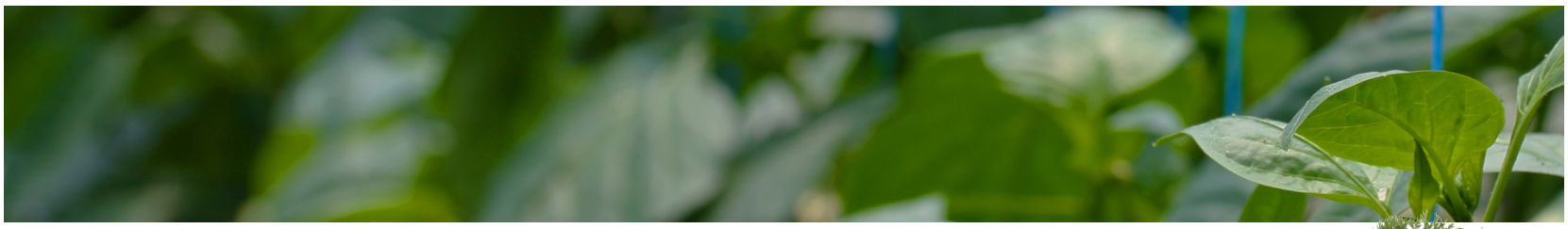
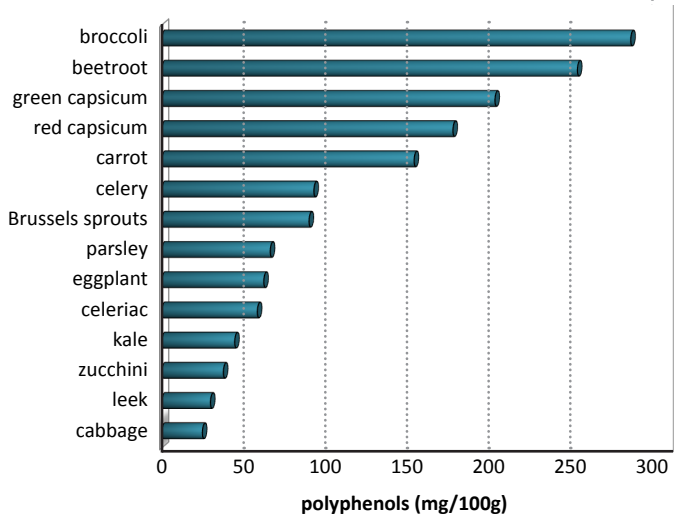


Polyphenols

Polyphenols are one of the largest of all groups of compounds found in plant foods. They contribute to the colours of fruit and vegetables, help plants resist pathogens and predators, and are involved in seed germination. Polyphenols include flavonoids, flavanols and anthocyanins.

They are an important part of the diet and are believed to have many possible health benefits, thanks to their anti-oxidant and anti-inflammatory properties. There is good evidence that polyphenols reduce the risk of cardiovascular diseases, certain cancers, inflammatory states (eg rheumatoid arthritis), cataracts, Parkinsons disease, Alzheimers and other disorders associated with ageing.

Many vegetables and fruit are rich in a wide range of polyphenols. Such compounds are often concentrated in peels and stems, the very parts most often discarded after harvest. For example, total phenolics in eggplant are highest in the peel, which contains nearly 10x the concentration found in the flesh.



Betalains

Betalains are the pigments responsible for the yellow and red colours of beetroot and silverbeet. Betalains are potent antioxidants as well as possibly anticarcinogenic. Like anthocyanins, they are water soluble, stable during processing, and concentrated in the most strongly coloured parts of the vegetable such as the skin and stem.

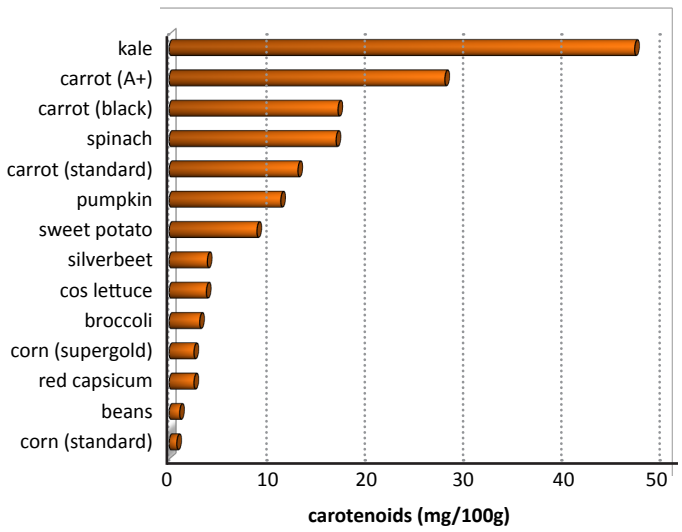
Carotenoids

Carotenoids are responsible for the colour of vegetables such as capsicums, sweet corn, carrots and sweet potato. Some leafy vegetables, such as spinach, are also high in carotenoids. All carotenoids are potent antioxidants and have been associated with a wide range of health benefits.

β-carotene becomes vitamin A in the body. Vitamin A deficiency can cause blindness. This remains a major issue in many parts of the Developing World and wherever people are severely lacking fresh fruit and vegetables. β-carotene supplements are widely used for everything from cancer to high blood pressure and sunburn sensitivity to weight loss.

Zeaxanthin, primarily found in sweet corn, and **lutein**, common in green vegetables, have been demonstrated to reduce the risk of macular degeneration and cataracts. It is thought that this is because they concentrate in the macula of the eye, where they absorb blue light at the high end of the visible spectrum.

Anthocyanins are the red and purple pigments found in carrots, cabbage, eggplant skin and 'jacaranda' cauliflower. Studies have suggested that anthocyanins may be useful in obesity control, diabetes control, cardiovascular disease prevention, and improvement of visual and brain functions.



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