ISSN:2583-9071
VOLUME 2, ISSUE 1 I JAN 2024

A STEP TOWARDS AGRICULTURE

Agri Roots
e-Magazine

WE WISH YOU A

HAPPY

NEW YEAR

2024

May the year ahead be a chapter of endless possibilities and new beginnings.

JANUARY 2024
WWW.AGRIROOTSMAGAZINE.IN

THERE IS NOTHING LIKE NEW YEAR TO SEEK NEW THINGS

·HAPPY·NEW·YEAR·

AGRI ROOTS
e-Magazine

ISSN:2583-9071(Online)

TABLE OF CONTENT

THE ARTICLES PUBLISHED IN THIS MAGAZINE ARE BASED ON PERSONAL VIEW/OPINION OF THE AUTHORS. MAGAZINE DOES NOT ENSURE THE GENUINELY OF THE FACTS MENTIONED IN THE ARTICLES. AUTHORS ARE SOLELY RESPONSIBLE FOR PLAGIARISM PRESENT IN THE ARTICLE

MEET *the* EDITORIAL BOARD

Dr. Ravindra Kumar

Editor

Senior Scientist, Plant Pathology, Crop Protection Division, ICAR- Indian Institute Of Wheat And Barley Research, Karnal (Haryana), India

Dr. Dilpreet Talwar

Editor

Extension Scientist (Vegetable), College Of Horticulture And Forestry, Punjab Agricultural University, Ludhiana (Punjab) India

Dr. Pankaj Kumar Kannaujia

Editor

Scientist (Senior Scale), Horticulture, Division Of Plant Exploration And Germplasm Collection, ICAR- NBPGR (New Delhi), India

Dr. Vineet Kumar

Editor

Assistant Professor, Department Of Soil Science, Galgotias University, Greater Noida (Uttar Pradesh) , India

MEET *the* REVIEWER BOARD

Dr. Khushboo Kathayat
Reviewer
Assistant Professor, Department of Horticulture, College of Agriculture. Lovely Professional University, Phagwara (Punjab), India

Dr. Pratima Gupta
Reviewer
Subject Matter Specialist, KVK, Nagina, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh), India

Dr. Sauhard Dubey
Reviewer
Subject Matter Specialist, KVK, Ujhani, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh), India

Dr. Pankaj Kumar
Reviewer
Subject Matter Specialist, KVK, Chandausi, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh), India

Mr. Navdeep Singh
Reviewer
Ph.D. Scholar, Horticulture (Vegetable Science), Punjab Agricultural University, Ludhiana (Punjab), India

WE WISH YOU A HAPPY

new year

from the editor

As we usher in the promising dawn of a new year, we extend our heartfelt wishes to the entire agricultural community. The resilience and dedication of farmers worldwide have been a source of inspiration, especially during challenging times. As we turn the page to a new chapter, let us express our sincere hopes for a year filled with abundant harvests, sustainable practices, and innovative solutions that elevate the agricultural sector.

May the fields be fertile, the weather cooperative, and the yields bountiful. In the spirit of collaboration, let us continue to foster connections within the agricultural community, sharing knowledge, and supporting each other in the pursuit of a thriving and resilient global food system.

Here's to a prosperous New Year in agriculture, marked by growth, prosperity, and the sustainable cultivation of our planet's most vital resources. May the upcoming seasons bring forth not only abundant crops but also new opportunities for advancement and prosperity for every farmer and agriculture enthusiast. Happy New Year to the unsung heroes of our sustenance – the farmers!

Here's to a flourishing New Year in agriculture, filled with promise, progress, and a plentiful harvest for all.

Dr. Deepak Kumar
FOUNDER & EDITOR

EXPLORING KNOWLEDGE & DISCOVERING AGRICULTURE

WE WISH YOU A HAPPY

new year

AGRI ROOTS E-MAGAZINE

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Fungi's Gift to the Soil: Transforming Waste into Green Gold with Spent Mushroom

ARTICLE ID: 0052

Rohit Kumar[1], Rinku Bhaskar[2], Shivani Datre[3]

[1,2]Ph.D. Research scholar, Department of Plant Pathology, Sardar Vallabhbhai Patel University of agriculture and Technology, Meerut (U.P.) 250110

[3]M.Sc. Ag. Department of Plant pathology. Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P)

The concept of spent mushroom substrate (SMS) revolves around the idea of repurposing the organic medium generated during mushroom cultivation. SMS, also known as spent mushroom compost (SMC), is essentially composed of agricultural residues and fungal mycelium that remain after the mushrooms have been harvested. This organic material is typically created from renewable sources, including sawdust, sugarcane bagasse, and various other agricultural byproducts. Each cycle of mushroom cultivation, which typically spans 5 to 6 months, results in a significant amount of SMS.

The key concept is to explore and promote the recycling and reuse of SMS, making it an economically and environmentally favourable option. This is driven by the fact that for every 1 kg of mushrooms produced, approximately 5 kg of SMS is generated. Given the high organic matter content of SMS, there has been a surge in scientific research and innovative applications in recent years.

Agaricus bisporus **(Button Mushroom)**

The article emphasizes recent advancements in enzyme production using SMS, highlighting its potential role in various areas. These include bioremediation, where SMS can be used to degrade contaminants in the environment. Additionally, SMS has been found to have applications in animal feeding, as it contains bioactive enzymes that enhance the nutritional value of livestock feedstock. Furthermore, SMS is being explored for its potential in alternative energy production.

The broadening spectrum of applications for spent mushroom substrate, including its uses in agriculture, environmental management, and energy recycling, has prompted the adoption of a more fitting name: "used mushroom substrate." This name change reflects the growing awareness of its versatile and valuable role in sustainability and resource management.

Mushroom Cultivation

Steps in Mushroom Production

- Selection of mushroom spores or strains
- Maintenance of mycelial cultures
- Development of spawn/inoculum
- Choosing a growing medium
- Pasteurizing or sterilizing the medium
- Seeding the beds with spawn (material from mature mushrooms grown on sterile media

Spent Mushroom Substrate

Spent mushroom substrate (SMS) is the soil-like material remaining after a crop of mushrooms has been harvested. It is high in organic matter, making it desirable for use as a soil amendment or soil conditioner. Sometimes this material is called spent mushroom compost (SMC).

Spent Mushroom Substrate

Recycling Procedure

Characteristic of Mushroom Waste

1. High Organic matter content
2. High moisture content
3. Moderate plant nutrient content
4. Relatively low bulk density
5. Unbalance distribution of major plant nutrients

Why Use SMS

The most valuable aspect of SMS is its high organic matter. This allows soil to retain moisture in dry weather and shed it during wet weather. By creating air spaces, SMS acts as a sponge in gravel or sandy soils and permits clay soils to drain. SMS will not leach from the ground. Nutrients remain in the soil and, unlike inorganic fertilizers, do not contribute to groundwater pollution if applied correctly.

There are many advantages of SMS over other composts produced from food and garden wastes including:

- A consistent, formulated & homogeneous product The SMS production cycle occurs all year round with consistent materials and compost products.
- High water & nutrient holding capacity SMS includes sphagnum peat and an organic matter formulation resulting in moisture and nutrient retention.

- ❖ Weed free nature Extensive composting and indoor pasteurization ensures that weed seeds cannot enter the product.
- ❖ No nitrogen draw-down problems Unlike wood and paper wastes frequently found in other products, SMS has been supplemented with nitrogen.
- ❖ Absence of heavy metals Reduces consumer concerns SMS supports plant growth and is a good soil amendment for farming, turf management and home gardening.

Nutritional Value of SMS

1. **Fiber:** Spent mushroom substrate is a good source of dietary fiber, which can aid in digestion and help maintain a healthy gut.
2. **Micronutrients:** It may contain small amounts of vitamins and minerals, such as B vitamins (like riboflavin, niacin, and pantothenic acid), potassium, and phosphorus.
3. **Organic Matter:** Spent mushroom substrate is rich in organic matter, which can contribute to soil enrichment when used as compost.
4. **Low in Calories:** It is relatively low in calories, making it a suitable option for adding bulk and fiber to meals without a significant caloric intake.

Use in Disease Management

The use of spent mushroom substrate (SMS) in the context of Trichoderma, a beneficial fungal genus, can have several important implications and benefits:

1. **Trichoderma as a Biocontrol Agent:** Trichoderma species are known for their biocontrol properties. They can act as natural antagonists against plant pathogens, including various soil-borne fungi. When SMS is used in agricultural or horticultural applications, it can serve as a substrate for the growth and proliferation of Trichoderma. This, in turn, enhances the potential for biological control of plant diseases, reducing the need for chemical pesticides.
2. **Enhanced Disease Suppression:** The incorporation of SMS enriched with Trichoderma into soil can improve the suppression of soil-borne plant pathogens. Trichoderma species are known to produce enzymes and secondary metabolites that inhibit the growth of pathogenic fungi. By providing a favourable environment for Trichoderma in SMS, growers can promote the natural antagonistic activity of these beneficial fungi.
3. **Improvement of Soil Microbial Activity:** SMS, with its high organic matter content, can enhance soil microbial activity. When Trichoderma is introduced to SMS, it can interact with other beneficial microorganisms, creating a balanced and diverse soil microbiome. This can lead to improved nutrient cycling, disease suppression, and overall soil health.
4. **Biological Priming:** Trichoderma-treated SMS can prime plants for better defense against pathogens. When SMS is enriched with Trichoderma and then applied to crops, it can induce a systemic resistance response in plants, making them more resilient to diseases.
5. **Biological Control:** Consider enriching SMS with beneficial microorganisms such as Trichoderma or mycorrhizal fungi. These microorganisms can help suppress soil-borne pathogens and promote plant health. When you apply SMS with these beneficial microbes, it enhances their activity and

effectiveness, in mushroom the use of anaerobically fermented spent mushroom substrate as casing material gave mushroom yield at par with that of the peat-based casing material with additional advantage of less bacterial blotch infection.

Conclusion

In summary, spent mushroom substrate (SMS) is a versatile resource with a wide range of applications, from enhancing soil quality to serving as a platform for beneficial microorganisms like Trichoderma. Its high organic matter content and eco-friendly characteristics make it a valuable asset in agriculture and environmental management. By repurposing SMS, we can promote sustainability and resource efficiency.

References

1. Abad M, Noguera P, Bures S (2001) National inventory of organic wastes for use as growing media for ornamental potted plant production: case study in Spain. *Bioresour. Technol* 77:197–200
2. Ajith Thekkuttuparambil A, Kainoor K. Janardhanan. Indian medicinal mushrooms as a source of antioxidant and antitumor agents. *Journal of Clinical Biochemistry and Nutrition* 2007;40(3):157-162
3. Rinker DL. Spent mushroom substrate uses. Edible and medicinal mushrooms: *Technology and applications Wiley, Hoboken* 2017, 427-54

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Sustainable Agriculture: A Path Towards Better Future

ARTICLE ID: 0053

Rakhi[1], Mohd Shah Alam[2], Jay Nath Patel[3]

Department of Agronomy, School of Agriculture, Abhilashi University Mandi – 175028 (Himanchal Pradesh)

Light of the shifting agricultural environment, production farming must give way to profit-driven sustainable farming. Through careful examination of input and output, the balance between financial gain and environmental concern can be accomplished in the context of research for sustainable agriculture. It is a significant problem, but research needs to concentrate on methods that can achieve balance in a more realistic manner. Here, we've compiled a list of many methods for enhancing the farming system's long-term production, profitability, and sustainability.

