



INSTITUTE OF HOTEL MANAGEMENT, SHILLONG

MEDICINAL & CULINARY USES OF BLACK RICE

**A Research Project submitted in partial fulfilment for the award
of bachelor's degree in hospitality & Hotel Administration**

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Institute of Hotel Management
Catering Technology and Applied Nutrition, Shillong

Government of India



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**6th Semester of 3 Year B.sc in Hospitality and Hotel Administration
2020-2021**



INSTITUTE OF HOTEL MANAGEMENT, SHILLONG

DECLARATION

I hereby declare that the Research Project titled “**MEDICINAL & CULINARY USES OF BLACK RICE**” submitted by me to Institute of Hotel Management, Shillong in partial fulfilment of the requirement for the award of the degree of BSc. in Hospitality and Hotel Administration is a record of original project work carried out by me. I further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for the award of any other Degree or Diploma in this Institute or any other Institute or University.

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SYNOPSIS

Medicinal & Culinary Uses of Black Rice

Introduction:

Black rice is a range of rice type of the species *ORYZA SATIVA L.* some of which are glutinous rice. Black Rice is also called '**FORBIDDEN RICE**' in ancient China since only those belonging to upper class could afford to eat it.

Black Rice is known as '**CHAK-HAO**' in Manipur and '**KHAOLONG**' in Shillong, where dessert made from black rice are served at major feasts.

In Bangladesh, it is known as '**KALO DHANER CHAL**' & used to make polao or rice-based dessert.

Black rice has a deep black colour and usually turns deep purple when cooked. Its dark purple content, which is higher in weight than that of other coloured grains.

Black rice is almost always sold as a whole grain with the outermost layer of bran intact making black rice technically a type of brown or unrefined rice.

The raw uncooked grains look black while cooked or soaked grain look purple. The result of the dark bran mixing with the white endosperm. Although they look similar, black rice is not related to wild rice, a grain of rice variety with genus '**ZIZANIA**'.

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 number of antioxidants, protein, and dietary fibre of all rice varieties; besides, it has phenolics, flavonoids, and anthocyanins. Antioxidants are first line of defence against free radical damage and are critical for maintaining optimum health and well-being. These antioxidant compounds have tremendous health benefits and can reduce the risk of developing various chronic diseases. This rice enhances health and longevity, protects heart health, reduces atherosclerosis, controls hypertension, improves digestive system, has anti-inflammatory action, reduces allergy, detoxifies the body, improves lipid profile, reduces risk of diabetes, helps in weight management, reduces growth of cancer, boost cognitive function, and increases quality of life.

Some of the famous Dishes made of Black Rice:

1. Black rice risotto
2. Black rice breakfast porridge with berries
3. Black rice dessert porridge with coconut milk fresh mango.
4. Black rice paella

Objective

1. Medicinal Importance of Black Rice.
2. Culinary Uses of Black Rice

Research Methodology:

AREA OF STUDY: IHM Shillong

POPULATION:

SAMPLING SIZE: 50

SAMPLING TECHNIQUE: Survey

COLLECTION OF DATA:

- Primary Sources of Data – Questionnaire, survey



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- Secondary Sources of Data – Internet, world wide web, books

DATA ANALYSIS & INTERPRETATION: Articulate all the main points which clearly presents the valid summary statement from the research work.

Significance Of The Study:

To understand how the grain originated and the microscopic view of the same.

Limitation Of The Study: -

1. Unavailability of book: Black Rice Research, History & Development by U.K.S Kushwaha
2. Since the origin of the rice is from China being a researcher was unable to collect more information about the same.
3. During my local market survey the most faced barrier was the linguistic difference for communication.

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CERTIFICATE

This is to certify that this Research Project titled "**MEDICINAL & CULINARY USES OF BLACK RICE**" submitted by "**NIVEDITA SAXENA**" in partial fulfilment of the requirement of the Degree of B.Sc. in Hospitality & Hotel Administration is based on the results of the research work carried out under my guidance and supervision. This Research work or any part thereof has not been submitted for any purpose to any other University or Institute.

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Shillong

Dated:

(Name and Signature of the Guide)



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ACKNOWLEDGEMENT

I would like to express my gratitude towards my research guide “**Mr. Rajeev Chatterjee**” for his guidance and support in completion of my project.

I would like to extend my gratitude to the Principal Sir “**Mr. Vijay Kumar**” and H.O.D. ma’am “**Ms. Balabynta Kharshiing**” for providing me with all the facilities that were required.

DATE:

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6TH SEM, 3RD YEAR

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INTRODUCTION

Rice is the staple food for most of the people in different countries. Black rice is one kind of rice that is getting more popular recently and is consumed as functional food due to the usefulness to health.

Black rice is also known as purple rice, forbidden rice, heaven rice, imperial rice, king's rice, and prized rice. 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. Black Rice is a good source of fiber and even a good source of plant-based protein.

It contains the highest number of antioxidants, protein and dietary fiber of all rice varieties. One serving of black rice (1/4 cup or 50g) contains approximately 160 calories. Each serving of this type of rice contains 5g of protein and 2g of fiber and 1g of iron. Both brown rice and black rice contain vitamins, minerals, and dietary fiber. However, black rice is superior when compared with brown rice because it contains more protein and fiber than brown rice. And, black rice has an extremely high antioxidant content, which provides several additional health benefits. Pigmented black rice contains about 6 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.



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LITERATURE



CHAPTER 1 – MEDICINAL USES OF BLACK RICE

Phytochemical content of the various rice types was divided into several groups such as carotenoids, phenolics, alkaloids, nitrogen, and organosulfur containing compounds. Phenolic compounds were sub grouped as phenolic acids, flavonoids, coumarins and tannins. Similarly, anthocyanins are one of such flavonoid compounds. Black rice has the highest content of total anthocyanins (327.60 mg - 100 g⁻¹) among all the studied colored grains. Anthocyanins as functional ingredient has role in preventing chronic and degenerative diseases due to their antioxidant, anti-inflammatory, anti-cancer, hypoglycemic activities. Anthocyanins are also considered as powerful dietary antioxidants.

Today black rice is becoming popular because of its health benefits. Black rice provides many health benefits including prevention and treatment of diseases and conditions such as heart disease, cancer, diabetes, high blood pressure, and extend the quality of life. Several studies suggest that black rice components play a role in the maintenance of health and prevention of diseases.

Role of Black Rice in Health and Diseases

Black Rice and Antioxidants

Antioxidants are first line of defence against free radical damage and are critical for maintaining optimum health and well – being. Oxygen is a highly reactive atom that can become part of potentially damaging molecules commonly called “free radicals.” Free radicals can attack the healthy cells of the body, causing them to lose their structure and function.

Reactive oxygen species (ROS) is a term which encompasses all highly reactive, oxygen-containing molecules, including free radicals. Types of ROS include the hydroxyl radical, the superoxide anion radical, hydrogen peroxide, singlet oxygen, nitric oxide radical, hypochlorite radical, and various lipid peroxides. All can react with membrane lipids, nucleic acids, proteins and enzymes, and other small molecules, resulting in cellular damage. Oxidants are capable of stimulating cell division, which is a critical factor in mutagenesis. Thus, a mutation can arise which in turn is an important factor in carcinogenesis. Antioxidants are capable of stabilizing or deactivating free radicals before they attack cells. It is believed that antioxidants exert their protective effect by decreasing oxidative damage to DNA and by decreasing abnormal increases in cell division.

