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Contents

1. SOIL SCIENCE

Importance of Carbon sequestration

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Introduction

Carbon dioxide, a greenhouse gas responsible for enhanced global warming, has become an issue of major concern due to its increased concentration in the atmosphere. The world currently emits about 47 billion tonnes of carbon dioxide every year (IPCC, 2021). Global warming, reversal of climates in temperate and tropics, and raise in sea level leading to inundation of low-lying areas are some of the visible repercussions of increased CO_2. Carbon sequestration implies transferring the CO_2 in the atmosphere to long-lived pools and storing it so that it is not immediately re-emitted into the atmosphere. In the context of agriculture, it can be defined as storing atmospheric CO_2 in green plants in form of biomass and its storage in soils as well as soil organic matter (Minasny *et al.*, 2017).

Importance of Carbon Sequestration in Point of Climate Change

Carbon sequestration is of paramount importance in the context of climate change, serving as a critical strategy to mitigate the adverse effects of greenhouse gas emissions. By capturing and storing carbon from the atmosphere, this process helps reduce the concentration of carbon dioxide, a major contributor to the greenhouse effect. Natural reservoirs like forests, soils and oceans play a pivotal role, acting as carbon sinks that absorb and store significant amounts of carbon. Preserving and restoring these ecosystems is crucial for maintaining biodiversity, enhancing soil health, and supporting sustainable agriculture.

Factors That Cause Depletion of Soil Organic Carbon

1. **Intensive Agriculture and Tillage:** Excessive or improper agricultural practices, such as intensive tillage, can accelerate the breakdown of organic matter in the soil. Tillage exposes organic matter to increased microbial activity, leading to faster decomposition.
2. **Deforestation and Land Use Changes:** Clearing land for agriculture or urban development often involves the removal of natural vegetation, including forests. When land undergoes deforestation or experiences drastic land use changes, the input of organic material decreases, and existing organic matter may be lost.
3. **Erosion and Soil Disturbance:** Erosion, whether caused by water or wind, can carry away the topsoil along with its organic content.
4. **Monoculture and Lack of Crop Rotation:** Planting the same crop repeatedly in a field (monoculture) without rotating crops can lead to the depletion of specific nutrients and a decline in organic matter.
5. **Overgrazing:** Intensive grazing by livestock can lead to the removal of plant material without sufficient time for vegetation to recover. This can result in reduced organic matter inputs to the soil.
6. **Inadequate Organic Inputs**: The absence of sufficient organic inputs, such as crop residues, cover crops, or organic amendments, can hinder the replenishment of soil organic matter.
7. **Residue Removal:** Residue removal, particularly in agriculture, involves the extraction of crop residues such as stalks and leaves from fields. This practice disrupts the natural cycle of organic matter incorporation into the soil, leading to reduced soil carbon content.

Management Practices That Enhance Soil Organic Carbon

1. **Cover Cropping:** Introducing cover crops, such as legumes or grasses, during periods when the main crop is not growing helps protect the soil from erosion and adds organic matter. Cover crops contribute to carbon sequestration by capturing carbon dioxide from the atmosphere during photosynthesis and incorporating it into the soil when they decompose.
2. **Crop Rotation:** Different crops have varying root structures and nutrient needs, which can enhance the overall organic matter content in the soil. Crop rotation also improves microbial diversity and activity, supporting organic matter decomposition and nutrient cycling.
3. **Reduced or No-Till Farming:** Minimizing or no tillage helps preserve soil structure and reduce the exposure of organic matter to microbial decomposition. Reduced tillage practices promote the accumulation of organic residues on the soil surface.
4. **Organic Amendments:** Adding organic amendments, such as compost, manure, or green waste, provides a direct source of organic matter to the soil. These materials enhance soil fertility, improve water retention, and contribute to the formation of stable organic compounds that resist rapid decomposition.
5. **Agroforestry and Windbreaks:** Integrating trees and shrubs into agricultural landscapes through agroforestry practices or windbreaks can contribute significantly to carbon sequestration. Trees not only provide organic matter through fallen leaves and branches but also create a favourable microclimate for soil organisms.
6. **Biochar Application**: Biochar, a type of charcoal produced from organic materials, can be added to the soil to enhance carbon sequestration. Biochar is known for its stability and ability to retain nutrients, making it a valuable amendment for improving soil structure and fertility.
7. **Grazing Management:** Implementing rotational grazing practices allows for periods of rest and recovery for pastures, promoting the growth of grasses and the accumulation of organic matter. Proper grazing management can prevent overgrazing, soil compaction, and the loss of organic material.
8. **Incorporating Legumes:** Including legumes in crop rotations enhances soil fertility, reduces the need for synthetic fertilizers, and promotes the accumulation of organic matter.
9. **Water Management:** Efficient water management, including practices such as rainwater harvesting, can help maintain soil moisture levels. Adequate soil moisture supports microbial activity and organic matter decomposition, contributing to a healthy soil ecosystem. Enhancing irrigation efficiency can also decrease the hidden C costs (Sauerbeck, 2001).

Conclusions

Carbon sequestration is only a temporary plan to mitigate the climate change. challenges such as the permanence and leakage risks associated with certain sequestration methods require careful consideration. Striking a balance between technological advancements and ecological preservation is essential to ensure the long-term effectiveness of carbon sequestration initiatives. Public awareness and policy support are crucial components for the success of carbon sequestration efforts, necessitating a collective commitment to sustainable practices.

References

IPCC. 2021. Cambridge University Press. In Press. IPCC, 2021: Summary for Policymakers. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Masson- Delmotte, V.P.

Lal R (2004) Soil carbon sequestration to mitigate climate change. Geoderma, 123(1-2):1-22.

Minasny, B., Malone, B.P., Bratney, A.B., Angers, D.A., Arrouays, D., Chambers, A., Chaplot, V., Chen, Z.S., Cheng, K., Das, B.S and Field, D.J. 2017. Soil carbon 4 per mille. Geoderma. 292: 59-86.

Sauerbeck, DR (2001) CO_2 emissions and C sequestration by agriculture—perspectives and limitations. Nutrient Cycling in Agroecosystems, 60, 253 – 266.

2. BIOTECHNOLOGY

Bioconversion of Citrus Peels: A Pathway to Eco-Friendly Fertilizers

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Introduction

Citrus fruits such as oranges and sweet limes hold a pivotal position in global agriculture, renowned not only for their delectable taste but also for their multifaceted utility and potential applications beyond mere consumption. A growing consensus among researchers and policymakers emphasizes the imperative of harnessing citrus peel waste (CPW) for sustainable development. Constituting approximately 50% to 70% of processed fruit weight, the volume of CPW varies depending on the processing technology employed and the cultivar of the fruit. Globally, an estimated 10 million metric tons of CPW are generated annually, underlining the substantial magnitude of this agricultural byproduct. Notably, among the cultivated citrus species, including oranges, mandarins, lemons, limes, pomelos, and grapefruits, the contribution to the agricultural economy is profound. [1].

The utilization of citrus peels presents a plethora of promising opportunities:

Biofertilizers: Transforming citrus peels into biofertilizers enriches soil with vital nutrients and organic matter, nurturing plant growth and health.

Essential Oils: Citrus peel essential oils, renowned for their antimicrobial, antioxidant, and insect-repellent properties, find versatile applications in agriculture, cosmetics, and the food industry.

Animal Feed: Dried citrus peels serve as nutritious feed for livestock, contributing to their well-being and productivity.

Biodegradable Materials: Citrus peels contribute to the creation of eco-friendly packaging and materials, advancing sustainability efforts [1].

Characteristics of Citrus Fruit Peels as Biofertilizers:

Nutrient-Rich: Citrus peels are abundant in essential nutrients such as phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg), vital for robust plant growth and root development.

Organic Matter: Citrus peels enhance soil structure and water retention capacity by contributing organic matter, fostering microbial activity and nutrient cycling.

Slow Nutrient Release: Biofertilizers derived from citrus peels release nutrients gradually, ensuring sustained availability for plant uptake.

pH Regulation: With their acidic nature, citrus peels aid in regulating soil pH, creating an optimal environment for nutrient absorption.

Bioactive Compounds: Phenolic compounds, flavonoids, and terpenes present in citrus peels possess antioxidant properties, enhancing plant resilience and defence mechanisms [2].

Nutritional Profile of Citrus Fruit Peels:

Ash Content: Citrus peels contain ash, enriching soil fertility with essential micronutrients like iron (Fe) and manganese (Mn).

Crude Fiber: High crude fiber content improves soil structure, aeration, and supports beneficial soil microorganisms.

Carbohydrates: Carbohydrates serve as an energy source for soil microbes, enhancing microbial activity and nutrient cycling.

Proteins: Citrus peels contain proteins that contribute to soil nitrogen availability, crucial for plant growth and chlorophyll synthesis.

Specific Amino Acids: Abundant amino acids like asparagine, glutamic acid, and

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aspartic acid in citrus peels play pivotal roles in plant metabolism and stress tolerance [2].

Vermicomposting vs. Direct Application of Citrus Fruit Peels to Soil

1. **Vermicomposting (Composting Using Earthworms)**: Vermicomposting, the process of utilizing earthworms to decompose organic matter, yields nutrient-rich compost known as vermicompost or worm castings. Through their digestive processes, earthworms enhance the availability of nutrients crucial for plant growth. The resulting vermicompost not only contains essential elements such as nitrogen, phosphorus, and potassium but also harbors beneficial microorganisms vital for soil health. Moreover, earthworms actively aerate the soil as they burrow, thereby enhancing its structure and promoting better water infiltration and root development. By diverting organic waste, including citrus peels, from landfills, vermicomposting contributes significantly to waste reduction efforts and fosters sustainability. However, it is imperative to consider that citrus peels, with their acidic nature (pH around 3.95), can upset the balance in vermicomposting systems if excessively added, potentially rendering the environment unsuitable for worms [2, 3].
2. **Direct Application of Citrus Fruit Peels to Soil:** Directly applying citrus fruit peels to soil offers a gradual release of nutrients as the peels decompose over time. This gradual release ensures sustained availability of essential elements such as potassium, nitrogen, and phosphorus, supporting plant growth. Additionally, the alkaline nature of citrus peels aids in balancing soil pH, particularly in alkaline soils, creating an optimal environment for plant development. Furthermore, citrus peels contribute to soil structure improvement and water retention, benefiting microbial activity and overall soil health. The utilization of powdered fruit peels allows for precise nutrient application, enabling tailored nutrient availability for specific crops or growth stages. This targeted approach minimizes waste while optimizing resource utilization, exemplifying an efficient and sustainable method for soil enrichment and crop management [2][3].

