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From the Editor's

Dear Readers,

In the July issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcomed for improvement.

Dr. R. S. Tomar
Editor-in-Chief
Rani Lakshmi Bai Central Agricultural University, (RLBCAU)
Jhansi, Uttar Pradesh

QUINOA AT THE CROSSROADS OF NUTRITION, LIVELIHOODS, AND CLIMATE RESILIENCE

Hirdayesh Anuragi[1], Ashok Yadav[1], Asha Ram[1], Naresh Kumar[1], AK Handa[1], RS Tomar[2] and A. Arunachalam[1]
[1]ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh, 284003, India
[2]Rani Laxmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, 284003, India
*Corresponding author: heartyanuragi@gmail.com

Quinoa (*Chenopodium quinoa* Willd.), a nutrient-rich grain native to the Andean mountains, is rapidly gaining global recognition for its potential to address three critical and interconnected challenges: ensuring nutritional security, improving farmer livelihoods, and strengthening resilience to climate change. Traditionally cultivated in South America, quinoa has now become a focus crop in many countries, including India, due to its remarkable adaptability and rich nutritional profile.

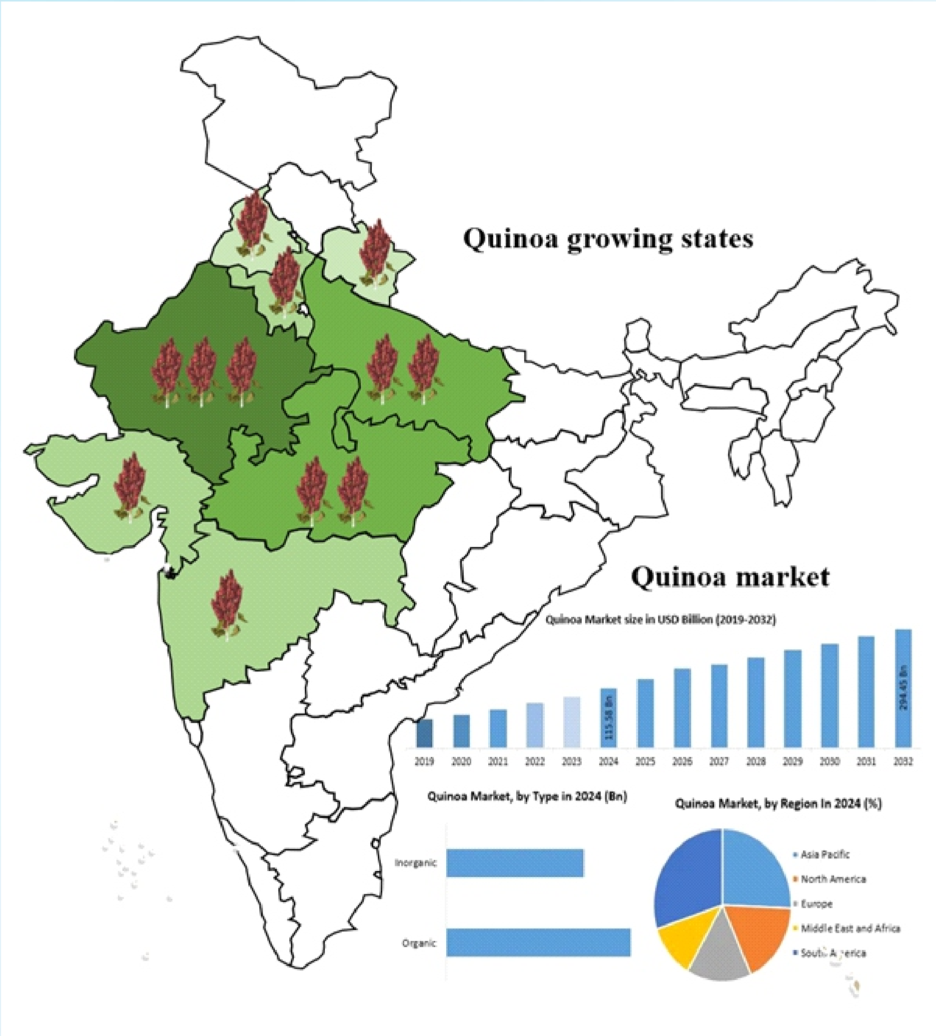
Nutritionally, quinoa stands out as a complete plant-based protein source, containing all nine essential amino acids. It is also rich in dietary fiber, calcium, iron, magnesium, vitamin B complex, and antioxidants. Because it is gluten-free and easy to digest, quinoa is particularly valuable for people with gluten intolerance and for populations suffering from malnutrition. One of quinoa's distinguishing features is its wide range of grain colors, primarily white, red, black, and less commonly, purple, orange, or mixed hues. Among these, black quinoa is often considered nutritionally superior due to its higher antioxidant content, especially anthocyanins, which help fight oxidative stress in the body. It also has a slightly sweeter flavor and a crunchier texture. Red quinoa is firmer and retains its shape better when cooked, making it ideal for salads and cold dishes. It has more fiber than white quinoa and is slightly richer in minerals. White quinoa, though the most common and mildest in taste, cooks fastest and is widely used in everyday meals. While all quinoa colors are nutritious, black and red varieties are typically preferred when antioxidant properties, fiber content, and visual appeal are key considerations, both for health benefits and premium market value.

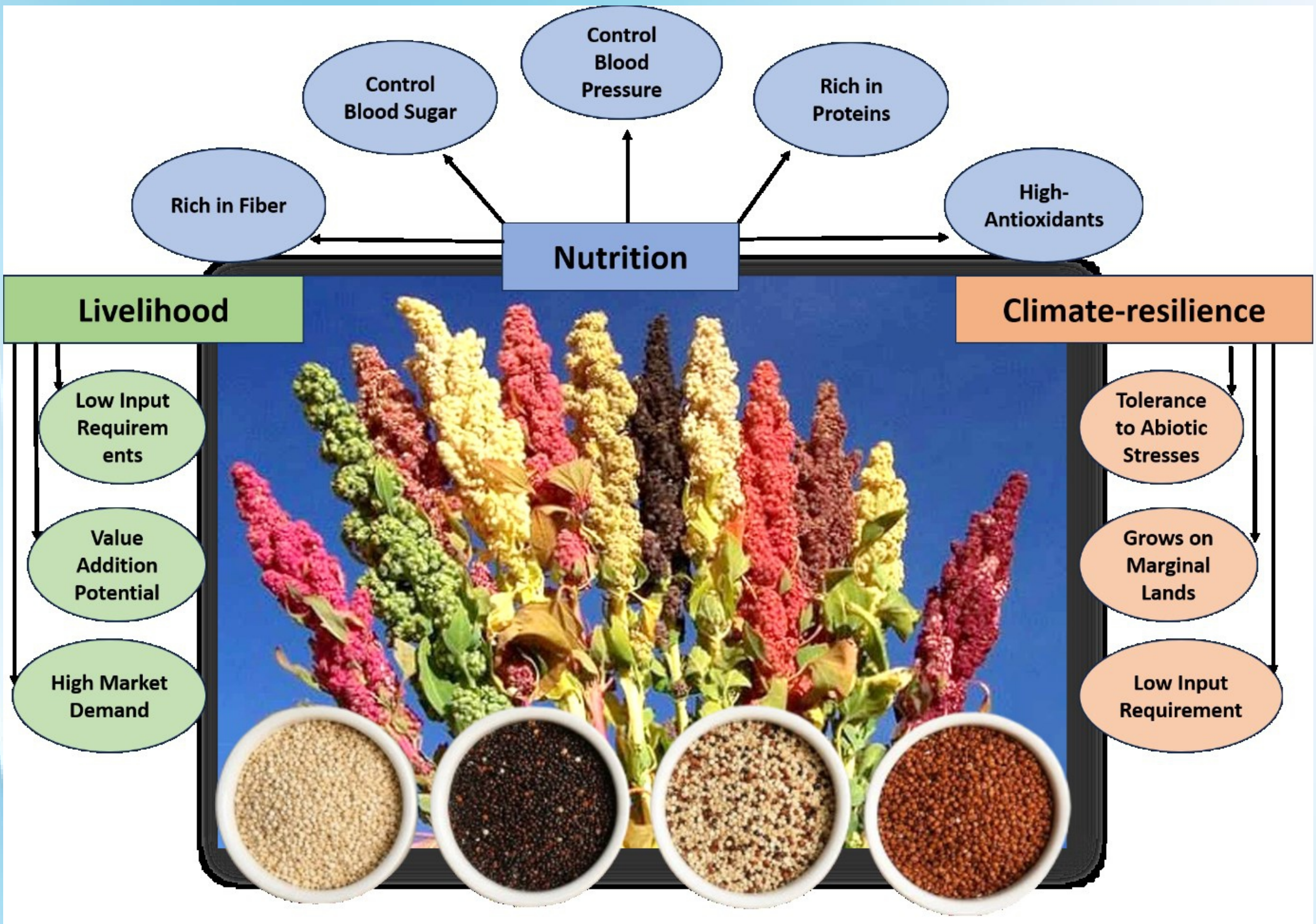
Quinoa's greatest strength, however, lies in its resilience. It can thrive in harsh agro-climatic conditions where other staple crops often fail. It tolerates drought, saline soils, frost, and high altitudes, making it ideal for cultivation in arid and semi-arid regions. In India, varieties like CAZRI-Quinoa-1, developed by ICAR-CAZRI for dry regions, and ICAR-IISS-Quinoa-1, suitable for Indo-Gangetic plains, have been bred for such challenging conditions. As global temperatures rise and rainfall patterns become increasingly erratic, quinoa offers a climate-smart solution for ensuring consistent food production. Its low input requirements also make it suitable for small and marginal farmers who struggle with the costs of conventional farming.

