



THAI FREEZE DRY
COMPANY LIMITED

Sprouted Black Rice Powder: *Oryza sativa*



Black Rice, also referred to as Purple Rice and, in Thailand as “Mountain Rice” (*khao doi*), is a dry-land rice, rich in anthocyanin antioxidants, minerals and vitamins. It is the most nutritious variety of rice with higher nutritional values than either white or brown rice. Black rice is a wholegrain which is gluten free, cholesterol free, low in fat, sugar and salt yet high in fiber, anthocyanin antioxidants, Vitamins B and E, niacin, thiamin, magnesium, iron and phosphorus.

The Ultimate Functional Food: The combination of attention to scientific detail with renewed reverence for correct cultural preparation has given life to the ultimate Functional Food. “Functional Food” is a new industry category assigned to foods that deliver therapeutic levels of beneficial constituents in a convenient Whole Food form. Our product maintains consumer acceptance as a common food while providing extensive scientific research of its effective use as a medicine. Independent studies have shown positive results from Black rice in weight management, treating various forms of Inflammation, regulating blood, gut rehabilitation and even certain forms of cancer.

CFL activated Sprouted Black Rice Powder is a one-of-a-kind functional food with a broad spectrum of popularity and application that is unique to the market.

Category Management: The Natural food industry as well as mass market utilizes

a system known as Category Management. Categories are created to designate shelf space for products that fit into specific dominant buying trends.

The hottest selling and most consistent categories are as follows:

- Gluten Free
- High Fiber
- High ORAC (Antioxidant rich)
- Low Glycemic
- Weight Management

The complex nature of our CFL freeze dried sprouted black rice powder will place us in the following categories:

- Gluten Free
- High Fiber
- High ORAC (Antioxidant rich)
- Low Glycemic
- Weight Management

Solubility: As a food ingredient black rice is highly soluble. Solubility ties into taste as well as ease to combine with other ingredients. Given a very low acid level, it mixes well with most ingredients. This high level of solubility (enhanced by the CFL freeze dry process which creates a more soluble particle structure), low acidity, and metabolic rate makes our sprouted black rice powder an ingredient that mixes well into a wide range of formulations.



Organically Certified Black Rice



Inspection Prior to Harvest

Fields



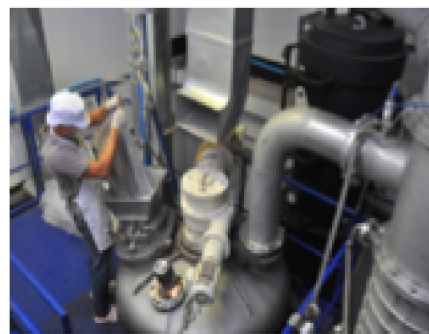
Fully Mature Black Rice



Soft-Milled for Maximum Benefits

Thai Freeze Dry works with organically certified black rice co-ops, which are composed of Hill Tribe farmers. An important part of our corporate culture is to support these farming communities in their attempts to obtain a sustainable income.

The Production Of Sprouted Black Rice Powder



Black Rice Sprouts

Loading The Machine To One Batch



Super-Freeze With Liquid C02

Sprouted Black Rice Powder



1 Serving = 4 grams of Black rice Powder

Finished Bottled Product

Organically Grown: Rice cultivation typically involves substantial use of chemicals. Wet-land rice, grown in the same rice paddies over many years, depletes the soil to the point that considerable use of chemicals is required. In contrast, all of our black rice is organically grown.

F.D.A. Approved / G.M.P. Certified: Thai Freeze Dry's Factory is F.D.A. Approved and G.M.P. Certified and our Sprouted Black Rice Powder product is approved by the Thai F.D.A.

Soft-Milled: The normal milling of "cargo" rice (rice for export) requires that the rice germ and the vast majority of the husk be removed. At the end of this milling process most of the benefits have been removed; the anthocyanin antioxidants in the husk, the fiber and other beneficial ingredients are lost in the normal milling process. In addition, some countries require that the milled rice be steamed prior to shipment. The exposure to extreme heat denatures the enzymes and diminishes the value of thermo-sensitive vitamins that may have survived the milling process. This rice is essentially dead on arrival.