Introduction

'Sustainable' is a term that is frequently used in today's society to describe a variety of concepts. Sustainability in agriculture aids in finding the ideal balance between the requirement to produce food and the maintenance of environmental ecosystems. According to estimates, the expected 9.6 billion people on the planet will require almost 70% more food than is now produced by the year 2050 in order to consume the necessary number of calories per day (FAO, 2017). Healthy food production is made possible by sustainable agriculture, which preserves future generations' ability to try to do the same. When it comes to resource consumption, agricultural practices are frequently found to be somewhat inefficient, which is closely related to production costs.

The practice of farming according to ecological principles, which is the study of interactions between living things and their surroundings, is known as sustainable agriculture. It has been described as an integrated system of practises for both plant and animal production that are site-specific and long-lasting.

Need for Sustainable Agriculture

- The world's population is expected to rise to 9.2 billion by 2050. Global food production will need to double by 2050.
- Food demand driven by population growth and land scarcity. Resources are limited.

- ❖ Up to 70% of the population in developing countries live in rural settings and rely on farming for their livelihoods.
- ❖ Challenges is to achieve global food security while having a positive impact on the environment and society.

Techniques for Adaptation of Sustainable Farming

Sustainability in agriculture is a broad concept with many facets, including social (having a fair deal with employees and a mutually beneficial relationship with the surrounding community), economic (should be a successful business contributing to a robust economy), and environmental (having potential to attenuate air, water, and climate pollution, build and maintain healthy soil, manage water wisely, and promote biodiversity). Working with nature rather than against it will be useful in order to meet these requirements.

The following considerations must be made in order to proceed in this direction: It is important to prevent irreversible changes to the land, such as erosion. It is important to make sure that natural resources (such as water, energy, soil, plants, animals, biodiversity, ecosystems, etc.) are used responsibly and sparingly. As long-term stability and productivity are necessary for sustainable agriculture, more renewable and diverse resources (such as wind energy, solar energy, etc.) should be utilised as opposed to total self-sufficiency. In the face of global farm consolidation and infrastructural development, sufficient revenue should be generated to remain on a farm. The "3 R concept" of reducing, reusing, and recycling should be given top priority. Due to this, farming will become both environmentally and financially viable.

Different Sustainable Farming Methods and Practices

1. Permaculture

David Holmgren and Bill Mollison are the authors of the term "permaculture," which originally meant "permanent agriculture" (Holmgren, D., 2002). It is a system that uses natural-world principles to guide the growth of human settlements, enabling people to coexist peacefully with the environment. The major goal of this system is to eliminate waste and boost system efficiency by "working smarter, not harder." In this case, emphasis is placed on the usage of perennial plants, such as fruit trees, nut trees, and bushes, which work together in a system that is supposed to imitate how plants in a natural ecosystem would work.

2. Biodynamic Farming

The farm is considered as a living system, and a lot of attention is placed on the overall development of the farm, according to this farming system concept. It is also taken into account how the soil, plants, animals, and microbes interact with one another on a farm. A biodynamic system combines "dynamic" practises with "biological" practises to develop the farm, its inhabitants, and its products with energy (Sharma, 2012). Dynamic practises involve the influence of cosmic forces to develop the farm, its inhabitants, and its products. Cow dung, silica, and extracts of various plant components, such as yarrow flowers, chamomile flowers, oak bark, stinging nettle shoots, etc., are the major ingredients in several biodynamic preparations, according to Reeve et al. (2011). These preparations can either be applied through field spraying.

3. Urban Agriculture

It includes a wide range of activities, including the raising of animals such as chickens and fish, growing different sorts of crops including grains, vegetables, mushrooms, and fruits, and cultivating non-food items like fragrant and therapeutic herbs or ornamental plants. It reveals an alternative way of thinking about how turning cities into agricultural producers rather than just consumers of food might help with sustainability, better health, and the eradication of poverty. It not only makes use of unused urban space for agricultural production but also contributes to the conversion of organic solid waste and wastewater into resources for farming (the former can be utilised as fertilizer and the latter as irrigation).

4. Hydroponics and Aqua- Ponics

With the help of specialised nutrients that are given to water, plants are grown using these cutting-edge agricultural methods without the use of soil. Crops are produced using a hydroponics system in which the roots are either directly exposed to a mineral solution or buried in an inert media, such as gravel or perlite. In this technique, it is typical to cultivate peppers, lettuce, tomatoes, and cucumbers. Aquaponics is the practise of raising aquatic animals (such as fish) with the cultivation of hydroponic plants using water that contains the waste products from the aquaculture fish. Both of these systems are widely accessible, ranging from modest home systems to large commercial systems.

5. Agroforestry and Food Forests

Agro-forestry is an integrated strategy that makes use of the beneficial interactions that result from integrating crops with trees and shrubs. In order to develop more diverse, productive, profitable, healthy, and sustainable land-use systems, it blends forestry and agricultural technologies. In addition to providing farmers with an additional source of income, trees improve soil structure, stabilise soils, reduce nutrient runoff, and provide a favourable microclimate that protects crops from wind and heavy rain while maintaining a favourable temperature and soil humidity. Permaculture systems called "food forests" are constructed of a multilayered edible "forest." Such a "forest" is almost entirely made up of perennial food plants, including climbing plants, a canopy of tall and dwarf fruit and nut trees, a layer of fruit shrubs, layers of perennial herbs, and vegetables and mushrooms at ground level.

6. Poly Culture and Crop Rotation

Polyculture and crop rotation over monoculture is a very scientific and innovative approach to tackling pest and weed problems (as some pests prefer specific host), maintaining and enhancing the soil quality, coping with weather fluctuations, ensuring additional income for the farmers, and a healthy diet for the community. Here, emphasis is placed on the idea that crops grown in close proximity should complement one another.

7. Growing Heirlooms and Older Varieties

Only a few kinds are grown commercially to satisfy market demand for food that can be transported over great distances and kept for extended periods of time. Because of this decreased genetic diversity, food crops are less able to adjust to alterations in the prevalence of disease, pests, and climate. Growing heirloom and older kinds and preserving their seeds is crucial for preserving the gene pool of indigenous varieties, preserving the richness of seeds, and creating future climate-resistant types.

8. Natural Animal Rising

Industrial agriculture keeps cattle off the land so that they can graze, protecting the crop from animal eating and keeping crops away from manure. However, there is a positive association between grazing animals and grassland. In addition to providing a wide range of nutrients to the animals through regulated grazing, heavy foot traffic prevents soil erosion by compacting the soil, and the manure that is left behind enriches the soil.

9. Mulching, Groundcovers and Manual Weed Control

Mulching and groundcovers are both effective ways to give the soil a layer of protection, control the growth of weeds, retain soil moisture, enhance soil health and fertility, and shield the soil from direct sunshine. Both organic and inorganic materials can be used as mulch; the former includes items like straws, husks, sawdust, grasses and cover crops, manures, composts, etc.; the latter mostly refers to polyethylene mulch, of which black plastic mulch is the most well-known.

10. Natural Pest Management

Instead, then utilizing pesticides, this approach of controlling pest insects uses birds, animals, plants, and mechanical methods. It is possible to manage the farm so that it supports agricultural pests' natural predators. It is possible to control the proliferation of dangerous pests by using the prey-predator interaction.

Advantages of Sustainable Agriculture

Sustainability in agriculture is the way to ensure and maintain agriculture productivity without the depletion of natural resources. It is economically, ecologically and socially adaptable and has many fold advantages in human life. Some of its advantages can be summarised as:

1. Biodiversity Conservation

Healthy soil is one of the prerequisites for agricultural productivity and sustained biodiversity. However, due to the use of excess chemical fertilizers and pesticides soil health is degraded reducing its productivity. We know that soil is the foundation for production as without it we are unable to produce. There are many ways to improve soil health to sustain biodiversity. Feeding soil with animal manure, green manure, crop residue etc may improve soil health and maintain biodiversity. Sustainable agriculture mainly focuses on the use of such types of matter and the reduction of the use of chemicals.

2. Environmental Benefits

Sustainable agriculture encompasses the use of renewable energy resources thus reducing environmental hazards. Sustainable agriculture also focuses on crop rotation, thus mitigating the problem of pest outbreaks and hence fewer pesticides are used. In this way, it helps in pollution control. It also focuses on the less waste of food for sustainability. Thus provide a basis for food supplements for an increased population.

3. Reduction in Cost of Production

Sustainable agriculture reduces production costs in several ways. Sustainable agriculture focuses on minimum tillage or zero tillage by which the cost is reduced. Besides the less use of chemicals and incorporation of green manure, crop residue and organic substances improve the soil health. This reduces the infestation of pests and hence farmers do not have to spend on pesticides.

4. More Production

Crop production is improved if one follows the measures of sustainable agriculture. Better soil -health due to the use of green manure, crop residue and less use of chemicals improves the production.

5. Better for Health

Sustainable agriculture focuses on the use of fewer chemicals like pesticides, fertilizers and more to organic farming. So, people may consume fresh products that are good for their health.

Conclusion

In conclusion, sustainable agricultural systems use cutting-edge, scientifically based techniques to increase productivity while minimizing environmental damage. More creative business strategies can be used to profit from the techniques being used to promote agricultural sustainability. All farms can benefit from the many sustainable farming techniques outlined above, which yield a variety of fuels, foods, and fibres. These techniques can guarantee productivity, profitability, and long-term sustainability of the farming system with scientific application and good management.

References

1. FAO, (2017). The future of food and agriculture–Trends and challenges. Annual Report.
2. Holmgren, D. (2002). Principles & pathways beyond sustainability. Holmgren Design Services, Hepburn.
3. Reeve, J. R., Carpenter-Boggs, L., & Sehmsdorf, H. (2011). Sustainable agriculture: A case study of a small Lopez Island farm. Agricultural Systems, 104(7), 572-579.
4. Sharma, S. K., Laddha, K. C., Sharma, R. K., Gupt, P. K., Chatt, L. K., & Pareeek, P. (2012). Application of biodynamic preparations and organic manures for organic production of cumin (Cuminumcyminum L.). International Journal of Seed Spices, 2(01), 7-11.

Volume 2, Issue 1
January I 2023
Agri Roots
e- Magazine
www.agrirootsmagazine.in
ISSN: 2583-9071

Precision Agriculture: Technology to Boost Crop Farming

ARTICLE ID: 0054

Simran Chauhan [1], Mohd Shah Alam [2], Jay Nath Patel [3]
Department of Agronomy, School of Agriculture, Abhilashi University Mandi – 175028 (Himanchal Pradesh)

Precision agriculture, also known as precision farming, is generally understood to be a farm management system based on information and technology that identifies, analyses, and manages spatial and temporal variability within fields for maximum productivity and profitability, sustainability, and protection of the land resource by minimising the production costs. Inputs are used in precise amounts in precision farming, which results in higher average yields than traditional cultivation methods. In order to increase production efficiency, improve product quality, increase the effectiveness of crop chemical use, conserve energy, and protect the environment, it is a comprehensive system that combines information, technology, and management. Therefore, precision farming is a compelling idea, and it follows naturally from its principles that more efficient use of farming inputs will increase revenues and result in production that is less harmful to the environment. The technology for tomorrow's environmentally friendly agriculture may be provided by the precision agricultural advancements of today.