Economically, quinoa farming holds strong potential to improve rural incomes. As health awareness rises, the demand for quinoa in both domestic and export markets is growing steadily. Because it can be grown with fewer inputs and on marginal lands, farmers can reduce cultivation costs while earning better returns. When supported with training in post-harvest handling, saponin removal, value addition, branding, and market access, quinoa can become a viable source of income and help build local agro-enterprises. Organizing farmers into producer groups or cooperatives can further enhance market reach and bargaining power. Introduced varieties such as Titicaca, originally from Denmark but successfully grown in Indian states like Rajasthan, MP, and Haryana, have also contributed to market expansion due to their early maturity and good grain quality.

To fully realize the benefits of quinoa, research and plant breeding play a vital role. Traditional breeding efforts focused on yield, plant type, and taste. Modern techniques like marker-assisted selection, transcriptomics, and gene editing (such as CRISPR-Cas9) are now being used to develop improved varieties that are higher-yielding, more nutritious, and better adapted to specific regional stresses like drought or salinity. Participatory breeding approaches—where farmers are directly involved in selecting and testing varieties—ensure that research remains grounded in real-world farming needs.

Looking forward, quinoa offers a unique opportunity to build sustainable and diversified farming systems. Its integration into crop rotations can enhance soil health, reduce pest pressure, and lower dependence on chemical inputs. As part of broader efforts to promote climate-resilient agriculture, quinoa can restore degraded lands, improve food system stability, and support national and global nutrition targets. Quinoa is far more than just a healthy grain, it is a transformative crop that can empower farmers, strengthen economies, and provide a buffer against climate stress. With coordinated efforts in research, farmer training, and policy support, quinoa can serve as a practical and scalable solution for building food, income, and climate security in the years to come.





Quinoa for nutrition and income enhancement and climate resilience

BETTER SOIL HEALTH: CALL OF THE TIME

S. K. Basu
PFS, Lethbridge,Alberta, Canada;
Email: saikat.basu@alumni.uleth.ca

Soil health refers to the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. It goes beyond just soil fertility and includes physical, chemical, and biological aspects of the soil. Key aspects of soil health include:

Biological activity: Presence of beneficial microorganisms, earthworms, and organic matter.

Chemical balance: Proper pH, nutrient availability, and absence of harmful contaminants.

Physical structure: Good soil texture, porosity, and water-holding capacity, allowing air and water to move freely.

Sustainability: Ability to resist erosion, degradation, and support long-term agricultural productivity.
Healthy soil supports plant growth, filters water, stores carbon, and plays a key role in climate regulation and food security.

Soil health is important for primary and secondary crops

Primary crops: Main crops grown in a region or on a farm, usually because they are the most important for food, income, or export. Examples: wheat, rice, maize.

Secondary crops: Additional or less dominant crops grown alongside primary crops. They often provide diversity, improve soil health, or supplement income. Examples: legumes, vegetables, or spices grown after or between primary crops.

Better soil health is essential for several critical reasons:

Food Production: Healthy soil is the foundation of productive agriculture. It provides essential nutrients, water retention, and a stable environment for crops, leading to higher yields and better-quality food.

Climate Regulation: Soils store vast amounts of carbon. Improving soil health helps sequester carbon dioxide, reducing greenhouse gas levels and mitigating climate change.

Water Management: Healthy soils improve water infiltration and retention, reducing erosion, runoff, and the risk of flooding and drought.

Biodiversity: Healthy soils are rich in microorganisms and other life forms that support ecosystem balance and resilience.

Pollution Control: Healthy soil can filter and break down contaminants, protecting groundwater and surrounding environments.

Sustainable Agriculture: Maintaining soil health reduces the need for chemical inputs, lowers costs for farmers, and promotes long-term land productivity.

Better soil health is vital for environmental sustainability, human health, and economic stability. Soil health has a critical influence on agriculture, both positively and negatively.

Positive Impacts of Good Soil Health on Agriculture:

Increased Crop Yields: Healthy soil provides essential nutrients, water, and oxygen that plants need to grow, leading to higher productivity.

Improved Soil Structure: Well-structured soil enhances root penetration and water retention, supporting better plant growth.

Enhanced Nutrient Cycling: Microbes in healthy soil help decompose organic matter and release nutrients, reducing the need for synthetic fertilizers.

Water Management: Healthy soil absorbs and retains water more effectively, reducing runoff, erosion, and the need for irrigation.

Pest and Disease Resistance: Healthy soils support beneficial organisms that suppress soil-borne diseases and pests naturally.

Sustainability and Resilience: Crops grown in healthy soils are more resilient to environmental stresses such as drought or heavy rains.

Negative Impacts of Poor Soil Health on Agriculture:

Reduced Crop Productivity: Degraded soil has fewer nutrients and poor structure, leading to lower yields.

Increased Dependency on Inputs: Farmers may need more fertilizers, pesticides, and irrigation to compensate for poor soil quality, raising costs.

Soil Erosion: Unhealthy soil is more prone to erosion, leading to loss of topsoil and further degradation.

Water Pollution: Poor soil health can lead to excess nutrient runoff (e.g., nitrogen and phosphorus), causing water pollution and algal blooms.

Carbon Loss: Degraded soils release stored carbon into the atmosphere, contributing to climate change.

Loss of Biodiversity: Poor soil health can reduce the number and diversity of beneficial soil organisms, disrupting natural cycles.

Maintaining soil health is essential for long-term agricultural productivity and environmental sustainability. Practices like crop rotation, application of green manure, cover cropping, composting, and reduced tillage can help improve and maintain soil health.

Crop rotation: An agricultural practice where different types of crops are grown in the same area in sequential seasons. This technique helps maintain soil fertility, reduce soil erosion, and prevent the buildup of pests and diseases. An important aspect of crop rotation is called **green manure** is a type of cover crop grown specifically to be plowed back into the soil to improve its fertility and structure. These plants, often legumes or grasses, add organic matter, nutrients (especially nitrogen), and help prevent soil erosion. Green manure

enhances soil health naturally, reducing the need for chemical fertilizers.

Key Benefits:
Improves soil health: Different crops contribute different nutrients to the soil or use them in varying ways.

Reduces pests and diseases: Rotating crops disrupts pest and disease life cycles.

Increases crop yield: Healthier soil leads to better plant growth.

Manages weeds: Varying crops can prevent certain weeds from becoming dominant.

Example of a Crop Rotation Cycle:
Year 1: Legumes (e.g., beans or peas) – fix nitrogen in the soil.

Year 2: Leafy vegetables (e.g., lettuce or cabbage) – use the nitrogen.

Year 3: Root crops (e.g., carrots or potatoes) – benefit from the improved soil structure.

Year 4: Fruits or grains (e.g., corn or wheat) – complete the cycle.

Cover Cropping: An agricultural practice where specific plants, called cover crops, are grown primarily to protect and improve the soil rather than for harvest. These crops help prevent soil erosion, improve soil fertility, suppress weeds, and enhance water retention. Common cover crops include clover, rye, vetch, and mustard.

Composting: The atural process of recycling organic waste—like food scraps, yard trimmings, and paper—into nutrient-rich soil called compost. It helps reduce landfill waste and enriches soil for gardening and farming.

Reduced Tillage: An agricultural practice that minimizes soil disturbance compared to conventional tillage. Instead of fully turning over the soil, farmers disturb it less intensively, which helps improve soil structure, retain moisture, reduce erosion, and promote beneficial soil organisms. It can also lower fuel use and labor costs.

Profile of Soil Health Scenario: Developed Versus Developing Countries
1. **Soil Quality and Degradation**
Developed Countries: Generally better managed soils with widespread adoption of conservation practices. Issues include salinization, acidification, and contamination from industrial pollutants.Advanced technology and stricter regulations help mitigate degradation.

Developing Countries: More vulnerable to soil degradation due to over-farming, deforestation, and poor land management. Problems like erosion, nutrient depletion, and desertification are common. Limited access to modern technology and resources hampers soil conservation efforts.