In conclusion, fruit peels, often dismissed as waste, possess significant potential as a sustainable asset for agriculture. These overlooked peels represent valuable resources for research and field experiments across diverse crop systems. By tapping into their rich reservoir of nutrients, bioactive compounds, and organic matter, we lay the groundwork for a more environmentally conscious and productive agricultural sector. As we push the boundaries of innovation in utilizing fruit peels, we actively contribute to forging a greener, more resilient future for our planet.

References:

Mukhametzyanov, R.R., et al., Changing the Global Production and Trade of Citrus Fruits, in Sustainable Development of the Agrarian Economy Based on Digital Technologies and Smart Innovations. 2024, Springer. p. 19-24.

Haokip, S.W., et al., Unraveling physicochemical profiles and bioactivities of citrus peel essential oils: a comprehensive review. European Food Research and Technology, 2023. 249(11): p. 2821-2834.

Krithika, R. and P. Raajeswari, Characterization of selected fruit peel as biofertilizer. Sustainability, Agri, Food and Environmental Research, 2024. 12(2).

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3. BIOTECHNOLOGY

Paper Waste-Derived Vermicompost: A Sustainable Approach for Soil Enrichment

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Introduction

Driven by educational institutions, the production of paper has significantly increased waste generation. Ironically, traditional paper recycling often falls short due to contamination and energy-intensive processes. However, amidst this challenge, vermicomposting emerges as a promising solution. By leveraging the natural abilities of earthworms, we can convert paper waste into nutrient-rich vermicompost, benefiting soil health and reducing waste simultaneously. This presents an opportunity to explore the feasibility, advantages, and practical applications of vermicomposting within educational settings. Educational institutes are pivotal in shaping the future, yet their paper-heavy operations inadvertently exacerbate environmental issues. The persistent demand for paper, whether for textbooks, administrative paperwork, or research publications, results in significant waste accumulation. Despite the good intentions behind traditional recycling methods, they encounter limitations such as contamination and energy inefficiencies. In the pursuit of sustainable alternatives, vermicomposting emerges as an innovative approach aligned with circular economy principles

[1].

Advantages of Vermicomposting:

Waste Reduction: Implementing vermicomposting systems in educational institutions can significantly diminish their paper waste output. Instead of disposing of paper in landfills, it becomes a valuable resource for producing vermicompost.

Enhanced Soil Health: Vermicompost improves soil structure, increases water retention, and enhances nutrient availability. Its slow-release properties foster plant growth, offering an eco-friendly substitute for synthetic fertilizers.

Financial Savings: Vermicomposting necessitates minimal infrastructure and can be established on-site. Institutions can cut down on waste disposal expenses while establishing a self-sustaining system [1].

Characteristic of Paper Favourable for Vermicomposting [1]	
Carbon-Rich Material	Paper consists mainly of cellulose, a complex carbohydrate, rendering it an excellent carbon source for vermicomposting. Earthworms flourish on a diet that includes a balance of carbon-rich materials like paper and nitrogen-rich materials such as kitchen scraps.
Shredded Texture	Shredded paper offers an ideal texture for earthworms

	to navigate and consume. The heightened surface area resulting from shredding facilitates expedited decomposition processes.
Moisture Retention	Paper retains moisture, a crucial element for sustaining earthworm activity and facilitating decomposition. Dampened shredded paper forms an optimal bedding for vermicomposting.
Balanced C/N Ratio	The carbon-to-nitrogen (C/N) ratio in paper typically stands at approximately 350:1. Combining paper with nitrogen-rich materials like kitchen scraps ensures earthworms receive a well-balanced diet.
Biodegradability	Paper readily decomposes owing to its organic composition. Earthworms adeptly transform paper into nutrient-rich vermicompost.
Nutrient Content	Although paper itself lacks significant nutrients, it enriches the diversity of organic matter in the vermicompost. As a result, the vermicompost produced contains essential nutrients like nitrogen, phosphorus, and potassium, crucial for supporting plant growth.

In envisioning a closed-loop system for paper waste management, educational institutions emerge as both producers and beneficiaries of sustainable practices. By harnessing their waste output, primarily composed of paper, and channelling it into vermicomposting, a transformative cycle is initiated. Through the miraculous work of earthworms, this discarded paper metamorphoses into nutrient-rich biofertilizer, enriching soil quality and fostering agricultural vitality. This biofertilizer, teeming with essential nutrients like nitrogen, phosphorus, and potassium, becomes a valuable resource that circles back to the educational institutes, completing the loop. As the soil thrives under the nourishing effects of the biofertilizer, so too does the educational institution flourish, illustrating the harmonious interplay between environmental stewardship and academic sustainability. This integrated approach not only mitigates paper waste but also cultivates a regenerative ecosystem where waste becomes a precious asset, perpetuating a cycle of renewal and abundance [2-4]

In conclusion, this article underscores the critical role of vermicomposting in addressing the pressing challenge of paper waste management within educational institutions. Traditional recycling methods, fraught with limitations, are insufficient in effectively mitigating the environmental impact of paper production. However, vermicomposting offers a sustainable alternative, capitalizing on the natural abilities of earthworms to convert paper waste into nutrient-rich vermicompost. This process not only reduces waste accumulation but also enriches soil health, promoting sustainable agricultural practices. As future research continues to explore and refine vermicomposting techniques within educational settings, it is imperative to recognize the transformative potential of this approach in fostering a circular economy. By embracing vermicomposting as a viable solution to paper waste management, educational institutions can pave the way for a more sustainable future, where waste is viewed not as a burden, but as a valuable resource in the journey towards environmental stewardship and academic excellence.

References

Blouin, M., et al., Vermicompost significantly affects plant growth. A meta-analysis. Agronomy for Sustainable Development, 2019. 39: p. 1-15.

Rogayan Jr, D.V., et al., Vermiculture and vermicomposting. Ramon Magsaysay Technological University: San Marcelino, Zambales, 2010.

Rajendran, P., et al., Vermiculture and vermicomposting biotechnology for organic farming and rural economic development. ECO Services International,(February), 2008.

Rupani, P.F., et al., Vermicomposting of green organic wastes using Eisenia fetida under field conditions: A case study of a green campus. Waste and Biomass Valorization, 2023. 14(8): p. 2519-2530.

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4. ENTOMOLOGY

Secondary Agriculture; A sunrise sector of Indian Economy

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Introduction

"Secondary agriculture" typically refers to activities that are undertaken after the primary agricultural production stage. Primary agriculture involves the cultivation of crops and the raising of livestock, while secondary agriculture involves the processing, marketing, and value addition to the raw agricultural products.

Secondary agriculture takes the output of the primary sector to produce finished goods suitable for other business and domestic usage. Mainly, Fruits, vegetables and their value-added products lead to income diversification and livelihood improvement of the farmers. India is going through economic and social transformation from an agriculture-based economy to product, service-based and knowledge-based economy. In the present context, the secondary agriculture is gaining importance to ensure doubling of farmers' income, sustainable use of natural resources, small farm viability and profitability, food and nutrition security and adoption to the changing climate.

Secondary Agriculture Activities Include

1. **Processing and Manufacturing:** This involves converting raw agricultural products into processed goods. For example, milling wheat into flour, processing fruits into jams or juices, and converting milk into dairy products.
2. **Agro-Processing:** This term is often used interchangeably with secondary agriculture. Agro-processing involves adding value to agricultural products through various processes such as drying, canning, and packaging.
3. **Food and Beverage Industry:** Secondary agriculture encompasses the food and beverage industry, which involves the production of a wide range of consumable goods derived from agricultural products.
4. **Textile Industry:** Agriculture also contributes to the textile industry through the cultivation of crops like cotton, and secondary agriculture involves processing these raw materials into textiles and clothing.
5. **Bioenergy Production:** Converting agricultural products, such as crops or waste materials, into biofuels or other forms of renewable energy falls under secondary agriculture.
6. **Supply Chain and Distribution:** This aspect involves the logistics, transportation, and distribution of agricultural products from the farm to the consumer. Efficient supply chains are crucial for ensuring that agricultural products reach their intended markets.
7. **Marketing and Retail:** Promoting and selling agricultural products to consumers through various channels, including supermarkets, farmers' markets, and online platforms.

Need of Secondary Agriculture in India

Secondary agriculture plays a vital role in adding value to raw agricultural products and ensuring that they reach consumers in a usable and marketable form. It involves a diverse range of activities that contribute to the overall agricultural value chain. It is of significant importance for several reasons, contributing to the overall development and sustainability of the agricultural sector and the economy as a whole. Here are some key reasons highlighting the importance of secondary agriculture:

1. **Value Addition:** Secondary agriculture adds value to raw agricultural products through processing, manufacturing, and other value-added activities. This enhances the economic value of agricultural goods and increases the potential income for farmers and other stakeholders in the agricultural value chain.
2. **Diversification of Income Sources:** By engaging in secondary agriculture, farmers and entrepreneurs can diversify their income sources. Instead of relying solely on the sale of raw produce, they can participate in various processing and manufacturing activities, which can provide additional streams of revenue.
3. **Employment Generation:** Secondary agriculture activities, such as agro-processing, manufacturing, and distribution, create job opportunities along the entire value chain. This helps reduce unemployment and underemployment in rural and urban areas, contributing to overall economic development.
4. **Rural Development:** The development of secondary agriculture can play a crucial role in rural development. It encourages the establishment of processing units and industries in rural areas, leading to improved infrastructure, better living standards, and overall economic growth in these regions.
5. **Food Security:** Secondary agriculture supports the availability of processed and preserved food products, contributing to food security. Food processing helps in reducing post-harvest losses and ensures a more stable and consistent food supply throughout the year.
6. **International Trade and Export:** Processed and value-added agricultural products are often more suitable for export, contributing to international trade. This can lead to increased foreign exchange earnings for a country, helping to balance trade deficits.
7. **Technological Innovation:** Secondary agriculture involves the application of technology and innovation in processing and manufacturing. This not only improves efficiency but also stimulates research and development in agriculture-related technologies.
8. **Waste Reduction and Sustainability:** Secondary agriculture often involves utilizing by-products and waste from primary agriculture. This reduces waste, promotes sustainability, and can contribute to environmentally friendly practices through recycling and repurposing.
9. **Market Development:** Developing a robust secondary agriculture sector helps in creating and expanding markets for agricultural products. Processed and value-added goods often have a broader appeal and can reach a wider consumer base.
10. **Economic Growth:** The growth of secondary agriculture contributes to overall economic growth by increasing the GDP of a country. It enhances the productivity and profitability of the entire agricultural sector, positively impacting the economy as a whole.