Need of Precision Farming

The food system around the world is currently facing significant difficulties that will only get worse over the next 40 years. With today's knowledge and technologies, a lot can be done right away with enough effort and money. The food system will need to undergo more significant changes in order to meet future challenges, and funding for research to develop fresh answers for brand-new issues will be necessary. Major issues in agricultural growth and development now include the decline in total productivity, diminishing and depleting natural resources, stagnating farm incomes, lack of an eco-regional approach, dwindling and fragmented land holdings, trade liberalisation on agriculture, limited employment opportunities in non-farm sectors, and global climatic variation. Therefore, one way to boost farm productivity in the future is through the implementation of recently developed technology.

Advantages of Precision Agriculture

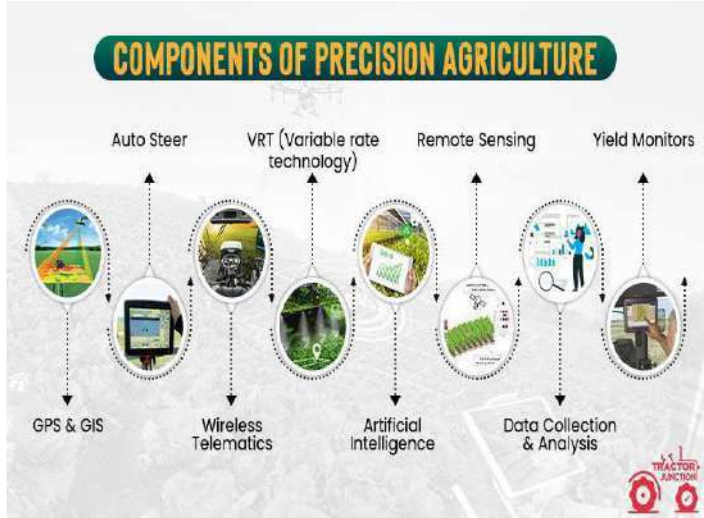
- ❖ Through regular plant inspections and data management, the precision farming approach detects all potential growth-related difficulties.
- ❖ Crop quality and output can be improved in a more efficient, precise, and time-saving manner.
- ❖ Simple precision farming chores include soil mapping and analysis.
- ❖ Precision farming is a technique used in modern agriculture to cut down on wasted fertilizer, herbicides, and irrigation water. Using accurate amounts of requirements is made possible by data management.
- ❖ In precision farming, making a chart to generalize and address a problem is simple.

In areas where there are few resources, precision farming has a big impact. For example, desserts often work quite well.

Precision Farming Has Drawbacks

1. Precision farming infrastructure is too pricey. It costs a lot of money and is currently impossible everywhere.
2. Precision farming cannot be used in rural areas for a number of reasons, including different types of land, ownerships, and infrastructure. Additionally, farmers in rural areas don't value the rapid advances in agricultural practices.
3. Precision farming is not a careless method of farming. It suggests that you need a proper team or individual to oversee and study daily information about needs, problems, and solutions.
4. Government subsidies for precision agriculture are not provided to farmers.

Tools and Equipment



1. **Global Positioning System (GPS):** With an accuracy range of between 100 and 0.01 m, GPS is a satellite-based navigation system that enables users to record positional data (latitude, longitude, and elevation). The precise location of field data, such as soil type, insect occurrence, weed invasion, water holes, boundaries, and impediments, can be found by farmers using GPS. There is an automatic controlling system with a DGPS, antenna, and receiver for light or sound. GPS receivers may determine their location by using the signals that are transmitted by GPS satellites. According to performance standards and prior input applications, the system enables farmers to accurately locate fields so that inputs (seeds, fertilisers, pesticides, herbicides, and irrigation water) can be applied to each field individually.
2. **Sensor Technology:** for sensors Measurements of humidity, vegetation, temperature, texture, structure, physical character, conductivity, photo electricity, and ultra sound are made using a variety

of methods, including electromagnetic, conductivity, photo electricity, and ultra sound. Crop species can be distinguished, stress points can be found, pests and weeds can be identified, and drought, soil, and plant conditions can all be tracked using remote sensing data. Sensors allow for the capture of enormous amounts of data without the need for laboratory examination.

3. **Geographic Information System (GIS):** The components of this system include hardware, software, and protocols for compiling, storing, retrieving, and analysing feature characteristics and position information to create maps. GIS connects data in one location so that it can be extrapolated as needed. Computerised GIS maps differ from traditional maps in that they include multiple layers of data (such as yield, maps of soil surveys, rainfall, crops, soil nutrient levels, and pests). GIS is a type of computerised map, but its true purpose is to evaluate people and places using statistical and spatial approaches. Information on field topography, soil types, surface drainage, subsurface drainage, soil tests, irrigation, chemical application rates, and crop production can all be found in a farming GIS database.

4. **VRT:** Automatic variable-rate technology (VRT) can be used in a variety of farming operations. Based on the soil type identified on a soil map, VRT systems determine the rate of delivery of agricultural inputs. Extrapolating data from the GIS can be used to control activities like planting, fertiliser and pesticide application, herbicide selection, and application at the proper time and place at a variable rate. The most common PFS technology in use in the US is probably VRT. The same concepts of soil sampling are applied in grid soil sampling, however sampling intensity is increased. The geographic location of soil samples gathered in a systematic grid also provides the ability to plot the data.

5. **Yield Monitor:** A mass flow sensor that has recently been developed operates on the idea of delivering microwave energy beams and measuring the amount of that energy that bounces back after striking the stream of seeds moving through the chutes. GPS receivers are utilised in all yield monitors to track the location of yield data and produce yield maps. Devices used in fodder crops to track weight, moisture, and other data on a per-bale basis are another type of yield monitoring system. Yield monitors are made up of a number of parts. They often contain a variety of sensors and other parts, such as a data storage device, user interface (display and keypad), and task computer, which is housed in the combine cab and manages the integration and communication of these parts. The sensors measure the speed of the separator, the ground speed, the mass or volume of the grain flow, and the grain itself. Grain yield is continuously monitored by measuring the force of the grain flow as it collides with a sensible plate in the combine's clean grain elevator.

6. **Precision Irrigation in Pressurized Systems:** Recent innovations in sprinkler irrigation are now being made available for commercial usage by regulating the motion of the irrigation equipment with GPS-based controls. In addition to motion control, wireless communication and sensor

technologies are being developed to keep track of soil and environmental conditions as well as the operation parameters of irrigation machines (such as flow and pressure) in order to increase the effectiveness of water application and crop utilisation. These technologies have amazing potential, but more work must be done before they can be bought on the open market.CTF is a whole-farm strategy that tries to reduce the costs associated with traditional methods by preventing unneeded crop damage and soil compaction by heavy machinery. Controlled traffic approaches use GNSS technology and decision support systems to restrict all field vehicles to the smallest possible area of permanent traffic lanes. Optimising the usage of fertilisers, starting with the three primary nutrients nitrogen, phosphorus, and potassium, is a significant application of precision agriculture in arable land. These fertilisers are administered consistently over fields at specific periods of the year in conventional farming. As a result, some areas experience overapplication while others experience underapplication. Overapplication, which permits nitrogen and phosphorus to leak from the field into the ground and surface waters, has a direct correlation to environmental cost.

Conclusion

In many developing nations, precision farming is still merely an idea, therefore it requires thoughtful assistance from both the public and business sectors to encourage its quick adoption. Exploration, analysis, and execution are the first three phases of a successful adoption, though. Environmental and economic concerns that now surround production agriculture can be addressed with precision agriculture. The idea of "doing the right thing in the right place at the right time" has a strong intuitive appeal, but questions remain regarding cost-effectiveness and the best methods to use the technical tools we now have. An all-out attempt should be made to leverage new technical inputs to transform the "Green Revolution" into a "Evergreen Revolution" in light of the pressing need of the day. Ultimately, the ability to swiftly and effectively find the knowledge required to lead the new technologies will determine how successful precision agriculture is. Using a systems perspective, precision farming offers a fresh approach to current agricultural problems like the need to strike a balance between productivity and environmental considerations. On cutting-edge information technology, it is based. It entails documenting and simulating soil and plant species variance, as well as integrating agricultural practises to satisfy site-specific needs.

References

1. Shibusawa S. Precision farming approaches to small farm agriculture. Agro-Chemicals Report. 2002; 2(4):13-20.
2. Fountas S, Ess D, Sorensen CG, Hawkins S, Pedersen HH, Blackmore S, Deboer LJ, Farmer experience with Precision Agriculture in Denmark and US Eastern Corn Belt. Precision Agriculture. 2004.
3. Lang L. GPS, GIS, remote sensing: An overview. Earth Observation Magazine. 1992; 23-26.

4. Batte MT, Van Buren FN. Precision farming – Factor influencingproductivity. In Northern Ohio Crops Day meeting, Wood County, Ohio, 21 Jan. 1999.
5. Chen F, Kissel DE, Clark R, West LT, Rickman D, Luval J, Adkin W. Determining surface soil clay concentration at a field scale for precision agriculture, University of Georgia, Huntsville. 1997.
6. Trimble. 2005. Precision agriculture. Available at: www.trimble.com.
7. Berntsen J, Thomsen A, Schelde K, Hansen OM, Knudsen L, Broge N, Hougaard H, Horfarter R. Algorithms for sensor-based redistribution of nitrogen fertilizer in winter wheat. Precision Agriculture. 2006; 7: 65-83.
8. Ferguson R., Dobermann, A. and Schepers, J. 2007. Precision agriculture: site-specific nitrogen management for irrigated corn. University of Nebraska Lincoln Extension. Bulletin.1- 7.
9. Adamchuk VI, Hummel JW, Morgan MT, Upadhyaya SK. On-the-go soil sensors for precision agriculture. Computers and Electronics in Agriculture. 2004; 44: 71-91.
10. Davis G, Massey R, Massey R. Precision agriculture: An introduction. www.muextension.missouri.edu/explore/envqual/ wq0450.htm. 2005.
11. Bowman K. Economic and environmental analysis of converting to controlled traffic farming, In 6th Australian Controlled Traffic Farming Conference, 2008. 61-68.
12. Njoroge JB, Ninomiya K, Kondo N. Automated fruit grading system using image processing, In Proceedings of the 41st SICE Annual Conference. 2002; 1346-1351.
13. Doruchowski G, Balsari P, Zande JC. Precise spray application in fruit growing according to crop health status, target characteristics and environmental circumstances; Proc. of 8th Fruit, Nut and Vegetable Production Engineering Symposium, Concepcion-Chile. 2009; 494- 502.
14. Ojeda H, Carrillo N, Deis L. Precision viticulture and water status II: Quantitative and qualitative performance of different within field zones, defined from water potential mapping, in XIV International GESCO Viticulture Congress, Geisenheim, Germany, 2005. 741-748.
15. Ferreiro-Arman M, Da Costa JP, Homayouni S. Hyperspectral image analysis for precision viticulture, In Image Analysis and Recognition, Springer Berlin Heidelberg. 2006; pp. 730-741.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Important Diseases of Cauliflower and Their Management

ARTICLE ID: 0055

Rinku Bhaskar[1], Rohit Kumar[2], Shivani Datre[3]

[1,2] Ph.D. Research Scholar, Department of Plant Pathology, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.)

