

## Cultivation of Amazing food in India – Black Rice

Tushar Kumar Pandey and Dr. Umesha C.

PG Research Scholar, Department of Agronomy, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh-211007

Assistant Professor, Department of Agronomy, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh-211007

E-mail – tkpandey01@gmail.com

 [www.naturesciencemagazine.in](http://www.naturesciencemagazine.in)

Article ID: 2.5.2. 35-47

Agriculture Magazine

Issue: March 2025

### Abstract

Black rice also called forbidden rice or emperor's rice. Black rice consumption gains its popularity in the modern world because of its various health benefits so it is also called the Super food of modern world. In modern era, black rice serves as one of the best food materials available to us to maintain our health with regular physical exercise. Now a days, coloured rice varieties impose special attention due to its presence of minerals and other bioactive compound that have numerous health benefits. It reduces the incidence of diabetes, heart attack, allergy, inflammation, obesity, cancer, improves digestive system, and have antioxidant activity. The nutritional value of black rice means that it has the properties to be used in the production of healthy food and beverage, such as

functional products and gluten - free benefits ton consumer. For farmers, producing black rice will be more profitable because the selling value is higher than other types of rice. The local farmers of many rural parts of India are unaware about the cultivation and processing technology of black rice. Thus, more training and awareness programs should be conducted by government and NGOs to increase the knowledge and infrastructure for cultivation of this crop. This review paper mainly focuses the nutritional properties and tremendous health benefits and also its role in crop improvement, toxicity, pharmacological uses, government initiatives and future opportunities of black rice for better health and well-being.

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**Keywords –** Black rice, Superfood, Nutrition, Toxicity, Health, Forbidden rice

### Introduction

The topic Black rice (*Oryza sativa* L.) is important because of its potential health benefits and nutritional value and a high bioactive component that helps fight illness. The other names of black rice are purple rice, forbidden rice, heaven rice, imperial rice, king's rice and prized rice. Black rice is cultivated in the kharif season which requires warm climatic conditions and a long growing period of about 3-6 months and is available in the market from the month of May to December. 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. Mostly, white or brown rice is consumed in the world whereas black rice

is consumed by a very small portion of people in Asia during the special occasions. It is a medium-grain, non-glutinous heirloom rice with a deep purple hue and a nutty, slightly sweet flavour. Black Rice is a good source of fibres and even a good source of plantbased protein. It contains the highest amount of antioxidants, protein and dietary fiber of all rice varieties. It is mainly grown in the North East region (called as ChakHao) and the southern parts (called as Kavuni in Tamil) of India. Black rice is grown in several states of India- Manipur, Assam, Meghalaya, Uttar Pradesh and some parts of West Bengal and Jharkhand. Black rice contains 18 essential amino acids, mainly lysine and tryptophan. Black rice is a whole grain, super nutritious type of rice that has higher levels of protein, fibers, vitamins B1 & B2, minerals such as

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iron, zinc, phosphorus, calcium. The consumption of black rice is said to be helpful in the prevention of heart disease, obesity, diabetes, cancer, and aging. The demand for black rice increases over time due to its widely accepted benefits and also the increasing demand for healthy food alternatives is seen among consumers. The farmers can respond to such an upsurge in demand for black rice by shifting from the cultivation of traditional rice varieties to black rice. Due to its demand in the international market and its health benefits, black rice can be considered a high-value medicinal crop. These days black rice is picking up in popularity and popping up in more health food stores. Actually, Rice contributes to about 40-43% of the total food grain production in India from one-fourth of the total cropped area and plays an import -

-ant role in the national food and livelihood security system (Bishwajit et al. 2013). Although the productivity of black rice is still lower than that of normal rice, its market value is much higher, so it generates higher returns per unit area. The quality and yield of black rice is obviously determined by local micro climate and varieties.

### What makes it black?

These kinds of rice are softly polished retaining its distinctive colour giving anthocyanin pigments which have high anti-oxidant properties and are present in the outer layers.

“The phenolic compounds, mainly anthocyanin, are mostly associated with the pericarp in the grain, the milling process to produce polished grain reduces the level of these compounds in the grain.” (Setyaningsih,

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Widiastuti et al. 2017).



