



Black Rice: The Modern Day Super Food

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Abstract

Black rice is a type of rice species *Oryza sativa* L. and is consumed as functional food due to the usefulness to health. Black rice contains higher levels of proteins, vitamins and minerals than common white rice. Black rice contains essential amino acids like lysine, tryptophan; vitamins such as vitamin B1, vitamin B2, folic acid; and it is a good source of minerals including iron, zinc, calcium, phosphorus and selenium. It contains the highest amount of antioxidants, protein and dietary fiber of all rice varieties, besides it has phenolics, flavonoids, and anthocyanins. Antioxidants serve as the primary defense against harm caused by free radicals, playing a crucial role in preserving overall health and promoting well-being. These beneficial compounds possess remarkable health advantages and can lower the likelihood of developing a range of long-term ailments. This particular type of rice promotes both health and longevity by safeguarding heart health, diminishing the risk of atherosclerosis, managing hypertension, enhancing the digestive system, possessing anti-inflammatory properties, reducing allergies, detoxifying the body, improving lipid profile, lowering the risk of diabetes, aiding in weight management, inhibiting cancer growth, enhancing cognitive function, and ultimately elevating one's overall quality of life. Due to its abundance of nutrients, high fiber content, and substantial antioxidant levels, black rice proves to be an exceptional substitute for white and brown rice.

Key Words: *Black Rice, Antioxidants, Phenolics, Flavonoids, Free Radicals, Atherosclerosis*

Introduction

Rice is the most important cereal food crop of the world. It is the staple food for more than half of the world's populations. Black rice has gained significant popularity in recent times and is increasingly being recognized as a functional food due to its various health benefits. Black rice is also known as purple rice, forbidden rice, heaven rice, imperial rice, king's rice and prized rice. In comparison to ordinary white rice, black rice possesses elevated levels of proteins, vitamins, and minerals. Black rice is abundant in essential amino acids like lysine and tryptophan, as well as vitamins such as vitamin B1, vitamin B2, and folic acid. Additionally, it serves as a valuable source of minerals including iron, zinc, calcium, phosphorus, and selenium. Furthermore, black rice provides a substantial amount of dietary fiber and is even considered a noteworthy source of plant-based protein. Among all rice varieties, black rice stands out with the highest concentration of antioxidants, protein, and dietary fiber. A single serving of black rice, measuring 1/4 cup or 50g, contains approximately 160 calories. Within this serving, there are 5g of protein, 2g of fiber, and 1g of iron. While both brown rice and black rice offer vitamins, minerals, and dietary fiber, black rice surpasses brown rice in terms of protein and fiber content. Moreover, black rice boasts an

exceptionally high antioxidant level, resulting in numerous additional health benefits. Notably, pigmented black rice contains around six times more antioxidants than brown rice. Rice (*Oryza sativa* L.) pigmented varieties, such as black rice, have a higher content of phenolic compounds as compared to other rice varieties.

Role of Black Rice in Health

Antioxidants: Black rice is rich in compounds with antioxidant properties, which are beneficial in protecting against the damaging effects of free radicals that contribute to aging, cancer, and diseases. Antioxidants also support memory function and coordination.

Anthocyanins: The outer bran layer of black rice contains abundant anthocyanins, a plant compound responsible for its dark color. These anthocyanins offer several benefits such as improving memory, enhancing vision, and acting as an anti-inflammatory agent.

Protein: Consuming a single serving of black rice provides approximately 10 percent of the recommended daily value of protein. Protein is a crucial macronutrient necessary for tissue and muscle building and repair. It also plays a role in enzyme production and supports various bodily functions.

Fiber: Black rice contributes around 8 percent of the recommended daily value of fiber. The soluble fibers in black rice help control weight by promoting a feeling of fullness in the stomach. Insoluble fibers add bulk to the diet and assist in preventing constipation.

