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1.

Biomass Treatment for Compost Production (Kitchen Waste): A Reading

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Abstract

Compost is one of the best well-organized and green methods of cultivating the excellence of the soil on a perm culture plot. It avoids wastage by transforming refuse from the kitchen into nutrient-rich humus that when added to soil will provide the plants growing in it a plenteous supply of the nutrients who need to cultivate, boom and set plentiful yields. It is a great solution for the environment and can be easy to do with the right setup. Thus, the present research paper is going to analyze kitchen waste in general and vegetables and fruits in particular.

Keywords: compost, kitchen waste and methods

Introduction:

Compost is one of the best well-organized and green methods of cultivating the excellence of the soil on a perm culture plot. It avoids wastage by transforming refuse from the kitchen into nutrient-rich humus that when added to soil will provide the plants growing in it a plenteous supply of the nutrients who need to cultivate, boom and set plentiful yields.It is a great solution for the environment and can be easy to do with the right setup.However, composting is very easy for hobby, gardeners, potato peelings and leaves from the gardens are simply thrown in to a pile and overtime, nature, transforms this in to nutrient rich soil. If however, the organic waste is instead, collected and disposed of in organic waste containers; it is then taken too large, centralized composting plants, which required significantly more efforts. Thus, the present research paper is going to analyze kitchen waste in general and vegetables and fruits in particular.

Significance of the Study:

Kitchen waste management is an essential facet of daily routine. The people who works in the hotel business, they can make their own business of waste management on the other hand in concerned to house it will easy to make natural composting which will useful for house garden. Thus, waste management or kitchen waste has cosmic scope as well as bright significance.

Research Methodology:

Composting requires the presence of kitchen based material. For this research kitchen waste was used. This practice was followed for one week for composting production. The kitchen waste consisted of vegetable and fruit peelings which are rich in nitrogen.

History of Compost:

It is said that older than dirtis certainly applies to compost. It was producing compost for millions of years as part of the lifecycle and passing on the Earth. D. L. N. Rao explain about the history of Composting in *The early history of scientific composting*, "From the beginning of cultivated agriculture till the dawn of industrial revolution in the west, the loss of humus involved in agricultural operations was made up either by the return of the waste material to the soil or by taking up virgin land for cultivation." (Rao, website) Compost was already known to the Romans and the Greeks and there are numerous references to the cultivation of the soil in the Bible. The word compost comes from 'Old French' but had various spellings: compass, compess, compast, composture and others. Composting has been the basis of organic gardening and farming since the days of Sir Albert Howard, father of the organic method. Between 1905 and 1934 he devised the Indore method of compost making, in which materials are layered sandwich fashion, then are turned (or mixed by earthworms) during decomposition.

There are three methods of composting. They are: Indore Method, The University of California Method and Biodynamic Method.Here are some other methods of composting that are being practiced: The City People's Method, Compost Tumblers, Compost in a Bag, Raised-Bin Method, Ogden's Step-byStep Method, Pit Composting, Mulch and Sheet Compost, Trench and Posthole Composting, Anaerobic Composting

Composting Step:

Compost is decomposed organic material. Compost is made with material such as Vegetables leaves, Potatos, Sopota, and kitchen scraps from plants. Thus, compost is considered as a 'black gold' because of its many benefits in the kitchen garden. **Compost is a great material for garden soil.** Adding compost to clay soils makes them easier to work and plant. In sandy soils, the addition of compost improves the water holding capacity of the soil. By adding organic matter to the soil, compost can help improve plant growth and health.Composting is also a good way to recycle leaves and other kitchen waste.

The composting process:

The composting process involves three main components: **organic matter, moisture,** Cow dung and**oxygen.**

1. Organic matter includes plant materials and kitchen waste. Organic materials used for compost should include a mixture of kitchen waste (Brown materials) which supplies carbon, while green materials supply nitrogen.
2. For piles that have mostly brown material (dead leaves).
3. Moisture is important to support the composting process. Compost should be comparable to the wetness of a wrung-out sponge.
4. Adding alternate layer in the composting jar as a soil, organic waste, cow dung and moisture until the jar full.
5. Then we have to making whole in the jar for aerobic condition maintained.
6. The composting expected optimum moisture for the better aeration.

How long does it take?

The amount of time needed to produce compost depends on several factors, including the size of the compost pile, the types of materials, the surface area of the materials, and the number of times the pile is turned.

Harvest your Compost:

After complete decomposition of organic matter we can harvest the compost.

Monitoring the Composting Process:

Temperature:

1. Heat is the by-product of microbial breakdowns and to gage how well the system is working can be understood by measuring temperatures between 40-50 °C in within just a couple of days.
2. As temperatures are capable of reaching highs exceeding 60 °C, in some cases the chances of these compost piles becoming a fire hazard are also likely.

Measuring PH:

The pH in the range of 5.5 to 8 is expected in every composting. During the initial stages of decomposition, organic acids are formed. As composting proceeds, the organic acids become neutralized, and mature compost generally has a pH between 6 and 8.

Measuring Moisture:

Composting proceeds best at a moisture content of 40-60% by weight.

Result:

To sum up, after 7 days the odor of compost is pleasant.

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2.

Benefits and Challenges of Organic Farming: An Overview

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Abstract

Agricultural development policy for developing countries needs to focus on increasing the productivity of the land under cultivation, with lower costs, higher efficiency of products with little or no damage to both humans and the environment. There is a developing significance on health benefits as people are getting cognizant about the food themselves their relatives and family members. Thus, there is a degree for organic farming developed products. Prior people used to expend quality local vegetables, heartbeats and organic products. This brought about a life span and solid way of life. This paper provides an overview of organic farming benefits and challenges and its present scenario in India.

Keywords: Agriculture, Organic Farming, Benefits, Challenges etc.

Introduction:

Agricultural development policy for developing countries needs to focus on increasing the productivity of the land under cultivation, with lower costs, higher efficiency of products with little or no damage to both humans and the environment. Organic farming systems have attracted increasing attention over the last one decade because they are perceived to offer some solutions to the problems currently besetting the agricultural sector. Organic farming has the potential to provide benefits in terms of environmental protection, conservation of non-renewable resources and improved food quality. From a farmer point of view, organic farming is a societal need. It is not only from the consumers perspective. For the transformation of rural agriculture into a well sustainable agriculture, organic farming might become a panacea which can build a plinth for sustainable agriculture and reimburse conversion cost and maintain the sustainability of soil. India is home to 30 per cent of the total organic producers in the world, but accounts for just 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares, according to the World of Organic Agriculture 2018 report. A majority of the farming community is resource poor and purchasing fertilizers and chemicals in adequate quantities is beyond their capacity, thus encouraging organic farming. Moreover, Organic farming is favorable for small and scattered agriculture land holders.

Objectives of the Study:

- To study the importance of organic farming in this era.
- To study the benefits and challenges of organic farming.

Organic Farming:

The term "organic farming" was coined by Lord Northbound in 1940. The beginnings of the organic movement can be traced back to the beginning of the 1800s. In 1840 Justus Von Liebig developed a theory of mineral plant nutrition. Liebig believed that manure could be directly substituted by certain mineral salts.

Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, genetically modified organisms and livestock food additives. To the maximum extent possible organic farming system rely upon crop rotations, use of crop residues, animal manures, legumes, green manures, off farm organic wastes, biofertilizers, mechanical cultivation, mineral bearing rocks and aspects of biological control to maintain soil productivity and tilth to supply plant nutrients and to control insect, weeds and other pests.

Organic methods can increase farm productivity, repair decades of environmental damage and knit small farm families into more sustainable distribution networks leading to improved food security if they organize themselves in production, certification and marketing. During last few years an increasing number of farmers have shown lack of interest in farming and the people who used to cultivate are migrating to other areas. Organic farming is one way to promote either self-sufficiency or food security. Use of massive inputs of chemical fertilizers and toxic pesticides poisons the land and water heavily. The after-effects of this are severe environmental consequences, including loss of topsoil, decrease in soil fertility, surface and ground water contamination and loss of genetic diversity.

Organic farming which is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity is hence important. Many studies have shown that organic farming methods can produce even higher yields than conventional methods. Significant difference in soil health indicators such as nitrogen mineralization potential and microbial abundance and diversity, which were higher in the organic farms can also be seen. The increased soil health in organic farms also resulted in considerably lower insect and disease incidence. The emphasis on small-scale integrated farming systems has the potential to revitalize rural areas and their economies.

Challenges in Organic Farming:

Shortage of Biomass:

Many experts and well informed farmers are not sure whether all the nutrients with the required quantities can be made available by the organic materials. Even if this problem can be surmounted, they are of the view that the available organic matter is not simply enough to meet the requirements

Disparity of Supply and Demand

Non-perishable grains can be grown anywhere and transported to any location but this is not the case with fruits and vegetables. It should be produced locally for which there should be willing companies, aggregators and farmers around that particular area from where the demand is coming. But generally, the demand comes from metros where there are no farmlands to produce organic fruits and vegetables. Smart transport and dedicated channels of supply are the solutions to this disparity.

Time:

Indeed, organic farming requires greater interaction between a farmer and his crop for observation, timely intervention and weed control for instance. It is inherently more labor intensive than chemical/mechanical agriculture so that, naturally, a single farmer can produce more crops using industrial methods than he or she could by solely organic methods.

High MRP:

It is almost obvious that due to the extreme care taken to go along with organic farming, the results would be kept at a high price. Once sold to the market, most of the place is devoted to the sale of these organic fruits and vegetables. Most people do that to approve of organic products because of this.The items sold in the market are half the price of non-organic products. So, we can say that organic items are expensiveand not every consumer is willing to pay the price for it.

Lack of special infrastructure:

Most large organic farms still operate in an industrialized agriculture style, including industrial transportation of the food from field to plate. Unfortunately, this involves the adoption of the same environmentally harmful practices as those of factory farms which are however hidden under the cover of being organic

Benefits of organic farming:

Better Taste and More Nutrition:

Fruits and vegetables that are organically raised have a much better taste than other mechanically farmed ones. This is due to the fact that they are given a much longer time to develop and are not pumped with artificial things. The sugar structures in these crops have more time to mature and develop into a tasty and nutritious product.

Reduces pesticide and chemical residue in soil:

Organic farming minimizes the use of pesticides and chemicals thereby reducing the major environmental issues. It ensures the health of soil, water, air and flora and fauna. Also reduces the major environmental issues like soil erosion, air pollution, water pollution etc

Promotion of Biodiversity:

Crop rotation to build soil fertility and raising animals naturally helps promote biodiversity, which promotes greater health across all living species. As organic farms provide safe havens to wildlife, local ecosystems also improve.

Consumes Less Energy:

Organic farming does not rely on the use of synthetic fertilizers as opposed to conventional techniques that are generous with these external chemicals. Avoiding fertilizers contributes to a greater cause of energy conservation. This is because manufacturing synthetic fertilizers consumes a significant amount of energy. On average, it's safe to say that the energy usage is lower by at least 30-50% in the organicfarming systems. The British Department for Environment, Food and Rural Affairs in one of their reports suggested that organic crops and organic dairying use 35% and 74% less energy respectively than their conventionally grown counterparts.

Long-term sustainability:

Organic farming is a long-term, sustainable approach to food production. Organic farming takes a proactive, preventative approach instead of dealing with problems after they emerge which can be too late.(https://www.econation.co.nz/organic-food/)

Reduced erosion and better water management:

Both soil improvement and the concept of keeping the ground "covered" as much as possible, either by mulches or cover crops, reduces soil erosion. Soils with improved structure and higher content of organic matter and the more compact growth of an organic crop also reduces the water consumption in agriculture.

Familiarity with the techniques:

Organic farming is like going back to the roots before mechanization hit the lands. Thus the farmers can easily understand and adapt to the techniques of organic farming that deploys traditional knowledge. The farming techniques are based on how well a farmer can make the best use of his immediate natural resources.

Conclusion:

The phenomenon of 'Organic agriculture' is the only solution to nurture the land and to regenerate the soil by going back to our traditional method of farming i.e., free from chemicals, pesticides and fertilizers.

This is a possible step for sustainable development by choosing not to use chemicals, synthetic materials, pesticides and growth hormones to produce high nutritional quality food and in adequate quantities (Onkar and Suryawanshi,2019) Organic farming is an option agricultural system which quickly changes farming rehearsals. It depends on composts of natural starting points, for example, fertilizer excrement, green excrement, and bone feast and so forth substantially more than deciding not to utilize pesticides, fertilizers

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3.

Use of Social-Ecological Tools for improving crop management and Balancing Environment

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Abstract

This article is based on a detailed investigation on Integrated pest management (IPM). Integrated pest management (IPM) is a valuable tool for reducing pesticide use and for pesticide resistance management. Despite the success of IPM over the last 50 yr, significant challenges remain to improving IPM delivery and adoption. We believe that insights can be obtained from the field of Social Ecological Systems (SES). We describe the complexity of crop pest management and how various social actors influence grower decision making, including adoption of IPM. We discuss how crop pest management fits the definition of an SES, including such factors as scale, dynamic complexities, critical resources, and important social–ecological interactions. Lastly, we describe heuristics and simulation models as tools to understand complex SES and develop new strategies. However, we conclude with a brief discussion of how social processes and SES techniques could improve crop pest management in the future, including the delivery of IPM, while reducing negative social and environmental impacts.

Keywords: Environment, Integrated Pest Management (IPM), Social Ecoogical Sysyems (SES), Pesticides, etc.

Introduction:

Integrated pest management (IPM) is a decision support system for the selection and use of pest control singly or harmoniously coordinated into a management strategy, based on cost–benefit analyses that takes into account the interests of and impacts on producers, society, and the environment. Methods used in IPM can reduce pesticide use and conserve pesticide efficacy. IPM programs have been estimated to have saved $1.3 billion in pesticide costs for almonds, cotton, oranges, and processing tomatoes since 1970. Examples of IPM tactics which may reduce either pest pressure or pesticide use include crop rotation, biological control, monitoring, economic thresholds, and resistant varieties.

