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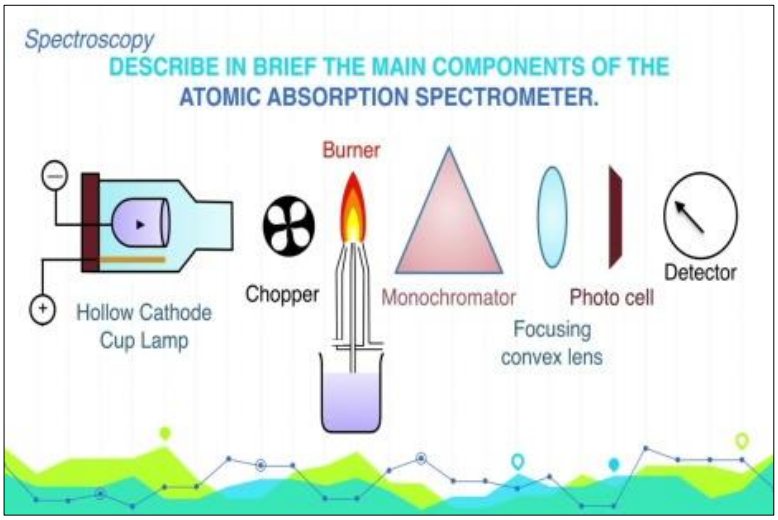
Theme Article



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From the Director General's Desk

Heavy metals such as lead (Pb), cadmium (Cd), mercury (Hg), and arsenic (As) are naturally occurring elements. Some heavy metals such as zinc, copper, and iron are essential in trace amounts, however can be toxic when concentrations exceed safe levels. Heavy metal is found in the environment due to industrial emissions, agricultural activities, waste disposal and landfill leachate etc. This heavy metal enters the food chain through soil and water contamination, air born deposition and **bioaccumulation in animals. Most commonly found metal in food such as lead,** cadmium, arsenic and mercury causes serious health issues to human. Their presence in the food chain and environment poses serious health and ecological risks especially in areas with poor environmental regulation. Therefore, **prevention through regular monitoring, proper regulation, and public awareness is the key** to minimize the risk of heavy metal.

India has also developed a range of laws and guidelines to monitor and control the presence of heavy metals in food, water, soil, air, and industrial emissions to protect public health and the environment. Ministry of Environment, Forest and Climate Change (**MoEFCC**) creates environmental policies and enforces pollution control laws. Food Safety Standard Authority of India (FSSAI) regulates heavy metal limits in food items. Central Pollution Control Board (**CPCB**) monitors industrial emissions, waste, and environmental contamination. State Pollution Control Boards (SPCBs) implement and monitor regulations at the state level. Bureau of Indian Standards (**BIS**) sets quality and safety standards for food and water.

Routine monitoring of heavy metals in the environment and food helps to ensure safe food and protect environment. Hence, effective analysis of heavy metals (multi elements) at low concentrations can be achieved through advance technology.

The theme article describes various techniques of heavy metal analysis and the importance of heavy metal analysis in the environment component and food commodities. Although each analytical techniques offers distinct advantages to specific applications, ICP-MS (Inductively Coupled Plasma Mass Spectrometry) is most effective and widely used method due to advanced and sensitive tool for **multi-element analysis,** detecting trace levels of heavy metals with fast and precisely. However, depending on cost, sample type, and required sensitivity, other methods such as ICP-OES (Inductively Coupled Plasma Optical Emission Spectroscopy) , AAS (Atomic Absorption Spectroscopy), or XRF (X-Ray Fluorescence (XRF) etc. may also be appropriate.

भारी धातुएँ जैसे कि सीसा (Pb), कैडमियम (Cd), पारा (Hg), और आर्सेनिक (As) प्राकृतिक रूप से पाए जाने वाले तत्व हैं। कुछ भारी धातुएँ जैसे कि जस्ता, तांबा एवं लोहा सूक्ष्म मात्रा में आवश्यक हैं। हालाँकि, जब सांद्रता सुरक्षित स्तर से अधिक हो जाती है तो वे विषाक्त हो सकती हैं। भारी धातु औद्योगिक उत्सर्जन, कृषि गतिविधियों, अपशिष्ट निपटान एवं लैंडफिल लीचेट आदि के कारण पर्यावरण में पाई जाती है। यह भारी धातु मिट्टी और पानी के प्रदूषण, हवा में जमा होने और जानवरों में जैव संचय के माध्यम से खाद्य श्रृंखला में प्रवेश करती है। भोजन में सबसे आम तौर पर पायी जाने वाली धातुएँ जैसे कि सीसा, कैडमियम, आर्सेनिक एवं पारा मनुष्यों के लिए गंभीर स्वास्थ्य समस्याएँ पैदा करती हैं। खाद्य श्रृंखला एवं पर्यावरण में उनकी उपस्थिति गंभीर स्वास्थ्य एवं पारिस्थितिक जोखिम पैदा करती है खासकर, खराब पर्यावरणीय विनियमन वाले क्षेत्रों में। इसलिए, नियमित निगरानी, उचित विनियमन एवं सार्वजनिक जागरूकता के माध्यम से रोकथाम भारी धातु के जोखिम को कम करने की कुंजी है।

भारत ने सार्वजनिक स्वास्थ्य एवं पर्यावरण की रक्षा के लिए भोजन, पानी, मिट्टी, हवा और औद्योगिक उत्सर्जन में भारी धातुओं की मौजूदगी की निगरानी एवं नियंत्रण के लिए कई कानून एवं दिशा-निर्देश भी विकसित किए हैं। पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय (MoEFCC) पर्यावरण संबंधी नीतियां बनाता है और प्रदूषण नियंत्रण कानूनों को लागू करता है। भारतीय खाद्य सुरक्षा मानक प्राधिकरण (एफएसएसआई) खाद्य पदार्थों में भारी धातु की सीमा को नियंत्रित करता है। केंद्रीय प्रदूषण नियंत्रण बोर्ड (सीपीसीबी) औद्योगिक उत्सर्जन, अपशिष्ट और पर्यावरण प्रदूषण की निगरानी करता है। राज्य प्रदूषण नियंत्रण बोर्ड (एसपीसीबी) राज्य स्तर पर नियमों को लागू करते हैं और उनकी निगरानी करते हैं। भारतीय मानक ब्यूरो (बीआईएस) भोजन और पानी के लिए गुणवत्ता एवं सुरक्षा मानक निर्धारित करता है।

पर्यावरण एवं भोजन में भारी धातुओं की नियमित निगरानी सुरक्षित भोजन सुनिश्चित करने एवं पर्यावरण की रक्षा करने में मदद करती है। इसलिए, उन्नत तकनीक के माध्यम से कम सांद्रता में भारी धातुओं (बहु तत्वों) का प्रभावी विश्लेषण प्राप्त किया जा सकता है।

इस लेख में भारी धातु विश्लेषण की विभिन्न तकनीकों एवं पर्यावरण घटक और खाद्य वस्तुओं में भारी धातु विश्लेषण के महत्व का वर्णन किया गया है। हालाँकि, प्रत्येक विश्लेषणात्मक तकनीक विशिष्ट अनुप्रयोगों के लिए अलग लाभ प्रदान करती है। आईसीपी-एमएस (इंडिक्ली कपल्ड प्लाज़्मा मास स्पेक्ट्रोमेट्री) बहु-तत्व विश्लेषण के लिए उन्नत एवं संवेदनशील उपकरण के कारण सबसे प्रभावी एवं व्यापक रूप से इस्तेमाल की जाने वाली विधि है, जो भारी धातुओं के ट्रेस स्तरों का तेज़ी से और सटीक रूप से पता लगाती है। हालाँकि, लागत, नमूना प्रकार एवं आवश्यक संवेदनशीलता के आधार पर, अन्य विधियाँ जैसे ICP-OES (इंडिक्ली कपल्ड प्लाज़्मा ऑप्टिकल एमिशन स्पेक्ट्रोस्कोपी), AAS (एटॉमिक एब्सॉर्प्शन स्पेक्ट्रोस्कोपी), या XRF (एक्स-रे फ्लोरोसेंस (XRF) आदि भी उपयुक्त हो सकती हैं।

(डॉ. सागर हनुमान सिंह, भा.डा.से.)
महानिदेशक

A Review on the Techniques of Heavy Metal Analysis in Food and Environmental Sample

Dr. Chintala Krishna, Dr. Maisnam Jaya, Dr. Nirmali Saikia

Introduction:

Heavy metals are naturally occurring elements, but human activities like industrial emissions, mining, and improper waste disposal have increased their presence in air, water, and soil. Heavy metals, such as Lead (Pb), Mercury (Hg), Cadmium (Cd), Chromium (Cr), and Arsenic (As), are naturally occurring elements that can become environmental contaminants when concentrations exceed safe levels. Due to their toxicity and persistence in the environment, these metals pose significant risks to human health, ecosystems and wildlife. Hence, it is necessary to analyse heavy metal as industrialization, urbanization, and agricultural practices continue to introduce such toxic substances into air, soil, water, and food in excess.

Effective monitoring and detection of heavy metals through advanced analytical techniques are essential for safeguarding public health, ensuring food safety, preserving water quality, and mitigating environmental hazards. From environmental monitoring to food safety measures, and from water quality testing to health risk assessments, heavy metal analysis plays a central role in identifying contamination sources, preventing exposure, and managing the long-term impacts on ecosystems.

Importance of Heavy Metal Analysis

Most heavy metals cause environmental and atmospheric pollution, and may be hazardous to humans. Some of the heavy metals that contaminate the environment include mercury, cadmium, arsenic, chromium, nickel, copper, and lead etc. Study (Saikat et. 2022) revealed that, exposure of the human body to heavy metals is either environmental, or through foreign sources. Chronic low dosage exposure to numerous elements is a substantial threat to public health in many regions with metal pollution. Heavy metals become strongly toxic by mixing with different environmental elements, such as water, soil, air. Understanding the mechanistic basis of heavy metal interactions is critical for the evaluation of health risks associated with chemical combinations and the management of such risks.

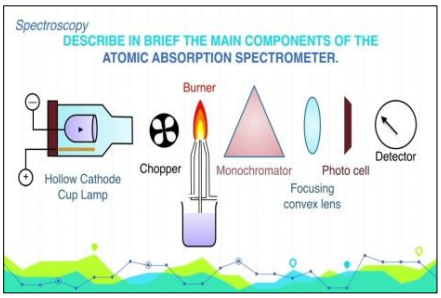
Mercury is an extremely hazardous heavy metal and due to human activities, it has become a widespread contaminant. Methyl mercury, a conversion product of mercury, when enters the human body through the food chain damage neurological development (Rice et al., 2014). The concentration of Lead, a non-biodegradable metal, is increasing continuously because of the human activities including manufacturing, mining, and fossil fuel burning (Loh et al., 2016). Manganese is found in various oxidation states in nature. Although manganese is required for a variety of physiological activities, excessive consumption results in substantial toxicity (O'Neal and Zheng, 2015). Cadmium released into the atmosphere as a result of natural or manmade activities. People can be poisoned by cadmium via ingesting food, breathing air, or drinking water rich in the metal. Chromium is used in many industries that pose a threat to regional climates and it is highly hazard to humans. The little amounts of cobalt usually have no negative consequences, but massive discharges into the environment can cause fatalities (Domingo, 1989). Nickel is a naturally abundant element and has extensive industrial uses. It is emitted from both natural and anthropogenic sources into the atmosphere (Li et al., 2016a). It has many adverse effects on humans, and causes allergies, nasal and lung cancer, and kidney and cardiovascular diseases owing to the inhalation of contaminated air (Genchi et al., 2020). Copper is recognized as a vital micronutrient for living organisms. However, its elevated exposure causes toxicity (Schwartz et al., 2003). Smelting and mining are major the sources of zinc. While zinc is essential, excessive intake can lead to toxicity, with symptoms including nausea, vomiting, and potentially affecting copper and iron absorption and immune function.