Conclusion

In India, the strengthening and expansion of secondary agriculture and its linkage to primary sector is very crucial. This can be speed up by encouraging public-private partnership and enabling rural industrialisation to link farm and non-farm activities.

References

Ayman Azad, Sameera Qayoom, F. A.

Bahar, S. S. Mehdi, Shayista Fayaz, Sadaf Iqbal, Nazir Hussain, Nazim Hamid and Ashraf Sultan., 2021., Secondary Agriculture towards Increasing Production and Sustainability., *Asian Journal of Agricultural Extension, Economics and Sociology.*, 39(10): 175-189.

Chengappa P. G., Secondary agriculture: A driver for growth of primary agriculture in India. Indian Journal of Agricultural Economic. 2013;68(1):1-19

5. HORTICULTURE

Urban farming: In Relation to Food and Nutritional Security

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Introduction

Agriculture is the mainstay of the Indian economy because of its high share in employment and livelihood over the years. Because of the fast growing population urbanization is inevitable and universal. It is the societal trend where the proportion of people living in cities increases while the proportion of people living in the country side diminishes. Growth of an urban center leads to considerable transformation in the investment, employment and production pattern of the farm economy in the surrounding areas. Urbanization has an impact on the cropping pattern, cropping sequence and cropping intensity in urban fringe agriculture.

Growing, processing, distribution of the food along with raising the lives stocks in and around the city is termed as Urban Farming. The concept was started in Central Africa in the 1960s, scattered and isolated UA surveys by individual social scientists have gradually been giving way to institutional projects led by multidisciplinary teams. It is practiced for income earning and food producing activities. Urban farming contributes to food security by increasing the amount of food available to people living in cities and provides fresh vegetables, fruits and meat. It occurs within and surrounding the boundaries of the cities and includes crops and livestock production. Poverty and food insecurity have often been considered to be largely rural problems. In urban settings, however, lack of income translates more directly into lack of food than in rural settings.

Need of Urban Farming:

Poverty

Ultimately, the main reason why most people are unable to feed themselves is not that food is unavailable but they cannot afford it. But poverty also reduces food output. By practicing farming in a piece of land may help to manage household expenditure and earn extra income.

Food Insecurity and Malnutrition

Increasing urban poverty goes hand-in-hand with growing food insecurity and malnutrition in cities. Urban food insecurity often is overlooked since at the aggregate level, economic and social conditions in urban areas are much better than those in rural areas.

Climate Change

The challenge posed by climate change and its interaction with urban poverty and food security is globally recognized. According to UN-Habitat, slum areas are anticipated to be the most vulnerable to the effects of climate change, given the paucity of shelter and the absence of public services.

Natural Resource Scarcity and Waste Disposal

Urban planning thus has a fundamental role to play in fostering sustainable and livable cities, including through making choices on the optimal use of land within a city.

Global food prices

Rising global food prices affect people's

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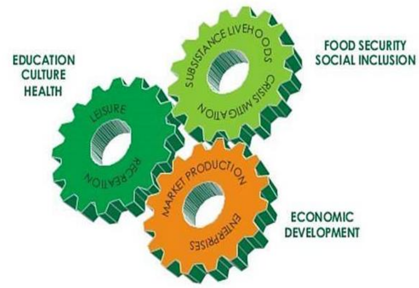
ability to buy enough to feed their families. Not surprisingly, the hardest hit are the poorest – especially the urban poor, who can spend as much as 80 per cent of their income on food. While it can saved through practicing kitchen or terrace gardening.

Benefits of Urban Agriculture:

- Non-market access to fresh, nutritious food for poor consumers, and income generation (especially for women);
- Supply of food to urban markets, street food and food processing, providing additional employment and income;
- Productive reuse of water and urban waste to provide water, animal fees and fertilizers for the demands of urban agriculture;
- Integrating urban agriculture with urban greening programs, which can provide fuel wood for urban residents, reduce urban pollution and temperatures, and offer recreation opportunities to improve quality of life for all urban residents, and in particular for youth and elderly people;
- Providing an opportunity for participation of urban residents to benefit from the implementation of urban agriculture within the broader context of urban greening programs, specifically stimulating the involvement of women as complementary activity;
- Helping cities become more resilient to climate change by reducing vulnerability of urban residents, particularly the poor, diversifying urban food sources and income opportunities, maintaining green open spaces and enhancing vegetative cover, which has important adaptation (and some mitigation) benefits.



Where it can be taken up?

Public and private land such as:

- Steep slopes, wet land, low lying urban lands.
- Vacant and derelict lands in and around cities.
- Along the sides of the road, canal, river and coastal bay
- Backyards, roof tops, vacant lots and community gardens.
- Peripheral land around institutions like schools, colleges etc.
- Garbage landfills, suburban farms. And Parks.

Different Dimensions of Urban farming:

- Micro farming in and around the house
- Community gardens
- Institutional garden
- Small scale commercial Horticultural based farms
- Small scale Livestock and Fish-Farming

Conclusion

In a world with rising food prices confronting climate change, Urban farming is an essential element. Food security has always been a key resilience facet for people living in cities. Local governments can use it for public areas and slum sites, on environmentally degraded areas for promotion of health and improved food security. In order to fight against the urban poverty, achieve food security, improve nutrition and promote sustainable agriculture Urban farming is an key element.

References

Bruhan, K, M., 2011, Economics Of Recycling Household Waste Water In Peri Urban Farming, Bangalore Metropolis, India. *M.Sc. (Agri.). Thesis* (unpub.), University of Agricultural Sciences, Bangalore.

Paule M., 2007, Urban Horticulture in Africa and Asia, an Efficient Corner Food Supplier. *Acta Hort*., **2(**1).

Rahul G., 2005, Peri-Urban Agriculture and Aqua Culture, Kolkata: Economic Gains from Waste Recycling. *International Journal of Environmental Science: Development and Monitoring*,**5**(2).

Sam C. M. and Hui, 2011, Green roof urban farming for buildings in high-density urban cities. *Journal of Green Building*.**5**(1): p 1-9

6. AGRICULTURE

Biodynamic Farming

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Introduction

Biodynamic agriculture is a form of alternative agriculture very similar to organic farming, but it includes various esoteric concepts drawn from the ideas of Rudolf Steiner. Rudolf Steiner was an Austrian philosopher and scientist who's thought was very much influenced by oriental philosophy, especially Buddhism, Hinduism, and the Vedic scriptures. Biodynamics has much in common with other organic approaches – it emphasizes the use of manures and composts and excludes the use of synthetic (artificial) fertilizers, pesticides and herbicides on soil and plants.

What is Biodynamic Farming?

- Biodynamic is a holistic, ecological and ethical approach to farming, gardening, food and nutrition.
- The term biodynamic is taken from Greek word bios means life and dynamic meaning energy. Hence biodynamic farming refers “working with the energies which create and maintain life”.
- Biodynamic farming is an advanced organic farming system that is gaining increased attention for its emphasis on food quality and soil health. It is a method of farming that aims to treat the farm as a living system that interacts with the environment, to build healthy living soil and to produce food that nourishes, vitalises and helps to develop humanity.

Historical Development in India

- Biodynamic Movement started in 1990s when Peter Proctor, a farmer from New Zealand working with biodynamic agriculture since 1965 was asked to come to India by T. G. K. Menon to teach Indian farmers about biodynamic farming. Among the 1st initiatives were the Kurinji Farm near Kodaikanal, Maikaal Cotton Project in M.P. and the Tea Project in Darjeeling.
- Biodynamic Association of India (BDAI) established in 1999 to promotes Biodynamic Farming in India
- Bhaikaka Krushi Kendra, Anand Started in 2002 by Sarvdaman Patel supported by Peter Proctor (Father of Modern Biodynamic farming).

Scenario of Biodynamic Farming

- According to Demeter International, there are 9,131.89 hectares of certified biodynamic farms in India.
- According to Sundeep Kamath, the ex-secretary of BDAI, India has nearly 1,00,000 farmers practicing some form of biodynamic farming, based on sales of biodynamic preparations and self reports.

- According to the Demeter International database, Gujarat, Madhya Pradesh, Uttarakhand, Uttar Pradesh, Andhra Pradesh, Kerala, Punjab, Karnataka, Tamil Nadu, Telangana, West Bengal, and Assam are among the states where biodynamic farms are most widespread.

Principle of Biodynamic Farming

- To create a diverse and balanced farm ecosystem that can support itself from within the farm
- To restore the soil through the incorporation of organic matter
- To treat soil as a living system
- To create a system that brings all factors which maintain life into balance
- To encourage the use and importance of green manure, crop rotation and cover crops

Main Effects of using Biodynamic Farming

- to increase the vitality of food
- to regenerate natural resources such as the soil (by restoring the organic matter present in the soil), the seeds and the water
- to create a personal relationship with the world in which we live, with Nature of which we are a part of and to learn to work together
- most of all, to be of service to the Earth and its beings by aiding nature where it is weak due to constant use

Why needs Biodynamic Farming?

Now a days use of agro-chemicals increases day by day which reduces the soil fertility and kill the microorganisms present in the soil. In soil concentration of soluble salts increases by using chemical fertilizers which increases the soil salinity and alkalinity.so the quality of food decreases. One of the solution of these problems is adopting organic and biodynamic farming.