2. Agricultural Practices
Developed Countries: Use of precision agriculture, crop rotation, cover crops, and organic amendments. Heavy reliance on synthetic fertilizers and pesticides, but with increasing focus on sustainable practices.

Developing Countries: Predominantly traditional farming methods, often subsistence-based. Low fertilizer use and limited soil fertility management. Frequent monoculture practices increase vulnerability to soil depletion.

3. Research, Technology, and Policy Support
Developed Countries: Strong research institutions and access to soil testing, monitoring technologies. Government policies encourage sustainable soil management.

Developing Countries: Limited research infrastructure and extension services. Policies may exist but lack enforcement or resources for implementation.

4. Awareness and Education

Developed Countries: Higher awareness among farmers and public about soil health importance. Better training and education programs available.

Developing Countries: Lower awareness due to education gaps and immediate economic pressures. Knowledge transfer often limited to NGO or international development projects.

5. Environmental and Economic Impact

Developed Countries: Soil health impacts linked to environmental regulations and economic incentives. Soil degradation can affect crop yields but mitigated by technological buffers.

Developing Countries: Soil degradation directly threatens food security and livelihoods. Economic constraints limit capacity for soil restoration.

Photo Credit: **S. K. Basu**

EXCESSIVE PLANT NUTRIENTS

Syed Shabih Hassan
Department of Fisheries Resource Management, College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana – 141004, Punjab, India
Email: *fish_ab@rediffmail.com*

One significant limiting element for plant growth is plant nutrients. The primary nutrient species that enter fresh and marine systems are nitrogen and phosphorus, which transform oligotrophic water into extremely productive eutrophic environments. Each phosphorus molecule encourages the assimilation of 40 carbon molecules and 7 nitrogen molecules in aquatic algae, according to Wetzel (1975). In the end, these nutrients have a tendency to build up in groundwater. Nitrogen depletion in the photic zone may result from the continuous addition of phosphorus to water. Blue green algae fix enough nitrogen to maintain eutrophic conditions under these circumstances. Lake sediments efficiently absorb phosphates and vital inorganic elements like iron and manganese, which combine to produce extremely insoluble compounds. Leaf loss from a potassium deficiency manifests as tiny dots and holes in older leaves.

As essential nutrients, calcium (Ca), magnesium (Mg), and sulphur (S) are typically not restricted. It may be necessary to supplement calcium and magnesium in soft water, and the substrate is the most effective way to do this. Like sulphur and calcium is essential for plant growth, and the centre atom in all chlorophyll molecules is magnesium. The building blocks of proteins, amino acids, contain sulphur as a crucial component (Fig.1). A vital component of cell walls, calcium gives them stability and strength. Cell division and elongation, which are critical for plant growth and development, are mediated by calcium. It also involved in the structure and function of many enzymes, which catalyze biochemical reactions. Blackened, stubby roots and stunted, gnarled growth are signs of calcium deficiency. Transparent, yellow to white leaves can be the result of magnesium deficiency. Although iron, such as ferrous matter, is required in very small amounts, yellowing is frequently caused by dietary deficiencies. In terms of dry weight, carbon is the most prevalent element in plants. Iron in intensive culture, calcium or magnesium in soft water circumstances, and carbon can all be "forced" to become the rate-limiting "minimum nutrient" element. In harsh waters, CO_2 infusion works well as a bicarbonate balancer. Rich plant growth is greatly aided by the pH stabilisation provided by CO_2 infusion.

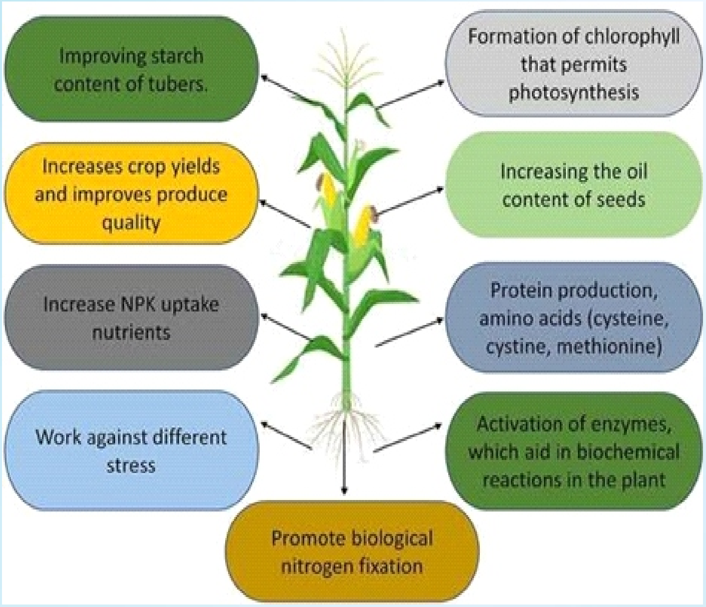


Fig. 1: Role of sulphur in plant growth and development.

Magnesium (Mg) is crucial for chlorophyll, photosynthesis, and enzyme activation, while potassium (K) regulates water balance, enzymes, and transports sugars and compounds. The two remaining macronutrients for plants are hydrogen and oxygen. Cl^-, Cu^{2+}, Mn^{2+}, Zn^{2+}, MoO^{42-}, BO^{3-}, or B_4O_{72} are examples of minor mineral nutrients that activate a variety of enzymes, nitrogen metabolism, calcium utilisation, membrane integrity, nucleic acid synthesis, and other processes (Fig.2). These elements are easily obtained from soil, tap water, and fish food sources and are vital to plant survival. Associated cations and carbonates cause artificial oligotrophy. Anaerobic conditions in water bodies allow a variety of diseases to develop on items. These could lead to the spread of deadly water-borne illnesses, some of which could become epidemic.

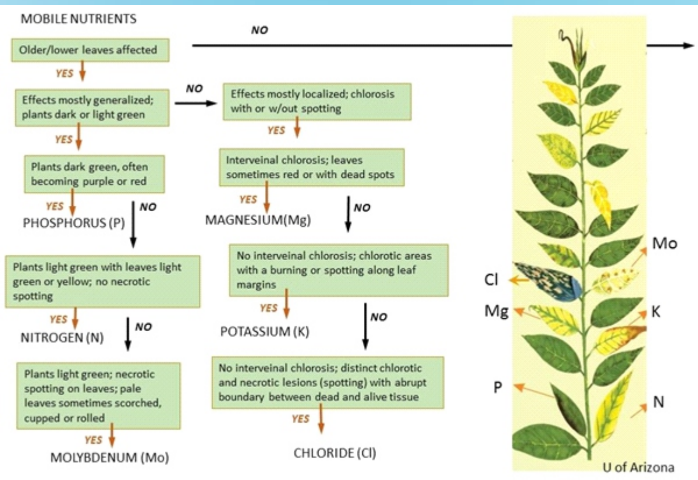


Fig. 2: Eficiency symptoms of mobile plant nutrients.

All life depends on nitrogen, which is the fundamental component of plant and animal proteins. There are various forms of nitrogen, including nitrates, nitrite, ammonia, and ammonium. A number of factors, including temperature, pH, and bacterial activity, affect how nitrogen compounds develop and take on certain forms. In aquarium plant culture, nitrogen is rarely the rate-limiting element; instead, a stable system will generate enough nitrogen for the plants' needs. Plants can use nitrogen from multiple fixed sources under different conditions; high nitrates and/or measurable quantities of ammonia are neither required nor desirable. However, recent research has demonstrated that human activity has surpassed the natural nitrogen cycle. The amount of nitrogen in industrial pollution and human waste-derived water is rising daily.

The environment now contains too much nitrogen, which has a variety of negative consequences, ranging from poisonous algal blooms to decreased soil productivity. The primary offender is agriculture's overuse of fertilisers, which increased by around four times worldwide between 1969 and 1995. The majority of this fertiliser runsoff into water bodies, where it promotes the growth of aquatic plants, including algae. This process, called eutrophication, suffocates fish and other marine life by cutting off their oxygen supply. Sixty percent of the world's biologically accessible nitrogen comes from human-made sources, particularly fertilisers.

In order to soften hard water by binding with the calcium ions in the calcium carbonate that produces the hardness, detergent manufacturers typically add sodium tripolyphosphate (STPP) and phosphates to washing powders. The carbonate is kept from settling on the cleaned clothing by the phosphates. Additionally, STPP and other phosphates aid in maintaining the pH level and water's alkalinity, which boosts the detergent's surfactant activity.

However, after the washing is finished, the phosphates are carried into the water bodies by the contaminated water. These water bodies become eutrophic due to phosphorus. The water bodies often receive their share of nutrients washed off from the top soil along with the runoff from the catchment. Phytoplankton and occasionally macrophytes can grow in water bodies because of the steady rise in nutrients. We call this "natural eutrophication." However, a surplus of nutrients brought on by humans accelerates waterbodies' productivity.

