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A STEP TOWARDS AGRICULTURE

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“Amidst the golden waves of wheat

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WHEAT: THE GOLDEN GRAIN THAT SUSTAINS NATIONS

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from the editor

As we delve into the intricacies of wheat harvesting, it becomes evident that this age-old practice is not just a seasonal routine but a cornerstone of agricultural history and modern sustenance. Wheat, a staple grain cultivated across continents, holds significance not only in culinary traditions but also in global economies. Wheat, a staple crop for millennia, holds a profound significance in human history and agriculture. From the dawn of civilization to modern industrialized farming, wheat has sustained populations, shaped economies, and influenced cultures around the globe. In this issue, we delve into the multifaceted world of wheat, exploring its nutritional value, its role in global food security, the challenges facing wheat production in the 21st century.

Exploring the multifaceted process of wheat harvesting offers a profound insight into the fusion of traditional methods and cutting-edge technologies. From the picturesque landscapes adorned with golden wheat fields to the mechanized marvels that efficiently gather the crop, the journey from field to table is a testament to human ingenuity and agricultural evolution.

As we embark on this exploration, let us immerse ourselves in the rich tapestry of wheat harvesting, acknowledging its pivotal role in shaping our past, sustaining our present, and paving the way for a resilient agricultural future.

Dr. Deepak Kumar
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Microplastic: Scenario in India

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The distribution and impacts of plastic debris, particularly microplastics (MPs), in diverse natural habitats have been the focus of India's attention. MPs are small plastic particles with a diameter of 1µm-5mm that have entered aquatic, terrestrial, and atmospheric environments. They are released through primary or secondary sources, such as fragmentation of plastic waste in aquatic environments, scuffs in vehicle tyres and plastic coatings (Sau et al., 2023). Wastewaters also contain a large number of MPs, including synthetic textile fibers from laundry, polyethylene microbeads from cosmetics, and disintegrating components of larger consumer objects flushed down the toilet. MPs in the environment come in various sizes and shapes, with the majority having irregular shapes, such as pieces, fibers, or films. Microplastics have gained attention for their safety and toxicity, potentially linking them to invasive species and environmental issues. Their small size allows them to be internalized by biota, accumulating in the food chain and adsorbing pollutants on their surfaces. However, microplastics can also carry hydrophobic organic contaminants through ingestion, absorption, or increased excretion. These pollutants penetrate through gill membranes and both direct and indirect nutritional intake of prey, posing a serious environmental problem. Despite these potential risks, the presence of microplastics remains a significant concern for ecotoxicologists (Anbumani and Kakkar 2018).

Microplastic Pollution

Microplastics represent a substantial health concern to both in vivo and in vitro systems since they are newly discovered pollutants with a high potential for bioaccumulation (Anbumani and Kakkar 2018). Many freshwater creatures, such as fish, birds, mammals, and plankton, may consume these little particles, which then build up throughout the aquatic food web. The adsorption of organic pollutants from the surrounding medium by chemical additives found in plastics, such as flame retardants, antistatic agents, plasticizers, heat stabilizers, acid scavengers, thermal stabilizers, and slide compounds, exposes animals to toxicants more often (Hahladakis et al., 2018). These additions can be generically categorized as colorants, fillers, reinforcements, and functional additives. Aquatic environments are threatened by hydrophobic persistent organic pollutants, which have been demonstrated in fishes of marine environment in a controlled laboratory environment using microplastics as vectors.

The fibres and film sheets of microplastics, which include foam plastics, plastic pellets, films, granules, microfibers, and other materials, are what define those (Rodrigues et al., 2019). They are found in greater abundance in lotic and lentic sediments, which may have come from washing clothes in municipal sewage effluents. Polypropylene, polyethylene, polystyrene, polyvinyl chloride, and polyethylene terephthalate are among the materials that may be used to make microplastics. The quality of plastics is impacted by the inconsistent separation and identification processes caused by their varied kinds, sources, and environmental degradation processes (Lahens et al., 2018).

Scenario of Microplastic In India

One-third of people in India reside along its 8000 km long coastline. Prominent industrial centres including as Chennai, Kochi, Kolkata, Mumbai, Visakhapatnam, and Surat are situated in close proximity to the coast, contributing significantly to the generation of plastic garbage (Veerasingam et al., 2017). By entering the maritime environment through bays, streams, and rivers, these wastes endanger coastal resources and ecosystems. Mumbai is one of the major cities that releases a lot of plastic garbage into the coastal waterways every day; other important cities that experience plastic pollution include Kolkata, Chennai, Visakhapatnam, Gujarat, Pondicherry, and Gopalpur (Nanthini et al., 2023). India contributed 8.33 million metric tonnes of plastic pollution yearly, bringing the total to 367 million metric tonnes worldwide in 2021 (Jambeck et al., 2015). India uses a lot of polyethylene and polypropylene as raw materials for microplastics. Ahmedabad, Mumbai, and Kolkata produce the most of these materials (Veerasingam et al., 2016a). Gujarat, the coastline of Chennai, the beaches of Mumbai, and Kerala Lake all have significant accumulations. Water samples have also been discovered to contain microplastics, with the highest concentrations of plastic particles recorded in Delhi, Mumbai, and Chennai. Microplastics have also been found in Indian estuaries and sediments around Vembanad Lake. The effectiveness of bacterial isolates obtained from the Vaigai river in India to degrade microplastics was assessed by Nanthini et al., 2021.

Terrestrial Ecosystem

As pollution from human activity increases, there is rising worry about plastic contamination in terrestrial habitats. Concerns regarding particle-induced toxicity and chemically-induced toxic symptoms during leaching are raised by the growing amount of microplastics (MPs) in the environment (Huerta et al., 2016). According to certain research, the presence of MPs may result from the physical or chemical breakdown of bigger plastic particles into smaller ones. Year 2010 saw the production of 275 million tonnes of plastic garbage, of which 4.8–12.7 million were disposed of in the ocean; the remainder amount was left in the terrestrial environment, suggesting a greater environmental load. For the drilosphere process to continue sustaining soil fertility, soil organisms are essential. According to recent research, there may be a negative relationship between MPs and soil biota that affects the behaviour and health of terrestrial species (Lwanga et al., 2017). The improper removal of plastic garbage, the using landfills to dispose of sewage sludge, human littering, and the contamination of agricultural land by sewage sludge application are some of the pathways through which microplastics (MPs) can enter terrestrial environments. These pathways can impact MPs' fate, retention, occurrence, deprivation, and conveyance. As plastic debris builds up on land, it is discharged into freshwater and marine environments. Additionally, washing textiles generates MP fibres, or microplastics, which damage aquatic life and alter freshwater ecosystem dynamics (Mai et al., 2018).

Marinewater Ecosystem

Oceans all across the world are home to microplastics, which serve as a sink for plastic waste. Studies indicate that they can be found in surface waters, biota, beaches, and the water column. Large ocean currents cause water columns to amass more microplastics (Anbumani and Kakkar 2018). During high tide, between 50 and 300 plastic particles per square metre were found along Caranzalem beach in Goa. There were found to be 68.83 particles/square metre, ranging in size from 1 to 20 mm, in Mumbai, India. Plastic pellets (sizes ranging from 1200 to 3000) with a particle size of 2.5 mm were discovered on the beaches of Goa and Chennai (Veerasingham et al., 2016b). These results emphasise how critical it is to solve the global problem of microplastics in seas. Despite the belief that the number of microplastic particles increases with universal plastic production and consumption, a newest study revealed no appreciable change in the concentration of microplastics in the marine environment of the Baltic Sea ecosystem over the previous three decades (Beer et al., 2018). Microplastics detection in biota is not limited in natural conditions. The research indicates that rather than being solely reliant on global plastic production and consumption, the amount of microplastic contamination may be directly linked to certain human activities.

Freshwater Ecosystem

There are microplastics in lakes, rivers, and estuaries, according to recent studies. Freshwater resources in India are not known to contain microplastic particles. In addition to direct effluent discharge from waste water treatment plants, microplastics can also reach the environment by dissolving in water columns and leaching from land into water basins. Near urban and touristic locations close to freshwater habitats, they are more prevalent. Microplastic particles from freshwater resources in India have not been identified. Industries in coastal areas contribute to significant plastic load into the sea (Anbumani and Kakkar 2018). A Swedish harbor area reported approximately 100,000 plastic particles m−3 near a polyethylene production plant. A significant correlation was observed between densely populated areas and plastic load across six continents. Studies demonstrating the presence of MPs in estuaries, rivers, and lakes indicate that MP pollution poses a serious danger to freshwater biota. Plastic particles may degrade and seep into the environment as a result of industrial, residential, and wastewater treatment plant effluent discharge (Browne et al., 2011).