To protect the cells and organ systems of the body against reactive oxygen species, both endogenous and exogenous components function interactively and synergistically to neutralize free radicals. These components include:

- Nutrient-derived antioxidants like ascorbic acid (vitamin C), tocopherols and tocotrienols (vitamin E), carotenoids.
- Antioxidant enzymes, e.g., superoxide dismutase, glutathione peroxidase, and glutathione reductase, which catalyse free radical quenching reactions.
- Metal binding proteins, such as ferritin, lactoferrin, albumin, and ceruloplasmin that are capable of catalysing oxidative reactions.

Numerous other antioxidant phytonutrients present in a wide variety of plant foods.



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Epidemiological evidence consistently relates low antioxidant intake or low blood levels of antioxidants with increased health risk. The day-to-day concern about the side effects of synthetic antioxidants like butylated hydroxyl anisole (BHA) and butylated hydroxyl toluene (BHT) have increased the interest among researchers and nutritionists in exploration of antioxidants from natural sources, which are both economically and physiologically justified. It has been validated by researchers that changing the dieting habits from artificially processed to a naturally providing foods having high content of bioactive components including antioxidants like tocopherols, tocotrienols, oryzanol, polyphenols, flavonoids, vitamin C, play an important role in defending the body from attack of chronic diseases. Pigmented rice having pleasant taste and odour are also associated with numerous health benefits. Pigmented rice possesses pigmented compounds such as Cyanidin-3-O- β -D-glucopyranoside in abundant content, which is associated with diverse functional properties such as, protection against cytotoxicity, anti-neurodegenerative activity, inhibition of glycogen phosphorylase, and possessing antioxidant and scavenging activity higher than white rice varieties.

Black rice bran has more anthocyanin antioxidants than blueberries. However, black rice bran has more health benefits. It contains more fiber and vitamin E (another essential antioxidant) and less sugar than blueberries. Antioxidants can neutralize free radicals and can help to prevent oxidative damage. Studies show that antioxidant supplementation can exert a preventive effect against the development of serious conditions like cancer, and may improve overall health.

Black Rice and Anti-Inflammation

Systemic inflammation is considered a key contributor to several diseases and illnesses prevalent in society today. This includes arthritis and other joint issues, asthma, Alzheimer's disease, heart disease, and even cancer. Black rice bran has the capacity to reduce inflammation at a cellular level. This results in a reduction in the amount of systemic inflammation within the body, improving cell health, and acting as a therapeutic agent for the treatment of inflammatory disease and illness. Black rice contains anti-inflammation properties that decrease reactive oxygen species in the body. Black rice also increases anti-inflammatory mediators such as superoxide dismutase, leading to better prevention against allergies, joint pains, atherosclerosis, and other symptoms related to aging. The anti-inflammation compounds found in rice could also help to prevent certain types of cancer.

Another important health benefit of black rice is its ability to reduce inflammatory responses in the body. Inflammation is the body's natural response to protect us from bacterial and viral infections. Chronic inflammation seems to be at the root of many serious illnesses and diseases. Research carried out on the anti-inflammatory effects of pigmented rice proved that it helped to reduce inflammation. Other researchers found that a diet containing black rice bran helped to suppress inflammatory skin conditions like dermatitis. They concluded by saying that black rice bran is anti-inflammatory and anti-allergic and can be used to treat and prevent diseases associated with chronic inflammation. That study also showed that brown rice had no effect on reducing inflammation in the body. So, that is another reason why black rice is superior to brown rice.

Black Rice and Weight Management

Black rice has an extremely high fiber content, which can promote gut health, and aid with digestive processes. Furthermore, as fiber is digested slowly (and subsequently stays in our stomach longer), it can reduce feeling of hunger, and results reduction in daily energy intake. This reduction in energy intake leads to weight loss. Black rice contains twice the



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amount of fiber content of brown rice. Fiber bulks up the stool so it can be passed to the colon and out of the body effortlessly. Fiber also binds with toxic compounds in the colon so it is flushed out from the body as waste.

Black Rice and Heart Health

Black rice has also been demonstrated to reduce plaque build-up within arteries. Plaque build-up within the arteries can cause the wall of those arteries to harden and become blocked. This negatively affects the function of those arteries, while also placing an increased demand on the heart, causing a significant rise in blood pressure. This is considered a key risk factor to both heart attacks and strokes. By reducing plaque build-up in the arteries, black rice can directly reduce the likelihood of developing cardiovascular and heart disease, while also improving heart health and function.

Adding black rice in the diet may also help to alter cardiovascular parameters, leading to lower triglycerides, it also improves HDL levels. Anthocyanins can prevent the progression of atherosclerotic plaques, the main cause of most heart attacks. Anthocyanins play a key role in lowering triglycerides. Research published in The Journal of Nutrition found that black rice helps to increase high-density lipoprotein (HDL) cholesterol. This is the type of “good” cholesterol that a healthy cardiovascular system needs to function properly. The study showed that black rice also helps to prevent hardening of the arteries that can lead to heart failure. Black rice is a rich source of dietary fiber. However, dietary fiber has also been linked with preventing heart disease, high blood pressure, stroke, and elevated blood sugar levels.

It was observed in the study “The role of black rice (*Oryza sativa* L.) in the control of hypercholesterolemia in rats” that diet containing black rice reduced the level of plasma cholesterol, triglycerides, and low-density lipoprotein and improved high density lipoprotein values. The diet containing black rice was more effective in controlling the hyper lipidemia.

Black Rice and Cancer Prevention

Cancer is characterized by the proliferation of abnormal cells that fail to respond correctly to normal regulatory mechanisms. Carcinogenesis, a term used to describe cancer development, is a multiple step process consisting of initiation, promotion, and progression of uncontrolled cells. At the initiation step, damage to deoxyribonucleic acid (DNA) occurs. Cells begin to proliferate and expand into abnormal cells during the promotion step. Finally, during the progression step, further changes occur to these abnormal cells, leading to formation of malignant cells.

Oxidative stress is the result of an imbalance between the production and the removal of reactive oxygen species (ROS) or reactive nitrogen species (RNS). ROS or RNS can be generated from exogenous and endogenous sources. The body’s antioxidant defense mechanisms include glutathione, superoxide dismutase, and catalase, protect against oxidative stress. Excess production of ROS has been associated with carcinogenesis with damage to nucleic acids, proteins, or lipids. During carcinogenesis, breaks in DNA strands and formation of abnormal DNA linkages have been observed. Oxidative stress plays important role in the pathogenesis of many cancers.

Cancer is caused by the interaction of dietary, genetic, and environmental risk factors. Dietary factors are considered to play a major role in cancer etiology. Healthy diet and lifestyle are excellent potential for cancer prevention and might reduce the burden of frequently occurring cancers of the breast, prostate, and colon. Several epidemiological and laboratory studies suggest a strong relationship between colon cancer risk and dietary factors. There is increasing evidence that risk is increased by high intakes of red meat and saturated fat, and that risk is decreased by high intakes of fruits, vegetables, and whole cereals.



