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Health Benefits of Black Rice

Rice is the most well-known cereal, a starchy grain that is utilised as a staple food by more than half of the world's population, owing to its wider adaptability and availability. Nowadays lifestyle-related disorders leading to oxidative stress and diseases such as diabetes, cancer and cardiovascular disease have become more common in humans. On the other hand, pigmented rice types such as black rice exhibit anti-inflammatory and antioxidant characteristics, making rice a possible choice for nutraceutical and functional food alternatives. The presences of various bioactive compounds in black rice have been linked to the medicinal effects and therapeutic properties extending its role in treatment of ailments and disorders.

INTRODUCTION

Rice is a staple food in many nations and provides a healthiest source of energy to billions of people worldwide. The term "black rice" refers to a kind of rice from the *Oryza sativa* L. species and this type of indica rice species thrives well in tropical climates. It is cultivated in countries such as China, Japan, Korea, Myanmar and North East India. Black rice is also known as purple rice, forbidden rice, heaven rice, imperial rice, king's rice and prized rice. Indonesian black rice and Thai jasmine black rice are the two most common forms of black rice on the market. Black rice has gained popularity among coloured rice types due to its sensory qualities, high nutritional content and most importantly due to its extensive health benefits. In Asia, pigmented rice cultivars possessing black, red, and purple brans existed in cultivation for a very long period. The history of black rice cultivation dates back to many centuries signifying their importance. It is stated that in ancient China, black rice was regarded so distinctive and nutritious that it was banned to all except royalty. A popular cultivar of black rice "Imperial rice" was consumed only by the emperors and another variety "forbidden rice" was only available to Chinese aristocracy. Royal families and monarchs used to consume these specific sorts of rice to maintain their health and to emphasise their

wealth. (Oikawa et al., 2015; Kushwaha, 2016). Besides being staple food with good flavour and aroma, these black rice cultivars were used for effective medications in curing different ailments and in various medicinal treatments.

NUTRITIONAL SIGNIFICANCE OF BLACK RICE

Black rice significantly possesses higher protein, vitamins and minerals in comparison to normally consumed white rice. It includes essential amino acids like lysine and tryptophan; vitamins like vitamin B₁, vitamin B₂ and folic acid and minerals like iron, zinc, calcium, phosphorus, and selenium. In addition, it is rich in fibre, antioxidants and plant-based protein. Black rice provides about 160 calories per serving (50g) and approximately 34g of carbohydrates, 4g of proteins, 1.5g of fat, 1 g of fibre and 6% of the Daily Value (DV) of iron per serving (Kang et al., 2011). Pigmented rice types such as black rice have abundant phenolic content and nearly six times higher level of antioxidants than other rice varieties. Black rice also possesses numerous therapeutic properties including antioxidant activity, endothelial cell protection, heart and cardiovascular disease prevention and anti-cancer activity (Tanaka et al., 2012). Black rice had also been discovered to contain over 23 bioactive plant compounds possessing antioxidant characteristics which includes polyphenols, flavonoids and carotenoids in addition to anthocyanin. The American Cancer Society and the American Health Association advocated black rice for its usage pertaining to its health benefits (USA Rice Federation, 2018).

ANTIOXIDANT PROPERTIES OF BLACK RICE

Antioxidants are organic compounds that promote health by shielding the body's cells from damage produced by free radicals and reactive oxygen species, which might otherwise have negative metabolic consequences. The antioxidant content of rice is the reason behind the low prevalence of some of the chronic ailments in rice-consuming parts of the world. Such antioxidants were abundant in black rice when compared with white or brown rice cultivars. Black rice contains antioxidant compounds such as phenolic acids, flavonoids, anthocyanins, proanthocyanidins, tocopherols, tocotrienols, γ -oryzanol and phytic acid which acts as first line of defence against free radical damage and they are essential for sustaining good health and well-being. Pigmented compounds such as Cyanidin-3-O- β -D-

glucopyranoside, Cyanidin 3-O-glucoside present in black rice is linked to a variety of functional properties including cytotoxicity protection, anti-neurodegenerative activity, inhibition of glycogen phosphorylase, and higher antioxidant and scavenging activity than white rice varieties. Antioxidant supplements in black rice exhibit a positive impact on health and a protective effect against the onset of major illnesses, such as cancer. Natural dietary compounds in black rice is gaining a lot of attention at present owing their ability to inhibit malignancies and lowering the risk of cancer formation by reducing oxidative stress (Walter et al., 2013).