[3] M.Sc. Ag. Department of Plant pathology. Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P)

Cauliflower, a versatile cruciferous vegetable, faces various diseases that can threaten its yield and quality. From fungal infections to viral outbreaks, these diseases pose challenges to cauliflower cultivation. Effective management strategies are crucial to mitigate these threats and ensure a healthy harvest. This article explores common diseases affecting cauliflower, shedding light on their symptoms and offering practical insights into proactive measures and treatments for successful disease management in cauliflower crops. Cauliflower, known as the 'Queen of winter vegetables,' is a prized cruciferous crop vulnerable to various diseases that can result in substantial yield losses, often reaching 50-70%. These diseases, including Alternaria leaf spot, Black rot, and Club root, pose significant challenges to its cultivation. An article "Diseases of Cauliflower and their Management" offers a comprehensive exploration of these cauliflower diseases. This knowledge empowers growers and researchers to implement effective disease management strategies, ensuring healthier cauliflower crops and a continuous supply of this nutritious vegetable.

1. Downy Mildew

Causal Organism: *Peronospora parasitica*

Symptoms: Small purplish brown spots on under surface of leaves. Plant shows small, pale yellow angular spots on upper surface of leaves, with downy growth on the undersurface. The spots coalesce leaves shrivel and dries up prematurely. In cabbage, these spots expose the heads to soft rot. Cauliflower curds look brownish at the tip. Stems show dark brown and depressed lesions or streaks which later develop downy growth of fungus.

Management

- ❖ Choose resistant cauliflower varieties like Graffiti 2.0, Snow Crown, and Alpha.
- ❖ Practice crop rotation, avoiding susceptible crops in the same area for 2-3 years.
- ❖ Apply hot water treatment at 50°C for 30 minutes.
- ❖ Promptly remove and dispose of infected plant material, avoiding composting.
- ❖ Work in dry conditions to prevent disease spread.
- ❖ Ensure proper plant spacing for good air circulation.
- ❖ Maintain balanced fertilization; avoid excessive nitrogen.
- ❖ Minimize overhead irrigation to reduce humidity.
- ❖ Consider using fungicides like mancozeb and Redomil Gold in case of recurring downy mildew issues.

2. Powdery Mildew

Causal organism: *Erysiphe cruciferarum*

Symptoms: The most distinctive symptom of powdery mildew is the appearance of white, powdery-looking spots or patches on the upper surfaces of cauliflower leaves. These spots can vary in size and may initially appear as small, isolated lesions. The affected cauliflower leaves may turn yellow or brown and become distorted. They may also curl or twist. Severely infected leaves may become brittle and eventually drop prematurely. It may start on the lower leaves and then spread to the upper parts of the plant. In severe cases, powdery mildew can affect the stem and curd. Infected curds may have white powdery patches on their surfaces. Cauliflower plants may exhibit smaller cauliflower heads and lower yields.

Management

- ❖ Use resistant cauliflower varieties.
- ❖ Remove and destroy infected plant debris.
- ❖ Practice crop rotation to reduce disease carryover.
- ❖ Remove infected plants to reduce disease spread.
- ❖ Maintain proper spacing between plants for good air circulation.
- ❖ Prevent overcrowding of plants, which promotes humidity and disease.
- ❖ Properly fertilize to maintain plant health. Consider organic options like neem oil or sulfur for control.
- ❖ Apply biological fungicides like Serenade.

3. Alternaria Leaf Spot or Blight Disease

Causal Organism: *Alternaria brassicicola*

Symptoms: Plant shows dark, irregular lesions with concentric rings on cauliflower leaves. Lesions grow larger over time, becoming necrotic and brown. Tissues surrounding lesions turn yellow, leading to leaf death. Dark, sunken lesions can also appear on cauliflower stems. Leaves may drop prematurely, further impacting yield. Severe infections can cause head rot with dark lesions on cauliflower curds. Infected tissues may produce dark spore masses on lesions. Infected plants produce smaller heads and lower yields.

Management

- ❖ Use resistant cauliflower varieties if available.
- ❖ Remove and destroy infected plant debris.Practice crop rotation to reduce disease carryover.
- ❖ Remove infected plants to reduce disease spread.
- ❖ Properly fertilize to maintain plant health.
- ❖ Seed treatment with Mancozeb 75% WP @ 2gm/Kg seed. 6. Foliar spray of Chlorothalonil 75 % WP @ 2gm/ltr. water.

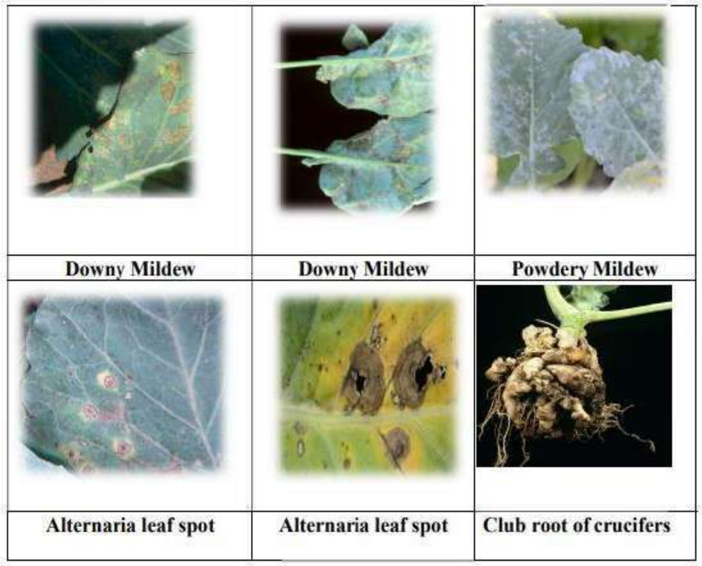
4. Club Root of Crucifers

Causal Organism: *Plasmodiophora brassicae*

Symptoms: Swollen, club-shaped, and distorted roots are a primary symptom. Infected plants exhibit reduced overall growth and may appear smaller than healthy plants. Affected plants may wilt, especially during hot weather, due to the compromised root system. Leaves turn yellow and exhibit nutrient deficiency symptoms, as the root galls hinder nutrient uptake. Leaves and entire plants may prematurely senesce and die, reducing cauliflower yield. Root galls can provide entry points for other soil-borne pathogens, further compromising plant health. On some occasions, lesions resembling water-soaked areas may appear on cauliflower roots. Roots may crack or split open as the disease progresses.

Management

- ❖ Use pathogen free plants. Remove and destroy infected plant.
- ❖ Practice crop rotation to reduce disease carryover.
- ❖ Seed treatment with Captan / Thiram @ 2gm/kg seed. Soil drenching with Copper oxychloride @ 2gm/ltr water.
- ❖ Raising soil pH at least 7-7.5 to prevent disease through the application of wood ash and calcium etc.
- ❖ Add boron as a micronutrient to the soil as a foliar spray or in the transplanting water.



Conclusion

Cauliflower, the 'Queen of winter vegetables,' faces significant disease challenges that can lead to substantial yield losses. Downy mildew, powdery mildew, Alternaria leaf spot, and club root threaten its cultivation. Effective management strategies, including crop rotation, resistant varieties, proper spacing, and sanitation, are essential to ensure healthier cauliflower crops and maintain a steady supply of this nutritious vegetable. Growers and researchers must continue to combat these diseases to protect this beloved cruciferous crop.

References

1. Agnihotri, V. P., & Joshi, P. C. (1984). Influence of *Alternaria brassicae* on yield, quality and storage behaviour of cauliflower. *Indian Phytopathology*, 37(3), 485-488.
2. Bhattarai, A., Adhikari, K., &Mainali, R. P. Disease diversity and disorder in cauliflower and their management practices adopted by farmers in Dhunibeshi municipality, Dhading. *NEPALESE JOURNAL OF AGRICULTURAL SCIENCES*, 39.

3. Carroll JE, Wilcox WF., (2003). Effects of humidity on the development of grapevine powdery mildew. *Phytopathology*. 93(9):1137-44.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Smart Water Management for Horticultural Crops in a Changing Climate

ARTICLE ID: 0056

Kalp Das

Ph.D. Scholar, Department of Vegetable Science, Punjab Agricultural University, Ludhiana (Punjab)

The realm of Indian Horticulture is undergoing a profound transformation in response to unpredictable environmental changes, necessitating a re-evaluation of both lifestyle and farming practices. The intensively cared-for horticultural crops experienced a decline in irrigated areas during the 1980s, driven by challenges such as high irrigation costs, soil salinization, and environmental considerations. However, the shifting global climate has redirected focus towards sustainable water management practices. The primary goal is to amplify water use efficiency by minimizing losses during application. Climate-smart water management seeks to synchronize water availability and crop needs in terms of quantity and quality, both spatially and temporally, with reasonable costs and environmentally acceptable impacts. Instead of adopting a uniform irrigation approach, the emphasis is on demand-driven strategies, with a priority on irrigation scheduling over specific methods.

Strategies for Smart Water Management in a Changing Climate

1. Precision Watering Through Localized Irrigation Implementing sophisticated irrigation methods like drip systems and micro-sprinklers ensures precise water delivery to the plant's root zone, minimizing wastage and maximizing water use efficiency.

2. Optimized Irrigation Scheduling

Employing a blend of traditional farming knowledge and cutting-edge technology facilitates accurate irrigation scheduling. Techniques such as Time Domain Reflectometry (TDR) and tensiometer-based soil water potential measurement contribute to informed decision-making.

3. Plant-Centric Responses to Crop Stress

Monitoring plant stress parameters, including leaf water potential, diameter changes in stems and fruits, sap flow, and canopy temperature, provides direct insights into plant water requirements, enabling timely interventions.

4. Data-Driven Insights from Climatic Parameters

Utilizing indirect methods that leverage weather data and empirical equations allows for accurate estimates of reference evapotranspiration (ETo) and crop evapotranspiration (ETc), ensuring efficient water management aligned with climatic conditions.

5. Holistic Approach with Soil Water Balance

Sophisticated models predicting soil water content based on soil characteristics, crop data, and climate information form the foundation of a holistic soil water balance approach, aiding in the development of precise irrigation calendars.

6. Fertigation for Nutrient Efficiency

Integrating fertigation, the simultaneous application of water-soluble fertilizers and water, proves beneficial for nutrient uptake in crops, contributing to increased nutrient use efficiency.

7. Strategic Deficit Irrigation Practices

In arid and semi-arid regions, practices like deficit irrigation, partial root drying, and subsurface irrigation are strategic solutions, enhancing yields without compromising critical growth stages.

Case Studies

- **Revolutionizing Mango Orchards in Andhra Pradesh**

Drip irrigation interventions in mango orchards significantly increased water use efficiency, fruit quality, and overall yield, showcasing the transformative impact of climate-smart water management.

- **Pioneering Progress in Punjab Orchards**

A progressive farmer in Punjab implemented climate-smart water management, emphasizing localized irrigation and advanced scheduling techniques. This resulted in optimized water usage, improved fruit quality, and reduced water wastage.

