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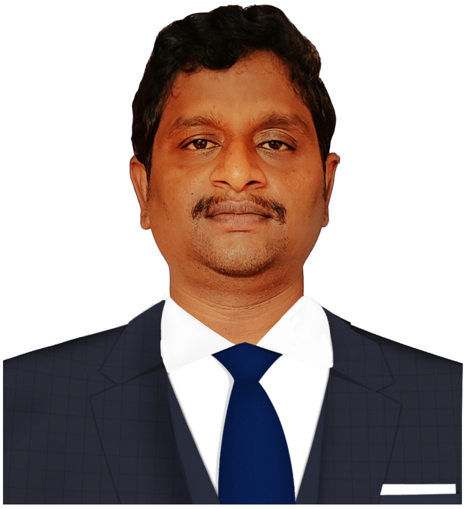
From the Desk of Editor-in-Chief



With immense humbleness and anticipation, I seek it's my pleasure to launch the April 2026 issue of the **"Krishi Netra"** a monthly e-Magazine subtitled "Invisible Vision on Farming" published by **GRN Creatives**. On behalf of the Krishi Netra Editorial Team, I would like to take this opportunity to thank our authors, editors, reviewers and all of them who have volunteered to contribute to the successful release of the first (December) issue of the e-Magazine.

The magazine aims to provide a common platform for the scientific community, research scholars and other readers to publish their ideas, new inventions, research findings etc., to provide the invisible insights for betterment of the farming community. Krishi Netra magazine is primarily focused on the areas of Agriculture, Horticulture, Precision Farming, Fisheries & Animal Sciences, Agriculture Engineering, Agribusiness Management, Food & Dairy Technology, Bio-Sciences/ Life-Sciences, Biotechnology & Biochemistry, Environmental Science &Forestry, Organic Farming, Sericulture and Home Science.

As we turn the pages of Krishi Netra, let us celebrate the unsung heroes, the farmers, the agri-entrepreneurs, the scientists, and the agri scholars. Together, we delve into the realms of sustainable practices, agro ecology, and the transformative power of technology, ensuring that the seeds we sow today yield a bountiful harvest for generations to come.

May this magazine be a source of inspiration, knowledge, and appreciation for the remarkable journey from seed to harvest. Join us on this exploration of the fields that bind us all, as we cultivate a deeper understanding and appreciation for the intricate dance of life on the farm.

I warmly welcome the authors with their contributions that can meet the practical appliances with an integrated/ convergent approach. I wish, with all your support I could see a very bright prospects for Krishi Netra magazine as an eye opener in serving the needs of the farming community.

We look forward for your valuable feedback!
For any questions/ suggestions/ concerns, please contact us: krishinetra@gmail.com
Thank you.

Editor-in-Chief
Gangisetty Srikanth Kumar

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3D Food Printing: A New Era Of Food Technologywith Innovations On Plate

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Introduction: The world population is increasing day by day and with this growth, the demand for novel and innovative food is also rising rapidly. But the natural resources required for food production are limited. Because of this, there is a strong need to develop new food sources and advanced technologies to meet the growing demand in a sustainable way.

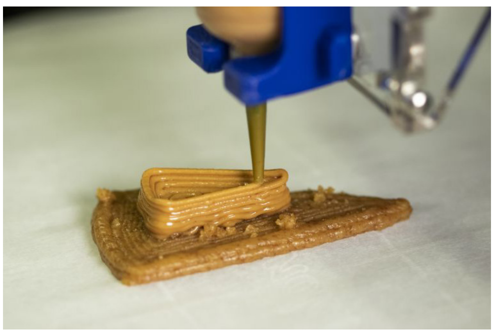
At the same time, technology is playing an important role in changing our daily lives. The way we produce, prepare and consume food is also evolving with time. One of the most interesting innovations to emerge in recent years is 3D food printing.

3D printing is a modern technology that creates objects by layering material from digital designs. It has already been used in many fields, including engineering, medicine and manufacturing. Now, this technology is being applied to the food industry and opening up new possibilities. It allows food to be created with great accuracy in specific shapes and designs.

In the food industry, 3D printing offers several advantages as it enables the preparation of customised food at a lower cost, tailored to individual needs and preferences. It also allows better control over the nutritional content in food which is especially useful in healthcare and personalised diets.

The imagine of a machine creating a beautifully designed food dish right in front of us with perfect shape and detail is very interesting. This futuristic idea is now becoming a reality as 3D food printing is bringing us closer to a future where food can be prepared with precision, creativity and personalisation like never before where food meets aesthetics and nutritional needs.

Definition of 3D food printing: 3D food printing is a modern technique where specialised printers create edible products by depositing food ingredients layer by layer. It is a form of additive manufacturing that builds three-dimensional food items with precise control over shape and nutrient content allowing the production of customised, personalised and sustainable meals.



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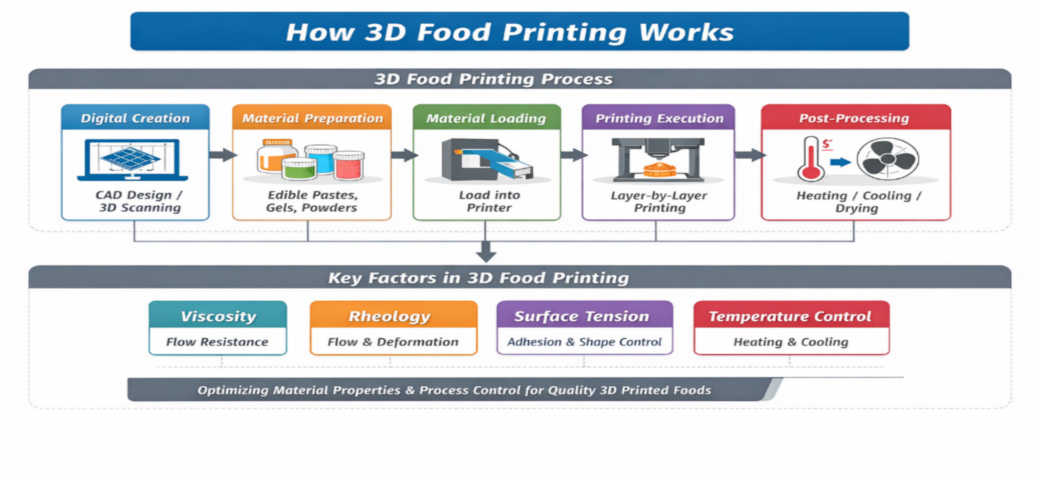
Working of 3D food printing: A 3D food printing system typically includes three main components that includes a computer for designing, a control unit for processing instructions and the printer for fabrication. The process starts with a computer-aided design (CAD) model that guides the printer. Food materials are precisely deposited using controlled extrusion or similar techniques. Temperature regulation like either heating or cooling is often applied during printing to achieve the desired texture and structural stability.

- A digital model of the food product is created using CAD software or obtained through 3D scanning, defining its shape, size and structure.
- The suitable edible substances such as gels, pastes or powders are selected or prepared with the required consistency for food printing.
- The prepared materials are filled into cartridges, syringes or extrudates of the printer.
- The printer builds the product layer after layer based on the digital design, ensuring precision through controlled material deposition.
- The printed food may undergo processes like heating, cooling, drying or baking to enhance its texture, taste and structural integrity.



Applications of 3D food printing:

- 3D food printing enables the preparation of foods tailored to individual dietary needs. The nutrients like proteins, vitamins and minerals can be adjusted based on age, health conditions or fitness goals. This is especially useful for patients, athletes and elderly people with special dietary requirements.
- It allows the creation of complex shapes, patterns and artistic food structures that are difficult to achieve with conventional methods. This is widely used in bakery and confectionery products.
- Using advanced material formulations like hydrocolloids and plant-based proteins, 3D printing enables the design of foods with specific textures.
- 3D printing can produce compact, long-lasting and nutritionally balanced meals making it highly suitable for space missions and defense sectors.
- Food can be printed fresh whenever needed reducing storage requirements and food wastage.