Another challenge, despite efforts at promoting IPM, is that much of America's broad-acre row crops (such as corn and soybean) falls victim to reliance on shock and awe pest management , a strategy that effectively results in the use of pesticides (or genetically modified pest resistant varieties) regardless of whether the targeted pests are likely to result in economically significant losses. This strategy results in a rapid loss of effective management products through evolution of pesticide resistance. There is a need to balance the short-term benefits of effective pest management against the need for pesticide conservation (or product stewardship) and a similar need to balance benefits against other costs associated with pesticide use.

IPM remains the most important pest management strategy for delivering positive environmental outcomes on the 99% of American agricultural acreage that is nonorganic. Since IPM remains so critical, efforts should continue to deliver IPM to stakeholders. In this article, we provide what we hope are useful insights from the field of Social Ecological Systems (SES) as a method to improve crop pest management in the future, including the delivery of IPM, while reducing negative social and environmental impacts. An SES frameworks have allowed researchers to understand how social behavior influences the resilience and vulnerability of systems, such as fisheries, rangelands, and forests that would not be explained by ecological factors alone. First, we review the complexity of crop pest management from the social perspective; second, we reframe this complexity as an SES; and third, we showcase SES tools for understanding the complexities of crop pest management.

Pest Management Is a Complex Social System

Pest management is a complex system of ecological processes and social actors including a number of key facets (Fig. 1). First, grower decision making is more strongly influenced by market forces and pesticide marketing than it is by IPM recommendations (A in Fig. 1). Pest management decisions are recommended by crop consultants who scout fields and monitor weather and pest traps, but this does not implicitly lead to pesticide reduction. Many growers rely upon extension to provide IPM guidance in the form of pest alerts, forecasts, and monitoring, but the decline in extension service funding may make growers more dependent upon advice from agricultural company salespeople. Second, pest pressure as a result of selection pressure, resistant genotypes, and emerging pests (such as Spotted Wing Drosophila, Drosophila suzukii Matsumura) is not constant but tends to increase over time (B in Fig. 1). The combination of (A) and (B) may cause growers to use more pesticides (D in Fig. 1) over IPM-based systems (C in Fig. 1) resulting in costs to human health and the environment (E in Fig. 1). The estimated damage to the environment and society caused by pesticides in the United States is between $10 and 35 billion/yr. This includes impacts on wildlife, pollinators, and human health. When a grower makes a decision to spray or not, these external costs of pesticide application rarely factor into the decision-making process. Public concern over these impacts may lead to the deregistration of critical pesticide products, which help ensure a reliable and low-cost food supply. Loss of pesticide efficacy (F in Fig. 1) results in crop losses (G in Fig. 1), which, in turn, leads to research and extension efforts (H in Fig. 1) to reduce these losses and pesticide environmental impacts. It should be noted that a lag period often exists between the intensification of a problem and the appearance of publications proposing solutions.

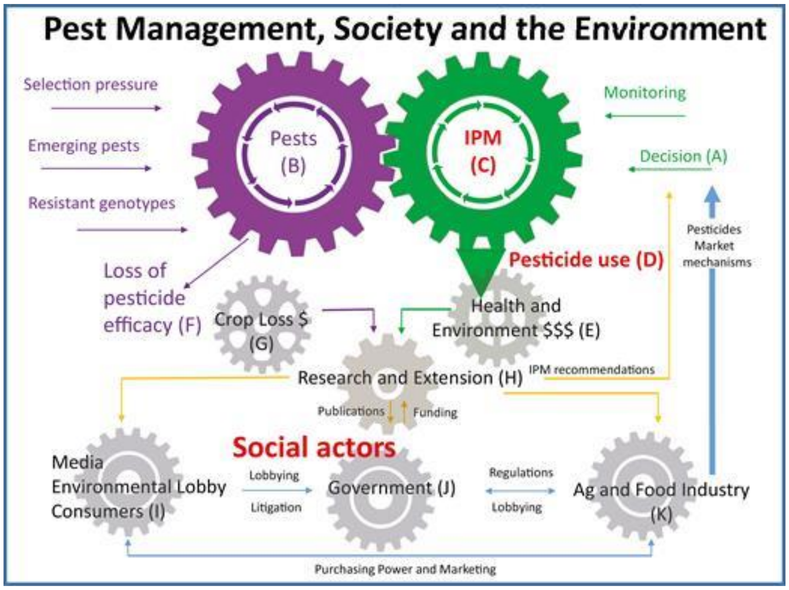

Fig. 1. Interactions of pest management with society and the environment.

Research on pesticide environmental impacts, is picked up by the media and environmental groups (I in Fig. 1), who lobby government agencies (J in Fig. 1), and in some cases litigate to enact regulatory changes that restrict or discourage pesticide availability and use. An example: the insecticide sulfoxaflor was approved by the EPA, but environmental groups sued the EPA to prevent its registration. A second example that emerged in 2018 is the presence of glyphosate in breakfast cereals made from oats in a research study conducted by an environmental lobby group. This study will likely decrease the social acceptance of glyphosate use and could result in eventual regulatory changes. Likewise, the agriculture and food industries lobby government to keep pesticides registered and minimize regulations (K in Fig. 1.) The lobbying power of the Agrochemical industry has likely increased in recent years, especially with consolidation into four major agrochemical companies.

Understanding and predicting the behavior of the whole pest management system (Fig. 1) seem difficult, given the large number of social actors and the complex interaction of ecological and social processes. In particular, we note that disturbances in the system such as the overuse of a class of pesticides with consequential increases in pesticide resistance, environmental impacts, and social acceptance may involve a considerable lag time before the system corrects or reorganizes. This is represented by Fig. 1 as a complex system of problem discovery, scientific investigation, lobbying, and finally, regulations either by the government or self-regulations by the industry. Whereas IPM provides an avenue for more rapid system self-correction, our efforts to improve IPM adoption often fall short of desired outcomes in part because the system does not economically reward IPM adopters, even as the benefits accrue system wide. To address these complex issues, we propose reframing the complexity of Fig. 1 in terms of an SES, so that tools and insights from this field can be used to improve pest management and the adoption of IPM.

Reframing Pest Management as an Social Ecological Systems (SES):

Before describing what SES are, we give an example of their application: bioeconometric modeling of a gag (a slow growing grouper) fishery. Whereas biological intuition and simulations based on fish life histories alone suggest that a spawning season closure will reduce fishing pressure and increase stocks; an SES approach that also accounts for the behavior of the fishing fleet based on economic conditions, such as price, biomass, and regulations, shows that these intended outcomes of the spawning closure do not materialize. The gag econometric model was validated with data of fish stock numbers. Once validated, the model can estimate the impact of new rules and regulations such as quotas and daily trip limits. The modeling tool can demonstrate to stakeholders which regulations promote healthy fish stocks, and thus provide a powerful tool to broker compromise solutions to contentious problems in fisheries management. Overall, utilizing the SES framework allows researchers to understand how social behavior influences the resilience and vulnerability of systems such as fisheries that would not be explained by ecological factors alone.

An SES can be defined as a system that includes 1) biophysical and social factors that interact in a resilient, sustained manner; 2) multiple spatial, temporal, and organizational scales; 3) critical resources (natural, socioeconomic, and cultural); 4) dynamic complexities that require adaptation; and 5) external social and biophysical factors (i.e., those factors that are outside of the system itself such as climate change or political forces; Crop pest management fits the definition of an SES in many ways 1) Biophysical factors of evolution of pesticide resistance, natural enemies, pest dispersal, and host diversity and social factors of government regulations, market mechanisms, crop insurance, and research and extension interact through the affordability of food, pesticide residues in food, and pesticide pollution. If food is not affordable, social processes increase food production at the expense of environmental issues, such as pesticide pollution. Provided food is affordable, public concerns over pesticide pollution, and residues in food favor social processes that result in less pesticide use. Examples are neonicotinoids which are a pesticide technology not at risk of abandonment due to economic concerns, or of being displaced by an improved technology, but rather where arguably unnecessary use and potential negative environmental impacts led to a decrease in social acceptance. 2) Pest management is a multiscale phenomenon: while it has been historically practiced mostly at the farm scale, the impacts generated by pesticides and their residues on water, wildlife, and food are relevant at much larger spatial scales 3) Critical resources include food and fiber that are products of agricultural systems. They also include clean air and water that can be polluted by agricultural activity including pesticide use. 4) Growers must adapt their pest management practices to maintain profitability in response to dynamic social and ecological processes, including emerging pests and climate change. 5) Finally, external social factors include commodity prices and agricultural regulations, and climate change is an external biophysical factor.

Although the complexities of an SES can seem overwhelming, tools are available to help scientists understand their behavior and design strategies to improve social and environmental outcomes.

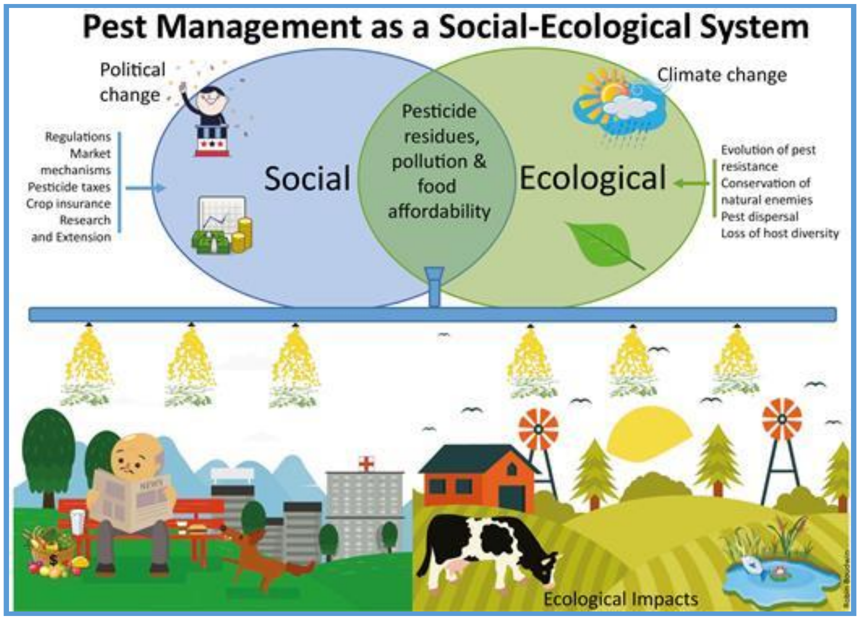

Fig:2- Pest management as an SES.

Conclusions:

We believe that in the United States while food remains affordable, the political, regulatory, and research agenda will increasingly be driven by environmental and human health issues. In this paper, we have already mentioned three examples that highlight this trend, litigation against the insecticide sulfoxaflor, glyphosate residues in cereals, and public concern over the environmental impact of neonicotinoids. Developers of IPM strategies have long understood that embracing ecological principles has been critical for the long-term success of pest management. Now in the 21st century, the understanding of how social and ecological processes work together will be critical for the future success of pest management. This paper outlines SES techniques including heuristics and modeling that offer potential to give fresh insights on pest management including: 1) pest management environmental efficiency, especially at multiple scales; 2) incentives for adopting IPM; 3) the stewardship of pesticides; and 4) the resilience of pest management strategies and tactics. Finally, we hope the insights in this paper will prompt ideas for future research that can improve the social acceptability of pest management in the future.

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4.

Organic Farming in Marathwada: Soil Health and Sustainable Agriculture

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ABSTRACT:

Farmers have started using chemical fertilizers, toxic pesticides for crop production, which are harmful to both human health and soil. At the same time, the environment is getting polluted. If farmers use organic methods to stop all this, both human health and soil will be protected and these problems can be controlled to a great extent.

Marathwada is a regular drought prone area and hence the prevalence of soil erosion and water scarcity is high in these areas. To overcome all these adverse conditions it is necessary to use traditional natural farming methods like organic farming. organic manure plays an important role, they are complementary to the chemical fertilizers and many times they have the capacity to replace them (Gholap 2021).

In India history & in some places today also, all the traditional agriculture, natural agriculture and so on have played a major role in the agrarian Indian culture. Until 1990, almost all farming families in Marathwada had dairy animals and all farms were farmed by oxen. And so all the crops grown using biofertilizers at that time were disease free and supplemented with all the nutrients. In a nutshell, these organic fertilizers have played an important role in the preparation of healthy nutritional food. This paper provides an overview of organic fertilizers such as compost manure, green manure, and bone meal farming benefits and challenges and its present conditions in Marathwada region.

Keywords: agriculture, Biofertilizers, compost manure, green manure, bone meal.

Introduction:

Agriculture is a primary sector of the Indian economy as about 70% of the total population depends on it and its dependence continuous unabated. Agriculture all over the world is burdened with risk and insecurity. In spite of several schemes designed for promoting and protecting the interests of Farmers, reports of suicides by several Farmers due to loss of income for various reasons including crop failure and the after effects of globalization are appearing in the press nowa days.

Marathwada is a regular drought prone area and hence the prevalence of soil erosion and water scarcity is high in these areas. To overcome all these adverse conditions it is necessary to use traditional natural farming methods like organic farming. organic manure plays an important role, they are complementary to the chemical fertilizers and many times they have the capacity to replace them (Gholap 2021).

Northbourne in the 1940, the term organic or the concept of organic farming was founded. organic farming is an agricultural system that uses fertilizers of organic origin such as compost manure, green manure, and bone meal and places emphasis on techniques such as crop rotation and companion planting (Wikipedia).

IFOAM, The International Federation of Organic Agriculture Movements suggests four basic principles on which organic farming is based: Care, Ecology, Fairness and Health.

Care: Organic farming should be done with responsibility, considering the environment and future generations

Ecology: It should support natural cycles, living systems and help in sustaining them.

Fairness: It should be built on strong relationships that encourage fairness concerning the environment, social justice and fair trade.

Health: It should improve soil health and sustaining animals, humans, plants as well as the planet.