Thai Freeze Dry works closely with its rice co-ops to "soft-mill" our black rice to our specifications. The rice germ is entirely left intact and the husk is included. The soft milled black rice provides a dramatically higher quality product.

There is a concern regarding the absorption and bioavailability of C3G and, in this case, we strongly suggest that the single extract of C3G (even in high concentrations) is not as effective as obtaining the C3G in whole food form. While the benefits in blood sugar reduction have been achieved by dosages well above what is available in black rice, long term benefits and preventative health benefits from regular consumption of black rice (*oraza sativa*) may be achieved with this lower dose of C3G over time.*

Sprouting: Our process respects traditional knowledge regarding the consumption of rice. By sprouting our black rice we create an easily digestible food in its culturally correct form. Several top selling books have been written on the "Paleolithic" theory explaining the benefits of eating sprouted foods. This theory has launched a popular

long-lasting dietary trend around such products to the point of becoming a foundation for mainstream nutritionists.

Sprouts are one of nature's most complete and nutritionally beneficial foods. Rice is designed by nature to remain dormant until it is fully mature and the right growing conditions exist. This dormant stage is enforced by enzyme and nutrient inhibitors such as phytic acid. In the sprouting process these inhibitors are neutralized and the enzyme and nutrient profile changes dramatically.

Thai Freeze Dry has imported state-of-the-art commercial sprouting machinery. Computerized controls allow us to adjust temperature, the speed and frequency of the rotation of the drums, adjust moisture levels and regulate airflow to achieve safe sprouts.

Nutrient	Amount
Alanine	0.437 g
Arginine	0.569 g
Ash	1.27 g
Aspartic acid	0.702 g
Calcium, Ca	33 mg
Carbohydrate, by difference	76.17 g
Copper, Cu	0.277 mg
Cystine	0.091 g
Energy	1515 kj
Energy	362 kcal
Fatty acids, total	0.971 g
monounsaturated	0.959 g

Nutrient	Amount
Magnesium, Mg	143 mg
Manganese, Mn	3.743 mg
Methionine	0.169 g
Niacin	4.308 mg
Pantothenic acid	1.493 mg
Phenylalanine	0.387 g
Phosphorus, P	264 mg
Potassium, K	268 mg
Proline	0.352 g
Protein	7.50 g
Riboflavin	0.043 mg
Serine	0.388 g

Fatty acids, total	
polyunsaturated	0.536 g
Fatty acids, total saturated	
Fiber, total dietary	3.4 g
Folate, DFE	20 mcg
	DFE
Folate, total	20 mcg
Glutamic acid	1.528 g
Glycine	0.369 g
Histidine	0.190 g
Iron, Fe	1.80 mg
Isoleucine	0.318 g
Leucine	0.620 g
Lysine	0.286 g

Sodium, Na	4 mg
Thiamin	0.413 mg
Threonine	0.275 g
Total lipid (fat)	2.68 g
Tryptophan	0.096 g
Tyrosine	0.281 g
Valine	0.440 g
Vitamin B-6	0.509 mg
Water	12.37 g
Zinc, Zn	2.02 mg
	0.281 g

Tested, approved and certified by Central Laboratory(Thailand) Co. Ltd.

Cellular Fraction-Line (CFL) Technology: Our Cellular Fraction-Line Technology is a key component in the creation of our functional foods. It allows us to preserve a Whole Food in its fresh form, thus maintaining all of the medicinal activity of a live plant while providing the safety of a stable commodity.

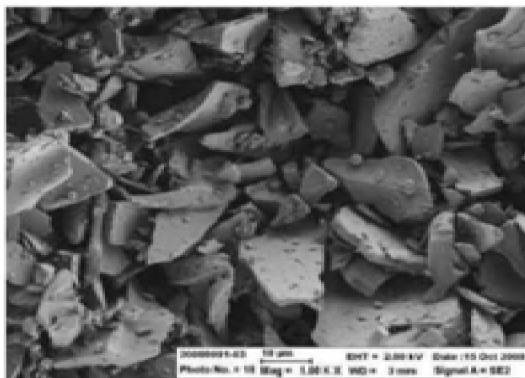
This proprietary and transitional preservation process gives Thai Freeze Dry the unique ability to provide superior products. The sprouted black rice is dried while it remains frozen in a vacuum. Rather than sitting motionless on trays, it is flying round (vigorously and continuously) in the product chamber. The deeply flash-frozen granules decrease in size due to the movement of the super-frozen particles and sublimation of the connecting ice structure and break into increasingly smaller particles along natural elemental fracture lines.