Investigations in The Indian Ocean

Microbes quickly colonize marine plastics when they are introduced into marine habitats, creating microbial biofilms on surfaces that contain water, nutrients, carbon, and energy (Wright et al., 2020). The way that these materials interact with their surroundings can be influenced by these biofilms, which are present on all natural surfaces. The formation of complex three-dimensional structures and extracellular polymeric substances (EPS) makes biofilms highly persistent microbial colonies that can withstand harsh environments (Xu et al., 2017). Plastic waste enters the global ocean annually, with 15% entering the Indian Ocean (Schmidt et al., 2017). NOAA data shows 4,291 macroplastic items in the Indian Ocean, Mediterranean Sea, North Pacific, South Atlantic, and South Pacific according to visual survey transects.

The Indian Ocean is home to up to 20% of riverine and 15% of coastal plastic, with the concentration of plastic pollution significantly influenced by river inflows. The Ganges, the second-most polluted river that runs alongside the seashore, releases 0.10-0.17 million tonnes of plastic into the Bay of Bengal annually (Roman et al., 2022). The combined Ganges, Meghna, and Brahmaputra rivers could release up to 1-3 billion MPs into the Bay of Bengal daily. The Bay of Bengal, along with the Eastern part of the Arabian Sea, is the largest coastal and riverine source for plastic pollution in the Northern Indian Ocean (Thiemann 2023). Plastics enter the marine environment through different river estuaries to varying degrees. Storm occurrences in a tiny seasonal river near Cape Town, South Africa, left trash stuck within 0.5 kilometres of the river mouth. It was discovered that the Punnakayal estuary in Chennai had up to 19.9 MPs per L of pollution, suggesting that MPs might be transported from inland regions to the Gulf of Mannar via this estuary (Selvam et al., 2021). According to Manickavasagam et al. 2020, a significant amount of the plastic trash carried down the South Juhu Creek from densely inhabited regions to the oceans was made up of macroplastic, which can ultimately convert the material into plastic. The Indonesian throughflow from the North Pacific may transport a significant amount of MPs to the Indian Ocean, primarily through fresh surface waters. However, MP abundances and types vary along E-W transects in the Indian Ocean, suggesting regional or local origins rather than solely from large river sources and low-salinity surface water.

Conclusion

India has a high population density and is the second most populated country in the world. Studies that have been published indicate that the marine environment in India is becoming more and more contaminated by microplastics. In India, the absence of scientific solid waste treatment poses a significant obstacle to future plastic pollution mitigation. The current article has finally concluded that there is a much higher level of microplastic contamination in the Indian marine environment than there is on average globally. If this issue is not addressed in a way that is both appropriate and grounded in science, there will be serious risks to both India's marine resources and the global environment.

References

1. Anbumani, S., & Kakkar, P., (2018). Ecotoxicological effects of microplastics on biota: a review. *Environ. Sci. Poll. Res.* 25:14373-14396.
2. Beer, S,, Garm, A., Huwer, B., Dierking, J., & Nielsen, TG., (2018) No increase in marine microplastic concentration over the last three decades–A case study from the Baltic Sea. *Sci. Total. Environ.* 621: 1272–1279.
3. Browne, MA., Crump, P., Niven, SJ., Teuten, EL., Tonkin, A., Gallowa, T., & Thompson, RC., (2011) Accumulations of microplastic on shorelines worldwide: sources and sinks. *Environ. Sci. Technol.* 45:9175–9179.
4. Hahladakis, JN,, Velis, CA., Weber, R., Iacovidou, E., & Purnell, P., (2018) An overview of chemical additives present in plastics: migration, release, fate and environmental impact during their use, disposal and recycling. *J. Hazard. Mater.* 344:179–199.
5. Huerta, LE., Gertsen, H., Gooren, H., Peters, P., Salánki, T., van der Ploeg, M., Besseling, E., Koelmans, AA., & Geissen, V., (2016) Microplastics in the terrestrial ecosystem: implications for *Lumbricus terrestris* (*Oligochaeta, Lumbricidae*). *Environ. Sci. Technol.* 50:2685–2691.
6. Koelmans, AA., & Geissen, V., (2017) Incorporation of microplastics from litter into burrows of *Lumbricus terrestris*. *Environ. Pollut.* 220:523–531.
7. Lahens, L., Strady, E., Kieu-Le, TC., Dris, R., Boukerma, K., Rinnert, E., Gasperi, J., & Tassin, B., (2018) Macroplastic and microplastic contamination assessment of a tropical river (Saigon River, Vietnam) transversed by a developing megacity. *Environ. Pollut.* 236:661–671.
8. Lwanga, EH., Gertsen, H., Gooren, H., Peters, P., Salánki, T., van der Ploeg, M., Besseling, E.,
9. Mai, L., Bao, LJ., Wong, CS., & Zeng, EY., (2018) Microplastics in the terrestrial environment. In: Microplastics contamination in aquatic environments. Elsevier, Amsterdam, pp 365–378.
10. Manickavasagam, S., Kumar, S., Kumar, K., Bhuvaneswari, G. R., Paul, T., & Shukla, S. P. (2020). Quantitative assessment of influx and efflux of marine debris in a water channel of South Juhu creek, Mumbai, India. *Reg. Stud. Mar. Sci.* 34:101095.
11. Nanthini, DK., Raju, P., Santhanam, P., & Perumal, P., (2023). The microplastics: their occurrence and impacts in India—a review. *Proceedings of the National Academy of Sciences, India Section A: Physical Sciences*, 93(2):205-210.
12. Nanthini, DK., Raju, P., Santhanam, P., Dinesh, KS., Krishnaveni, N., Roopavathy, J., & Perumal, P., (2021) Biodegradation of lowdensity polyethylene and polypropylene by microbes isolated from Vaigai River, Madurai. *India Arch. Microbiol..* 203:6253–6265.

13. Rodrigues, JP., Duarte, AC., Santos-Echeandia, J., & Rocha-Santos, T., (2019) Significance of interactions between microplastics and POPs in the marine environment: a critical overview. TrAC-*Trends Analyt. Chem.* 111:252–260

14. Roman, L., Hardesty, B. D., & Schuyler, Q., (2022). A systematic review and risk matrix of plastic litter impacts on aquatic wildlife: A case study of the Mekong and Ganges River Basins. *Sci. Total Environ.* 843:156858.

15. Sau, D., Hazra, T., & Shiuly, A., (2023). Microplastics in lentic environments: implications for Indian ecosystems. *Environ. Sci. Pollut. Res.* 30:114756-114778.

16. Schmidt, C., Krauth, T., & Wagner, S., (2017) Export of plastic debris by rivers into the sea. *Environ. Sci. Technol.* 51:12246–12253.

17. Selvam, S., Jesuraja, K., Venkatramanan, S., Roy, P. D., & Kumari, V. J., (2021). Hazardous microplastic characteristics and its role as a vector of heavy metal in groundwater and surface water of coastal south India. *J. Hazard. Mater.* 402:123786.

18. Thiemann, T. (2023). Microplastic in the marine environment of the indian ocean. *J. Environ. Prot.* 14:297-359.

19. Veerasingam, S., Saha, M., Suneel, V., & Vethamony, P., (2017) Microplastic pollution: a serious threat to the marine ecosystem. *Blue Waters Newsl Mar. Environ Protect* 18:6–9

20. Veerasingam, S., Vethamony, P., Mugilarasan, M., & Venkatachalapathy, R., (2016a) Occurrence and spatial distribution of microplastic pellets in sediments around Kavaratti Island, Lakshadweep Archipelago National seminar on approaches to CSD in coastal zones of India. CSIR-National Institute of Oceanography, Mumbai

21. Veerasingham, S., Saha, M., Suneel, V., Vethamony, P., Rodrigues, AC., Bhattacharyya, S., & Naik, BG., (2016b) Characteristics, seasonal distribution and surface degradation features of microplastic pellets along the Goa coast, India. *Chemosphere* 159:496–505

22. Wright, RJ., Erni-Cassola, G., Zadjelovic, V., Latva, M., & Christie-Oleza, JA. (2020) Marine plastic debris: a new surface for microbial colonization. *Environ. Sci. Technol.* 54:11657–11672.

23. Xu, D., Jia, R., Li, Y., & Gu, T., (2017) Advances in the treatment of problematic industrial biofilms. *World J. Microbiol. Biotechnol.* 33:1–10

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The International Year of Camelids: 2024 Heroes of Deserts and Highlands: Nourishing

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The year 2024 has been designated by the United Nations as the International Year of Camelids, shining a spotlight on these extraordinary animals and their significance to human societies across the globe. Camelids, including camels, llamas, alpacas, vicuñas, and guanacos, hold a special place in the hearts and histories of many cultures around the world. In recognition of their significance, the United Nations has designated 2024 as the International Year of Camelids. This global initiative aims to raise awareness about these unique animals, promote their conservation, and highlight their contributions to sustainable development. It aims to build awareness of the untapped potential of camelids and to call for increased investment in the camelid sector, advocating for greater research, capacity development and the use of innovative practices and technologies.

