

Compounds Naturally Found In Blanca Isabel

Studies conducted by Dr. Agnes M. Rimando, a research Chemist for the USDA's revealed that Blanca Isabel contains the following antioxidant compounds:

- Cyanidin-3-O-Glucoside And Peonidin-3-O-Glucoside,
- Catechins and
- Resveratrol.

Cyanidin-3-O-Glucoside And Peonidin-3-O-Glucoside

Anthocyanins from plants are known to have positive health effects on test animals and humans. In vitro and in vivo studies have suggested that anthocyanins have an array of health-promoting benefits in addition to anti-oxidative and anti-inflammatory actions, including a substantial capacity to improve plasma cholesterol levels. Recent studies have shown that anthocyanins, particularly cyanidin-3-O- β -glucoside and peonidin-3-O- β -glucoside induce cholesterol efflux from mouse peritoneal macrophages and macrophage-derived foam cells. Cholesterol is a basic component of all membranes and is the precursor of steroid hormones, bile acids, and vitamin D. Anthocyanins have excellent antioxidant properties. They scavenge damaging particles in the body known as free radicals, helping to prevent or reverse damage to cells. Antioxidants have been shown to help prevent a number of long-term illnesses such as heart disease, cancer, and an eye disorder called macular degeneration.

Cyanidin-3-O-glucoside and peonidin-3-O-glucoside are among the important health compounds in berries, such as, blueberry, acai, and bilberry. These compounds were also found in the Blanca Isabel purple rice variety.

Catechins

Catechins are polyphenolic antioxidant plant metabolites that belong to the flavonoids family. These compounds are abundant in teas derived from the tea-plant *Camellia sinensis* as well as in some cocoas and chocolates (made from the seeds of *Theobroma cacao*). The health benefits of catechins have been studied extensively in humans and in animal models. Catechin and epicatechin are also found in the traditional Chinese medicine plant *Uncaria rhynchophylla*. Catechin has been found to be the most powerful scavenger between different members of the different classes of flavonoids. Reduction in atherosclerotic plaques was seen in animal models. Reduction in carcinogenesis was seen in in vitro tests on human cells.

Many studies on health benefits have been linked to the catechin content. According to Norman Hollenberg, professor of medicine at Harvard Medical School, epicatechin can reduce the risk of four of the major health problems: stroke, heart failure, cancer and diabetes. He studied the Kuna people in Panama, who drink up to 40 cups of cocoa a week, and found that the prevalence of the "big four" was less than 10%. He believes that epicatechin should be considered essential to the diet and thus classed as a vitamin. Green tea catechins have also

been shown to possess antibiotic properties due to their role in disrupting a specific stage of the bacterial DNA replication process. Catechins, when combined with habitual exercise, have been shown to delay some forms of aging. Mice fed catechins showed decreased levels of aging. Oxidative stress was lowered in cell mitochondria, as well as increase in mRNA transcription of mitochondria related proteins.

Resveratrol

Resveratrol, reported by Dr. Rimando in Blanca Isabel Purple Rice, has been reported to have important health benefits in test animals and humans. This is the first report of resveratrol naturally occurring in rice. Resveratrol is the compound in red wines reported to give these wines their health enhancement properties. In 1997, Jang et al. reported that topical resveratrol applications prevented skin cancer development in mice treated with a carcinogen. There have since been many studies of the anti-cancer activity of resveratrol in animal models. No results of human clinical trials for cancer have been reported. Resveratrol interferes with all three stages of carcinogenesis—initiation, promotion and progression. In vitro, resveratrol “inhibited the proliferation of human pancreatic cancer cell lines.” In some lineages of cancer cell culture, resveratrol has been shown to induce apoptosis, which means it kills cells and may kill cancer cells. Resveratrol also possesses antioxidant and anti-angiogenic properties.

Resveratrol (1 mg/kg orally) reduced the number and size of the esophageal tumors in rats treated with a carcinogen and in several studies, small doses (0.02–8 mg/kg) of resveratrol, given prophylactically, reduced or prevented the development of intestinal and colon tumors in rats given different carcinogens. Similarly, topical application of resveratrol in mice, both before and after the UVB exposure, inhibited the skin damage and decreased skin cancer incidence. Resveratrol treatment appeared to prevent the development of mammary tumors in animal models; however, it had no effect on the growth of existing tumors. Injected in high doses into mice, resveratrol slowed the growth of neuroblastomas.

Neuroprotective effects of resveratrol: In November 2008, researchers at the Weill Medical College of Cornell University reported that dietary supplementation with resveratrol significantly reduced plaque formation in animal brains, a component of Alzheimer and other Neurodegenerative diseases. In mice, oral resveratrol produced large reductions in brain plaque in the hypothalamus (-90%), striatum (-89%), and medial cortex (-48%) sections of the brain. In humans it is theorized that oral doses of resveratrol may reduce beta amyloid plaque associated with aging changes in the brain. Researchers theorize that one mechanism for plaque eradication is the ability of resveratrol to chelate (bind) copper. The neuroprotective effects have been confirmed in several animal model studies. Research at the Northeastern Ohio Universities College of Medicine and Ohio State University indicates that resveratrol has direct inhibitory action on cardiac fibroblasts, and may inhibit the progression of cardiac fibrosis.

Cardioprotective effects of resveratrol: It has long been known that moderate drinking of red wine reduces the risk of heart disease. This is best known as “the French paradox. The cardioprotective effects of resveratrol are also theorized to be a form of preconditioning—the best method of cardioprotection, rather than direct therapy. A 2011 study concluded, “Our data demonstrate that both melatonin and resveratrol, as found in red wine, protect the heart in an experimental model of myocardial infarction via the SAFE pathway.”

Anti-diabetic effects of resveratrol: Studies have shown that resveratrol possesses hypoglycemic and hypolipidemic effects in both streptozotocin (STZ)-induced diabetes rats and STZ-nicotinamide-induced diabetes rats. Resveratrol ameliorates common diabetes symptoms, such as polyphagia, polydipsia, and body weight loss. Other diabetic animal model studies by different researchers have also demonstrated the anti-diabetic effects of resveratrol. In human clinical trials, conducted by Sirtris Pharmaceuticals, Inc., resveratrol has lowered blood sugar levels in both Phase Ib and Phase Iia trials.

Antiviral effects of resveratrol: Studies show that resveratrol inhibits herpes simplex virus (HSV) types 1 and 2 replication by inhibition of an early step in the virus replication cycle.

Although the Catechin and Resveratrol levels in this rice were low, their presence shows the genetic potential to breed and select for higher levels.