### Constraints of black rice production in India

- It is less popular among farmers due to its inherent undesirable traits such as low yield, highly photo insensitive, longer vegetative phase, tall stature which causes its lodging, are the main reason behind its unadoption among farmers.
- Lower productivity and higher price are the reason behind inaccessibility of nutrient-enriched black rice by common people.
- Black rice does not receive the same level of support as mainstream rice varieties, such as through subsidies or research investments. (Agricultural Policy in India: An Analysis, P Banerjee, 2017).
- Black rice is not widely known outside certain regions in India. As a result, there is a lack of awareness about its health benefits and potential as a specialty crop. (Book: The Future of Rice Production, Cereal Science and Technology, 2018)

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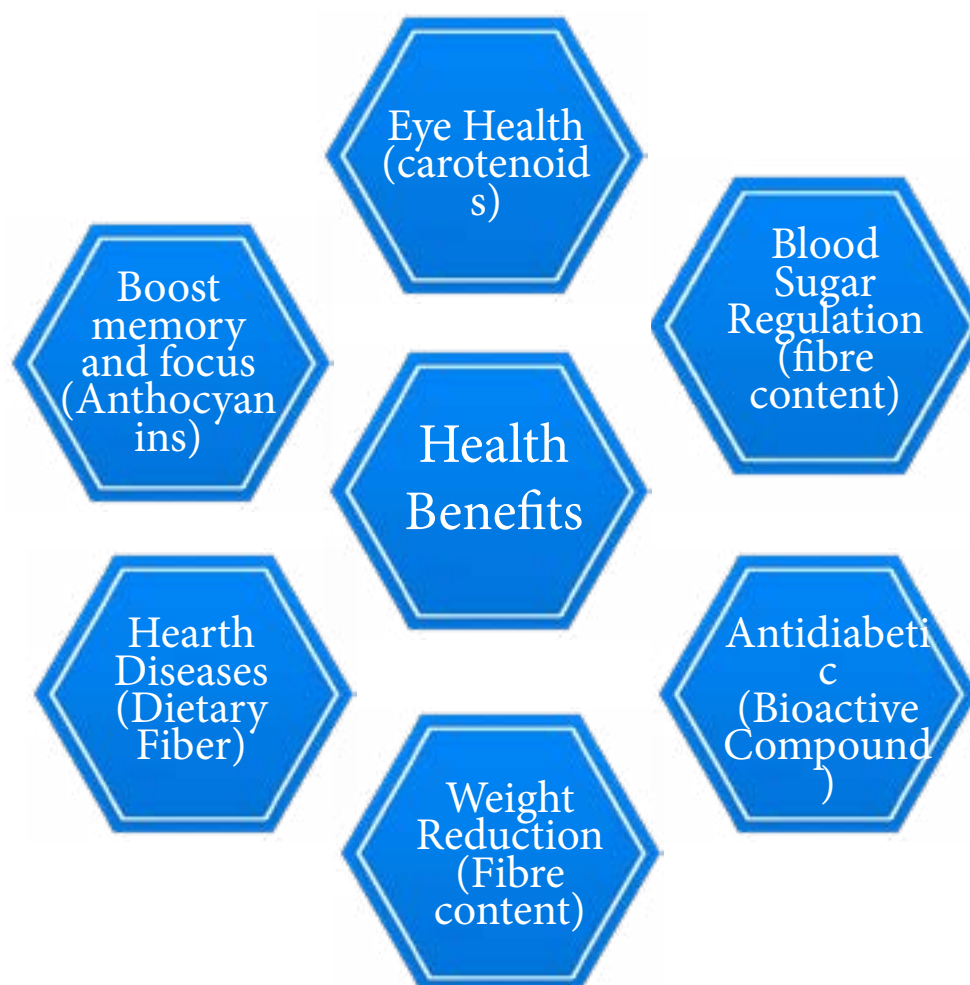
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- Black rice is prone to spoilage due to its higher oil content, which affects its shelf life. (Verma et al. 2016, Postharvest Biology and Technology discusses the post-harvest handling issues of black rice)

## Health Benefits of Black Rice





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Above mention things are the health benefits of incorporating black rice into our diet which promote better health. Apart from this Black rice is loaded with higher number of proteins, vitamins, and minerals.

**Protein content - 9.1g/100g.**

## Future Prospects of Black Rice in India

- Efforts are being made to develop high yield varieties without losing the grain's quality, cooking quality and aroma of black rice.
- It can adopt in wider range of India if, developed with new desirable agronomic traits and it is necessary to develop varieties that can give early and higher yield..
- More research needs to be done in black rice with Maintaining sustainability.
- No systematic work has been done on the improvement of black glutinous aromatic rice so, more researches should be done.

State	variety	Major characteristics
Manipur	Chak-hao	Leaves and husks are light black in colour. Short duration cultivar is grown twice or thrice in a year.
Tamil Nadu	Karapu Ka vani, Karunguruvai, Kattu anam, Mappillai Samba	Duration - 140 day. Average yield 1 t/ acre. But few farmers are getting even upto 2 tones/ acre.

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State	variety	Major characteristics
Orisha	Kalabhathi	Husk purple in colour, while the rice is black in colour. It grows up to 5 to 6.5 feet in height and changes its colour every week. The total duration of the variety is 150 days (long duration cultivar).
Maharashtra	Kalabhat	It is tall, hardy cultivar, required minimal water to thrive while adapting well to various soil and climatic conditions.
Northeast states	Burma Black	Direct seeding – 125 days Transplanting – 135 to 145 days.