Fig 1. Different Methods of Irrigation in Horticultural Crops

Additional Examples of Smart Water Management in Horticultural Crops (SWMHC) Practices in India

- Mulching to reduce soil evaporation and retain moisture.
- Rainwater harvesting and storage for irrigation during dry periods.
- Precision agriculture tools like sensors and drones to monitor soil moisture.
- Farmer training and capacity building on SWMHC practices.

Benefits of Smart Water Management

- Increased water uses efficiency and crop yields.
- Improved soil health and fertility.

- ❖ Reduced greenhouse gas emissions from agriculture.
- ❖ Enhanced climate resilience and adaptation.
- ❖ Improved livelihoods and income for farmers.

Challenges and Opportunities

- ❖ Initial investment costs can be high.
- ❖ Limited access to technical knowledge for farmers.
- ❖ Institutional constraints and lack of awareness.

Despite challenges, SWMHC offers a promising approach for sustainable water management in horticultural crops in India, paving the way for enhanced production, improved water security, and heightened resilience to climate change.

Conclusion

In navigating the uncertainties posed by a changing climate, the adoption of climate-smart water management practices emerges as a beacon of hope for sustainable horticultural practices in India. The holistic framework, encompassing precision irrigation, optimized scheduling, plant-centric stress responses, data-driven insights, soil water balance, fertigation, and strategic deficit practices, not only mitigates environmental challenges but also enhances productivity and resilience. The case studies from mango orchards in Andhra Pradesh and progressive orchards in Punjab exemplify the transformative impact of climate-smart water management. These success stories underscore the potential to revolutionize agricultural landscapes, optimizing water usage, improving crop quality, and securing livelihoods. As India grapples with challenges such as initial investment costs, limited access to technical knowledge, and institutional constraints, the benefits of climate-smart water management—from increased water use efficiency to improved soil health—underscore its potential to usher in a new era of sustainable agriculture.

To realize the full potential of climate-smart water management, ongoing efforts are needed to address these challenges, promote awareness, and provide support to farmers. Through a concerted and collaborative approach, India can build a resilient agricultural sector that not only adapts to climate change but also contributes to environmental sustainability and economic prosperity.

References

1. FAO. (2017). Climate-Smart Agriculture Sourcebook (2nd ed.). Food and Agriculture Organization of the United Nations.
2. IPCC. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
3. Kadam, P., Saravanan, R., & Panigrahi, B. (2018). Climate-Resilient Horticulture: Adaptation and Mitigation Strategies. Springer.
4. Lal, R. (2020). Climate-Resilient Food Security: Adaptive Land Use and Management. CRC Press.
5. Singh, A. L., Saha, S., & Jat, M. L. (2019). Water Management in Agriculture under Climate Change. CRC Press.

6. Wani, S. P., Pathak, P., Sudi, R., & Hoanh, C. T. (2012). Climate Change Impact and Adaptation in Agriculture: A Global Assessment. CAB International.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Mushroom Cultivation in India: A Boon for Diversification, Health and Sustainability

ARTICLE ID: 0057

Shivani Datre[1] Rohit Kumar[2], Rinku Bhaskar[2]

[1]M.Sc. Ag. Department of Plant pathology. Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P)

[2]Ph.D. Research scholar, Department of Plant Pathology, Sardar Vallabhbhai Patel University of agriculture and Technology, Meerut (U.P.) 250110

Mushroom cultivation offers diversification and addresses the challenges of quality food, health, and environmental sustainability. India has seen a recent surge in commercial mushroom farming, with several states, including Haryana and Maharashtra, leading in production. Notably, button, oyster, paddy straw, and milky mushrooms are recommended for year-round cultivation. Mushroom farming provides an additional income source for farmers, especially those facing low returns from traditional agriculture. Its low land requirements make it accessible to individuals with limited space, contributing to income generation and environmental benefits through the efficient utilization of waste materials.

Crop room   Fruiting bodies   Harvesting

Benefits of Mushroom

1. Nutritional Benefits

Mushrooms are well-suited to supplement diets which lack proteins and, in a sense, they are rightly called "vegetable meat". Carbohydrate and fat contents of edible mushrooms are quite low. Mushrooms have a high percentage of water 93-95% as compared to raw beef (70%) and fresh vegetables (92%). The absence of starch in mushrooms makes it an ideal food for diabetic patients and for persons who want to shed excess fat. Mushrooms are low in calories, fat-free, cholesterol-free and very low in sodium.

2. Medicinal Benefits

More than 100 medicinal functions are produced by mushrooms and fungi and the key medicinal uses are antioxidant, anticancer, antidiabetic, antiallergic, immunomodulating, cardiovascular protector, anticholesterolemic, antiviral, antibacterial, antiparasitic, antifungal, detoxification, and hepatoprotective effects;

3. Economic Benefits

Mushroom cultivation is a space confined technology and requires marginal investment. It utilizes agricultural residue as substrate for mushroom production. Cultivation of mushrooms is a source of national income, as well as means of poverty alleviation. Well as in marketing activities as labour-intensive management and offering opportunities for processing enterprises. Mushroom farming needs low capital, low technical knowledge and even in an indoor setting it is possible to cultivate mushrooms in their homes like rearing poultry with a little capital Therefore mushroom cultivation not only empowers rural women but also alleviates poverty from the grass root level.

4. Environmental Benefits

Mushrooms play an important ecological role in the management of ecosystems. Indirect mushroom cultivation is a bioconversion process of organic substances which provides opportunities for the recycling of organic matter thus reducing pollution substances used in mushroom cultivation are applied as organic manures to the land after harvesting of mushrooms. Mushroom cultivation is an appropriate technology for management of agricultural and agro-industrial residues.

FYM Saw Dust Cocopeat Biomix

Mushrooms Value-Added Products

Trending mushroom products available on markets are snacks, fried mushrooms, burger, pastry, nuggets, popcorn, pickles, biscuit, ketch-up, soup powder and candy.

Opportunities

Mushroom production in India holds significant promise due to a growing demand stemming from the nutritional and medicinal benefits of mushrooms. The rise in health-conscious diets has made mushrooms an appealing choice. What makes this opportunity even more attractive is the low initial investment and the potential for high returns in a short period, making it an excellent option for income diversification among farmers. Mushroom cultivation's adaptability to small-scale and indoor setups enables those with limited land resources to participate. Moreover, it promotes sustainable agriculture by utilizing agricultural and industrial waste as substrates. This environmentally friendly practice not only addresses waste recycling but also creates job opportunities, particularly in rural areas, empowering women and alleviating poverty. Additionally, the mushroom market extends beyond fresh produce, with a growing demand for value-added products like snacks and soups. Some Indian states offer government initiatives and incentives, further propelling the expansion of mushroom cultivation. In essence, mushroom production in India caters to dietary, economic, and environmental needs, making it an enticing prospect for individuals exploring opportunities in the agriculture and food sectors.

Challenges of mushroom production in India

Key constraints in the mushroom industry in India include the unavailability of raw materials like spawn and compost, complex loan procedures, insufficient government support, limited awareness of nutritional value, inadequate technical guidance, production fluctuations, perishable nature, transportation challenges, cumbersome compost preparation, lack of cold storage, and quality spawn. Furthermore, poorly organized markets, limited financial assistance knowledge, concerns about mushroom poisoning, and inadequate preservation and recipe information are major hindrances to building a sustainable mushroom industry.

Conclusion

Mushroom cultivation in India offers numerous benefits, including nutritional value, medicinal properties, economic opportunities for farmers, and positive environmental impacts through organic waste recycling. It empowers rural communities and provides a source of income. However, challenges such as limited access to raw materials, complex loan procedures, lack of government support, and insufficient awareness hinder its growth. Addressing these challenges is essential for building a sustainable mushroom industry in the country.

References

1. Chang R. Functional properties of edible mushrooms. *Nutrition Reviews*. 2012; 54:91-93.
2. Gautam Ashok Kumar et al. Constraints in adoption of mushroom production enterprise. *Indian Journal of Extension Education*. 2014;5(1, 2):39-41.
3. Marshall E, Nair NG. Make money by growing mushrooms *Food and Agriculture Organization of the United Nations (FAO) Rome*. 2009.
4. Miah MN, Begum A, Shelly NJ, Bhattacharjya DK, Paul RK, Kabir MH. Effect of different sawdust substrates on the growth yield and proximate composition of white oyster mushroom (*Pteurofus ostreatus*). *Bioresearch Communications*. 2017;3(2):397-410
5. Patel S, Goyal A. Recent developments in mushrooms as anti-cancer therapeutics. *Journal of Biotechnology*. 2013; 2:1-15

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Hydroponic Techniques Used in Fruit Crops

ARTICLE ID: 0058

Prabhat Kumar[1], Avdhesh Kumar[1], Aman Srivastava[2], Divyansh Mishra[1]

[1]Reasarch Scholar, Department of Fruit Science, ANDUA&T Kumarganj, Ayodhya (UP) 224229

[2]Reasarch Scholar, Department of Genetics and Plant Breeding, ANDUA&T Kumarganj, Ayodhya (UP) 224229

Hydroponics is a soilless method of growing plants using a nutrient-rich water solution. While it is commonly associated with growing vegetables and herbs, hydroponics can also be used for fruit crops. Here are some hydroponics techniques that can be employed for fruit crops. This technique has gained popularity in various agricultural sectors, including fruit crop production, due to its numerous advantages over traditional soil-based farming. Here's an introduction to hydroponics in fruit crops:

Nutrient Film Technique (NFT)

- In NFT, a thin film of nutrient-rich water is continuously circulated over the plant roots, providing a constant supply of nutrients.
- Ideal for shallow-rooted fruit crops such as strawberries and lettuce.
- Requires a sloping channel where nutrient solution flows, promoting oxygen exchange and nutrient uptake.

Drip System

- Nutrient solution is delivered directly to the base of each plant through a network of tubes and emitters.
- Suitable for a wide range of fruit crops, including berries, melons, and tomatoes.
- Allows precise control of nutrient delivery and minimizes water wastage.

Aeroponics

- Plants are suspended in air, and nutrient solution is misted onto the roots.
- Ensures excellent oxygenation and nutrient absorption.
- Effective for various fruit crops, promoting rapid growth and high yields.

Deep Water Culture (DWC)

- Plants are suspended in a nutrient solution with their roots submerged in oxygenated water.
- Appropriate for fruit crops like tomatoes and cucumbers.
- Air stones or diffusers provide oxygen to the root zone, ensuring proper aeration.

Vertical Farming

- Utilizes vertical space to grow fruit crops in stacked layers or towers.
- LED lighting and controlled environments optimize growth conditions.
- Efficient for space utilization and can be used for various crops, including strawberries and herbs.

Ebb and Flow (Flood and Drain)

- This system floods the growing medium with nutrient solution periodically and then allows it to drain away.
- It is adaptable for various fruit crops and can be controlled to meet specific water and nutrient requirements.

Aquaponics

- Combines hydroponics with aquaculture, utilizing fish waste to fertilize plants.
- Fruit crops like tomatoes, peppers, and herbs thrive in this symbiotic system.
- Promotes sustainability by recycling nutrient-rich water.

Coir or Rockwool Substrates

- Coco coir, a natural fiber extracted from coconut husks, is used as a soilless medium.
- Combined with a nutrient-rich solution, it provides excellent aeration and water retention.
- Suitable for crops like strawberries, peppers, and tomatoes.