Farmers have started using chemical fertilizers, toxic pesticides for crop production, which are harmful to both human health and soil. At the same time, the environment is getting polluted. If farmers use organic methods to stop all this, both human health and soil will be protected. And these problems can be controlled to a great extent. So in this article we are going to give you a brief overview on how Marathwada region farmers can do various types of organic fertilizers or farming as well as relared Government schemes to Promote Organic Farming.

Review of Literature:

Gholap (2021) Organic manure gives their multiple benefits due to the balanced supply of nutrients as well as increased soil nutrient availability due to increased soil microbial activity, decomposes harmful elements and fillup soils with micronutrients and increased soil water availability, soil texture and structure improvement helps roots and shoots development.

Agriculture post (2020) As per international resource data from Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM) Statistics 2020, India stands at 9th position in terms of certified agricultural land with 1.94 million hectare (2018-19).

Nedumaran et al (2020) Agricultural development policy for developing countries needs to focus on increasing the productivity of the land under cultivation, with lower costs, higher efficiency of products with little or no damage to both humans and the environment.

Singh (2019) A majority of the farming community is resource poor and purchasing fertilizers and chemicals in adequate quantities is beyond their capacity, thus encouraging organic farming. Moreover, Organic farming is favorable for small and scattered agriculture land holders.

Pandey and Sengupta (2018) India is home to 30 per cent of the total organic producers in the world, but accounts for just 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares, according to the World of Organic Agriculture 2018 report.

Charyulu and Dwivedi (2016) Organic farming has the potential to provide benefits in terms of environmental protection, conservation of non-renewable resources and improved food quality.

Agboola et al (1982) The quantity of soil organic matter depends on the quantity of organic material which can be introduced into the soil either by natural returns through roots, stubbles, sloughed-off root nodules and root exudates or by artificial application in the form of organic manure which can otherwise be called organic fertilizer.

Objective:

1. To study the need of organic farming sustaining soil health in Marathwada region.
2. To study the benefits and challenges of organic farming sustainable agriculture in Marathwada region.

Types of Organic fertilizers and Farming in Marathwada region:

Organic farming is of two types: Integrated Organic Farming and Pure Organic Farming.

Integrated Organic Farming: Integrated organic farming is the practice of managing economic and environmental standards along with pest and nutrient management.

Pure Organic Farming: The use of pesticides and fertilizers from natural sources is called pure organic farming, in which the use of all unnatural means is avoided.

Types of organic fertilizers used in Marathwada region: Organic manure is the compost made from the remains of plants and animals, in Marathwada region popularly used Organic fertilizers include Dung Fertilizer, compost manure, green manure, oilseed meal manure, earthworm manure, bone meal manure, killer manure, fish manure etc.

1. Dung Fertilizer: Fertilizer made from compost like dung, urine, cow dung etc. is called compost. It contains Nitrogen, Phosphorus and Potash. The main use of dung is for energy generation in biogas and the remaining thin dung is used as a nutrient for growth of crops.

2. Compost manure: Field hay, crop residue, sawdust, sugarcane husk, cotton husk etc. Organic matter is decomposed by microorganisms and the amount of carbon and nitrogen in it is reduced and a well decomposed substance is formed which is called compost manure. It contains Nitrogen, Phosphorus and Potash.
3. Green manure: By selecting early growing crops, sowing them densely and burying them in the soil with the help of Nagar before the crop reaches flowering, the soil gets nitrogen from it. Soil texture improves and it becomes fertile. Such fertilizers are called green manure.
4. Oilseed meal manure: Oilseeds remaining after extracting oil may have use as bioherbicides or organic fertilizers, oilseed meals as a sustainable alternative to mineral fertilizers.

5. Earthworm manure: This manure contains earthworm droppings, naturally rotten substances, earthworm eggs, infancy and many useful bacteria.

6. Bone meal manure: This fertiliser is made by coarsely crushing animal bones and other waste like hooves and horns.

7. Slaughterhouse Fertilizer: Slaughterhouse or killer manure which is made from animal blood and residue is called slaughterhouse fertilizer which contains good amount of Nitrogen and Phosphorus.

8. Fish Fertilizer - Fertilizer which is made from wasted fish from the beach and also from the residue left after fish oil extraction which is rich in Nitrogen, Phosphorus and Potash is also called as Fertilizer.

Materials and methods: Major crops pattern in Marathwada region.

1. Field site - The photos of experiment was conducted on the Organic farm located at

   Khandepargaon, V-P High-tech Research farm, Tal., Dist. Beed, Marathwada.

Early stage Organic farm of Arhar (Tuvar) crop, Harvested stage Org.farm of Arhar (Tuvar) crop

Harvested stage organic farm wheat crop

Organic Farm of Harvested stage Sugarcane crop

2. Field site - The photos of experiment was conducted on the Organic farm located at Gholap Vasti Research farm, Tal. Patoda, Dist. Beed, Marathwada.

Organic farm of near about mature stage of Jowar crop

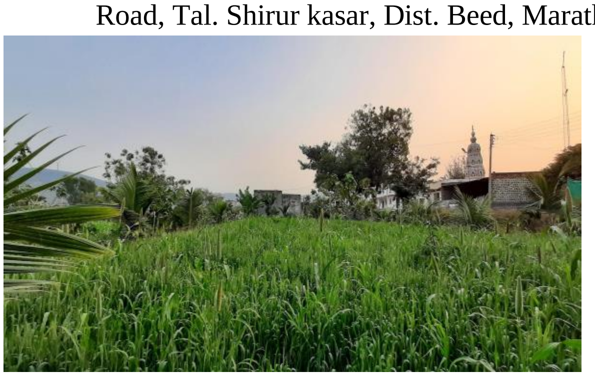
Organic farm of Onions crops

Organic farm of near about Mature stage of Gram crop

Organic farm of kharif season Bajra crop

Harvested stage organic farm of Rajma

3. Field site - The photos of experiment was conducted on the Organic farm located at Beed Shirur Kasar Road, Tal. Shirur kasar, Dist. Beed, Marathwada.



Organic farm of Summer season Bajra crop

Organic farm of Sugarcane crop **Government schemes to Promote Organic Farming:**

According to Agriculture post, Cultivable land area under organic farming has increased from 11.83 lakh hectare in 2014 to 29.17 lakh hectare in 2020 due to the focused efforts of the government. Following five are the government initiatives to promote organic farming

1. Paramparagat Krishi Vikas Yojana (PKVY): Paramparagat Krishi Vikas Yojana promotes cluster based organic farming with PGS (Participatory Guarantee System) certification. Cluster formation, training, certification and marketing are supported under the scheme. Assistance of Rs. 50,000 per ha /3 years is provided out of which 62 percent (Rs. 31,000) is given as incentive to a farmer towards organic inputs.
2. Mission Organic Value Chain Development for North Eastern Region (MOVCDNER): The scheme promotes third party certified organic farming of niche crops of north east region through Farmer Producer Organisations (FPOs) with focus on exports. Farmers are given assistance of Rs 25,000 per hectare for three years for organic inputs including organic manure and bio-fertilisers among other inputs. Support for formation of FPOs, capacity building, post-harvest infrastructure up to Rs 2 crore are also provided in the scheme.
3. Capital Investment Subsidy Scheme (CISS) under Soil Health Management Scheme: Under this scheme, 100 percent assistance is provided to state government, government agencies for setting up of mechanised fruit and vegetable market waste, agro waste compost production unit up to a maximum limit of Rs 190 lakh per unit (3000 Total Per Annum TPA capacity). Similarly, for individuals and private agencies assistance up to 33 percent of cost limit to Rs 63 lakh per unit as capital investment is provided.
4. National Mission on Oilseeds and Oil Palm (NMOOP): Under the Mission, financial assistance at 50 percent subsidy to the tune of Rs. 300 per hectare is being provided for different components including bio-fertilisers, supply of Rhizobium culture, Phosphate Solubilising Bacteria (PSB), Zinc Solubilising Bacteria (ZSB), Azatobacter, Mycorrhiza and vermi compost.
5. National Food Security Mission (NFSM): Under NFSM, financial assistance is provided for promotion of bio-fertiliser (Rhizobium/PSB) at 50 percent of the cost limited to Rs 300 per hectare.

Benefits of organic farming / Soil Health:

1. Organic farming increases soil fertility, improves soil quality and also increases the duration of irrigation for crops.
2. Farmer does not use chemical fertilizers in the field and uses organic fertilizers, then the cost of cultivation on the crop also decreases and also reduces soil, food and water pollution is very beneficial to our environment
3. Using Organic farming the farmer's crop yield increases, which in turn increases farmers' income. There is also a high demand at the international market for organic products which makes him more profitable. The problem of agriculture will be solved and the physical condition of the farmers will also improve.
4. Organic farming method increases the water holding capacity of the soil, groundwater levels rises and also reduces water evaporation.
5. Using animal dung and manure to make compost reduces pollution and reduces mosquito and other contamination, there by preventing disease.

6. Most of the agriculture in India is rain-fed and nowadays it does not rain on time, which also affects agriculture. This problem can be solved if farmers adopt organic farming.

In this way, the use of organic farming multiplies the production, does not harm the environment and also provides chemical free food to eat, which does not harm the health.

Challenges of organic farming / Sustainable Agriculture:

1. In the Marathwada region, due to the rows of Balaghat, almost all the villages have no transportation system. Biopesticides are not available in the local market and training in organic farming is not available.
2. low availability of tools like organic seeds.
3. Due to the fact that a large number of young people in Marathwada are moving to the metropolitan cities in search of jobs, the labor required for the work is not available that's why rising input costs.
4. Due to the fact that agriculture in the Marathwada region is surrounded by remote mountains and rivers and due to the unbalanced effect of nature, the supply chain cannot be smooth so supply chain irregularities happens.
5. low response to organic products in the domestic market.
6. International market competition.

These are major challenges facing organic farming for sustainable agriculture in Marathwada region.

Conclusion:

Marathwada region is an option agricultural system which quickly changes farming rehearsals ‘Organic farming ’ is a possible step for sustainable development by choosing compost farming, green manure and bone meal farming options are available for Soil Health and

Sustainable Agriculture.

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Bio-fertilizers play vital role for organic farming

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Abstract :

Bio-fertilizers being essential components of organic farming play vital role in maintaining long term soil fertility and sustainability by fixing atmospheric dinitrogen (N=N) mobilizing fixed macro & micro nutrients to convert insoluble P in the soil in to forms available to plants, they by increases their efficacy and availability.Currently there is a gap of ten million tonnes of plants nutrients between removal of crops and supply through chemical fertilizers.In content of both the cost and environment impact of chemical fertilizers,excessive reliance on the chemical fertilizers is not viable strategy in long run because of the cost,both in domestic resources and foreign, exchange involved in setting of fertilizers plants and sustaining the production. In this context,organic manures (bio-fertilizers) would be the viable option for farmers to increase productivity per unit area.

Micro-organisms such as plant growth promoting Rhizobacteria and Mycorrhizal fungihave demonstrated their ability in the formulation of biofertilizers in the agricultural sector,proving plants with nutrients required to exchange their growth,increaseyield,manage abiotic and biotic stress and prevent phytopathogens attack,Recently beneficial soil microbes have been reported to produce some volatile organic compounds,Which are beneficial to plants and the smendent of these microbes with lacaly available organic materials and nanoparticles is currently used to formulate biofertilizers to increase plant productivity.This review focuses on the important role performed by beneficial soil microorganisms as a cost-effective, nontoxic and eco-friendly approach in the management of the rhizosphere to promote plant growth and yield.

Key words – Bio-fertilizers,Sustainability,Beneficial micro-organisms,Crop production,Soil fertility, Sustainable agriculture.

Introduction-

Bio-fertilizers are being essential component of organic farming are the preparations containing live or latent cells of efficient strains of nitrogen fixing, phosphate solubilizing or cellulotic micro-organisms used for application to seed, soil or composting areas with the objective of increasing number of such micro-organisms and accelerate those microbial processes which augment the availability of nutrients that can be easily assimilated by plants. Bio-fertilizers play a very significant role in improving soil fertility by fixing atmospheric nitrogen, both in association with plant roots and without it, solubilize insoluble soil phosphates and produces plant growth substances in the soil. They are in fact being promoted to harvest the naturally available, biological system of nutrient mobilization (Venkatashwarlu,2008). The role and importance of biofertilizers in sustainable crop production has been reviewed by several authors

(Biswas et al 1985 ;Wani and Lee 1995 ; Katyal et al.1994). But the progress in the field of BF production technology remained always below satisfaction in Asia because of various constraints.

It may be need only 30% of India's total cultivable area is covered with fertilizers where irrigation facilities are available and the remaining 70% of the arable land. Which is mainly rain fed,very negligible amount of fertilizers are being used. Farmers in these areas often use organic manures as a source of nutrients that are readily available either in their own farm or in their locality. The North-Eastern region of India provides considerable opportunity for organic farming due to least utilization of chemical inputs. It is estimated that 18 million hectare of such land is available in the north east that can be exploited for organic production . With the sizable acerage under natutally organic cultivars. India has tremendous potential to grow crops organically and emerge as a major supplier of organic products in world's organic market . The report of task force on organic farming,appointed by the Government of India also observed that in vast area of the country. Where limited amount of chemicals are used and have productivity could be exploited as potential areas to develop into organic agriculture. Arresting the decline of soil organic matter is the most potent weapon in fighting against unabated soil degradation and imperiled sustainability of agriculture. In tropical regions of India,semiarid and sub-humid climate. Application of organic manures particularly biofertilizer's is the only option to improve the soil organic and future agricultural productivity (Ramesh,2008)`

Why using Bio-fertilizers—

More use of synthetic fertilizers has led to pollution and contamination of the soil,which has polluted water basins,destroyed micro-organisms and friendly insects making the crop more prone to diseases and reduced soil fertility. Following points are great concern

- Demand is much higher than the availability. It is estimated that by 2020 to achieve the targeted production of 321 million tones of food grain,the requirement of nutrient will be 28.8 million tones, while their avalibility will be only 21.6 million tones being a deficit of about 7.2 million tones.
- Depleting fossil fuels and increasing cost of fertilizers. This is becoming unaffordable by small and marginal farmers.
- Depleting soil fertility due to widening gap between nutrient removal and supplies.
- Increasing threat to sustainable agriculture.
- Growing concern about environmental hazards.

