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MILLETS

THE SUPER FOOD
A Sustainable Path
towards Food &
Nutritional Security

24th & 25th March 2023





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Ancient Vs Modern Grains

HISTORICAL OVERVIEW

Time Period	Grain Type	Region
13,500-8,200 years ago	Wheat	Asia
9,000 years ago	Millet	Mexico
6,000 years ago	Wheat	Near East
7,000 years ago	Millet	China
8,000 years ago	Wheat	Near East
8,000 years ago	Millet	China
6,000 years ago	Wheat	Near East
6,000 years ago	Millet	China
3,200 years ago	Wheat	Near East
2,000 years ago	Millet	China

ANCIENT GRAINS:

- Planted, cultivated and processed in traditional methods
- Have a lot more crunch, density and a little nutty flavor infusion
- Low levels of pesticides, herbicides, fungicides
- Not subjected to any modern breeding or selection
- Able to retain grain characteristics like individual viability, taste

MODERN GRAINS:

- Best to eat fresh, processed through modern processing methods
- Created to produce higher yield and lower cost
- Result of genetic erosion
- Processed through hybridization or genetic modification
- Highly refined and milled

Advantages:

- High fiber content
- High protein content
- High mineral content
- High antioxidant content
- High phytochemical content

Challenges:

- Low yield
- High cost
- Low market demand
- Low awareness
- Low government support



Major and Minor Millets in India

Millet Type	Major Crops	Minor Crops
Wheat	Wheat	Wheat
Rice	Rice	Rice
Millet	Millet	Millet
Barley	Barley	Barley
Oats	Oats	Oats
Sorghum	Sorghum	Sorghum
Buckwheat	Buckwheat	Buckwheat
Millet	Millet	Millet
Wheat	Wheat	Wheat
Rice	Rice	Rice
Millet	Millet	Millet
Barley	Barley	Barley
Oats	Oats	Oats
Sorghum	Sorghum	Sorghum
Buckwheat	Buckwheat	Buckwheat
Millet	Millet	Millet

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Ancient Vs Modern Grains

HISTORICAL OVERVIEW

- 13,500-8,200 years ago
 - Rice in Asia
- 9,000 years ago
 - Maize in Mexico
- 8,000 years ago
 - Wheat in Near East
 - Millet in China
- 7,000 years ago
 - Spelt in Europe
 - Teff in Africa
- 6,000 years ago
 - Sorghum in Africa
 - Amaranth in Mexico
- 3,200 years ago
 - Barley and Buckwheat in Europe
- 1,000 years ago
 - Wheat in Eastern Mediterranean

- Planted, cultivated and processed in traditional ways
- Have a bit more crunch, density and a little more fiber
- Low levels of pesticides, fertilizers, irrigation
- Not subjected to any modern breeding or selection
- Able to retain grain characteristics like individual viability, brittle

Examples:

Black barley	Durum wheat	Quinoa
Basmati rice	Einkorn, Emmer	Amaranth seeds
Red and Black rice	Millets	Buckwheat
Spelt	Oats	Chia
Teff	Freekeh	Bulgur (cracked wheat)
Khorasan wheat	Sorghum	Rye



Advantages:

- Less processed
- Contains more vitamins, minerals, fiber
- No use of chemical pesticides
- Improves blood sugar
- Reduces inflammation
- Reduces heart and cancer risk
- Majorly gluten-free like quinoa, millets, sorghum, teff



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MODERN GRAINS:

- Best for rapid growth, processed through hybridization or genetic modification
- Created to produce higher yield and lower crop cost
- Result of genetic erosion
- Gained through hybridization or genetic modification

Historical Overview:

- 18th century: 18th century
- 19th century: 19th century
- 20th century: 20th century
- 21st century: 21st century

Modern Grains:

- 18th century: 18th century
- 19th century: 19th century
- 20th century: 20th century
- 21st century: 21st century

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Millet: The Solution to a Sustainable Future
Importance of food security
Ensures physical and economic access to sufficient, safe and nutritious food