Features of Biodynamic Farming

- Biodynamic farming is an affordable and sustainable which makes farmer stay in their land in future.
- Biodynamic farming increases the vitality of food.
- It regenerates natural resources such as the soil (by restoring the organic matter present in the soil), the seeds and the water.
- It creates a personal relationship with the world in which we live, with nature of which we are a part of and to learn to work together.
- Most of all, to be service to the earth and its beings by aiding nature where it is weak due to constant use.

Components of Biodynamic Farming

- BD Preparation
- BD Planting Calendar
- Cow Pat Pit
- Crop Rotation
- Liquid Manure
- Mulching
- Peppering

Biodynamic Preparations

These simple, natural, homeopathic preparations are used to enhance the effects of the planets and of silica and lime on the soil and the plants, and also to enhance the breaking down process and potential life forces in the compost heaps. Dr Steiner gave two preparations to be sprayed directly on the soil or the plants (numbered 500 and 501), and six preparations to be used when making compost (numbered 502 to 507).

Steiner gave two groups of Biodynamic Preparation			
crop spray preparations		Compost preparation	
BD 500	Cow manure	Preparation No.	Main Ingredient
BD 501	Silica	BD 502	Yarrow flower
BD 508	Horsetail herb or Casuarina	BD 503	Chamomile
		BD 504	Stinging nettle

		BD 505	Himalayan oak bark
		BD 506	Dandelion
		BD 507	Valerian

BD 500 (Cow Horn Manure)

It is basically fermented cow dung. It is the basis for soil fertility and the renewal of degraded soils. It is buried in Sept./Nov and lifted in Feb/March. This is the period when the earth is breathing in and cosmic earth forces are most active (winter).

Materials

- Cow horns
- Fresh cow dung from a lactating cow. Average 50-150 gm dung/horn (depends on horn size)

Preparation Process:

- Feed cattle with high quality food for two days prior to collecting dung for BD 500 (good green fodder and less protein artificial feed).
- Prepare burial pit: 18 inches deep. Pit area should not be subject to flooding, vigorous root systems or earthworms. BD 500 takes the character of the soil it is buried in, so good quality earth in the burial pit is essential.
- Collect cow horns – remove any paint.
- Collect fresh dung – reasonably firm.
- Fill cow horns with cow dung in October/November (rather than September due to India's warmer climate).
- Place horns in burial pit, 1 inch apart with base downwards, surround with 50% compost and soil.
- Cover with soil and bury for 4 to 6 months. If the soil is not rich enough, add compost to an extent of 50% to enhance soil quality.
- Keep burial pit soil moist and shaded, at temp of approx. 200C and free from weeds and earthworms.
- After 4 months check for dung fermentation. Dig up one horn. If the green cow dung has turned into a dark, smooth earthy smelling humus (BD 500) they are ready to be lifted. Remove the BD 500, use and store. If not, leave them longer.

Application Process

Apply when the dew is falling (the earth breathes in) i.e., late afternoon or evening – descending Moon.

- 25 grams BD 500/acre in 15 litres rain/pure warm water (approx. 15-20 °C).
- Check water for high calcium, iron or other minerals.
- Stir for 1 hour alternately clockwise and anti-clockwise forming a vortex.
- Spray in the late afternoon or evening (just before sunset), when Moon is descending.
- Spray 4 times a year – during the beginning and after rains, i.e., Feb-May-Nov-Dec.

Storage

- Place in glazed earthenware pots with loose fitting lids.
- Bury in a box surrounded with coir pith, which is kept moist and can be closed.
- Keep in dark and at temp of not more than 25 °C.
- Use within 1 year.

Effect/Result:

- Promotes root activity
- Stimulates/increases soil micro-life
- Regulates lime and nitrogen
- Helps to release trace elements
- Increases germination

BD 501 (Cow Horn Silica)

This is finely ground quartz crystals specially prepared. The crystal should be of good quality, shape and clear. It is buried in a similar manner to preparation 500 but this time it is buried during the summer time (buried in April/May and lifted in September). This is the period when the earth is breathing out and the cosmic light energy is most active (summer).

Materials:

- Cow horn

- Silica quartz crystal – should be clear and well formed. Average 200-300 gm powdered quartz crystal/horn

Preparation Process:

- Crush silica quartz using a pounding rod, a mortar and pestle, or hammer.
- Grind to a fine powder between 2 plate glasses First glass – 12″ square and 9 mm thick with a wooden frame. Second glass – 4″ square glass plate mounted in a wooden block (handle).
- Ensure that the quartz dust is not inhaled as it could lead to silicosis. It is advisable that masks are provided while making the preparation.
- Moisten with water to make a stiff paste.
- Fill horns with the silica paste.
- Bury horns in soil pit, 1 inch apart with base downwards, surround with 50% compost and soil from March/April (spring equinox) to September (autumn equinox).

Application Process:

Apply 501 only after one or two applications of BD 500. Apply when the dew is rising (the earth breathes out) i.e., early morning 6-8 a.m. at sunrise during ascending Moon or Moon opposition Saturn.

- 1 gm silica (enough to cover the small finger nail) in 15 litres of warm quality water.
- Dissolve silica in water, stirring for 1 hour before sunrise, alternatively clockwise and anti-clockwise forming a vortex.
- Spray the plants using a low-pressure sprayer (Knapsack 80-100 psi). Spray into the air to fall as a gentle mist over the plants.
- As a general rule, spray twice during the planting cycle; at the beginning and again just before harvest.

Storage:

Store in a glass jar with a loose-fitting lid, placed in an open area exposed to sunlight up to 3 years.

Effect/Result:

- Enhances light metabolism of the plant
- Stimulates photosynthesis and formation of chlorophyll
- Improves colour, aroma, flavour and keeping quality
- Decreases fungal growth

Compost Preparations 502 – 507

These are a series of preparations made from various medicinal herbs, in such a way as to enhance their inherent qualities. Experience in India and in many overseas countries of using these preparations in composts and liquid manures, has shown that they accelerate the processes of humus formation and as such avoid losses of valuable plant nutrients.

BD 502 Yarrow (Achillea millifolium)

- This is made from yarrow flowers combined with the bladder of a stag.

Method of Preparation:

- Urinary bladder of the stag is used. The stag with its antlers magnifies the effect of the cosmos.
- Smell of the stag bladder and that of the yarrow are similar.
- Cosmos activity of the flower is enhanced by the cosmic activity of the bladder.
- The energies received by a stag from the cosmos through the antlers center around the bladder.
- Start the preparation making under the planetary influence of Venus.
- Blow up the bladder with air when the bladder is fresh.
- Air dry and then collapse.
- At the time of use moisten to make it flexible.
- Cut the bladder, insert a funnel and introduce the flowers till the bladder is packed.
- Moisten the flowers with plant extract, stitch up the slit with cotton thread.
- Store in a closed basket to keep away rodents/pests.

Result:

- Permits plants to attract trace elements in extremely dilute quantities for best nutrition.

BD 503 Chamomile (Matricuria chamomilla)

This is composed of the flowers of the Chamomile plant combined with cow intestine.

Harvesting:

- Pick flowers when petals are horizontal (mid-morning-10 am)
- Ideal flower will have two rows of petals around the cone
- Harvest into a tray as the flowers if left together produce heat
- Use drying trays

Storage:

In air tight containers.

Preparation:

- The intestine of a cow or bull can be used
- Do not wash intestine
- Cut into 15 cm bits
- Run finger along intestine, like milking a cow, to squeeze out undigested matter
- Tie cut bits at one end with a cotton string
- Fix funnel to open end and fill with dry flowers
- Pack not too hard or loose
- Stack the filled sausages into a bundle, which could be placed in a mud pot surrounded with fertile soil

Time of burial to lifting:

Bury in October and let it remain in the soil till Feb/March.

Result:

It stabilizes Nitrogen within the compost and increases soil life so as to stimulate plant growth

BD 504 Himalayan stinging nettle (Urtica parviflora)

Method of Preparation:

- Fill the dried leaves into terracotta pipes or mud pots
- Press well into the containers
- Ensure that the lid is on
- Place the pot under the influence of Mars
- (Moisten dry leaves with juice of leaves before filling if found dry)

Time of Burial to Lifting:

- Harvest leaves in May and September
- Lift the preparation in September after a year

Result:

Stimulates soil health, by providing plants with the individual nutrition components needed 'enlivens' the earth

BD 505 Himalayan Oak Bark (Quercus glauca)

This is prepared by combining bark of the oak tree with the skull of an animal.

Method of Preparation:

- Crush the oak bark
- The skull of any domestic animal may be used.
- The link between the skull and bark is their calcium properties.
- Further, it is the Ca formation and the skull formation that takes place first in the case of the development of the embryo Place the crushed oak bark in the brain cavity of the skull. Block the opening with a well shaped bone piece.
- Place the skull in a watery environment with weeds and plant muck which would have been damaged by the local diseases that affect the crop. This helps build up the resistance of the plants and follows the principles of Homeopathy.
- It should be placed in a location where there is exchange of water such as rain drain/swamp.
- It should be noted that a foul smell is emitted on lifting the preparation and removing it from the skull.
- This gradually reduces with drying after removal in a dark dry place

Time of Burial to Lifting:

The preparation is placed in September and lifted in March.

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BD 506 Dandelion (Taraxicum officinalis)

It is made from the dandelion wrapped up in a bovine mesentery.

Method of Preparation:

- Use the mesentery of the cow. The flower is very sensitive to light and hence it is placed in the mesentery of a cow, which itself is sensitive.
- Ensure that extra fat is cut off.
- Do not wash the mesentery.
- Place the dried flowers in the mesentery and wrap into a parcel and tie with a jute thread.
- Place the parcel in a good mixture of soil and compost into a pot.
- While lifting the preparation the mesentery may or may not be seen

Time of Burial to Lifting:

Place in September and lift in March.

Result:

It stimulates relation between Si and K so that the Si can attract cosmic forces to the soil.

BD 507 Valerian (Valeriana officinalis)

The juice of valerian flowers is used for this preparation.

Method of Preparation:

- Place the clipped flowers into a mortar and pestle and grind into a paste.
- This paste is added to water in the ratio of 1:4 in a bottle.
- Ensure storage in a cool place.

Result:

It stimulates compost so that Phosphorus component is properly used by the soil.

BD 508 - Horsetail herb (Equisetum arvense)

It is very high in silica, it can be used as a tea to control fungus in the early season.