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Challenges and Limitations of 3D Food Printing:

1. **Low printing accuracy**: It is difficult to get exact shapes and fine details and can be affected by material properties and printing settings.
2. **Slow production speed**: It takes more time compared to traditional methods and faster printing reduces quality.
3. **Technical complexity**: Multi-nozzle printers are difficult to control and require advanced technology and skills.
4. **Limited food materials**: Not all foods can be printed and need special materials with proper consistency.
5. **Difficulty in multi-attribute foods**: Hard to produce foods with multiple colours, different flavours and various textures.

Future scope and innovations in 3D food printing:

- Improved control over materials and printing process
- Development of high-speed printers
- Ability to produce attractive and tasty foods
- Integration of AI and automation
- Restaurants, hospitals, space food and special needs foods
- Use of plant proteins, gels and functional ingredients

Conclusion: 3D food printing is an emerging and innovative technology that has the potential to transform the food industry. This technology allows the production of customised, nutritionally balanced, and visually appealing food products, meeting the diverse needs of consumers. Although there are challenges like limited printing accuracy, slow production speed and material constraints but, continuous research and technological advancements can help to overcome these limitations. The integration of advanced systems like automation and artificial intelligence will further improve efficiency and precision. Overall, it represents a promising step towards a more personalised, sustainable and innovative approach to food production.

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Healthy Soil, Healthy Plate: Where Nutrition Truly Begins

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Abstract

Healthy soil is the foundation of nutritious food and human well-being, though its role in food quality is often overlooked. This article provides an overview of how soil health influences crop nutrition, food quality, and human health through the soil–plant–human continuum. Healthy soils rich in nutrients, organic matter, and microbial diversity support plant growth and improve nutritional quality. Essential minerals such as zinc, iron, selenium, calcium, and magnesium move from soil into crops and ultimately into human diets, influencing growth, immunity, and health. The article also highlights the effects of soil on food quality, safety, and flavor, while discussing soil degradation, contamination, hidden hunger, and sustainable management practices for ensuring food security and improved nutrition.

Introduction: Food Begins Beneath Our Feet

When we think about nutritious food, we often focus on vegetables, fruits, grains, or supplements, rarely considering the soil beneath them. Yet, nutrition begins underground in a living system rich in minerals, organic matter, microbes, water, and air. Healthy soil forms the foundation of food quality by supplying essential nutrients that move from soil to plants and eventually to human diets. For centuries, farming communities recognized that fertile land produced healthier crops and healthier people. However, modern agriculture increasingly emphasized yield over soil health, contributing to hidden hunger despite record food production. According to the World Health Organization, nearly two billion people suffer from micronutrient deficiencies even when calorie intake is sufficient (Elegbeleye *et al.,* 2025). Nutrient-poor soils often produce nutrient-deficient crops, affecting human health and well-being. Therefore, understanding the connection between soil and nutrition is essential for improving food quality, combating malnutrition, ensuring food security, and building a healthier future (Figure 1).

Figure 1: The Soil–Plant–Human Continuum: Investigating the Impact of Soil Health on Nutritional Quality, Food Security, and Human Well-Being

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Understanding Healthy Soil

Before understanding how soil shapes nutrition, we must first understand what makes soil healthy. Although the terms *soil* and *dirt* are often used interchangeably, they are fundamentally different. Dirt is lifeless material, whereas soil is a living, dynamic ecosystem capable of supporting plants, animals, and humans while maintaining environmental quality. Healthy soil is far more than a medium for anchoring plant roots; it is a complex system where minerals, organic matter, water, air, and living organisms interact continuously to sustain life. Several characteristics define healthy soil. It contains adequate nutrients in plant-available forms, sufficient organic matter to improve fertility, balanced pH for proper nutrient uptake, and good aeration and water-holding capacity. Healthy soil also supports rich biological activity, with billions of microorganisms that recycle nutrients and maintain soil fertility while minimizing contamination from harmful substances. Importantly, soil is not merely inert matter—it is a living ecosystem (Hohl and Verma, 2009). A single teaspoon of healthy garden soil contains more microorganisms than there are people on Earth (Pavlis, 2020). These microscopic organisms drive nutrient cycling, improve soil structure, and play an essential role in producing healthy, nutritious food.

Soil as the Foundation of Plant Nutrition

Plants are remarkable natural chemists that convert sunlight, water, and carbon dioxide into energy through photosynthesis. However, sunlight alone cannot produce healthy and nutritious crops. Plants rely on soil to obtain essential mineral nutrients required for growth, development, and food quality. Through their roots, they absorb at least 17 essential elements, including macronutrients, secondary nutrients, and micronutrients. Macronutrients such as nitrogen, phosphorus, and potassium promote plant growth, root development, energy transfer, and resistance to diseases. Secondary nutrients like calcium, magnesium, and sulphur support cell structure, chlorophyll formation, and protein synthesis. Micronutrients, including zinc, iron, copper, boron, and selenium, though needed in small quantities, are vital for plant and human health. Beneficial fungi called mycorrhizae often assist plants in nutrient uptake. These nutrients move into grains, fruits, vegetables, and seeds, becoming part of human diets. Therefore, healthy soil ensures healthy crops and ultimately supports human nutrition and well-being.

From Soil Nutrients to Human Nutrition

The relationship between soil health and human health is measurable, predictable, and, in many cases, preventable. Although food reaches people through farms, markets, and kitchens, many of the minerals essential for human survival begin their journey in the soil. Plants absorb nutrients from the soil through their roots, and these nutrients are transferred into grains, fruits, vegetables, and pulses consumed by humans. When soils are deficient in essential nutrients, crops grown in those soils often become nutrient-poor, eventually contributing to deficiencies in human diets. This direct relationship forms the basis of the soil–plant–human health continuum, emphasizing that human nutrition fundamentally begins beneath the soil surface.

One of the most significant examples of this connection is zinc deficiency, one of the world's most widespread micronutrient disorders. Soils lacking sufficient zinc frequently produce cereals with reduced zinc concentrations. Since cereals constitute staple foods for much of the global population, zinc deficiency becomes common, especially among children and pregnant women (Rahman and Das, 2025). Zinc plays a critical role in enzyme activity, immune system functioning, wound healing, cellular growth, and normal

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development. According to the World Health Organization (WHO), zinc deficiency contributes to over 400,000 child deaths annually, particularly in regions where dietary zinc intake remains inadequate (Liberato *et al.,* 2015). Children suffering from zinc deficiency commonly experience stunted growth, weakened immunity, delayed development, and increased vulnerability to infectious diseases.

Iron deficiency presents another major challenge linked to soil fertility. Iron-deficient soils often produce crops containing lower iron concentrations, increasing the risk of anemia, chronic fatigue, reduced work productivity, impaired cognitive development in children, and higher maternal mortality. Despite widespread supplementation and food fortification programs, iron deficiency anemia remains the most prevalent nutritional disorder globally, affecting more than 1.6 billion people, especially women and children dependent on cereal-based diets (Yunus, 2020).

Selenium deficiency further illustrates the importance of soil chemistry in human health. Selenium levels differ considerably among regions due to geological and environmental variations. In countries such as China, Finland, and New Zealand, selenium-poor soils historically resulted in crops with very low selenium content, increasing susceptibility to weakened immunity, cardiovascular diseases, thyroid dysfunction, and poor antioxidant defence. Conversely, selenium-rich soils support stronger immunity and healthier populations.

Other soil-derived nutrients are equally essential. Calcium-deficient soils may lower the nutritional quality of vegetables and legumes, indirectly affecting bone strength, muscle function, and nerve signalling. Magnesium depletion in soils can reduce food quality and influence hundreds of enzyme-mediated reactions in the human body. Copper deficiency interferes with iron metabolism and immune function, while boron affects plant reproduction and indirectly influences crop nutritional value.