Hence, it is important to analyse heavy metal in the environment component and food commodities to

Various methods of Heavy Metal Detection:

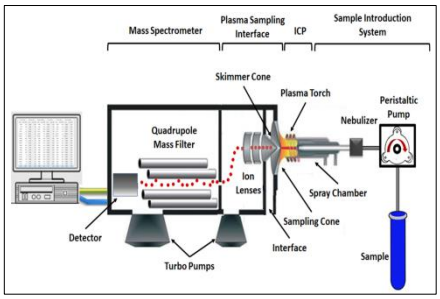
Various analytical methods/techniques can be used to identify and quantify heavy metals. Most common methods employed in heavy metal detection are given below:

Atomic Absorption Spectroscopy (AAS)



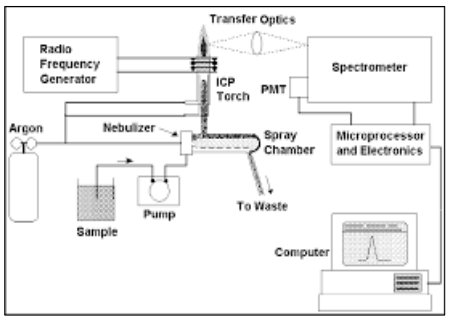
Atomic Absorption Spectroscopy (AAS) is a technique that measures the concentration of metal ions by detecting the absorption of light by free atoms in a vaporized sample. When a sample is introduced into a flame or graphite furnace, metal atoms absorb light at specific wavelengths, which correlates with the metal concentration. By using this method, heavy metals like lead (Pb), cadmium (Cd), iron (Fe), copper (Cu) and zinc (Zn) and arsenic (As) etc. can be detected and quantified in the environmental sample, food and water sample. The advantages of this method are cost-effective, reliable, and widely used for a variety of metals. The limitations of this method are that it is limited to a few metals at a time and requires proper sample preparation (EPA Method 7000 Series, U.S. Environmental Protection Agency)

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)



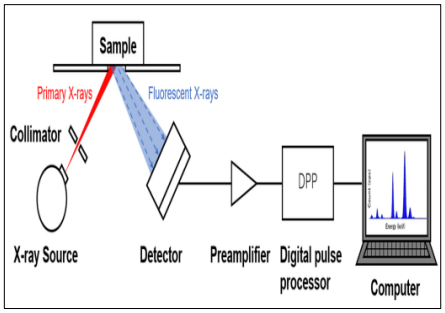
ICP-MS uses a high-temperature plasma to ionize sample components and the mass spectrometer detects the ions based on their mass-to-charge ratio. It offers extremely high sensitivity and precision in detecting trace metals in complex matrices. This technique is use to detect and quantify multiple metals like mercury (Hg), arsenic (As), lead (Pb), cadmium (Cd) and mercury (Hg) etc. in the environmental sample, food and water sample. The advantage of this technique is extremely sensitive, capable of multi-element analysis and suitable for trace-level analysis. The limitation of this technique is that the instrumentation is expensive and requires trained personnel for operation (ISO 17294-2, International Organization for Standardization)).

Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)



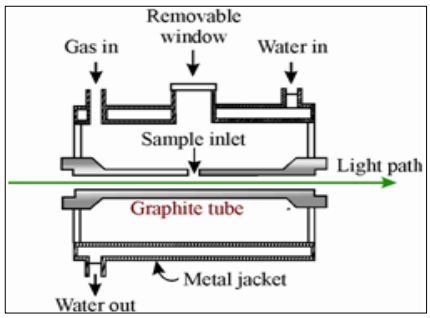
ICP-OES uses plasma to excite atoms and ions in the sample and the emitted light is detected to identify and quantify the metals present. Each metal emits light at characteristic wavelengths. This technique is applicable to analyse metals such as copper (Cu), chromium (Cr) and cadmium (Cd), calcium (Ca), magnesium (Mg) and iron (Fe), zinc (Zn), manganese (Mn) and sodium (Na) in the environmental sample, food and water sample. The main advantage is to analyse multi-element, high sensitivity and fast results however the limitation is high cost and maintenance requirements of ICP-OES instrument (EPA Method 200.7, U.S. Environmental Protection Agency).

X-ray Fluorescence (XRF) Spectroscopy



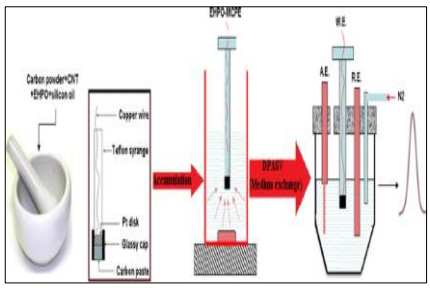
XRF spectroscopy involves bombarding a sample with X-rays, which causes the elements to emit secondary (fluorescent) X-rays. The energy of these X-rays is characteristic of the elements present, allowing their identification and quantification. This technique is applicable to screen heavy metals in environmental sample, food and water sample. The advantage of this technique is non-destructive, rapid and requires little sample preparation. However, due to lower sensitivity it requires calibration for accuracy (ASTM E1479, American Society for Testing and Materials)

Graphite Furnace Atomic Absorption Spectroscopy (GFAAS)



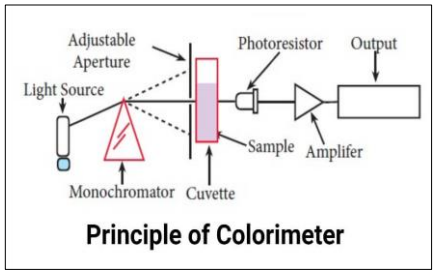
GFAAS is a more sensitive version of Atomic Absorption Spectroscopy (AAS) where the sample is vaporized in a graphite furnace rather than a flame. This allows for the detection of metals at trace levels with improved sensitivity. This technique is applicable to detect trace levels of mercury (Hg), arsenic (As), and cadmium (Cd) in soil and sediment, analysis of low concentrations of metals like mercury (Hg) in fish or lead (Pb) in canned goods and trace metals like lead (Pb) and cadmium (Cd) in drinking water. Highly sensitive and capable of detecting metals at very low concentrations is the main advantage of this technique. This technique requires specialized equipment and can be time-consuming for sample preparation (EPA Method 7000 Series, U.S. Environmental Protection Agency).

Anodic Stripping Voltammetry (ASV)



ASV involves the electrochemical reduction of metal ions onto a working electrode, followed by the oxidation (stripping) of the metal to produce a current proportional to its concentration. It is used to detect metals such as mercury (Hg), cadmium (Cd), and lead (Pb) in water and soil samples and also used to determine the presence of trace metals in food and beverages. This technique is also used in monitoring of mercury (Hg) and lead (Pb) in water sources, including rivers and lakes. The Anodic Stripping Voltammetry (ASV) is high sensitive, cost-effective, and suitable for field measurements. The technique is limited to certain metals and requires careful calibration (EPA Method 3050B, U.S. Environmental Protection Agency).

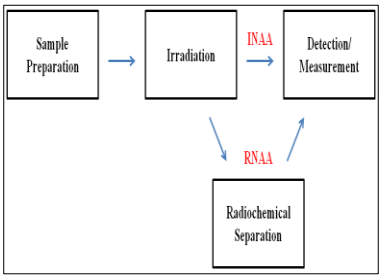
Colorimetry



Principle of Colorimeter

In colorimetry, a reagent is added to the sample, which reacts with the metal ions to produce a color change. The intensity of the color is measured using a spectrophotometer, which correlates with the metal concentration. It is used to detect metals like copper (Cu) and iron (Fe) in water and soil, food products. It is used to analyse metals like nickel (Ni) and copper (Cu) in drinking water and wastewater. The technique is very simple, inexpensive, and easy to use however less sensitive than other methods and limited to metals that form distinct color reactions (ISO 8288, International Organization for Standardization).

Neutron Activation Analysis (NAA)



NAA involves irradiating the sample with neutrons, which causes the elements in the sample to become radioactive. The emitted gamma rays are detected and used to identify and quantify the metals. The technique is used to detect broad range of metals such as mercury (Hg), arsenic (As), and cadmium (Cd) in soil, sediments, water and for determining metals like zinc (Zn) and iron (Fe) in food samples. It is uses in monitoring of trace metals in water sources, particularly in complex matrices. This technique is **e**xtremely sensitive and capable of detecting multiple elements simultaneously however, requires a nuclear reactor and specialized equipment, limiting its widespread use (ISO 15759, International Organization for Standardization)

Regulations and Compliance

Global organizations like the World Health Organization (WHO), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA) have strict guidelines on acceptable heavy metal levels in different materials. To protect against high exposures of metals contaminants, Codex Alimentarius Commission has set limits in food commodities at international level. At National Level, Food Safety Standard Authority of India (FSSAI) has also prescribed maximum limits for the heavy metals in various food commodities. Compliance with these standards helps to protect public health and the environment (Guidance Note No. 15/2020, FSSAI).

Conclusion

Heavy metal analysis is indispensable for ensuring public health, environmental safety, food safety and compliance with regulatory standards. The persistence and toxicity of heavy metals in the environment food and water necessitate robust monitoring and detection methods. With advancements in analytical techniques, detecting and mitigating heavy metal risks has become more efficient, helping industries meet regulatory requirements and protect human health.

Each analytical technique offers distinct advantages to specific applications, such as Atomic Absorption Spectroscopy (AAS) for cost-effective and reliable analysis or X-ray Fluorescence (XRF) for rapid, non-destructive measurements. However, Inductively Coupled Plasma Mass Spectrometry (ICP-MS) is widely regarded as the most advanced and sensitive tool for detecting trace levels of heavy metals. Its ability to perform multi-element analysis with exceptional precision and sensitivity makes it the preferred choice for complex sample matrices, ensuring even the lowest concentrations of toxic metals are detected.

Heavy metal analysis is not just a technical requirement but a critical component in safeguarding public health, protecting environmental quality and ensuring food safety. The potential toxicity of heavy metals and their widespread presence in various components highlight the importance of continual monitoring. As technology advances, the refinement of these analytical techniques will further enhance the ability to monitor and reduce the environmental and health impacts of toxic metal exposure.

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12. Reference Method: ASTM E1479 (American Society for Testing and Materials)
13. Reference Method: EPA Method 7000 Series (U.S. Environmental Protection Agency)
14. Reference Method: EPA Method 3050B (U.S. Environmental Protection Agency)
15. Reference Method: ISO 8288 (International Organization for Standardization)
16. Reference Method: ISO 15759 (International Organization for Standardization
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Around the World

1. 339 Insecticides / Pesticides are registered under section 9(3) of the Insecticides Act, 1968 and 49 Pesticides are banned for manufacture, import and use as on 31.03.2024 in India

2. The Environmental Protection Agency announced new measures to protect farmworkers from pesticide exposure by expanding restrictions to apply outside of farm boundaries. A final rule published earlier this month reinstates rules from 2015 that extended the boundary for "application exclusion zones (AEZ)," or areas where workers and bystanders aren't allowed in when pesticides are being applied. Farmers are required to stop applying chemicals when members outside their immediate family are within the designated zone. The new distance for "application exclusion zones" is 25 feet if farmers spray pesticides with medium or larger droplets from a height greater than 12 inches from the soil. For pesticides with fine droplets, the AEZ is 100 feet. (https://www.agriculturedive.com/news/epa-pesticide-exposure-farmworker-rule/729882/, published Oct 2024)

3. EPA releases Rodenticide Strategy, Including Final Biological Evaluation on the Effects of 11 Rodenticides on Endangered Species and Associated Mitigation (Released on November 22, 2024). The 11 rodenticides evaluated in the BE are: chlorophacinone; diphacinone and its sodium salt; warfarin and its sodium salt; brodifacoum; bromadiolone; difenacoum; difethialone; bromethalin; cholecalciferol; strychnine; and zinc phosphide. These rodenticides are intended to control target animals using different biochemical mechanisms (e.g., neurotoxicity, reduced blood clotting). Some rodenticides may remain in target animals long enough such that predator or scavenger animals that consume the target animals may be affected. (**https://www.epa.gov/pesticides/epa-releases-rodenticide-strategy-including-final-biological-evaluation-effects-11**)

4. EPA seeks to limit use of pesticide chlorpyrifos in food (Published Dec. 5, 2024). The agency proposed a rule limiting chlorpyrifos use to the following 11 crops: alfalfa, apples, asparagus, tart cherries, citrus, cotton, peaches, soybeans, strawberries, sugar beets and wheat. Chlorpyrifos is banned in places like the European Union and a handful of U.S. states due to its links to brain damage in children. The insecticide is a type of organophosphate, a class of chemicals that were repurposed as nerve agents by the Germans in World War II (https://www.agriculturedive.com/news/epa-chlorpyrifos-partial-ban-pesticide-insecticide/734737/).

5. The 47th session of the Codex Alimentarius Commission (CAC47) held from 25 to 30 November 2024 in Geneva, Switzerland, to adopt food safety and quality standards with a focus on meeting future needs. The session also saw the election of a new chairperson and three vice-chairpersons (https://www.who.int/news/item/07-02-2025-codex-alimentarius-commission-spotlight-on-side-events-at-the-forty-seventh-session-in-geneva).

6. FSSAI in collaboration with BMC takes steps to make street food safer and more hygienic in Mumbai. FSSAI and BMC partner to provide Food Safety Training to more than 10,000 street Food Vendors in Mumbai, (Posted on December 24, 2024). The Food Safety and Standards Authority of India (FSSAI) and The Brihanmumbai Municipal Corporation (BMC) signed a Memorandum of Understanding (MoU) to collaborate on a long-term strategic partnership to enhance food safety practices among street food vendors in Mumbai. The MoU was signed by Shri G. Kamala Vardhana Rao CEO, FSSAI and Shri Bhushan Gagrani, Municipal Commissioner, Brihanmumbai Municipal Corporation (BMC) in presence of Ms. Pritee Chaudhary, Regional Director-West Region and other senior FSSAI and MCGM officials. The collaboration aims at promoting food safety, hygiene and cleanliness among Street food

vendors of Mumbai (**https://pib.gov.in/PressReleasePage.aspx?PRID=2087533** and **https://fssai.gov.in/press-note.php**).