Why Camelids?

Camelids are members of the biological family Camelidae. There are seven existing members in this group. Camelids are divided into two groups, viz., Old-World Camelids and New World Camelids. Old World Camelids consist of Dromedary camel (*Camelus dromedarius*), Bactrian camel (*Camelus bactrianus*), and Wild Bactrian camel (*Camelus ferus*). In India, about three hundred double hump camels are present in the Nubra Valley of Ladakh. Llama (*Lama glama*), Alpaca (*Vicugna pacos*), Guanaco (*Lama guanicoe*), and Vicuña (*Vicugna vicugna*) are four members of New World Camelids. They are known for their remarkable adaptability to diverse environments, from the arid deserts where camels thrive to the high-altitude regions where alpacas and vicuñas roam. They have played crucial roles in the lives of people for centuries, serving as sources of transportation, food, fibre, and cultural symbolism.

Conservation Challenge: Despite their resilience, camelids face various challenges, including habitat loss, climate change, and poaching. The International Year of Camelids seeks to address these threats by promoting conservation efforts, sustainable management practices, and research into their biology and ecology.

Cultural Significance: Camelids are deeply intertwined with the cultures and traditions of many societies. For example, camels have been essential companions for nomadic communities, providing transport and sustenance in harsh desert environments. Llamas and alpacas have been domesticated for their wool, which is prized for its softness and warmth. Vicuñas and guanacos hold spiritual significance for indigenous peoples in the Andes, where their wool is considered sacred.

Contributions to Sustainable Development: Camelids offer unique opportunities for sustainable development and play an important role in advancing the Sustainable Development Goals (SDGs) of the UN on fight against hunger, eradication of extreme poverty, empowerment of women, and sustainable use of terrestrial ecosystems. Their wool is an environmentally friendly alternative to synthetic fibers, promoting sustainable fashion and reducing carbon footprints. Camel milk and meat are nutritious sources of food, particularly valuable in arid regions where other livestock struggle to survive. Furthermore, camelids' ability to thrive in challenging environments makes them valuable assets for agricultural diversification and climate resilience

Educational and Cultural Events: Throughout the International Year of Camelids, a range of educational and cultural events will take place worldwide. These may include seminars, workshops, art exhibitions, and festivals celebrating camelid heritage. By engaging people of all ages and backgrounds, these activities aim to foster appreciation for camelids and inspire conservation action.

Importance of the International Year of Camelids for India

India is the home of rich camel genetic resources. There are nine breeds of camel registered by the ICAR-National Bureau of Animal Genetic Resources (ICAR-NBAGR). Other than the listed nine breeds, some other breeds are expected to be listed in future (e.g., Sindhi). Double-humped camel is also present in India in Nubra Valley of Ladakh. The International Year of Camelids can hold significant importance for India for several reasons:

Traditional Significance: In India, camels have deep cultural and traditional significance, especially in regions like Rajasthan where they are integral to the desert ecosystem and nomadic lifestyles.

Livelihoods: Camel rearing and related activities support livelihoods in many parts of India, providing income opportunities for communities involved in camel herding, transportation, and related industries.

Diverse Applications: Camels are versatile animals with diverse applications. They are used for transportation, milk production, and even as a source of income through tourism activities like camel safaris.

Resilience to Climate Change: Camels are known for their resilience to harsh environments, making them valuable assets in regions prone to climate change effects such as droughts or desertification.

Genetic Resources: India has several indigenous camel breeds that are adapted to local conditions. Recognizing the International Year of Camelids can promote conservation efforts and the sustainable use of these genetic resources.

Potential for Research and Innovation: The focus on camelids during this international year can also encourage research and innovation in areas such as camel milk processing, camel-based products, and the development of camel-based therapies.

Global Collaboration: Participation in the International Year of Camelids allows India to engage in global discussions, share knowledge and best practices, and collaborate with other countries on camelid-related initiatives, benefiting from international expertise and experiences.

Camels in Border Security: Camels are also important for the border security of India. The Border

Security Force (BSF) uses camels for patrolling the Indo-Pak border adjoining Rajasthan and Gujarat. Jaisalmer breed is used for this purpose. Recently, BSF introduced the first women camel riding squad which is the first of its kind in the world. The Indian Army has deployed double-humped camels for last-mile delivery of logistical support and for mounted patrolling.

Role of Camelids in Agriculture

Transportation: Camels have been used for centuries as pack animals in arid and desert regions. They can carry heavy loads over long distances, making them valuable for transporting goods and agricultural products in areas where other vehicles may struggle to navigate.

Dung as Fertilizer: Camel dung is rich in nutrients and has been traditionally used as fertilizer in agricultural practices. It helps improve soil fertility and structure, making it more suitable for farming.

Milk Production: Camels produce milk that is rich in nutrients and has unique properties, making it valuable for human consumption. Camel milk is often considered healthier than cow's milk in certain aspects and is used to make various dairy products.

Drought Resistance: Camels are well-adapted to arid and semi-arid environments, making them valuable in agricultural settings where water scarcity is a concern. They can survive on minimal water and food, making them resilient in harsh conditions.

Ploughing and Tilling: In some regions, camels are used for ploughing fields and tilling soil. Their strength and ability to work in challenging terrains make them suitable for tasks traditionally performed by tractors or other agricultural machinery.

Genetic Resources: Camels possess genetic traits that make them valuable for breeding programs aimed at developing livestock breeds that are more resilient to heat, drought, and other environmental stresses. This genetic diversity is crucial for future agricultural sustainability in challenging climates.

Major Stakeholders and their roles in IYC-2024

Multiple players – government agencies, NGOs, private companies, local community-based organizations, research institutions – are engaged in evolving a congenial environment for the development of camel herders and camel entrepreneurs. Promoting camel conservation, utilising the camel for dairy and ecotourism purposes, organising capacity development of camel herders and camel entrepreneurs, developing market for camel milk and milk products, and developing public awareness about camel milk as a natural adjuvant is a herculean task. . NGOs, such as Lokhit Pashu Palak Sansthan (Pali, Rajasthan), Urmul Seemant Samiti (Bajju, Rajasthan), and Sahjeevan (Bhuj, Gujarat), are working for the empowerment of camel herders and the development of innovative camel milk-based products. ICAR-National Research Centre on Camel (ICAR_NRCC), Bikaner, has made a significant contribution through basic and applied research on camel including enhancing dairy potential of camel, developing molecular diagnostic tools for screening and diagnosis of camel diseases. ICAR-NRCC is utilising X (Twitter) (@IcarCamel), Facebook (NRC Camel), Instagram (nrcc_insta), YouTube Channel (ICAR-NRC on Camel), press releases and print media along with other traditional methods for dissemination of technology.

Conclusion

The International Year of Camelids (IYC) 2024 has been a significant milestone in highlighting the crucial role of camelids in agriculture and sustainable development. Through various events, discussions, and initiatives, IYC has brought attention to the unique contributions of camelids such as camels, llamas, and alpacas to food security, biodiversity conservation, and rural livelihoods. The year has provided a platform for promoting research, innovation, and partnerships aimed at harnessing the potential of camelids for addressing global challenges like climate change and food insecurity. As we conclude this remarkable year, it is evident that camelids will continue to play a vital role in shaping a resilient and sustainable future for agriculture and communities worldwide.

References

1. FAO's Official IYC 2024 Page: The Food and Agriculture Organization of the United Nations (FAO) typically provides detailed information about the International Year of Camelids, including its objectives, activities, and impact on agriculture and food security.
2. "The Camelid Companion: Handling and Training Your Alpacas & Llamas" by Marty McGee Bennett.
3. "Camelids: An Introduction to their Management and Medicine" by Chris Cebra, David E. Anderson, and Ahmed Tibary

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Cordyceps- Nature's Biological Gold

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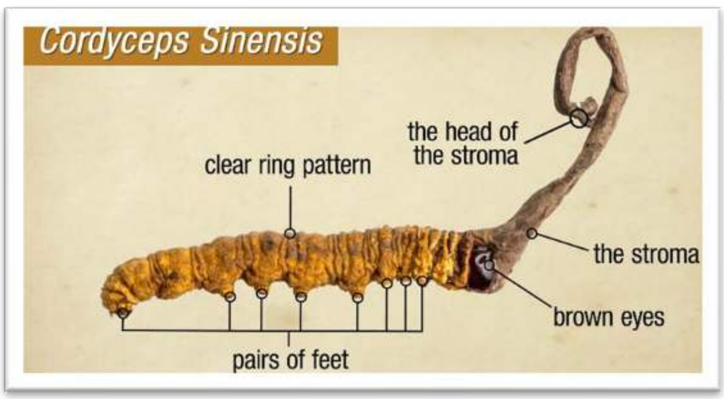
In the realm of natural treasures, there exists a remarkable organism that transcends ordinary fungal life. Cordyceps, often referred to as "biological gold," is a fascinating genus of parasitic fungi with a rich history deeply interwoven with traditional medicine, ecological dynamics, and modern scientific research. From the highlands of the Himalayas to the depths of ancient Chinese pharmacopeia, cordyceps has captivated human imagination for centuries, offering a myriad of health benefits and ecological wonders.