This global challenge is often described as "hidden hunger," where people consume enough calories but remain deficient in vital micronutrients. Nearly two billion people worldwide suffer from deficiencies of iron, zinc, iodine, and vitamin A. Therefore, sustainable solutions such as balanced fertilization, micronutrient management, biofortification, organic matter restoration, and biologically active soils are essential for producing nutrient-rich crops and healthier populations.

Does Soil Affect Food Taste and Quality?

Beyond providing basic nutrition, soil strongly influences the sensory qualities of food, including flavor, aroma, texture, sweetness, and overall eating experience. The noticeable difference between a tomato grown in fertile garden soil and one produced commercially often reflects the role of soil in determining food quality. Scientifically, soil affects taste and aroma through several interconnected mechanisms. Nutrient availability regulates the production of volatile organic compounds that create distinctive flavors and fragrances in crops. Potassium, for example, enhances sugar synthesis and aromatic compounds in fruits, while balanced soil moisture helps maintain desirable sugar-to-acid ratios essential for flavor development. Soil microorganisms further contribute by producing compounds that plants transform into flavor-related molecules.

A clear example can be observed in aromatic rice varieties of Southeast Asia. Basmati rice from India and Pakistan, jasmine rice from Thailand, and other premium rice types develop their characteristic fragrance only when cultivated in specific soils; the same genetic variety grown elsewhere often produces inferior aroma and taste. Likewise, tea quality is heavily influenced by soil properties such as acidity, mineral composition,

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and organic matter, explaining differences between Darjeeling and Assam tea. The French concept of *terroir* captures this relationship, emphasizing how soil, climate, and farming practices together create distinctive food qualities, making healthy soils essential not only for nutrition but also for flavor and food diversity (Parker, 2015).

The Hidden Workforce: Soil Microorganisms

Beneath the soil surface exists a vast hidden community of microorganisms that continuously supports soil fertility and plant growth. Healthy soil contains billions of bacteria, fungi, protozoa, nematodes, and other microbes that together form the soil food web, carrying out essential biological functions beyond the ability of plants alone. One of their most critical roles is nutrient cycling. Although nitrogen constitutes nearly 78% of Earth's atmosphere, plants cannot use atmospheric nitrogen directly. Beneficial bacteria such as *Rhizobium*, associated with leguminous crops, and free-living *Azotobacter* convert atmospheric nitrogen into plant-available forms, naturally improving soil fertility and reducing fertilizer dependence (Rahman and Das, 2025). Similarly, mycorrhizal fungi help overcome phosphorus limitations by extending thread-like structures beyond plant roots, enabling access to phosphorus and water unavailable in surrounding soil. Nearly 80% of terrestrial plants depend on such associations. Other microorganisms decompose organic matter, solubilize phosphorus, suppress diseases, and stimulate growth. However, excessive tillage, monocropping, and chemical overuse can damage these beneficial microbial communities, making soil biological restoration essential for sustainable agriculture and human nutrition.

Soil Degradation: A Threat to Nutritious Food

Agricultural soils worldwide are degrading at an alarming pace despite growing awareness of soil health. The United Nations estimates that nearly one-third of global soils are moderately to highly degraded, while around 24 billion tons of fertile topsoil are lost annually through erosion (Rahman and Das, 2025). Since topsoil contains most nutrients, organic matter, and beneficial microorganisms, its loss directly reduces soil fertility and crop quality. Continuous harvesting without balanced nutrient replenishment causes nutrient depletion, gradually lowering productivity. Excessive use of synthetic fertilizers, especially nitrogen, may worsen soil degradation through acidification, microbial imbalance, and nutrient dilution, where crops appear productive but contain fewer minerals. Additional threats include salinity, declining organic matter, heavy metal contamination, and climate change–driven erosion, droughts, and floods. Consequently, higher yields may not always ensure healthier, nutrient-rich food.

Soil Contamination and Food Safety

From a food science perspective, soil acts as both a source of nutrients and a potential pathway for contaminants into food. While healthy soil supplies essential minerals, contaminated soils may transfer harmful substances into crops through the same soil-to-plant pathway. Heavy metals are among the most serious concerns. Cadmium, a toxic metal and known carcinogen, can accumulate in crops such as leafy vegetables, potatoes, and grains, often originating from phosphate fertilizers containing cadmium impurities. Lead contamination, though reduced after the phaseout of leaded gasoline, persists in urban and roadside soils and poses severe risks to children, particularly affecting cognitive development. Arsenic presents another challenge, especially in flooded rice-growing systems where paddy rice absorbs arsenic more efficiently, increasing chronic exposure risks in rice-consuming populations (Rahman and Das, 2025). Pesticide residues

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may also persist in soils and enter root and leafy vegetables. Since soil-derived contaminants become integrated into plant tissues, they cannot easily be removed through washing or cooking. ***The message is clear: safe food starts with safe soil.*** Regular soil testing, contamination prevention, and responsible land management are essential to protect food quality and human health.

Building Healthy Soil for Healthy Food

The encouraging reality is that degraded soils can be restored through proper management and sustainable agricultural practices. Healthy soil develops gradually through continuous interaction among farmers, soil organisms, and the surrounding environment. One of the first steps in soil restoration is soil testing, which helps determine nutrient status, soil pH, organic matter content, and possible contamination. Understanding soil conditions allows farmers to apply nutrients more precisely, preventing both deficiencies and excessive fertilizer use. Balanced fertilization is equally important for maintaining productivity and soil health. Nutrients should be supplied in appropriate amounts and combinations rather than through indiscriminate fertilizer application. Combining synthetic fertilizers with organic sources such as compost, farmyard manure, crop residues, and biofertilizers improves nutrient efficiency and long-term sustainability. Organic amendments restore soil organic matter, improve water retention, and stimulate beneficial microbes. Cover crops reduce erosion and enrich soil fertility, while crop rotation balances nutrient demands and suppresses pests. Conservation agriculture and biofortification further strengthen soil health, ultimately producing resilient crops and more nutritious food for future generations.

Soil Health and Food Security

With the global population projected to approach 10 billion by 2050, ensuring adequate and nutritious food for all presents a major challenge. Climate change, water scarcity, and shrinking agricultural land further intensify this problem, making soil health essential for long-term food security. Healthy soil contributes to food security in several ways. First, it improves crop productivity, often producing 10–30% higher yields than degraded soils due to better fertility, structure, and biological activity (Brevik, 2010). Second, healthy soils enhance nutritional quality, producing crops richer in essential vitamins and minerals, thereby helping address hidden hunger. Third, soils rich in organic matter provide climate resilience by storing more water during droughts and improving drainage during heavy rainfall, reducing crop failure risks. Fourth, healthy soils reduce dependence on expensive external inputs such as fertilizers, pesticides, and irrigation, lowering farming costs and environmental impacts. Finally, healthy soils sustain rural livelihoods by maintaining long-term agricultural productivity. Therefore, investing in soil health through research, farmer education, and sustainable management practices is not merely an agricultural priority—it is essential for public health, climate resilience, and global food security.

Conclusion

The journey from farm to nutrition begins beneath our feet—in healthy soil. The nutritional quality, flavor, and safety of food largely depend on soil health, which supports plant growth, nutrient availability, and microbial activity. Healthy soil nourishes crops, and crops, in turn, nourish people. However, soil degradation, contamination, and poor management increasingly threaten food quality and human nutrition. Sustainable practices such as balanced fertilization, organic matter management, crop rotation, and soil conservation can restore degraded soils and improve food systems. Protecting soil health is therefore not only an agricultural

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responsibility but also a public health necessity. Simply put, ***healthy soil and healthy food are inseparable—nutrition truly begins in the soil.***

References

Brevik, E. C. (2010). Soil health and productivity. Soils, plant growth and crop production, 1, 106.