The water becomes hypoxic and occasionally almost anoxic as a result of the algae bloom's demise and subsequent consumption of dissolved oxygen. Excessive eutrophication can increase pathogenic animals, kill fish, and produce odours.

Numerous minerals, including calcium, phosphorus, and nitrogen in a particular ratio, are necessary for plant growth. The limiting factor for plant growth in water bodies is a nutrient that is present in disproportionately lower amounts. Phosphorus is frequently the limiting element in plant growth in Indian water bodies.

Phosphates in detergents serve a variety of purposes, as can be seen above. For instance,

(a) They form a connection with calcium ions to soften hard water. In this manner, they stop the lime that is in the water from settling or depositing on the fabric. Water loses its capacity to dissolve soap and its cleaning power if it is hard and includes dissolved lime.

(b) Phosphates maintain the surfactants' alkalinity. They stop the dissolved dirt from returning to the clothing by keeping it in the water.

But phosphate containing detergents are also harmful to the environment. Water bodies become eutrophic due to phosphates. Algal blooms are caused by an excess of phosphorus as phosphate (less than 1 ppm). The development of the algae grows, and the water loses dissolved oxygen as the algae die and break down. This raises the number of pathogenic organisms and kills the fish in the water. Human activity close to bodies of water is typically the source of eutrophication. Eutrophication is indicated by a loss in transparency, an increase in alkalinity, a drop in dissolved oxygen, an increase in chlorophyll content, and an increase in plankton biomass.

BEST MANAGEMENT PRACTICES (BMP) FOR MONSOON AGRICULTURE IN INDIA

S. K. Basu
PFS, Lethbridge, Alberta, Canada;
corresponding author: saikat.basu@alumni.uleth.ca

Do crop plants need fertilization during the monsoon season ?

Yes, crop plants often do need fertilizer application during the monsoon, but with careful management. Here's why and how:

Why it's needed:
Leaching of nutrients: Heavy monsoon rains can wash away essential nutrients from the soil, especially nitrogen.

Increased growth demand: Plants grow rapidly during the monsoon due to ample water, increasing their nutrient needs.

Key considerations:
Type of fertilizer: Use slow-release or organic fertilizers to reduce leaching.

Split application: Apply fertilizers in split doses—before planting and then at intervals during the growing season—to improve uptake and minimize loss.

Avoid application before heavy rains: Fertilizing just before a downpour can lead to runoff and nutrient waste.

Use of micronutrients: Rain can cause micronutrient deficiencies, so balanced fertilization (NPK + micronutrients) is important.

What kind of fertilizers are mostly needed during the monsoon and why ?

During the monsoon season, crops experience rapid growth due to increased water availability, but heavy rainfall can also lead to nutrient leaching—especially of nitrogen. The types of fertilizers most needed during the monsoon are:

1. Nitrogen-based Fertilizers
Why: Nitrogen is essential for vegetative growth, and it gets easily leached from the soil due to heavy rains.

Examples: Urea, Ammonium Sulfate.

Application Tip: Apply in split doses to reduce loss due to leaching.

2. Phosphorus-based Fertilizers
Why: Phosphorus supports root development and early plant growth. Though it doesn't leach easily, wet conditions can make it less available to plants.

Examples: DAP (Diammonium Phosphate), SSP (Single Super Phosphate).

Application Tip: Apply at the time of sowing for better root uptake.

3. Potassium-based Fertilizers
Why: Potassium improves disease resistance and water regulation in plants. It's moderately leachable and thus may need replenishment.

Examples: MOP (Muriate of Potash), SOP (Sulfate of Potash).

4. Micronutrients (as needed)
Why: High rainfall can deplete micronutrients like zinc, iron, and magnesium.

Examples: Zinc sulfate, Ferrous sulfate.

During monsoon, balanced fertilization with an emphasis on nitrogen (in split doses), along with phosphorus and potassium at sowing, ensures healthy crop.

Do organic fertilizers or compost application work better compared inorganic synthetic chemical fertilizer application during the monsoon ?

During the monsoon season, organic fertilizers or compost often perform better than synthetic chemical fertilizers for several key reasons, although the best choice can depend on the specific crop, soil, and farming practices. Here's a comparison based on monsoon conditions:

1. Nutrient Retention
Organic Fertilizers/Compost: Release nutrients slowly, which reduces nutrient leaching due to heavy rainfall. This makes nutrients available over a longer period.
Chemical Fertilizers: Release nutrients quickly, which can be washed away by rain, leading to nutrient loss and groundwater contamination.

2. Soil Structure and Health
Organic: Improve soil structure, increase water-holding capacity, and promote microbial activity — all beneficial during wet conditions.

Inorganic: Do not improve soil structure; repeated use can degrade soil quality over time.

3. Environmental Impact
Organic: Less likely to pollute water sources; environmentally safer.

Inorganic: Higher risk of runoff and eutrophication of nearby water bodies during heavy rain.

4. Immediate Nutrient Needs
Organic: Not ideal for emergency nutrient supplementation, as they release nutrients slowly.








Inorganic: Provide quick nutrient supply — useful if crops show deficiency symptoms that need fast correction.

5. Cost and Labor
Organic: May require more labor and bulk handling; cost varies based on availability.

Inorganic: Easier to apply and manage; more predictable nutrient content.

6. Best Management Practices for Monsoon Farming:
Integrated Nutrient Management (INM): Combine both organic and synthetic fertilizers. Use compost or well-decomposed manure to improve soil health and apply minimal chemical fertilizers based on soil tests to meet immediate nutrient demands. Use slow-release or coated fertilizers if relying on synthetic options during the monsoon. Well-managed organic soils or systems with strong crop rotations and cover crops may need less fertilizer.

Should the use of liquid fertilizer applications, fertigation and use of foliar sprays be restricted or completely haulted during the monsoon ?

The use of liquid fertilizers, fertigation, and foliar sprays during the monsoon season should be approached with caution rather than completely halted. Here's a breakdown:

1. Liquid Fertilizer & Fertigation
Caution: YES | Complete Halt: NO (with conditions)
Challenges: Heavy rains can cause nutrient leaching, washing away fertilizers before plants can absorb them. Risk of waterlogging, especially in poorly drained soils, can lead to nutrient loss and root damage.

Best Management Practices: Apply during dry spells or just before light rains, avoiding periods of heavy or consistent rainfall. Use split applications (smaller, frequent doses) to reduce leaching risks. Employ slow-release or stabilized fertilizers if available. Use soil moisture sensors or weather forecasts to guide timing.

2. Foliar Sprays
Caution: YES | Complete Halt: NO (with timing adjustments)

Challenges: Rain can wash sprays off the leaves, making them ineffective. High humidity can promote foliar diseases and reduce spray drying time.

Best Management Practices: Spray during dry windows (e.g., early morning or late afternoon when rain is unlikely). Use sticking agents or spreader-stickers to improve adhesion and effectiveness. Avoid spraying before or during expected rainfall.

Instead of a full halt, adapt the timing, type, and method of application to the monsoon conditions. Monitoring weather, using protective technologies (like covered fertigation systems), and precision agriculture practices will ensure nutrient efficiency and reduce losses.

Photo credit: **S. K. Basu**

SIGNIFICANT DISASTERS CAUSE ENVIRONMENTAL DISTURBANCES

Syed Shabih Hassan
Department of Fisheries Resource Management,
College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India
Email: *fish_ab@rediffmail.com*

Disasters involving aquatic poisoning happen when dangerous substances including industrial chemicals, heavy metals, radioactive materials, or agricultural runoff contaminate water bodies. These disasters have a devastating impact on aquatic ecosystems, kill fish and wildlife, and present serious health risks to those who depend on these water sources for irrigation, drinking, and fishing.

Degradation of water quality is ascribed to both human activity and natural processes. Natural factors include climate change, water-rock interactions, and geological features, while human activities like agriculture, urban waste, and industrial waste contribute significantly to pollution. Water resources can be degraded by these forces acting alone or in concert. Natural disasters, such as floods and droughts, can mobilize pollutants into water bodies. Human activities, such as agriculture, urban waste, and industrial waste, can introduce pollutants into water bodies. Improper waste disposal, construction activities, and urban development also contribute to water pollution. The combined impact of natural and anthropogenic factors can exacerbate water quality problems (Fig.1). Understanding both factors including significant past disaster events mentioned below is crucial for developing effective strategies to protect and restore water quality.
In 992 AD/CE, ergotism was prevalent in France and Spain. 'Holy fire' was the term used to describe ergot toxicity or ergotism. 'Fire' was used to describe the scorching feelings in the extremities that people with gangrenous ergotism experienced, and 'holy' was used since it was thought to be God's retribution. St. Antony's fire was a later term for ergotism. Ergotism claimed the lives of over 40,000 people.