A Natural Marvel: Cordyceps species are renowned for their unique lifestyle, wherein they parasitize insects and other arthropods. The fungus invades its host, eventually replacing its tissue entirely, and then emerges as a distinctive fruiting body. This process, though seemingly macabre, is a testament to the intricate balance of nature, where every organism plays a crucial role in the ecosystem.

Historical Significance: The use of cordyceps in traditional medicine dates back over a thousand years, primarily in Tibetan and Chinese cultures. Revered for its purported rejuvenating properties and ability to enhance vitality, it was reserved for emperors and nobility in ancient China. *Cordyceps sinensis*, in particular, gained fame for its wide-ranging medicinal applications, from improving respiratory function to boosting energy levels.

Modern Scientific Interest: In recent decades, cordyceps has attracted significant scientific attention, leading to a surge in research exploring its pharmacological potential. Studies have unveiled a plethora of bioactive compounds within cordyceps, including polysaccharides, nucleosides, and cordycepin, each contributing to its diverse therapeutic effects. These effects span from immune modulation and anti-inflammatory properties to antioxidant activity and potential anticancer properties.

Nutrients Content in Cordyceps

Nutrient	Content/Properties
Protein	10% - 25% of dry weight
Polysaccharides	Immunomodulatory properties
Nucleosides	Adenosine, uridine, guanosine (cellular metabolism)
Cordycepin	Potential anticancer, antimicrobial, anti-inflammatory
Vitamins	B1 (thiamine), B2 (riboflavin), B3 (niacin), B12 (cobalamin), E
Minerals	Potassium, zinc, selenium, iron
Antioxidants	Protection against oxidative stress
Sterols	Ergosterol (cholesterol-lowering effects)
Essential Fatty Acids	Omega-3 and omega-6 fatty acids

Health Benefits: Cordyceps supplements have gained popularity in the wellness industry, touted for their ability to support overall health and well-being. Athletes and fitness enthusiasts often seek cordyceps for its purported ability to enhance endurance and athletic performance. Additionally, its adaptogenic properties are believed to help the body cope with stress more effectively, promoting resilience and vitality.

Conservation Concerns: Despite its widespread popularity, the ecological sustainability of cordyceps harvesting has come under scrutiny. In regions like the Himalayas, where cordyceps are endemic, overharvesting poses a significant threat to local ecosystems and biodiversity. Sustainable harvesting practices and cultivation methods are thus crucial to ensure the preservation of these invaluable resources for future generations.

Future Perspectives: As our understanding of cordyceps continues to deepen, the potential for its application in various fields, including medicine, agriculture, and biotechnology, is immense. From novel drug discovery to eco-friendly pest control solutions, the possibilities are boundless. However, responsible stewardship of this biological treasure is paramount to harness its benefits while safeguarding the delicate balance of nature.

Conclusion

Cordyceps stands as a testament to the awe-inspiring complexity of the natural world. From its humble origins as a parasitic fungus to its revered status in traditional medicine and modern science, it exemplifies the intricate interplay between humans and nature. As we unravel its mysteries and harness its potential, let us tread with reverence, recognizing cordyceps not merely as a commodity but as a symbol of the profound connections that bind us to the world around us.

References

1. Paterson, R. R. M. (2008). Cordyceps–a traditional Chinese medicine and another fungal therapeutic biofactory?. *Phytochemistry*, *69*(7), 1469-1495.
2. Panda, A. K., & Swain, K. C. (2011). Traditional uses and medicinal potential of Cordyceps sinensis of Sikkim. *Journal of Ayurveda and integrative medicine*, *2*(1), 9.

3. Olatunji, O. J., Tang, J., Tola, A., Auberon, F., Oluwaniyi, O., & Ouyang, Z. (2018). The genus Cordyceps: An extensive review of its traditional uses, phytochemistry and pharmacology. *Fitoterapia*, *129*, 293-316.
4. Chen, P. X., Wang, S., Nie, S., & Marcone, M. (2013). Properties of Cordyceps sinensis: a review. *Journal of Functional Foods*, *5*(2), 550-569.

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Recent Advances in Nutrient Management

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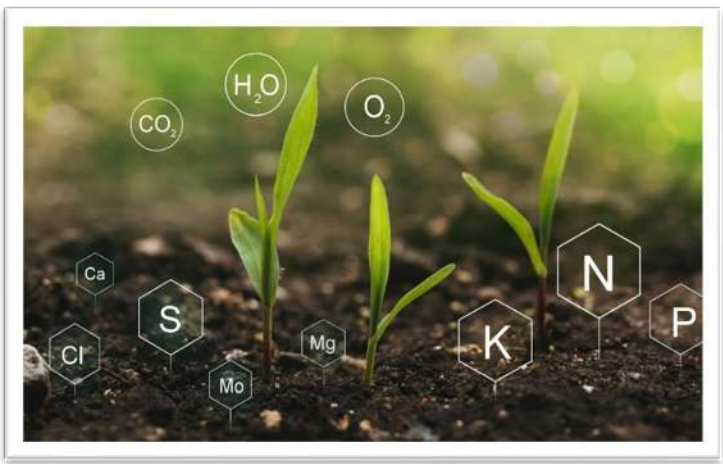
The focal points were to improve the nutrients management through increases the efficiency in the use of fertilizers (FUE) and minimize its negative impact on the environment and on the ground for a long time. Increasing the FUE in India is very important due to its relatively low FUE and severe losses of nutrients by leaching, volatilization, etc. This article reviews recent advances in technologies to increase FUE. These include specific sites and real-time nitrogen management, rapid non-destructive testing of plant nitrogen status, new slow-release fertilizers and controlled release fertilizers, site-specific nutrient management and use of urease inhibitor and nitrogen inhibitor to reduce nitrogen losses.



Conventional Approach to Increase Fertilizer Use Efficiency

Commonly used measures to increase FUE, Agricultural practice can be summarized as follow:

1. Correct Rate

When the level of nitrogen fertilizer application is low, crop yield will increase with greater amount of nitrogen fertilizer. When the amount of nitrogen fertilizer exceeds the limit, the crop performance will decrease rather than increase. The same time, the loss of N will increase with increasing application of nitrogen fertilizer rate and nitrogen utilization efficiency fall. Therefore, the amount of nitrogen fertilizer the application must be controlled in the correct range.

2. Control of Fertilizer Applied in Combination with Water

Water games an important role in the nitrogen circulation process and absorbed by crops. In actual practice, there must be a proper function of nitrogen and water considered as a whole, and the growth characteristics of the crops in several stages must be taken into account. Increasing a comprehensive approach is often recommended it.

3. Deep Placement and Split Application

Deep location is one of the best practices to improve the efficiency of fertilizer use with stable effect. Some research showed that deep placement of ammonium bicarbonate and urea increase the yield by 2.7-11.6%, compared to surface application. At the same time, the efficiency of nitrogen use was also increased, by 7.2-12.8%. Compared to single app, split application is possible increase the efficiency of nitrogen utilization and reduces losses.

4. Balanced Fertilization

Balanced function in nitrogen, phosphorus, potassium, combined with secondary and microelements can ensure a balanced supply of all essential nutrients for normal growth. This technique can avoid fertilizer inefficiency due to unbalanced nutrients. The main point of this technique is to control the proportion of various nutrients, and the balance between crop demand and volume of fertilizer applied in all growth stages.

With the development of technology and science, new techniques and approaches were implemented in agricultural production practices. Apart from traditional methods, there are new techniques developed as site-specific nitrogen management, slow-release fertilizer and controlled release (SR&CRF), site-specific precision nutrient management, urease and nitrification inhibitor. Those techniques play an important role in reducing the loss of fertilizers and increasing FUE. Although some techniques are not widely applied in India due to various borders, its potential is enormous. The precision agriculture inspired a number of changes in thinking and agriculture management, and these changes would be technical basis for sustainable development agriculture, rational use of resources and meliorating bio-energy; therefore, they were great importance.