Controlled Environment Agriculture (CEA)

- Integrates hydroponics with controlled temperature, humidity, and lighting.
- Allows year-round cultivation of fruit crops, overcoming seasonal limitations.
- Enhances productivity and quality through precise environmental control.

Conclusion

Hydroponics offers a sustainable and efficient alternative for fruit crop production, addressing challenges associated with traditional soil-based farming. As technology continues to advance, the integration of hydroponics in fruit crop cultivation is likely to play a significant role in meeting the increasing demand for fresh, high-quality produce in a resource-efficient manner.

References

1. Corrêa, R. M., do Carmo Pinto, S. I., Reis, É. S., & de Carvalho, V. A. M. (2012). Hydroponic production of fruit tree seedlings in Brazil. *Hydroponics–A standard methodology for plant biological researches*, 225.
2. Rubio-Asensio, J. S., Parra, M., & Intrigliolo, D. S. (2020). Open field hydroponics in fruit crops: Developments and challenges. In *Fruit Crops* (pp. 419-430). Elsevier.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Cryopreservation: A Scientific Approach

ARTICLE ID: 0058

Avdhesh Kumar[1], Prabhat Kumar[1], Aman Srivastava[2], Jainendra Singh[2]

Research scholar, Department of Fruit Science, ANDUAT, Kumarganj, Ayodhya 224229

Research scholar, Department of Genetics and Plant Breeding, ANDUAT, Kumarganj, Ayodhya 224229

Biomaterials are preserved at very low temperatures throughout the cryopreservation procedure. This is often carried out at –196°C (–321°A) in liquid nitrogen, or sometimes at –80°C (–112°F) in solid carbon dioxide (dry ice). As long as biological materials have stopped their activities and metabolism at cryogenic temperatures (below –100°C), they may theoretically be thawed to normal physiological temperatures and then somewhat reanimated. Actually, a dip in body temperature below freezing, or "cryo-hibernation," occurs naturally in a number of amphibian species. These animals have developed defence mechanisms to help them withstand the harsh winters. For instance, in order to prevent the development of ice, wood frogs (Rana sylvatica) can raise the quantities of urea and glucose in their bodily fluids. Cryopreservation technology is considered to be a tool for preservation of biological materials in perpetuity and has been applied in many fields.

Cryopreservation

Biological materials are preserved or conserved with the use of cryogenic temperatures, which are typically below 180°C. Germplasm is the term for the genetic materials of germ cells, such as seed, sperm, or eggs, that have been cryopreserved. preservation by freezing. Vitrification is another name for the cryopreservation of biological materials at a very fast cooling pace without the creation of ice crystals.

It is vital to preserve plant genetic resources in whatever way possible in order to stop the decline in plant biodiversity. There are two main approaches to conservation: in situ and ex situ. In situ conservation is the preservation of germplasm in its native environment. The preservation of germplasm in gene banks is referred to as ex situ conservation. The complete genetic variety of a crop species can be preserved in one location with relatively less expense and less extensive management thanks to ex situ conservation strategies. Seed gene banks, field gene banks, botanic gardens, in vitro banks, cryogene banks, and DNA banks are examples of ex situ conservation techniques. When creating long-term base collections of crops for use in the far future, liquid nitrogen (LN) storage is typically used. LN serves as a safety precaution for similar collections kept in clonal repositories, field gene banks (FGB), or in situ conserved genetic material, which is vulnerable to natural whims. (Anushma 2020).

Principles of Cryopreservation Technology

The materials being cooled typically consist of biological cells, buffers that are intracellular (found inside the cell), and cryoprotectants that are dissolved in buffer that is extracellular (found outside the cell). Quantifying the biological, chemical, and physical changes that occur during the cooling and warming (thawing) processes is one of the main challenges in cryopreservation technology. These studies specifically address the following topics: changes in cell size and structure; additional or extracellular ice formation and heat transfer; effects of cooling and warming rates; and the exchange of water, cryoprotectant, and ions across the cell membrane (a semi-permeable membrane that permits only certain substances to pass through while keeping others in or out). Many single cells, including sperm, and blood cells, including erythrocytes, lymphocytes, and hemopoietic cells, were studied experimentally. Important discoveries were made into the mechanisms underlying cell damage during cryopreservation.

Procedure of Germplasm Cryopreservation

1. Quality control and sample collecting
2. Cryoprotectant addition and equilibration
3. Sample labelling, packaging, and sealing
4. Sample cooling
5. Keeping samples in liquid nitrogen
6. Refreezing to utilise Advantages of Preservation

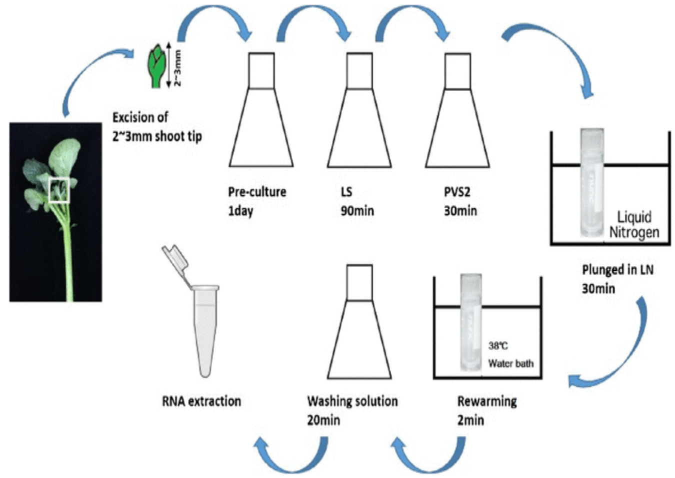


Fig. 1 Schematic Diagram of Cryopreservation

Benefits of Cryopreservation

There are many benefits of cryopreservation technique. These include:

- Treatments for fertility.
- Little labour and space are needed.
- Protection against genetic taint.
- Preserves the genetic integrity of priceless stains.
- Protects endangered species' germplasm.
- It is possible to maintain biological samples for an extended length of time.
- Shields the samples from microbiological and medical contamination.
- Uses cryopreservation to stop genetic drift in gametes, embryos, etc.

Types of Plant Materials Subjected to Cryopreservation

Algae, bryophytes, ferns, dedifferentiated cell cultures, embryogenic cultures, excised embryos and embryonic axes, latent buds, meristem and shoot tips, root tips, pollen, and seeds can all be preserved using cryopreservation procedures now accessible (Nukari et al., 2009).

Application of Germplasm Cryopreservation Technology

One long-term storage method called cryopreservation is primarily used to keep biological samples viable for an extended period of time. Numerous fields, such as cryosurgery, molecular biology, ecology, food science, plant physiology, and numerous medical applications, use this preservation technique extensively. Additional uses for the cryopreservation method include:

1. Gene Bank.
2. Blood transfusion.
3. In vitro fertilization.
4. Organ transplantation.
5. Artificial insemination.
6. Storage of rare germplasm

Conclusion

Since the use of cryopreservation facilitates the storage and quick multiplication of plant germplasm in a pathogen-free aseptic environment as well as the optimisation of physical space and labour, the initial technological investment for the practice will be lower than the maintenance costs for applying the various techniques later on. When it comes to conservation strategy, it is more expensive to introduce an accession into cryopreserved storage than it is to establish one in the field or in vitro culture. However, cryopreservation costs are significantly lower for long-term (more than 20 years) maintenance in the field or in vitro, especially when numerous accessions are preserved.

References

1. Anna Nukari, Marjatta Uosukainen, Veli-Matti Rokka, Kristiina Antonius Qiaochun Wang and Jari P.T. Valkonen *(2009)* Cryopreservation techniques and their application in vegetatively propagated crop plants in Finland. Agricultural and Food Science. *18,117–128.*
2. *Biotechnology and Molecular Tools*, DOI 10.1007/978-3-319-22521-0_3
3. Elena Popova, Mukund Shukla, Haeng Hoon Kim, and Praveen K. Saxena (2015) Plant Cryopreservation for Biotechnology and Breeding. *Advances in Plant Breeding Strategies: Breeding,*
4. Florent Engelmann (2004). Plant Cryopreservation: Progress and Prospects. In Vitro Cell. Dev. Biol.—Plant 40:427–43.
5. P. L. Anushma, K. Dhanyasree and M. Rafeekher (2020). Cryopreservation of Fruit Genetic Resources-A Review *Int.J.Curr.Microbiol.App.Sci . 9*(10): 1532-1542

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Seed Treatment: New Farming Techniques

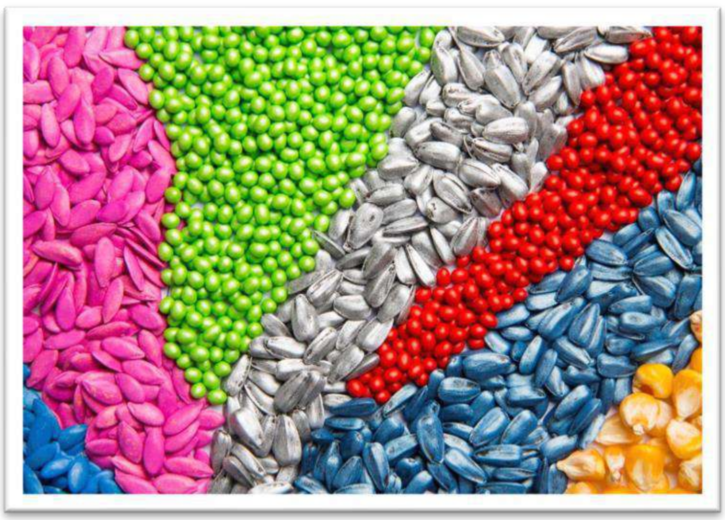
ARTICLE ID: 0060

Mohd Wamiq[1], Manoj Kumar Singh[2]

[1]Ph.D. Research Scholar, Department of Vegetable Science, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut

[2]Professor, Department of Vegetable Science, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut

Seed treatment is a process in which seeds are treated by biological and chemical methods to keep them free from diseases and diseases. This may includes solar treatment, hot water treatment, bacterial culture, fungicide etc. If the farmers are not able to achieve the target of production even after systematic sowing in the fields, then one of the main reasons is the disease of seeds. There are many diseases that occur in the crop due to seeds. For example, diseases like seed rot, plant rot etc.



Seed Treatment

Seeds should be treated well before sowing in the fields. Seeds can be treated in three ways, physical, chemical and biological. In physical treatment, measures like drying the seeds in the sun and cleaning them with hot water are adopted, then in chemical remedies, the seeds are treated with the help of various chemicals. At present, seed treatment by organic method is the cheapest and most popular. Agricultural scientists believe that it is very important to increase awareness among farmers about the use of treated seeds and healthy seeds. With this help, the productivity of the crop can increase significantly. Here are some common seed treatment methods:

Coating or Encrusting

Seeds can be coated with various materials such as polymers, nutrients, fungicides, and insecticides. This coating provides protection against diseases and pests and may also include substances that promote early plant growth.

Dressing

Seed dressing involves applying fungicides or insecticides to the surface of the seed. This method helps protect the seed and emerging seedlings from soil-borne diseases and pests.

Inoculation

Inoculants, usually containing beneficial bacteria or mycorrhizal fungi, can be applied to seeds. These microorganisms form symbiotic relationships with plants, enhancing nutrient uptake and promoting plant growth.