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Natural dietary agents have drawn a great deal of attention because of their potential to suppress cancers and to reduce risk of cancer development by decreasing oxidative stress. Although a chemoprevention approach, which is a relatively new and promising strategy to prevent cancer using natural dietary compounds and synthetic substances, showed promising results in in vitro and animal studies. Natural dietary agents have drawn a great deal of attention because of their potential to suppress cancers and to reduce risk of cancer development by decreasing oxidative stress.

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Antioxidant phytochemicals may modulate the initiation of carcinogenesis process by protecting against DNA damage. Antioxidant phytochemicals could inhibit cell proliferation and induce cancer cell death. Antioxidants stop the formation of free radicals, which in turn, protects the body from the onset and development of cancer.

Furthermore, black rice consumption has demonstrated in lowering tumour metastasis (referring to the spread of cancer around the body). The antioxidant anthocyanins in black rice helps to protect from cell damage in the body that can cause cancer. In fact, extracts from black rice have been shown to have an anti-cancer effect and prevent the growth and spread of tumours.

One explanation for this relationship is that vegetables, fruits, and whole grains contain a wide variety of phytochemicals (like terpenes, isothiocyanates, carotenoids, and flavonoids), which have potential to modulate cancer development. Flavonoids are plant secondary metabolites, with a wide variety of beneficial biological properties such as anticarcinogenic and antioxidative modes of action. Much research proved anti carcinogenic effect of one class of flavonoids, anthocyanins. The prevention of cancer-cell invasion property of peonidin, peonidin 3-glucoside, cyanidin 3-glucoside, and other major anthocyanins of black rice has been reported. In recent years, considerable studies have exhibited the ability of anthocyanins to inhibit oxidative stress and to induce apoptosis in malignant cells which suggest that anthocyanins may prevent carcinogenesis. Anthocyanins extracted from black rice, especially cyanidin and peonidin-3-glucoside, showed an in vitro inhibitory effect on cancer cell proliferation a high protection of endothelial cells from oxidative stress events.

Black Rice and Liver Health

Based on in vitro and in vivo studies, natural bioactive food components derived from plants and animals such as phytosterols, carotenoids, polyphenols, and fatty acids, have been proposed as valuable substitutions for anticipation and management of hepatotoxic effects and its chronic complications.

Remarkable studies demonstrated that the health promoting effects of bioactive components of black rice have been frequently attributed to their antioxidant properties and facilitate to increase cellular antioxidant defense system and thereby scavenge free radicals, inhibit lipid peroxidation, augment anti-inflammatory potential, and further protect the liver from damage. The inclusion of black rice into the diet has shown to reduce risk factors that lead to fatty liver disease, suggesting its direct influence on liver health. By supporting liver health and function, black rice can further protect us from several negative health issues. The antioxidant properties of black rice can also help to detoxify liver and improve liver function. Black rice increased fatty acid metabolism and helped to reduce the risk of elevated blood sugar levels and high cholesterol. There was also a lower risk of developing liver disease.



Black Rice and Management of Type 2 Diabetes Mellitus

The number of cases of type 2 diabetes is increasing worldwide. This disease can be characterized by insulin resistance and pancreatic β cell dysfunction, which lead to macro- and micro vascular complications. Anthocyanins are flavonoids that occur naturally in plants and are responsible for their color. Studies with cell lines and animal models and clinical trials in humans suggest that anthocyanins in black rice exhibit antidiabetic properties. Published data suggest that anthocyanins may lower blood glucose by improving insulin resistance, protecting β cells, increasing secretion of insulin and reducing digestion of sugars in the small intestine. The mechanisms of action are primarily related to their antioxidant properties, but enzymatic inhibition and other pathways may also be relevant.

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Black Rice and Brain Function

The antioxidant effect of anthocyanins also has a beneficial effect on improving brain function. This means that black rice can help to improve memory impairment and prevent or reduce the risk of diseases like Alzheimer's disease, dementia, and depression. Clinical studies also showed that anthocyanins helped to improve learning capacity and reduce symptoms of depression. By adding black rice in the diet, help to boost memory and prevent premature cognitive aging.

Scientifically proven health benefits of Black Rice

There are many other terrestrial and marine medicinal plants pharmacological activities are also reported previously by many researchers. But this article is in the review of black rice, we have focused only on the scientifically proven pharmacological activities of black rice. Black rice has been proven scientifically for its various pharmacological activities. Research has also confirmed the antioxidant activity, antitumor, anti-inflammatory, antiproliferative, anticancer, anti-diabetes and hyper lipidemia, and anti-atherosclerosis activity of black rice, the cholesterol and lipid metabolism, and the tyrosinase inhibitor activity. All this may be due to the presence of the secondary metabolites present in it. α -Glucosidase and α -amylase are the key enzymes causally linked to the postprandial glucose level and the anthocyanin isolated from the black rice inhibits the aforesaid enzyme levels; thus, it could be used in the management of diabetes. Germinated black rice possesses stronger antidiabetic and antioxidant activity than the normal black rice extract.

Black rice extract reduces the glycaemic index more than wheat flour and reduces the level of α -glucosidase more than the standard drug acarbose. Cyanidin-3-glucoside content present in the *Stevia rebaudiana* leaf extract also possessed strong antioxidant and antidiabetic activity represents mechanism of action of cyanidin-3-O-glucoside ameliorates palmitate-induced insulin resistance. Cyanidin-3-glucoside proficiently ameliorates oxidative damage, inflammation, metabolic dysfunctions, apoptosis pathways, and controls diabetic cardiomyopathy. From these, it can be concluded that cyanidin-3-glucoside, an anthocyanin compound, is capable of controlling diabetes. Intestinal epithelium actively contributes to the mucosal immune system. TNF- α and interferon are the inflammatory causing agents in the intestine. The movement of leukocytes in the inflamed region of the intestine creates an unbalanced response to the microorganisms and causes chronic inflammatory bowel disease. Anthocyanins present in the natural form can reach the colon of the intestine and it could be the appropriate candidates for nutritional therapy for the gastrointestinal tract disorders. Cyanidin-3-O-glucoside modulates the inflammation that appears in the intestinal cell lines and, thus, it could be effective in the management of chronic gut inflammatory diseases.