MILLETS 2023
Millet as "Smart" Food

AIDS FOOD SECURITY	BENEFITS THE ENVIRONMENT	PROMOTES NUTRITION
• Climate change and a rising global population calls for a need for versatile crops like millets • Poor man's crop due to significant contributions to a resource-limited population's diet • Millet production has remained relatively stable over the past few years • Genetic diversity and easy adaptability provides several opportunities for cultivation in developing countries • Millet market expected growth at a rate of over 4.5%, with a value projection of over USD 12 billion in 2025 • Thus, will help achieve the UN 2030 Agenda for Sustainable Development	• Millets are C4 crops and hence are climate change compatible • Crops possess special features (molecular, biochemical and morphological) that allow them to thrive in adverse conditions like arid environment, high soil salinity, etc. • Resilient to extreme conditions including high temperature and drought • Reduce carbon footprint and helps maintain temperature	• Nutri-cereals: Promotes good health • A well-balanced profile of essential amino acids (source of cysteine and methionine) • Rich in micronutrients like iron, etc. • Presence of bioactive compounds (antioxidants and phytochemicals in functional foods) • Contains omega 3 and other important fatty acids • Gluten-free, high fiber content • Prevents non-communicable diseases • Helps to prevent and overcome malnutrition

Sustainable Development Goals

Millet Nutrition

[Source: United Nations, 2018]



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FSSAI STANDARDS FOR MILLET

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FSSAI STANDARDS FOR MILLET



Research & Development Highlights

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Balasubramanian Singathirulan

Mrs. M Thabusum, Senior Technical Assistant, M...

You

:17 AM | Conference invite link: Day 2 "Millets-The S...









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MILLET'S
THE SUPER FOOD:
A Sustainable Path
Towards Food & Nutritional Security
24th & 25th March 2023



DIA
ENTRE

Why millets...?

Because of

- To save water, mother earth, reduce chemical fertilizers with high productivity and nutrients more similar diets

■ "globalised diet composed of big crops like wheat, rice, potato and sugar. includes crops that were important 50 years ago wheat has long been a staple food in more than 97 per cent of countries"

- Health and well-being





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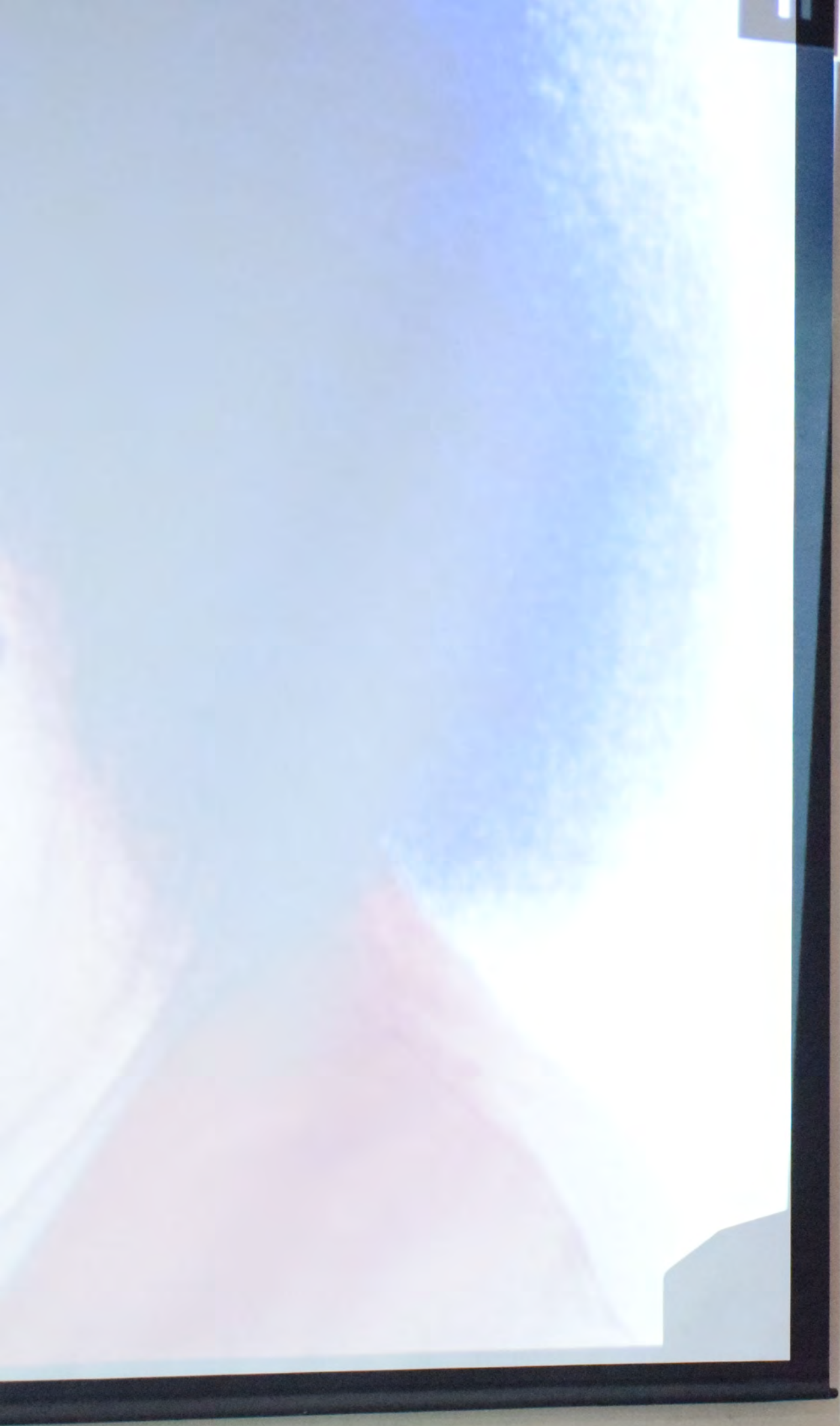
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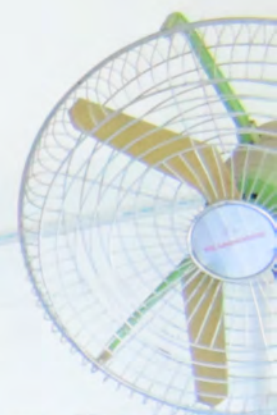