This creates a smaller particle size and porous particle structure without the cellular hemorrhaging caused by mechanical grinding. These particles are much more easily absorbed and metabolized (more bioavailable), and are more soluble for use as an ingredient in other formulations.

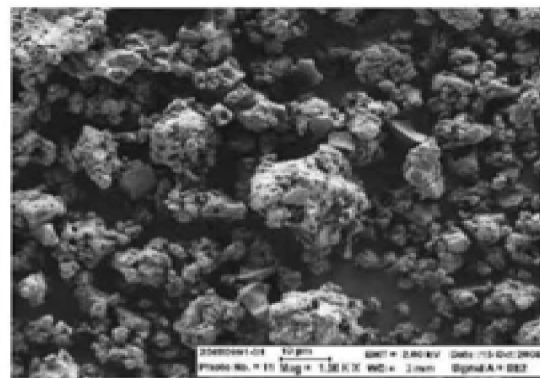
Louisiana State University (Department of Food Sciences) researchers have suggested that food manufacturers can use black rice as a catalyst ingredient to boost the health value of cereals, beverages, shakes, smoothies, rice cakes, ice cream, gelato, yogurt, noodles, protein and meal replacement bars, snack foods, cookies and other baked goods and packaged foods.

The quality and effectiveness of our black rice powder is the result of the remarkable protocols and processes we employ from the fields to the finished product.

10 μm scale



Tray Freeze Dried/Mechanically Ground



Bio-Dynamic Freeze Drying Particle Structure

The quality and effectiveness of our black rice powder is the result of the remarkable protocols and processes we employ from the fields to the finished product.

- Organically grown black rice
- F.D.A. Approved / G.M.P. Certified
- Soft-Milled to preserve the beneficial qualities of the raw rice
- Germinated to eliminate enzyme and nutrient inhibitors

- CFL Freeze Dried for best preservation and highest bioavailability and solubility

HEALTH BENEFITS OF BLACK RICE

Formulations: Black Rice Powder can be used in formulations to boost the health value of breakfast cereals, meal replacement/power bars, beverages, baked goods, noodles and a broad spectrum of products. The high level of solubility due to our small particle size and porous particle structure make it an exceptionally soluble ingredient. In addition to food products which include black rice, we provide black rice in pure powder form for our customers to utilize in their own formulations. This empowers customers to determine their own health destiny and make a sound investment in their most precious asset.

Why should I eat black rice? What are its benefits?

This may be best answered by referring to just a few among the huge number of scientific studies that focus on black rice and provide insight into why our black rice powder is one of nature's most well-balanced "superfoods" truly remarkable in its abilities.

Antioxidants: The remarkable dietary balance of black rice makes it an antioxidant rich whole super food.

A distinguishing characteristic of Black Rice is the strong anthocyanin antioxidants contained in the deep-purple flavonoid pigments in its husk. The strong antioxidant properties of Black Rice make it an effective anti-inflammatory food; which helps cut down on general infections and illnesses. Many health reports point out that anthocyanins protect against damaging free radicals that can give rise to a wide spectrum of serious health problems.

Dr. Zhimin Xu, associate professor at the Department of Food Sciences of Louisiana State University reports that "Just a spoonful of black rice bran ... contains more

health promoting anthocyanin antioxidants than are found in a spoonful of blueberries, but with less sugar, and more fiber and vitamin E antioxidants.”

- Findings announced at 240th National Meeting of the American Chemical Society (ACS) Boston, Mass.

Cornell University researchers found that antioxidant content was approximately six times higher in black rice than in common brown/white rice. The black rice bran had higher content of phenolics, flavonoids and anthocyanins.

- *Journal of Agricultural and Food Chemistry*, July 14, 2010; 58(13): 7580-7

Hypertension: In an article published in the “American Journal of Clinical Nutrition” investigating the consumption of major flavonoid groups (flavonoids, flavones, flavonols, flavan-3-ols, proanthocyanidins, and anthocyanins) determined that anthocyanins were the group most significantly associated with prevention of hypertension.