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Skin cancer is found to be more common in the developed countries; ultraviolet radiation (UV) disrupts the immune mechanism and promotes skin carcinogenesis. UV radiation causes inflammation to the surface, which in turn mediates the phosphorylation of protein kinases and damages the DNA level by the increased production of reactive oxygen species in the form of cyclobutane pyrimidine dimers. External application of cyanidin-3-O-glucoside inhibits the UV-caused epidermal thickening and decreases the mRNA and protein expression of proliferating cell nuclear antigen and cyclin by regulating UV-induced inflammation-mediated signalling pathways such as phosphorylation of extracellular-signal-related protein kinases, stress-activated protein kinases. Anthocyanins immersed in the intestine might be distorted as phenolic acids via gut microbial ring cleavage, dehydroxylation, and methylation reactions. These phenolic acids have been proven to motivate the growth of beneficiary bacteria and restrain the production of harmful bacteria. Bifido bacteria and lactobacilli are the intestinal bacteria that are beneficiary to humans and animals; they are proven probiotics. Anthocyanin isolated from purple sweet potato induces the growth of the beneficiary bacteria present in the human intestine. Cyanidin-3-O-glucoside connects with β -glucoside and provides energy to the bacteria and results in the enhanced growth like prebiotic activity. Anthocyanins are the chemical compounds that can reach the brain within 10 min as soon as it reaches the stomach and gets accumulated in the cerebellum, cortex, hippocampus, and striatum and in the rat brain. Cyanidin-3-glucoside enhances exercise performance by up-regulating the skeletal muscle peroxisome proliferators activated receptor gamma co-activator.

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CHAPTER 2 – CULINARY USES OF BLACK RICE

CULINARY USES OF BLACK RICE

It makes for a great ingredient for desserts and salads. One can include it in risottos, puddings, and ice-creams,” says chef Sujeet Singh, Radisson Noida. Black rice has a tantalising aroma, and it can replace basmati rice in various dishes, such as biryani, as a healthier substitute.

BLACK RICE AS AN INGREDIENT IN FOOD PROCESSING

The various positive health benefits of black rice and the presence of the black pigment-"Anthocyanin" makes black rice a wonder ingredient in food processing. The use of black rice in food processing can increase the nutritional profile of the food products being created with black rice and can also be converted into a functional food targeting a particular group of people (e.g.: diabetic patients, obese people or people with high blood pressure and cardiac ailments). As black rice is not well known among the common people, its use in food processing will be novel as well as a healthy alternative to other common foods for the future generation.

APPLICATION OF BLACK RICE IN BAKERY PRODUCTS

Bakery products are increasingly becoming popular in India as indicated over 250% increase in their production. Baked products have a great demand throughout the world due to its ease of availability, ready to eat, convenience, unique taste, and reasonable cost even in rural areas. Baked products include a wide range of products such as biscuits, cakes, cookies, puffs, pastries, bun, bread etc. At present, consumers are demanding newer options for existing baked goods, and the industry has been trying on new ingredients for fortification, enrichment, or value-added bakery products to satisfy the appetite of health-conscious people. Black rice powder in cakes. Cakes are important bakery products in which wheat is the main ingredient to provide structure to the cakes due to the presence of gluten. Black rice is also rich in protein content and can be used as a substitute for wheat flour in the preparation of cakes. Black rice is milled to flour/powder and incorporated at different levels 0,10,20,30,40,50,60,70,80,90 and 100% (W/W) of wheat flour in chiffon cakes. The proximate composition of the black glutinous flour was 8.0% protein, 0.4% fat, 1.5% ash, 0.9% crude fiber and 89% carbohydrates on dry basis. It was observed that the specific gravity of cake batter increased but the batter viscosity decreased on substitution of black rice powder. On evaluating the properties of black rice powder incorporated baked cakes, it



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was found that the crumb hardness, crust, and crumb color, chewiness increased. The cakes also observed a dense crumb structure instead of airy porous nature. The moisture content, cake volume, springiness and resilience decreased in baked cakes. Further there was a positive increase in antioxidant activity of the cakes. The sensory scores showed good results for incorporation levels of black rice powder between 10-60%, but replacement level between 70-100% reported less sensory scores. The high protein content of black rice flour increases the overall nutritional profile of cakes and makes it a healthy alternative to traditional cakes made from refined wheat flour. Black rice powder in bread. Bread is a fermented bakery product produced by yeast fermentation (*saccharomyces cervisiae*). The major ingredients used in the preparation of bread are refined wheat flour, salt, water, and yeast. During fermentation, yeast acts upon the carbohydrates present in flour along with sugar to release carbon dioxide which is trapped in the protein network (gluten) causing the dough to raise. The viscoelastic nature of gluten is responsible for good texture and quality of bread. Till now many ingredients like hydrocolloids (xanthum gum), transglutaminase and proteases are being substituted in wheat flour to get the same viscoelastic properties. Recently attempts were made to substitute black rice flour in small quantities in wheat flour for bread preparation as it also has high protein content. Black rice flour has Nutraceutical properties and can be used for fortification of bread. In a study black rice flour was replaced at 2% level substitution in wheat flour and was found that there was no significant difference from control bread (0% black rice flour). At 4% level of substitution, it was observed that baked bread had a dense crumb structure and less elasticity. Further in this study a mathematical model was designed to examine the digestion rates of black rice flour substituted bread. The results showed that the digestion rates were lowered in both the cases (2% and 4% substitution level). Thus, it was concluded that replacing black rice flour in wheat flour can increase the health benefits and can serve as a functional food especially for diabetic patients as it lowered the starch digestion rates and maintains the blood glucose levels. Black rice powder in cookies/biscuits The term cookies and biscuits mean the same, the difference lies only in the places where they are known. In American countries it is referred as cookies and in British countries it is referred as biscuits. Technically, cookies are thick and soft having slightly higher moisture content whereas the latter are thin and crispy and with slightly low moisture content. Overall, cookies and biscuits are one and the same. Cookies or biscuits are prime bakery products and are cherished as an all-time snack by everyone. A study was conducted to analyze the quality characteristics of black rice powder incorporated cookies. Wheat flour was substituted with 20% black rice powder and the cookies were prepared using the standard procedure. Certain properties of the dough were evaluated, and it was observed that the pH of cookie dough increased on addition of black rice powder. Also, it was found that the moisture content of the dough was high because black rice powder tends to absorb more water due to its sticky nature and so the cookies also had high moisture content due to high fiber content in the black rice flour. The cookies were baked and were tested for color, spread ability and textural properties. The dough had a darker color due to substitution of black rice powder and on baking the color increased further. There was no change on the texture of cookies even after addition of black rice powder. Addition of black rice powder increased the spread ratio. The sensory scores revealed that 20% substitution of black rice flour in cookies was greatly accepted by the panelists. Substitution beyond 20% had a strong flavour and had texture and poor sensory scores. In another study purple rice flour was incorporated in biscuits at 25%, 50% and 100% substitution levels and found that the protein digestibility increased with an increase in addition of purple rice flour and decreased the starch digestion rates. It was observed that 100% purple flour biscuits had extremely low levels of glycemic index. 25 and 50% substitution levels showed good overall acceptability in sensory analysis. Thus, it was

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concluded that addition of purple rice flour in cookies or biscuits could serve as a functional food for diabetic patients as it lowered the starch digestion rates and maintain the blood glucose levels.

SUPPLEMENTATION OF BLACK RICE IN EXTRUDED PRODUCTS

Extruded snacks are most commercially successful products due to their different variety of products, easy availability, ready to cook, convenience and long shelf life. Some examples of extruded products are pasta, noodles, breakfast cereals, modified starches etc. They are made from cereal flour with high starch content because starch can gelatinize during extrusion cooking and convert into a plasticized mass and forced into die to get desired shape products. Extruded products can be made from raw materials with high protein too. Some examples include texturised vegetable protein, meat mince, pet foods etc. Since black rice has high protein and high starch content research tried to use black rice in extrusion process to create highly nutritious products.