Elegbeleye, J. A., Fayemi, O. E., Agbemavor, W. S. K., Krishnamoorthy, S., Adebowale, O. J., Adeyanju, A. A., ... & Bamidele, O. P. (2025). Beyond Calories: Addressing Micronutrient Deficiencies in the World's Most Vulnerable Communities—A Review. Nutrients, 17(24), 3960.

Hohl, H., & Varma, A. (2009). Soil: the living matrix. In Soil heavy metals (pp. 1-18). Berlin, Heidelberg: Springer Berlin Heidelberg.

Liberato, S. C., Singh, G., & Mulholland, K. (2015). Zinc supplementation in young children: A review of the literature focusing on diarrhoea prevention and treatment. Clinical Nutrition, 34(2), 181–188. https://doi.org/10.1016/j.clnu.2014.08.002

Parker, T. (2015). Tasting French terroir: the history of an idea (Vol. 54). University of California Press.

Pavlis, R. (2020). Soil Science for Gardeners: Working with Nature to Build Soil Health. New Society Publishers.

Rahman, R., & Das, K. N. (2025). A Nexus of Soil and Human Health. Shashwat Publication.

Yunus, F. (2020). The effects of iron-fortified lentils on the iron (Fe) status of adolescent girls in Bangladesh: a double-blind, community-based, cluster-randomized controlled trial (Doctoral dissertation, University of Saskatchewan).

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Integrated Pest And Disease Management In Onion And Garlic

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Abstract

Onion and garlic are vital bulb crops globally, yet their productivity is frequently limited by diseases and insect–nematode pests. This review outlines integrated disease management for major onion and garlic diseases such as dampingoff (caused by *Pythium*, *Rhizoctonia*, *Fusarium*, and *Sclerotium* spp.), purple blotch (*Alternaria porri*), and Stemphylium blight (*Stemphylium vesicarium*), focusing on symptoms, conducive conditions, and management through clean seed, nurserybed solarization, proper spacing, drainage, and fungicide or bioagent use. Integrated pest management is also described for key pests including thrips (*Thrips tabaci*), onion maggot (*Delia antiqua* and *D. platura*), and rootknot nematodes (*Meloidogyne* spp.), emphasizing cultural practices, appropriate fertilization, irrigation, mulching, intercropping, biological options, and soil health. The synthesis highlights that combining cultural, biological, and chemical measures in a holistic strategy can reduce yield losses, improve bulb quality, and enhance the sustainability of onion and garlic production systems.

Keywords: onion, garlic, dampingoff, purple blotch, Stemphylium blight, thrips, onion maggot, rootknot nematode, integrated disease management, integrated pest management, crop protection.

Introduction

Onion and garlic are among the most important bulb crops grown worldwide, contributing significantly to both home consumption and commercial trade. However, their productivity is frequently constrained by a complex of fungal diseases and insect–nematode pests that reduce stand establishment, bulb size, and yield. Diseases such as dampingoff, purple blotch, and Stemphylium blight directly affect foliage and bulbs, whereas pests like thrips, onion maggots, and rootknot nematodes damage seedlings, roots, and bulbs, often leading to crop loss and poor market quality. An integrated approach that combines cultural, biological, chemical, and physical tactics is essential for sustainable management of these constraints. This compilation presents the major diseases and key pests of onion and garlic, along with their symptoms and recommended integrated management strategies, to support judicious and environmentally sound crop protection.

Integrated disease management in onion and garlic

1. Damping-off

Causal organisms: Pythium aphanidermatum, Pythium debaryanum, Rhizoctonia solani, Fusarium spp., Sclerotium spp.

Symptoms: Damping-off in onion seedlings occurs in two phases: pre-emergence and post-emergence. In the pre-emergence phase, seedlings die before emerging from the soil. In many cases, death occurs even

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before the hypocotyl breaks through the seed coat.

In the post-emergence phase, seedlings collapse after emerging from the soil. The infection typically occurs at or just above ground level, where tissues become soft and water-soaked

Management:

Prepare raised nursery beds (8–10 cm height) to ensure proper drainage.

Use healthy, disease-free seeds.

Follow crop rotation with non-host crops for 3–4 years.

Solarise the nursery beds with transparent polythene sheets for about 30 days before sowing.

2. Purple blotch

Causal organism: Alternaria porri

Symptoms: Purple blotch is a common disease affecting onion and garlic worldwide. It develops best at temperatures between 21–30°C and is particularly severe in hot and humid climates, causing up to 50% reduction in bulb and seed yield.

Initial symptoms appear as small, sunken, whitish spots on leaves, which enlarge and may encircle them. Later, oval-shaped lesions with characteristic purple coloration develop, often showing concentric rings. Leaves and stems gradually fall over

Management: Use certified, healthy seeds or planting materials.

Treat seeds with Thiram or Captan @ 2.5 g/kg, Carbendazim @ 1 g/kg, or Trichoderma viride @ 4–5 g/kg.

Apply nursery drenching with Thiram (2.5%), Carbendazim (0.1%), or Trichoderma viride @ 4–5 g/L.

3. Stemphylium blight

Causal organism: Stemphylium vesicarium

Symptoms: Stemphylium blight affects onion and garlic crops in many regions including Europe, Africa, the USA, and India. Early symptoms appear as small yellow to orange streaks or flecks on leaves. These develop into elongated, spindle-shaped or oval lesions that may extend to leaf tips. The center of the spots turns grey, while margins become brown to dark olive.

Management: Maintain proper plant spacing and good field drainage.

Avoid excessive application of nitrogen fertilizers.

Integrated pest management in onion and garlic

Thrips

Causative Agent: *Thrips tabaci*

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Symptomatology and Thresholds : No reliable treatment threshold exists, but mid-season levels of 30 thrips per plant warrant action. For small onion producers, treat when 20% of plants are infested. Other thresholds include 3 thrips per green leaf or cumulative thrips-days of 500–600 (e.g., 50–60 thrips over 10 days).

Management Strategies

Mulching: Aluminum-coated mulch repels thrips by 33–68%.

Intercropping: Pairing onions with maize or carrots reduces thrips populations.

Soil Nutrition: Avoid low calcium or high nitrate levels, which attract thrips.

Irrigation: Use sprinkler irrigation to mimic rainfall and suppress thrips. Water stress amplifies damage by increasing water loss from affected tissues.

Onion Maggot

Causative Agent: *Delia antiqua* (Meigen) and *D. platura*

Symptomatology : Adults are ¼-inch-long, gray-brown, bristly, humpbacked flies. Eggs are white, elongated, with ridged surfaces and a hexagonal pattern. Maggots are ⅓-inch-long, legless, creamy-white cylinders tapering at the head; they pupate in chestnut-brown puparia. Females lay small batches of eggs on soil near seedling bases after mating once (males mate repeatedly). Maggots thrive in soils rich in organic matter, where they target seeds.

Management Strategies : Avoid planting in soils high in undecomposed organic matter.

Follow proper crop rotations to prevent infestations.

Biological Control: No reliable field-level natural enemies exist. Braconid (*Aphaereta pallipes*), staphylinid, and *Aleochara bilineata* increase maggot mortality but perform poorly in fields. Ground beetles' prey on maggots; enhance populations by adding grassy refuse strips within onion crops

Root-Knot Nematode

Causative Agent: *Meloidogyne* spp.

Symptomatology

Affected crops exhibit stunted growth, leaf yellowing, smaller bulbs, delayed maturity, and wilting despite sufficient soil moisture. Severely infected seedlings develop few roots and often die quickly. Heavy infections in mature plants lead to sudden wilting and premature death.

Management Strategies

Grow seedlings in nematode-free soil; test fields for nematodes before planting.

Use crop rotation; avoid repeated planting of susceptible crops in infested areas.

Practice summer fallowing: Keep infested areas free of vegetation to starve nematodes (hatched juveniles die without host plants).