Iron: One serving of black rice supplies approximately 4 percent of the recommended daily value of iron, an essential mineral for maintaining strong and healthy blood. Iron is vital for oxygen transport in the body, and insufficient oxygen can lead to fatigue, reduced brain function, and a weakened immune system.

Nutritive value of Black Rice

Black rice has the highest nutritional content of any type of rice. This rice is minimal in sugar, salt, and fat and devoid of gluten and cholesterol. It is a whole grain, incredibly nutrient-dense variety of rice that is rich in fibre, anthocyanin, antioxidants, vitamins B complex and E, iron, thiamine, magnesium, niacin, phosphorus, and other minerals. According to estimates, 50 g of black rice contains 35% of the recommended daily allowances of selenium, copper, zinc, and magnesium. Protein content and quality are higher than in any other rice variety. There are 18 amino acids in it. It is helpful for individuals worried about getting enough iron on a plant-based diet because it is a naturally good source of iron. According to the daily recommended values, one half serving of cooked or one fourth cup of uncooked black rice has about 160 kcal of energy, 1.5 g of fat, 34 g of carbohydrate, 2 g of fibre, 7.5 g of protein, no saturated fat, and no cholesterol.

Health Benefits

(i) Prevention of Cardio Vascular Diseases: Black rice consumption ought to be improved in order to minimise the risk of cardiovascular disease, according to the 2005 Dietary Guidelines for Americans, the American Cancer Society, and the American Health Association. Iron, vitamins A and B, in addition to other vitamins and minerals that are good for heart health and overall good health are all plentiful in black rice. Black rice may have antiatherogenic properties and may enhance some metabolic processes connected to fructose-rich diets. In this connection, Qin said that anthocyanin supplementation in humans increases cellular cholesterol efflux to serum and improves LDL- and HDL-cholesterol concentrations. The suppression of CETP may be the cause of these advantages.

(ii) Anti-Inflammatory Function: Systemic inflammation is thought to be an important factor in a number of illnesses and disorders that are common in today's culture. This covers conditions including cancer, asthma, heart disease, Alzheimer's disease, and various joint problems. At the cellular level, black rice bran has the ability to alleviate inflammation. By

increasing cell health and serving as a therapeutic agent for the treatment of inflammatory diseases and illnesses, this causes a decrease in the level of systemic inflammation inside the body. Black rice has anti-inflammatory qualities that reduce the body's production of reactive oxygen species. Additionally, black rice boosts anti-inflammatory mediators like superoxide dismutase, which improves defence against allergens, joint discomfort, atherosclerosis, and other aging-related symptoms.

(iii) Antioxidant Effect : Anthocyanin, one of a number of substances found in black rice, is the one that scavenges dangerous molecules, aids in artery protection, and reduces the risk of DNA damage. The flavonoid pigments in black rice are called anthocyanins. It serves as a source of antioxidants and has the power to prevent the synthesis of or lower the levels of reactive free radicals, which can harm cells. It can be seen that the cooking water of pigmented rice, which is in the form of an aqueous extract, has the potential to be the foundation for an antioxidant drink, according to Adyati Putriekasari Handayani, Roselina Karim, and Kharidah Muhammad's paper (Handayani, et al. Superoxide anions can be neutralised by black rice extract more efficiently than by hydroxyl radicals by themselves. In addition to anthocyanins, tocopherols, another potent antioxidant better known as vitamin E, are abundant in black rice. According to recent studies, foods containing two or more forms of antioxidants may provide greater health advantages than the total of the benefits of each type of antioxidant alone.