IMPORTANCE OF BLACK RICE IN CANCER PREVENTION

Cancer is caused by the combination of risk factors such as nutrition, genetics and environment. Dietary factors were found to have a significant impact in cancer genesis. A healthy diet and lifestyle provide a higher potential for cancer prevention and may lessen the burden of commonly occurring malignancies such as breast, prostate, and colon cancer. Anthocyanin compounds in black rice have potent anticancer properties thereby reducing the number of human breast cancer cells, as well as slowing their growth and their ability to spread. Further, black rice reduces tumour metastasis and assist in preventing cell damage which in turn leads to cancer. Even extracts from black rice have anti-cancer properties and inhibit tumour development and spread due to presence of bioactive compounds such as peonidin, peonidin 3-glucoside and cyanidin 3-glucoside.

ROLE OF BLACK RICE IN PROMOTING EYE HEALTH

The antioxidants lutein and zeaxanthin found in black rice have ability to protect retina from potentially harmful free radicals and aid in retinal protection by blocking out damaging blue light waves. These antioxidants play a vital role in preventing age-related macular degeneration (AMD), the main cause of blindness in the world. They also lower chance of developing cataracts and diabetic retinopathy.

SIGNIFICANCE OF BLACK RICE IN HEART DISORDERS

The impact of black rice on heart health signifies its importance in today's diet and lifestyle. Flavonoids contained in black rice acts as a potential compound

in lowering risk of developing and dying from heart disease. Many of the antioxidants present in black rice helps in protection against heart disease thereby regulating the cholesterol and triglyceride levels by enhancing HDL (good) cholesterol levels and significantly lowering LDL (bad) cholesterol levels. Anthocyanins in black rice have the ability to slow down the growth of atherosclerotic plaques which are the primary cause of most heart attacks and reduces triglycerides by enhancing high-density lipoprotein cholesterol for a healthy cardiovascular system. Black rice also helps in preventing artery hardening, which can lead to heart failure. As a good source of fibre, it helps in prevention of heart disease, high blood pressure, stroke, and high blood sugar.

OTHER POTENTIAL BENEFITS OF BLACK RICE

Consuming black rice rich in anthocyanin results in lowering the blood sugar levels in type 2 diabetes and reduces the risk of nonalcoholic fatty liver disease (NAFLD) since consumption of black rice to a high fat diet decreases fat formation in the liver. Higher protein, anthocyanins and fibre content in black rice aids weight reduction by suppressing hunger and promoting feelings of fullness thereby reducing body weight and body fat percentage. Another significant health advantage of black rice is its capacity to suppress inflammatory reactions in the body. Black rice bran is anti-inflammatory and anti-allergic and is utilised in treatment and prevention of disorders caused by chronic inflammation. Black rice also enhances anti-inflammatory mediators such as superoxide dismutase which leads to better protection of allergies, joint aches, atherosclerosis, and other ageing signs. Anti-inflammation compounds in black rice also aid in the prevention of some forms of cancer. Consuming black rice bran helps to decrease skin disorders such as dermatitis. Whereas, brown rice exhibits no effect in reducing inflammation in the body (Chatthongpisut *et al.*, 2015). The medicinal properties of black rice is significantly higher than white or brown rice because of the presence of various bioactive compounds and secondary metabolites.

CONCLUSION

Historical significance, composition, nutritional and functional characteristics of black rice reveals its remarkable importance as a food as well its curative properties. Presence of anthocyanins and other bioactive compounds emphasis their significant role

as a potential antioxidant governing various ailments such as free radical scavenging, antitumor, antiatherosclerosis, hypoglycemic and antiallergic activities. However, further extensive research on these bioactive compounds and their effects on antioxidant status, as well as the mechanisms of action in relation to biological impacts in people are necessary to explore further the potential advantages of black rice which represents a promising area for future investigation.

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