Nuclear Bomb Explosions in Japan in 1945: On August 6, 1945, and August 9, 1945, the United States dropped two atomic bombs on the Japanese cities of Hiroshima and Nagasaki as part of the closing stages of World War II. The acute impacts of the bombings killed 90,000 to 166,000 people in Hiroshima and 60,000 to 80,000 in Nagasaki in the first two to four months. Flash or flame burns accounted for 60% of the fatalities on the day of the explosion, followed by falling debris at 30% and other causes at 10%. Many people perished in the months that followed as a result of burns, radiation illness, and other wounds.

The Three Mile Island catastrophe, also known as the nuclear accident in Pennsylvania, occurred in 1979 when a core meltdown occurred in a unit of the Three Mile Island Nuclear Generating Station in Pennsylvania, USA. About 2.5 million curies (Ci) of radioactive gases and about 15 curies (Ci) of 131I were released in what was the most significant accident in the history of the commercial nuclear power generating business in the United States. The curie (Ci) and becquerel (Bq) are the units used to measure the intensity of radioactivity. When an element (like uranium) spontaneously releases energy due to the radioactive decay of an unstable atom, this value represents the quantity of ionising radiation that is released. 3.7 × 1010 disintegrations per second is equivalent to 1 Ci.

Bhopal gas tragedy: Often referred to as the Bhopal disaster, the Bhopal gas tragedy was one of the deadliest industrial disasters in history. It took place at the Union Carbide India Pesticide Plant in Bhopal, Madhya Pradesh, India, on the evening of December 2–3, 1984. Hundreds of thousands of individuals were exposed as a result of the plant's release of methyl-isocyanate gas and other toxins. Estimates of the number of deaths vary. The Madhya Pradesh government has acknowledged 3,787 deaths linked to the gas leak, but the official immediate death toll was 2,259.

Nuclear accident at the Chernobyl Nuclear Power Plant in Ukraine: On April 26, 1986, a nuclear accident occurred at the Chernobyl nuclear power plant. Large amounts of radioactive contamination were discharged into the atmosphere by an explosion and fire, and this contamination spread throughout most of Europe and the Western USSR. It is regarded as the worst accident involving a nuclear power facility in history. A total of 350,400 persons were evacuated between 1986 and 2000.

Japan nuclear reactor crisis: Floods and nuclear reactor damage recently caused a nuclear crisis in Japan. The Fukushima crisis is the biggest nuclear accident since the Chernobyl accident in 1986, but it is more complicated because it involves several reactors and spent fuel pools.

Sulfur mustard gas Poisoning: Alkylating agents like sulphur mustard gas were initially employed during World War I. It has since been employed in numerous wars, most recently the Iran-Iraq conflict. We don't know how many people are impacted. It can cause severe and protracted harm to the respiratory system, eyes, and skin as well as mucous membranes. Beyond military applications, though, it has also led to issues. Approximately 100,000 tonnes of mustard gas bombs were dumped into the Baltic Sea after World War II. The bombs have occasionally resurfaced in fishermen's nets, causing them to contract mustard gas sickness. 197 fishermen had been impacted by 1985; 26 of them needed hospitalisation, and two of them had passed away.

Arsenic Poisoning: This was likely the biggest environmental catastrophe to date, affecting between 35 and 77 million people in West Bengal and Bangladesh. Microorganisms have contaminated surface water supplies in Bangladesh, leading to a considerable increase in sickness and mortality. The United Nations Children's Emergency Fund (UNICEF) collaborated with the Department of Public Health Engineering to install tube wells in the 1970s in an effort to get around this issue and provide the populace with a safe supply of drinking water. The first reports of skin lesions caused by arsenic were found in 1983. Since then, the exposed population has been shown to contain thousands of these cases. Internal malignancies, especially those of the bladder, genitourinary system, and lungs, are predicted to become much more common. The latency of these tumours is lengthy.

Fluoride poisoning: The Rift Valley system, Northern Africa, and a region that stretches from Turkey to China are all affected by fluoride poisoning. High naturally occurring fluoride concentrations in drinking water are typically the cause of poisoning. Fluoride concentrations in drinking water that are more than 10 mg/l are deemed hazardous. Skeletal fluorosis and related skeletal deformities are the result of this. The problem is often compounded by concomitant malnutrition.

Methyl mercury Poisoning: In 1956, four patients in Minamata Bay, Japan, had a strange neurological condition that was initially believed to be an infectious sickness. A connection to mercury consumption was discovered through additional research. Although no accountability was acknowledged until 1968, a nearby chemical plant employed inorganic mercury as a catalyst in the synthesis of acetaldehyde. Mercury was released into the factory's effluent, which gathered at the bottom of Minamata Bay. There, Venus japonica and other native shellfish concentrated the mercury and biotransformed it into organic mercury. Predatory fish acquired methylmercury in ever-increasing concentrations due to a process known as biomagnification, which poisoned local fishermen who mostly ate the fish they caught in the bay. Ataxia, visual field constriction, and impairment of speech, hearing, and movement were the usual symptoms. Up to 50,000 persons were exposed to the issue, and more than 2000 of them have confirmed Minamata sickness. There were also an unknown number of spontaneous abortions and 28 congenital instances with a cerebral palsy-like condition and an IQ below 75.

The Sandoz Chemical Spill in Switzerland (1986): A fire at a chemical warehouse released pesticides and mercury compounds into the Rhine River, causing significant pollution and fish fatalities across Germany, France, and the Netherlands. The global impact of aquatic poisoning led to stricter chemical regulations in Europe.

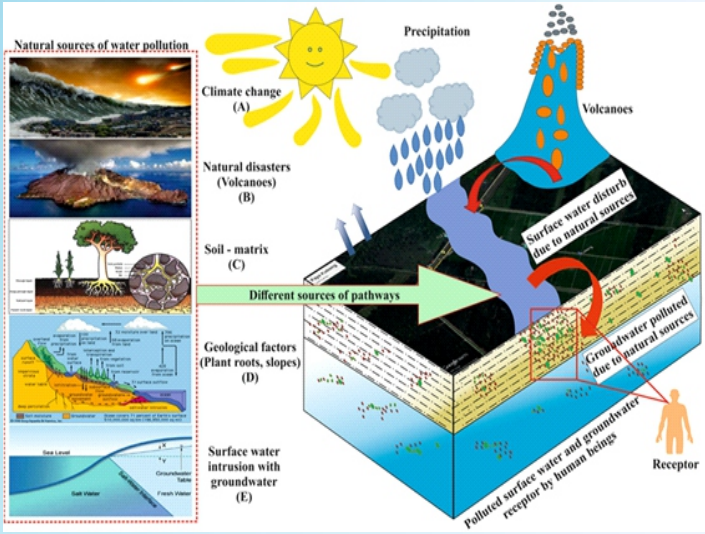


Fig.1: Attribution of water quality degradation due to both natural and human-induced factors.

Cadmium Poisoning: Itai-Itai (Ouch-Ouch) sickness was initially documented in Toyama, Japan in the 1960s and is characterised by renal disease (renal tubules exhibit severe shrinkage and degeneration) and chronic bone pain (osteomalacia). When it was determined that the Jinzu River was contaminated by mining and zinc refineries, the Japanese Ministry of Health in 1968 blamed it on cadmium toxicity. The locals irrigated their rice fields with the water, causing cadmium contamination of the crop. There have been several documented examples of persistent cadmium toxicity (Fig.2).

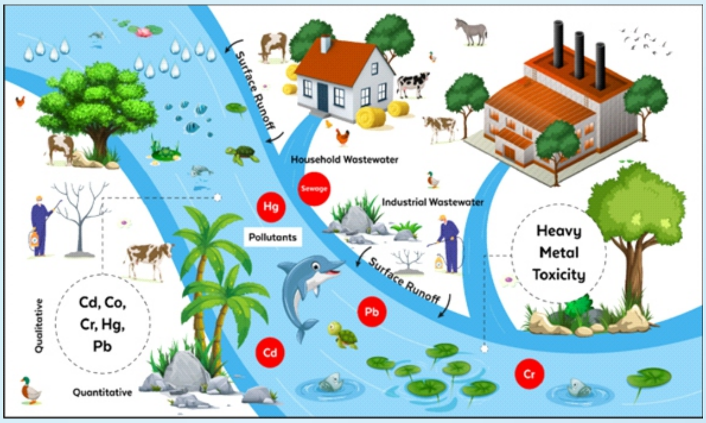


Fig. 2: Heavy metal contamination in surface water and bed-sediment quality in aquatic environment.

Mercury Poisoning: In the Brazilian Amazon basin, elemental mercury is used extensively in the mining and refining of gold. Every year, an estimated 100 tonnes of mercury are emitted. Significant amounts of organic mercury have been discovered in river effluents after biotransformation, as well as elemental mercury after the melting of gold-mercury amalgams. Mercury levels in local fishermen and miners have significantly increased as a result of this.