Characteristics of Bio-fertilizers—

Nitrogen fixers

Rhizobium: belongs to family ***Rhizobiaceae***, symbiotic in nature, fix nitrogen 50-100 kg/ha. With legumes only. It is useful for pulse legumes like chickpea, red-gram, pea, lentil, black gram, etc. oil-seed legumes like soyabean and groundnut and forage legumes like berseem and Lucerne.Successful nodulation of leguminous crops by ***Rhizobium*** largely depends on the availability of compatible strain for a particular legume. It colonizes the roots of a specific legumes to form tumour like growths called root production. ***Rhizobium*** has ability to fix association with legumes and certain non-legumes like Parasponia. ***Rhizobium*** population in the soil depends on the presence of legume crops in the field. In absence of legumes, the population decreases. Artificial seed inoculation is often needed to restore the population of effective strains of the ***Rhizobium***near the rhizosphere to hasten N-fixation. Each legume requires a specific species of***Rhizobium*** to form effective nodules. Many legumes may be modulated by diverse strains of *Rhizobia*, but growth is enhanced only when nodules are produced by effective strains of ***Rhizobia***. It is thus extremely important to match microsymbionts prudently for maximum nitrogen fixation. A strain of Rhizobia that nodules and fixes a large amount of nitrogen in association with one legume species may also do the same in association with certain other legume species. This must be verified by testing. Leguminous plants that demonstrate this tendency to respond similarly to particular strains of ***Rhizobia*** are considered "effectiveness" group (Wani and Lee,2002).

Azospirillum: belongs to family ***Spirilaceae***, heterotrophic and associative in nature. In addition to their nitrogen fixing ability of about 20-40 kg/ha, they also produce growth regulating substances. Although there are many species under this genus like,***A.amazonense***, ***A.halopraeferens, A.brasilense***, but, worldwide distribution and benefits of inoculation have been proved mainly with the ***A.lipoferum*** and ***A.brasilense***. the ***Azospirillum*** form associative symbiosis with many plants particularly with those having the C4-dicarboxyliac pathway of photosynthesis (Hatch and Slack pathway) , because they grow and fix nitrogen on salts of organic acids such as malic, aspartic acid(Arun 2007a). Thus it is mainly recommended for maize, sugarcane, sorghum, pearl millet etc. the***Azobacter*** colonizing the roots not only remains on the root surface but also a sizable proportion of them penetrates into the root tissues and lives in harmony with the plants. They do not, however, produce any visible nodules or out growth on root tissue.

Azobacter: belongs to family ***Azotobacteriaceae,*** aerobic, free living, and heterotrophic in nature. ***Azobacters***are present in neutral or alkaline soils and***A.chroococcum*** is the most commonly occurring species in arable soils**. *A.vinelandii, A.beijerinckii, A.insignis*** and ***A.macrocytogenes*** are other reported species. The number of ***Azotobacter*** rarely exceeds of 10

Of soil due to lack of organic matter and presence of antagonistic microorganism in soil. The bacterium produces anti-fungal antibiotics which inhibits the growth of several pathogenic fungi in the root region thereby preventing seedling mortality to a certain extent (Subba Rao, 2001a). The isolated culture of ***Azotobacter*** fixes about 10 mg nitrogen of carbon source under in vitro conditions. ***Azotobacter*** also to known to synthesize biologically active growth promoting substances such as vitamins of B-group, indole acetic acid(IAA) and gibberelins. Many strains of ***Azotobacter*** also exhibited fungi static properties agains plant pathogens such as***Fusarium,Alternaria*** and***Helminthosporium.*** The population of ***Azotobacter*** **i**s generally low in the rhizosphere of the crop plants and in uncultivated soils. The occurrence of this organism has been reported from the rhizosphere of a number of crop plants such as rice, maize, sugarcane, bajra, vegetables and plantation crops,(Arun,2007a).

Blue green algae (cyanobacteria) and Azolla:

These belongs to eight different families,phototrophic in nature and produce Auxin. Indole acetic acid and Gibberlic acid,fix 20-30 kg N/ha in submerged rice fields as they are abundant in paddy,so also referred as paddy organisms N is the key input require in large quantities for low land rice production . Soil N and BNF by associated organisms are major sources of N for low land rice. The 50-60% N requirement is met through the combination of mineralization of soil organic N and BNF by free living and rice plant association bacteria (Roger and Ladha,1992). To achieve food security through sustainable agriculture,the requirement for fixed nitrogen must be increasingly met nyBNF rather than by industrial nitrogen fixation. Most N fixing BGA are filamentous,consisting of chain of vegetative cells including specialized cells.called heterocyst which function as micro nodule for synthesis and N fixing machinery. BGA formssymbiotic association capable of fixing nitrogen with fungi,Liverworts,ferns and flowering plants,but the most common symbiotic association has found between a free floating aquatic fern the *Azolla* and Anabaena azollae 9BGA).*Azolla* contains 4—5 % N on dry basis and 0.2—0.4% on wet basis and can be the potential source of organic manure and nitrogen in rice production. The important factor in using *Azolla* as biofertilizer for rice crop is its quick decomposition in the soil and efficient avalibility of its nitrogen to rice plants (Kannaiyan,1990). Besides N—fixation, these biofertilizers or biomannures also contribute significant amounts of P,K,S,Zn,Fe,Mb and other micronutrient. The fern forms a green mat over water with a branched stem,deeply boiled leaves and roots. The dorsal fleshy lobe of the leaf contains the algal symbiont within the central cavity. *Azolla* can be applied as green manure by incorporating in the fields prior to rice planting .The most common species occurring in India is *A.pinnata* and same can be propagated on commercial scale by vegetative means. It may yield on average about 1.5 kg per square meter in a week. India has recently introduced some species of *Azolla* for their large biomass production,Which are *A.carolinianaA.microphylla, A. filiculoides and A.mexicana*.

Zinc solubilizers :

The nitrogen fixers like ***Rhizobium ,Azospirillum,Azotobacter,BGA*** and Phosphate solubilizing bacteria like ***B.magaterium***,***Pseudomonasstriata*** and phosphate mobilizing Mycorrhiza have been widely accepted as bio-fertilizers (Rao subba,2001). However these supply only major nutrients but a host of microorganism that can transforms micronutrients are there in soil that can be uised as bio-fertilizers to supply micronutrients like zinc,iron,copper etc,zinc being most important is found in the earth's crust to the tune of 0.008 percent but more than 50 per cent of Indian soils exhibit deficiency of zinc with content must below the critical level of 1.5 ppm of available zinc.The plant constraints in absorbing zinc from the soil are overcome by external application of soluble zinc sulphate ($ZnSO_4$).But the fate of applied zinc in the submerged soil conditions is pathetic and only 1-4 % of total available zinc is utilized by the crop and 75 % of applied zinc is transformed into different mineral fractions (Zn-fixation) which are not available for plant absorption.

Phosphate absorbers Mycorrhizae :

It is a symboticassociation between host plants and certain group of fungi at the root system in which the fungal partener is benefited by obtaining it's carbon requirements from the photosynthates of the host and the host in turn is benefited by obtaining the much needed nutrients especially phosphorus,calcium,copper,zinc etc,.Which are otherwise inaccessible to it,with the help of the fine absorbing hyphae of the fungus.These fungi are associated with majority of agriculture crops.They are ubiquitous in geographic distribution occurring with plants growing in artic,temperate and tropical regions alike VAM occur over a broad ecological range from aquatic to desert environments.

Zinc solubilizers:

The nitrogen fixers like ***Rhizobium, Azospirillum, Azotobacter***, BGA andPhosphate solubilizing bacteria like ***B. magaterium, Pseudomonas striata***, and phosphatemobilizing Mycorrhiza have been widely accepted as bio-fertilizers (Rao Subba, 2001). Howeverthese supply only major nutrients but a host of microorganism that can transform micronutrientsare there in soil that can be used as bio-fertilizers to supply micronutrients like zinc, iron, copperetc., zinc being most important is found in the earth's crust to the tune of 0.008 per cent but morethan 50 per cent of Indian soils exhibit deficiency of zinc with content must below the criticallevel of 1.5 ppm of available zinc. The plant constraints in absorbing zinc from the soil areovercome byexternalapplication of soluble zinc sulphate (ZnSO4). But the fate of applied zinc inthe submerged soil conditions is pathetic and only 1-4% of total available zinc is utilized by thecrop and 75% of applied zinc is transformed into different mineral fractions (Zn-fixation) whichare not available for plant absorption.

Role of Bio-fertilizers in Agriculture

Nitrogen-fixers and Phosphate solubilizers:

The use of bio-fertilizers plays major role inimproving soil fertility, yield attributing characters and thereby final yield has been reported bymany workers (Sabashini et al . 2007; Son et al . 2007). In addition, their application in soilimproves soil biota and minimizes the sole use of chemical fertilizers (Subashini et al., 2007).Under temperate conditions, inoculation of Rhizobium improved number of pods plant-1, numberof seed pod-1and 1000-seed weight (g) and thereby yield over the control. The number of podsplant-1, number of seed pod-1 and 1000-seed weight (g) recorded were 25.5, 17.1 and 4.7 per centmore over the control, respectively which was statistically significant (Bhat et al, 2010). In riceunder low land conditions, the application of BGA+ Azospirillum proved significantly beneficialin improving LAI and all yield attributing aspects. Grain yield and harvest index also exhibit adiscernable increase with use of bio-fertilizers. Field trials carried out in different locations havedemonstrated that under certain environmental and soil conditions inoculation withAzotobacteria has beneficial effects on plant yields. Inoculation with Azotobacter + Rhizobium +VAM gave the highest increase in straw and grain yield of wheat plants with rock phosphate as aP-fertilizer concluded that with microbial inoculation rock phosphate could be used as cheapsource of P in alkaline soils and that combined inoculation could reduce the rate of fertilizerrequired to maintain high productivity. It is an established fact that the efficiency of phosphaticfertilizers is very low (15-20%) due to its fixation in acidic and alkaline soils and unfortunatelyboth soil types are predominating in India accounting more than 34% acidity affected and morethan seven million hectares of productive land salinity/alkaline affected. Therefore, theinoculations with PSB and other useful microbial inoculants in these soils become mandatory torestore and maintain the effective microbial populations for solubilization of chemically fixedphosphorus and availability of other macro and micronutrients to harvest good sustainable yieldof various crops.

Mycorrhizae:Arbuscularmycorrhizal (AM) fungi is most abundant in agriculture. They accountfor 5–50% of the biomass of soil microbes and some products formed by them may account foranother 3000 kg (Lovelock et al, 2004). Pools of organic carbon such as glomalin produced by

AM fungi may even exceed soil microbial biomass by a factor of 10–20. The external myceliumattains as much as 3% of root weight. Approximately 10–100 m mycorrhizal mycelium can befound per cm root.

The mineral acquisition from soil is considered to be the primary role ofmycorrhizae, but they play others various role in Agriculture

1. Improved nutrient uptake (Macro and Micronutrients).
2. Better water relation and drought tolerance.
3. Soil structure.
4. Enhanced phytohormone activity.
5. Crop protection (Interaction with soil pathogens).

Constraints in bio-fertilizer use

Production Constraints

_ Unavailability of appropriate and efficient strains
_ Unavailability of suitable carrier
_ Mutation during fermentation

Market level constraints

_ Lack of awareness of farmers:
_ Inadequate and Inexperienced staff
_ Lack of quality assurance
_ Seasonal and unassured demand
_ Resource constraint
_ Limited resource generation for BF production

Field level constraints

_ Soil and climatic factors:
_ Native microbial population
_ Faulty inoculation techniques
_ Liquid Bio-fertilizers (Break through in bio-fertilizer technology)

Conclusion

Biofertilizer is a substance which contains living microorganisms, used in the agricultural field asa replacement to conventional fertilizers. Those are not as effective as chemical fertilizers. So,farmers often try to use chemical fertilizers in the field for better crop development, but they arenot environment friendly and responsible for water, air and soil pollution and can spread cancercausing agents. Moreover, they may destroy the fertility of the soil in a long term manner.Therefore Scientists have developedBiofertilizerto prevent pollution and to make this world
healthy in a natural way.

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Effect of Changing Environment on Economic growth of India: An Overview

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Abstract:

Economic growth means an increase in real output (real GDP). Therefore, with increased output and consumption we are likely to see costs imposed on the environment. The environmental impact of economic growth includes the increased consumption of non-renewable resources, higher levels of pollution, global warming and the potential loss of environmental habitats. However, not all forms of economic growth cause damage to the environment. With rising real incomes, individuals have a greater ability to devote resources to protecting the environment and mitigate the harmful effects of pollution. Also, economic growth caused by improved technology can enable higher output with less pollution.

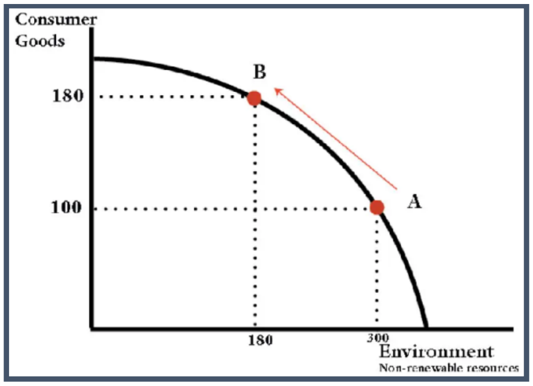
Introduction:

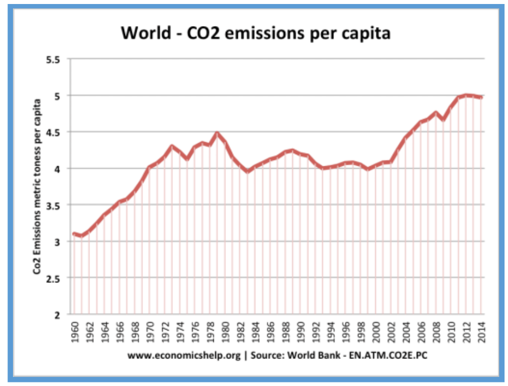
India ranks second worldwide in farm output. Agriculture and allied sectors like forestry, logging and fishing accounted for 18.6% of the GDP in 2005, employed 60% of the total workforce and despite a steady decline of its share in the GDP, is still the largest economic sector and plays a significant role in the overall socio-economic development of India. Yields per unit area of all crops have grown since 1950, due to the special emphasis placed on agriculture in the five-year plans and steady improvements in irrigation, technology, application of modern agricultural practices and provision of agricultural credit and subsidies since the green revolution.