Materials

- 1 kg Equisetum arvense (Horsetail herb) or Casuarina
- 10 litres water

Preparation Process

Make a strong tea/tincture by boiling the Equisetum arvense or Casuarinain hot water for 2 hrs. Let it sit for 2 days.

Application Process

- Dilute the tincture: 50 grams tincture to 10 litres of water
- Spray onto the soil or over the plants in the early growing stages
- For mild fungus problems BD 508 is often sufficient, but for more severe problems BD 501 is more effective.

BD Compost

Making the biodynamic way

Use a mixture of protein rich materials

e.g. Animal manures, lawn clippings, Fresh green grass, leaves and shoots of legumes trees, such as glirisidia, erythrina, Crotalaria and Carbon rich materials e.g. shredded coconut fronds, coir pith, paddy straw, hay, wood clip and dry leaves

Process:

- Build an air tunnel at the bottom of the heap with bale or corn stalks
- It is made in layering method, with the one layer of carboneous about 10 cm deep, alternating with the protein material about 15cm deep and cow dung slurry used as a pouring material
- Add hydrated lime to the green vegetation layer
- If the soil need phosphate, rock phosphate can be applied to the heap
- Make 5 balls of 1 gram each of the BD 502-506 put it in the compost heap
- Stir 10ml of BD 507 in 1 litre of water for 10 mins and pour half of it into hole on top
- Insert a stick into the heap to measure heat
- Water regularly

Cow Pat Pit (CPP)

- Cow Pat Pit (CPP) is a specialized type of compost refers to cow manure mixed with crushed eggshell and basalt dust, then put into a 12-inch-deep pit lined with bricks. The dung is fermented together with the preparation BD 502-507 for a period of three to four months. It is applied in the evenings during the cooler days.
- 60 kgs of cow dung gives about 30-35 kgs of CPP after fermentation

- Application: 1 kg in 40 litres of water per acre

Benefits

- CPP stimulates activity of microorganisms and promotes water retention capacity
- It enhances germination
- It promotes rooting in cutting and grafts
- It improves soil structure
- It provides resistant to plants against pests and diseases

Preparation Process

- Fermentation of locally available plant material and cow dung through BD 502-507 in pot
- Fermentation period: 8-12 weeks

Benefits

- Provides trace elements to the soil and plants
- Aids in the formation of humus
- Acts as a plant tonic: Good for insect control

Peppering

- Peppering is a technique suggested by Rudolf steiner to reduce the incidence of weeds, insects and rodents.
- The term peppering refers to the ash produced using this method of pest control, which is then sprinkled over effected areas

Process:

- Collect weed seeds, root of growing weeds
- Placed in a very hot fire and burnt at full moon
- Ash is mixed with sand or wood ash and spread over the affected land at full moon, several times in the year if needed

Crop Rotation

Crop rotation, proper soil cultivation and other organic farming methods: intelligent planning to let the soil rest after heavy-feeding crops (such as potatoes, tomatoes, cabbage), by sowing green manures (legumes, clover) and covering the soil (grass, clover) so that it may build up its humus content and nitrogen levels.

Mulching

- Mulch is a layer of dried weeds, grass or leaves placed over plant beds
- During rainy months mulching protects the beds from soil erosion
- Conservation of moisture and temperature balance in the soil
- suppress the weed growth

Biodynamic Planting Calendar

This calendar is based on the suggestions given by Rudolf Steiner. But one can conduct experiments with different rhythms, different locations and different cycles of the seasons and each time observing and noting the results then you can get very good knowledge about the procedures. In this calendar we describe some of the basic rhythms that can be used in Biodynamic Farming.

- Ascending days (Moon)
- Descending days (Moon)
- Nodes
- Apogee
- Perigee
- Full moon
- New moon
- Moon opposite Saturn

Ascending days (Moon):

- The distance between moon and earth increases day by day for 13.6 days approx. These days are ascending days.
- The earth is breathing out- the development occurs in upper parts of the plant E.g. Shoots48 hours before full moon is suitable time for sowing seeds and applying liquid manures including CPP as foliar spray. Panchagavyam can be sprayed.

In these days we can

- Sowing seeds in direct seed sowing methods.
- Sowing seeds for raising the seedlings
- Spraying liquid manures as foliar spray.
- Spraying panchaghavy as foliar spray.

- Spraying B.D 501 (Horn Silica) upto 10.00 AM
- Harvesting leafy vegetables and fruits

Descending Days (Moon):

- These days are indicated in black tint
- The distance between moon and earth becomes closer for 13.6 days approx. These days are mentioned as descending days
- The earth is breathing in- the development occurs in below the ground parts of the plant E.g. Roots

In these days we can

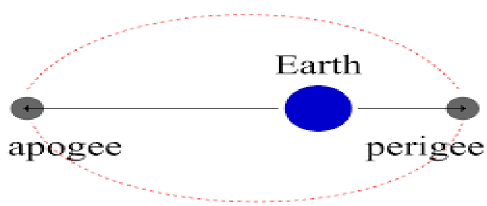
- Transplanting the seedlings
- Making compost
- Compost application to the field
- Ploughing
- BD 500 + CPP and Liquid manure application in the soil
- Harvesting bulbs and roots

The Nodes

The Moon crosses the path of the sun (The Ecliptic). The crossing points are called as **Nodes** and these are the places and times where eclipses can occur. The terms ascending node and descending node indicates whether the moon is ascending and descending in relation to the sun's path. In this calendar the node indicates the occurring time. Before and after 6 hours from the time avoid important agri activities.

Apogee and Perigee:

When the moon is closest to the Earth is called **perigee** and the farthest from the earth is called **apogee**. The moon moves from perigee to apogee and back again in 27.5 days approx. The distances at apogee and perigee are not constant. Before and after 6 hours at the particular time we must avoid seed sowing and transplanting. But on apogee days we can sow the tuber like potato.



Full moon:

48 hours before full moon is suitable time for sowing seeds and applying liquid manures including CPP as foliar spray. Panchagavy can be sprayed in this day at morning hours. B.D. 501 (Horn Silica) can be sprayed for fungal control.

New Moon:

- Avoid sowing seeds
- Felling timber
- Seeds such as black gram shall be collect for sowing and preserving purpose

Moon Opposite Saturn:

It's simply when Moon and Saturn are standing opposite side to earth at 180°. This position occurs in 27.5 days.

- Seed sowing and transplanting
- B.D. 501 (Horn Silica) spraying at early morning
- It is auspicious day for all important agri activities

Advantages of Biodynamic farming

- Biodynamic preparations rapidly benefit soil physical, chemical and microbial biomass which makes the soil a living system.
- Biodynamic agriculture ensures high soil fertility, which produces the best and quality food for humans.
- Besides the higher earthworm abundance, enzymatic activities and microbial population in the soil, higher yield is also obtained with a combination of biodynamic and organic farming practices.
- Thus, biodynamic agriculture altered the degenerative effect of intensive farming practices, build and sustain soil productivity as well as plant, animal and human health.
- More Nutritious Foods (Better Quality Soil, leads to Better Quality Food)
- Reduced Exposure to Toxic Chemicals (Pesticides, Herbicides, Fertilizers)

Disadvantages of Biodynamic Farming

- Small scale Today agriculture is all about "Mass Production". Biodynamic farming is also not very conducive to

mechanization, so it's difficult to practice on a large scale and its distribution is also limited.
- Labor Intensive - Biodynamic farming is more labour intensive than conventional farming practices, which makes the produce more expensive.
- More Expensive for the Consumer
- Lack of scientific evidence to support this idea

Against the Mainstream

- Difficult to persuade people away from conventional farming due to an overall lack of environmental concern in our society.
- It can also be seen as a pseudoscience by non-believers, a fact that contributes to a general lack of mainstream acceptance.

Biodynamic Association of India (BDAI)

- The Biodynamic Association of India was formally registered as a Society under the Karnataka Societies Registration Act, in 1999 and its registered office is at Bangalore.
- Biodynamic Association of India promotes farming that produces safe and healthy food for our families in synergy with Nature's connectedness with the Cosmos and coordinates the Biodynamic Agriculture movement in India.

Demeter

- The Biodynamic Federation Demeter International is the only agricultural association that has built up a network of individual certification bodies for biodynamic farmers worldwide.
- The Demeter symbol was introduced and registered as a trademark in 1928. Its use is permitted only for authorized license according to the National or International Demeter Labelling Standard.
- Internationally, it is the only agency currently certifying Biodynamic farms.
- Demeter association of biodynamic farmers for maintaining production standards used both in farming and processing foodstuffs.

Strategies for popularization of biodynamic farming

- Inventory of prevailing biodynamic production systems and their validation for vegetable crops
- Scientific explanation for response of biodynamic farming on yield, quality and particularly soil fertility, water quality needs to be ascertained
- Promotion of establishment of demonstration for preparation of biodynamic compost, cow horn manures, cow horn silica, cow pat pit (CPP), liquid manures and liquid biodynamic pesticides
- Promotion for field demonstration for biodynamic preparations
- Organizing intensive training to farmers, NGO representatives, entrepreneurs and extensive workers for biodynamic preparations and their applications
- State Agriculture universities should initiate few courses on 'Biodynamic farming'
- Establishment of National Standards governing BD Certification and marketing channels

References

Jukneviciene, E., Danilcenko1, H., Jariene, E., Zivatkauskiene, V., Zeise, J. & Fritz, J. (2021). The effect of biodynamic preparations on growth and fruit quality of giant pumpkin (*Cucurbita maxima* D.). *Chemical and Biological Technologies in Agriculture*. **8**, 1-15.

Pathak, R. K. & Ram, R. A. (2005). Successful conversion of conventional to organic/biodynamic: a case study. In: conference on Production and Export of Organic Fruit and Vegetables in Asia, 61-70.

Shinogi K. C., Rashmi I., Srivastva R., Thakur J. k., Meena P. B. & Pandurang G. R. (2023). Significance of biodynamic methods to rebuild self-reliant small holder farming systems, Harit Dhara *6(1) January – June, 2023*

RecommendedWebsite
http://www.biodynamics.in/
http://www.organichutbkk.com
http://supabiotech.org/

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7. PLANT BITECHNOLOGY

Importance of Molecular Breeding over Conventional Breeding

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Summary

Molecular breeding, leveraging modern biotechnology and genomics, has revolutionized agricultural practices, offering significant advantages over conventional breeding. This article explores the importance of molecular breeding, its various types, methodologies, applications, and concludes with its profound impact on agriculture.