Deepwater Horizon oil spill in the United States (2010): Deepwater Horizon oil spill in the United States was triggered by an explosion on an offshore drilling rig in the Gulf of Mexico. Crude oil poured into marine waters killed fish, birds, and marine animals, while coral reefs suffered damage. These were the main effects seen. The incident raised significant concerns about the safety of oil drilling as well as long-term ecological damage.

Polychlorinated Bi-phenyls Poisoning: In 1968, the Yusho (oil illness) outbreak on the Japanese island of Kyusho afflicted up to 1850 individuals. During production, polychlorinated biphenyls tainted rice oil. The illness was most likely brought on by related polychlorodibenzafurans and polychloroquarterphenyls that were created when the oil was fried. The most common symptom was chloracne. The general death rate of individuals exposed over the following 15 years did not rise noticeably, while some children born to impacted women displayed signs of pollution, such as low birth weights and discoloured skin.

Industrial waste discharge, agricultural runoff, falling native fish populations, and worsening water quality are the main causes of heavy metal and pesticide pollution in Kerala's Vembanad Lake A Ramsar wetland, endangering local livelihoods that rely on inland fisheries.

Yamuna River contamination: The need for pollution control and river restoration initiatives is highlighted by the frequent fish deaths, the discharge of untreated sewage, industrial effluents, and pesticides, as well as the risks that heavy metal and pathogen contamination provide to human health and aquatic biodiversity.

Ennore Creek Oil Spill in Tamil Nadu (2017): Oil flowed, aquatic life perished, coastal waters became contaminated, and local fisheries were affected when two ships collided near Chennai port. sparked worries about emergency response and coastal management.

Disasters involving aquatic poisoning are a reflection of the hazardous effects of unbridled industrialisation, inadequate waste management, and regulatory shortcomings.

- Strict adherence to environmental standards is necessary to avert such catastrophes.
- It is necessary to implement pollution control technologies.
- Water body monitoring should be transparent and methodical.
- The sustainable management of aquatic environments depends on community involvement and public knowledge.

These disasters serve as a reminder that water sources, which are essential to life, ought to be responsibly and urgently protected.

FERTILIZATION DURING THE MONSOON

Saikat Kumar Basu
PFS, Lethbridge, Alberta, Canada;
Email: *saikat.basu@alumni.uleth.ca*

Do crop plants need fertilization during the monsoon season?

Yes, crop plants often do need fertilizer application during the monsoon, but with careful management. Here's why and how:

Why it's needed:
Leaching of nutrients: Heavy monsoon rains can wash away essential nutrients from the soil, especially nitrogen.

Increased growth demand: Plants grow rapidly during the monsoon due to ample water, increasing their nutrient needs.

Key considerations:
Type of fertilizer: Use slow-release or organic fertilizers to reduce leaching.

Split application: Apply fertilizers in split doses—before planting and then at intervals during the growing season—to improve uptake and minimize loss.

Avoid application before heavy rains: Fertilizing just before a downpour can lead to runoff and nutrient waste.

Use of micronutrients: Rain can cause micronutrient deficiencies, so balanced fertilization (NPK + micronutrients) is important.

What kind of fertilizers are mostly needed during the monsoon and why ?

During the monsoon season, crops experience rapid growth due to increased water availability, but heavy rainfall can also lead to nutrient leaching—especially of nitrogen. The types of fertilizers most needed during the monsoon are:

1. Nitrogen-based Fertilizers
Why: Nitrogen is essential for vegetative growth, and it gets easily leached from the soil due to heavy rains.

Examples: Urea, Ammonium Sulfate.

Application Tip: Apply in split doses to reduce loss due to leaching.

2. Phosphorus-based Fertilizers
Why: Phosphorus supports root development and early plant growth. Though it doesn't leach easily, wet conditions can make it less available to plants.

Examples: DAP (Diammonium Phosphate), SSP (Single Super Phosphate).

Application Tip: Apply at the time of sowing for better root uptake.

3. Potassium-based Fertilizers
Why: Potassium improves disease resistance and water regulation in plants. It's moderately leachable and thus may need replenishment.

Examples: MOP (Muriate of Potash), SOP (Sulfate of Potash).

4. Micronutrients (as needed)
Why: High rainfall can deplete micronutrients like zinc, iron, and magnesium.

Examples: Zinc sulfate, Ferrous sulfate.

During monsoon, balanced fertilization with an emphasis on nitrogen (in split doses), along with phosphorus and potassium at sowing, ensures healthy crop.

Do organic fertilizers or compost application work better compared inorganic synthetic chemical fertilizer application during the monsoon ?

During the monsoon season, organic fertilizers or compost often perform better than synthetic chemical fertilizers for several key reasons, although the best choice can depend on the specific crop, soil, and farming practices. Here's a comparison based on monsoon conditions:

1. Nutrient Retention
Organic Fertilizers/Compost: Release nutrients slowly, which reduces nutrient leaching due to heavy rainfall. This makes nutrients available over a longer period.
Chemical Fertilizers: Release nutrients quickly, which can be washed away by rain, leading to nutrient loss and groundwater contamination.

2. Soil Structure and Health
Organic: Improve soil structure, increase water-holding capacity, and promote microbial activity — all beneficial during wet conditions.

Inorganic: Do not improve soil structure; repeated use can degrade soil quality over time.

3. Environmental Impact
Organic: Less likely to pollute water sources; environmentally safer.
Inorganic: Higher risk of runoff and eutrophication of nearby water bodies during heavy rain.

4. Immediate Nutrient Needs
Organic: Not ideal for emergency nutrient supple-




mentation, as they release nutrients slowly.
Inorganic: Provide quick nutrient supply — useful if crops show deficiency symptoms that need fast correction.

5. Cost and Labor
Organic: May require more labor and bulk handling; cost varies based on availability.

Inorganic: Easier to apply and manage; more predictable nutrient content.

6. Best Management Practices for Monsoon Farming:
Integrated Nutrient Management (INM): Combine both organic and synthetic fertilizers. Use compost or well-decomposed manure to improve soil health and apply minimal chemical fertilizers based on soil tests to meet immediate nutrient demands. Use slow-release or coated fertilizers if relying on synthetic options during the monsoon. Well-managed organic soils or systems with strong crop rotations and cover crops may need less fertilizer.

Should the use of liquid fertilizer applications, fertigation and use of foliar sprays be restricted or completely haulted during the monsoon ?

The use of liquid fertilizers, fertigation, and foliar sprays during the monsoon season should be approached with caution rather than completely halted. Here's a breakdown:

1. Liquid Fertilizer & Fertigation
Caution: YES | Complete Halt: NO (with conditions)

Challenges: Heavy rains can cause nutrient leaching, washing away fertilizers before plants can absorb them. Risk of waterlogging, especially in poorly drained soils, can lead to nutrient loss and root damage.

Best Management Practices: Apply during dry spells or just before light rains, avoiding periods of heavy or consistent rainfall. Use split applications (smaller, frequent doses) to reduce leaching risks. Employ slow-release or stabilized fertilizers if available. Use soil moisture sensors or weather forecasts to guide timing.

2. Foliar Sprays
Caution: YES | Complete Halt: NO (with timing adjustments)

Challenges: Rain can wash sprays off the leaves, making them ineffective. High humidity can promote foliar diseases and reduce spray drying time.

Best Management Practices: Spray during dry windows (e.g., early morning or late afternoon when rain is unlikely). Use sticking agents or spreader-stickers to improve adhesion and effectiveness. Avoid spraying before or during expected rainfall.

Instead of a full halt, adapt the timing, type, and method of application to the monsoon conditions. Monitoring weather, using protective technologies (like covered fertigation systems), and precision agriculture practices will ensure nutrient efficiency and reduce losses.

Photo credit: ***S. K. Basu***

MANGO DISEASES AND PEST: CONTROL MEASURES

Nimisha Sharma, Abeer Ali,
Damini Singh and Hatkari Vittal
Division of Fruits and Horticultural Technology,
ICAR-Indian Agricultural Research Institute,
New Delhi, 110012; Corresponding author
Email: *nims17sharma@gmail.com*

Mango is a globally important fruit crop, contributing to food security and economic development in many parts of the world. Mango called the "king of fruits," in the tropics and subtropics. Mangoes are a good source of vitamins A and C, and fiber, making them a healthy part of a balanced diet. Mangoes offer a range of potential health benefits, including improved eye, skin, and hair health, and support for a healthy immune system. They are also rich in micronutrients and other beneficial compounds. There are numerous varieties of mangoes, each with unique characteristics. Mangoes are consumed fresh, processed into products like juice, jam, and powder, and used in a variety of culinary dishes. Mango cultivation plays a significant role in income generation and food security in many regions. Mango production faces challenges, including insect pests and the need for improved storage and ripening techniques. Present article highlights the major insect pest and disease of mango and their control measures. Major insects with their damaging symptoms shown in Table 1.

Table 1: Major Insects of Mango, Symptoms and Natural Enemies.

