

Antioxidant phytochemicals in Acai

The dense pigmentation of açai has led to several experimental studies of its anthocyanins, a group of polyphenols that give the deep color to fruits and vegetables and are high in antioxidant value. A recent study using a standardized freeze-dried açai fruit pulp and skin powder found the total anthocyanin levels to be 319 mg per 100 grams (Schauss et al., 2006a). Cyanidin 3-glucoside and cyanidin 3-rutinoside were the major anthocyanins determined in this study as well several other studies including one by Lichtenthaler in 2005.

Twelve other flavonoid-like compounds were additionally found in the Schauss et al. 2006a study, including homoorientin, orientin, taxifolin deoxyhexose, isovitexin and scoparin, as well as several unknown flavonoids. Proanthocyanidins, another group of polyphenolic compounds high in antioxidant value, totalled 1,289 mg per 100 grams of the freeze-dried pulp/skin powder, with a profile similar to that of blueberries (Schauss et al., 2006a). Resveratrol was additionally found to be present in acai in this study, although at low levels of 1.1 microgram per gram.

A number of studies have measured the antioxidant strength of açai. Unfortunately, the sources of açai and preparations (e.g., whole fruit, juice, extract or soluble powder) for reporting the results vary. A recent report using a standardized oxygen radical absorbance capacity or ORAC analysis on a freeze-dried açai powder found that this powder showed an extremely high antioxidant effect against peroxy radical. In fact, it had the highest total antioxidant level (1027 micromol TE/g) of any other food tested by ORAC to date. This includes a high lipophilic antioxidant content when compared to other berries. The ORAC value for this freeze-dried powder was significantly higher than when other methods of drying the fruit were tested (Schauss, 2006c).

The freeze-dried powder also showed very high activity against superoxide, with a SOD assay level of 1614 units/g. Superoxide is thought to be the initial producer of other more potent reactive oxygen species, and thus protection against it is very important as a first line of defense for the body. Antioxidant activity against both peroxynitrite and hydroxyl radicals was also observed, although effects were milder than that seen against peroxy radical and superoxide. Additionally, antioxidant molecules from the freeze-dried powder were shown to actually enter freshly obtained human neutrophils and inhibit oxidation induced by hydrogen peroxide, even at very low concentrations of the açai powder including 0.1 part per trillion (Schauss et al., 2006b). A previous report using a total oxygen scavenging capacity assay also found that açai has extremely high antioxidant effects against peroxy radical, as well as a high capacity against peroxynitrite, and a moderate capacity against hydroxyl radical when compared with other fruit and vegetable juices. (Lichtenthaler et al, 2005).

Interestingly, the Lichtenthaler et al. study determined that only 10% of açai's high antioxidant effects could be explained by its anthocyanin content. Schauss et al. similarly found that that ratio of the hydrophilic ORAC levels to the total phenolics in the freeze-dried fruit was 50, which is quite a bit higher than the average fruit and vegetable ratio of

10. This suggests that either there are other unknown antioxidants present contributing to this high antioxidant activity and/or the antioxidants that açai contains are especially strong.

Schauss et al. (2006b) also utilized the "Total Antioxidant" or TAO assay to differentiate the "fast-acting" (measured at 30 seconds) and "slow-acting" (measured at 30 minutes) antioxidant levels present in freeze-dried powder. Acai was found to have a higher "slow-acting" antioxidant components, suggesting a more sustained antioxidant effect compared to "fast-acting" components.

Although it is unknown exactly how these *in vitro* antioxidant levels will translate into health potentials for humans *in vivo*, it is likely that açai fruit imparts health benefits associated with consumption of foods high in antioxidants, such as reduced risk or prevention of chronic and oxidative stress related disorders.

Antioxidant values of the seeds of the açai fruit have also been reported (Rodrigues, 2006). Similarly to the berries, the antioxidant capacity of the seeds were strongest against peroxy radicals, at a concentration in the same order of magnitude as the berries. The seeds had a stronger antioxidant effect than the berries for peroxynitrite and hydroxyl radicals, although still less than its effects against peroxy radical. The results of this study were not linear based on the concentration of the seeds that were used. The authors suggest the future use of the seeds (a by-product of juice making) for antioxidant benefits such as prolonging shelf-life of foods.