Introduction

Conventional breeding has been the cornerstone of agricultural development for centuries, involving the selection of plants with desirable traits and cross-breeding them over multiple generations. However, this method is time-consuming, labor-intensive, and often limited by the genetic potential of the plants. Molecular breeding, an advanced form of plant breeding, utilizes molecular biology tools to enhance the precision and efficiency of breeding processes. This approach includes techniques like marker-assisted selection (MAS), genomic selection, and genetic modification, significantly accelerating the development of crops with improved traits.

Significance of Molecular Breeding over Conventional Breeding

The significance of molecular breeding over conventional breeding lies in its precision, efficiency, and ability to address complex traits. Key benefits include:

- **Speed and Efficiency**: Molecular breeding dramatically reduces the time required to develop new plant varieties.
- **Precision**: Enables the identification and incorporation of specific genes responsible for desirable traits.
- **Trait Improvement**: Enhances traits such as yield, disease resistance, drought tolerance, and nutritional quality.
- **Complex Trait Management**: Facilitates the study and improvement of polygenic traits that are challenging to address through conventional methods.
- **Global Food Security**: Contributes to increased agricultural productivity and sustainability, essential for meeting the food demands of a growing global population.

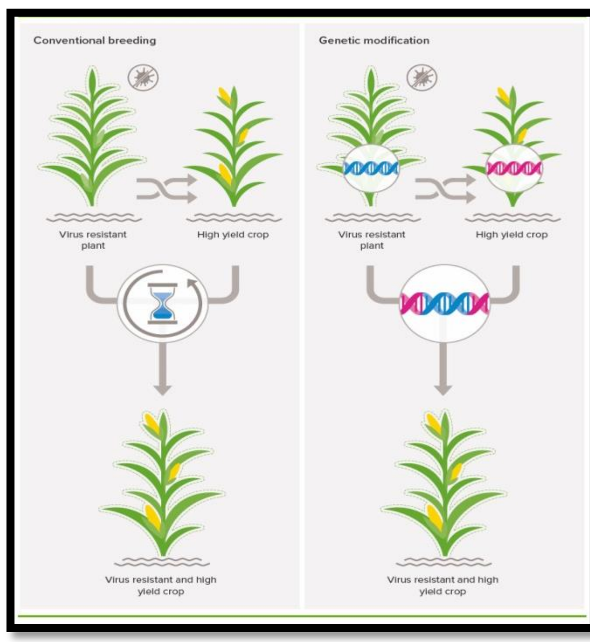

Fig: Conventional Breeding VS Molecular Breeding

Types

- **Marker-Assisted Selection (MAS)**: Utilizes molecular markers linked to specific traits to select plants with desired characteristics early in the breeding process.
- **Genomic Selection**: Uses genome-wide markers to predict the performance of breeding candidates, allowing for more accurate selection.
- **Genetic Modification (GM)**: Direct manipulation of an organism's DNA to introduce new traits or enhance existing ones.
- **CRISPR/Cas9 and Gene Editing**: Precise editing of genes to improve traits or remove undesirable characteristics.

Methodology

- **DNA Extraction and Sequencing**: Isolating and sequencing the plant's DNA to identify genetic markers associated with desirable traits.
- **Marker Identification**: Identifying and validating markers linked to specific traits.
- **Genotype-Phenotype Correlation**: Establishing a relationship between genetic markers and observable traits.
- **Selection and Breeding**: Using identified markers to select parent plants and cross-breed them to develop new varieties.
- **Field Trials and Validation**: Testing the new plant varieties in field conditions to validate their performance and stability.

Applications

- **Disease Resistance**: Developing crops resistant to pathogens, reducing reliance on chemical pesticides.
- **Abiotic Stress Tolerance**: Enhancing tolerance to stresses like drought, salinity, and extreme temperatures.
- **Yield Improvement**: Increasing crop yield to meet global food demands.
- **Nutritional Enhancement**: Biofortification of crops to improve nutritional content, addressing malnutrition.
- **Sustainable Agriculture**: Promoting sustainable practices by developing crops that require fewer inputs like water and fertilizers.

Conclusion

Molecular breeding represents a transformative approach in agricultural science, offering substantial advantages over conventional breeding methods. Its ability to precisely and efficiently develop crops with enhanced traits is crucial for addressing global challenges such as food security, climate change, and sustainable agriculture. As technology continues to advance, molecular breeding will undoubtedly play a pivotal role in the future of agriculture, ensuring a resilient and productive food system for generations to come.

8. AGRICULTURE

Model Genome Club for Sustainable Agricultural Development

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Introduction

The Model Genome Club for Sustainable Agricultural Development is an innovative initiative under the Rashtriya Krishi Vikas Yojana (RKVY) aimed at harnessing the power of genomics to enhance agricultural productivity, promote sustainable farming practices, and improve the livelihoods of farmers. This club will serve as a platform for integrating advanced genomic technologies with traditional agricultural knowledge, fostering a new era of precision agriculture and sustainable development.

Objectives

1. **Enhance Crop Productivity:**
   a. Utilize genomic tools to develop high-yielding, disease-resistant, and climate-resilient crop varieties.
2. **Promote Sustainable Practices:**
   a. Encourage the adoption of environmentally friendly farming practices through the application of genomics.
3. **Capacity Building:**
   a. Provide training and resources to farmers, researchers, and agricultural professionals on genomic techniques and their applications.
4. **Facilitate Research and Development:**
   a. Support collaborative research projects between academic institutions, government bodies, and private sector stakeholders to drive innovation in agricultural genomics.
5. **Improve Livelihoods:**
   a. Enhance the economic conditions of farmers by increasing productivity, reducing losses, and creating new market opportunities through improved crop varieties.

Key Features

1. **Genomic Resource Center:**
   a. Establish a central hub equipped with state-of-the-art genomic sequencing and analysis tools to support research and development activities.
2. **Collaborative Research Projects:**
   a. Facilitate partnerships between universities, research institutions, and agricultural organizations to conduct cutting-edge genomic research focused on crop improvement.
3. **Training and Workshops:**
   a. Organize regular training sessions, workshops, and seminars to educate farmers and agricultural professionals on the applications of genomics in agriculture.
4. **On-Field Demonstrations:**
   a. Implement demonstration projects on model farms to showcase the benefits of genomic technologies in real-world agricultural settings.
5. **Seed Banks and Genetic Libraries:**
   a. Develop seed banks and genetic libraries to preserve and share improved crop varieties developed through genomic research.
6. **Farmer Support Services:**
   a. Provide advisory services to farmers, including soil health assessments, pest and disease management, and precision farming techniques based on genomic data.

Implementation Strategy

1. **Initial Setup:**
    - Secure funding and resources from RKVY and other stakeholders to establish the Genome Club's infrastructure and resource center.
2. **Partnership Building:**
    a. Form strategic partnerships with academic institutions, research organizations, and private sector companies to drive collaborative research and development efforts.
3. **Capacity Development:**
    a. Train a cadre of experts and extension workers who can disseminate knowledge and assist farmers in adopting genomic technologies.
4. **Pilot Projects:**
    a. Launch pilot projects in selected regions to test and demonstrate the effectiveness of genomic interventions in improving crop productivity and sustainability.
5. **Scaling Up:**
    a. Based on the success of pilot projects, expand the program to other regions, tailoring interventions to local agricultural conditions and challenges.

Challenges

1. **Awareness and Acceptance:**
    a. Ensuring that farmers understand and are willing to adopt genomic technologies is a significant challenge that requires continuous education and demonstration.
2. **Resource Availability:**
    a. Securing sufficient funding, advanced equipment, and skilled personnel to support genomic research and its applications in agriculture.
3. **Integration with Traditional Practices:**
    a. Balancing the integration of advanced genomic techniques with traditional farming practices to ensure holistic development.
4. **Data Management:**
    a. Handling large volumes of genomic data and ensuring its effective use in practical agricultural applications.

Future Prospects

The Model Genome Club for Sustainable Agricultural Development holds immense potential to revolutionize Indian agriculture by making it more productive, resilient, and sustainable. By integrating genomic technologies with traditional practices, this initiative can significantly enhance crop yields, reduce environmental impact, and improve the economic conditions of farmers. Continued support and collaboration among stakeholders will be crucial to overcoming challenges and realizing the full benefits of this innovative approach to agricultural development.

Conclusion

The Model Genome Club under RKVY represents a forward-thinking approach to sustainable agricultural development, leveraging the power of genomics to address key challenges in the sector. By fostering innovation, building capacity, and promoting sustainable practices, this initiative can play a pivotal role in transforming Indian agriculture, ensuring food security, and improving farmer livelihoods.

9. AGRICULTURE

Rashtriya Krishi Vikas Yojana (RKVY): A Boost for Indian Agriculture

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Introduction

Rashtriya Krishi Vikas Yojana (RKVY) is a landmark initiative by the Government of India aimed at developing the agricultural sector and ensuring food security in the country. Launched in 2007, RKVY has played a significant role in improving agricultural productivity, enhancing farm incomes, and promoting sustainable farming practices.

Objectives

RKVY was introduced with several key objectives in mind:

1. **Bridging Yield Gaps:** To incentivize states to increase public investment in agriculture and allied sectors, thereby bridging the yield gaps in important crops.
2. **Holistic Development:** To ensure a holistic approach to agriculture by promoting integrated development of crop, dairy, fisheries, poultry, and other sectors.
3. **Beneficiary Empowerment:** To empower farmers through the adoption of innovative agricultural practices and modern technologies.
4. **Sustainable Practices:** To promote sustainable farming practices that are environmentally friendly and economically viable.