New Development in Improving Nutrients Management

1. Site-specific/real-time nutrient management (SS/RTNM)

RTNM and SSNM are new management techniques use a nitrogen fertilizer developed from SPAD to guide fertilization. The first application of nitrogen fertilizers is managed for the recommended fertilization of crops. SPAD value obtained by testing color changes for differences steps are compared to suggested scale amount of fertilizer to decide to add the fertilizer and the amount to add. An obvious advantage of this method is that the time and the amount of fertilizer applied match the actual amount well crop demand. SPAD used to guide rice nitrogen fertilizer management and can increase the agronomic efficiency of nitrogen significantly than fixed-term nitrogen application. SSNM determines the amount of fertilizer given to crops comprehensively elements. In this way, a valid nitrogen supplement, phosphorus and potassium in the soil, the result, the stem-eating nutrients and climatic characteristics taken as an essential index, which is analyzed fertilization decision system, and then what is best fertilizer application is set as scale. Finally, the amount of the fertilizer to use is determined according to the SPAD the value of the leaves.

It is very important to determine the SPAD threshold; the value of SPAD 35 is appropriate for most tropical indica rice breeds, that SS / RTNM could relationship between yield and quality of rice. Because of this, the key step is determining the correct schedule. SPAD portal based on characteristics and ratings of rice breeds under their experimental conditions, Model SSRTNM recommends SPAD38-39 for one variety, and SPAD 35-37 for another variety, respectively.

When using SPAD to diagnose nitrogen in crops nutrient status under field conditions, different periods and proven jobs lead to different results. So, the correct periods and locations must be chosen for the diagnosis. Otherwise, the result will be affected. It is the best diagnostic periods for corn are from the ninth to the tenth leaf period; and the best position is the middle part the upper leaves. Chlorophyll SPAD value and the total nitrogen content in the plant and the nitrogen rate they are closely related. The relationship between them can use as a tool to diagnose nitrogenous nutrients state of corn. However, there are gaps between SPAD results obtained from various test sites. In this case, there must be an independent diagnostic index settled down. Another option is to use relative chlorophyll SPAD value of leaves up to current nitrogen state crop nutrients. When using the last method, SPAD will achieve 66.7% in predicted accuracy for recommended fertilization for summer corn.

SPAD is characterized by its comfort, agility, efficiency and without causing trauma. The most important point is that it can reduce the rate of nitrogen fertilizer and increasing FUE. Currently, SPAD has been widely used in rice, wheat, rapeseed and corn. SSNM can reduce the applied fertilizer dose 38.7-41.3%, production rose 2.5-3.5% and increased nitrogen use efficiency and physiological nitrogen transformation 34.0-39.5% and 46.1-61.6%, respectively, compared to traditional ways.

Despite many advantages over traditional practice, SPAD has its own limitations. You can only test one area as small as 6 mm^2, so the number of samples you can analyze limited. Subsequently, the nitrogen content was tested using this method is only a rough estimate based on those limited points. Comparatively, spectrum analysis the technique showed its advantages due to its speed and economy. Its mechanism is malnutrition in plants that cause changes in color, thickness and shape leaves and these changes stimulate spectral reflection traits. Quickly configure a test pattern for the nutritional statuses of plants, through which the information on spectral analysis of plant nutrient content you, get the technique. This technique is one of the essential and indispensable techniques in a different version precision agriculture fertilization and irrigation. It fits better than SPAD in crop nitrogen monitoring content in large areas.

2. Slow Release/Controlled Release Fertilizer (SR/CRF)

One of the reasons for the low FUE is the imbalance between time and intensity that yields fertilizer its nutrients and the demands of the crops. Slow release / Controlled-release fertilizer is produced by control common water solubility fertilizers. The nutrient release is effectively controlled or delayed by enhancing the fertilizer itself, which matches the release time and intensity to crop demands. This method can be combined with nutrient demand by crops and supply nutrients, thus increasing yield. It is believed that be the fastest and most convenient way to reduce increase loss of fertilizer and FUE.

There can be many types of SR / CRF divided into three types as follows. There is the first type SR/CRF coated with two subtypes: 1) mineral coated fertilizer (composed mainly of sulfur, silicate, gypsum and phosphoric acid) and 2) organic polymer coated fertilizer composed mainly of high natural molecule materials (such as starch, fibrin, and high molecular weight composite materials (such as such as polyethylene and PVC), and high molecular weight semi-compounds materials (such as ethyl cellulose). – A the second type is composed of SIUCRF coated material which is a compound type of mono / polyunsaturated coating with another type of nutrient. Common coating is urea, humic acid, potassium sulfate and diatomite. The third type is low quality composite. SR/CRF is soluble with limited water solubility, e.g. Urea-formaldehyde fertilizer, IBDU and FMP.

There are two common methods for release SWCRF Characteristic Nutrients: Water / Solution solubility method and soil leaching method. In the first method, SR/CRF is removed in a solution of water or salt, and then the solubility is within a certain period of time calculated. This is the most method used, because it is easy and fast to use. Imagine the latest "Soil fertilizer" system to measure nutrient content released from the fertilizer. This method is closer to reality, because it reflects the liberation fertilizer element in the soil solution.

SR/CRF is undoubtedly one of the best solutions to this situation. The main step is the urgent problems as follows: 1) prices SCF to reduce the cost to farmers; 2) set and publish the necessary SCF regulations and standards, as a release function to ensure quality from SCF; 3) establish a national research platform to the common system (relevant public funds) research institutes and executing organizations enterprise system) and enterprise system (with enterprise) investment, development center, production and participating farmer consumers) to solve technical problems derived from international conflicts objective, objective of the company and interest of the farmer.

3. Farmland Nutrients Precision Management Technique

Precision agriculture is a revolution in agriculture modern technology of combining spatial data and agronomic technology. It is precise and complex determines and manages content in the field according to specific conditions each operating unit. Convert the traditional high consumption and a low efficiency production model into high efficiency and low consumption style while saving a lot of material and environmental protection (Hu and Li 2005). Precision fertilizer applies fertilizer accurate and timely depending on soil and crops demand pattern to meet the needs of different crops degrees. It achieves the greatest economic effect with invest the least amount of fertilizer; therefore, the FUE increases and which improves the agricultural ecosystem.

Precision agricultural technology can be divided into four Parts of the implementing procedure: field data collection, data management, analysis and decision - making and implementation of decisions in the fields. Precision fertilization is one of the most widely used and mature techniques for agricultural precision determination analysis and decision making.

First, get the details soil nutrients (such as N, P, K, pH, organic material content) and crop growth. Secondly, yes it distinguishes the diversity of spatial properties in the field, later makes the decision to apply fertilizer in the basis of variable rate fertilization determination analysis system, the model of crop growth and the demand for nutrients. Finally, you understand precision fertilization, with DGPS (differential geographic information system) variable rate fertilization technology and monitoring system. Various experiments in Guangxi of China showed that precision fertilization increases nitrogen utilization efficiency in rice and corn by 7.8%, on average, compared to the traditional way of fertilization.

The balanced fertilization technique is regionalized developed on the basis of precision agriculture. He shares large range in different management units according to regarding planting patterns, soil nutrient supply capacity, fertilizer application status, agricultural type and soil texture to implement the recommended fertilization. This is developed an effective approach to achieving macro-control and reasonably improve fertilization accuracy small-scale ground operation system in world, and it helps balanced fertilization, promoting soil fertility, and FUE and increase production. The concrete steps are 1) to analyze the spatial variability and distribution of soil nutrients through co – use GI, GPS and geostatistics, to a soil nutrient distribution map; 2) on this basis, the area tested is divided into different regions according to the soil nutrient status and crop yield target; and 3) then, balanced fertilization is recommended for all regions.

The balanced fertilization technique was regionalized used at different levels in terms of management units: farm field level, city level and at the county level. On a relatively large scale (municipal level and above), the key step is to select and determine the most appropriate one sampling density and spatial scale of the sample, affect nutrient regionalization decision – making administration. Balanced regional yield technique is a good approach to help function reasonably precise nutrient management and balanced fertilization in large areas of small-scale separated underground operating today.

4. Urease / Nitrification Inhibitor

Urea is the most widely used nitrogen fertilizer in India and abroad, it represents more than half of all chemical substances apply nitrogen fertilizers every year. When applied in soil with effect of urea in soil, urea whether hydrolysis and the formation of NH_3 will be accelerated, causing major economic and environmental losses corruption. The urease inhibitor delays water dissolution, urea and extends the time of urea diffusion fertilizer application points. In this way, density NH_4^+ and NH_3 in the soil can be reduced and loss of ammonia is reduced by volatility. The main types include quinines, acidamide, poly-acid, poly-phenol, humic acid, and formaldehyde.