Other Research

Açai, in the form of a specific freeze-dried fruit pulp, has been shown to have mild ability to inhibit cyclooxygenase enzymes COX-1 and COX-2, with more effect on COX-1 (Schauss et al., 2006b). These enzymes are important in both acute and chronic inflammation, and are targeted by many of the anti-inflammatory medications (NSAIDs). Additionally, lower concentrations (but not higher concentrations) of the freeze-dried pulp were found to be slightly stimulating to macrophages in vitro. Macrophages are white blood cells that are an important part of the immune system of the body. Also in macrophages, freeze-dried açai pulp was found to inhibit the production of nitric oxide that had been induced by the potent inflammatory inducer lipopolysaccharide (LPS), which is part of the cell membrane of certain bacteria (Schauss et al. 2006b). This effect increased as the concentration of the açai increased. This suggests again the potential for an anti-inflammatory effect of açai, although requires more research.

In 2006, a study performed at the University of Florida showed that açai fractions containing polyphenolics could reduce proliferation of HL-60 leukemia cells *in vitro*. This was most likely due to increased rapid cell death (apoptosis) as fractions were also found to activate caspase-3 (an enzyme important in apoptosis) which was inversely correlated to cell death. (Pozo-Insfran et al., 2006). This is a very preliminary study, but indicates a need for more research on the possible anti-cancer effects of açai.

Due to its deep pigmentation, orally-administered açai has been tested as a contrast agent for magnetic resonance imaging of the gastrointestinal system (Cordova-Fraga et al., 2004). Its anthocyanins have been characterized for stability as a natural food coloring agent (Del Pozo-Insfran et al., 2004).

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Proanthocyanidin-rich extracts from Grape seed extract may protect against skin cancer

By Stephen Daniells

3/27/2007 - **Proanthocyanidin-rich extracts from grape seeds may prevent skin cancer by boosting the immune system, says a new study that used hairless mice to model human sun exposure.**

Researchers from the University of Alabama told attendees at the 233rd national meeting of the American Chemical Society that hairless mice supplemented with proanthocyanidins extracted from [grape seed](#) had 65 per cent fewer skin tumours than mice not supplemented with the compounds.

The research adds to a small but expanding number of other studies that suggest the grape seed extracts may benefit skin "from within". Indeed, only recently researchers in Germany reported that 42 subjects randomly assigned to receive a daily supplement of Masquelier's Original OPCs (oligomeric proanthocyanidins) Anthogenol (100 mg/day) had reduced reddening of the skin by 13 per cent when exposed to UV radiation (*Skin Pharmacology and Physiology*, Vol. 20, pp. 43-49).

The new study, led by Santosh Katiyar, supplemented the diet (AIN76A) of SKH-1 hairless mice with grape seed proanthocyanidins (0.2 and 0.5 per cent, w/w) and exposed them to UVB (180 mJ/cm²) radiation to induce [skin cancer](#).

Katiyar told attendees in Chicago that supplementation with grape-seed extracts at both levels (0.2 and 0.5 per cent) reduced tumour incidence by 20 and 35 per cent, respectively, tumour multiplicity by 46 and 65 per cent, respectively, and tumour size by 66 and 78 per cent, respectively, compared to control mice with no supplementation.S

In an additional experiment using C3H/HeN mice, the researchers investigated the mechanism behind the apparent benefits, and found that supplementation with the grape seed extracts appeared to reduce the UVB-induced increase in the cytokine interleukin-10 (IL-10), previously reported to suppress immune function.

On the other hand, the proanthocyanidin-rich extracts were found to increase the production of IL-12, reported to be a stimulator of the immune system.

"Together, our data suggested that prevention of photocarcinogenesis by grape seed proanthocyanidins is mediated through development of anti-tumour immune responses, which are regulated by IL-12 induction in mice," said Katiyar.

According to the European School of Oncology, there are approximately 460,000 new cases of skin cancer in Europe each year, with survival rates improving thanks to more awareness and earlier detection.

Source: *233rd national meeting of the American Chemical Society*
March 25 2007, Abstract: AGFD 011

"Dietary grape seed proanthocyanidins inhibit photocarcinogenesis through prevention of UV-induced suppression of immune responses via induction of interleukin-12 in mice"

Author: S.K. Katiyar

<http://www.foodnavigator-usa.com/news/ng.asp?n=75279&m=1FNU327&c=coihwetnaplzfkh>

Review supports olive oil as nature's super food for the heart

By Stephen Daniells

3/29/2007 - **The benefits of olive oil for heart health go way beyond just reducing levels of LDL ('bad') cholesterol, says a new review that looks set to further bolster the healthy image of the oil.**

Numerous studies have reported that [olive oil](#) - the main fat in the Mediterranean diet - to improved cardiovascular health and protection from certain types of cancer, and this science has filtered down to the consumer.

Indeed, Mintel's *Edible Oils* report said that the UK olive oil market has been on fire since 2000, growing by 39 per cent to date in order to break through the £100m mark.

"The wide range of antiatherogenic effects associated with olive oil consumption could contribute to explain the low rate of cardiovascular mortality found in Southern European Mediterranean countries, in comparison with other western countries, despite a high prevalence of [CVD](#) factors," wrote reviewer Maria-Isabel Covas.

