



Nutrient Loss in Wheat & Rice

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Why in News

Recently, researchers from various institutes under the **Indian Council of Agricultural Research (ICAR)** and Bidhan Chandra Krishi Viswavidyalaya found **depleting trends in grain density of zinc and iron in rice and wheat** cultivated in India.

The researchers collected seeds of **rice (16 varieties)** and **wheat (18 varieties)** from the gene bank maintained at the **ICAR's Cultivar repositories**.

Indian Council of Agricultural Research

- It is an **autonomous organisation** under the **Department of Agricultural Research and Education (DARE)**, Ministry of Agriculture and Farmers Welfare.
- It is the **apex body for coordinating, guiding and managing research and education in agriculture** including horticulture, fisheries and animal sciences in the entire country.
- It was **established on 16th July 1929** as a registered society under the Societies Registration Act, 1860.
- It is **headquartered at New Delhi**. With **102 ICAR institutes and 71 agricultural universities** spread across the country this is one of the largest national agricultural systems in the world.
- **Cultivar repositories** are nodal institutes that preserve and archive the old cultivars or varieties from our country.

Key Points

- **Observation:**
 - **Concentrations in Rice:**
Zinc and iron concentrations in grains of rice cultivars released within the **1960s were 27.1 mg/kg and 59.8 mg/kg. This depleted to 20.6 mg/kg and 43.1 mg/kg, respectively within the 2000s.**
 - **Concentrations in Wheat:**
The concentrations of zinc and iron were **33.3 mg/kg and 57.6 mg/kg in cultivars of the 1960s**, dropped to **23.5 mg/kg and 46.4 mg/kg, respectively in cultivars released during the 2010s.**
- **Reason for the Decrease:**
 - **Dilution effect'** that is caused by **decreased nutrient concentration in response to higher grain yield.**
 - This means the **rate of yield increase is not compensated by the rate of nutrient take-up by the plants.** Also, the soils supporting plants could be low in plant-available nutrients.
- **Suggestions:**
 - Growing **newer-released (1990s and later) cultivars of rice and wheat cannot be a sustainable option** to alleviate zinc and iron malnutrition in Indian population.
Zinc and iron deficiency affects billions of people globally and the countries with this deficiency have diets composed mainly of rice, wheat, corn, and barley.
 - The **negative effects need to be circumvented by improving the grain ionome (that is, nutritional make-up)** while releasing cultivars in future breeding programmes.
 - There is a **need to concentrate on other options like biofortification**, where we breed food crops that are rich in micronutrients.

Biofortification

- **About:**
Biofortification is the process by which the **nutritional quality of food crops is improved** through agronomic practices, conventional plant breeding, or modern **biotechnology**.

- **Initiatives Taken by India:**

- Recently, the Prime Minister **dedicated 17 biofortified varieties of 8 crops** to the nation. Some **examples**:
 - **Rice**- CR DHAN 315 has excess zinc.
 - **Wheat**- HI 1633 rich in protein, iron and zinc.
 - **Maize**- Hybrid varieties 1, 2 and 3 are enriched with **lysine and tryptophan**.
- **Madhuban Gajar**, a biofortified carrot variety, is benefitting more than 150 local farmers in Junagadh, Gujarat. It has higher **β-carotene and iron** content.
- ICAR has started **Nutri-Sensitive Agricultural Resources and Innovations (NARI) programme** for promoting family farming linking agriculture to nutrition, **nutri-smart villages** for enhancing nutritional security and **location specific nutrition garden models** are being developed to ensure access to locally available, healthy and diversified diet with adequate macro and micronutrients.
- The production of bio-fortified crop varieties will be upscaled and **linked with government programmes** of **mid-day meal, Anganwadi** etc. to reduce **malnutrition**.

- **Importance of Biofortification:**

- **Improved Health:**

Biofortified staple crops, when consumed regularly, will **generate measurable improvements in human health and nutrition**.
- **Higher Resilience:**

Biofortified crops are also often **more resilient to pests, diseases, higher temperatures, drought** and provide a high yield.
- **Greater Reach:**

Biofortification fills an important gap as **it provides a food-based, sustainable and low-dose alternative to iron supplementation**. It does not require behavior change, **can reach the poorest sections of the society, and supports local farmers**.
- **Cost Effective:**

After the initial investment to develop the biofortified seed, it can be replicated and distributed without any reduction in the micronutrient concentration. This makes it **highly cost-effective and sustainable**.

- **Challenges for Biofortification in India:**

- **Lack of Acceptance:**

Lack of consumer acceptance due to color changes (e.g. golden rice) and **last mile reach of fortified food remains a big challenge**.
- **Cost:**

Adoption by farmers and **cost involved in the process of fortification**.
- **Slow Process:**

Though biofortification can be done using non-genetically-modified methods it is a **slower process than genetic modification**.

Way Forward

- Because of the prevalence of diverse food practices in the country, **biofortification will need to achieve high rates of adoption and consumption** in geographically distinct areas.
- Strategies for delivery of biofortified crops must be **tailored to the local context for each crop–nutrient pair**.
- The **government should facilitate public-private partnerships**. Private sector engagement can leverage technological solutions for scaling up food fortification initiatives, and complement the government’s outreach efforts through mass awareness and education campaigns in communities.
- The lack of nutrition is not only a denial of a fundamental human right, but it is also poor economics. Biofortification is a partial solution, which must **go hand in hand with efforts to reduce poverty, food insecurity, disease, poor sanitation, social and gender inequality**.

Source: TH