- Cassidy; Habitual intake of flavonoid subclasses and incident hypertension in adults; *American Journal of Clinical Nutrition* (2011) 93:338-347.

Satiation / Weight Management: Satiation is a complex neurobiological phenomenon mediated by hormones and enzymatic reactions that send signals to the brain associated with the recognition of the feeling of fullness (satiety). In general, when your food provides adequate nutrition, receptors in the brain say “enough.” Your body is getting what it needs and this subconscious neurobiological realization signals you to stop eating. An understanding of human appetite regulation needs to account for the ongoing and recurring drive to eat and the suppression of eating via satiety signaling.

In the case of black rice there is a super-satiation effect that can greatly assist all those for whom weight management is a concern. In the dark purple flavonoid pigments in rice husk (pericarp) there are eleven distinct anthocyanin species many of which are localized. Due to different localization patterns these are not released and digested in the same place and at the same time in your digestive tract. The effects are felt over time. They are, in a sense “time released.” The recognition process and digestion of the multiple species of anthocyanins slows the pace at which food moves through the digestive tract. In addition, the anthocyanins carried in the fiber slows down the oxidation of the food causing it to move slower and take

longer to be processed.

- *Different Localization Patterns of Anthocyanin Species in the Pericarp of Black Rice Revealed by Imaging Mass Spectrometry*” Yukihiro Yoshimura, Nobuhiro Zaima, Tatsuya Moriyama and Yukio Kawamya Published online 2012 February 17, doi: 10.1371/journal.pone.0031285

Black rice has antioxidants woven through a carrier that is nutritionally well balanced, high in fiber (soft milled) and very low in sugar. Other foods with high levels of antioxidants (blueberries for one example) may also be high in sugar. Sugar oxidizes quickly and may neutralize any satiation benefit.

Cyanidin-3-glucoside -- C3G: This is an antioxidant found in abundance in the dark pigments of black rice that affects the gene expression of fat metabolism. It turns off the gene expression for fat storage and turns on the gene expression for fat metabolism. You burn fat instead of storing fat. In addition C3G will move fat into muscle. This makes black rice an effective and safe vehicle for weight loss and, at the same time, drives glucose and nutrients preferentially into muscles.

- *“Microarray profiling of gene expression in human adipocytes in response to anthocyanins”* Takanori Tsuda, Yuki Ueno, Toshikazu Yoshikawa, Hitoshi Kojo, Toshihiko Osawa *Biochemical Pharmacology* 71 (2006) 1184-1197

Scientific studies using rats (with dosage adjusted to the human equivalent of 250 mg C3G) indicate that in thirty days, C3G reversed the weight gain of a high fat diet to the level of a normal diet. Weight gain was significantly lower in the high fat diet plus anthocyanins as compared to the high fat diet only.

- Kwon; Anti-Obesity and Hypolipidemic Effects of Black Soybean Anthocyanins; *Journal of Medicinal Food* (2007) 10:552-556.

C3G helps to override the body's dysfunctional inflammatory nutrient uptake signals that cause fat cells to store high levels of glucose which results in out-of-control appetite and obesity. Decreased levels of leptin ((fat cell signaling protein secretions) and increased levels of the enzyme AMPK and adiponectin (a hormone) help to regulate your weight by triggering the use of stored energy from fat. The metabolic pathway and biological mechanism is covered in detail on the brief on C3G available at www.thaifreezedry.com

The overall effect of C3G results in prevention of obesity from diet.

Anti-inflammation: Researchers at Ajou University in Suwon, S. Korea tested brown rice and black rice for their effectiveness in protecting against skin inflammations and found that the black rice bran did suppress dermatitis, but the brown rice bran did not. This scientific study suggests that black rice may be a “useful therapeutic agent for the treatment and prevention of diseases associated with chronic inflammation.”

- *Journal of Agricultural and Food Chemistry*, Aug. 23, 2010: 58(13):7580-5

In a study published in the “American Chemical’s Journal of Agricultural and Food Chemistry,” researchers found that mice fed with a diet supplemented with ten percent black rice bran significantly reduced inflammation and also found that black rice bran inhibits the release of histamine, a chemical that triggers inflammation. Black rice consumption can alleviate allergic dermatitis symptoms such as swelling, and allergy and asthma sufferers may find relief by adding black rice to their diet.

