



Fortification of Rice

For Prelims: [Fortification of Rice](#), [Food Safety and Standards Authority of India \(FSSAI\)](#), [World Health Organization](#), [Public Distribution System](#), [Nanotechnology](#).

For Mains: Benefits of Iron Fortification of Rice, Risks Associated with Iron Fortification of Rice.

Why in News?

In a response to the **recent wave of criticism surrounding the distribution of iron fortified rice**, the Union Food Ministry has released an official statement dismissing the allegations levelled against the iron fortified rice.

What is Fortification of Rice?

▪ About:

- **Fortification** is the process of adding nutrients to food products that are not naturally present or are present in insufficient amounts.
- Fortification of rice can be **done by coating the rice grains with a premix of micronutrients, or by producing extruded rice kernels that are enriched with micronutrients and then blended with regular rice.**
 - According to [Food Safety and Standards Authority of India \(FSSAI\)](#) norms, 1 kg fortified rice shall contain **iron (28 mg-42.5 mg), folic acid (75-125 microgram) and Vitamin B-12 (0.75-1.25 microgram).**

▪ Purpose:

- India has **very high levels of malnutrition among women and children.** According to the Food Ministry, every second woman in the country is anemic and every third child is stunted.
- Rice is a **source of protein and contains various vitamins.** Some nutrients, including **vitamin E, magnesium, potassium, and manganese, are lost during milling and polishing** (the process by which brown rice becomes white or polished rice).
 - **Rice** is one of the most **widely consumed staple foods in the world**, especially in Asia and Africa.
 - Per capita rice consumption in India is 6.8 kg per month. Therefore, **fortifying rice with micronutrients is an option to supplement the diet** of the poor.
- **Iron deficiency** also is a major public health problem that **affects more than two billion people globally**, causing anaemia, weakness, fatigue, impaired learning and increased risk of infections and maternal mortality.
 - To address this problem, **some countries have adopted the strategy of fortifying rice with iron and other micronutrients, such as folic acid and vitamin B12.**
 - Most of the iron we need comes from meat, which gets absorbed 50% by our body. Through vegetables, there is limited intake and only 3% absorption. **This is the reason why iron deficiency is a major problem in India.**

Vitamin B12

- **Vitamin B12**, also known as **cyanocobalamin** is synthesized by most bacteria and algae with the help of enzymes.
 - It is synthesized in microorganisms that enter the human food chain through incorporation into food of animal origin.
 - It is also crucial to the **normal function of the brain and the nervous system**.
- **Deficiency of Vitamin B12 causes pernicious anaemia**. It is rarely caused due to lack of Vitamin B12 in the diet but because of the **absence of the intrinsic factor in the stomach leading to failure of absorption of Vitamin B12**.

Folic Acid

- **Folate is the natural form of vitamin B9**, water-soluble and naturally found in many foods. It is also added to foods and **sold as a supplement in the form of folic acid**.
- Folic acid needs to be taken by pregnant women before conception.
 - Deficiency of folic acid in pregnant women leads to **Neural Tube Defects in the baby such as Spina Bifida**.
 - Spina bifida is a condition that **affects the spine and is usually apparent at birth**.
- **India & Southeast Asia & some parts of Africa** have the highest cases of neural Tube defects (4.7-9 per 1000 in Punjab & Haryana).
 - In the developed world, **it is less than 1 per 1000**.

What are the Benefits of Iron Fortification of Rice?

- According to the [World Health Organization \(WHO\)](#), fortification of rice with micronutrients can be an **effective, simple and inexpensive strategy to improve the nutritional status and health outcomes** of populations that consume rice regularly. Some of the benefits of iron fortification of rice are:
 - **Improved Cognitive Development:** Iron plays a crucial role in **brain development and function**.
 - Adequate iron intake during early childhood is essential for optimal cognitive development and learning abilities.
 - By **fortifying rice with iron, particularly in regions where rice is a primary dietary staple, the potential for cognitive impairment due to iron deficiency can be reduced**, leading to improved cognitive performance and better educational outcomes.
 - **Enhanced Maternal and Infant Health:** Anemia is prevalent among pregnant women and can increase the risk of complications during [pregnancy and childbirth](#).
 - Iron fortification of rice can help **improve the iron status of pregnant women**, reducing the occurrence of maternal anemia and the associated risks. Additionally, adequate iron intake during pregnancy is essential for fetal development and can contribute to healthy birth outcomes.

What are the Risks Associated with Iron Fortification of Rice?

- **Chances of Ineffectiveness:**
 - It **may not be sufficient to meet the iron requirements of all individuals**, especially those with high needs or **low bioavailability of iron**.
 - Bioavailability of iron refers to the **proportion of iron that is absorbed and utilised by the body**, which depends on several factors such as the **type and amount of iron compound used for fortification**, the **presence of enhancers or inhibitors of iron absorption in the diet**, and the physiological status and genetic variation of the individual.

- **Adverse Effects on Sensitive Individuals:**
 - It may cause **adverse effects in some individuals who have excess iron intake or accumulation**. Excess iron can be toxic to the body and cause **oxidative stress, inflammation, organ damage** and increased risk of infections and chronic diseases.
 - Some groups that may be at risk of excess iron intake or accumulation are those with **genetic disorders such as hemochromatosis or thalassemia**, those with liver diseases or infections such as hepatitis or **malaria**, and those who consume other sources of fortified foods or supplements.
- **Barriers Abound:**
 - It may face **technical, regulatory or social barriers to implementation**.
 - Technical barriers include ensuring the **quality, stability and safety of the fortified rice products**;
 - Regulatory barriers include **establishing and enforcing standards, guidelines and monitoring systems for fortification**;
 - Social barriers include ensuring the **acceptability, affordability and accessibility of the fortified rice products** among consumers and stakeholders.

Way Forward

- **Deploying Nanotechnology:** There is a need to **explore the use of nanotechnology to encapsulate iron particles and enhance their bioavailability**.
 - Nanoparticles can be engineered to **increase iron absorption by improving solubility and preventing interactions with inhibitors present in rice**.
- **Blending Iron Fortification with Biofortification:** There is a need to combine iron fortification with **biofortification strategies**.
 - Biofortification involves **breeding crops with higher nutrient content**, including iron, through **conventional breeding techniques**.
 - By integrating iron fortification and biofortification, we can **develop rice varieties that are naturally enriched with iron**.
- **Public-Private Partnerships:** There is a need to foster collaborations between **governments, research institutions, private sector entities, and NGOs to promote and scale up iron fortification efforts**.
 - These partnerships can facilitate the development of innovative technologies, funding mechanisms, and distribution networks for iron-fortified rice.
- **Continuous Research and Development:** There is a need to encourage ongoing research and development to explore **new technologies, formulation methods, and fortification techniques**.
 - Regularly assessing the efficacy and impact of iron fortification programs is required to identify areas for improvement and innovation.

[Source: TH](#)

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