7. Steps taken by the Government to ensure the availability of safe food products to consumers. FSSAI launches Special Festive Drives to combat Adulteration in Milk, Sweets, and other Food Products during the holiday season. FSSAI enhances Food Testing Ecosystem with Financial and Technical Support to States/UTs for Improved Quality Monitoring (Posted On: 13 DEC 2024 4:30PM by PIB Delhi). FSSAI has also implemented the following initiatives to raise awareness about food safety among consumers, the food industry, and citizens: **Website and Social Media**, **Adulteration Videos**, **Food Safety Magic Box**, **Food Safety on Wheels (FSWs), Food Safety Guidebook for Teachers/Students** (https://pib.gov.in/PressReleseDetailm.aspx?PRID=2084189&reg=3&lang=1)

Training Programs

Plant BioSecurity Division

The Plant Biosecurity Division has organized following training programmes during the months of **October-December, 2024**.

CAPACITY BUILDING PROGRAMMES:

S. No.	Name of The Programme	Duration	Date	
			From	To
	Plant Biosecurity Division (PBD)			
1)	Seed Health Testing and Molecular Diagnostic Techniques for Plant Pathogens	05 Days	14.10.2024	18.10.2024
2)	Diagnosis of Pests, Pest Risk Analysis, Pest Surveillance and Phytosanitary Treatments for safe trade- ITEC MEA International Programme	14 Days	06.11.2024	19.11.2024
3)	Fumigation as a Phytosanitary Treatment	15 Days	12.11.2024	26.11.2024
4)	Stored Grain Pest and Warehouse Management for officers of Andhra Pradesh State Warehousing Corporation (APSWC)	05 days	25.11.2024	29.11.2024
5)	Customized training on Stored Grain Pest Management for Officers of FCI	05 Days	02.12.2024	06.12.2024
6)	Warehouse Management and Awareness on e-NWR to the APCOB Officers	05 Days	18.12.2024	20.12.2024
7)	Forced Hot Air Treatment	05 days	16.12.2024	20.12.2024
8)	APAARI - EUPHRESCO III Stakeholder Consultation on Plant Health Challenges in South & South East Asia	01 Day	20.12.2024	20.12.2024

Vertebrate Pest Management (VPM)				
9)	Urban Pest Management for technicians (Level 1)	03 days	09.10.2024	11.10.2024
10)	Vertebrate Pest Management	03 Days	14.10.2024	16.10. 2024
11)	Level 1: Urban Pest Management for Technicians	03 Days	13.11.2024	15.11.2024
12)	Vertebrate Pest Management for the scientists of AICRP – Groundnut and ICAR-DGR	01 Day	28.11.2024	28.11.2024
13)	Urban Integrated Pest Management	15 days	04.12.2024	18.12.2024
PBD – Farmers Programmes				
14)	Farmers Awareness Programme on WDRA and eNWR	01 Day	30.09.2024	30.09.2024
15)	Farmers Awareness Programme on WDRA and eNWR	01 Day	30.09.2024	30.09.2024
16)	Farmers Awareness Programme on WDRA and eNWR	01 Day	04.10.2024	04.10.2024
17)	Awareness Programme on Export of Horticultural Commodities	01 Day	10.10.2024	10.10.2024
18)	Sensitization on Sanitary & Phytosanitary Requirement for Export of Fresh Vegetables and Fruits	01 Day	20.11.2024	20.11.2024
19)	Enhancing fruit export competitiveness through Area wide management of fruitflies targeting export clusters and production sites" -Anantapur,Andhra Pradesh	01 Day	21.11.2024	21.11.2024
20)	Enhancing fruit export competitiveness through Area wide management of fruitflies targeting export clusters and production sites" -Chittoor, Andhra Pradesh	01 Day	19.11.2024	19.11.2024
21)	Export Potential of Sugarcane and Bio-inputs in Sugarcane Farming" -Krishi Vigyan Kendra Kalawade, Karad, Maharashtra	01 Day	04.12.2024	04.12.2024
22)	Export Potential of Sweet Lemon (Mosambi) and Bio-inputs in Sweet Lemon Farming- Krishi Vigyan Kendra Aurangabad, Maharashtra	01 Day	06.12.2024	06.12.2024
23)	Awareness Program on e-NWR to the Farmers at Jammikunta, Telangana	01 Day	23.12.2024	23.12.2024
24)	Awareness Program on e NWR to the Farmers at Jangoan, Telangana	01 Day	27.12.2024	27.12.2024
25)	Area-wide Management of Fruit flies in Banana- Krishi Vigyan Kendra, Jalgaon , Maharashtra	01 Day	03.12.2024	03.12.2024

- **Seed Health Testing and Molecular Diagnostic Techniques for Plant Pathogens :** A programme on Seed Health Testing and Molecular Diagnostic Techniques for Plant Pathogens was organised during 14th-18th October, 2024 and attended by 10 participants and they get acquainted with different techniques to detect and diagnose the plant pathogens.

- **Diagnosis of Pests, Pest Risk Analysis, Pest Surveillance and Phytosanitary Treatments for Safe Trade:** In collaboration with ITEC-MEA (Indian Technical and Economic Cooperation - Ministry of External Affairs), Government of India, NIPHM has organized this fourteen days programme from 06th - 19th November, 2024. This International training imparted skills in the areas of plant quarantine, pest risk analysis, detection and diagnosis of pests, pest surveillance and phytosanitary treatments for safe trade. Twenty six officers from 17 countries viz. Bangladesh, Bhutan, Cote D' Ivoire, Ethiopia, Eritrea, Ghana, Nigeria, Jamaica, Sri Lanka, Malaysia, Maldives, Morocco, Peru, South Sudan, Suriname, Thailand and Zambia attended the training.

- **Fumigation as a Phytosanitary Treatment :**For this fifteen days programme, NIPHM is one of the notified Institutes under Insecticides Rules 1971 Chapter III -10, (3a) (iii) for imparting training for commercial pest control operators on fumigation using Methyl bromide and Phosphine. The programme was organized for private industry , wherein during the training period (12th-26th November, 2024) the participants (24 Pest Control Operators) get acquainted to the guidelines laid in NSPM-11, 12 (MBr fumigation) and NSPM-22 (Phosphine fumigation) to conduct appropriate fumigation procedures as well as the accreditation procedure of fumigation operators prescribed by the Directorate of PPQ&S.

- **Stored Grain Pest and Warehouse Management for Officers of Andhra Pradesh State Warehousing Corporation (APSWC)*:*** Training on Warehouse Management and the Importance of WDRA-eNWR (Electronic Negotiable Warehouse Receipt) System was organized for the officers of APCOB (Andhra Pradesh State Cooperative Bank), DCCB (District Central Cooperative Bank) as APCOB provides financial assistance to District Central Cooperative Banks (DCCBs), which is routed to PACS for constructing and maintaining of storage godowns. The programme was organized from 18th-20th December, 2024 and attended by 16 officials.

- **Warehouse Management and Awareness on e-NWR to the APCOB Officers :**Stored Grain Pest and Warehouse Management for the officers (30 Nos.) of Andhra Pradesh State Warehousing Corporation (APSWC)" from 25th - 29th November, 2024 to enhance the technical efficiency of officials in maintenance of the grain storage and other technical quality control aspects at storage godowns with respect to Prophylactic and Curative treatments (Fumigation with ALP) and Warehouse Management.


- **Customized training on Stored Grain Pest Management for Officers of FCI :**Customized training for the Officers of FCI was organized during 02nd to 06th December, 2024 to train the quality control officers (44Nos.) of FCI in prophylactic and curative measures, identification of stored grain pests, silos management, alternatives to fumigation etc.


- **Forced Hot Air Treatment :**The packaging material is one of the most threatening pathways for incursion of timber pests across the globe. Forced Hot Air Treatment (FHAT) is one of the approved treatments for packaging material under ISPM -15. National Standard for Forced Hot Air Treatment (NSPM-9) has been developed which prescribes treatment procedures and the steps to register the facility. NIPHM is the only Institute in India to offer a specialized training programme on FHAT for industry stakeholders. The programme was attended by fifty nine participants during 16th-20th December, 2024.


- **APAARI (Asia Pacific Association of Agricultural Research Institutions) - EUPHRESCO III Stakeholder Consultation on Plant Health Challenges in South & South East Asia:** NIPHM along with Plant Protection Association of India (PPAI), Asia-Pacific Association of Agricultural Research Institutions (APAARI) and EUPHRESCO III organized the "APAARI - EUPHRESCO III Stakeholder Consultation on Plant Health Challenges in South & South East Asia" stakeholder consultation meeting on 20th December, 2024 at NIPHM to discuss about plant health challenges and the ideas of collaboration and partnership to tackle plant health challenges and explore networking opportunities. A total of 45 officers representing ICAR institutes, state agricultural universities, APEDA, Hyderabad, PQ station, Shamshabad, NIPHM and industry representatives from Agrochemicals, Biologicals and Seed Industry were attended the programme.

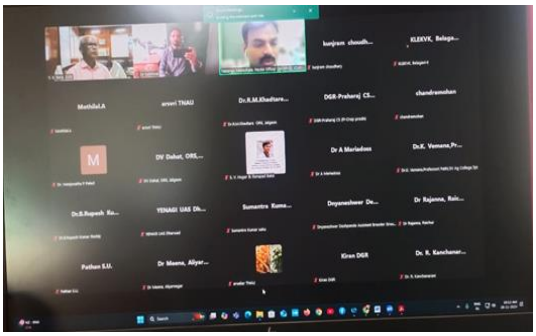
VERTEBRATE PEST MANAGEMENT (VPM)

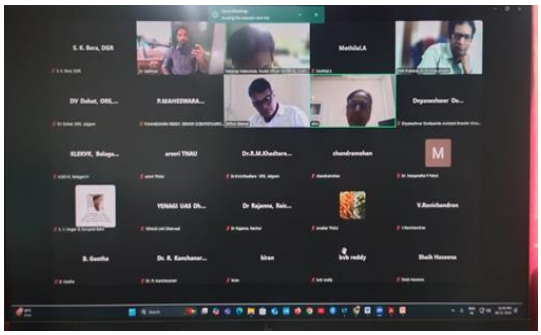
- **Level 1: Urban Pest Management for Technicians*:*** The programme was organised at All India Institute of Local Self Government, Mumbai from 09th - 10th October, 2024. Total 105 technicians from different company were attended the training. The topics covered were Principles of scientific storage structure, Biology and Management of mosquitos, Biology and management of termites, Fly management, Bedbug management, Vertebrate pest management in storage and Safe use of pesticides, Dosage of chemicals and its importance and basic method of first aid in handling. The hands on practices of various pest management practices such as fogging, spraying techniques also demonstrated to the participants.

- **Vertebrate Pest Management:** The programme was organized from 14th-16th October, 2024. Total eight Horticulture officers/scientists were attended the training. The training was focused to create the trained manpower and to create awareness about the major vertebrate pests like wild boar, monkey and birds including their management techniques to the extension functionaries.


- **Urban Pest Management for technicians- Level 1:** Three day off-campus training was organized at All India Institute of Local Self Government, Mumbai, Maharashtra from 13th-15th November, 2024 in association with Envu India. Total 36 Pest Management technicians of different companies were attended the training. Along with technical sessions, the hands on practice of various pest management practices such as fogging, spraying techniques were demonstrated to the participants.


- **Vertebrate Pest Management for the scientists of AICRP – Groundnut and ICAR-DGR:** Online programme was organized on 28th November, 2024 and attended by 44 officials.





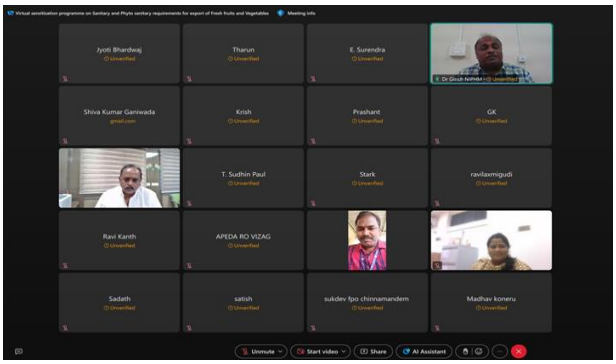
- **Urban Integrated Pest Management*:*** Fifteen days training programme for private industry was organized during 04th-18th December, 2024 and attended by 33 participants. As per the Insecticides Act, 1968 the PCOs applies for grant of license to undertake pest control operations should be trained and obtain certificate of minimum 15 days training. The training provided an opportunity to the participants to develop skills in urban pest's biology, bionomics and management practices and prepares the participants for emergency preparedness to prevent the outbreak of communicable zoonotic diseases, to develop skills in safe use of chemical pesticides.