Pelleting

Pelleting involves coating seeds with a mixture of materials, such as clay, fertilizers, and pesticides, to create larger and more uniform seeds. This process facilitates planting and can enhance seed performance.

Priming

Seed priming is a pre-sowing treatment that involves controlled hydration and dehydration of seeds to initiate the early stages of germination. Primed seeds often germinate faster and more uniformly than non-primed seeds.

Chemical Treatments

Seeds may be treated with chemicals to control or prevent diseases caused by fungi, bacteria, or viruses. These treatments can include fungicides, bactericides, and virucides.

Biological Treatments

Some seed treatments involve the use of beneficial microorganisms, such as mycorrhizal fungi or rhizobium bacteria, to enhance plant growth and nutrient uptake.

Organic Seed Treatment

Seed treatment by organic fungicide like Trichoderma virdi and cow urine in pulse crops, for control of diseases like root rot, plant rot etc which ultimately increase crop production to 15 to 20% with bio-fertilizer culture.

FIR Method

- Fungicide
- Insecticide
- Rhizobium

Seed treatment with biofungicide chemical: Trichoderma 3-5g/kg 1 kg of seeds

Seed treatment with fungicide chemical: Carbendazim, Mancozeb, Benomil, Captan, Thiram 2-3 g/kg 1 kg of seeds

Seed treatment with insecticide: chlorpyriphos 25ml/kg of seeds, imidacloprid or thiamethoxam 3 g/ml 1 kg of seeds

Seed treatment from bacteria

- N= Rhizobium, Azotobacter, Azospirillum
- P = Phosphotic (PSB)
- K = Potassic bacteria 5-7 g/mol 1 kg of seeds

Caution

- Never put seeds in the sun after treatment dry the treated seed. Use a shady place.
- Sowing of culture-treated seeds should be done soon.
- Must wear Gloves in hands and face masks, glasses

Bijamrit

Materials

1. Cow dung 5 kg
2. cow urine - 5 liters
3. Lime 50 gm
4. Water 20 litres
5. 100 kg wheat seed
6. 50 gm soil

Seed Treatment prescriptions

Bijamrut is used for seed purification. Seed treatment means preparing seeds to protect them from seed borne or soil-borne diseases. Many diseases spread through seeds from which it is very important to save the crop.

Treatment of pathogenic diseases is possible only by seed treatment. But even today most farmers sow untreated seeds in the field. Seed treatment also increases the germination capacity of seeds. Seed treatment helps in early and good quantity of seeds. The roots grow at a rapid pace and the soil does not cause the outbreak of diseases on the crops.

Production Procedure

Take 20 liters of water in a vessel and mix cow urine in it. Then mix cow dung, lime and soil of the tree bed and mix the mixture well. Keep this mixture in shade for 24 hours. Then spread 100 kg of seeds on the floor or polythene sheet and sprinkle seeds on it. After spraying, the seeds are thoroughly mixed by hand. So that a layer of bijamrut climbs all the seeds.

Utility

Seed treatment should be done 24 hours before sowing. Dry the seeds in the raid after using the beejamrit. After that, sow the seeds in next morning. This treatment proves useful in the prevention of seed borne diseases.

Conclusion

Seed treatment is a common practice in modern agriculture as it can contribute to higher crop yields, better stand establishment, and increased resistance to pests and diseases. The choice of seed treatment depends on factors such as the type of crop, environmental conditions, and the specific challenges faced in a particular agricultural setting. Additionally, it's important to follow recommended application rates and guidelines to ensure effective and safe seed treatment practices.

References

1. Aladjadjiyan, A. (2007). The use of physical methods for plant growing stimulation in Bulgaria. J. Cent. Eur. Agric., 8(3): 369-380.
2. Bel'skii, A.I. and Mazulenko, N.N. (1984). Effects of presowing treatment of barley seeds on the incidence of fungal diseases on the plants. Mikologiya Fitopatologiya, 18: 312-316.
3. Bennett, M.A., Grassbaugh, E.M. and Evans, A.E. (2013). Vegetable crop seed vigor and seedling performance. Acta Horticulturae, 975: 172-179.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

Dryland Agriculture: Problems and Solutions

www.agrirootsmagazine.in

ISSN: 2583-9071

ARTICLE ID: 0061

Komal[1], Mohd Shah Alam[1], Jay Nath Patel[1]

[1]Department of Agronomy, School of Agriculture, Abhilashi University Mandi – 175028 (H.P.)

Dryland farming is a special case of rainfed agriculture practiced in arid and semiarid regions in which annual precipitation is about 20–35% of potential evapotranspiration. Management objectives center on preserving precipitation on the land, lowering soil surface evaporation to enhance the amount of evapotranspiration needed for transpiration, and adopting drought-tolerant plants that bloom when precipitation patterns are most favorable. Dry regions are those with insufficient irrigation systems and little or no reliable rainfall. Desert agriculture is important to the economy since it is used to grow the majority of the coarse grain crops, pulses, oilseeds, and raw cotton. Crops created for dry farming can either survive or avoid drought. Crops that can withstand drought, such as sorghum, have the ability to reduce transpiration (the emission of moisture). In fact, they may even practically cease growing when there is a lack of moisture, resuming up growth again when the conditions are favorable. The conversation is limited to topics involving agricultural technology and research. In addition to pressures on traditional farming systems, the future and stagnation of dryland crops and the growing scarcity of natural resources are the main factors aggravating the situation of dryland agriculture. Although these objectives have not changed for millennia, new technologies are emerging to enhance food productivity in these disadvantaged places. Crops that are adapted to dry farming typically require more land and mature more quickly than crops cultivated in humid environments.

Introduction

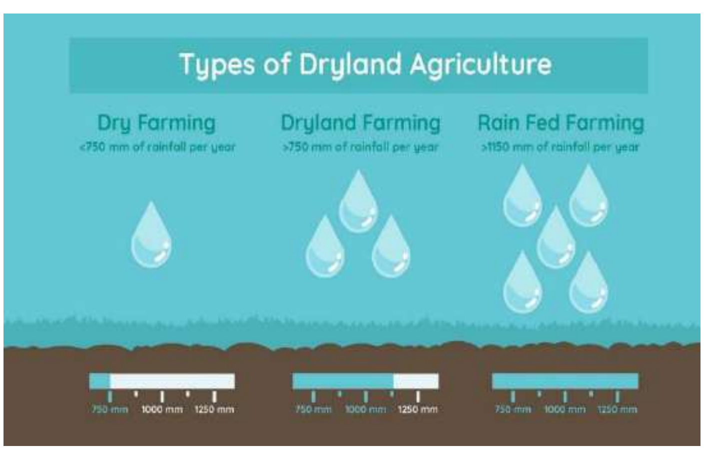
Dryland Agriculture refers to growing of crops entirely under rainfed conditions. In India, about 70% of arable land depends entirely on rainfall for crop production and the practices of agriculture here is called dryland farming. Drylands constitute the land both on steep slope and flat valley plains where water resources (surface and ground water) are not sufficed and hence, agriculture depends on rainfall. As per the encyclopedia Britannica, "dryland farming consists of making the best use of a limited water supply by storing in the soil as much of the rainfall as possible and by growing suitable crop plants by method that make the best use of this moisture". The fourth five-year plan document of India defines dry farming areas as those, which receive as annual rainfall ranging from 375 to 1125mm and with very limited irrigation facilities. Areas, which receive less than 375 mm of average rainfall, are considered as absolutely arid or desert areas, which require special treatment. Dryland agriculture is a system of crop farming under situations where water becomes a major limiting factor for production with no provision of any planned irrigation. Crop production is solely dependent on rainfall. Rainfall farming is the practice of growing crops, entirely depending on rainfall as a source of moisture where the mean annual rainfall is around 750 mm. the quantity of rainfall should be adequate/sufficient to meet the crop demand. Dryland farming technology refers to cropping pattern/rotation, varieties and agronomic practices adjusted and adopted to the moisture regime of the region.

History of Dry Farming

First systematic scientific approach to tackle the problems of dry farming areas was initiated by Tamhane in 1923 on small plots of Manjari farm near Pune and the work passes on to Kanitkar in 1926. A comprehensive scheme of research was drawn up by Kanitkar with financial support from ICAR. Realising the importance, the ICAR launched a comprehensive project on dryland farming in five centres: Sholapur and Bijapur in 1933. Hagari and Raichur in 1934 and Rohtak in 1935. A decade of work upto 1943-44 mainly on rainfall analysis, physico-chemical properties of soils, physiological studies in millets and on agronomic aspects resulted in series of dry farming practices commonly known as the Bombay dry farming practices. Hydrabad dry farming practices and Madras dry farming practices. These practices stressed the need for contour bunding, deep ploughing, application of FYM, low seed rate with wide spacing, mixed cropping and crop rotation. These recommendations could not motivate the farmers to adopt them as the yield advantage was about 15-20 per cent over a base yield of 200- 400 kg ha^{-1} By the mid1950s, importance of soil management was realised for improving the productivity of drylands and the ICAR established eight Soil Conservation Research Centres in 1954. However, yield improvement was not more than 15-20 per cent over the basic yield of 200-400 kg ha^{-1}. importance of short duration cultivars maturing within adequate soil moisture available period (crop growing period) was recognised during 1960s. The place of high yielding varieties and hybrids for yield advantage in dryland agriculture was realised in mid – 1960s. With the establishment of All India Coordinated Research Project for Dryland Agriculture (AICRPDA) IN 1970, emphasis was shifted to multi-disciplinary approach to tackle the problem from several angles. Similar efforts were initiated at ICRISAT, Hyderabad in 1972. The ICAR selected 23 dryland agricultural centres all over the country on basis of the moisture deficit, soil type and rainfall characteristics.

Climate Resilient Smart Agriculture: Approaches & Techniques

Crops that are adapted to dry farming are typically smaller and mature faster than those grown in more humid environments, and they are typically given more room. India is recognized as the leading agricultural nation in terms of both area and produce value. 70% of the world's poor reside in rural regions and rely heavily on irrigation provided by rainfall for their agricultural activities (Sharma et al., 2005). The country's rain-fed regions cover roughly 31.7 million hectares of land, of which 41.5% is arable and 19% is cultural wasteland. The North-West and Southern parts of the country are where you'll find the majority of the rainfed regions. Western Rajasthan (19.62 million hectares), North-western Gujarat (6.2 million hectares), South-western Punjab (1.45 million hectares), South-western Haryana (1.28 million hectares), Andhra Pradesh (2.16 million hectares), Karnataka (0.86 million hectares), and Maharastra (0.13 million hectares) are the main regions of the country that experience hot, arid conditions (Meena et al. 2009). These areas of the nation are distinguished by an unstable eco-system and a harsh agro-climate. The dry land areas are characterized by an annual rainfall between 100 and 500 mm with a coefficient of variation (CV) ranging from 40 to 70 percent; low relative humidity; high potential evapo transpiration value ranging from 1600 mm in the eastern part to 1800 mm in the western part of the region (Yadava and Soni 2008).



Dry Farming

Cultivation of crops in areas where annual rainfall is less than 750mm and crop failures due to prolonged dry spells during crop period are most common. In arid areas, dry farming is carried out with the aid of moisture-conservation techniques. In this area, a different land use system is advised.