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Apply soil solarization: Cover moist, raised beds with clear plastic for 2–4 months during peak heat; elevated temperatures kill nematodes, eggs, and pathogens as juveniles hatch and starve.

Conclusion

Effective production of onion and garlic requires a proactive, integrated strategy that addresses both biotic constraints and field conditions. Timely identification of dampingoff, purple blotch, and Stemphylium blight, along with clean seed use, crop rotation, nurserybed solarization, and judicious fungicide or bioagent treatments, can greatly reduce disease incidence and yield loss. Similarly, integrated pest management based on proper planting, balanced fertilization, soil preparation, intercropping, mulching, and biological options helps keep thrips, onion maggot, and rootknot nematode populations below economic thresholds. By combining these practices into a coherent plan, growers can sustain yields, improve bulb quality, reduce reliance on chemicals, and enhance the longterm sustainability of onion and garlic cultivation..

References

Mishra, R. K., Jaiswal, R. K., Kumar, D., Saabale, P. R., & Singh, A. (2014). Management of major diseases and insect pests of onion and garlic: A comprehensive review. Journal of Plant Breeding and Crop Science, 6(11), 160-170.

Mishra, R. K., Adholeya, A., & Sardana, H. R. (2012). Integrated Pest Management: strategies for onion and garlic. The Energy and Resources Institute (TERI)

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Role of SHG–Bank Linkage Programme in Advancing Financial Inclusion and Sustainable Development Goals in India

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Abstract

The Self Help Group - Bank Linkage Programme has been a major step forward for India in financial inclusion, women's empowerment and poverty reduction. This analysis based on NABARD data for the year 2022-23 brings forth significant increase of savings and credit, decline in NPAs, continuing regional imbalances and considerable contribution of the programme to achievement of multiple Sustainable Development Goals.

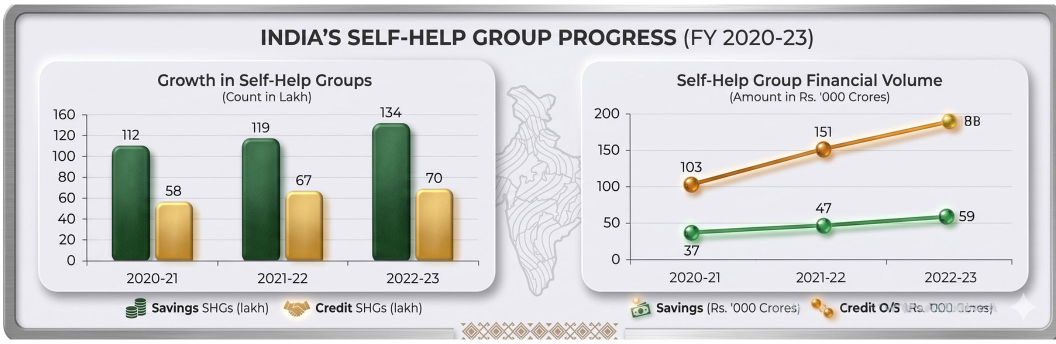
Keywords – SHG-Bank Linkage Programme; Financial Inclusion; Women Empowerment; Sustainable Development Goals (SDGs)

Introduction

Microfinance has emerged as an important tool for financial inclusion and poverty alleviation in India during the last three decades, impacting almost 100 million rural families (NABARD, 2023). It is based on the ideas of Muhammad Yunus and supports women`s empowerment, savings and diversification of income through collateral free financing. India's diversified microfinance ecosystem include banks, RRBs, cooperative banks, NBFC-MFIs, and Small Finance Banks. Started by National Bank for Agriculture and Rural Development in 1992, today the world's biggest microfinance program, is a key driver to accomplishing the Sustainable Development Goals.

The SHG-Bank Linkage Programme: Structure and Models

The Self Help Group-Bank Linkage Programme is based on three types. In Model I, self-formed SHGs are directly financed by banks. The most popular form, form II, is that of NGOs and other agencies promoting SHGs and linking them to banks. In Model III, the MFIs are intermediates, borrowing from banks and lending to SHG members. The scheme is supported by the Reserve Bank of India policy and encourages savings and credit discipline. Massive increase, yet credit gaps persist. In 2022-23, 66.6 lakh SHGs (46.24%) were not



... 2020-21 to 2022-23 while ...% of SHGs, showing the

Figure 1: India's Self-Help Group Progress (FY 2020-23) — Growth in SHG Count (lakh) and Financial

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Volume (Rs. '000 Crores). Source: NABARD, 2023.

The savings- and credit-linked SHGs have shown sustained expansion (Fig. 1). Credit-linked groups, however, increased more slowly, suggesting a persisting credit gap. The financial depth and the maturity of the SHGs increase with the increase in the loans per group.

Regional and Agency-wise Performance

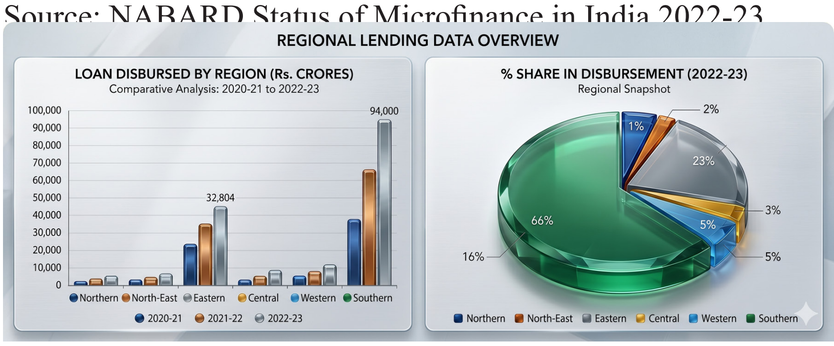
Region-wise Savings Linkage

Table 1 shows FY 2022-23 SHG savings deposits with banks by area. The Southern area leads with Rs. 28,968 crore, approximately 49.2% of the national total of Rs. 58,893 crore. Eastern area follows at 29.6% (Rs. 17,425 crore). North had a 38.6% fall over the previous year, while West saw the biggest increase of 65.3%, showing momentum in non-traditional states.

Table 1: Region-wise Savings Linkage of SHGs with Banks (FY 2022-23)

Region	Savings Amount 2022-23 (Rs. (Cr	Change over Previous Year %
Northern	1,225	−38.6%
North-Eastern	1,272	+19.5%
Eastern	17,425	+28.3%
Central	4,587	+40.8%
Western	5,416	+65.3%
Southern	28,968	+20.4%
Total	**58,893**	**+24.7%**

Source: NABARD Status of Microfinance in India 2022-23



…s. 58,071 crore in 2020-21 to Rs. 1,45,200 …%) and the East (23%). In FY 2021-22, the …e its tiny share.

Figure 3: Regional Lending Data Overview — Loan Disbursed by Region (Rs. Crores) and % Share in Disbursement (2022-23). Source: NABARD, 2023.

A bar chart displays loan distribution by location and a pie chart shows FY 2022-23 percentage share in Figure 3. Southern dominance is 66% in the pie graphic. Eastern is second (23%), while Northern, North-Eastern, Central, and Western make up 11%. This regional lending skew reveals that the SHG-BLP's credit delivery infrastructure is concentrated in historically strong states, a systemic issue that future programming must address.

Agency-wise Performance

SHG-BLP agency status for FY 2022-23 appears in Table 2. Commercial banks dominate the initiative with 57.8% of savings-linked SHGs (77.53 lakh groups) and 59% of total loans. Rural Regional Banks hold 30.2% of savings-linked SHGs. Though grassroots, cooperative banks have a 6.15 percent Non-Performing Asset (NPA) percentage compared to 2.63 percent for commercial banks and 2.48 percent for RRBs, necessitating institutional development and better credit evaluation.