Among them, there are most widely used as NBPT (*Thiophospheric triamide*) and HQ (hydroquinone). NBPT restricts volatility NH_3 under alkaline soil and good ventilation conditions HQ can reduce the loss of NH_3 delaying the urea hydrolyzing. More importantly, it makes an impact continuous transformation of urea hydrolysis. HQ is given wide attention for its low price compared to other urease inhibitors. Iodine salt of it has been shown to contain heavy metals, such as Hg and Ag effective urease inhibitor, but cannot be used in agricultural practice, because heavy metals can cause soil contamination.

It should be the perfect inhibitor of urease nitrification alone slowing down NH_3 volatility and loss of NO_3 -N by leaching, but they have no negative effect on the crop growth for full absorption of crop nutrition and best yield effect. This is important principle of urease screening, titration inhibitor. Although they had some effect on agricultural production, there were no inhibitors applied worldwide. In most countries they are still under testing and under investigation. Their effect on production is not stable and is easily affected factors such as inhibitor dose, fertilizer dose, environmental temperature, pH and soil quality. Also, most of them have a high price, some have toxic to crops, and is likely to cause it corruption. Therefore, they are difficult to apply in agriculture, large - scale production. The agricultural scientists in the future are developed of urease / nitrification inhibitors with a very efficient, safe, cheap and harmless.

Expectations

The use of fertilizers it has greatly contributed to cereal production in India and world. At present, India faces a major challenge in food provision to support the growing population limited arable land in the 21st century. It is crucial for India to continue to develop techniques that continue to increase crop yield, improve and mitigate FEU pressure on the environment to ensure food supply, and biodiversity protection. Therefore, it is it is recommended that the following tasks be reinforced.

1. Accelerate the development of new types of fertilizers and improving normal fertilizer; low cost development and high efficiency coating materials and SR / CRF for certain types of crops; to set the standard for quality assessment and environmental assessment of SR/CRF; develop research on organic fertilizers fermentation rapidly at high temperatures, and the detect bacteria from the depleted compound and combination; develop key techniques for high efficiency granular glue material; lead research on organic and mineral compound fertilizers production; to accelerate key stages of investigation on liquid fertilizers (Jin 2005).
2. Investigate the ecological and physiological improvement mechanisms FEU your bar, to develop new techniques for promotion improve crop yield with high efficiency in fertilizer use that further integrate and enhance nutritional resources management systems that guarantee high performance and quality crop production with high efficiency in fertilizer use and improving the quality of the environment.
3. Investigation physiological and genetic mechanisms of the crop genotypes in the discrepancy on the efficiency of nutrient use, that improve the efficiency of nutrient use in crops by using of biotechnology, to new types of crop with genotypes that make effective use of the nutrient, to implement plant nutrient enhancement characters to enhance plant nutrient utilization.
4. Establish national and regional intelligence management systems and monitoring platform use of nutrient resources, to monitor soil fertility, crop

status and responses to fruiting at national level and regional scales; set up scientific fertilization environmental decision - making and assessment system alarming system, in order to make rational allocations and efficient use of fertilizer resources at national level and regional scales.

Conclusion

Recent advances in nutrient management offer promising solutions to address the challenges facing modern agriculture. From precision agriculture and nutrient recycling to microbial solutions, nanotechnology, and digital agriculture platforms, a diverse array of innovative technologies and approaches are reshaping the way we manage nutrients in farming systems. Embracing these advancements is essential for promoting sustainability, enhancing food security, and safeguarding the environment for future generations. As we continue to push the boundaries of innovation, the future of nutrient management holds great promise for creating a more resilient and productive agricultural landscape.

References

1. Andrew N. Sharpley (2018): Nutrient Management - an overview | ScienceDirect Topics
2. Blesh J, Isaac ME, Schipanski ME and Vanek SJ (2022): Editorial: Ecological Nutrient Management as a pathway to Zero Hunger. Front. Sustain. Food Syst. 6:1079973
3. Ma et al. (2013b): Advances and Challenges for Nutrient Management in China
4. Thilakarathna, M.S.; Raizada, M.N.: A Review of nutrient management studies involving finger millet in the semi-arid tropics of Asia and Africa

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Unfruitfulness in Fruit Crops

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Unfruitfulness

It is a condition under which plant unable to produce flowers/blooming or fruit set or carry them up to maturity.

Or

In an orchard all the fruit trees do not bear equally or frequently and sometimes fail to set of flower and fruit under similar conditions where another plant bear heavily. Thus, failure to set fruits may be attributed to unfruitfulness.

Or

Any of the fruit orchards which are initially having good bearing capacity but presently that is not in bearing form or no fruit bearing capacity due to several factors, commonly referred to unfruitfulness.

Fruitfulness

It refers to able of fruit plants for flowering and fruiting whereas inability of any fruit plants for blooming and/or fruiting is called unfruitfulness. It is a major problem in fruit crops.

Self fruitful: When the fruiting occurs only by self pollination commonly known as self fruitful.

Self unfruitful: When the fruiting occurs without self pollination commonly known as self pollination.

Causes of unfruitfulness

a) Internal factors

b) External factors

c) Other factors

a) **Internal factors:** These are divided into three parts

- Due to evolutionary tendencies
- Due to genetic influences
- Due to physiological factors

i. Due to Evolutionary Tendencies

1. Imperfect flowers/defective flowers

Monoecious

When male and female flowers are present on the same plant, it is considered as monoecious.

e.g. Cocoa, Aonla and Jackfruit etc.

Dioecious

When male and female flowers are present on the different plant, it is considered as dioecious.

e.g. Papaya, Date palm, Kiwifruit, Pistachio etc.

2. Dichogamy

When staminate and pistillate flowers are mature at the different time. On the basis of maturation, it is divided into two parts:

Protandry: Anther/staminate mature first. e.g. Passion fruit, Coconut, Walnut, *A. muricata,* etc.

Protogyny: Pistillate mature first. e.g. Annona, Fig, Banana, Sapota, Apple, Pear, Pomegranate etc.

3. Heterostyly

A condition in which stigma is at different height due to varying length of styles. e.g. Cashewnut etc.

It is divided into two parts

Pin type: e.g. Pomegranate, Litchi and Sapota etc.

Thrum type: Almond and Carambola etc.

ii. Due to Genetic Influences

1. Due to Incompatibility

Self Incompatibility

The failure of pollen tubes to penetrate the full length of the style and to effect the fertilization in bisexual flowers is known as self incompatibility. It is divided into two types-

Homomorphic

- ❖ It is caused by genetical//physiological factors.
- ❖ In this type, incompatibility is not connected with morphological differences of flowers. It has also two types:

Sporophytic

It is determined by the diploid genotype of the sporophyte generation e.g. Mango, Cocoa and Aonla etc.

Gametophytic

It can be determined by the genotype of the haploid pollens. e.g. Ber, Pineapple and temperate fruits.

Heteromorphic

In this type of incompatibility same species produce more than one morphological type of flower.

e.g. Carambola etc.

2. Due to inter-fertility

3. Due to hybridity

4. Due to reciprocal crosses

iii. Due to physiological influences

1. Poor pollen germination
2. Slow growth of the pollen tubes
3. Premature or delayed pollination
4. Nutritive condition of the plant

b) External Factors

- **i. Temperature:** High temperature leads dry of stigmatic fluid hence pollination fail resulted unfruitfulness.
- **ii. Relative Humidity:** Low humidity leads dry of stigmatic fluid hence pollination fail resulted unfruitfulness.
- **iii. Rainfall:** Washes off the pollen from the anthers hence pollination fail resulted unfruitfulness.
- **iv. Frost:** Destroy of flowers/flower drops.
- **v. Cloudy weather:** Promotes the infestation of diseases/pests.
- **vi. Light intensity:** It determines the fruit set in deciduous plants, especially in strawberry. Fluctuation in light badly affected. (10000 lux light is sufficient)

c) Other factors

- **i.** Nutrient supply
- **ii.** Rootstocks
- **iii.** Pruning
- **iv.** Age and vigour of the plant
- **v.** Locality

vi. Insects and pests

Control measures

a) Use of suitable dwarfing rootstocks

b) Control of frost damages

c) Proper nutrition

d) Control of pollination by emasculation (Proper used of pollinizers i.e. Bombay Green and Bombay Yellow in mango while Golden Delicious in apple)

e) Application of PGRs

f) Using breeding tools (To develop regular bearer varieites)

g) To overcome the problem of Self Incompatibility, Male Sterility and other genetic problems.

h) Others

Conclusion

Unfruitfulness in fruit crops poses significant challenges to global agriculture, food security, and socio-economic well-being. Addressing the multifaceted causes of unfruitfulness requires collaborative efforts among farmers, researchers, policymakers, and stakeholders across the agricultural value chain. By implementing sustainable practices, advancing research and breeding efforts, and promoting pollinator conservation, we can enhance the resilience and productivity of fruit crops, ensuring a more secure and sustainable food future.