Key Features of Rashtriya Krishi Vikas Yojana (RKVY)

Rashtriya Krishi Vikas Yojana (RKVY) is designed to enhance agricultural productivity and promote sustainable development in India's agricultural sector. Its key features include:

1. **State-Led Planning:**
   a. **Decentralized Approach:** RKVY empowers states to develop and implement agricultural plans based on their specific needs and priorities, ensuring that interventions are tailored to local conditions and challenges.
   b. **Autonomy:** States have significant autonomy in choosing and executing projects, fostering innovation and addressing region-specific issues effectively.
2. **Flexibility and Innovation:**
   a. **Adaptive Implementation:** The scheme provides flexibility in the planning and execution of projects, allowing states to adapt strategies based on evolving needs and emerging challenges.
   b. **Encouragement of Innovation:** By offering the freedom to design unique interventions, RKVY encourages states to experiment with new technologies and innovative practices to boost agricultural productivity.
3. **Incentive-Based Funding:**
   a. **Investment Incentives:** RKVY incentivizes states to increase their investment in agriculture and allied sectors by providing additional financial support based on their expenditure and commitment to agricultural development.
   b. **Performance-Linked Funding:** Funding allocations are linked to the performance and achievements of states in implementing their agricultural plans, promoting accountability and efficient use of resources.
4. **Comprehensive Coverage:**
   a. **Holistic Development:** RKVY supports the integrated development of various agricultural and allied sectors, including crop production, horticulture, animal husbandry, dairy development, fisheries, and agro-forestry.
   b. **Wide Range of Activities:** The scheme covers a broad spectrum of activities, from improving crop yields and promoting organic farming to enhancing market linkages and developing rural infrastructure.
5. **Infrastructure Development:**
   a. **Irrigation and Water Management:** RKVY funds the creation and expansion of irrigation facilities, promoting efficient water use and ensuring reliable water supply for agriculture.
   b. **Storage and Logistics:** The scheme supports the construction of storage facilities, cold chains, and transportation infrastructure to reduce post-harvest losses and improve

market access for farmers.

6. **Promotion of Sustainable Practices:**
   a. **Environmental Sustainability:** RKVY emphasizes the adoption of sustainable and environmentally friendly farming practices, such as organic farming, integrated pest management, and conservation agriculture.
   b. **Soil Health and Fertility:** Initiatives under the scheme include soil health management programs, soil testing services, and the promotion of balanced fertilizer use to maintain soil fertility and enhance productivity.
7. **Farmer Empowerment and Capacity Building:**
   a. **Training and Extension Services:** RKVY provides extensive training and extension services to farmers, enhancing their knowledge and skills in modern agricultural practices and technologies.
   b. **Technology Dissemination:** The scheme facilitates the dissemination and adoption of new technologies, such as precision farming, remote sensing, and mobile-based advisory services, enabling farmers to make informed decisions.
8. **Focus on Inclusivity:**
   a. **Support for Vulnerable Groups:** RKVY aims to include small and marginal farmers, women farmers, and other vulnerable groups in its initiatives, ensuring equitable growth and development in the agricultural sector.
   b. **Income Diversification:** By promoting the diversification of agricultural activities, the scheme helps farmers increase their income sources and reduce dependency on single-crop cultivation.

Achievements of Rashtriya Krishi Vikas Yojana (RKVY)

Since its inception in 2007, the Rashtriya Krishi Vikas Yojana (RKVY) has achieved several significant milestones that have contributed to the overall development of Indian agriculture:

1. **Increased Investment in Agriculture:**
   a. **Boost in Funding:** RKVY has led to a substantial increase in public investment in the agricultural sector. The scheme encourages states to allocate more resources towards agriculture and allied activities, resulting in enhanced funding and support.
   b. **State Initiatives:** Various states have utilized RKVY funds to implement innovative and region-specific projects, addressing the unique needs and challenges of their agricultural sectors.

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2. **Enhanced Agricultural Productivity:**
   a. **Yield Improvements:** The scheme has contributed to significant improvements in crop yields through the adoption of modern farming practices, quality seeds, and advanced technologies.
   b. **Diversification:** RKVY has promoted diversification in agriculture by supporting horticulture, fisheries, dairy, and livestock management, leading to increased productivity and income for farmers.
3. **Infrastructure Development:**
   a. **Irrigation Projects:** RKVY has facilitated the development and expansion of irrigation infrastructure, ensuring better water management and availability for farming activities.
   b. **Storage and Warehousing:** The scheme has supported the construction of storage facilities, cold chains, and warehouses, reducing post-harvest losses and improving market access for farmers.
   c. **Market Linkages:** By improving market infrastructure and linkages, RKVY has helped farmers get better prices for their produce, reducing their dependency on middlemen.
4. **Promotion of Sustainable Practices:**
   a. **Eco-Friendly Techniques:** RKVY has encouraged the adoption of sustainable and eco-friendly farming techniques, such as organic farming, integrated pest management, and conservation agriculture.
   b. **Soil Health Management:** Initiatives under RKVY have focused on soil health management, including soil testing and the use of balanced fertilizers, leading to improved soil fertility and productivity.
5. **Farmer Empowerment and Capacity Building:**
   a. **Training and Extension Services:** RKVY has provided extensive training and extension services to farmers,

enhancing their knowledge and skills in modern agricultural practices.

b. **Technology Adoption:** The scheme has facilitated the dissemination and adoption of new technologies, such as precision farming, remote sensing, and mobile-based advisory services, empowering farmers to make informed decisions.

6. **Holistic Development:**
   a. **Integrated Development:** RKVY has promoted integrated development of agriculture and allied sectors, ensuring a more comprehensive and balanced approach to rural development.
   b. **Inclusive Growth:** The scheme has aimed to include small and marginal farmers, women farmers, and other vulnerable groups, ensuring equitable growth and development in the agricultural sector.

Challenges Faced by Rashtriya Krishi Vikas Yojana (RKVY)

Despite its successes, the Rashtriya Krishi Vikas Yojana (RKVY) encounters several challenges that hinder its full potential:

1. **Implementation Gaps:**
   a. **Variation Across States:** There is a notable disparity in the effectiveness of RKVY implementation across different states. Some states have effectively utilized the funds and achieved significant progress, while others lag due to administrative inefficiencies or lack of proper planning.
   b. **Delayed Execution:** Delays in project approvals and fund disbursement can lead to stalled projects and reduced impact.
2. **Monitoring and Evaluation:**
   a. **Lack of Robust Mechanisms:** Effective monitoring and evaluation are critical for the success of any large-scale scheme. However, RKVY faces challenges in establishing robust monitoring mechanisms to track the progress and impact of various projects.
   b. **Data Collection Issues:** Accurate and timely data collection is essential for assessing the scheme's outcomes, but inconsistencies in data reporting and collection pose a challenge.
3. **Resource Allocation:**
   a. **Optimal Use of Funds:** Ensuring that the allocated funds are used optimally and for the intended purposes is a significant challenge. Misallocation or misuse of resources can undermine the scheme's objectives.
   b. **Equitable Distribution:** Achieving an equitable distribution of resources across different regions and sectors remains a concern. Some areas may receive more attention and funding than others, leading to imbalanced development.
4. **Capacity Building:**
   a. **Training and Skill Development:** There is a need for continuous training and capacity building of the personnel involved in implementing RKVY projects. Lack of adequate training can result in inefficiencies and poor execution of projects.
   b. **Farmer Awareness:** Ensuring that farmers are aware of and can benefit from the various initiatives under RKVY is crucial. Limited awareness and outreach can restrict the scheme's reach and effectiveness.
5. **Sustainability of Projects:**
   a. **Long-Term Impact:** Ensuring the sustainability of projects and initiatives undertaken under RKVY is vital. Some projects may show short-term gains but fail to provide lasting benefits due to lack of maintenance or follow-up.
   b. **Environmental Considerations:** Balancing agricultural development with environmental sustainability is a key challenge. Promoting practices that are both productive and eco-friendly is essential for long-term agricultural growth.
6. **Coordination Among Stakeholders:**
   a. **Inter-Departmental**

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Coordination: Effective coordination among various government departments and agencies is necessary for the successful implementation of RKVY. Lack of synergy and cooperation can lead to fragmented efforts and reduced impact.

b. **Public-Private Partnerships:** Leveraging public-private partnerships can enhance the reach and efficiency of RKVY. However, establishing and managing these partnerships can be challenging.

Conclusion

The Rashtriya Krishi Vikas Yojana (RKVY) is a pivotal initiative aimed at enhancing agricultural productivity and sustainability in India by empowering states to tailor interventions to their unique needs. With objectives centered around increasing public investment, promoting holistic development, and fostering sustainable farming practices, RKVY has achieved significant milestones, including increased agricultural investment, enhanced productivity, and improved infrastructure. However, challenges such as implementation disparities, monitoring inefficiencies, and resource allocation issues persist. Addressing these challenges while leveraging the scheme's flexibility and innovative potential will be crucial for RKVY's future success, ensuring resilient agricultural growth and improved livelihoods for farmers

10. ENTOMOLOGY

Entomotherapy: Unveiling the Medicinal Potential of Insects

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Introduction

Since ancient times, humans have utilized animals, including insects, for medicinal purposes, creating remedies from body parts, secretions, and other materials. Insects offer various therapeutic benefits due to their properties, making them valuable in traditional and modern medicine. Entomotherapy, the use of insects for medicinal purposes, reflects their longstanding significance in healthcare. Historically, insects have been used for thousands of years in traditional medicine. Bees, for instance, provide honey and other products with medicinal properties. In Chinese medicine, insect extracts treat various ailments, including cancer. In Brazil, indigenous peoples and settlers have used insects medicinally. In India, with its unique ecological diversity, insects have been extensively utilized in traditional medicine. Local tribes employ various insect species to treat a wide range of conditions. From pneumonia to liver disorders, insects play a significant role in the medicinal practices of rural communities across the country.

Major Insect Groups Involved

- **Hymenoptera**: Honey bee and wasp venom treat infections, arthritis, and cancer. Bee sting therapy and honey-based products heal wounds, infections, and arthritis, with honey-treated wounds showing enhanced healing. Bee venom peptides like melittin combat various cancers, while bee pollen acts as a health tonic for ulcers and skin conditions. Propolis has antibacterial properties, royal jelly prevents arteriosclerosis, and fire ant venom inhibits angiogenesis. Ant eggs improve vision, and ants aid in paralysis treatment.
- **Coleoptera**: Cantharidin, found in blister beetles, is used to treat warts, skin issues, and various cancers. This toxic terpenoid has been utilized for over 2000 years, showing effectiveness against melanoma, leukemia, breast

cancer, hepatoma, bladder and gall bladder carcinomas, colorectal carcinoma, and pancreatic cancer.