PASTA

Pasta is one of the common foods consumed throughout the world due to its easy cooking methods, convenience, taste, and nutritional properties. Traditionally pasta is manufactured from a special variety of wheat called durum wheat because of its high protein content among all other wheat varieties, thus giving the product a good texture. As black rice also has appreciable amount of protein content, studies were conducted to use black rice as a bioactive compound in the manufacturing of pasta. Durum wheat flour along with some quantity of black rice flour was used for pasta making and certain quality attributes were studied. It was observed that the water absorption index and water solubility index of black rice pasta was increased due to the swelling power of black rice flour. It was also found that there was a decrease in antioxidant activity and phenolic content of black rice pasta as there was degradation of anthocyanins at high temperature extrusion cooking. Noodles. Noodles are ready to cook instant foods which are made from wheat flour, salt, oil, and water through the process of extrusion. Noodles can be prepared anywhere at any time as it needs only water for cooking. Though noodles have lot of advantages among the customers, it also has some disadvantages because most of the nutrients such as protein, dietary fiber and vitamins are lost during refining process of wheat. With increasing concerns for healthy and functional foods, researchers examined the possibility of supplementing Black rice bran powder as an ingredient in noodles. In this study noodles were prepared using Black rice bran powder at 0, 2, 5, 10 and 15% substitution levels in wheat flour and the chemical and functional properties were evaluated. The proximate analysis of Black rice bran powder incorporated noodles revealed that the protein, fat, and ash contents increased. Also, the moisture content increased with increasing the level of addition of Black rice bran powder. The color and texture analysis showed that the lightness of noodles with black rice bran powder decreased on increasing the levels of black rice bran powder. The texture of noodles also became harder on increasing the concentration of black rice bran powder and it also decreased the cohesiveness. The cooking characteristics of noodles were tested and found that the optimum cooking time for black rice bran noodles was 7minutes. Studies also revealed that the antioxidant activities were increased in an ascending manner in raw noodles with 15% substitution level showing the highest antioxidant activity. But the antioxidant activity subsequently decreased in cooked noodles. The reason for this may be explained because of leaching of phenolic compounds into the cooking medium. The overall nutritional profile of black rice bran noodles was improved as black rice bran has high amount of anthocyanin antioxidants fiber content. It is also found that black rice bran has preventive effect against cancer and prevents oxidative damage thus improving the overall health. Therefore, black rice bran is an excellent ingredient to be used in noodles.

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APPLICATION OF BLACK PIGMENT- "ANTHOCYANIN" IN FOOD PROCESSING

Anthocyanins are a class of organic compounds belonging to the group of flavonoids, formed by the phenyl propanoic pathway. Anthocyanins are water soluble pigments and generally appear in dark blue or purple color. Depending on the pH the color may vary from red, purple, blue etc., Food plants that are rich in anthocyanins are blueberry, raspberry, black rice, black soybean. Black rice contains the highest number of anthocyanins (327.60 mg/100 g) than any other fruit or vegetable. Anthocyanins in black rice are present in higher concentrations in the outer pericarp (bran) of the rice kernel. It is also found in variety of color like red, purple, blue in the petals of flowers. The major anthocyanins present in black rice include cyanidin-3-o-glucoside, peonidin-3-oglucoside, malvidin-3-o-glucoside, pelagonidin-3-o-glucoside, and delphinidin-3-o-glucoside. Anthocyanins have high antioxidant activity and wide variety of health benefits such as reducing the risk of developing cardiac diseases, obesity, diabetes, cancer and used in the treatment of skin cancer or other skin related issues. Use of anthocyanin for food application can increase the nutritional profile and bioavailability of nutrients and used for the development of functional foods. Anthocyanin in fermented Thai pork sausage The fermented Thai pork sausage is one of the popular varieties of sausage in Thailand. It is made from pork meat, cooked rice along with salt and other spices. Some food additives like nitrates and nitrites are also added to give the sausage an intense pink color to attract the consumers with its appearance. This color is developed by the formation of nitroso myoglobin. Nitrates are also used to prevent the microbial growth and prevent spoilage of sausages. But nitrates when consumed along with sausages have adverse effects on health and proved to be carcinogenic. Thus, the addition of nitrates/nitrites in meat products is currently restricted by European Commission. Therefore, research was carried out to introduce a new natural pigment which fulfils the function of nitrates like color development, prevention of lipid oxidation, preventing spoilage. The colorant powder was obtained from black rice bran through ohmic heating-assisted solvent extraction method. The Thai sausage was prepared by replacing nitrate salts with different concentrations of colorant powder. The sausages were prepared with six different concentrations of colorant powder (0, 0.2, 0.4, 0.6, 0.8 and 1g per 100 g of sample) compared with commercial sausage (containing 120 mg/kg of sodium nitrate). It was found that 0.8 and 1 g levels of colorant powder had developed a scarlet red color on sausages like that of commercial sausage. Further it also retarded the lipid oxidation. Sensory scores showed more acceptability of 0.8 and 1% colorant powder sausages. Thus, the colorant powder extracted from black rice bran has the potential to be added as a natural coloring agent and antioxidant in fermented meat sausages. Anthocyanin as natural colorant in yogurt is a fermented dairy product obtained by bacterial fermentation of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* cultures. Yogurts are generally available as flavoured yogurt which has gained popularity worldwide. Flavoured yogurts are developed using artificial flavours and color which may have some adverse health effects if consumed in long run. Yogurt has become an important part of the human diet. Research was conducted to eliminate the use of artificial color and replacing it with natural color. Attempts were made to make use of the natural pigment anthocyanin obtained from glutinous rice (black rice) in yogurt. Anthocyanin has a bright purple color and antioxidant activity. An experiment was conducted to investigate the use of black rice bran colorant in yogurt and the potential use as a functional ingredient. The black rice bran colorant powder was obtained through enzymatic extraction and flavoured yogurt was prepared by adding 3 different levels of black rice bran colorant powder (0.2, 0.4, 0.6 per 100 g of sample) by weight to raw milk. The yogurt was then prepared by standard yogurt manufacturing process and the samples were stored at 4° C for 21 days to check the color stability of the colorant powder. 771 days