References

1. 'Agua de Aranjuez'. J. Amer. Soc. Hort. Sci. 132(2): 166-171 Sanzol J, Herrero M (2001). The effective pollination period in fruit trees. Sci. Hort. 90: 1-7.
2. Sanzol J, Rallo P, Herrero M (2003). Stigmatic receptivity limits the effective pollination period in ' Agua de Aranjuez' pear. J. Amer. Soc. Hort. Sci. 128(4): 458-462.

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Mulching: A Mechanism Towards Conserving Soil and Water Erosion in Dry Land Areas

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India is a land of agriculture and where large section of the people is entirely dependent on it for fostering the food security problem as well as maintaining their livelihood. Agriculture is a such type of activity which is heavily dependent on water for its productivity as well as obtaining higher crop yield from the field. Indian agriculture is generally practised on such areas which receives annual rainfall less than 750mm in a year and that areas is termed as Dry land areas. This areas are entirely dependent on rainfall for better crop production and yield. It is creating a big obstacle in todays agriculture for feeding tomorrow's population as the quality of water within present land use, as new arable land is relatively limited (Prem *et al.,* 2017). Agriculture utilises the most water in the world, accounting for around 70% of total demand (Qin *et al.,* 2018). A part from which , 80% of global cropland is covered by non-irrigated (rain-fed) that contributes 60–70% of the world's food production (Chen *et al.,* 2018). Bearing in mind the rising water scarcity, rain-fed cultivation plays a vital role in the global food supply (Sun *et al.,* 2012; Li *et al.,* 2017). Thus, to save water in cultivated land, agriculture water management is a key concern. Also, in dryland farming rain-fed cultivation is being stressed which needed more effective consumption of water resources by using water-saving technologies (Qin *et al.,* 2013). Therefore, in arid and semi-arid regions of the world, several approaches have been utilised to conserve the water as well as soil erosion to enhance the better productivity. The primary goal of all water conservation systems is to maximise productivity while using as little water as possible.So to combat these all problems several questions comes in our mind that What are the strategy to mitigate these challenges? What are the approaches adopted by the farmers produce maximum while minimizing the water loss? The answer to this question is very simple and effective

in todays agriculture is the application of mulching in our cropped field.So , the mulching could be the best way to conserve the moisture and soil erosion while maintain the crop productivity in dry land areas. The term mulch comes from the German word "molsch," which means soft to decay, and appears to refer to gardeners spreading straw and leaves over the ground as mulch (Jack et al.,1955). As a result, mulch is commonly defined as any material used to cover the soil surface. Mulch is defined as a covering material applied to the soil surface (Kasirajan & Ngouajio, 2012). Mulching is an important cultural technique that can reduce the amount of work required in gardening, resulting in healthier plants and possibly increased vegetable production. Mulching is the practice of protecting the soil surface around plants with a living or non-living mulch to create favourable circumstances for plant growth and effective crop production (Chakraborty et al., 2008; Kader et al., 2017a). It covers the soil, protecting organisms and plant roots from a variety of weather conditions. Mulching optimises water consumption and promotes crop development and yield (Yu et al. 2018). Mulching's primary goals are to reduce erosion and conserve water in low-lying areas.

Furthermore, mulch can effectively reduce water vapour loss, weed issues, soil erosion, and nutrient loss (Van Derwerken and Wilcox, 1988). Mulching is often classified into two categories: organic and inorganic. Other types of mulching include natural and synthetic. Organic mulches, such as tree barks, are typically a byproduct of various forest businesses that decompose freely over time. Inorganic mulches, such as plastic films, may not decompose quickly and may remain in the atmosphere for an unspecified period of time. The container allows for access to the majority of mulch types. It is advisable to lay organic mulch immediately after purchase or distribution.

Benefits of Mulching

Mulching enhances soil productivity, promotes soil ventilation around plants, aggregates soil particles, and improves drainage of excess water (Kader et al., 2017a). It offers numerous benefits in crop fields, including reducing soil water loss, erosion, weed growth, and the kinetic energy of water droplets, while minimizing competition between neighboring fields for nutrients and water (Tarara, 2000; Yang et al., 2015; Kader et al., 2017a). Mulching can also improve soil structure and nutrient distribution by facilitating earthworm movement into the soil (Qin et al., 2015). Moreover, it lowers soil pH, thereby enhancing nutrient availability. Organic mulch enriches soil with nutrients as it decomposes, increasing their availability over the long term (Larentzaki et al., 2008).

Plastic mulch acts as a barrier to gas movement, enhancing solarization and fumigation processes, thereby contributing to soil health and pest control (Chalker-Scott, 2007). It also aids in nutrient retention around plant roots for efficient nutrient uptake and reduces fertilizer leaching. The uniform appearance of mulched landscapes adds aesthetic appeal (Li et al., 2013; Chen et al., 2018).

Additionally, soil moisture and temperature suitability undergo viable changes at different crop growth stages. After organic mulch decomposition, soil organic matter content increases rapidly, consequently boosting soil water holding capacity (Kader et al., 2017c). Some other benefits are described below:

Mulching provides a multitude of advantages for your garden and landscape

Moisture Retention: Mulch acts as a barrier, minimizing evaporation from the soil surface, which is particularly beneficial in arid climates or during dry spells.

Weed Suppression: A thick layer of mulch blocks sunlight, inhibiting weed growth and reducing the need for manual weeding and nutrient competition among plants.

Soil Temperature Regulation: By insulating the soil, mulch helps moderate soil temperatures, fostering stable conditions for plant roots and encouraging healthier growth.

Soil Erosion Prevention: Mulch lessens the impact of rain and wind on the soil surface, preventing erosion, particularly on slopes or in erosion-prone areas.

Improved Soil Structure and Fertility: Organic mulches gradually decompose, enriching the soil with organic matter, enhancing nutrient levels, and promoting microbial activity for better soil structure and fertility.

Pest and Disease Control: Certain mulch types, like cedar or cypress, may naturally deter pests or inhibit the growth of plant diseases, acting as a protective shield for your plants.

Enhanced Aesthetic Appeal: Mulch provides a tidy uniform surface, defining garden bed borders and enhancing overall landscape appearance with its variety of colors and textures.

Reduced Soil Compaction: By minimizing foot traffic on the soil surface, mulch helps prevent soil compaction, allowing for improved air and water infiltration and supporting healthier root growth.

Classification of Mulches

A) On the basis of organic matter

a. **Organic mulches:** Organic mulches can be made of naturally occurring various substances which contains organic matter in it. Common examples of organic mulching are bark clippings, grass clippings, compost, dry leaves etc.

b. **Inorganic mulches:** Inorganic mulches made up of inorganic substances which does not contains organic matter in it. Inorganic mulches include stones and gravels, polyethylene films, landscape materials and rubbers.

(B) On the basis of living matter

a. **Natural mulches:** Natural mulches are generally made up of naturally occurring materials. Organic mulches are also known as natural mulches. No prerequisite for replacement of natural mulches because it decomposes readily.

b. **Synthetic mulches:** Synthetic mulches are made of artificial non-living substances. Various types of synthetic mulch materials are available in market for use in crop fields such as plastic films, plain and oiled paper, spun materials etc.

(C) On the basis of method of application

a. **Surface mulching:** When mulches are spread on the soil surface in order to lessens the evaporation rate and increase the moisture holding capacity of soil, then it is called as surface mulching. In rain-fed farming, surface mulching is broadly used as water conserving practice (Chakraborty et al. 2008; Zribi et al. 2015).

b. **Vertical mulching:** It is the soil treatment which is conducted near the root system of tree's in order to improve the root function and health of tree by ventilating the compressed soil, increasing water retaining power of soil, advancing infiltration capacity of soil and adding nutrients to the soil. Vertical mulching commonly known as composting. It is conducted by digging of 30 cm deep and 15 cm wide trenches across the slope at interval of 2 to 4 m and adding some organic materials like grasses, straws, stubbles etc. (Telkar *et al.,* 2017).

c. **Growing Vegetative Barriers:** Subabul and Glyricidia plants are planted on the contour lines as vegetable barriers in order to serve as a mulch, which can improve the moisture holding capacity of soil (Patil *et al.,* 2013).