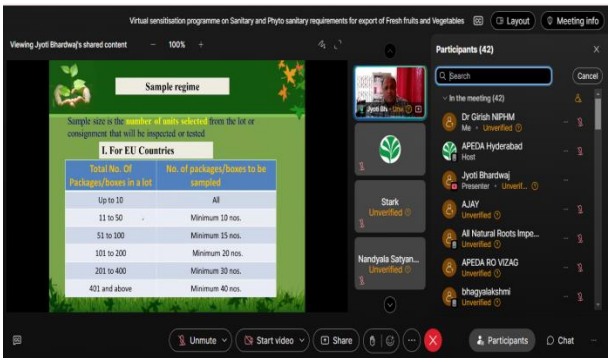
PBD - FARMERS PROGRAMME

- **Farmers Awareness Programme on WDRA and eNWR *(WDRA Sponsored)*:** Five awareness programmes on WDRA and e-NWR were organized at different places of Telangana on 30th September (2 programmes), 04th October, 23rd and 27th December, 2024.The programmes were attended by total of 250 farmers.

- **Awareness Programme on Export of Horticultural Commodities:** The programme was organised at Muchintal, Hyderabad and total of 23 farmers attended the programme.

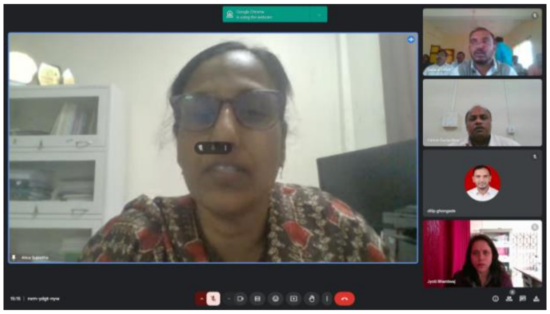
- **Sensitization on Sanitary & Phytosanitary Requirement for Export of Fresh Vegetables and Fruits:** In collaboration with Agricultural and Processed Food Products Export Development Authority (APEDA), the programme was organized on 20th November, 2024 and attended by 52 participants from FPO&FPC of Telangana & Andhra Pradesh as well APEDA officials from Regional Office (Hyderabad &Visakhapatnam) and Head Office (New Delhi).

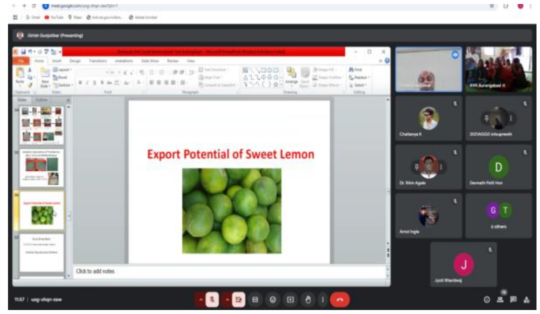




- **Enhancing fruit export competitiveness through Area wide management of fruit flies targeting export clusters and production sites":** APEDA Sponsored programmes were organized in collaboration with Regional Office (Telangana), APEDA & State Horticulture Department (Andhra Pradesh) at Anantapur and Chittoor, Andhra Pradesh on 19th & 21st November, 2024 and attended by 60 and 76 farmers respectively.

- **Export Potential of Sugarcane & Sweet Lemon (Mosambi) and Bio-inputs in Sugarcane & Sweet lemon Farming:** Two export promotion programmes in collaboration in collaboration with Krishi Vigyan Kendra Kalawade, Karad, Maharashtra and Krishi Vigyan Kendra Aurangabad, Maharashtra were organized on 04th & 06th December, 2024 and attended by 33 and 54 FPOs, farmers, and officials of KVKs respectively.





- **Area-wide Management of Fruit flies in Banana- Krishi Vigyan Kendra, Jalgaon, Maharashtra (*APEDA Sponsored)***: One day training programme was organized at Krishi Vigyan Kendra, Jalgaon on 03rd December, 2024 and attended by 125 participants (entrepreneurs/exporters, progressive farmers, banana tissue culture labs and other stakeholders).

दिव्य मराठी चाळीसगाव 07-12-2024

पिचर्डे येथे केळी पिकाचे प्रदर्शन अन् परिसंवाद; निर्यात वाढवण्यासाठी जिल्हाधिकाऱ्यांचे आवाहन

प्रतिनिधी | भडगाव

राष्ट्रीय वनस्पती स्वास्थ्य प्रबंधन संस्था हैदराबाद, कृषी विज्ञान केंद्र, कृषी विभाग जळगाव व श्री गिरणाकाठ शेतकरी उत्पादक कंपनी भडगाव यांच्या संयुक्त विद्यमाने पिचर्डे येथे जिल्हास्तर केळी पीक प्रदर्शन, निर्यातक्षम केळी उत्पादन व फळमाशी नियंत्रण या विषयावर केळी परिसंवाद घेण्यात आले. जिल्हा कृषी अधिकारी कुरबान तडवी यांनी केळी निर्यातीसाठी भडगाव क्लस्टरमध्ये होत असलेल्या कार्यप्रणालीचे कौतुक करत यासाठी आवश्यक सुविधा घेऊन जास्तीत जास्त केळी निर्यातीसाठी शेतकऱ्यांनी पुढाकार घेण्याचे आवाहन केले.

यावेळी जिल्हा कृषी अधिकारी कुरबान तडवी, वैज्ञानिक अधिकारी डॉ. चंद्रशेखर गुप्ता, अपेडाच्या झोनल मॅनेजर प्रणिता चौरे, नाबार्ड जिल्हा व्यवस्थापक अमित तायडे, अपेडाचे उपव्यावस्थापक प्रशांत वाघमारे यांच्यासह बहुसंख्य केळी बागायतदार उपस्थित होते. प्रदर्शनात निर्मल सीड्स, झुआरी ॲग्रो इंडस्ट्रीज, राम बायोटेक, नमो बाय प्लांट, यारा फर्टीलायझर, पोलन ॲग्री करोलरीसह विविध कंपन्यांचे स्टॉल लागले होते. बायोसिस आपी कंपनीचे स्टॉल लावले होते. प्रथम आधुनिक पद्धतीने लागवड केलेल्या टिश्यूकल्चर केळीची पाहणी केली.

पिचर्डे (ता.भडगाव) येथील कृषी प्रदर्शन व परिसंवादात सहभागी झालेले अधिकारी व शेतकरी.

केळीच्या उत्पन्नवाढीसाठी शेतकऱ्यांना मान्यवरांनी दिला मोलाचा सल्ला

पीक परिसंवादात डॉ.चंद्रशेखर गुप्ता यांनी अपेडाच्या मार्गदर्शक सूचनेनुसार केळी निर्यातीत अडसर ठरणाऱ्या केळी फळमाशीची ओळख, प्रसार व त्याचे योग्य व्यवस्थापन यावर मार्गदर्शन केले. अपेडाचे व्यवसाय विकास व्यवस्थापक प्रणिता चौरे यांनी केळी निर्यातीस लागणाऱ्या सुविधा, परवाने, प्रक्रिया व लागणारे अपेडाची मदत यावर मार्गदर्शन केले. यानंतर नाबार्डचे जिल्हा विकास व्यवस्थापक अमित तायडे यांनी शेतकरी उत्पादन कंपनीस इंटिग्रेटेड पॅक हाऊससह कंपनीस लागणाऱ्या सर्व सुविधा पुरवण्याचे आश्वासन दिले.

FORTHCOMING PROGRAMMES OF PBD & VPM (JANUARY-MARCH, 2024)

Name of the programme	No. of Days	From	To
PBD			
Fruit fly: Surveillance and Management for major fruits and cucurbits	05 Days	3.02.2025	07.02.2025
Plant Quarantine Procedures for Import and Export	05 Days	10.02.2025	14.02.2025
Introduced and Emerging Pest threats to India	03 Days	24.02.2025	26.02.2025
Stored Grain Pest and Management	05 Days	03.03.2025	07.03.2025

Pest Surveillance techniques for Agricultural and Horticultural crops (Kharif/Rabi)	05 Days	17.03.2025	21.03.2025
Pest Risk Analysis w.r.t protecting agriculture and trade	05 Days	24.03.2025	28.03.2025
Phytosanitary Inspection Training	30 Days	01.01.2025	30.01.2025
Fumigation as a Phytosanitary Treatment (Methyl Bromide and Aluminium Phosphide)	15 Days	11.03.2025	25.03.2025
VPM			
Risk assessment and management of vertebrate pests in agriculture and horticulture ecosystem	05 Days	17.02.2025	21.02.2025
Certificate Course on Urban Integrated Pest Management	15 Days	Dates to be decided	

Plant Health Management Division

The Plant Health Management Division has organized following training programmes during the months of **October-December, 2024**.

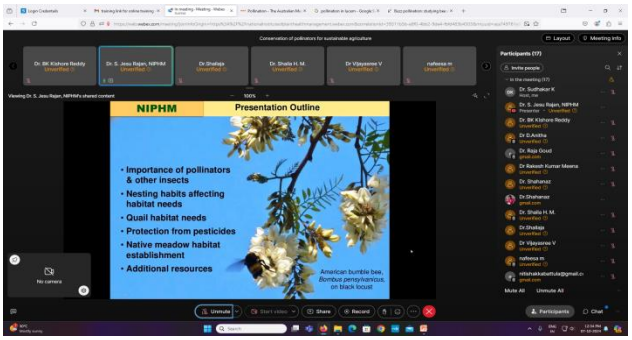
CAPACITY BUILDING PROGRAMMES:

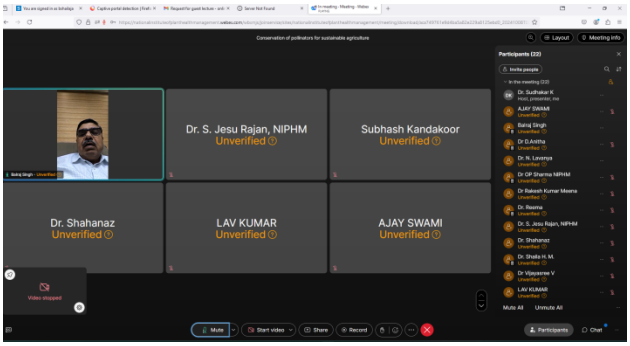
S No	Name of the programs	Duration (Days)	From	To
I.	**Officers programme**			
1.	Conservation of pollinators for sustainable agriculture (Online)	03	07.10.2024	09.10.2024
2.	Production Protocols of Bio-inputs for Sustainable Agriculture	14	09.10.2024	22.10.2024
3.	Plant Health Management in Rabi Oilseed crops (Online)	03	06.11.2024	08.11.2024
4.	Locust Pest Management	03	12.11.2024	14.11.2024
5.	Bio-input Production and Application in Organic and Natural Farming Systems	05	29.07.2024	02.08.2024
6.	Production protocol for bio-fertilizers and bio-pesticides	03	05.08.2024	07.08.2024
7.	Training of Trainers on On-Farm production of Trichoderma and Pseudomonas using NIPHM media	02	05.08.2024	06.08.2024
8.	Bio-input Production and Application in Organic and Natural Farming Systems	05	19.08.2024	23.08.2024

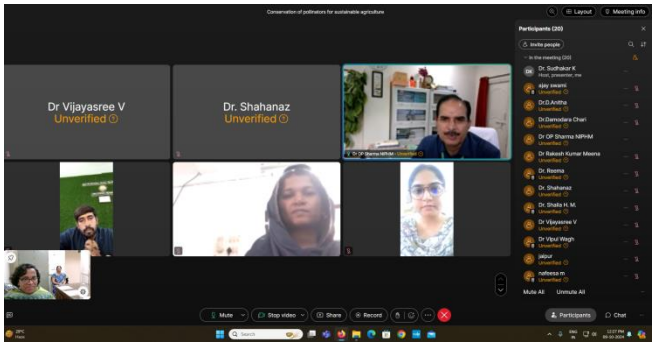
9.	On-farm production of bio control agents and microbial bio pesticides	10	21.08.2024	30.08.2024
10.	Plant Health Management Strategies for Organic and Natural Farming Systems	05	02.09.2024	06.09.2024
11.	Production Protocol for Entomo-pathogenic Nematodes	05	09.09.2024	13.09.2024
12.	Pest problems and their management under changing climatic scenario	03	18.09.2024	20.09.2024
13.	Field diagnosis of pests for Integrated Pest Management	05	23.09.2024	27.09.2024
II.	**Farmers training programme**			
1.	Establishment of Bio- input Resource Centres	05	04.11.2024	08.11.2024
2.	On-farm production of Bio-inputs	02	05.11.2024	05.11.2024
3.	On-farm production of Bio-inputs	02	11.11.2024	12.11.2024
4.	On-farm production of Bio-inputs	03	25.11.2024	27.11.2024
5.	On-farm production of bio-inputs	03	03.12.2024	05.12.2024
6.	Integrated pest management in coconut and oilpalm	01	16.12.2024	16.12.2024
7.	On-farm production of bio-inputs	03	18.12.2024	20.12.2024
8.	On-farm production of bio-inputs	03	24.12.2024	26.12.2024
9.	Plant Health Management in FCV tobacco	01	27.12.2024	27.12.2024
III.	**Student training programme**			
	Certificate Course on PHM in Organic and Natural Farming CCONF	90	27.11.2024	05.03.2025

- **Conservation of pollinators for sustainable agriculture**

As per the NIPHM training calendar 2024-25, an online training programme on 'Conservation of pollinators for sustainable agriculture' was organized at NIPHM from 07.10.2024 to 09.10.2024 (3 days). In this program, a total of 21 officers/scientists from different states & organizations have participated. During the program different types of pollinators and their role in increase of crop production, mass production and use of beneficial insects as pollinators, ecological engineering methods for conserving pollinators, apiculture for sustainable agriculture, ecological importance of Pollinators and their conservation and effect of climate change on pollinators were covered.