Table 2: Agency-wise Status of SHG-Bank Linkage Programme (FY 2022-23)

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Agency	Savings SHGs (No.)	Savings Amt (Rs. lakh)	Loan Dis-bursed (No.)	Loan O/S (Rs. lakh)	NPA %
Commercial Banks	77,53,137	34,68,998	24,71,417	1,29,24,409	2.63%
Regional Rural Banks	40,47,836	18,20,277	15,70,469	48,21,594	2.48%
Cooperative Banks	16,02,110	5,99,993	2,53,635	10,61,877	6.15%
Total	**1,34,03,083**	**58,89,268**	**42,95,521**	**1,88,07,880**	**2.79%**

Source: NABARD Status of Microfinance in India 2022-23.

NPA Trends and the E-Shakti Digital Initiative

The SHG-BLP's portfolio-wide drop in Non-Performing Assets (NPAs) is positive. Figure 4 shows that the SHG loan portfolio's NPA proportion dropped from 6.2% in FY 2018-19 to 2.79 percent in FY 2022-23, notwithstanding the COVID-19 epidemic as shown in Figure 4.

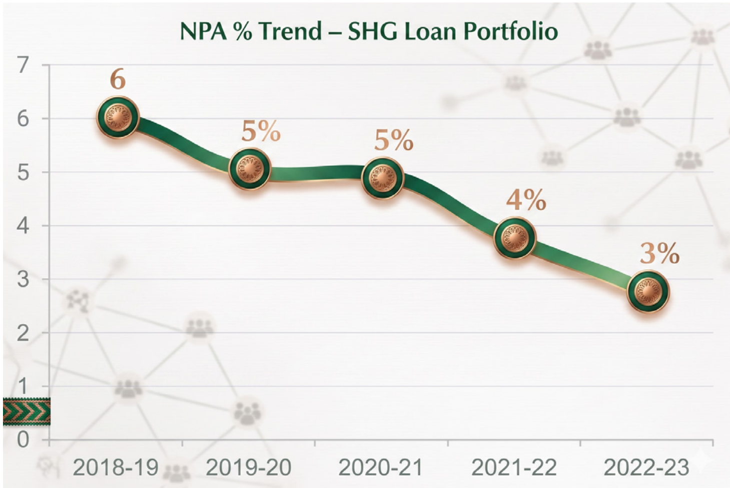

Figure 4: NPA % Trend — SHG Loan Portfolio (FY 2018-19 to 2022-23). Source: NABARD, 2023.

This development was assisted by NABARD's 2015 E-Shakti digital project. SHG records, savings, loans, repayment history, and group grading are digitized to enable banks make data-driven lending decisions and eliminate information asymmetry between rural groups and formal financial institutions.

Microfinance and the Sustainable Development Goals

The Self Help Group–Bank Linkage Programme reduces poverty, improves food security, health, education, and women's empowerment. Credit increases income diversification, savings, and micro-enterprise growth, furthering SDG 1, 2, and 8. SHG involvement enhances healthcare awareness and children's education, supporting SDG 3 and 4. As most borrowers are women, SHG-BLP supports SDG 5 (Gender Equality) and helps India achieve its 2030 development objective.

Conclusions

In India, the Self Help Group–Bank Linkage Programme has altered poverty reduction, women's empowerment, and financial inclusion. The world's largest microfinance program connects disadvantaged people to formal finance through savings and group loans. NPAs decreased from 6.2% in 2018-19 to 2.79% in 2022-23, with outstanding credit reaching ₹1.88 lakh crore. Despite this development, over half of SHGs are uncredit-

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linked and regional inequities continue. The scheme, supported by National Bank for Agriculture and Rural Development, Reserve Bank of India, and E-Shakti, is crucial to reaching the Sustainable Development Goals by 2030.

References

Imai, K. S., Arun, T., & Annim, S. K. (2010). Microfinance and household poverty reduction: New evidence from India. World Development, 38(12), 1760–1774.

NABARD. (2023). Status of Microfinance in India 2022-2023. National Bank for Agriculture and Rural Development, Mumbai, India.

Sarumathi, S. (2011). Role of Micro Finance in Women's Empowerment. Journal of Management Science, 1(5), 11–21.

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Maturity Indicators and Harvesting Practices in Solanaceous Crops

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Abstract

Solanaceous crops such as tomato (*Solanum lycopersicum*), brinjal (*Solanum melongena*), chilli (*Capsicum annuum*), and capsicum play a vital role in vegetable production and nutrition. Proper identification of maturity indices and timely harvesting are essential for ensuring optimum yield, quality, and market value. These crops exhibit specific maturity indicators such as colour change, fruit size, glossiness, firmness, and seed development, which vary depending on their intended use (fresh consumption, processing, or distant transport). Harvesting practices including stage selection, method of picking, and harvesting intervals significantly influence post-harvest quality and shelf life. Understanding these aspects helps in minimizing losses and improving economic returns to farmers.

Introduction

Solanaceous vegetables are among the most widely cultivated and economically important crops in India and across the world. Crops like tomato, brinjal, chilli, and capsicum are valued for their nutritional content, culinary uses, and market demand. However, achieving high productivity and quality depends largely on harvesting the fruits at the correct stage of maturity. Maturity indices serve as reliable indicators to determine the appropriate time for harvesting. These indices include external characteristics such as colour, size, and gloss, as well as internal factors like seed development and firmness. Since solanaceous crops are harvested for different purposes—such as fresh consumption, processing, or long-distance marketing—the stage of harvest varies accordingly. In addition, proper harvesting techniques, including careful handling, appropriate tools, and timely picking, are essential to reduce mechanical damage and post-harvest losses. Therefore, knowledge of maturity indices along with suitable harvesting practices is crucial for maintaining quality, extending shelf life, and ensuring better returns for growers.

1. Tomato : Tomato fruits are harvested at different stages depending on market distance and purpose.

Important maturity indices:

- **Green mature stage** – fruit is fully grown but green; suitable for distant markets
- **Breaker/pink stage** – slight pink colour appears; ideal for local markets
- **Red ripe stage** – full red colour, soft texture; best for fresh consumption
- **Fully ripe stage** – maximum colour development and sweetness

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Other indicators:

- Seeds become hard and gel fills locules
- Colour change from green to red
- Fruit softening during ripening

Brinjal

Brinjal fruits are harvested at the tender stage before full maturity.

Key maturity indices:

- Fruits attain desirable size and shape
- Bright, glossy skin (loss of shine indicates over maturity)
- Soft, immature seeds inside
- Flesh remains tender and non-fibrous

Additional clues:

- Fruit harvested about 40 days after flowering
- Over-mature fruits become dull, seedy, and bitter

3. Chilli

Chilli harvesting depends on its end use (green vegetable or dry spice).

Maturity indices:

For green chillies:

- Fully grown fruits but still green in colour
- Firm and tender

For dry chillies:

- Fruits turn bright red
- Fully ripe and suitable for drying

General indicators:

- Colour change from green → red
- Harvesting done in multiple pickings (5–6 times)
- Crop matures in about 60–90 days

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4. Capsicum / Bell Pepper

Capsicum fruits are usually harvested at the immature stage for vegetables.