Dry Land Farming

Cultivation of crops in areas where annual rainfall is more than 750 mm but less than 1150 mm is called Dry land farming. For dryland farming methods in semi-arid climates, soil and moisture conservation measures are crucial. A drainage system can be necessary, particularly in dark soils.

Rainfed Farming

Means cultivation of crops in regions where annual rainfall is more than 1150mm. There is less chances of crop failures due to dry spells. There is adequate rainfall and drainage becomes the important problem in rainfed farming.

Only a very large volume could possibly cover the entire subject because the methodologies are so different. The application of agronomic approaches, the adoption of water collection concepts, and the usage of resistant crop varieties that may be advantageous in such locations are then advised. Vegetable crops use a variety of moisture conservation techniques, including ridges and furrows, ridges and furrows plus mulch, and farmers' practices (Flatbed method). The vigor of the vegetable crops was improved by ridge and furrows, mulch, and better plant height, leaf area, and dry matter production (Allolli et al., 2008).

At present, the major arid vegetables being grown by the farmers on small scale (0.10 ha) to large scale (2.50 ha) in different cropping systems during Kharif and Rabi seasons are Citrullus lanatus, Snapmelon, Brinjal, Okra, Bottlegourd, Ridge gourds, Clusterbean, Round melon, Tomato, Chilli, Pea, Cauliflower, Cabbage, Spinach, Fenugreek (leaves), Coriander (green), Carrot, Radish,, Green Onion, Garlic, Mustard leaves, Moringa pods, etc. (Meena et al .2009).

Dry Farming - Constraints

Rainfall is the primary and most important factor affecting productivity in drylands and the occurrence of rainfall is the most uncertain and erratic. About 40% of cereals, 70% of finger millet and cotton, 90% pulses and oil seeds and almost 100% of millets are grown on rainfed lands. Drylands are generally poor in productivity. Most of the crop and varieties grows in drylands are subsistence oriented with low yields. The cultivars are of longer duration, photosensitive and have a low harvest index with low response to inputs such as fertilizers. Deforestation, overgrazing and unlimited cultivation on sloping lands have increased the run-off, reduced the recharge of the soil profile and ground water and caused severe soil erosion. Crop production in such area is highly marginal.

The major constraints of dry farming may be classified as follows:

- Basic resource constraints
- Socio-economic constraints
- Technological constraints

Basic Resource Constraints

Drylands farms have, for centuries been the scene of frequent droughts floods and others forms of human tragedy due to erratic rainfall pattern and others natural hazards. More than 80% of the dryland farmers own less than 2 hac of land per capita. The drylands are characterized by uncertain and aberrant weather. Uncertainty and variability of rains, of both space and time, is the biggest constraints affecting agricultural production in rainfed farming, Drylands are generally low in soil fertility. The soils are universally deficient in nitrogen and frequently in phosphorus. Potash in adequate in many cases except in light textured soil or in soils under continual high production. Problem such as soil salinity or alkalinity further aggravate the situation. The average consumption of fertilizers in cropped area of drylands is less than 10 kg/ha in the 114 predominantly non-irrigated semi- arid tropical districts. In rainfed agriculture, drought stress can occur at any time during crop growth.

Socio- Economical Constraints

Most of the dryland farmers are poor and have very little cash reserve available. The total operation is of the subsistence type and the farmer's concern is to grow staple crops for home consumption. Dryland farmer are not able to utilize the credit facilities provided by the co- operatives and banks in areas where they exist because of their ignorance/ low literacy rates.

Technological Constraints

Lack of suitable genotypes capable of giving high and stable yields under rainfed conditions is a major constraint. Many farmers are unable to use inputs like fertilizers, herbicide and pesticides due to lack of adequate moisture.

Dry Farming Techniques

Dry farming techniques is highly site- specific and will vary from region to region, depending on the type of soil and rainfall patterns in the area. The following approaches and practices may help in boosting crop production in drylands:

1. Determination of the effective growing season
2. Selection of suitable genotypes to match the rainfall pattern
3. Selecting an intercropping system to ensure sustainability of production and income
4. Creation of a local, cheap water source like a farm pond or a dug well
5. Using improved agricultural implements for timeliness and precision of operations
6. Use of moderate amounts of nutrients to starve of nutrients stress
7. Harvesting water and recycling it in the events of drought.
8. Maintaining a vigil on yield reduces like diseases, pests and weeds and controlling them effectively.
9. Harvesting the crop at physiological maturity stage.

Conclusion

Dryland farming plays a crucial role in agricultural practices in regions with limited water availability. There is no one solution for the dryland farming to make it more productive. By utilizing appropriate crop selection, water conservation techniques, and traditional knowledge, farmers can successfully cultivate crops and achieve sustainable agricultural practices. Each dry environment is distinct in its own; solutions developed should be based on the basic needs of the local conditions prevailing in that region. Soil, water and all the natural resources are never taken for granted, these resources when utilized in a judicious manner gives maximum output. Green revolution of the 1960s was oriented on growing improved varieties and the present-day emphasis should be a sustained development of agriculture especially in dryland areas.

References

1. Allolli, T.B., Hulihalli, K., and Anthani, S.I. 2008. Influence of in- situ Moisture Conservation practices on the performance of Dry land Chilli. Karnataka J. Agric. Sci. 21(2): 253-255.
2. Guhathakurta and Rajeevan. Trends in Rainfall Pattern in Guhathakurta and Rajeevan. Trends in Rainfall Pattern in India. International Jounal of Climatology. 2008;8(11).
3. Gunnell, Y. (2003). Past and present status of runoff harvesting systems in dryland peninsular India: A critical review. Ambio., 32: 320-324.
4. Rao, S.C. and Ryan, J. Crop Science Society of America. Symposium on Rao, S.C. and Ryan, J. Crop Science Society of America. Symposium on Challenges and Strategies for Dryland Agriculture. Challenges and strategies for dryland agriculture. Crop Science Society of America, Madison, Wis. 2004.
5. Rao, S.C. and Ryan, J. (2004). Crop Science Society of America. and Symposium on Challenges and Strategies for Dryland Agriculture. Challenges and strategies for dryland agriculture. In: Challenges and strategies for dryland agriculture. Crop Science Society of America, Madison, Wis.
6. Sharma, R.Bharat., Rao, K.V.,Vittal.,K.P.R.,and Amarsingh,U.A.2005.Realising the potential of Rainfed Agriculture in india. Central Research Institute for Dryland Agriculture, Hyderabad, India and International Water Management Institute, Asia Regional Office, New Delhi, India: 1-19.

7. Singh, H.P., Sharma, K.P., Reddy, G.S. and Sharma, K.L. (2004). Dryland Agriculture in India. p. 67-92. In: Chalenges and strategies for dryland agriculture.
8. SubbaRao, I.V. (2002). Land use diversification in rainfed agriculture. CRIDA Foundation Day lecturer. Central Research Institute for Dryland Agriculture, Hyderabad (A.P.) INDIA.

Volume 2, Issue 1
January I 2024

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Flourishing Beauty: Exploring the World of Floriculture and Landscaping

ARTICLE ID: 0062

Rishubh Motla

Ph.D. Research Scholar, Department of FLA, College of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut

Floriculture and landscaping are two interconnected fields that celebrate the vibrant beauty of nature while enhancing our surroundings. Floriculture, the cultivation of flowers and ornamental plants, and landscaping, the art of designing and arranging outdoor spaces, work together to create aesthetically pleasing environments that uplift the human spirit. This article delves into the world of floriculture and landscaping, exploring their significance, techniques, and the positive impact they have on our lives.

Floriculture: Nurturing Nature's Palette

Floriculture is a branch of horticulture that focuses on the cultivation of flowers and ornamental plants for decorative and aesthetic purposes. This artful practice encompasses the entire lifecycle of plants, from propagation to harvesting. With a rich history dating back centuries, floriculture has evolved from a basic practice to a sophisticated industry, catering to the diverse tastes of individuals, communities, and cultures worldwide.

Key Aspects of Floriculture

1. Propagation Techniques

Floriculture employs various propagation methods, including seeds, cuttings, grafting, and tissue culture. Each technique has its advantages, allowing growers to select the most suitable method based on the type of plant and desired outcomes.

2. Greenhouse Cultivation

Greenhouses play a crucial role in floriculture by providing a controlled environment for optimal plant growth. These structures allow cultivators to manipulate factors like temperature, humidity, and light, ensuring year-round production and a wider variety of blooms.

3. Market Trends

The floriculture industry is influenced by ever-changing consumer preferences and market trends.

Sustainable practices, exotic blooms, and personalized arrangements are gaining popularity. Local flower markets, online flower delivery services, and specialty florists contribute to the dynamic nature of the floriculture market.

Landscaping: Crafting Nature's Canvas

Landscaping is the art and science of designing and arranging outdoor spaces to create aesthetically pleasing and functional environments. From residential gardens to public parks and commercial spaces, landscaping transforms open areas into visually appealing and harmonious settings. It involves careful consideration of elements such as plants, hardscapes, water features, and lighting.

Essential Components of Landscaping

1. Design Principles

Successful landscaping relies on fundamental design principles, including balance, unity, proportion, and focalization. Landscape architects and designers use these principles to create visually striking compositions that seamlessly integrate with the surrounding environment.

2. Plant Selection

Plants play a central role in landscaping, contributing color, texture, and form. The choice of plants is influenced by factors like climate, soil type, and desired aesthetic. Well-designed landscapes often feature a diverse selection of trees, shrubs, flowers, and groundcovers.

3. Hardscaping Elements

Hardscaping involves the use of non-living elements such as pathways, patios, walls, and sculptures to enhance the overall design. Thoughtful integration of hardscapes adds structure, functionality, and visual interest to outdoor spaces.

Positive Impacts on Society

1. Aesthetic Pleasure

Both floriculture and landscaping contribute to the beauty of our surroundings, offering a feast for the eyes and soothing the mind. Well-designed landscapes and vibrant floral displays enhance the aesthetic appeal of residential areas, public spaces, and commercial establishments.

2. Environmental Benefits

Plants cultivated through floriculture and integrated into landscaping provide environmental benefits, including improved air quality, reduced noise pollution, and habitat for wildlife. Sustainable landscaping practices also promote water conservation and soil health.

3. Well-being and Mental Health

Surrounding ourselves with natural beauty has been linked to improved mental well-being. Access to green spaces and the presence of flowers can reduce stress, anxiety, and depression, fostering a sense of calm and connection to the natural world.

Conclusion

Floriculture and landscaping represent the harmonious collaboration between human creativity and the beauty of the natural world. From carefully cultivated flower gardens to meticulously designed outdoor spaces, these practices contribute to the enrichment of our lives by enhancing the aesthetic appeal of our surroundings. As we continue to appreciate and invest in these artistic endeavors, we simultaneously nurture our connection to nature and create spaces that celebrate the inherent beauty of our planet.

References

1. Bhattacharjee, S.K. and De, L.C. 2003. Advanced Commercial Floriculture. Aaviskar Publishers, Jaipur, Vol -1, pp 4-5.
2. Das, P., Samanta, P.K.S. and Parthasarathy, V.A. 2002. Gerbera. In.Commercial Floriculture Vol. I. eds. T.K. Bose, and others. Naya Prokash. pp 163.