Organic Mulches

Organic mulches are made up of animal compost, grass clippings, crop straw, dried leaves, tree bark cuttings, and sawdust. It has an easily degradable capacity because it attracts slugs, insects, and worms, which consume them and aid in their quick breakdown, resulting in the addition of some nutritional and organic material to the soil. Organic mulch provides a lot of beneficial properties. Some of them include soil moisture conservation by slowing evaporation, regulating soil temperature, decreasing soil erosion, inhibiting weed growth, encouraging the growth of beneficial soil microorganisms, and reducing the spread of soil-borne diseases. Organic mulches improve soil structure and nutrient content as they decompose (Telkar et al., 2017). Some of the types of organic mulch are:

Figure 2: Bark clipping mulching (Source: https://media.spokesman.com)

Figure 3: Tree wastes (Source: https://wikimedia.org/wikipedia/)

Figure 4: Leaf Mulching (Source: https://www.greenyflic.ly)

Figure 6: Composted animal manure (Source: https://en.wikipedia.org/wiki/Manure)

Figure 7: Newspaper mulching (Source: https://www.waldeneffect.org/)

Figure 8: Straw mulching (Source: http://agritech.tnau.ac.in/agriculture/)

Benefits of Organic Mulching

Organic mulch plays an important role in reflecting solar energy. It decreases evaporation and keeps the soil cold. Prevents weed germination and growth, lowers soil erosion and runoff, increases soil moisture retention, enhances infiltration and percolation of water, advances soil condition, makes soil porous, and promotes root growth. It can also regulate soil temperature.

Inorganic Mulches

Inorganic mulches are often used to prevent weed germination and for decorative purposes. Inorganic mulches, such as stones, gravels, and rocks, do not decompose voluntarily, so they do not contribute to soil improvement; however, bio-degradable and photo-degradable plastic mulches decompose readily and improve soil condition after decomposition because they are made from plant sugars or starches. Rocks absorb and reflect heat, making them helpful in both dry and hot environments. Some of the inorganic mulches are:


Figure 10: Landscape fabric (Source: https://www.[illegible].com/)


Figure 11: Stone mulching (Source: https://[illegible].com/)


Figure 13: Plastic mulching (Source: http://agritech.tnau.ac.in/agriculture/)


Figure 14: Colored mulch film (Source: http://agritech.tnau.ac.in/)

Advantages of Plastic Mulching

It is totally impervious to water. Plastic mulching reduces rate of evaporation, increases moisture holding capacity, stops the rise of water containing salts, lessens the leaching of plant nutrients, prevent germination of weeds, repel insects and pests, increases the germination speed, maintains soil structure and reduces soil erosion.

Effect of mulching on soil water conservation

Mulching is effective in retaining soil moisture in dryland areas by slowing evaporation (Yang et al. 2015; Kader et al. 2017a; Chakraborty et al. 2008; Zribi et al. 2015). Plastic mulch with moisture barricade features does not enable soil moisture to escape because fluid evaporates beneath the mulch film, condenses, and returns to the soil as water droplets. Thus, moisture is stored for many days, which extends the irrigation season and reduces irrigation demand during crop cultivation (Kader et al. 2017b). Plastic mulching is more effective than straw mulching for soil water conservation (Li et al. 2013). The primary goal is to reduce the rate of surface evaporation in order to preserve soil moisture and reduce soil erosion.

Conclusions

In summary, mulching plays a crucial role in conserving soil and combating water erosion, especially in dry land areas. By employing a variety of organic materials like animal compost, grass clippings, straw, dried leaves, and tree bark, mulching offers a versatile approach to soil preservation and moisture retention.

Its capacity to reduce evaporation rates, moderate soil temperatures, and curtail soil erosion makes mulching essential for maintaining soil health in arid climates. Organic mulch fosters an environment conducive to beneficial soil organisms, improves soil structure, and enriches nutrient levels as it decomposes.

Additionally, the weed-suppressing properties of mulch help plants thrive by minimizing competition for water and nutrients while also reducing the spread of soil-borne pathogens. These combined benefits establish mulching as a vital component of sustainable agriculture and landscaping practices, particularly in regions prone to dry conditions and water scarcity.

Embracing mulching as a soil conservation strategy not only safeguards against erosion but also promotes the resilience and vitality of ecosystems in dry land areas.

This approach encourages sustainable land management practices to address environmental challenges effectively.

References

1. Chen B, Liu E, Mei X, Yan C, Garre S. Modelling Soil Water Dynamic in Rainfed Spring Maize Field with Plastic Mulching. *Agric Water Manag*.2018; 198:19-27.
2. Daryanto S, Wang L, Jacinthe P. A. Can Ridge-Furrow Plastic Mulching Replace Irrigation in Dryland Wheat and Maize Cropping Systems? *Agric Water Manag*.2017; 190:1-5.
3. Divya, V. U, Sarkar, N. C. Plastic Mulch Pollution and Introduction of Biodegradable Plastic Mulches: A Review. *Agricultural Reviews*.2019; 40(4):314-318.
4. Kumar V, Prasad S, Kumar D, Kumar J, Shahi B, Singh S. K, Kumar M. Effect of Straw and Plastic Mulching on Soil Environment, Crop Performances and Profitability of Brinjal (solanum melongena l.) in Semi Arid Region of Bihar. *Bull Env Pharmacol Life Sci.*2018;8(1):162-167.

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Exploring Culinary and Nutritional Potential of Underutilized Vegetable Varieties: From Farm to Table

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In the bustling world of culinary arts and nutrition science, there exists a rich tapestry of vegetable varieties often overshadowed by their more popular counterparts. These underutilized vegetables, brimming with unique flavors, textures, and nutritional profiles, hold immense potential to diversify our plates, enrich our palates, and bolster our health. From farm to table, their journey offers a fascinating exploration of culinary creativity, sustainable agriculture, and nutritional abundance.

Rediscovering Forgotten Treasures

In the relentless pursuit of convenience and familiarity, many exceptional vegetable varieties have fallen into obscurity. However, beneath the soil lies a hidden treasure trove of botanical wonders waiting to be rediscovered. From the earthy sweetness of sunchokes to the vibrant hues of purple sweet potatoes, these forgotten gems beckon adventurous cooks and health-conscious consumers alike to explore their culinary and nutritional bounty.

Cultivating Diversity on the Farm

At the heart of the underutilized vegetable movement lies the crucial role of agricultural diversity. Traditional farming practices often prioritize high-yield, uniform crops, leaving lesser-known varieties to languish on the sidelines. Yet, as awareness grows about the importance of biodiversity for ecosystem resilience and food security, farmers are increasingly embracing the cultivation of underutilized vegetables.

Through agroecological approaches and heirloom seed preservation efforts, farmers are reclaiming lost varieties and reintroducing them to local markets. From community-supported agriculture (CSA) programs to farmer's markets, these diverse vegetables are finding their way from the farm to the hands of eager consumers, fostering a deeper connection to the land and its culinary heritage.

Unlocking Culinary Creativity

In the kitchen, underutilized vegetables serve as a canvas for culinary innovation. Their unique flavors and textures lend themselves to a myriad of culinary applications, inspiring chefs and home cooks to experiment with new recipes and cooking techniques. Whether roasted to caramelized perfection, pickled for tangy crunch, or pureed into velvety soups, these vegetables offer endless possibilities for gastronomic exploration.

Moreover, incorporating underutilized vegetables into everyday meals adds excitement and variety to the dining experience, challenging conventional notions of taste and texture. From the exotic bitterness of bitter melon to the earthy richness of celeriac, each vegetable brings its own distinct character to the table, inviting diners on a sensory journey of discovery.

Nutritional Abundance

Beyond their culinary allure, underutilized vegetables boast impressive nutritional credentials. Often overlooked in favor of their more mainstream counterparts, these vegetables pack a powerful punch of vitamins, minerals, and phytonutrients essential for health and well-being. From the antioxidant-rich leaves of amaranth to the vitamin C-packed pods of moringa, these vegetables offer a diverse array of nutrients to support a balanced diet.

Moreover, their resilience to adverse growing conditions and minimal input requirements make underutilized vegetables a sustainable choice for farmers and consumers alike. By promoting the cultivation and consumption of these nutrient-dense varieties, we can not only enhance our own health but also contribute to the resilience of our food systems and the preservation of agricultural biodiversity.

Conclusion

In conclusion, the exploration of underutilized vegetable varieties offers a compelling narrative of culinary discovery, agricultural sustainability, and nutritional abundance. From the humble farm to the vibrant dining table, these forgotten treasures enrich our lives in ways both tangible and profound. By embracing diversity in our diets and supporting efforts to preserve agricultural heritage, we can cultivate a more resilient and vibrant food future for generations to come.

References

1. Buturi CV, Mauro RP, Fogliano V, LeonardiC, Giuffrida F. Mineral Biofortification ofVegetables as a Tool to Improve HumanDiet. Foods. 2021;10:223.2.
2. Santosh Rani and Makhan Lal. MediaEffectiveness on Rural Women in Haryanafor Vegetables Cultivation, Indian Journalof Extension Education. 2019;55(1):21-27.3.
3. Anil Kumar Jena, Rimi Deuri, PranamikaSharma and Surya Prakash SinghUnderutilized vegetable crops and theirimportance, Journal of Pharmacognosyand Phytochemistry. 2018;7(5):402-407