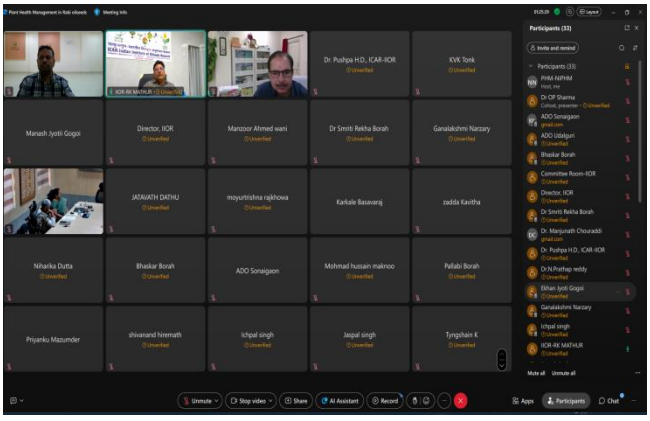


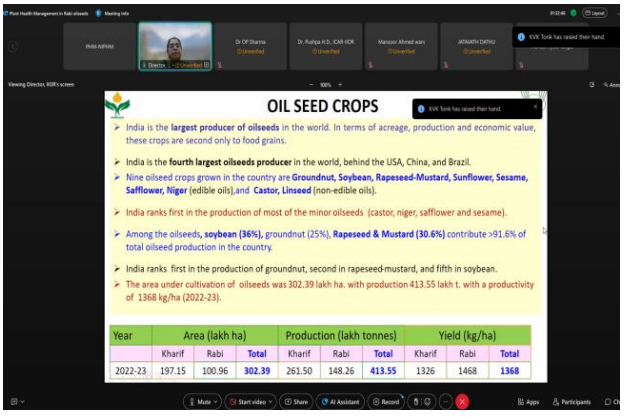
➢ **Production Protocols of Bio-inputs for Sustainable Agriculture (ITEC –MEA sponsored international training program)**

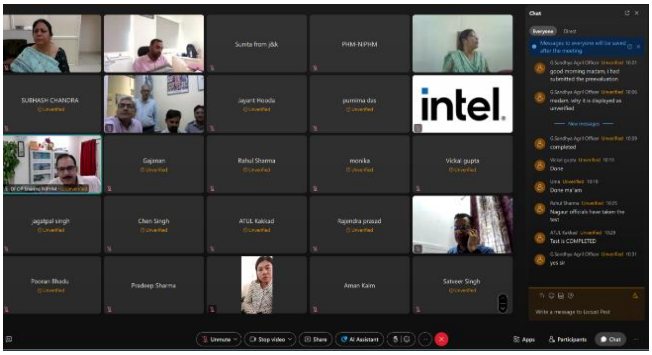
The training program on "Production Protocols of Bio-inputs for Sustainable Agriculture" was conducted from 09.10.2024 to 22.10.2024 for the officials of various countries. A total of 27 international delegates from 16 different countries viz., Algeria, Argentina, Belize, Bhutan, Cameroon, Egypt, Eritrea, Ethiopia, Fiji, Ghana, Guyana, Morocco, Nicaragua, Tanzania, Turkey and Zimbabwe have participated. They underwent different lectures and hands on training sessions on bio-input production and application, Impact of climate change on natural enemies and biodiversity and Biological control of weeds etc. the participants alsovisited NIPHM laboratories, NIPHM farm, organic farming field and natural farming preparations unit, Pragati resorts, Shankarpally, Hyderabad, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), bio-input manufacturing unit (Varsha Bioscience & Tech Pvt. Ltd. Hyderabad) for real time exposure and experience.

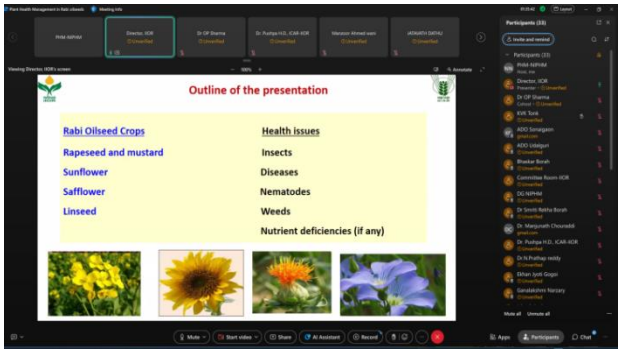
➢ **Plant Health Management in Rabi Oilseed crops**

An online program on 'Plant Health Management in Oilseed Crops' was conducted from 06.11.2024 to 08.11.2024 (3 days) at NIPHM. The program was conducted done in collaboration with ICAR-IIOR with a total of 28 participants from different states. Various topics of plant health management *viz*., integrated pest management resistant genotypes, nutrient management, diagnosis and management of major diseases of agro ecosystem analysis and ecological engineering in oil seeds, use of entomopathogenic nematodes in insect pest management, on-farm production and use of bio fertilizers and bio pesticides in rabi oilseed crops were covered.



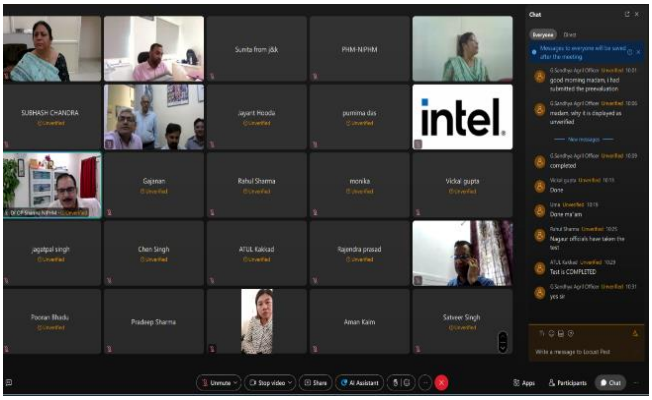


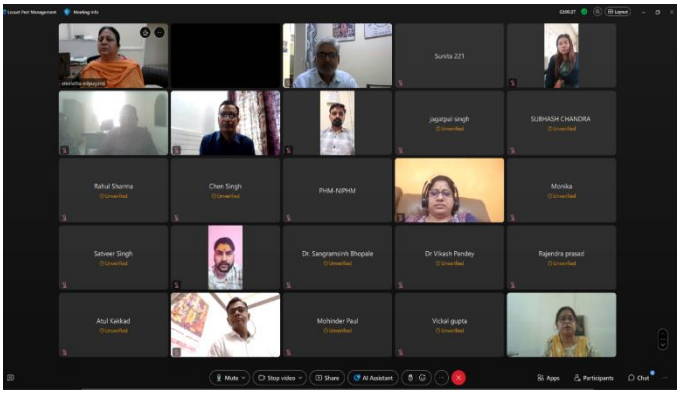




➢ **Locust Pest Management**

An exclusive training program on Locust Pest Management was conducted through online mode from 12 .11.2024to 14.11.2024 (3 days). In this program 33 officers/scientists from DPPQ&S, SAUs, KVKs and ICAR institutes and state department are participated. History of locust pest outbreaks, critical factors leading to pest outbreak, surveillance and different management tactics were covered in the training program.





➢ **Bio-input production and application in organic and natural farming systems**

As part of the capacity building agreement with Panjabrao Deshmukh Naisargik Sheti Mission (PDNSM)-Maharashtra, two training programmes on plant health management strategies for organic and natural farming systems have been organized from 09.12.2024 to 13.12.2024 and 16.12.2024 to 20.12.2024 (5 days). A total of 48 officers from different districts of Maharashtra have participated. The participants underwent sessions on the concept and principles of organic and natural farming, Agro Ecosystem Analysis, Ecological Engineering for pest management, protocols and requirements for the establishment of Bio-input Production Centres, hands-on practice sessions on farm-level production of bio-fertilizers, bio-pesticides, and biological control agents, etc. This program was helpful to the participants in the knowledge on protocols for on-farm production of bio-inputs, application methods, establishment of BRCs and quality control aspects. Officers shall be able to train other field-level staff in the execution of the bio-control programmes and bio-inputs production at the field level. The trainee officers have keenly observed and practiced the production methods of different bio-inputs.




- **Plant health management approaches for sustainable agriculture**

A training program on 'Plant health management approaches for sustainable agriculture' was conducted from 20.11.2024 to 10.12.2024 (21 days). In this training program 10 participants from different KVKs, SAU and agriculture and allied departments have participated. As a part of this training program, plant health management strategies, practical sessions on natural farming preparations and its application methods, on-farm production of bio-pesticides (Trichoderma & Pseudomonas), On-farm production of bio-fertilizers, EPF, NPV, predators, parasitoids and nematodes quality control of biopesticides etc. were conducted. The participants have visited NIPHM laboratories, NIPHM Demonstration farm and polyhouse , ICRISAT and IIOR as part of institutional visits.


➢ **Agroecological approaches for pest management in *Rabi* crops**

The training program on 'Agroecological approaches for pest management in *Rabi* crops' was conducted at NIPHM from 16.12.2024 to 20.12.2024 (5 days). In this program, a total of 14 officers/scientists (Male: 7 and Female: 7) from different SAUs, KVKs have participated. Concept of AESA along with different components of plant health management like use of biofertilisers, biopesticides, biocontrol agents and natural farming preparations for pest and disease management was explained. The nematode problems in *Rabi* crops and their management was also covered.

Farmers training programmes

➢ **Establishment of Bio- input Resource Centres**

A special training programme on Establishment of Bio-input Resource Centres (BRCs) was organized at NIPHM from 04.11.2024 to 08.11.2024 (5 days). A total of 42 FPO members from different states have participated. They underwent sessions on protocols and requirements for the establishment of bio-input production centres, hands-on

practice sessions on farm-level production of bio-fertilizers, bio-pesticides, and biological control agents, etc. This program shall be helpful to the participants in the knowledge of protocols for low-cost production of bio-inputs, and application methods. These FPOs shall be able to establish the local bio-input centres. The participants have visited NIPHM laboratories, a model BRC centre at Kothur, and Ag-Hub, PJTSAU, Hyderabad and shared their experiences. The trainees have keenly observed and practiced the production methods of different bio-inputs.




- **On-farm production of Bio-inputs**

In collaboration with Development Foundation, Ghaziabad, 6 training programmes for FPO farmerson 'On-farm production of Bio-inputs were organized from 05.11.2024 to 06.11.2024; 11.11.2024 to 12.11.2024 (2 days); 25.11.2024 to 27.11.202403.12.2024 to 05.12.2024; 18.12.2024 to 20.12.2024 and 24.12.2024 to 26.12.2024 (3 days). During these programs on-farm production of bio-inputs and their applications in crops like onion, garlic and paddy crops were covered. A total of 218 FPO members/ farmers from different districts of Maharashtra have participated. Participants underwent practical sessions on natural farming preparations and its application methods, on-farm production of bio-pesticides (Trichoderma & Pseudomonas), On-farm production of bio-fertilizers, EPF, NPV, predators, parasitoids and nematodes. This program shall be helpful to the participants in providing the knowledge of protocols for on-farm production of bio-inputs, application methods, and establishment of BRCs.






- **Integrated pest management in coconut and oilpalm**

An off campus FPO training program was conducted at Ambajipeta, Andhra Pradesh on 16.12.2024. The major coconut and oil palm growing areas inAndhra Pradesh facing lot of pest problems in coconut and oilpalm. As per the request received from growers an off campus training program on IPM in coconut and Oil palm was conducted at Ambajipeta, AP. A total of 49 farmers/ FPO members from Krushivala coconut farmers producing company LTD have participated. During this training program important pests attacking coconut and oil palm and their management was explained in detail.