Insect	Symptoms	Natural Enemies
Mango hopper	The wedge shaped nymphs and adult insects puncture and suck sap of tender parts, reducing vigour of plants and particularly destroying the inflorescence and causing fruit drop.	Parasitoids: *Polynema* spp., *Gonatocerus* sp, *Tetrastichus* sp Predators: *Mallada boninensis*, *Plexippus paykullii*
Mango mealy bug	The adult bugs are covered with whitish powder and colonize between bark of tree trunk, young shoots and panicles (Fig. 1)	Predators: *Menochilus sexmaculatus*, *Rodolia fumida*, *Cryptolaemus montrozieri*
Fruit fly	The female punctures outer wall of mature fruits with the help of its pointed ovipositor and insert eggs in small clusters inside mesocarp of mature fruits.	Parasitoids: *Fopius arisanus*, *Diachasmi morphakraussi*
Inflorescence midge	The most damaging one is first attack in which the entire inflorescence is destroyed.	Parasitoids: *Tetrastichus* sp., *Platygaster* sp., *Systasis dasyneurae*, *Aprostocetus* spp.
Stem borer	Grub tunnels in the sapwood on the trunk or branches. Wilting of branches or entire tree.	-
Bark eating caterpillar	Webbing consists of wooden frass and faecal pellets of larvae hanging outside the tunnel. Heavy infestations retard the growth of tree and affect the fruits yield.	-
Mango nut weevil	Grub makes zigzag tunnels in pulp. Fruit dropping at marble stage.	Predators: *Rhizoglyphus* sp, *Camponatus spoecophylla*, *Smaragdina* sp.
Shoot gall psyllid	The galls are usually seen during September-October. Consequently there is no flowering and fruit setting	Parasitoids: Tiny parasitic wasp, *Inostemma apsyllae* Predators: Ladybird beele, purplish pirate bug, brown lacewings

Leaf webber	Initially caterpillars feed on leaf surface gregariously by scrapping/Later they make web of tender shoots and leaves together and feed within.	Parasitoids: *Brachymeria lasus*, *Hormius* sp. *Pediobius bruchicida*. Predators: Carabid beetle, reduviid bug etc.
Shoot borer	Larvae bore into tender shoots near the growing point tunneling downward, throwing their excreta resulting in dropping of leaves and wilting of terminal shoots.	Parasitoids: Bracon greeni.

According to different development stages like vegetative growth, before flowering, flowering and fruit development, major pest and management have shown in Table 2.

Cultural Management

Cultural, biological, nutritional, management practices should be integrated to control the insect, pest and diseases with minimum use of chemicals. Some common cultural practices like identification and destroy of alternate host plants are very important alternatively sowing of the ecological engineering plants could be done. Deep summer ploughing of field reduces the incidence of mealy bug and soil-borne pathogens Plough the field before planting to destroy existing weeds in the field. Similarly, plough deep after harvest to bury the pupae. Maintain proper shade, irrigation & drainage. Rogue out diseased seedling.

Nutrient and weed Management

Use recommended dose of primary, secondary and micronutrients via soil application or foliar spray. Hand weeding and timely mulching should be practiced. Remove new sprouts emerging from root stock at frequent intervals. Periodic shift the grafts frequently from one place to another to prevent them from striking roots into the ground. To control soil borne pathogens well decomposed farm yard manure coupled with *Trichoderma viride/harzianum* should be used. Nursery beds should be raised and fumigated with 4% formalin. Drenching of the planting pits with Chlorpyrifos 20 EC @ 5 ml/l of water. Collect and destroy crop debris, disease infected and insect damaged plant parts. Enhance parasitic activity by avoiding chemical spray, when 1-2 larval parasitoids are observed. Handpick the older larvae during early stages collect and

Fig. 1 : Leaves Affected by Sooty Mould Developed due to Honeydew Excretion from the Pest

Table 2 Integrated Pest and Disease Management in Mango.

Development Stage	Month	Major Pest	Management
Vegetative Growth	August - October	Leaf-eating caterpillar, Bark borer	Lamda-cyhalothrin 5% EC (1 ml/liter) or neem-based insecticide (4–5 ml/liter) or *Beauveria bassiana* or *Metarhizium robertsii* (1000CFU/ml)
Before Flowering	November - December	Hopper	Imidacloprid 17.8% SL (0.3 ml/l) or Thiamethoxam 25% WG (0.3 g/l)
		Mealybug	Tree banding by ICAR-CISH / *Beauveria bassiana* (4000 CFU/ml)
Flowering	January - March	Hopper, Thrips, Flower Midge	Imidacloprid 17.8% SL (0.3 ml/l) or Thiamethoxam 25% WG (0.3 g/l) / *Beauveria bassiana* or *Metarhizium anisopliae* (1000 CFU/ml)

Fruit Development	April - May	Anthracnose	Carbendazim + Mancozeb (1.5 g/l) or Tebuconazole + Trifloxystrobin (0.75 ml/l)
		Fruit fly	Methyl eugenol-based trap / 10 traps per hectare

destroy plant parts infested with insect pest and diseases. Handpick the gregarious caterpillars and the cocoons which are found on stem and destroy them in kerosene mixed water. Use yellow sticky traps @ 4-5 trap/acre and light trap @ 1/acre and operate between 6 pm and 10 pm. Install pheromone traps @ 4-5/acre for monitoring adult moths activity (replace the lures with fresh lures after every 2-3 weeks). Erecting of bird perches @ 20/acre for encouraging predatory birds such as King crow, common mynah etc.Set up bonfire during evening hours at 7-8 pm. Conserve natural enemies through ecological engineering and augmentative release of natural enemies.

INNOVATIVE CRISPR – BASED STRATEGIES TOWARDS FUNCTIONAL CURE OF HIV

Yashi Bhardwaj, Priya Gupta and Humaira Rani
Department of Biotechnology
Microbiology KCMT Bareilly, U.P.
E-mail: *humairaprincess450@gmail.com*

Introduction

➢ HIV and the problem of Latency: -

- HIV Latency refers to a period where the virus remains dormant within infected cells persisting despite antiretroviral therapy (ART).
- This dormancy is characterized by the virus's DNA integrating into the host cell's genome but not actively producing new viral particles or proteins. This state allows the virus to evade the immune system and ART, making it a major hurdle in the quest for an HIV cure.

➢ CRISPR / cas as a therapeutic alternative-

- CRISPR-cas system, particularly cas9, are emerging as a powerful therapeutic alternative due to their ability to precisely edit DNA, offering potential for treating genetic disease, cancer and viral infections.
- This technology allows for targeted gene editing, potentially correcting faulty genes.

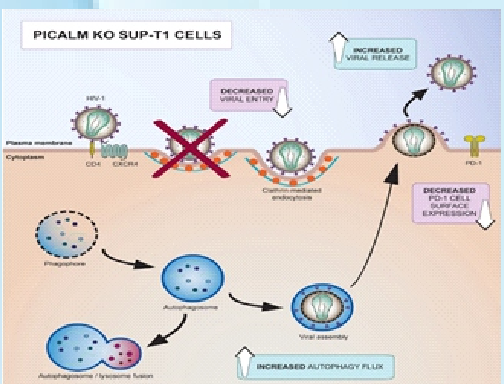


Fig: 1: This image depicts the impact of PICALM knockout(ko) on HIV-1 infection of SUP-1 cells.

Preclinical Success-

➢ HIV provirus excision from infected cells: -

- Preclinical successes in HIV provirus excision involve using tools loke CRISPR -cas9 to target and remove the viral DNA from infected cells, effectively eliminating the virus's ability to replicate.

➢ Dual CRISPR Targeting + ART –

- Preclinical success with dual CRISPR targeting is being explored in the context of achieving a functional HIV cure, particularly when combined with antiretroviral therapy (ART). This approach aims to eliminate or significantly reduce the viral DNA reservoirs that persist despite ART, potentially leading to a longer-lasting and more effective treatment for HIV.

➢ Monkeys and viral reservoirs:

- In the context of preclinical success in monkeys, the concept of "viral reservoir" refers to the persistent presence of viral DNA, even in the presence of effective antiretroviral therapy (ART), that can lead to viral rebound upon treatment cessation. Studies using non-human primate (NHP) models, particularly SIV-infected macaques, are crucial for understanding the dynamics of viral reservoirs and for evaluating potential interventions to eliminate or control them.

➢ Early human trial: EBT - 101 ---

- The EBT-101 Phase 1/2 clinical trial, a first-in-human study, is a single ascending dose study designed to evaluate the safety, tolerability, and preliminary efficacy of EBT-101 in individuals with HIV-1 who are suppressed on antiretroviral therapy. The study involves nine participants and assesses safety, biodistribution, pharmaco-dynamic, and efficacy.