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Adoption and Incorporation of Millets in Nutritional Programmes and Public Distribution Systems across India



Millets, recently renamed as the Nutri cereals/Smart food, have the potential to address India's food and nutrition security. The challenge of micronutrient deficiency can be tackled by incorporating them in nutrition programs and public distribution systems.

NITI Aayog promoted the need for the introduction of millets in the Mid-day meal programme shifting the focus cereals

Karnataka

- Karnataka became the first state to include jowar and ragi in PDS in July 2015 in accordance with recommendations in the National Food Security Act, 2013.

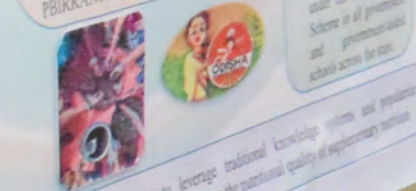
Telangana

- Telangana is taking steps to include millets in public diets by introducing them in (ICDS).
- Planned to distribute millet packets among tribal women and children in Khammam region through Anganwadi centres to enhance nutrition in their diets. (2023)

Uttar Pradesh

- Millets will be included in the midday meal programme in schools and will also be made available to people through public distribution system in the state of Uttar Pradesh. (Agriculture minister UP 2023)

MISSION POSHAN 2.0: Working to leverage traditional knowledge, systems and practices incorporation of millets in the local recipes in the local recipes to enhance the nutritional quality of supplementary nutrition



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DEFINITION

Bio-fortification is a scientific approach of creating modified selective nutrient-rich crops for tackling nutrient deficiencies. (Vinoth, 2017)

PURPOSE

Millets are crops that are rich in protein, dietary fiber, and other nutrients. They are also gluten-free and have a low glycemic index. Millets are a good source of iron, calcium, and B vitamins. They are also a good source of fiber, which can help with digestion and prevent constipation. Millets are a healthy and nutritious food that can be included in a variety of diets.

Future Prospects

With the increasing awareness of the health benefits of millets, there is a growing demand for these crops. This has led to an increase in the production of millets in India. In the future, it is expected that the production of millets will continue to grow, and they will become a more prominent part of the Indian diet.



SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING (Deemed to be University) Department of Food and Nutritional Science Millet – Gastro protective



SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING (Deemed to be University) Department of Food and Nutritional Sciences BIO-FORTIFICATION OF MILLETS

SL. NO	NAME	NUTRIENT	QUANTITY	OUTCOME	REFERENCE
1	Heart Millet	Iron, Zinc	>40 ppm >70 ppm	Increased absorption of Fe Zinc increased yield & quality, lysine (Govindaraj, & soluble sugar content of the 2019) grains.	(Mahalingam, 2016)
2	Sorghum	Iron, Zinc, Provitamin A, Lysine	5-12 % 5-8 % 14 mg/kg 60%	Incremental enhancement in grain (Shivran, micronutrient concentration 2016)	(Sharma, 2016)
3	Finger millet	Calcium	480 mg/g	Higher Ca than national check variety (Diya) without compromising the yield	(Sharma, 2019)
4	Fontal millet	Selenium	76.875 mg/kg	Increased Se concentration in the (Xiaojun edible part of the millet.	(Liu, 2022)
5	Buckwheat millet	Selenium	125-265 µg/kg	Increased the Se conc and enhanced (Ying the Se accumulation in roots	(Jiang, 2018)

BIO-FORTIFYING AGENCIES

HarvestPlus (CGIAR), IIMR, ICAR, ICRISAT, Africa Harvest Biotechnology Foundation International

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1. Mahalingam, S. (2016). Bio-fortification of Millets: A Sustainable Approach for Nutritional Security. *Journal of Food Science*, 91(1), 1-10.

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3. Liu, X. (2022). Bio-fortification of Millets: A Sustainable Approach for Nutritional Security. *Journal of Food Science*, 91(1), 1-10.

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- ### BENEFITS
- Easy accessibility of diverse and nutritious source.
 - Eradication of malnutrition and deficiencies.
 - Mitigation of hunger.
 - Ensures food security.
 - Helps to promote sustainable agro-ecosystem.

FUTURE PROSPECTS

The concept of bio-fortification of millets is an emerging technology that has to leap through several challenges such as identification of markers, promoters, etc. Lastly, the determination of bio-fortification requires a multidisciplinary approach involving plant breeding, molecular biology, and food science.

- novel integration of genomics, transcriptomics, proteomics, and metabolomics.



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FSSAI STANDARDS FOR MILLETS

- India introduced an international brand name for millet **"SHREE ANNA"** during the budget, 2023.
- The Food Safety and Standards Authority of India has issued standards for millets, which are effective from September 2023.
- Earlier, India had only individual standards for sorghum, bajra, and ragi. Now, FSSAI has issued standards for **types of millets** with 8 quality parameters i.e. maximum limits for moisture content, uric acid content, extraneous matter, other edible grains, defects, weevilled grains, immature and shrivelled grains, so as to ensure availability of good quality (standardized) millets in domestic and international markets

Newly introduced standards:

- 1. Moisture content < 13% by mass.
- 2. Maximum limit of extraneous matter to be 1% by mass (mineral matter, mineral impurities of animal origin < 0.10%).
- 3. Edible grains < 2% by mass.
- 4. Grains with serious defects < 1%.
- 5. Grains with slight defects < 7% by mass.
- 6. Weevilled Grains < 4% by count.
- 7. Immature and shrivelled grains < 5% by mass.
- 8. Uric acid content < 100mg/kg.



Newly included millets in standard list:

1. Amaranthus (Chaulai)
2. Barnyard Millet (Jhangora)
3. Brown top (Korale)
4. Buckwheat
5. C...

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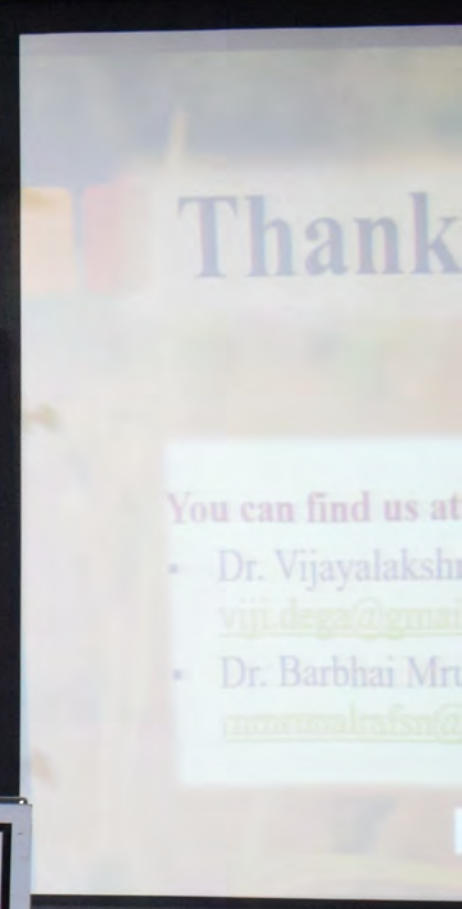


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