India is the largest producer in the world of milk, cashew nuts, coconuts, tea, ginger, turmeric and black pepper. It also has the world's largest cattle population (193 million). It is the second largest producer of wheat, rice, sugar, groundnut and inland fish.[16] It is the third largest producer of tobacco. India accounts for 10% of the world fruit production with first rank in the production of banana and sapota, also known as chiku. The required level of investment for the development of marketing, storage and cold storage infrastructure is estimated to be huge. The government has implemented various schemes to raise investment in marketing infrastructure. Amongst these schemes are *Construction of Rural Go downs*, *Market Research and Information Network*, and *Development / Strengthening of Agricultural Marketing Infrastructure, Grading and Standardisation*

Economic growth means an increase in real output (real GDP). Therefore, with increased output and consumption we are likely to see costs imposed on the environment. The environmental impact of economic growth includes the increased consumption of non-renewable resources, higher levels of pollution, global warming and the potential loss of environmental habitats. With rising real incomes, individuals have a greater ability to devote resources to protecting the environment and mitigate the harmful effects of pollution. Also, economic growth caused by improved technology can enable higher output with less pollution.

Classic trade-off between economic growth and environmental resources:





This PPF curve shows a trade-off between non-renewable resources and consumption. As we increase consumption, the opportunity cost implies a lower stock of non-renewable resources. For example, the pace of global economic growth in the past century has led to a decline in the availability of natural resources such as forests (cut down for agriculture/demand for wood)

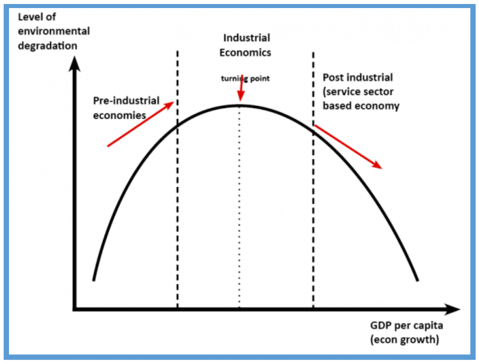
External costs of economic growth

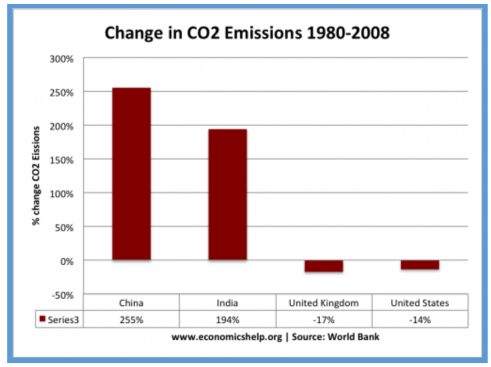
- **Pollution.** Increased consumption of fossil fuels can lead to immediate problems such as poor air quality and soot, (London smogs of the 1950s). Some of the worst problems of burning fossil fuels have been mitigated by Clean Air Acts – which limit the burning of coal in city centres. Showing that economic growth can be consistent with reducing a certain type of pollution.
- **Less visible more diffuse pollution.** While smogs were a very clear and obvious danger, the effects of increased CO2 emissions are less immediately obvious and therefore there is less incentive for policymakers to tackle. Scientists state the accumulation of CO2 emissions have contributed to global warming and more volatile weather. All this suggests economic growth is increasing long-term environmental costs – not just for the present moment, but future generations.This graph shows CO2 emissions per capita. It shows a 66% rise in per capita pollution between 1960 and 2014. The total emissions are also higher because of population growth. 1960 to 2014 was a period of strong economic growth and despite the development of new technologies, has failed to halt the rise.

- **Damage to nature**. Air/land/water pollution causes health problems and can damage the productivity of land and seas.
- **Global warming and volatile weather**. Global warming leads to rising sea levels, volatile weather patterns and could cause significant economic costs
- **Soil erosion**. Deforestation resulting from economic development damages soil and makes areas more prone to drought.
- **Loss of biodiversity.** Economic growth leads to resource depletion and loss of biodiversity. This could harm future 'carrying capacity of ecological systems' for the economy. Though there is uncertainty about the extent of this cost as the benefit of lost genetic maps may never be known.

- **Long-term toxins**. Economic growth creates long-term waste and toxins, which may have unknown consequences. For example, economic growth has led to increased use of plastic, which when disposed of do not degrade. So there is an ever-increasing stock of plastic in the seas and environment – which is both unsightly but also damaging to wildlife.

U-Shaped curve for economic growth and the environment

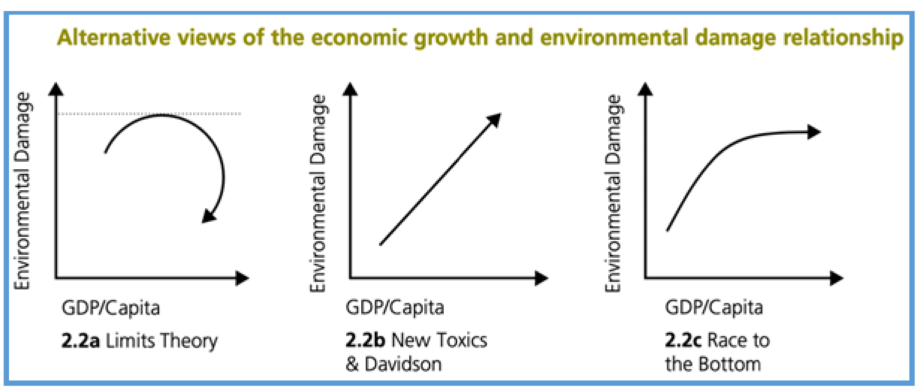




One theory of economic growth and the environment is that up to a certain point economic growth worsens the environment, but after that the move to a post-industrial economy – it leads to a better environment.

1. It may be true there is a Kuznets curve for some types of visible pollutants, but it is less true of more diffuse and less visible pollutants. (like CO_2)
2. The U-shaped maybe true of pollutants, but not the stock of natural resources; economic growth does not reverse the trend to consume and reduce the quantity of non-renewable resources.
3. Reducing pollution in one country may lead to the outsourcing of pollution to another, e.g. we import coal from developing economies, effectively exporting our rubbish for recycling and disposal elsewhere.
4. Environmental policies tend to deal with pressing issues at hand but ignore future intergenerational problems.

Other models of a link between economic growth and environment:



Limits Theory

This suggests that economic growth will damage the environment, and damage will itself start to act as a brake on growth and will force economies to deal with economic damage. In other words, the environment will force us to look after it. For example, if we run down natural resources, their price will rise and this will create an incentive to find alternatives.

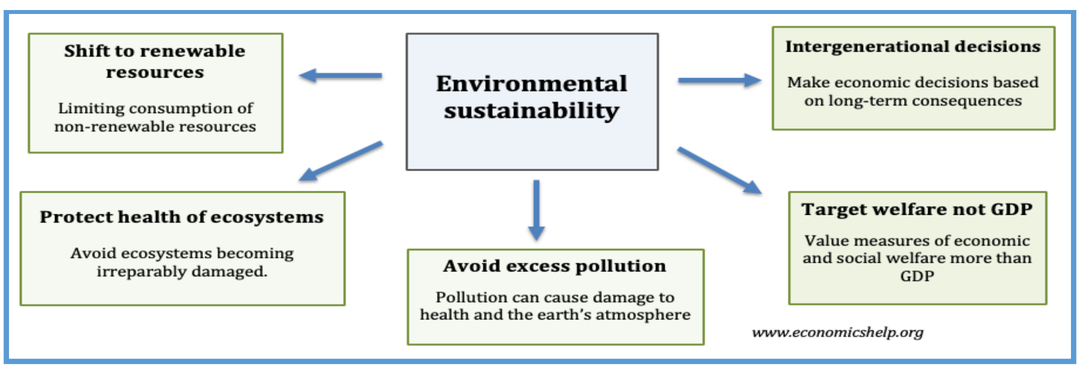
New toxics

This is more pessimistic suggesting that economic growth leads to an ever-increasing range of toxic output and problems, some issues may get solved, but they are outweighed by newer and more pressing problems which are difficult if impossible to overturn.This model has no faith that the free-market will solve the problem because there is no ownership of air quality and many of the effects are piling up on future generations; these future effects cannot be dealt with by the current price mechanism.

Race to the bottom

This suggests that in the early stages of economic growth, there is little concern about the environment and often countries undermined environmental standards to gain a competitive advantage – the incentive to free-ride on others' efforts. However, as the environment increasingly worsens, it will reluctantly force economies to reduce the worst effects of environmental damage. This will slow down environmental degradation but not reverse past trends.

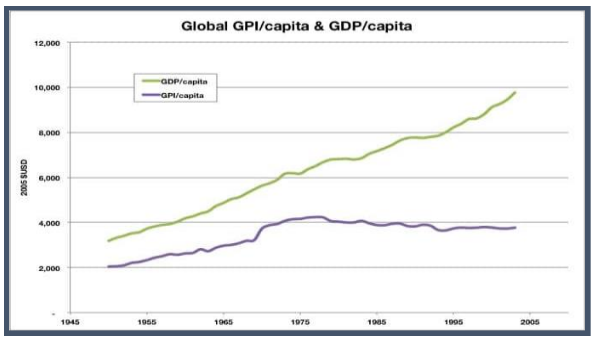
Economic growth without environmental damage



Some ecologists argue economic growth invariably leads to environmental damage. However, there are economists who argue that economic growth can be consistent with a stable environment and even improvement in the environmental impact. This will involve

- **A shift from non-renewables to renewables** A recent report suggests that renewable energy is becoming cheaper than more damaging forms of energy production such as burning coal and in 2018 – this has led to a 39% drop in new construction starts from 2017, and an 84% drop since 2015.

- **Social cost pricing.** If economic growth causes external costs, economists state it is socially efficient to include the external cost in the price (e.g. carbon tax). If the tax equals the full external cost, it will lead to a socially efficient outcome and create a strong incentive to promote growth that minimizes external costs.
- **Treat the environment as a public good**. Environmental policy which protects the environment, through regulations, government ownership and limits on external costs can, in theory, enable economic growth to be based on protection of the environmental resource.
- **Technological development**. It is possible to replace cars running on petrol with cars running on electricity from renewable sources. This enables an increase in output, but also a reduction in the environmental impact. There are numerous possible technological developments which can enable greater efficiency, lower costs and less environmental damage.
- **Include quality of life and environmental indicators in economic statistics.** Rather than targetting GDP, environmental economists argue we should target a wider range of living standards + living standards + environmental indicators. (e.g. Genuine Progress Indicators GPI)



Conclusion:

Climate change is expected to affect the human well being in many different ways such as capital, ecosystem, disease and migration. Irrespective of the importance of the issue, it is not clear how to compute the value with the current state of the art of economics. A meaningful development involves at least transformation from agricultural to a non- agricultural economy reducing the dependence on agriculture. Since most of the labor force—about 70%—directly and indirectly depends on the sector for livelihood and employment, it is when this sector is more productive and ensures food self-sufficiency that it will release the necessary labor and capital for the manufacturing and service sectors. In the context of the current debate about climate change, it is necessary to show, far from being inactive in India, that considerable actions in terms of policies, programs and projects are being taken. Technology transfer can speed up the modernization process and additional funds can accelerate government in energy conservation. However, policies for poverty alleviation must be given priority

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Organic farming in India: A vision towards healthy nation

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Abstract

Food quality and safety are the two important factors that have gained ever-increasing attention in general consumers. Conventionally grown foods have immense adverse health effects due to the presence of higher pesticide residue, more nitrate, heavy metals, hormones, antibiotic residue, and also genetically modified organisms. Moreover, conventionally grown foods are less nutritious and contain lesser amounts of protective antioxidants. In the quest for safer food, the demand for organically grown foods has increased during the last decades due to their probable health benefits and food safety concerns. Organic food production is defined as cultivation without the application of chemical fertilizers and synthetic pesticides or genetically modified organisms, growth hormones, and antibiotics. The popularity of organically grown foods is increasing day by day owing to their nutritional and health benefits. Organic farming also protects the environment and has a greater socio-economic impact on a nation. India is a country that is bestowed with indigenous skills and potentiality for growth in organic agriculture. Although India was far behind in the adoption of organic farming due to several reasons, presently it has achieved rapid growth in organic agriculture and now becomes one of the largest organic producers in the world. Therefore, organic farming has a great impact on the health of a nation like India by ensuring sustainable development.

Keywords: Food safety, organic food, biodiversity, sustainable farming, conventional farming

Introduction:

Food quality and safety are two vital factors that have attained constant attention in common people. Growing environmental awareness and several food hazards (e.g. dioxins, bovine spongiform encephalopathy, and bacterial contamination) have substantially decreased the consumer's trust towards food quality in the last decades. Intensive conventional farming can add contamination to the food chain. For these reasons, consumers are quested for safer and better foods that are produced through more ecologically and authentically by local systems. Organically grown food and food products are believed to meet these demands.

In recent years, organic farming as a cultivation process is gaining increasing popularity Organically grown foods have become one of the best choices for both consumers and farmers. Organically grown foods are part of go green lifestyle. The term 'organic' was first coined by Northbourne, in 1940, in his book entitled 'Look to the Land'.