Maturity indices:

- Fruits are well-developed, firm, and glossy
- Green or yellow colour at harvest stage
- Crisp texture and proper size
- For processing, fruits may be harvested at full colour stage (red/yellow)

General Principles of Harvesting

- Harvest at the proper maturity stage depending on purpose (fresh market, processing, or transport)
- Carry out harvesting during cool hours (morning or evening)
- Avoid harvesting during rain or wet conditions
- Use hand picking or sharp tools to prevent damage
- Handle fruits carefully to avoid bruising and injury
- Perform grading and sorting immediately after harvest

1. Tomato

Harvesting stage:

- **Mature green stage** – for distant markets
- **Breaker/pink stage** – for nearby markets
- **Fully ripe stage** – for local consumption and processing

Method:

- Fruits are picked by hand with or without pedicel
- Harvesting starts 60–90 days after transplanting
- Multiple harvests at 3–4-day intervals

2. Brinjal (Eggplant)

Harvesting stage:

- Fruits harvested at tender stage when they are glossy and firm
- Seeds should be soft and immature

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Method:

- Fruits are cut with a small portion of stalk using a knife or secateurs
- First harvest begins 50–70 days after transplanting
- Picking is done at 4–5-day intervals

3. Chilli

Harvesting stage:

- **Green chillies** – harvested when fully grown and green
- **Dry chillies** – harvested when fruits turn red and ripe

Method:

- Fruits are picked manually
- Harvesting starts 60–80 days after transplanting
- Done in 5–6 pickings at weekly intervals

4. Capsicum (Bell Pepper)

Harvesting stage:

- Harvested at green mature stage for vegetables
- For processing, harvested at full colour stage (red/yellow)

Method:

- Fruits are harvested with a short stalk using a knife
- First harvest starts 60–75 days after transplanting
- Picking is done every 3–5 days

References:

- *Moriondo, M., Bindi, M., & Sinclair, T. (2005). Analysis of Solanaceae species harvest-organ growth by linear increase in harvest index and harvest-organ growth rate. Journal of the American Society for Horticultural Science, 130(6), 799-805.*
- *Okiror, P., Lejju, J. B., Bahati, J., Kagoro Rugunda, G., & Sebuuwufu, C. I. (2017). Maturity indices for tomato (Solanum lycopersicum L.), cv. Ghalia 281 in Central Uganda.*

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Innovative essential oil -based coatings for extending the shelf life of vegetables

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Abstract

Vegetable post-harvest losses are a chronic worldwide problem due to their rapid perishability, leading to significant nutritional and economic losses. Interest in natural preservation techniques has increased due to growing customer demand for safe, chemical-free foods. Essential oil-based edible coatings are a novel, environmentally responsible way to extend the shelf life of vegetables. These coatings reduce respiration, water loss, and microbial growth on product surfaces by forming a thin, semi-permeable layer. The oils have strong antibacterial and antioxidant properties that inhibit deterioration and maintain quality since they are infused with powerful bioactives, including linalool, eugenol, and cinnamonaldehyde.Methods like spraying or dipping encourage optimal performance and uniform covering. These coatings significantly increase storage time while maintaining texture, colour, and nutrient content, according to research. In conclusion, they offer a practical, environmentally friendly alternative to chemical preservatives, promoting sustainable post-harvest methods, waste minimisation, and food security.

Keywords: essential oils, edible coatings, shelf life extension, post-harvest losses, vegetable preservation

Introduction: The need for natural solutions to reduce vegetable spoilage:

Present day consumers are highly conscious towards healthy food options. This created the need to look into natural alternatives to enhance the shelf life of perishable produce by reducing the use of chemical preservatives and other additives. Post-harvest losses of fruits and vegetables account for more than 20% of losses or squandered, creating a huge global issue, and 3-18% lost during processing owing to human error in handling, poor management, and mechanical failures. Vegetables are prone to higher perishability due to their high water content, continuous respiration, and sensitivity to ethylene. This leads to loss of membrane permeability of cells, and the produce will lose its texture. This will further make them vulnerable to microbial contamination, rendering them susceptible to deterioration by bacteria, fungi, and moulds. For example, fruits with a pH below 4.5 are less susceptible to fungal growth, whereas vegetables having a pH between 4.8 and 6.5 are more susceptible to both fungi and bacteria. Though storage at low temperatures between 0-5 °C can reduce respiration and microbial growth, chilling damage and the survival of psychrotrophic bacteria remain a concern. With the global population expected to exceed 9.1 billion by 2050, simply expanding output will not suffice; decreasing post-harvest losses, using eco-friendly preservation technologies such as edible coatings is critical. Edible coatings are applied as a thin layer with biopolymer-based coatings, serve as natural packaging, act as a barrier between the produce and atmosphere thereby helps in reduces respiration rate,

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minimises moisture loss, and protects against microbial deterioration, providing a more sustainable alternative to chemical additives and plastic packaging materials, while prolonging shelf life and improving food quality. (Perez-Vazquez *et al*., 2023).

The power of essential oil -based extracts from various horticultural plants:

nature's hidden preservatives:

Common culinary spices have significant antibacterial and antioxidant qualities, making them excellent natural preservatives for fresh produce. Medicinal and aromatic crops including lemongrass, oregano, tulsi, mint, neem, and spices such as cinnamon, and clove have bioactive components that limit the growth of spoilage microorganisms and minimise the oxidative processes that cause quality degradation. Eugenol, cinnamaldehyde, linalool, azadirachtin are some of the bioactive components present in various essential oils, with antibacterial and antifungal action. When these essential oil -extracts are mixed into edible coatings, along with barrier effect of edible coating it will also get antifungal and antibacterial action, thereby protects perishable vegetables from microbial invasion. Essential oils also form a thin protective layer on the upper surface of vegetables, helping to control respiration rate, prevent moisture loss, delay enzymatic browning by preventing the exposure of the produce surface to oxygen, and suppress microbiological growth. This protective layer reduces physiological and biochemical changes during storage, preserving freshness, texture, and nutritional value. As a result, vegetables treated with essential oil -based edible coatings can stay fresh for 15-35 days in low-temperature storage, whereas the untreated vegetables typically last for only 8-10 days (Rajial *et al*., 2024). This clearly underscores the promising role of essential oil -based edible coatings in shelf-life extension and quality retention of perishable vegetables.

Innovative essential oil -based edible coatings: how the technology works:

Innovative essential oil -based edible coatings create a thin protective layer of natural, food-grade ingredients on the surface of vegetables, acting as a semi-permeable barrier against moisture, oxygen, and microbial contamination. Essential oil applied on the surface of produce as a coating restricts the entry of oxygen to the produce. This leads to slow down of respiration and also reduces enzymatic browning caused by enzymes such as polyphenol oxidase (PPO). The activity of PPO enzyme gets inactivated in the absence of oxygen. Antifungal and antibacterial properties of essential oils prevent the microbial invasion by preventing the availability of oxygen to microbes for their normal respiration, which can lead to inhibition of energy production and result to death of microorganisms. These coatings are often made from natural polymers such as polysaccharides, proteins, or lipids and can be supplemented with antibacterial and antioxidant-rich plant extracts, herbs, or essential oils extracted from various spices, medicinal and aromatic crops. The coating can be applied by either dipping or spraying vegetables with a prepared solution, which generates a protective film on the surface. As a result, the produce's metabolic activity is slowed, which helps to maintain texture, colour and nutritional content throughout storage. Such coatings also prevent microbial growth, which leads to significant (roughly 30%) postharvest losses in horticultural crops after harvest, during transportation and storage. When proper protocols are followed for the concentration used and thickness of the coating maintained, these edible films can increase the storage life of minimally processed veggies to 21 days without compromising the nutritional quality and sensory properties, which generally last only 4-7 days under normal storage conditions (Zdulski *et al*.,2024).