(iv) Weight Management: Black rice has a very high fibre content, which can help with digestion and enhance gut health. Furthermore, fibre can decrease feelings of hunger and lead to a reduction in daily energy intake because it is digested slowly (and stays in our stomach for a longer period of time. Weight loss results from this decrease in energy consumption. The fibre level of black rice is twice as high as that of brown rice. Fibre gives the stool bulk so that it can easily move through the colon and leave the body. Additionally, as hazardous substances bind with fibre in the colon, they are eliminated from the body as waste. Black rice has a very high fibre content, which can help with digestion and enhance gut health. Furthermore, fibre can decrease feelings of hunger and lead to a reduction in daily energy intake because it is digested slowly and stays in our stomach for a longer period of time. Weight loss results from this decrease in energy consumption. The fibre level of black rice is twice as high as that of brown rice. Fibre gives the stool bulk so that it can easily move through the colon and leave the body. Additionally, as hazardous substances bind with fibre in the colon, they are eliminated from the body as waste.

(v) Cancer Prevention: The growth of aberrant cells that do not react properly to typical regulatory processes is what defines cancer. Cancer development is referred to as carcinogenesis, a multi-step process that involves the beginning, promotion, and advancement of uncontrolled cells. Damage to deoxyribonucleic acid (DNA) occurs at the beginning step. During the promotion step, cells start to multiply and transform into aberrant cells. Finally, during the advancement stage, these aberrant cells undergo additional alterations that result in the creation of malignant cells.

Reactive oxygen species (ROS) or reactive nitrogen species (RNS) generation and clearance are out of equilibrium, which causes oxidative stress. Both external and internal sources can produce ROS or RNS. Glutathione, superoxide dismutase, and catalase are examples of antioxidant defence mechanisms in the body that guard against oxidative stress. Damage to lipids, proteins, or nucleic acids has been linked to carcinogenesis and excessive ROS generation. Breaks in DNA strands and the development of aberrant DNA connections have been seen during carcinogenesis. A significant part of the aetiology of many malignancies is oxidative stress.

Dietary, genetic, and environmental risk factors interact to cause cancer. It is believed that dietary factors significantly contribute to the aetiology of cancer. A healthy food and

way of life have great potential for preventing cancer and may lighten the burden of malignancies like breast, prostate, and colon that are common. Numerous epidemiological and laboratory investigations point to a significant link between dietary elements and colon cancer risk. There is mounting evidence that eating a lot of red meat and saturated fat increases risk while eating a lot of fruits, vegetables, and whole grains lowers risk. Natural dietary supplements have received a lot of interest due to their capacity to inhibit cancer growth and lower risk of cancer development by reducing oxidative stress. Although research in in vitro and on animals utilising the chemoprevention approach, a relatively new and promising method for preventing cancer, revealed encouraging results. Natural dietary supplements have received a lot of interest due to their capacity to inhibit cancer growth and lower risk of cancer development by reducing oxidative stress.

(vi) Anti-Diabetic Effects: Black rice has high fibre content and low sugar content, both of which are proven to help the body fend off diabetes mellitus. It does not induce the blood glucose swings like white rice frequently does. Additionally, black rice has vital nutrients that support blood pressure control. Therefore, consuming black rice as part of a diabetic diet has many advantages.

(vii) Reduces Allergies: According to studies, black rice may be able to reduce the inflammation brought on by allergies and other disorders. Histamine release may be limited by the rice's bran or outer husk. Allergy symptoms are brought on by histamine. Additionally, black rice aids in reducing swelling and irritation brought on by allergic contact dermatitis.

(viii) Prevention of Constipation: Studies suggest that black rice may be able to lessen the inflammation caused by allergies and other conditions. The bran or outer husk of the rice may be able to control histamine release. Histamine is the culprit of allergy symptoms. Black rice also helps to lessen the itch and swelling that are caused by allergic contact dermatitis.

Summary and Conclusion

This analysis of the literature examined how black rice affects both health and disease. Because of its high nutrient density, high fiber content, and abundant antioxidant content, black rice is a fantastic substitute for white and brown rice. Because it contributes to illness prevention and control in addition to providing nutrients, black rice is now viewed as a nutraceutical and functional food. According to several studies, eating black rice may improve heart and liver health, weight loss, control of blood glucose levels and lipid profiles, as well as the prevention and management of inflammation and cancer. Black rice may also be able to lower the risk of contracting a number of diseases and illnesses.

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