Table 1: Prominent varieties of black rice in different states of India

### Rice Bowl of Uttar Pradesh: Chandauli District (Case Study)

In 2018, paddy cultivation in Chandauli district of Uttar Pradesh took a new turn, when black rice grains were first introduced here. Navneet Singh Chahal, who was Chandauli's district magistrate then, brought 12 kg of black rice seeds from Manipur at a cost of Rs 1,200 per kg and distributed them to 30 paddy farmers. Sashikant Rai, a progressive farmer from Amda village who has been practising agriculture for a decade also spoke of the drastic drop in demand that has led to many farmers giving it up.

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But he continues to grow black rice. The government has done a lot to promote this nutritious variety of black rice from Chandauli. According to data from the agriculture department of Chandauli, 150 kg of black rice was produced in 2018 and 70 kg of it was sold at the Prayagraj Kumbh Mela at Rs 70 a kilo. In 2019, about 1,600 quintals of the black rice was exported to Qatar, Australia, New Zealand, the United Arab Emirates, and some other countries. In 2020, there were 275 farmers growing black rice and they produced 1,300 quintals of which about 250 quintals were sold to companies in NOIDA, Sonapat and Mirzapur in 2021. Chandauli Black rice has been added to the state government's One District One Product (ODOP) scheme, and has won the Prime Minister's Excellence Award in 2020-21. (Source: Gaon connection, Your connection with rural India.)



(Black rice requires no chemical fertilisers and the farmer can save at least Rs 3,000-4,000 /acre.)



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RICE	PROTEIN	IRON	FIBRE
Polished white rice	6.8g	1.2g	0.6g
Brown rice	7.9g	2.2g	2.8g
Red rice	7.0g	5.5g	2.0g
Black rice	8.5g	3.5g	4.9g

**Source: M. Aadhirai and Kannayiram Gomathi, (2023) Black Rice: History, Development, Health Benefits, Nutritional and Functional Properties: A Review. International Research Journal of Modernization in Engineering Technology and Science 5(12).**

Black rice comparison to other rice listed above have protein, Fibre in higher quantity.

Black rice comprises of the excessive nutrients, it combines the anthocyanin and tocopherols which is also known as vitamin E that contribute the major role in health benefits and obviate non-communicable disease.

### Application of Black Rice

- Application of black rice in bakery industries.

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- Application of black rice extract in extruded product.
- Application of black rice in preparation of mead, a type of beverage.
- Application of anthocyanin extracted from black rice.

Variety	Objective	Application
Oryza sativa cv.	Examination of feasibility in incorporation of anthocyanin-rich black rice bran (BRB) for preparation of pasta with enriched functional properties.	Pasta preparation by supplementation of black rice bran (5%, 10%, 15%, 20%, 25%) with semolina flour.
Oryza sativa cv.	Black rice bran was used as one of the main ingredients in production of noodles.	Black rice bran with different amount (2%, 5%, 10%, and 15%) was used as substitute of wheat flour for the production of noodles.
ABRE (Anthocyanin rich black rice extract powder)	Fortified bread was produced by incorporation of anthocyanin rich black rice extract powder & studies were made on the quality parameters and in-vitro digestibility of the fortified bread.	Fortified breads were prepared by incorporation of 2% & 4% ABRE.

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Variety	Objective	Application
Oryza sativa cv.	Preparation of mead (an alcoholic beverage) using different types of black rice grains (polished and unpolished) and various types of honey (Chinese milk vetch honey, clover honey, blend of acacia honey & clover honey) & the characteristics of meads prepared compared.	Mead, a type of alcoholic beverage containing almost 12 % ethanol (v/v) & higher quantity of phenolics was produced by fermentation of honey and black rice grains on action of yeast <i>Saccharomyces cerevisiae</i> .
Oryza sativa L.	Pigment anthocyanin, extracted from bran of black rice, as a source of natural food colorant was incorporated in yoghurt to study its properties as natural food colorant.	Flavour enriched yoghurt was prepared. Anthocyanin (powdered form) in 0.2, 0.4 & 0.6 % by weight was incorporated in yoghurt.

## Conclusion

Rice is the staple food crop in our country. Black rice, with its unique coloration and remarkable nutritional content, has become increasingly popular due to its captivating flavour and various health benefits. Due to excellent source of high fiber, high nutrient and antioxidant, black rice is a substitute to brown and white rice. Consumption of black rice lowers the risk of various degenerative diseases, diabetes, cancer, heart disease, Alzheimer's disease, etc.

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As Anthocyanin being originated as a new movement in the direction to increase the cultivation value in current decades that brings a new revolution in the cultivation of Rice in India and across the world. Promoting black rice cultivation and its consumption will improve the nutritional status of poor farming communities.

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