

Nuclear Techniques in Global Food Standards

Why in news?

Recently in International Symposium on Food Safety and Control the Director-General of FAO underscores the importance of nuclear technologies for measuring, managing and controlling food safety.

International Symposium on Food Safety and Control 2024

- **Host-** IAEA headquarters at Vienna in Austria.
- **Organized by-** Food and Agriculture Organization and the International Atomic Energy Agency (IAEA) through the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture.
- **Purpose-** To bring together experts and stakeholders in food safety and food control systems to consider the protection of the integrity of the food supply chain and measures to improve its resilience to food security challenge.
- **Forum-** The event will provide a forum for networking, facilitate a broad understanding of food safety and food control systems, and promote the peaceful use of nuclear technologies.

What is Food control system?

- **About-** It underpins food safety and quality, which are vital components of food security and are both necessary to safeguard international trade in food commodities.
- **Need-** It plays a critical role in protecting public health, ensuring fair trade practices, and fostering *consumer confidence* in the food supply.
- **Disruptive effects-** They are under increasing pressure due to pandemics, food-borne diseases, and conflicts affecting food production, distribution, and supply chains.
- **Climate change-** It alters the weather pattern and creates condition that promote the growth of microbes and pests, this leads to increased food contamination, illness, wastage and losses.

What is nuclear technique?

- Nuclear technologies are very important tools for **measuring, managing, and controlling food safety.**

Stable isotope	What can be determined?	What food fraud can be identified?	What products can be affected?
Carbon	Photosynthesis (C3, C4 and CAM pathways)	Adulteration (e.g. sweetening with cheap sugar)	 Honey  Liquor  Wine  Olive oil  Butter
Hydrogen	Local-regional rainfall and geographical area	Watering of beverages; origin of product	 Coffee  Liquor  Wine  Water  Sugar  Meat
Nitrogen	Fertilizer assimilation by plants	Mislabelling (Organic and non-organic)	 Vegetables  Meat
Oxygen	Local-regional rainfall and geographical area	Watering of beverages; origin of product	 Coffee  Liquor  Wine  Water  Sugar  Meat
Sulfur	Local soil conditions; proximity to shoreline	Origin of product	 Vegetables  Meat  Honey

- It plays an important role in **analytical laboratory services** as many of the separation, identification, and quantification methods rely on a nuclear related phenomenon.

Nuclear techniques	Benefits
Isotope analysis	To characterize the origin of food
Nuclear spin	It is used in nuclear magnetic resonance.
Ionization	Mass spectrometry
Mass spectrometric separation	It is based on the mass differences of nuclei.

What is the significance of nuclear technique in global food standard?

- **Food safety**- Nuclear techniques are often used in conjunction with complementary, non-nuclear methods to provide powerful solutions to food safety and control problems.
- **Useful in food processing techniques**- Pre-packaged fresh produce is exposed to controlled ionizing radiation to prevent pests, ensure quality, prevent illness, reduce losses, and extend shelf life.
- **One Health approach**- This method can also help contribute in the framework of global initiatives such as 'One Health'. (Holistic approaches to human, animal and environmental health.)
- **Antimicrobial resistance**- It has a role in helping address issues such as antimicrobial resistance and mitigation of the effects of climate change on the food

supply.

- **Food authenticity**- Field-deployable methods to check food authenticity at the point of contact and promotion of food authenticity for food safety and to improve nutrition.
- **Food and phytosanitary irradiation**- Food irradiation to maintain and extend food quality, minimize pathogens in food and food packaging.
- **Detect chemical residues**- It helps in detection and control of chemical residues and contaminants in food and feed to protect human and animal health.
- **Emergency responses**- They are used to speed up the natural process of plant mutation to develop crops that better withstand diseases and climatic shifts.
- **Combat hunger**- It offers competitive and unique solutions to combat hunger, reduce malnutrition, enhancing environmental sustainability.
- **Tracing pathogens**- It can assess nutrient use and water use in soil, diagnose and characterize disease pathogens in animals, trace sources of contamination in water and study various forms of malnutrition.

What lies ahead?

- **Awareness generation**- Integrating nuclear techniques into food control systems requires promoting their benefits, fostering dialogue, and ensuring good communication among research centers, academia, regulatory bodies, and industry.
- **Safety concerns**- There is a need to address food safety and quality requirements for market access.
- **Four betters**- We must strive to help all member countries achieve the "four betters" - better production, better nutrition, a better environment and a better life for all.
- **Atoms4Food initiative**- It was launched by the IAEA and FAO to support countries in using innovative nuclear techniques in enhancing agricultural productivity, reducing food losses, ensuring food safety, improving nutrition and adapting to the challenges of climate change.

Quick facts

Food and Agricultural Organization (FAO)

- **About**- It is a ***specialized agency of the United Nations*** that leads international efforts to *defeat hunger*.
- **Established year**- 1945.
- **Headquarters**- Rome, Italy
- **Goal**- To achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives.
- **Membership**- **195 members** including the European Union
- **India**- It is one of the founding member of FAO.
- **Codex Alimentarius Commission**- It is created by WHO and FAO in 1961 to develop food standards, guidelines and texts such as codes of practice under the Joint FAO/WHO Food Standards Programme.
- **Publications**- The State of Food and Agriculture, The State of Food Security and Nutrition in the World, The State of World's Forests, The State of Fisheries and Aquaculture etc.,

References

1. [FAO | Nuclear techniques can play a crucial role in setting science-based global food standards](#)
2. [IAEA | International Symposium on Food Safety and Control](#)