- **Blattodea**: Cockroach heads contain substances that can kill pathogens like *Escherichia coli* and Methicillin-resistant *Staphylococcus aureus* (MRSA). These pathogens cause severe infections, and cockroach-derived treatments offer alternatives to conventional medications. Cockroach tissue extracts have shown efficacy in eliminating over 90% of MRSA and *E. coli* infections. Additionally, cockroaches have been used to treat various ailments such as dropsy, ulcers, Bright's disease, whooping cough, epilepsy, and boils.
- **Termites**: Termites are employed in traditional medicine to treat various disorders. Different species are used to address health issues such as asthma, bronchitis, influenza, whooping cough, sore throat, sinusitis, and tonsillitis. Termite species like *Microkeratomes exiguous* and *Nasturtiums macrocephalus* are particularly noted for their medicinal uses.
- **Diptera**: Blood-feeding insects like ticks, horseflies, and mosquitoes inject bioactive substances that prevent blood clots and thrombosis. Fruit flies can detect cancer by identifying specific cancer markers. Maggot therapy involves using sterile blow fly larvae to remove necrotic tissue, prevent infection, and promote healing in chronic wounds. Maggots secrete compounds like allantoin and proteolytic enzymes that kill bacteria and aid wound healing. Commonly used flies in maggot therapy belong to the families Calliphoridae (Blow Flies) and Sarcophagidae (Flesh Flies).
- **Orthoptera**: Grasshoppers are used to treat kidney disorders and digestive diseases. A mixture of crushed grasshopper hind legs and water acts as a potent diuretic. Grasshoppers are also used to treat hepatitis, asthma, and violent headaches. In Nigeria, mole crickets are applied to infected feet, and crickets are consumed for mental development and prenatal care.
- **Hemiptera**: Oil extracted from bugs is used to treat kidney, liver, and stomach problems, as well as Scrofula and other tubercular illnesses. These bugs possess analgesic and anaesthetic properties, useful for gastrointestinal disorders, toothaches, and rheumatic pain. Mealy bugs are used to treat leprosy, skin disorders, muscle pain, itching, burns, and dropsy. The "grana" mealybug, *Dactylopius coccus*, is also employed for its medicinal and practical uses.
- **Lepidoptera**: Silkworms are used in traditional medicine for treating impotence, detoxification, and bacterial infections causing sore eyes, swollen throats, and speech loss. A compound extracted from *Bombyx mori* pupae inhibits phosphodiesterase and increases nitric oxide production, offering a potential treatment for vasculogenic impotence in men.

Conclusion

Insects have been integral to traditional medicine across various cultures for centuries, offering a rich reservoir of therapeutic substances with potential applications in modern medicine. From the venom of bees and wasps to the healing properties of maggots and the medicinal use of termites, these creatures provide a diverse array of bioactive compounds that address a wide range of ailments, including infections, chronic wounds, cancers, and inflammatory diseases. The historical and ongoing use of insects in traditional remedies underscores their significance as natural pharmacies, presenting opportunities for novel medical treatments and pharmaceutical innovations. As scientific research continues to explore and validate these traditional practices, the integration of insect-based therapies into contemporary medicine holds promise for enhancing healthcare and expanding the arsenal of effective, natural treatments.

References

Bairagi, S. H. 2019. Insects with potential

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medicinal significance: a review. *Biomedical Journal of Scientific & Technical Research*, 16(3), 12024-12027.

Pungavi, R., Priyadarshini, V.M., Harikaran, K and Gokul, D. Pharmaceutical significance of insects an overview. *Dimension in agricultural sciences*, p.143.

Shrivastava, S. K and Prakash, A. 2015. Entomotherapy: An un-explored frontier for make in India: a review. *Journal of Applied Zoological Researches*, 26(2), 113- 123.

11. AGRICULTURE

Seaweeds in Agriculture and Food System

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Seaweed's extraordinary adaptability, short development period, and resource sustainability have made it one of the most promising resources. It is a useful innovation to lessen resource shortages in the future. Because of the growing production and demand for seaweed globally in recent years, algae resources have reached a high level of growth.

Generally in 2019 over 95% of the world's seaweed culture production was produced using the following five types of seaweed. And 34.65% of the world's cultivation is for human consumption, mostly for salads, sauces, and seasonings. This includes *Laminaria* and *Saccharina*. And 32.62% of the carageen came from tropical algae, namely *Kappaphycus* and *Eucheuma*, and was primarily utilized to produce carrageenan. *Porphyra, Undaria,* and *Gracilaria* contributed for 10.32%, 8.33%, and 7.16% respectively. Seaweeds (such as brown algae, leafy algae, and kelp) are frequently used as fish feed in Asia and South Africa. In China, for example*, Laminaria* and *Sargassum* are used as seaweed fertilizer, while in India, *Kappaphycus* is utilized, and in most European nations, it is manufactured into livestock feed.

Seaweed farming

Seaweed is one of the most abundant and promising sources of biologically active metabolites. These bioactive components of seaweed include polysaccharides, unsaturated fatty acids, phenols, peptides, terpenoids, and other compounds with unique structures and properties, which have the antioxidant, antiviral, anticoagulant, antibacterial and antitumor effects. Many active substances are found in the brown, red, and green seaweeds, which have the great potential in agricultural, edible, and medical fields.

Seaweed is used in horticulture and agriculture as animal feed, manure, soil conditioner, and growth stimulant for crops. It can also be used in liquid extract form to protect crops from pests and diseases. Sea weeds have long been used in agriculture, according to historical accounts, and this practice is commonplace wherever there are plentiful supplies. Animals still regularly eat fresh seaweed or are fed prepared seaweed meal in the coastal regions of Iceland, Norway, Great Britain, Ireland, and France. In coastal areas, seaweed is carried straight into the fields; otherwise, it is used as powdered, dried seaweed meal. Some red seaweeds, referred to as "maerl" on the French coast, are used as a soil conditioner in acid-humus-rich or peat soils instead of lime due to their incredibly high (up to 80%) calcium carbonate concentration.

Agriculture

Seaweed is abundant in unique mineral elements, nutrients, and biologically active chemicals. In recent years, agricultural output has played an increasingly vital role. Seaweed can be utilized as a protectant for diseases and as a stimulant in horticulture, promoting and enhancing all aspects of plant growth and development. Green seaweed *Ulva* crude extracts and sulfated polysaccharides have antibacterial activity against common bean (*Phaseolus vulgaris L.*) anthracnose, as well as considerably promoting soybean growth. Furthermore, seaweed can boost the ability of plants to absorb nutrients, hence improving plant quality. A new study showed that leaf spraying and seed soaking can significantly improve the yield and nutritional quality of carrots treated with seaweed (*Sargassum vulgare*) extract. Seaweed is a valuable animal feeding as well as a source of agricultural chemicals. A variety of algal diets have been utilized to grow a range of fish, shrimp, crabs, and shellfish throughout the last two decades. The most commonly alga are Chlorella, Spirulina, and other microalgae. Many minerals remain in the waste biomass after cyanobacteria recovering oil and carbohydrate, which can be used as fertilizers to improve various physical and chemical properties of soil while boosting yield and conserving fertilizer nitrogen. The Asia–Pacific region accounted for more than 15% of global seaweed fertilizer market revenue in 2017. By 2025, the global market for seaweed fertilizer is estimated to reach 17.1 million US dollars. Organic agriculture is gaining traction, and the usage of seaweed fertilizer is on the rise. As a result, seaweed processing is predicted to become a key resource guarantee in green and modern agriculture.

Food industry

Today, seaweed is as widely used as a vegetable. In many Asian countries, seaweed is an important part of human diet in its fresh, dried, flaky, and flour form. Commercial production of seaweed has been the focus of seaweed research in the past, but recently the researches have been a shift towards high-value products with health benefits. Studies have shown that adding *Chlorella* to foods (such as pasta and biscuits) can improve the nutritional quality of the diet. *Chlorella* and *Spirulina* are mostly applied in tablet, capsule, and liquid form for nutritional supplements because of their high nutritional value and ease of growth. Moreover, an edible cyanobacterium Spirulina platensis has gained worldwide attention as a food additive due to its high nutritional value as a human food. It has proven to be a rich source of protein, polyunsaturated fatty acids, and pigment. Clearly, the food industry is beginning to focus on developing high-value non-commercial products for human health. In the future, many seaweeds are likely to become important components of functional products.

Other applications

Algae is a decent candidate because of its renewable and sustainable features, as well as its economic viability meeting the world's demand of fuels for transportation. Algae can be used to produce biodiesel, bioethanol, biohydrogen, and biomethane. And it is particularly popular in energy applications due to its high safety, lack of competition from food crops, high reproductive capacity, and short cycle In addition, algae has been used in the construction industry.. It can improve building insulation, rainfall attenuation, sound insulation, and lessen the heat island effect and extend the life of the roof. Besides, algae can also help to tackle the problem of eutrophication in water bodies. Green algae were utilized to treat municipal wastewater in ponds. They may remove up to 99% of ammonium and phosphate under cultivation conditions, and then offer valuable wastewater treatment services and supply raw materials for liquid biofuel synthesis. Seaweed would encapsulate its value in a variety of industries due to its unique composition.

It is necessary to strengthen investment in seaweed farming and processing technologies and develop high value-added products with the integrated multi-trophic aquaculture, which have great market potential and need in-depth exploration.

References

1. Ambati, R. R., Phang, S. M., Ravi, S., & Aswathanarayana, R. G. (2014). Astaxanthin: Sources, extraction, stability, biological activities and its commercial applications–a review. *Marine Drugs, 12*(1), 128–152. https://doi.org/10.3390/md12010128

2. Battacharyya, D., Babgohari, M. Z., Rathor, P., & Prithiviraj, B. (2015). Seaweed extracts as biostimulants in horticulture. *Scientia* Horticulturae, 196, 39–48. https://doi.org/10.1016/j.scienta.2015.09.012

3. Francavilla, M., Franchi, M., Monteleone, M., & Caroppo, C. (2013). The red seaweed *Gracilaria gracilis* as a multi products source. *Marine Drugs*, 11(10), 3754–3776. https://doi.org/10.3390/md11103754

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