The new review, published on-line in the journal *Pharmacological Research*, is a timely "pulling together" of the biological and clinical effects of olive oil-rich diets on lipoprotein metabolism, blood pressure, thrombosis, and markers of oxidative damage, inflammation, and dysfunction of the cells that line the blood vessels (endothelium) that occurs early in atherosclerosis development).

Looking at studies published in peer-reviewed literature, Covas, from the Institut Municipal d'Investigació Mèdica (IMIM - Hospital del Mar) in Madrid, states: *"The benefits of olive oil consumption are beyond a mere reduction of the LDL cholesterol."*

Indeed, significant evidence exists that oxidative damage from reactive oxygen species (ROS) can be reduced in a dose-dependent manner with olive oil's [polyphenol](#) content, indicating that higher concentrations of the antioxidant polyphenols in the oil have a bigger positive effect.

"The consistency of the anti-inflammatory effects of olive oil in humans results is promising, and further studies are now required to obtain sustained evidence of the anti-inflammatory activity of olive oil and its minor olive oil components per se in humans," said Covas.

However, the subject is not "cut and dried" and Covas called for more research into the health benefits of the oil: *"The mechanisms by which olive oil exerts its beneficial effects merit further investigation, and further studies are required to obtain evidence of the benefits of olive oil consumption on primary end points for cardiovascular disease."*

Cardiovascular disease (CVD) causes almost 50 per cent of deaths in Europe, and is reported to cost the EU economy about €169bn (\$202bn) per year.

Source: *Pharmacological Research* (Elsevier)
Published on-line ahead of print, doi: 10.1016/j.phrs.2007.01.010
"Olive oil and the cardiovascular system"
Author: M.-I. Covas

<http://www.nutraingredients-usa.com/news/ng.asp?n=75316&m=1NIU329&c=coihwetnaplzfhk>

Superfruits could wrestle gut health beverages from dairy

By Jess Halliday

10/27/2006 - **New Zealand's HortResearch is conducting research aimed at taking fruit and fruit-derived ingredients into the next generation of gut health drinks based on their prebiotic properties.**

Probiotic products containing beneficial bacteria found in the human gut have captured the public's imagination in recent years, but the majority of probiotic drinks have been in the dairy category.

According to Euromonitor International, the retail sales value of probiotic 'little bottles' grew by 52 per cent in 2004 to be worth £28 million, with the highest growth in the core European markets.

As the marketplace becomes more crowded, manufacturers are seeking to differentiate their products from their competitors'. [HortResearch](#) believes that tapping the *prebiotic* properties of fruit – that is, their ability to make the environment of the gut more amenable to healthy bacteria – could herald the next generation of gut health products.

There are already efforts afoot to develop probiotic fruit [beverages](#), at Finland's Valio, for example. But Dr Lesley Stevenson, science group leader for health and food at HortResearch believes that fruit-derived prebiotics will “*radically enhance*” the functionality of gut health drinks.

Moreover, encouraging the growth of healthy bacteria boosts gut immunity – and immunity is another key area of research for the company.

“Scientists worldwide are beginning to recognise and accept that fruit – and specifically some specific fruit compounds – exhibit anti-inflammatory, antimicrobial and antiviral potential,” said Dr Stevenson.

HortResearch has already identified some interesting examples of this.

For instance, polyphenols have been shown to inhibit salmonella attachment to gut cell models;

Some apple extracts have been seen to inhibit the production of TNF Alpha, a marker for inflammation, in cell systems;

And investigations are underway into how fruit can positively influence the gene-based pathway between an environmental insult and gut inflammation response.

Taking fruit into new market areas with the science to support it should not engender a great leap of faith, since it already wears a 'health halo', based largely on its antioxidant profile.

Dr Stevenson said that combining existing consumer awareness with broader health benefits, scientific evidence of specific function and targeted delivery will be the catalyst for new superfruit-based functional foods.

HortResearch boasts the world's largest fruit compound database, and has developed a number of new varieties bred for their desirable properties – such as crispier, tastier apples and the convenient 'kiwiberry'.

Certain superfruits, such as blueberries, pomegranate and acai, are now used in their whole form in juices, bars and other foods – and are proving remarkably popular.

The challenge has been laid down to identify the *next* big superfruit. Karl Crawford, HortResearch food business leader, said: *"I can't you what it will be, what colour or shape or taste."*

But he said it will have five key qualities. *"Superfruit success requires novelty, validated health benefits, convenience, controlled supply, and promotion"*.

<http://www.foodnavigator-usa.com/news/ng.asp?id=71650>