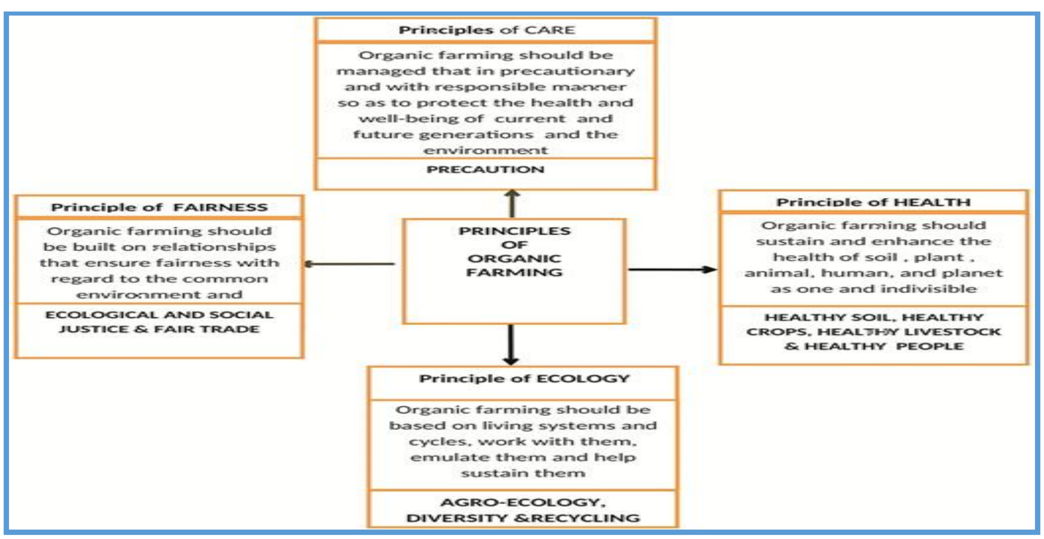
Northbourne stated that 'the farm itself should have biological completeness; it must be a living entity; it must be a unit which has within itself a balanced organic life'. Northbourne also defined organic farming as 'an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity'.

Organic Farming Process:

Organic farming and food processing practices are wide-ranging and necessitate the development of socially, ecologically, and economically sustainable food production system. The International Federation of Organic Agriculture Movements (IFOAM) has suggested the basic four principles of organic farming, i.e. the principle of health, ecology, fairness, and care (Figure 1). The main principles and practices of organic food production are to inspire and enhance biological cycles in the farming system, keep and enhance deep-rooted soil fertility, reduce all types of pollution, evade the application of pesticides and synthetic fertilizers, conserve genetic diversity in food, consider the vast socio-ecological impact of food production, and produce high-quality food in sufficient quantity.

According to the National Organic Programme implemented by USDA Organic Food Production Act (OFPA, 1990), agriculture needs specific prerequisites for both crop cultivation and animal husbandry. To be acceptable as organic, crops should be cultivated in lands without any synthetic pesticides, chemical fertilizers, and herbicides for 3 years before harvesting with enough buffer zone to lower contamination from the adjacent farms. Genetically engineered products, sewage sludge, and ionizing radiation are strictly prohibited. Fertility and nutrient content of soil are managed primarily by farming practices, with crop rotation, and using cover crops that are boosted with animal and plant waste manures.

Figure 1:



Pests, diseases, and weeds are mainly controlled with the adaptation of physical and biological control systems without using herbicides and synthetic pesticides. Organic livestock should be reared devoid of scheduled application of growth hormones or antibiotics and they should be provided with enough access to the outdoor. Preventive health practices such as routine vaccination, vitamins and minerals supplementation are also needed (OFPA, 1990).

Benefits of Organic Farming

Nutritional benefits and health safety

The growing demand for organically farmed fresh products has created an interest in both consumer and producer regarding the nutritional value of organically and conventionally grown foods. Organically grown foods, especially leafy vegetables and tubers, have higher dry matter as compared to conventionally grown foods. Although organic cereals and their products contain lesser protein than conventional cereals, they have higher quality proteins with better amino acid scores. Lysine content in organic wheat has been reported to be 25%–30% more than conventional wheat.

Organically grazed cows and sheep contain less fat and more lean meat as compared to conventional counterparts. Organically fed cow's muscle contains fourfold more linolenic acid, which is a recommended cardio-protective ω-3 fatty acid, with accompanying decrease in oleic acid and linoleic acid.

Fruits and vegetables contain a wide variety of phytochemicals such as polyphenols, resveratrol, and pro-vitamin C and carotenoids which are generally secondary metabolites of plants. According to a Food Marketing Institute, some organic foods such as corn, strawberries, and marionberries have greater than 30% of cancer-fighting antioxidants. The phenols and polyphenolic antioxidants are in higher level in organic fruits and vegetables. It has been estimated that organic plants contain double the amount of phenolic compounds than conventional ones. Organic wine has been reported to contain a higher level of resveratrol

Organic vegetables normally have far less nitrate content than conventional vegetables. Nitrates are used in farming as soil fertilizer but they can be easily transformed into nitrites, a matter of public health concern. Nitrites are highly reactive nitrogen species that are capable of competing with oxygen in the blood to bind with haemoglobin, thus leading to methemoglobinemia. It also binds to the secondary amine to generate nitrosamine which is a potent carcinogen. Therefore, organic foods ensure better nutritional benefits and health safety.

Environmental impact:

Organic farming has a protective role in environmental conservation. The effect of organic and conventional agriculture on the environment has been extensively studied. It is believed that organic farming is less harmful to the environment as it does not allow synthetic pesticides, most of which are potentially harmful to water, soil, and local terrestrial and aquatic wildlife. In addition, organic farms are better than conventional farms at sustaining biodiversity, due to practices of crop rotation. Organic farming improves physico-biological properties of soil consisting of more organic matter, biomass, higher enzyme, better soil stability, enhanced water percolation, holding capacities, lesser water, and wind erosion compared to conventionally farming soil. Organic farming uses lesser energy and produces less waste per unit area or per unit yield. In addition, organically managed soils are of greater quality and water retention capacity, resulting in higher yield in organic farms even during the drought years.

Socioeconomic impact:

Organic cultivation requires a higher level of labour, hence produces more income-generating jobs per farm. An organic product typically costs 10%–40% more than the similar conventionally crops and it depends on multiple factors both in the input and the output arms. On the input side, factors that enhance the price of organic foods include the high cost of obtaining the organic certification, the high cost of manpower in the field, lack of subsidies on organics in India, unlike chemical inputs. But consumers are willing to pay a high price as there is increasing health awareness. Some organic products also have short supply against high demand with a resultant increase in cost.

Biofertilizers and pesticides can be produced locally, so yearly inputs invested by the farmers are also low. As the labours working in organic farms are less likely to be exposed to agricultural chemicals, their occupational health is improved. Organic food has a longer shelf life than conventional foods due to lesser nitrates and greater antioxidants. Nitrates hasten food spoilage, whereas antioxidants help to enhance the shelf life of foods. Organic farming is now an expanding economic sector as a result of the profit incurred by organic produce and thereby leading to a growing inclination towards organic agriculture by the farmers.

Organic Agriculture and Sustainable Development:

The concept of sustainable agriculture integrates three main goals environmental health, economic profitability, and social and economic equity. The concept of sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.

The very basic approach to organic farming for the sustainable environment includes the following:

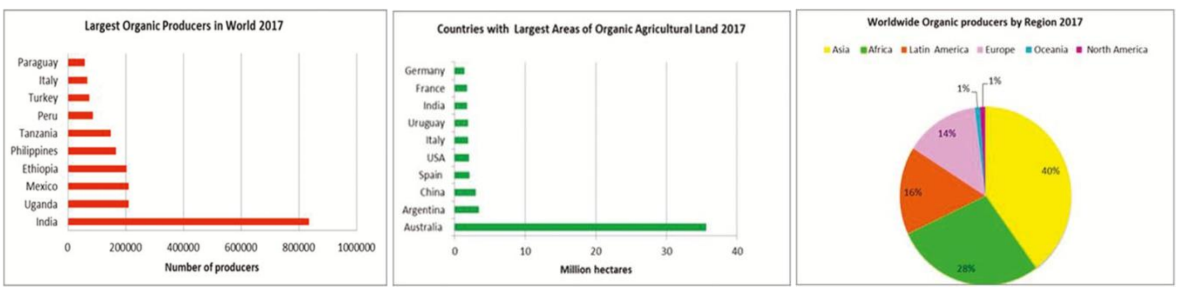
1. Improvement and maintenance of the natural landscape and agro-ecosystem.
2. Avoidance of overexploitation and pollution of natural resources.
3. Minimization of the consumption of non-renewable energy resources.
4. Exploitation synergies that exist in a natural ecosystem.
5. Maintenance and improve soil health by stimulating activity or soil organic manures and avoid harming them with pesticides.
6. Optimum economic returns, with a safe, secure, and healthy working environment.
7. Acknowledgement of the virtues of indigenous know-how and traditional farming system.

Long-term economic viability can only be possible by organic farming and because of its premium price in the market, organic farming is more profitable. The increase in the cost of production by the use of pesticides and fertilizers in conventional farming and its negative impact on farmer’s health affect economic balance in a community and benefits only go to the manufacturer of these pesticides. Continuous degradation of soil fertility by chemical fertilizers leads to production loss and hence increases the cost of production which makes the farming economically unsustainable. Implementation of a strategy encompassing food security, generation of rural employment, poverty alleviation, conservation of the natural resource, adoption of an export-oriented production system, sound infrastructure, active participation of government, and private-public sector will be helpful to make revamp economic sustainability in agriculture

Status of Organic Farming in India: Production, Popularity, and Economic Growth

Organic food and farming have continued to grow across the world. Since 1985, the total area of farmland under organic production has been increased steadily over the last three decades. The countries with the largest areas of organic agricultural land recorded in the year 2017 are given in Figure 2. Australia has the largest organic lands with an area of 35.65 million hectares and India acquired the eighth position with a total organic agriculture area of 1.78 million hectares.

Figure 2:

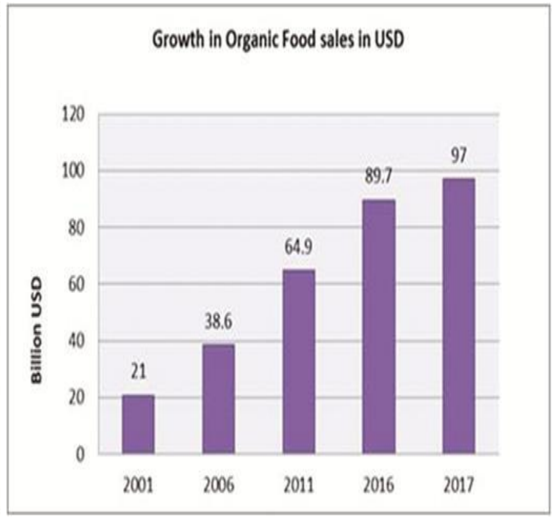


The growth of organic farming in India was quite dawdling with only 41 000 hectares of organic land comprising merely 0.03% of the total cultivated area. In India during 2002, the production of organic farming was about 14 000 tonnes of which 85% of it was exported. The most important barrier considered in the progress of organic agriculture in India was the lacunae in the government policies of making a firm decision to promote organic agriculture. There were several major drawbacks in the growth of organic farming in India which include lack of awareness, lack of good marketing policies, shortage of biomass, inadequate farming infrastructure, high input cost of farming, inappropriate marketing of organic input, inefficient agricultural policies, lack of financial support, incapability of meeting export demand, lack of quality manure, and low yield.

Figure 5.

	CONSTRAINTS OF ORGNIC FARMING IN INDIA IN THE PAST
1.	Lack of awareness
2.	Lack of good marketing policies
3.	Shortage of biomass
4.	Inadequate farming infrastructure
5.	High input cost of farming
6.	Inappropriate marketing of organic input
7.	Inefficient agricultural policies
8.	Lack of financial support
9.	Inability to meet the export demand
10.	Lack of quality standards for manure, and
11.	Low yield
12.	Lack in governmental policies to promote organic agriculture

Figure 6.



Future Prospects of Organic Farming in India:

India is an agriculture-based country with 67% of its population and 55% of manpower depending on farming and related activities. Agriculture fulfils the basic needs of India's fastest-growing population accounted for 30% of total income. Organic farming has been found to be an indigenous practice of India that practised in countless rural and farming communities over the millennium. The arrival of modern techniques and increased burden of population led to a propensity towards conventional farming that involves the use of synthetic fertilizer, chemical pesticides, application of genetic modification techniques, etc.

Even in developing countries like India, the demand for organically grown produce is more as people are more aware now about the safety and quality of food, and the organic process has a massive influence on soil health, which devoid of chemical pesticides. Organic cultivation has an immense prospect of income generation too. The soil in India is bestowed with various types of naturally available organic nutrient resources that aid in organic farming.

India is a country with a concrete traditional farming system, ingenious farmers, extensive dry lands, and nominal use of chemical fertilizers and pesticides. Moreover, adequate rainfall in north-east hilly regions of the country where few negligible chemicals are employed for a long period of time, come to fruition as naturally organic lands.

Various newer technologies have been invented in the field of organic farming such as integration of mycorrhizal fungi and nano-biostimulants (to increase the agricultural productivity in an environmentally friendly manner), mapping cultivation areas more consciously through sensor technology and spatial geodata, 3D printers (to help the country's smallholder), production from side streams and waste along with main commodities, promotion and improvement of sustainable agriculture through innovation in drip irrigation, precision agriculture, and agro-ecological practices. Another advancement in the development of organic farming is Bee Scanning App, through which beekeepers can fight the *Varroa destructor* parasite mite and also forms a basis for population modelling and breeding programmes.

The technology works towards (1) energization of soil system: reactivation of soil-plant-microflora dynamics by restoration of the population and efficiency of the native soil microflora and (2) energization of plant system: restoration of the two defense mechanisms of the plant kingdom that are nutrient use efficiency and superior plant immunity against pest/disease infection.