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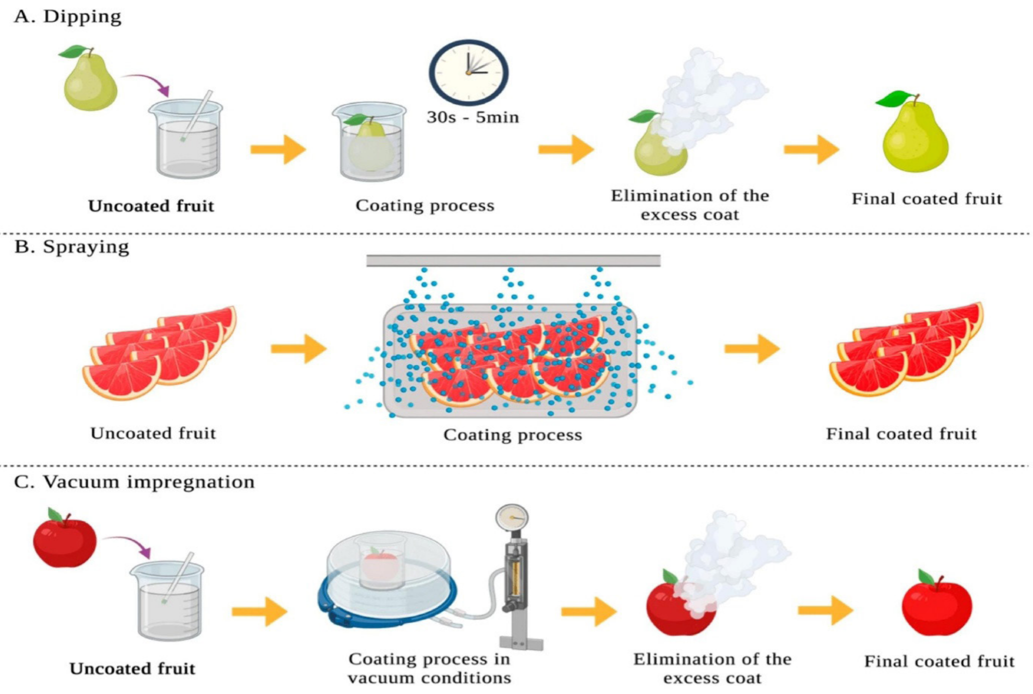

Schematic representation of the processes used for the coating application on fruits and vegetables. (A): dipping; (B): spraying; (C): vacuum impregnation. (Perez-Vazquez *et al*.,2023).

Benefits of essential oil -based coatings for food safety and sustainability:

Important advantages for food safety and sustainability are provided by edible coatings derived from essential oil -based extracts. Being extracted from the natural sources the ill-effects caused by chemical preservatives and other additives can be surpassed. In addition, they will provide additional health being rich in bioactive compounds with antioxidant capacity. Thereby, helps in scavenging the free radicles formed and act as anticancer agents. Terpenes, pehnols and aldehydes present in various essential oils prevent microbial spoilage without causing any adverse effects to human health. They also have flavour compounds that improve the sensory characteristics in the vegetables. These essential oil-based edible coatings play a pivotal role in shelf-life extension and quality retention of minimally processed vegetables, where no chemical additives are accepted because of the risk due to direct contact of the chemicals with the produce. Microbial deterioration is reduced, and spoilage organisms are further controlled by adding plant based extracts and essential oils, which are rich in terpenes and phenolic compounds that have antibacterial and antifungal properties. Overall, by reducing synthetic chemicals and packaging materials for extending the shelf life of perishable goods, these essential oil -based coatings act as sustainable and healthy alternative to prevent postharvest losses and allow for longer transit and storage times by extending shelf-life, minimise food waste and enhance eco-friendliness (Zaidi *et al*.,2023).

Conclusion: a promising future for essential oil -based preservation:

Vegetables and other perishable horticulture items can be preserved with a promising and sustainable method using edible coatings based on essential oils extracted from various spices, medicinal and aromatic plants. The essential oil -based coatings improve the sensory properties, maintains nutritional quality and prevent enzymatic browning and microbial invasion. Vegetables and other perishable horticultural items can be preserved in a promising and sustainable way by applying spice-based coatings that are rich in flavour

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compounds. The inclusion of natural bioactive ingredients such as plant extracts and essential oils enhances vegetables' antibacterial and antioxidant activities, extending their nutritional and sensory qualities. (Perez-Vazquez et al.,2023).

References:

Perez-Vazquez, A., Barciela, P., Carpena, M., & Prieto, M. A. (2023). Edible coatings as a natural packaging system to improve fruit and vegetable shelf life and quality. Foods, 12(19), 3570.

Rajial, H., & Varma, S. (2024). Edible Coatings: a Novel Approach to extending the Shelf life of fruits and vegetables. Journal of Advances in Biology & Biotechnology, 27(7), 25-37.

Zaidi, M., Akbar, A., Ali, S., Akram, H., Ercisli, S., Ilhan, G., ... & Anjum, M. A. (2023). Application of plant-based edible coatings and extracts influences the postharvest quality and shelf life potential of "Surahi" guava fruits. ACS omega, 8(22), 19523-19531.

Zdulski, J. A., Rutkowski, K. P., & Konopacka, D. (2024). Strategies to extend the shelf life of fresh and minimally processed fruit and vegetables with edible coatings and modified atmosphere packaging. Applied Sciences, 14(23), 11074.

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Success story of a farmer under organic farming

Success story of a farmer under organic farming

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ABSTRACT

Mule Ramnanda Reddy father from Obulapuram village of Mydukur mandal of YSR District had been doing chemical farming and is practicing mono-cropping system which didn't fetch him higher yields and profits. At present he is getting an additional income of Rs.60,000/- per month due to Organic farming cultivation in Jasmine.

Keywords: organic inputs, Organic farming and Biofertilizers

Introduction: By getting interest in farming M.Ramananda Reddy had said good bye to mono-cropping and started practicing Integrated farming. He practiced Integrated farming by avoiding chemicals and pesticide usage and included Natural farming and Organic farming and was interested in getting awareness of the above. By practicing this type of farming daily he was getting good income by facing drought conditions and even flood situations. The farmer was having 2 acres of land and in this he is growing Jasmine, Lily, Drumstick, Super Napier for fodder purpose. Most importantly he is growing Jasmine and getting good income by reducing cost of cultivation through organic farming.

Ramnanda Reddy in his Jasmine crop he is using DravaJeevamrutham, Ghanajeevamrutham and along with that Dr.YSRHU, KVK, Vonipenta Scientists have said him to use bio-fertilizers like *Trichoderma, Phosphate Solubilizing Bacteria (PSB) and Azospirillum*. By using these fertilizers, the jasmine flower quality, shelf life and the colour was bright which helped him to get good market price. By using this bio-fertilizers his cost of cultivation had been reduced and fetched him with higher profits was said by Dr.M.Balakrishna, Senior Scientist and Head, KVK, Vonipenta

During initial days when he first kept the Jasmine crop, he was growing intercrops like Coriander, Groundnut and was getting good income even from the intercrops. He was growing border crops and by this he was controlling pest and disease spread and also through the fodder he is using it for his cattle and also by selling the fodder slips he is getting good income.

Ramnanda Reddy said that when he was practicing natural farming, he was not able to do the natural

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products at the correct time. KVK, Vonipenta scientists have given suggestions on usage of bio-fertilizers and by using them my jasmine crop had fetched good yields and had increased the shelf life of the jasmine crop also. My field is green for 365 days and getting daily income. He said I am very grateful to the scientific staff of KVK, Vonipenta who have helped me in all means and a special thanks to Dr.M.Balakrishna garu, Senior Scientist and Head of KVK, Vonipenta.

KVK, staff who have given suggestions on usage of biofertilizers Ramnanda Reddy was growing Jasmine crop for a period of 6 months he was getting good yields and good income. February to July or up to August jasmine flower will be obtained. In this everyday he is getting 15 kgs of flowers where 1 kg costed Rs. 200/- with a gross income of Rs.3000/- and with cost of cultivation of Rs.1000/- for labour on an average he is getting Rs.60,000/- per month per acre. Marketing aspects he is taking the help of KVK, Vonipenta and he is standing as a best example and he is inspiring to most of the farmers was said by Dr.Srividya Rani.N, Scientist (Extension).

In the month of January pruning activities and remove the leaves and cut the stems and by this the size of the Jasmine had increased and also the buds had been increased. For this cultivation his wife Lakshmi help and also his family support was very good and due to that only he is doing farming happily.

Conclusion:

Organic farming through usage of Biofertilizers fetched in getting higher returns. Biofertilizers like Trichoderma, Azospirillum and Pseudomonas mainly helped in reducing the risk of over fertilization and minimizing chemical run-off. His family is the major strength to him in supporting in doing organic farming in Horticultural crops.