ABN ఆంధ్రజ్యోతి

మొక్కలను నాటి సంరక్షిస్తే మంచి ఫలితాలు

అంబాజీపేట, డిసెంబరు 16(ఆంధ్రజ్యోతి): రైతులు మొక్కలు నాటడంతో పాటు వాటి సంరక్షణ బాధ్యతలు తీసుకుని కాపాడితే మంచి ఫలితాలు సాధించవచ్చునని నేషనల్ ప్లాంట్ హెల్త్ మేనెజ్‌మెంట్ అసిస్టెంట్ డైరెక్టర్ డాక్టర్ శ్రీలక్ష్మి సూచించారు. అంబాజీపేట కృషీవల కోకోనట్ ఫార్మర్స్ ప్రొడ్యూసర్స్ కంపెనీ కార్యాలయంలో చైర్మన్ గణపతి వీరరాఘవులు అధ్యక్షతన మొక్కల ఆరోగ్య నిర్వహణ అంశంపై రైతులకు అవగాహన కార్యక్రమాన్ని నిర్వహించారు. ఈ సందర్భంగా శ్రీలక్ష్మి మాట్లాడుతూ సహజ, సేంద్రియ పంటల ఉత్పత్తిలో మొక్కల ఆరోగ్య నిర్వహణ, మొక్కల రక్షణలో బయోయాక్టివ్ సమ్మేళనాల పాత్ర అంశాలపై అవగాహన కల్పించారు. జిల్లాలో అపారంగా ఉన్న కొబ్బరి పంటకు సోకే వివిధ రకాల తెగుళ్ళు, పురుగులకు క్షేత్రస్థాయిలో చర్యలను రైతులు చేపడితే చాలావరకు నష్టాన్ని నివారించవచ్చన్నారు. శాస్త్రవేత్త శైలజ, రైతు నాయకులు ముత్యాల జమీలు, అడ్డాల గోపాల కృష్ణ, యాళ్ళ వెంకటానందం పాల్గొన్నారు.

ఆరోగ్యకరమైన మొక్కల పెంపకం బాధ్యత రైతులదే

- ఎన్ఐపిహెచ్ఎం అసిస్టెంట్ డైరెక్టర్ డాక్టర్ శ్రీలక్ష్మి

అంబాజీపేట, డిసెంబర్ 16, (ప్రభాతవార్త) :

ఆరోగ్యకరమైన మొక్కల పెంపకం బాధ్యత రైతులదేనని, మొక్కలతోపాటు చెట్లను సంపూర్ణ ఆరోగ్యం కోసం రైతులు వాటి నిర్వహణకు బాధ్యతగా భావించడం వల్ల మంచి ఫలితాలు పొందుతారని జాతీయ పంట ఆరోగ్య పరిరక్షణ సంస్థ, హైదరాబాద్ (నేషనల్ ఇనిస్టిట్యూట్ ఆఫ్ ప్లాంట్ హెల్త్ మేనేజ్మెంట్) (ఎన్ఐపిహెచ్ఎం) అసిస్టెంట్ డైరెక్టర్ డాక్టర్ శ్రీలక్ష్మి సూచించారు. అంబాజీపేటలోని కృషీవల కోకోనట్ ఫార్మర్స్ ప్రొడ్యూసర్స్ కంపెనీ కార్యాలయంలో చైర్మన్ గణపతి వీరరాఘవులు అధ్యక్షతన మొక్కల ఆరోగ్య నిర్వహణ అంశంపై రైతులకు సోమవారం సమావేశాన్ని నిర్వహించారు.

ఈ సందర్భంగా డాక్టర్ శ్రీలక్ష్మి మాట్లాడుతూ వివిధ రకాలలో పండిస్తున్న ఉన్న మొక్కలను సంరక్షిస్తే సంపూర్ణ ఆరోగ్యకరమైన పంటలను ఉత్పత్తి చేయవచ్చున్నారు. డాక్టర్ బి.ఆర్.అంబేద్కర్ కోనసీమ జిల్లాలో విస్తరించి ఉన్న కొబ్బరి పంటకు సోకే వివిధ రకాలు తెగుళ్ళు, పురుగులకు క్షేత్రస్థాయిలో చర్యలను రైతులు చేపడితే చాలా వరకు నష్ట నివారణ చేయవచ్చున్నారు. కొబ్బరిలో వేరు, కొమ్ము పురుగుల నివారణపై రైతులకు అవగాహన కల్పించారు. బయోకంట్రోలు,నేట్ పరిష్కారానికి రైతులు తీసుకోవాల్సిన చర్యలను వివరించారు. భూమిలో సేంద్రియ కర్బనం ప్రభావంపై రైతులకు తెలియజేశారు. కొబ్బరి పంటను ఆశించే వివిధ రకాల పురుగుల నివారణకు ఎన్ఐపిహెచ్ఎం వారి ద్వారా లభించే వివిధ రకాల ఉత్పత్తులను రైతులకు పరిచయం చేశారు.

కాకినాడ బయో కంట్రోల్ ల్యాబ్ అసిస్టెంట్ డైరెక్టర్ రత్న ప్రశాంతి మాట్లాడుతూ అజో స్పైరిలం,పి ఎస్ బి పటాస్ మొబిలైజర్, ట్రైకోడెర్మా విరిడి సూడోమోనాస్ కాకినాడ ప్రభుత్వ ల్యాబ్లో అత్యంత నాణ్యత ప్రమాణాలతో తయారు చేస్తున్నామని, ల్యాబ్ లో తయారైన ఉత్పత్తులను రైతులకు పరిచయం చేశారు.బయోచార్ వినియోగాన్ని, ఉపయోగాన్ని కృషీవల కంపెనీ సీఈవో అడ్డాల గోపాలకృష్ణ రైతులకు వివరించారు. అనంతరం కృషీవల కంపెనీ సభ్యత్వం కలిగిన రైతులు నీటి సంఘాల డైరెక్టర్లుగా ఎన్నిక కావడంతో వారిని కంపెనీ తరఫున ఘనంగా సత్కరించారు. ఎన్ఐపిహెచ్ఎం సభ్యులు ముత్యాల జమ్మీల్, శాస్త్రవేత్త డాక్టర్ శైలజ, కృషీవల సంస్థ ప్రతినిధు లు యాళ్ల వెంటానందం,బొక్కా అదినారాయణ,గోదాశి నాగేశ్వరరావు, మాకిరెడ్డి పూర్ణిమ,కాకినాడ ఏడీఏ రత్నప్రశాంతి, హెచ్ఓ శైలజ,

- **Plant Health Management in FCV tobacco**

  An off-campus farmers training programme on Plant Health Management in FCV tobacco has been organized at Regional Manager Office, Tobacco Board, Ongole, Andhra Pradesh on 27.12.2024. A total of 49 tobacco growers from Southern Black soils of AP have participated. In this program, created awareness on disease/pest/nutrient disorders and diagnosis, management pests through IPM/INM methods. NIPHM experts have visited nearby fields for diagnosis of pest/disease damages.



Educational programme:

Certificate Course on Plant Health Management in Organic & Natural Farming (CCONF) (*In Technical Collaboration with ICAR- Indian Institute of Farming System Research***):** The participants are in part II of the training program**.** In this part-II, field activities shall be undertaken by the participants in the form of on-farm practice-based project work.

Forthcoming training programmes

S No	Name of the programme	Duration (No. of Days)	From	To
I.	**Officers training programmes**			
1.	Bio-inputs production and application in organic and natural farming systems	05	06.01.2025	10.01.2025
2.	Production and application techniques of bio-inputs	10	22.01.2025	31.01.2025
3.	Quality control of microbial biopesticides	05	03.02.2025	07.02.2025
4.	Bio-inputs production and application in organic and natural farming systems	05	10.02.2025	14.02.2025
5.	Advances in Weed Management – In collaboration with ICAR - DWR	21	20.11.2024	10.12.2024
6.	Plant Health Management in Fruit Crops	05	09.12.2024	13.09.2024
7.	Production Protocol for Microbial Bio-pesticides	05	03.03.2025	07.03.2025
8.	Bio-inputs production and application in organic and natural farming systems	05	17.03.2025	21.03.2025

II.	**Farmers training programmes**			
1.	Establishment of bio-input production centre	03	Dates to be decided	
III.	**Certificate course-**			
1.	**Certificate Course on PHM in Organic and Natural Farming**	90	27.11.2024	05.03.2025

Pesticide Management Division

The Pesticide Management Division has organized following training programmes during the months of **October-December, 2024**.

CAPACITY BUILDING PROGRAMMES:

Sl. No.	Name of the programme	No. of Days	From	To
1.	Method validation and Measurement of Uncertainty in Pesticide Residue Analysis	5	18.11.2024	22.11.2024
2.	Pesticide Residue Analysis (PRA)	21	20.11.2024	10.12.2024
3.	Inspection, Sampling & Prosecution Procedures under Insecticide Act,1968	4	03.12.2024	06.12.2024
4.	Laboratory quality Management system and Internal Audit as per ISO/IEC 170252017	5	09.12.2024	13.12.2024

- **Method validation and Measurement of Uncertainty in Pesticide Residue Analysis:**

The Division has conducted 5 days training programme on "Method validation and Measurement of Uncertainty in Pesticide Residue Analysis**"** from 18.11.2024 to 22.11.2024 to impart hands on training on method validation and estimation of measurement uncertainty. Method validation is and measurement uncertainty is an important activity of testing laboratory to ensure the quality of the test result. A total of six officers from Food Corporation of India, Chhattisgarh, and two Research fellows from ICAR- NMRI Telangana and one Student from Karnataka were participated the programme.

- **Pesticide Residue Analysis (PRA):**

The Division has conducted 21 days training programme on "Pesticide Residue Analysis" from 20.11.2024 to 10.12.2024 to impart basic hands on training on Pesticide Residue Analysis. A total of 13 participants from State Agriculture Universities of Jammu & Kashmir and State Agricultural Department of Uttarakhand, Punjab, Assam and Telangana have attended the training programme. They were trained on sampling of agricultural commodities, basic on pesticide residue extraction and chromatography techniques for qualitative and quantitative analysis for testing of residue.

- **Inspection, Sampling and Prosecution Procedures under Insecticide Act, 1968 (ISPP):**

Four days training programme on "Inspection, Sampling and Prosecution Procedures under Insecticide Act, 1968 was conducted from 03.12.2024 to 06.12.2024. A total of 13 participants were participated from State Agriculture Department of Andhra Pradesh, Maharashtra and Madhya Pradesh. The participants were trained on inspection, techniques of sampling of pesticides & procecution for quality control and various aspects of the Insecticide Act , 1968 & Insecticide Rules 1971.

- **Laboratory Quality Management System and Internal Audit as per ISO/IEC 17025: 2017**

Five days training programme on "Laboratory Quality Management System and Internal Audit as per ISO/IEC 17025: 2017" was conducted from 09.12.2024 to 13.12.2024. A total of 34 trainees were participated from State Agriculture Department of Maharashtra, Tamil Nadu, Telangana, Haryana, Kolkata and Rajasthan. The participants were trained on general requirements of a testing laboratories and procedure for internal Audit as per ISO/IEC 17025: 2017.

Forthcoming Training Programmes:

Sl. No.	Title of the Programme	Duration (Day)	From	To	Eligibility Criteria
1.	Role of PT and ILC in Quality Assurance and maintaining accreditation as per the ISO: 17025:2017	1 (online)	08.01.2025		Analysts / Scientists working in Govt. labs/Universities
2.	Pesticide Formulation Analysis (PFA)	60	20.01.2025	20.03.2025	Analysts working at SPTLs / RPTLs/ CIL
3.	Refresher program on Pesticide Formulation Analysis	10	21.01.2025	30.01.2025	Analysts who had undergone training on Pesticide Formulation Analysis (PFA)
4.	Documentation procedures for NABL accreditation for PTLs and PRLs	4	11.02.2025	14.02.2025	Analysts / Scientists working in Govt. labs/Universities with knowledge of ISO 17025
5.	Laboratory Quality Management System and Internal Audit as per ISO/IEC 17025: 2017	5	10.03.2025	14.03.2025	Analysts working in Government Laboratories

Plant Health Engineering Division

The Plant Health Engineering Division has organized following training programmes during the months of **October-December, 2024**.

CAPACITY BUILDING PROGRAMMES:

S No	Category	Name of the programme	No. of Days	From	To
1.	Officers	Pesticide Application Techniques and Safety Measures (BAMETI) on Payment-Physical Mode	03	14.10.2024	16.07.2024
2.	Officers	Irrigation Systems and Advancements-Physical Mode	03	07.10.2024	09.10.2024
3.	Officers	Remote Sensing and GIS applications in Plant Health Management-Virtual Mode	03	19.11.2024	21.11.2024
4.	Officers	Post Harvest Management and Storage Techniques	03	16.12.2024	18.12.2024
5.	Students	Pesticide Application Techniques and safety Measures -Physical Mode	04	21.10.2024	24.10.2024
6.	Students	Pesticide Application Techniques and safety Measures	05	09.12.2024	13.12.2024

Drone Remote Pilot Certification

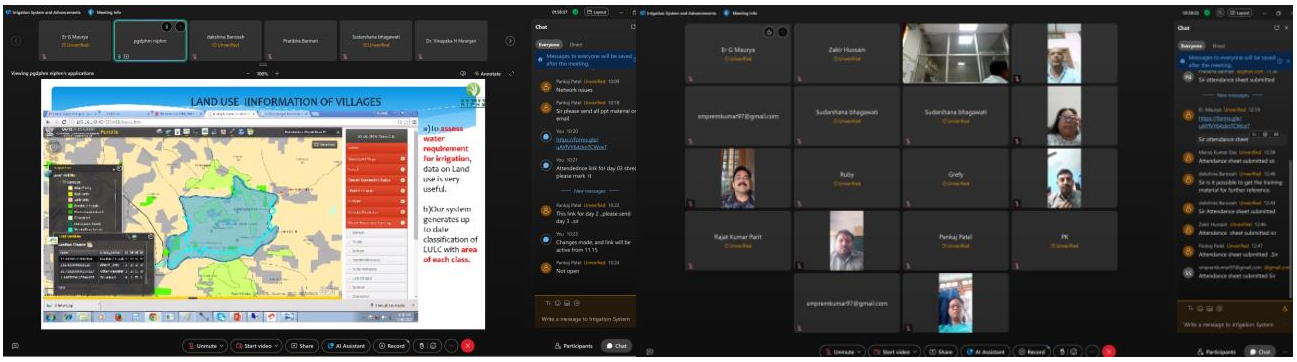
S No	Category	Name of the programme	No. of Days	From	To
1.	Enterprenuers	Basic RPC course – Batch 47	5	30-09-2024	05-10-2024
2.	Students	Basic RPC course – Batch 48	5	11-11-2024	15-11-2024
3.	Farmers	Basic RPC course – Batch 49	5	18-11-2024	22-11-2024
4.	Farmers	Basic RPC course – Batch 50	5	25-11-2024	29-11-2024
5.	Entrepreneurs	Basic RPC course – Batch 51	5	16-12-2024	20-12-2024

- **Pesticide Application Techniques and Safety**

On campus training programme on "Pesticide application techniques and safety measures" was conducted for officials between 14th to 16th October 2024. The group consisted of 07 participants (05 female and 02 male). The trainees were imparted the principles of pesticide application techniques, nozzles, various types of application methods, formulation and compatibility issues, advanced application measures, drones in agriculture. In detailed practical's on Spraying techniques, nozzles, calibration and etc. Pre and post evaluation was conducted and good feedbacks received.