Conclusions:

Organic farming yields more nutritious and safe food. The popularity of organic food is growing dramatically as consumer seeks the organic foods that are thought to be healthier and safer. Thus, organic food perhaps ensures food safety from farm to plate. The organic farming process is more eco-friendly than conventional farming. Organic farming keeps soil healthy and maintains environment integrity thereby, promoting the health of consumers. Moreover, the organic produce market is now the fastest growing market all over the world including India. Organic agriculture promotes the health of consumers of a nation, the ecological health of a nation, and the economic growth of a nation by income generation holistically. India, at present, is the world's largest organic producers and with this vision, we can conclude that encouraging organic farming in India can build a nutritionally, ecologically, and economically healthy nation in near future.

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Nutritional Benefits of Organic Farming on Human Health and Environment

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Abstract

Organic food contributes to better health through reduced pesticide exposure for all and increased nutritional quality. In order to understand the importance of eating organic food from the perspective of toxic pesticide contamination, we need to look at the whole picture—from the farm workers who do the valuable work of growing food, to the waterways from which we drink, the air we breathe, and the food we eat. Organic food can feed us and keep us healthy without producing the toxic effects of chemical agriculture.

Keywords: Organic Farming, Pesticide, Farm workers, Consumers, Children etc.

Introduction:

Organic foods are the ones that are chemical-free and grown using no pesticides or chemical fertilizers. Unlike conventional foods, during the production of organic fruits and vegetables, no chemicals are used to increase their size or to ripe them before time. However, it is difficult to distinguish between common foods and organic foods as they look similar in colour and shape. Today, in this blog we will tell you how to identify organic food and the health benefits of organic food for the elderly.

Organic foods are the ones that are chemical-free and grown using no pesticides or chemical fertilizers. Unlike conventional foods, during the production of organic fruits and vegetables, no chemicals are used to increase their size or to ripe them before time. However, it is difficult to distinguish between common foods and organic foods as they look similar in colour and shape. Today, in this blog we will tell you how to identify organic food and the health benefits of organic food for the elderly. All kinds of fruits and vegetables are available in the market, which looks very fresh, but this does not mean that they are organic. Organic food items are certified separately. These are affixed or printed with certified stickers. Their taste is also slightly different from normal food. The smell of organic food is stronger than that of normal food.

Organic food has more nutrients in comparison to non-organic foods. It is because non-organic food loses its nutrient during the processing phase. Natural fertilizers are used for organic foods such as cow manure. On the other hand, non-organic food is fertilized with chemicals. Non-organic foods that were grown on traditional farms use human faeces as fertilizers. This practice, however, is not allowed in organic farms. Organic food does not contain hormones, while non-organic foods contain hormones, hormones are injected for animals to speed up their growth. Food poisoning is more likely to occur with non-organic foods than organic.

In recent years, the trend of organic food is becoming increasingly popular. Sales of organic food manufacturers have steadily increased during the past decade, although organic food prices are inherently higher. But the best part is that food produced through organic farming is completely free from chemicals, drugs and growth hormones. Moreover, it is an ecologically balanced approach. Here are some common environment talk benefits of organic food:

- Organic food strives for crop rotation resources, which promotes ecological balance and preserves biodiversity. The use of pesticides and fertilizers is considered harmful to the environment as well as health.
- Organic food irradiation is not processed using an industrial solvent or synthetic food additives, hence it is environment friendly.
- Organic food contains small amounts of pesticides. Whatever food, grains, fruits, vegetables, etc. we eat, the pesticide residues remain on it, but, in organic food, it is in small quantities.
- Organic farming is beneficial for the environment because it causes less pollution, conserves water, increases soil fertility and consumes less energy.
- Animals that are reared organically are not given any antibiotics, growth hormones or harmful products. This not only keeps the animals healthy but also the products they get are healthier than other products.

Farm worker health

The population groups most affected by pesticide use are farmworkers and their families. These people live in communities near the application of toxic pesticides, where pesticide drift and water contamination are common. Farmworkers, both pesticide applicators and fieldworkers who tend to and harvest the crops, come into frequent contact with pesticides. Their families and children are then exposed to these pesticides through contact with them and their clothing. Pregnant women working in the fields unwittingly expose their unborn babies to toxic pesticides. Organic agriculture does not utilize these toxic chemicals and thus eliminates this enormous health hazard to workers, their families, and their communities.

There is no national reporting system for farmworker pesticide poisonings. In California, one of the few states to require reporting pesticide poisonings, there was a yearly average of 475 reported farmworker poisonings from pesticides in the years 1997-2000 according to the report Fields of Poison 2002: California Farmworkers and Pesticides. As discussed in the paper, this probably drastically underestimates the true number of poisonings, since many cases are never reported for myriad reasons including rising health care costs that have heightened reluctance to seek medical attention, misdiagnosis from medical professionals, and the failure of insurance companies to forward reports to proper authorities.

Acute pesticide poisonings for farmworkers are only one aspect of the health consequences of pesticide exposure. Many farmworkers spend years in the field exposed to toxic chemicals, and some studies have reported increased risks of certain types of cancers among farmworkers. The emerging science on endocrine disrupting pesticides reveals another chronic health effect of pesticide exposure. Children living in areas with high pesticide use are at great risk of health effects because of their high susceptibility to pesticides. In 1998, a groundbreaking study by Elizabeth Guillette published in

Environmental Health Perspectives showed the severe developmental effects of pesticides on children in an agricultural area of Mexico.

Pesticide exposure for pregnant women working in the fields can have devastating effects on their babies. One study compares three case studies of birth defects caused by probable pesticide poisoning. In one case that was brought to court and decided in favor of the plaintiffs, a mother exposed illegally to pesticides gave birth to a child without arms or legs.

Consumer health:

Nutrition:

The production of organic food better for human health and the environment than conventional production, emerging science reveals what organic advocates have been saying for a long time—in addition to lacking the toxic residues of conventional foods, organic food is more nutritious.

A study published by The Organic Center reveals that organic food is higher in certain key areas such as total antioxidant capacity, total polyphenols, and two key flavonoids, quercetin and kaempferol, all of which are nutritionally significant (read a summary in the Beyond Pesticides Daily News Blog). Another study published in the Journal of Agricultural Food Chemistry looked specifically at the total phenolic content of marionberries, strawberries, and corn, and found that organically grown products contained higher total phenolics. Phenolics are important for plant health (defense against insects and diseases), and human health for their "potent antioxidant activity and wide range of pharmacologic properties including anticancer, antioxidant, and platelet aggregation inhibition activity."

Animals raised organically are not given antibiotics and are required to be grazed on organically managed pastureland or fed organically grown feed. Some organic milk producers have been cited for violations in the organic standard, making it all that much more important to chose a local, organic dairy farm where operations are transparent. For more on maintaining organic dairy integrity, visit the Cornucopia Institute's page on organic milk.

Pesticide Contamination:

Pesticide residues in food are regulated by the Food Quality Protection Act (FQPA), but the tolerance levels assigned for certain pesticides, though determined "allowable", still pose potential health risks. The only way to avoid pesticide residues is to switch to organic foods. Some foods tend to have lower pesticide residues either because fewer pesticides are used in their production or because they have thicker skins and, when peeled, contain smaller amounts of pesticides than more thin-skinned products return to top

Children and pesticides:

Children are particularly susceptible to the effects of pesticide exposure because they have developing organ systems that are more vulnerable and less able to detoxify toxic chemicals. Beyond Pesticides has produced a factsheet entitled Children and Lawn Chemicals Don't Mix, that outlines the need to eliminate children's exposure to toxic lawn chemicals. Pesticide exposure also occurs through food, and switching to an organic diet is an important step in reducing this exposure.

Research has shown that switching children to an organic diet drastically reduces their exposure to organophosphates, a class of pesticides that includes the common and toxic malathion and chlorpyrifos. A study published in 2015 compared the urine concentrations of organophosphorus pesticides and their metabolites in children eating conventional vs. organic diets. The results indicate that for certain types of pesticides, such as organophosphates, diet is the primary route of exposure and switching to an organic diet decreases exposure substantially. The most important organic food products to purchase for children are not only those that contain high residues in conventional form, but those that they consume in great quantity. For example, if children drink a lot of juice, purchasing organic juice is particularly important to reduce their pesticide exposure.

While dietary contamination is a source for pesticide exposure and organic agriculture is critical to reducing this, it is paramount that we also consider all sources of pesticide exposure for children. We must also advocate for pesticide free schools, parks, buildings, and private lawns. For more information on these issues, please visit Beyond Pesticides program pages for schools, lawns and lawncare, and alternatives factsheets.

Conclusion:

The positive environmental benefits of organic farming are well-documented. Organic farming preserves biodiversity and soil fertility, prevents soil erosion and reduces contamination of the water supply from toxic runoff. Anecdotal evidence and common sense tell us that organic food tastes better and is less likely to be contaminated with pesticides. However, when it comes to the assertion that organic food is actually more nutritious than non-organic food, most scientists agree there is a need for more research. Fortunately, studies of this type are increasing and many recent studies are concluding that organic food may indeed have higher levels of some nutrients and antioxidants and lower levels of nitrates and pesticides.

As consumer interest in organic products continues to grow, new studies will continue to shine light on the many possible benefits of eating and growing organically. At Down to Earth, we have always been aware of the value of organics, whether supported by science or simple common sense, and we remain committed to supporting organic farming and providing you with quality organic products.

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9.

Aeromycoflora Of Insects Parts And Hyphal Fragements Over Sunflower Fields

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Abstract :

Present paper deals with the aerobiological investigation over Sunflower fields by using Volumetric continuous Tilak Air Sampler was employed for exploring fungal air spora over a Sunflower field at Kada, Tal. Ashti and Dist. Beed, from 5th July to 30th September 2016 for first Kharif season and from 1st July to30thSeptember 2017 for second Kharif season. The present paper deals with airborne concentration of Insect parts and Hyphal fragments over sunflower fields. The concentration of airborne Insect parts and Hyphal fragments was assessed and the roles of the metrological parameters over the concentration were discussed. The Insect parts and Hyphal fragments concentration was maximum (7550/^{m3}, 10201/^{m3}and 966/^{m3}, 2338m3of air) in the month of September 2016, August 2017 and September 2016 and 2017 during first and second Kharif season respectively.

Key Words: Aerobiology, Aeromycoflora Hyphal Fragments, Insect Parts, Air Sampler, Sunflower field.

INTRODUCTION

Aerobiology is an interdisciplinary science which deals with the study of biological component like pollen grains, fragments of fungal spores, hyphal fragments, bacteria, viruses, algae, lichens, minute insects & insect parts, protonzoancyst, etc. In the atmosphere a biotic particulates & gases affecting living organisms have been recently included in the concept of aerobiology. The aerobiological studies are mainly concern with interrelationship between the biological component in the atmosphere, source of biological component, their release in the atmosphere, their deposition & impact on health of plants & animals including human beings. Airborne infections & the resulting diseases threaten the lives & productivity of plants. Airborne diseases still pose a challenge to mankind.

The role of fungi in causing diseases to crop plants, man, domestic animal, in bringing deterioration of food grains in storage, valuable monuments has been subject of great interest for long time. Standing vegetation has a great influence of Aerospora of any place and it changes with changes in weather. Aerobiological survey conducted in various part of India revealed richness of Aerospora.

Sunflower (*Helianthus annus* L.) is one of the most important oil seed crops being grown all over the world. It is mainly grown for its oil, which is generally for culinary purposes in preparation of vanaspati and in manufacture of soaps and cosmetics .The sunflower oil is chemically a tri-glyceride. It contains 68% linolic acid, so it is especially recommended for patients having heart troubles. Sunflower seed cake or meal is a protein reach feed and is used as a concentrate for cattle, animals like pig, sheep, goat and poultry feed. Sunflower is native of North America. In Germany and Russia it is grown on large scale. Now a day's sunflower crop cultivation has become more popular among the farmers of Marathwada region. As considering survey of this crop that since last few years sunflower is subjected to various type of fungal diseases which may be soil borne, seed borne, airborne etc. The aim of present study was to find out the atmospheric concentration of Hyphal fragments and Insect parts and its correlation with meteorological parameters. It was with the aim to find out the important airborne pathogens, their distribution and seasonal variation in the concentration these investigation were undertaken, the prediction of airborne fungal disease could be attempted. If well in advance information of airspora of this crop is made timely available. In view of the above fact using by continuous Volumetric Tilak Air Sampler carried out an aero mycological survey over sunflower field for two Kharif season.

MATERAIL AND METHODS

In the present investigation and exploration of airborne Insect parts and Hyphal fragments (Tilak and Kulkarni 1970) was undertaken over the fields of sunflower field for two Kharif season. Tilak Air Sampler was installed at a constant height of 1.5 meters above the ground level at Kada Tal Ashti Dist Beed (M.S.) for two Kharif season i.e5thJuly to 30th September 2016 for first Kharif season and from 1st July 30thSeptember 2017 for second Kharif season . The air was sampled at the rate of 5litres/minutes which left traces of deposition over cellophane tape, affixed on the outer surface of drum. The slides were prepared every offer eight days. Before the scanning, the slides were marked with a ball pen point pen in the six equal parts, each part, indicating the spore catch of two hours of sampling period. Area of 9600sq.micron of the total area of the trace obtained was scanned under 10X x 45X eye piece objective combination of binocular research microscope. The transformation of spore was done which was based on visual characteristics of spore such as size, shapes. The metrological data was recorded during period of investigation.

RESULT AND DISCUSSION:

Insect Parts: The present investigation encountered insect scales, insect wings, insect legs, parts, and sometimes complete insect and all these were placed under group insect parts. They occurred throughout the period of present investigation. They contributed 0.62% and 0.73% during two Kharif seasons.

The maximum monthly mean concentration (7550/^{m3} and 966/m^3) was recorded in the month of September 2016 and 2017 during first and second Kharif season respectively. The maximum daily mean concentration (152/m^{3}and 410/m^3) was recorded on 25th September 2016 and 12th September 2017 during first and second Kharif season respectively.