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for 21 days and found that yogurt added with 0.6% black rice bran colorant powder has a pleasant purplish pink color. The phytochemical content was also increased, and it can be made into a functional food. The color was stable at 4° C for 21 days which proves that application of black rice bran colorant powder as a natural coloring agent to yogurt was successful. Black rice bran oil is extracted from the outer layers (Bran) of the Rice kernels. Rice bran oil is an edible vegetable oil obtained only from the plant sources packed with high number of bioactive compounds. Rice bran oil is rich in antioxidants and has a balanced fatty acid profile. Rice bran oil has a longer shelf life than any edible vegetable oil due to its own antioxidant properties and is regarded as the “healthiest” of all edible vegetable oils. Rice bran oil is rich in Oryzanol which is a more powerful antioxidant than vitamin E. It lowers the LDL (Bad cholesterol) levels in the body and fights against free radicals. The general composition of Rice bran oil is 81-84% triglycerides, 2-3% diglycerides, 5-6% monoglycerides, 2-3% fatty acids, 0.3% wax, 0.8% glycolipids, 1.6% phospholipids and 4% un-saponifiables. Rice bran oil can be extracted from the bran using different extraction methods like solvent extraction, cold extraction, hot extraction, supercritical fluid extraction etc. Rice bran oil is extracted from all rice types (white rice, red rice, brown rice, and black rice). A comparative study was done to understand the physicochemical and antioxidant properties of rice bran oil extracted from the colored bran. The oil was extracted using 3 different extraction methods namely solvent extraction, supercritical fluid extraction and cold press extraction and the physicochemical and antioxidant activities were compared. It was found that the antioxidant activities and γ oryzanol and α tocopherol contents were higher for oil extracted from the bran of brown rice and black rice than white rice bran. The fatty acid profile also revealed that the amount of unsaturated fatty acids are more than saturated fatty acids for brown and black rice bran oil. For Black Rice Bran Oil, the supercritical CO₂ extraction method gave high yield of oil along with high antioxidant and physicochemical properties. Thus, it is advisable to replace other edible oils with Black Rice Bran Oil for cooking purposes or incorporate small amounts of Black Rice Bran Oil in the daily human diet to gain a healthy lifestyle.

How black rice gets its colour and how it is cooked

Black rice has a deep, dark colour, which can also turn deep purple when cooked or soaked in water. The dark colour of the rice comes from anthocyanin, a powerful antioxidant, found in abundance in the rice. “Black rice is simple to cook. Soak the rice for 25 to 35 minutes. After that, it can be cooked in water in the same way you cook any other varieties of rice. But it is important to remember the proportion of water to rice while cooking. It should be 2:1 and it takes about 20 to 30 minutes in boiling water to cook black rice.

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CHAPTER 3 – SOME RECIPES OF FAMOUS BLACK RICE DISHES

RECIPE 1 – BLACK RICE CAKE

Ingredients

- 10 servings
- 1 cup Black Rice
- 1/2 cup Whole wheat flour
- 3/4 cup Sugar
- 1 tbsp Vinegar
- 1/2 tsp Baking soda
- 1 tsp Baking powder
- 1/2 cup + 2 tbsp warm milk
- 1/2 cup Canola oil or any unflavoured oil
- 1/8 tsp Cardamom powder
- 2-3 tbsp pistachios, almond and cashew chopped
- as needed Powdered sugar for dusting (optional)

Steps

1. Soak the rice for 3-4 hours or overnight. Drain it and sundry it, not necessary to dry them completely. Grind them into a fine powder.
2. In a mixing bowl add the black rice flour, whole wheat flour, baking powder, cardamom powder.
3. Mix well and incorporate them nicely.
4. In a mixing bowl add the vinegar, baking soda, mix well and let it stand for 5 mins. Add sugar, milk, oil, and mix.
5. Add the wet ingredients to the dry ingredients and gently fold it to make a smooth batter.
6. Preheat oven at 180 for 10 mins. Grease a cake pan with oil and keep aside. Pour the batter into the greased pan and tap the pan for 2-3 times.
7. Sprinkle the chopped nuts over it.
8. Bake the cake for 35 mins. Start checking from 30 mins onwards. A tooth pick inserted should come out clean.
9. Remove from oven and let it stand for about 5 mins.
10. Demould, cut, and serve.





RECIPE 2 – CREAMY MUSHROOM SOUP WITH BLACK RICE

Ingredients

- 3/4 cup black rice or any kind of wild rice
- 1-ounce dried mushrooms porcini, morels, or shiitakes
- 1 tablespoon olive oil
- 2 tablespoons unsalted butter or use more olive oil
- 1 pound cremini mushrooms or white button, thinly sliced
- 1 pound shiitake mushrooms stemmed, thinly sliced
- 1 Spanish onion peeled and chopped (about 2 cups)
- Kosher salt and freshly ground black pepper to taste
- 4 large garlic cloves peeled and minced
- 2 teaspoons fresh thyme leaves minced
- 4 sage leaves minced
- 1/2 cup dry sherry divided
- 6 cups chicken stock (low sodium), or vegetable stock
- 4 ounces mascarpone (or cream cheese or vegan cream)

For the Enoki Mushroom and Breadcrumb topping:

- 2 tablespoons unsalted butter or extra virgin olive oil, divided
- 2 ounces enoki mushrooms separated into 1-inch pieces
- Kosher salt and ground pepper to taste
- 1 garlic clove grated
- 1/2 loaf 12-inch crusty baguette torn into rough 1/2-inch pieces

STEPS

1. Cook the rice according to the package directions. Remove from the heat and set it aside to cool.
2. Soak the dried mushrooms in 1 cup of hot water for 20 to 30 minutes, until soft. Strain the soaking liquid through a coffee filter to remove any grit and reserve the liquid, along with the reconstituted mushrooms, until needed.
3. Heat the olive oil and butter in a large (5 quart) Dutch oven or heavy soup pot set over a medium-high heat. Add the cremini and shiitake mushrooms. Toss them in the oil and then cover the pot until the mushroom release their liquid, about 5 minutes. Then remove the cover and cook them, uncovered, stirring occasionally, until they turn golden brown and caramelized, about 10 minutes. Add the onion, and season with some salt and pepper. Cook until the onions are soft and translucent, about 7 minutes. Then add the garlic, thyme and sage and cook until the garlic is fragrant, about 1 minute.
4. Stir in a 1/4 cup of sherry, all the stock, the dried mushrooms, and the filtered soaking water. Bring the liquid to a boil, then turn the heat down to low and simmer for 30 minutes. Add the other 1/4 cup sherry and simmer for 5 minutes longer. Using an immersion blender, puree the soup until completely smooth (or use a standing blender, working in batches and return the pureed soup to the pot). Stir in the mascarpone and the cooked rice.

To make the Enoki Mushroom and Breadcrumb topping:

1. Set an 8-inch skillet over medium-high heat and add one tablespoon of butter or oil. When hot, add the mushrooms and let them brown on one side, about 3 minutes. Turn and crisp the other side. Season to taste with salt and pepper and remove to plate. Add the other





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tablespoon butter and the grated garlic. Stir until the garlic is fragrant, about 30 seconds, and add the breadcrumbs. Toss the bread in the garlic butter and cook, stirring them often, until the bread browns and crisps. Season with a little more salt and pepper.

2. Divide the soup into bowls, and top each with some mushrooms and breadcrumbs.

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RECIPE 3 – BLACK RICE RISOTTO

INGREDIENTS

- 6 cups low-sodium chicken broth
- 1 tablespoon extra-virgin olive oil
- 1 medium onion, finely diced
- 1 1/2 cups black rice
- 1/2 cup dry white wine
- Kosher salt and freshly ground pepper
- 3/4 cup grated parmesan cheese
- 1/4 cup fresh basil leaves, thinly sliced

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STEPS

1. Bring the broth to a simmer in a saucepan over medium-high heat; cover and keep warm.
2. Meanwhile, heat the olive oil in a large saucepan over medium heat. Add the onion and cook until soft, about 4 minutes. Add the rice and cook, stirring, 1 minute. Reduce the heat to medium low. Stir in the wine until the liquid is absorbed, about 3 minutes.
3. Ladle in 3/4 cup hot broth and cook, stirring constantly, until the liquid is absorbed, 6 to 7 minutes. Repeat with the remaining broth, adding 3/4 cup at a time, until the rice is tender but somewhat chewy, about 50 minutes.
4. Stir in 3/4 teaspoon salt, pepper to taste and 1/2 cup parmesan. Divide among bowls. Top with the remaining 1/4 cup parmesan and the basil.