- **Irrigation Systems and Advancements:**

Total 23 officers 12 male and 11 female participants attended the 3-day programme, conducted during 7th to 9th October 2024. Lectures were arranged on topic viz., Overview of irrigation techniques, micro irrigation system and fertigation, roles of RS and GIS in agriculture, advances in irrigation technology, subsidy on drip and sprinkler irrigation system, and care and maintenance of micro irrigation system. Pre and post evaluation along with assignments on various sessions were given to assess the knowledge transfer. Good appreciation received from the participants.



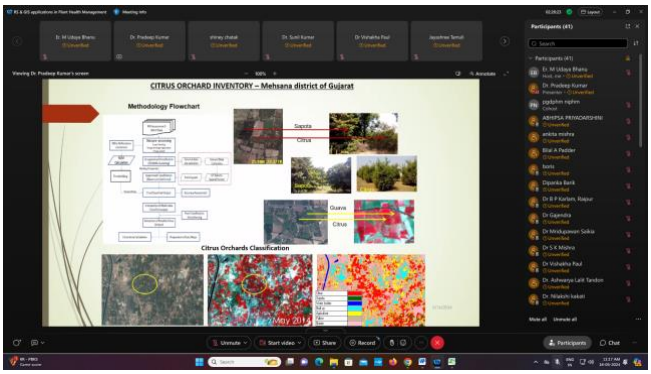
- **Pesticide Application Techniques and Safety Measures**

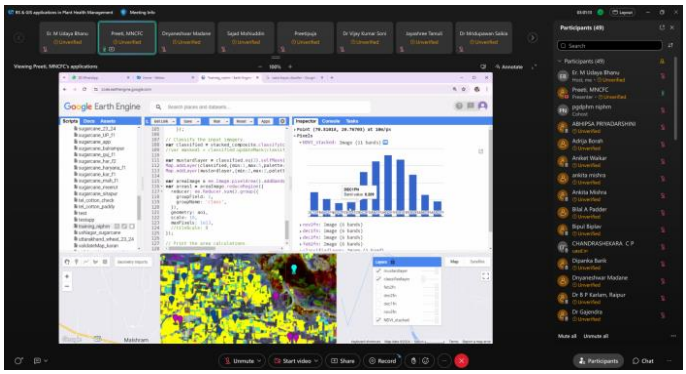
Pesticide Application Techniques and Safety Measures" conducted for the Agricultural Engineering students from St. Thomas College of Engg & Technology, Coimbatore, Tamilnadu. A total of 46 students attended the 4 days training programme from 21st to 24th October 2024. The program emphasized on adverse impact of pesticides, principles of spraying, application techniques and selection of sprayer, nozzles and its selection criteria, calibration, advanced spraying equipment, safety measures while handling pesticides, care and maintenance of equipment, formulations and compatibility, pesticide drift management, droplet size, Drones in Agriculture.




- **Remote Sensing and GIS applications in Plant Health Management**

A 3 day virtual training program on "Remote Sensing and GIS applications in Plant Health Management" was organized from 19th to 21st November 2024. 37 participants from 11 different states were registerd and enriched with basic principle of remote sensing, basic concepts of GIS, and applications of RS & GIS in agriculture, different open source and commercial software available. Eminent speakers from Mahalanobis National Crop Forecast Center, MNCFC were invited to enrich participants knowledge on various case studies of RS & GIS in agriculture through different Crop models, Crop yield forecasting and Crop Insurance inputs based on estimation of crop damage; Digital Image Processing on how to enhance the quality of images, extract meaningful information from images, and automate image-based tasks; Image classification and accuracy assessment for different crops identification using pixels, method of crop area identification, how the crop area is estimated from Google engine and demonstration of FASAL; different data sources available along with their platforms, demonstrated drought monitoring mapping, mapping of flood and effected areas; RS & GIS for horticulture.





- **Post Harvest Management and Storage Techniques**:

Training programme on "Post-Harvest Management and Storage Techniques" conducted during 16.12.2024 to 18.12.2024. Eleven participants attended the programme from 07 states. In the training the following topics were covered; Post-harvest losses in cereals and fruits and vegetables, Crop modelling to improve post-harvest supply chain, Insect and pest Management in Storage, Special crops for value addition, Harvesting Techniques, Handling and transportation, Storage methods and structures, Import and export procedures, Alternative processing methods, Packaging and Packaging materials. A visit to nearby processing plant was also organized for better understanding to the participating trainees.

- **Pesticide Application Techniques and safety Measures (Students):**

Pesticide Application Techniques and Safety Measures" conducted for the Agricultural Engineering students from Vignan's Foundation for Science, Technology and Research, Vadlamudi, Guntur. A total of 20 students attended the 5 days training programme from 9th to 13th December 2024. The program emphasized on adverse impact of pesticides, principles of spraying, application techniques and selection of sprayer, nozzles and its selection criteria, calibration, advanced spraying equipment, safety measures while handling pesticides, care and maintenance of equipment, formulations and compatibility, pesticide drift management, droplet size, Drones in Agriculture.

Drone trainings

- **Basic Remote Pilot Certification:**

This training is part of the Drone Academy who trains and certifies the Drone Pilots for use of drones in various applications. The academy has been certified as RPTO (Remote Pilot Training Organization) in association with an Industry partner (M/s Marut Drones). Five training programmes on Basic Remote Pilot Certification conducted. Training conducted from 3**0th to September to 04th October 2024** for 03 male partcipants, **11th to 15th November** 2024 and total 04 male candidates attended the 5-day programme. From **18th to 21st November 2024**, and 3 male attended the 5 day programme. Fourth programme was conducted from **25th Nov to 30th Nov 2024** with 3 male and 2 female candidates and fifth training was conducted from **16th to 20th December, 2024.** Lectures were arranged on topic viz., Introduction on international civil aviation organization, RPAS with in ICAO frame work, formation of RPAS, Classification of drones, Drone operation zones, ATC procedure , radio telephony and flight radio telephony, Basic principles of flight, Types of wind designs, Battery maintenance, Rotorcraft operations and aerodynamics, Application of drones in each sector, Hybrid operations and aerodynamics, Weather and meteorology, Risk assessment and analysis safety management system, drone maintenance etc. The lab assembly and maintenance of drones and simulation experiments for drone flying also was included in the curriculum. Exclusive 2 days of on-field flying classes also were conducted in dual as well as solo mode.




Forthcoming Training Programmes:

S.No	Title of the Programme	From	To	Eligibility criteria	Course Coordinator & e-mail
1.	Pesticide application techniques and safety measures (Collaborative)	**06.01.2025**	**08.01.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs, NGOs	Er. M. Udaya Bhanu sopheniphm2-ap@nic.in
2.	Pesticide application techniques and safety measures	**20.01.2025**	**24.01.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs, NGOs	Er. Govind Maurya asopheniphm1-ap@nic.in
3.	Digital Agriculture	**20.01.2025**	**22.01.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs	Er. Liyakhat Ali Ahmed Shaik adict-niphmhyd@gov.in
4.	Farm equipment for plant health management	**11.02.2025**	**13.02.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs. NGOs	Dr. Vidhu Kampurath jdenggniphm-ap@nic.in

1.	National workshop/ webinar on Farm mechanization for small and marginal farmers	**20.02.2025**	**21.02.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs	Dr. Vidhu Kampurath jdenggniphm-ap@nic.in Er. M Udaya Bhanu sopheniphm2-ap@nic.in
2.	Pesticide application techniques and safety measures	**03.03.2025**	**07.03.2025**	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs, NGOs	Dr. Vidhu Kampurath jdenggniphm-ap@nic.in

Special Events

World Soil Day:

National Institute of Plant Health Management (NIPHM) celebrated the World Soil Day - 2024 with the theme of "***Caring for Soils: Measure, Monitor, Manage.***" on 5th December, 2024. Dr. OP Sharma, Director-PHM has explained about theme and stressed upon the importance of healthy soil and to advocate for the sustainable management of soil resources. The theme underscores the importance of accurate soil data and information in understanding soils characteristics and supporting informed decision-making on sustainable soil management for food security. The guest speakerSmt. Punita Mahendran, Head, Biochar Center of Excellence, Heartfulness Institute, Hyderabad, has delivered a elaborative talk on Bio-char production technology for soil health improvement. She mentioned that biochar, a game-changing soil amendment initiative that has the potential to regenerate the soils of India.

Research & Development

- Commercial scaling up of irradiation protocol as phytosanitary measure for major cut flowers -funded by BARC-Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy (DAE), GOI.
- Survey and field evaluation of sterile insect technique for the management of Oriental fruit fly, *Bactrocera dorsalis* (Diptera:Tephritidae) infesting economically important fruit crops-funded by BARC-Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy (DAE), GOI.
- Development of eco-friendly and integrated stored grain pest management techniques for food grain storage in FCI godowns (multi-locations) - Funded by FCI.
- Hot Water Immersion Treatment (HWIT) of Chillies at Commercial scale -Funded by APEDA.
- Evaluation of Animal Out repellent against the wild boar & rodents
- In–house study on Feeding preference and development of stored pests in different millets and screening of plant powders for management.

AICRP on Biological Control of Crop Pests

Title : Evaluation of NIPHM white media for production of *Nomuraea rileyi (Metarhizium rileyi)* NIPHM MRF-1 strain for management of Maize Fall Army worm (*Spodoptera frugiperda*) (NIPHM, Hyderabad).The pot culture experiment was conducted in glass house, NIPHM with the following objective:

Objective: To evaluate the efficacy of *M.rileyi* produced on NIPHM white media on *Spodoptera frugiperda* under glass house condition (pot culture studies). The study was designed in CRD (Homogeneity is maintained) with 3 treatments and 8 treatments. The mortality of the larvae was recorded and the analysis of the data is under progress.

Pesticide Formulation and Residue Analytical Centre (PFRAC):

The Pesticide Formulation and Residue Analytical Centre (PFRAC), Pesticide Management Division, is an accreditated laboratory in accordance to ISO/IEC 17025:2017. During the period the laboratory has collected 286 samples (Fruits, vegetables, cereals, pulses, milk and water) from Banjarahill Hyderabad, Medchal/Malkajigiri, Alwal and Saidabad under Central Sector Scheme “Monitoring of Pesticide Residues at National Level (MPRNL). The samples were analyzed for pesticide residues by LC-MS/MS and GC-MS/MS. A total of 180 samples (fruit and vegetables) were received from ANGRAU and samples were analyzed under MPRNL scheme. The Laboratory also analyzed 105 water samples received from CSIR-NEERI under MPRNL scheme.

The division has also analyzed pesticide residues in tobacco samples of Tobacco Board, Guntur and soil samples of CDP Meghalaya. Botanical/bio-pesticides samples received from Gujarat, Karnataka, Kerala and Telangana were also analyzed to check the presence of pesticide.

Moreover, Pesticides formulation samples from National Seed Corporation, Food Corporation of India and other pvt. Customers were analyzed for quality test.


Proficiency Testing Center (PTC):

- **Proficiency testing programme on Pesticide Residues Analysis (PT-PRA)**

PTC has organized PT PRA programme (PTC/PR/01 & 02/24-25) on Pomegranate and Rice Powder for evaluation of performance of the laboratory and final reports were sent to 36 laboratories. Another PT programme on water samples (PTC/PR/03/24-25) was also organized during the month of September 2024 for evaluation of performance of the laboratory and the final reports of were sent to the participating laboratories.