- U.S. Dept. of Agriculture’s Western Regional Research Center in Albany, Ca. presented in the American Chemical Society’s podcast series: “Global Challenges/Chemistry Solutions.”

Diabetes: C3G is closely associated not only with weight management but also has a positive effect on fat cell dysfunctional inflammatory nutrient signals that contribute to high levels of glucose in the blood and insulin resistance. The regulation of fat cell signaling protein secretions (such as leptin) is important for protection against insulin oversensitivity. C3G decreases leptin and increases AMPK, an enzyme that triggers the use of stored energy from fat and enhances the removal of sugar and fats from the blood. AMPK de-sensitizes fat cells to the effects of insulin. C3G also increases levels of adiponectin, a fat cell protein hormone that promotes insulin de-sensitivity and suppresses metabolic derangements that cause Type 2 Diabetes.

Harvard School of Public Health scientists estimated that replacing about two servings a week of white rice with the same amount of black rice would lower diabetes risk by 16%.

- *Archives of Internal Medicine*, June 14, 2010: 170 (11); 96-99

Insulin resistance has been strongly associated with nonalcoholic fatty liver disease. Numerous studies have suggested that natural anthocyanins are potent antioxidants associated with prevention of diabetes. "We hypothesize that black rice containing C3G may reduce the risk of hepatic fat accumulation and improve insulin resistance."

- *Black rice (Oryza sativa L.) extract attenuates hepatic steatosis in C57BL/6J mice fed a high-fat diet via fatty acid oxidation* Hwan-Hee Jang, Mi-Young Park, et. al. "Nutrition & Metabolism" 2.89

Scientific studies using rats as subjects with dosage adjusted to human equivalency of 120mg C3G demonstrated that in eight weeks C3G inhibited lipid peroxidation (cell membrane damage leading to cell death) , improved activity of superoxide dismutase (antioxidant defense mechanism of the body) and demonstrated a hypoglycaemic effect (lowering of blood sugar levels).

- Nasri; Vascular mechanisms of cyanidin-3-glucoside response in streptozotocin-diabetic rats; *Pathophysiology* (2011) 18:273-278

A clinical evaluation published in "American Journal of Clinical Nutrition" investigating the effects of consumption of major flavonoid groups concluded that anthocyanins were the only group significantly associated with a lower risk of Type II Diabetes.

- Wedick; Dietary flavonoid intakes and risk of type 2 diabetes in US men and women; *American Journal of Clinical Nutrition* (2012) 95:925-933.

C3G decreases blood sugar levels and is, therefore, considered to exhibit strong anti-diabetic effects (alleviation of diabetic progression) associated with metabolic syndrome (antioxidant and anti-inflammation). C3G anti diabetic activities include:

- Stimulation of insulin regulated transporter activity in fat cells.
- Reduction of retinol binding protein 4 expression which contributes to insulin resistance
- Tumor Necrosis Factor-alpha levels associated with Type 2-diabetes are lowered
- Inhibition of terminal kinase activations which contribute to inflammation
- Reduction of reactive oxygen species (ROS) produced inside fat cells that can result in oxidative stress
- Increased glucose uptake

GABA Rice: The digestion of grain proteins results in many nutrients including γ *aminobutyric* acid (GABA). GABA is a neurotransmitter in the brain and spinal cord and induces tranquilizing effects. It is used as a medication to increase blood flow to the brain, to inhibit cancer-cell proliferation and provide other beneficial health effects. A purple (black) rice variety exhibited the highest GABA content of all 21 rice varieties tested. This indicates the importance of Thai purple rice cultivars for adding nutritional value to functional food products.

- “ *γ -Aminobutyric acid (GABA) content in different varieties of brown rice during germination*” D. Karladee , S. Suriyong Department of Plant Science and Natural Resources, Faculty of Agriculture, Chiang Mai University, Purple Rice
Research Unit, Institute for Science and Technology, Chiang Mai University
ScienceAsia 38 (2012):13-17