RECIPE 4 – KHAOLONG PITHE (LOCAL DISH)

INGREDIENTS

- Milk 1 ½ litter (1500ml)
- Black Rice ½ cup (with measuring cup or 1 cup with medium-size regular use cup)
- Sugar 3 or 4 table spoon (As you per your taste)
- Dry fruits (Almond and Raisin)
- Water as required for the rice to soak
- Ghee 1 table spoon (Clarified Butter)

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STEPS

1. Wash the rice with normal water
2. Add some water, so the rice can soak and leave it for 3 to 4 hours. This is because black rice outer shell is hard as compared to normal white rice.
3. Take a pen and boil the milk
4. Once the milk started to boil reduce the gas flam so the heat of the milk also reduces and add black rice with some water.
5. Cook in low to medium heat to prevent overflow of milk and stir
6. Add Raisin (Kismis),
7. When the rice is 70% cooked after that adds sugar as per your taste.
8. Add 1tb spn ghee (Pure Ghee) or Clarified Butter
10. Stir continuously and mix all ingredients properly
11. If the rice (pudding) is getting too much thick then add ¼ (250 ml) of milk and stir constantly
12. When the milk is getting thicker, and the rice also becomes soft and nice turn off the heat and leave it for about 10 minutes to rest.
13. Cut almonds and add and mix
14. Now you can serve it hot. If you are making it in summer season you can serve it after becoming cold.





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METHODOLOGY USED

Primary Sources of Data

- ☐ Questionnaire
- ☐ Interview

Secondary Sources of Data

- ☐ Internet
- ☐ world wide web
- ☐ books

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ANNEXURE

Name:

Occupation:

Q1. How many types of Rice are you aware about please mention their names.

Q2. Have you heard of Black Rice? If yes, please let us know what you know about it.

Q3. Have you tasted Black Rice? If yes, how did you find it in comparison to White Rice.

Q4. What is the other name for Black Rice?

- A. Purple Rice
- B. Heaven Rice
- C. Forbidden Rice
- D. Imperial Rice
- E. All of the above
- F. Don't know

Q5. Which Rice of the following categories is considered good in diet plan?

- A. White Rice
- B. Black Rice
- C. Red Rice
- D. Brown Rice
- E. Don't know

Q6. What is the name of the colour pigment present in Black Rice?

- A. Anthocyanins
- B. Chlorophyll
- C. Carotenoids
- D. Spirulina
- E. Don't know

Q7. What makes Black Rice superior in comparison to Brown Rice?



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- A. Protein
- B. Fiber
- C. All of the above
- D. Don't know

Q8. Do you think Black Rice can help in Prevention of cancer?

- A. Yes
- B. No
- C. Not sure

Q9. What helps the Black Rice to work as an Anti-inflammatory?

- A. Black Rice Pigment
- B. Fibers
- C. Superoxide dismutase
- D. None

Q10. What content in Black Rice helps to promote gut health?

- A. Proteins
- B. Vitamin
- C. Fiber
- D. Starch
- E. Not sure

Q11. What are the different forms of Black Rice can be used in preparation of food?

Q12. Can black rice flour be used as a substitute of refined/wheat flour in cake making? If yes, please elaborate.

Q13. Can Black Rice flour be used in making Pasta?

- A. Yes
- B. No
- C. Not sure

Q14. Please mention some applications of Black Rice Pigment in Food Processing.

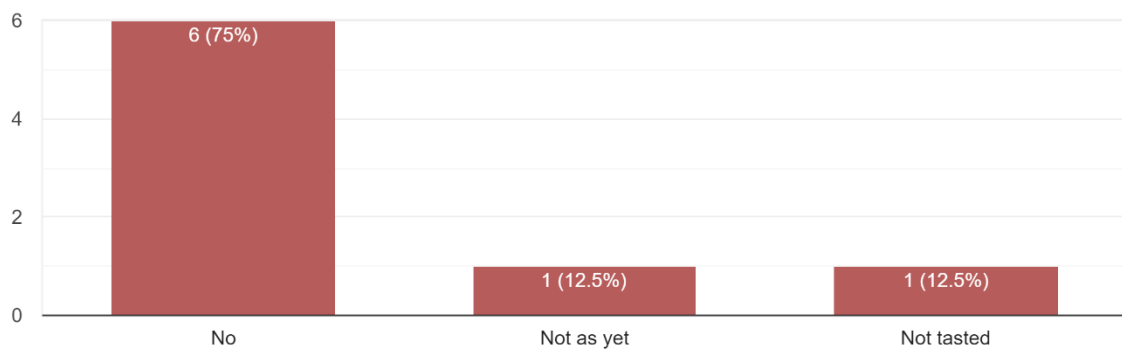
Q15. Do you know any traditional dish name that includes Black Rice as the main ingredient? Please Mention.



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Have you tasted Black Rice? If yes, how did you find it in comparison to White Rice.

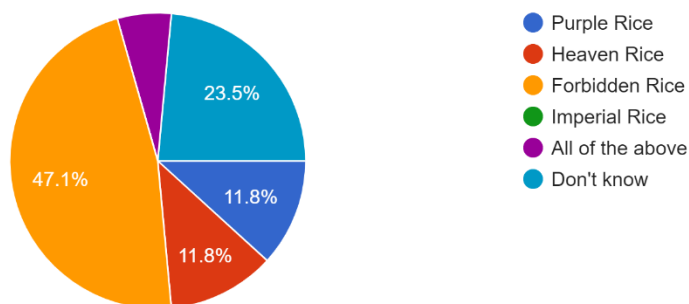
8 responses



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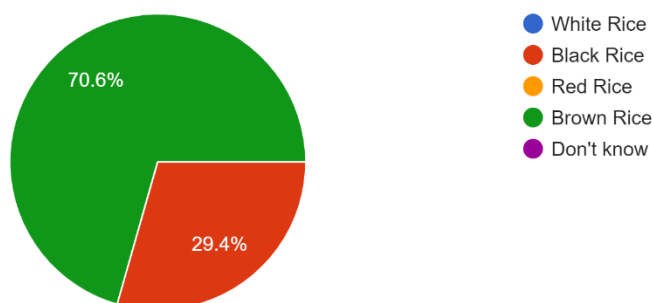
What is the other name for Black Rice?

17 responses



Which Rice of the following categories is considered good in diet plan?