Laboratory (PT provider) has also initiated another PT-programme (PTC/PR/04/2024-25)**,** during the month of December 2024 on cucumber and Red gram. Samples were prepared and dispatched to 30 laboratories including 5 pvt. participants.




Sample Preparation of Cucumber (PTC/PR/04/2024-25)




Sample Preparation of Red gram (PTC/PR/05/2024-25)

Proficiency testing programme on Pesticide Formulation Analysis (PT-PFA)

PTC conducted PT PFA programme on Acetamiprid SP (PTC/PF/04/2024-25), Fipronil SC (PC/PF/05/2024-25) & Tricyclazole Technical (PTC/PF/06/24-25) during the period. Final report of PT programme on Lambda Cyhalothrin Technical, Imidacloprid WS and Fenvalerate EC (PTC/PF/01, 02 & 03/2024-25) were sent to the participating Laboratories.

Lab Activities

- **QC lab for bio-pesticides:** During the quarter, 26 biopesticide samples were received and tested for various quality parameters.
- **Biofertilizer Laboratory:** As a licensed Biofertilizer production unit, biofertilizers like Rhizobium, Azotobacter, Azospirillum, Phosphate Solubilizing Bacteria (PSB), Potassium Releasing Bacteria (KRB), Zinc Solubilizing Bacteria (ZnSB) and Mycorrhiza (VAM) are produced at NIPHM to make it available to beneficiaries like farmers and other stakeholders such astobacco board. Biofertilisers are provided to 23 farmer/ officers during this quarter.
- **Bio-pesticide laboratory:** Activities like demonstration of on-farm production of *Trichoderma* and *Pseudomonas* to trainees, maintenance of mother culture of Trichoderma and Pseudomonas are performed in the lab. Bio-inoculum startup kits were provided to 105 trained officers / FPO farmers from different states for demonstration.
- **Host, predators and parasitoids lab:** NIPHM is maintaining and producing various parasitoids and predators for insect pest control. These beneficial insects, biocontrol agents were supplied to trainees and farmers for use in their fields. In this quarter, thirteen farmers/ Scientists have taken different predators and parasitoids from NIPHM.
- **Nematology Laboratory.** As a part of the regular activities soil testing is done for nematode population. During this quarter 12 samples were tested for nematode population and advisories were given, accordingly.

Extension Activities / Village Adoptions

- **Farmer Advisory Cell Activities:**
  Under farmers advisory cell, faculty are interacted farmers about their queries related to plant protection, bioinputs usage etc. Total 56 farmers approached NIPHM through telephonic communication during the quarter.

- **NIPHM Instructional farm and polyhouse**
  PHM division is maintaining IPM demonstration farm and polyhouse with diversified crops. Biointesive approaches in various activities the farmers and trainees visit for observation and practical sessions on AESA , Ecological engineering, collection of insect pests and beneficial insects. A biochar unit has also been operationalized using waste material in the campus.




- **Village Adoption:**

  As a part of the development of model IPM village by NIPHM, the farmers of Peddashapur village are encouraged for organic farming practices.

Other Activities

- MoU was signed between Meghalaya Basin Management Agency and NIPHM under the Cluster Development Programme. Dr. SH Singh, IPoS, (DG, NIPHM) along with Dr. Vijay Kumar D, IAS and other officers of MBMA and Grant Thornton were present during the occasion.

➢ **Faculty achievements (Publications / trainings / webinar-seminar / Awards etc):**

Dr. O.P. Sharma, Director PHM and Dr. Damodara Chari attended workshop on natural farming at MANAGE on 23rd and 24th December, 2024 and participated in group discussion and presentation

- Research article entitled "Genome-wide association mapping reveals novel genes and genomic regions controlling root-lesion nematode resistance in chickpea mini core collection" published in The Plant Genome peer-reviewed scientific journal Crop Science Society of America. NAAS Score: 10.20 & Impact factor: 4.089.

- NIPHM has participated in the exhibition and showcased the technologies to the farmers during diamond jublee celebrations of PJTAU om 20-21 December, 2024.

- During this quarter, an international team of officers from EUPHERSCO and APARI visited NIPHM in connection to assess the research needs of PHM in India.
- Dr. Neelam Patel , Advisor (Agriculture), NITI Aayog; Shri Gagnesh Sharma, Director , NCONF; Dr. A.K. Yadav, formor Director NCOF ; Dr. Baljeet Singh Saharan, Principle Scientist , HAU and other officials visited NIPHM
- Agricultural students from SR University, Warangal along with two faculties visited Plant Health Engineering workshop on 25.10.2024 and got acquainted with low cost developed equipment and different types of sprayers and Drones.

Student Article

HYDROGELS

Nature's Hydration Hack for Sustainable Agriculture

Bheemavarapu Sri Varshith, PGDPHM Scholar, NIPHM

Introduction

Water scarcity is one of the most pressing challenges in agriculture, affecting crop productivity and food security. **With climate change increasing drought frequency**, many regions are experiencing erratic rainfall and declining groundwater levels. As a result, efficient **water retention** technologies are crucial to maintaining agricultural sustainability.

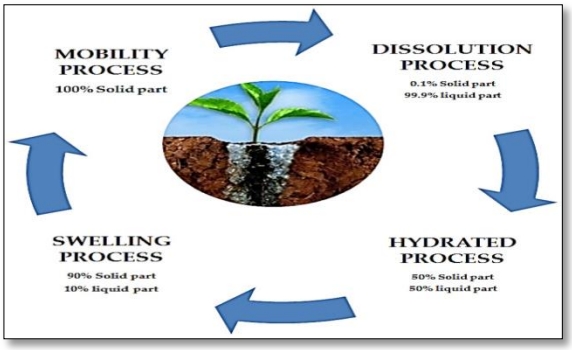
Picture a world where every drop of water whispers secrets to polymer chains, where microscopic networks dance with moisture molecules in a ballet of absorption and release. Welcome to the revolution of Hydrogels – nature's water wizards re-imagined through scientific innovation. These remarkable materials don't just hold water; they cradle it like ancient wisdom passed down through generations of soil particles. In the grand theater of agriculture, hydrogels perform

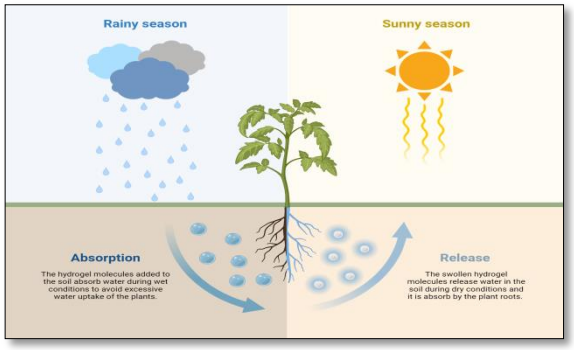
a transformative act: they become temporary oases, microscopic reservoirs that challenge our traditional understanding of soil-water relationships. This article delves into the fascinating realm where chemistry meets agriculture, where synthetic polymers mimic nature's own water-holding capacity, and where the future of farming might just lie in the hands of these tiny moisture maestros. As climate change rewrites the rules of agriculture, hydrogels emerge as silent guardians of crop resilience, orchestrating a delicate balance between water conservation and optimal plant growth. Through this exploration, we unravel not just the science, but the poetry of how these remarkable materials are reshaping our approach to sustainable agriculture, one water molecule at a time.

Understanding Hydrogels and Their Magic

Hydrogels are **three-dimensional polymer networks** capable of absorbing up to **400 times their weight in water**. Their mechanism follows a **cyclic absorption and release process**, which optimizes moisture availability in the soil:

1. **Water Absorption & Swelling** – Hydrogels absorb water from irrigation or rainfall, expanding into a gel-like structure.
2. **Storage & Retention** – Water remains within the polymer matrix, reducing evaporation and percolation losses.
3. **Gradual Release & Root Uptake** – As soil moisture depletes, hydrogels **slowly release water**, ensuring continuous hydration.
4. **Pulse Release Mechanism** – Water is discharged in controlled pulses, preventing over-watering or excessive dryness.





Types of Hydrogels

- **Natural Hydrogels** – Derived from **cellulose, starch, and proteins**, these are biodegradable and eco-friendly.
- **Synthetic Hydrogels** – Made from **petroleum-based polymers**, these offer higher absorption but may leave chemical residues.

Real-World Applications of Hydrogels in Agriculture

1. **Drought Management & Dryland Farming** - Hydrogels retain soil moisture for extended periods, reducing crop losses due to drought. This has proven effective in semi-arid and desert regions, where conventional irrigation is insufficient.

➢ **Case Study: Rajasthan, India**

In one of India's driest states, farmers used **potassium polyacrylate-based hydrogels** to cultivate wheat and pulses. Results showed:

- **40% increase in crop yield** compared to non-hydrogel-treated fields.
- **50% reduction in irrigation frequency**, conserving groundwater.
- **Improved soil aeration and root penetration**, leading to stronger plant growth.

2. **Seed Germination & Transplanting** - Young seedlings are highly susceptible to **moisture stress**. Hydrogels help **retain water in the root zone**, improving germination rates and reducing transplant shock.

➢ **Case Study: Kenyan Maize Farmers**

A study in Kenya tested **hydrogel-coated maize seeds** in dry soils. Farmers observed:

- **25% increase in germination rate**, ensuring better crop establishment.
- **Extended seedling survival**, even during water shortages.
- **Challenges in affordability**, with researchers recommending cost-effective **biodegradable hydrogel options**.

3. **Soil Amendment & Structure Improvement** - Hydrogels improve soil texture, aeration, and water retention, making them ideal for sandy and degraded soils.

➢ **Case Study: Date Palm Cultivation in Saudi Arabia**

In the **Al-Qassim region**, hydrogel-amended soils resulted in:

- **30% higher plant survival rates**, as date palms received sustained moisture.
- **Better resistance to wind erosion**, stabilizing the desert soil.
- **Lower groundwater dependency**, reducing overall irrigation costs.

4. Urban & Vertical Farming - Hydrogels are highly useful for **urban agriculture**, where limited space and irrigation challenges exist. Rooftop gardens, balcony farms, and hydroponic setups benefit from **water-efficient hydrogel-based substrates**.

➢ **Case Study: Smart Vertical Farming in The Netherlands**

Dutch researchers integrated **sensor-based hydrogel irrigation** into **vertical farms**, achieving:

- **35% improvement in water-use efficiency**, reducing input costs.
- **Uniform crop growth**, leading to better quality vegetables and herbs.
- **Reduced nutrient leaching**, optimizing fertilizer application.

Challenges - While hydrogels offer numerous benefits, they also pose **challenges** that must be addressed for wider adoption:

1. **High Initial Cost** – Quality hydrogels are expensive, limiting accessibility for smallholder farmers.
2. **Degradation Concerns** – Some synthetic hydrogels break down over time, requiring periodic replenishment.
3. **Environmental Impact** – Non-biodegradable hydrogels may leave **chemical residues**, affecting soil microbes.
4. **Soil Compatibility** – Hydrogels work **best in sandy soils** but may be less effective in **clay-rich environments**.

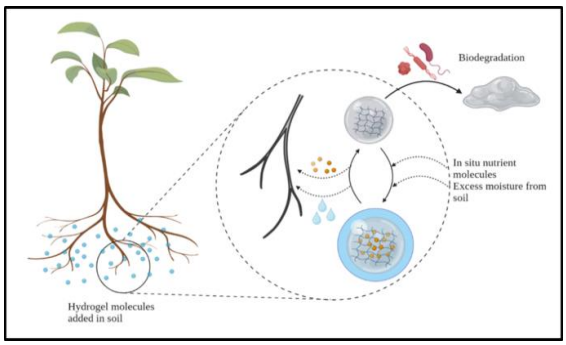
➢ **Case Study: Sub-Saharan Africa**

Farmers in **Sudan and Ethiopia** tested **hydrogel-based soil amendments**. While results showed:

- **20% increased crop resilience to drought**,
- **40% water savings**,
- Adoption was slow due to **high costs** and lack of awareness.

Future of Hydrogel Technology in Agriculture - With ongoing research and development, hydrogel applications are expanding:

- **Biodegradable Hydrogels** – Derived from **cellulose and starch**, reducing environmental concerns.
- **Nano Hydrogels** – Improved absorption and **nutrient delivery**.
- **Smart Hydrogels** – Integrated with **sensors** for **precision irrigation**.



- **Case Study: Precision Irrigation in California**

In California's **vineyards**, **smart hydrogels with IoT sensors** helped optimize irrigation schedules, resulting in:

- **30% lower water consumption**, without yield reduction.
- **Better grape quality**, improving wine production.

Hydrogels represent a significant advancement in agricultural water management technology. Their ability to enhance water use efficiency, improve soil properties, and support sustainable farming practices makes them valuable tools in modern agriculture. As research continues and technology evolves, hydrogels are likely to play an increasingly important role in addressing global food security challenges while promoting environmental sustainability.As the global demand for water-efficient agricultural solutions grows, hydrogels stand as a promising innovation, bridging the gap between resource conservation and food security while fostering healthier plant ecosystems.

References:

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