➢ Safety outcomes –

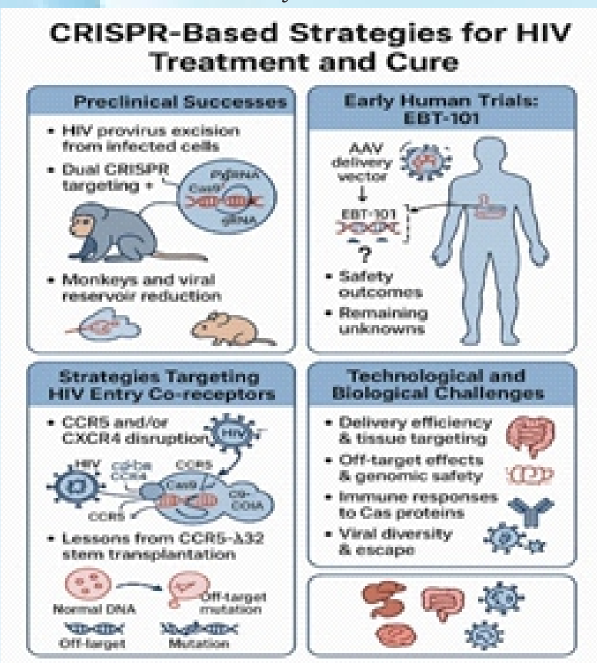
Three of five participants who stopped antiretroviral therapy experienced viral rebound and had to restart their medication.

➢ Strategies targeting HIV entry co receptors –

- CCR5 and CXCR4 disruption: -Strategies targeting HIV entry co-receptors CCR5 and CXCR4 aim to block the virus's ability to enter cells by disrupting these receptors. This can be achieved through various methods, including gene editing and the development of small molecule inhibitors.
- Lessons from CCR5 - Δ32 stem transplantation: - Strategies targeting HIV entry co-receptors, particularly CCR5, are a promising avenue for developing HIV cures and preventing infection. The success of CCR5-delta32 homozygous stem cell transplantation in the "Berlin patient" highlighted the potential of blocking CCR5-mediated HIV entry.

➢ Technological and biological challenges: -

- Targeting: HIV-1's high mutation rate and genetic diversity within a host make precise targeting a challenge. CRISPR systems need to accurately target specific viral sequences while minimizing off-target effects.
- Off-target effects: Ensuring the CRISPR system only targets the intended DNA sequences and avoids unintended changes in other parts of the genome is critical for safety.
- Viral escape: HIV can mutate and evolve, potentially escaping the targeting effects of the CRISPR system. This necessitates developing strategies to target specific viral sequences that are less likely to mutate.
- Latent reservoirs: The persistence of latent HIV reservoirs (virus that is dormant but can be reactivated) presents a challenge. CRISPR strategies need to target and eliminate these reservoirs effectively.



➢ **Future outlook:**

- CRISPR-Based Approaches for HIV Cure: Excision of Integrated HIV DNA.

CRISPR technology can be used to remove the integrated HIV proviral DNA from host cells, effectively eliminating the latent viral reservoir.

- CCR5 Editing:

CRISPR can be used to edit the CCR5 gene, rendering cells resistant to HIV infection, similar to the naturally occurring CCR5Δ32 mutation.

- Shock and Kill Strategies:

CRISPR can be used to activate latent HIV, allowing for subsequent purging with antiretroviral therapy (ART).

➢ **Current Challenges and Future Directions:**

- Viral Escape: The virus can evolve to overcome CRISPR-mediated editing, requiring strategies like multiplex editing or targeting multiple viral and host genes.
- Off-Target Effects: Ensuring precise editing without unintended consequences is essential.
- Ethical considerations: Germline Editing and Future Generations:
- While some CRISPR-based therapies target somatic cells (cells that are not involved in reproduction), the potential for germline editing (modifying the DNA passed down to future generations) raises ethical questions about the long-term impact on human evolution and the rights of future individuals. Informed Consent and Patient Autonomy:
- Given the potential for unintended consequences and long-term effects of CRISPR based therapies, ensuring informed consent and respecting patient autonomy are crucial. Patients must be fully aware of the risks and benefits, and the potential for long-term uncertainties.

Conclusion:

CRISPR-based editing has shown significant potential in treating HIV by removing the virus from infected cells and disrupting its ability to enter cells. While preclinical studies have yielded promising results, several challenges must be addressed before this technology can be used effectively in humans. These challenges include developing safe and efficient delivery methods, ensuring precise editing to avoid unintended consequences, and navigating the ethical implications of gene editing. If these hurdles can be overcome, CRISPR-based editing may offer a functional cure for HIV that is both safe and effective.

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NESA FELLOW DR. PRASANTA K. DASH WINNER OF PRESTIGIOUS RASHTRYIA KRISHI VIGYAN PURASKAR-2025

Dr. Dash earned his BSc (Ag) degree from OUAT, Bhubaneswar, MSc and Ph.D degrees from IARI, New Delhi with gold medal. He was a BOYSCAST fellow at SALK Institute Biology, California, USA and has thirty years of experience in research, teaching, and training in biotechnology at ICAR-National Institute for Plant Biotechnology, New Delhi. He specializes on plant biotechnology and currently is the Assistant Director General (Commercial crops) at ICAR, New Delhi. Dr. Dash. He and his coworkers have used combinations of molecular genetics, 'omics techniques, and elegant transgenic approach' to determine pathways/mechanisms of plant growth in response to the biotic and abiotic stress and designs new strategies to engineer crops to combat climate change. He has made pioneering contributions to understanding fundamental biological principles and concepts in an orphan crop flax, pigeonpea, and model crop rice, and has inspired others with bold technological advances to further their fields such as:

(i) International effort (Indo-Canadian), wherein he decoded whole genome sequence of flax. The *de novo* deep-coverage assembly predicted 43,384 genes. This reference sequence of flax has enhanced genomic research and molecular breeding in flax and other species in the Linaceae family.

(ii) In a team effort, he deciphered whole genome sequence of pigeonpea that predicted 59,515 protein-coding genes. The genome sequence has been used to identify hyper-variable (HASSR) markers. These markers are being used for fingerprinting, diversity analysis and molecular breeding of pigeonpea.

Broadly, the finding translated into agronomically important trait of yield and disease resistance, which is thought to be the major trait underpinning increased flax and rice yields. With colleagues, he established the first molecular genetic map of flax and pigeonpea and tagged many genes for disease, insect resistance and stress tolerance using molecular and qRT-PCR markers. These advances are applied with molecular marker-aided selection in flax and pigeonpea improvement. Dr. Dash investigated species relationships in genus Oryza by studying molecular evolution and identified useful genes for transfer from wild species to cultivated rice. The far-seeding aspect of his research activities centered on development of New Plant Type (NPT) of rice and pigeonpea through genetic engineering. Twelve rice varieties, one transgenic pigeonpea (BRL II stage), and a flax transgenic has been developed by him.

Since 2001, he has been involved in teaching M.Sc/Ph.D students of IARI, New Delhi. While, three of his students received gold medal in M.Sc, 25 students have become scientist at various organizations, and >75 Students have qualified CSIR/ICAR NET. He was also selected by ICAR-MEA to teach M.Sc/Ph.D students of Yezin Agriculture University, Myanmar under, GoI collaboration. He is a best teacher awardee, fellow of five national societies and **winner of prestigious Rashtryia Krishi Vigyan Puraskar-2025.**

National Environmental Science Academy (NESA), New Delhi
206, Raj Tower-I, Alaknanda Community Centre, New Delhi-110 019
E-mail: infonesa88@gmail.com; nesapublications@gmail.com
Website: www.nesa-india.org

NOTIFICATION NO. 2

APPLICATIONS ARE INVITED FOR NESA ANNUAL AWARDS – 2025

LAST DATE: 30th September, 2025

This is to notify that applications are invited for the **NESA Annual Awards 2025** from the Life Members of the Academy. The prescribed application forms for the following categories can be downloaded from our website: www.nesa-india.org • https://nesa-india.org/nesa-annual-awards-2025/

Separate applications should be submitted for independent awards. For detailed guidelines the website of NESA may be approached by log in to website: https://nesa-india.org/nesa-annual-awards-2025/

The last date for all the categories of awards is 30th September, 2025.

The categories of Awards are given as under:

(1) NESA FELLOWSHIP AWARD - 2025
(2) NESA EMINENT SCIENTIST AWARD - 2025
(3) NESA DISTINGUISHED SCIENTIST AWARD - 2025
(4) NESA SCIENTIST OF THE YEAR AWARD - 2025
(5) NESA ENVIRONMENTALIST AWARD - 2025
(6) NESA GREEN TECHNOLOGY INNOVATIVE AWARD - 2025
(7) WOMEN EXCELLENCE AWARD - 2025
(8) NESA YOUNG SCIENTIST AWARD - 2025
(9) NESA JUNIOR SCIENTIST AWARD - 2025

Contact for more details:

Mobile : 98112 38475, 8527568320; 9971383650 • infonesa88@gmail.com