17 responses

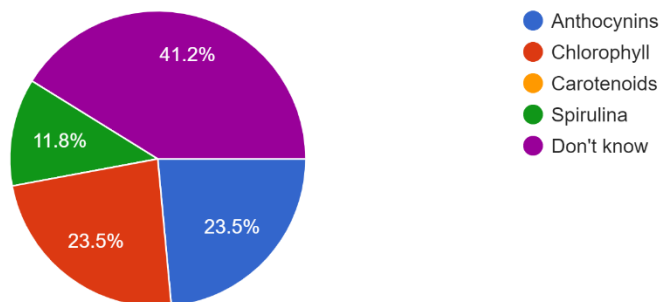




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What is the name of the colour pigment present in Black Rice?

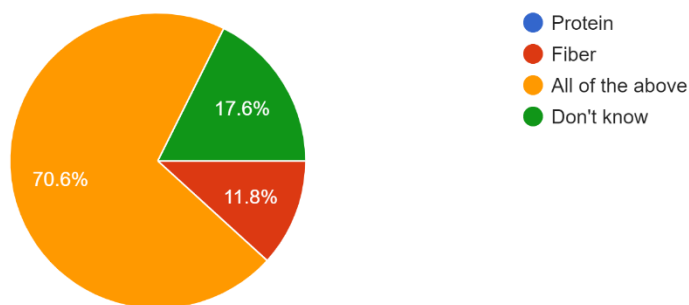
17 responses



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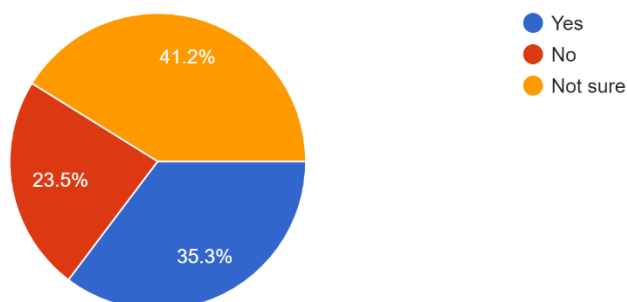
What makes Black Rice superior in comparison to Brown Rice?

17 responses



Do you think Black Rice can help in Prevention of cancer?

17 responses

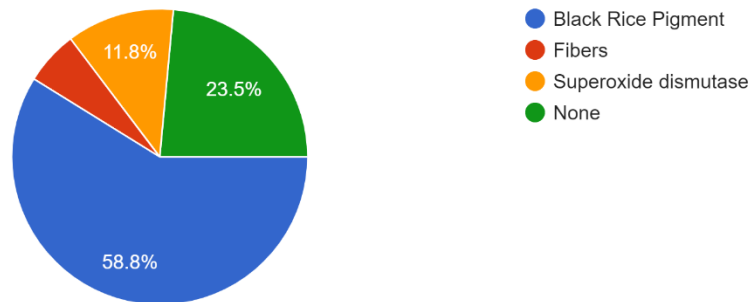




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What helps the Black Rice to work as an Anti-inflammatory?

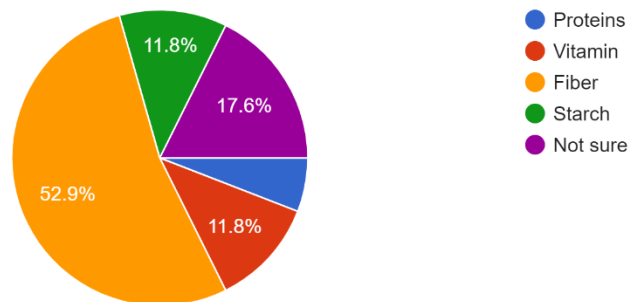
17 responses



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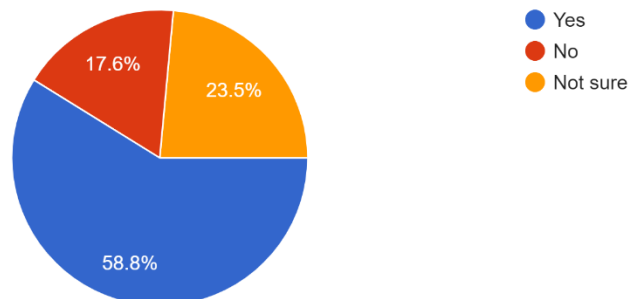
What content in Black Rice helps to promote gut health?

17 responses



Can Black Rice flour be used in making Pasta?

17 responses





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INTERPRETATION

The questionnaire was surveyed to approximately 25 – 30 people. To which the researcher has received sound responses of 17 respondents. From the same the researcher has interpreted that most of the people amongst the respondents are unaware about this variety of rice. Even though if they are aware, they haven't tasted the same.

However, there are approximately 4 different names of the rice and only 5.8% respondents were aware that all of the mentioned answers are correct.

Moreover, only 29.4% of the respondents were aware that Black Rice is more beneficial than any other rice variety when it comes to health. Also, only 23.5% of the respondents knew about the pigment that gave the rice its name: ANTHOCYANINS. About 70.6% of the attendees say and so does the researcher agree that both Proteins & Fiber makes Black Rice more beneficial as compared to Brown Rice. However, only 35.3% are aware that Black Rice has a property to prevent cancer. In addition only 58.8% people know that Black rice pigment works as the anti-inflammatory character in Black Rice. Black Rice has a characteristic that promotes gut health, only 52.9% of the people are aware that the dominant body for the same is Fiber.

Only 1-2% of the respondents were aware about the different forms in which black rice is used in culinary arts. These include raw/grain, powder etc. Similarly, same no. of people are aware about the facts that black rice flour can be used as a substitute of refined/wheat flour, however they are not aware how. According to the research black rice flour can be used for the preparation of Pasta and approximately 58.8% of the respondents agree to this. Almost 1% of the respondents are aware about different traditional dishes made from black rice i.e., Black Rice pudding, Black Rice risotto etc.

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LIMITATIONS

1. Unavailability of book: Black Rice Research, History & Development by U.K.S Kushwaha
2. Since the origin of the rice is from China being a researcher was unable to collect more information about the same.
3. During my local market survey the most faced barrier was the linguistic difference for communication.

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CONCLUSION

This review evaluated the literature on the Medicinal & Culinary uses of black rice. Black rice is an excellent alternative to white and brown rice, due to its nutrient density, high fiber content, and rich antioxidant content. Currently, black rice is regarded as a nutraceutical and functional food because beyond supply of nutrients it involves in the prevention and control of diseases. Several research suggested that black rice may have the capacity to reduce the likelihood of developing several diseases and illnesses, suggesting that black rice consumption may promote heart and liver health, weight loss, control on blood glucose level and lipid profile, prevention and control of inflammation and cancer.

The high antioxidant activity of black rice makes it a super food and its application as an ingredient in other food products can create highly nutritious foods. Anthocyanin, the main pigment of black rice has gained attraction among the researchers due to its high antioxidant activity, health benefits and natural coloring properties for use in other food applications. Black rice is rich source of tocopherols (vitamin E), iron, antioxidants and the overall nutritional profile of black rice has made it a functional and novel ingredient in food processing. Consumption of black rice by individuals those who show allergic symptoms to other cereal grains has proved to be beneficial and helps in reducing the risk of developing cardiovascular diseases, diabetes, and obesity. There is a dire need to include black rice as a novel ingredient in food processing to explore its complete benefits.