Rees 1964 reported 034% insect scales at Brisbane. Tilak and Srinivasulu (1967) reported 1.05% insect scales from airspora of Aurangabad. Talde (1969) reported 0.76% from Parbhani. Kulkarni (1971) reported 3.35% insect scales at Aurangabad.Gaikwad (1974) reported 3.42% at Ahmedpur. Pande (1976) reported 1.40% at Nanded. Mane (1978) reported 2.51% from Vaijapur. Some of the others reports of Tilak and Bhalke (1978), Shastri (1981), Patil (1985). Ramakrishna Reddy (1987), Minhaj (1988), Meghraj (1989) and Kavishwar (1990) reported the incidence of the insect parts at different places. Shinde (1996), Thite (1998) and Pawar (1998), recorded these insect parts over different fields. Tuljapurkar (2000), Garje (20000, Mali (2002) and Banswadkar (2002) recorded these insect parts over different fields. Gopan (2004) and Pathare (2005) reported insect parts over sunflower fields.

Hyphal Fragments: Different types of hyphal fragments like short, long, coloured or dark hyaline were recorded throughout the period of investigation. The hyphal fragments were thick walled and broken. The hyphal fragments contributed 5.25% and 3.28% during first and second Kharif season respectively. The maximum monthly mean concentration (10201/m^3and2338 /m^3) was recorded in the month of September 2016 and August 2017 during first and second Kharif season respectively. The maximum daily mean concentration (461/$m^3$and 556/m^3) was recorded on 10th September 2016 and 24th September 2017 during first and second Kharif season respectively.

Newman (1948) reported hyphal fragments in the air over Pacific Ocean. Pady and Kapica (1955) reported them over Atlantic Ocean. Hamilton (1959) reported hyphal fragments in the air at England. Paddy and Kramer (1966) found that in June and September diurnal periodicity peaks were in the afternoon with minor peak at night, whereas in May, July and August, reverse seemed to be true. They further suggested the abundance of viable fungal filaments suggest that this may be an important mean of asexual reproduction. Tilak and Srinivasulu (1967) reported 3.22% hyphal fragments from the airspora of Aurangabad. Talde (1969) reported 12.2% from Parbhani. Kulkarni (1971) reported 5.14% at Aurangabad. Gaikwad (1974) reported 0.65% hyphal fragments at Ahmedpur, Pande (1976) reported 4.89% at Nanded. Mane (1978) reported 1.77% fungal hyphae from Vaijapur. Kulkarni (1979) reported its incidence at Kolhapur. Bhalke(1981) reported 3.42% over jowar fields,Shastri (1981) reported 8.62%,Patil(1983) reported 3.80%,Wankhede (1983)reported 0.52% over jowar fields. Some of the others reports of Minhaj (1988), Meghraj (1989) and Kavishwar (1990) reported the incidence of the hyphal fragments at different places. Kotwal(1992) Thite (1998) and Pawar (1998), recorded these hyphal fragments over different fields. Tuljapurkar (2000), Garje (2000), Mali (2002) and Banswadkar (2002) recorded these hyphal fragments over different fields. Gopan (2004) and Pathare (2005) reported hyphal fragments over sunflower fields.

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10.

Organic farming in India: Benefits and Challenges

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Abstract

Organic farming (OF) has developed as a reaction to negative effects of modern industrialized agriculture in the twentieth century. These effects, mostly caused by use of agrochemicals, are contamination of individual components of the environment, decrease in soil fertility, decrease in plant vitality and immunity, decrease in biodiversity, and lowered quality of food with negative effect on human health.There is a developing significance on health benefits as people are getting cognizant about the food themselves their relatives and family members. Thus, there is a degree for organic farming developed products. Prior people used to expend quality local vegetables, heartbeats and organic products. This brought about a life span and solid way of life. This paper provides an overview of organic farming benefits and challenges and its present scenario in India.

Keywords: Organic farming, Organic products, Soil health, Climate Change, Biomass, Biodiversity.

Introduction

Agricultural development policy for developing countries needs to focus on increasing the productivity of the land under cultivation, with lower costs, higher efficiency of products with little or no damage to both humans and the environment. Nedumaran, et al (2020) Organic farming systems have attracted increasing attention over the last one decade because they are perceived to offer some solutions to the problems currently besetting the agricultural sector. Organic farming has the potential to provide benefits in terms of environmental protection, conservation of non-renewable resources and improved food quality. Charyulu, and Dwivedi, (2016) Organic farming is a societal need; it is not only from the consumer"s perspective but also from a farmer point of view. For the transformation of rural agriculture into a well sustainable agriculture, organic farming might become a panacea which can build a plinth for sustainable agriculture and reimburse conversion cost and maintain the sustainability of soil. Yadava, (2019) India is home to 30 percent of the total organic producers in the world, but accounts for just 2.59 percent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares, according to the World of Organic Agriculture 2018 report. Pandey and Sengupta (2018) (A majorityof thefarming communityis resource poor and purchasing fertilizers and chemicals in adequate quantities is beyond their capacity, thus encouraging organic farming. Moreover, Organic farming is favourable for small and scattered agriculture land holders. Singh, (2019)

Review of Literature

According to Mendon et al, (2020) the farming of organic products is a unique practice which balances the environmental sustainability and also controls the detrimental effect both on customer’s safety by creating a positive notion in the minds of the customers. Varkey, (2020) contends that countries, developing as well as developed are emphasising environment sustainability of agricultural production, methods and practices. The traditional wisdom of farmers on indigenous agrarian practices increasingly being called into question owing to a host of factors.

The work of Magnaye,(2018) examines the relationship between smallholder organic farming and entrepreneurship taking into account the environmental conservation approach of organic farming and the economic enhancement features of entrepreneurship. Furthermore, it intends to determine, through qualitative analysis using case studies, how smallholder organic farming can be planned, and the competencies needed by an organic farmer when venturing into an organic farm enterprise. On the other hand, Giovannucci, (2007) assert that generally speaking, find that there is significant evidence that organic methods could be favourablefor small farmers. In fact, most of the cases clearly noted a number of direct benefits and related externalities from which it is reasonable to conclude that the promotion of organic agriculture methods among small and resource-poor farmers can be well warranted. Yadav, et al, (2013) add that in thepost-independence period, the most important challenge in India has been to produce enough food for the growing population. Hence, high-yielding varieties are being used with infusion of irrigation water, fertilizers.

Objective

To study the importance of organic farming in this era.

To study the benefits and challenges of organic farming.

Organic farming

The term "organic farming" was coined by Lord Northbound in 1940. The beginnings of the organic movement can be traced back to the beginning of the 1800s. In 1840 Justus Von Liebig developed a theory of mineral plant nutrition. Liebig believed that manure could be directly substituted by certain mineral salts. Filipovich, (2020)

Organic Farming in India

Ever increasing population as opposed to an ever-decreasing supply of living resources like food and water has made it necessary to increase agricultural production and stabilize it in a viable and feasible manner. The benefits of ‘Green Revolution’ credited to Dr. MS Swaminathan have now reached a plateau and with diminishing returns it has become necessary to devise alternate techniques. In addition, the excess use of fertilizers and artificial growth regulators has led to an issue called ‘pollution’. The need of the hour is a natural balance between life and property for existence. Keeping in view the fact that fossil fuels are on their way of extinction and are non-renewable, organic, nature friendly ways of farming and agriculture has gained importance. (https://www.farmingindia.in/organic-farming/)

India producedaround 2.75 million MT (2019-20) of certified organic products which includes all varieties of food products namely Oil Seeds, Sugar cane, Cereals & Millets, Cotton, Pulses, Aromatic & Medicinal Plants, Tea, Coffee, Fruits, Spices, Dry Fruits, Vegetables, Processed foods etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. Among

different states Madhya Pradesh is the largest producer followed by Maharashtra, Karnataka, Uttar Pradesh and Rajasthan. In terms of commodities Oil seeds are the single largest category followed by Sugar crops, Cereals and Millets, Tea & Coffee, Fiber crops, fodder, Pulses, Medicinal/ Herbal and Aromatic plants and Spices & Condiments. The total volume of export during 2019-20 was 6.389 lakh MT. The organic food export realization was around INR 4,686 crore (689 million USD). Organic products are exported to USA, European Union, Canada, Switzerland, Australia, Japan, Israel, UAE, New Zealand, Vietnam etc.In terms of export value realization Processed foods including soya meal(45.87%) lead among the products followed by Oilseeds (13.25%), Plantation crop products such as Tea and Coffee(9.61%), Cereals and millets (8.19%), Spices and condiments (5.20%), Dry fruits(4.98%, Sugar(3.91), Medicinal plants(3.84%) and others.
(http://apeda.gov.in/apedawebsite/organic/Organic_Products.htm)

Types of Organic Farming

Pure organic farming

It involves the use of organic manures and biopesticides with complete avoidance of inorganic chemicals and pesticides (Kankam, et al ,2020)

Integrated Organic Farming Systems

Pure organic farmers don’t want to use much or any technology in their work.This isdifferent from integrated organic farming systems, which use all technology they can get to make their life easier and to make more food. But they still don’t include some big amounts of chemicals or pesticides or something like that. Still inside organicrules.(https://farmingbase.com/organic-farming-types-importances-advantages-and-benefits/)

Integrated organic farming

Integrated organic farming involves integrating techniques aimed at achieving ecological requirements and economic demands such as integrated pest management and nutrients management. (https://byjus.com/biology/agriculture-and-organic-farming)

Government Initiatives to Promote Organic Farming

Paramparagat Krishi Vikas Yojana (PKVY)

Paramparagat Krishi Vikas Yojana promotes cluster based organic farming with PGS (Participatory Guarantee System) certification. Cluster formation, training, certification and marketing are supported under the scheme. Assistance of Rs. 50,000 per ha /3 years is provided out of which 62 percent (Rs. 31,000) is given as incentive to a farmer towards organic inputs. (https://agriculturepost.com/5-govt-schemes-promoting-organic-farming-in-india/#:~:text=The Government of India provides, the country though different)

Rashtriya Krishi Vikas Yojna

Assistance for promotion of organic farming on different components are also available under Rashtriya Krishi Vikas Yojana (RKVY) with the approval of State Level Sanctioning Committee.(http://www.indianbotanists.com/2014/02/avail-benefits-from-government-schemes.html)

One District - One Product (ODOP)

The programme aims to encourage more visibility and sale of indigenous and specialized products/crafts of Uttar Pradesh, generating employment at the district level. The presence of aggregators is imperative to bring about economies of scale for the small and marginal farmers. (Drishti IAS,2020)

National Mission on Oilseeds and Oil Palm (NMOOP Financial assistance@ 50% subsidy to the tune of Rs. 300/- per ha isbeing provided for different components including bio-fertilizers, supply of Rhizobium culture/Phosphate Solubilising Bacteria (PSB)/Zinc Solubilising Bacteria (ZSB)/ Azotobacter/ Mycorrhiza and vermicompost. (https://pib.gov.in/Pressreleaseshare.aspx?PRID=1656146)

The Organic Farming Action Programme 2017-2020

The objective of the Organic Farming Action Programme is to promote and significantly develop organic farming by means of priority measures

● As a particularly high number of organic farms are active in Unique areas, they also obtain a quarter of the compensatory allowance for less-favoured areas.

● Bonus for organic production, the so-called ‘Biobonus’ (higher subsidy, better assessment in the selection process) in connection with aids granted for investments, processing and marketing, education, information, and sales.

A holistic philosophy and a farming cycle as complete as possible, with a diverse structure, are the principles and prerequisites of successful organic farming. The natural resources of soil and water are used in an environmentally compatible manner and are preserved for future generations (http://www.organicfarmbest.com/organic-farm/)

Challenges in Organic Farming

Shortage of Biomass

Many experts and well-informed farmers are not sure whether all the nutrients with the required quantities can be made available by the organic materials. Even if this problem can be surmounted, they are of the view that the available organic matter is not simply enough to meet the requirements.(https://www.yourarticlelibrary.com/essay/major-problems-and-constraints-for-organic-farming-in-india/25013)

Disparity of Supply and Demand

Non-perishable grains can be grown anywhere and transported to any location but this is not the case with fruits and vegetables. It should be produced locally for which there should be willing companies, aggregators and farmers around that particular area from where the demand is coming. But generally, the demand comes from metros where there are no farmlands to produce organic fruits and vegetables. Smart transport and dedicated channels of supply are the solutions to this disparity. (https://www.bizencyclopedia.com/article/major-challenges-in-organic-farming-in-india)

Time

Indeed, organic farming requires greater interaction between a farmer and his crop for observation, timely intervention and weed control for instance. It is inherently more labour intensive than chemical/mechanical agriculture so that, naturally, a single farmer can produce more crops using industrial methods than he or she could by solely organic methods (https://small-farm-permaculture-and-sustainable living.com/

High MRP

It is almost obvious that due to the extreme care taken to go along with organic farming, the results would be kept at a high price. Once sold to the market, most of the place is devoted to the sale of these organic fruits and vegetables. Most people do that to approve of organic products because of this. The items sold in the market are half the price of non-organic products. So, we can say that organic items are expensive and not every consumer is willing to pay the price for it.(http://www.akmindia.in/organic-farming-pros-cons/)

Lack of special infrastructure

Most large organic farms still operate in an industrialized agriculture style, including industrial transportation of the food from field to plate. Unfortunately, this involves the adoption of the same environmentally harmful practices as those of factory farms which are however hidden under the cover of being organic.(https://greentumble.com/pros-and-cons-of-organic-farming/)

Benefits of organic farming

Better Taste and More Nutrition

Fruits and vegetables thatare organicallyraised have a much better taste than other mechanically farmed ones. This is due to the fact that they are given a much longer time to develop and are not pumped withartificial things. The sugar structures in these crops have more time to mature and develop into a tasty and nutritious product.(https://www.b2bio.bio/en/noticias-productos-ecologicos/advantages-and-disadvantages-of-organic-farming)

Reduces pesticide and chemical residue in soil

Organic farming minimizes the use of pesticides and chemicals thereby reducing the major environmental issues. It ensures the health of soil, water, air and flora and fauna. Also reduces the major environmental issues like soil erosion, air pollution, water pollution etc.

Promotion of Biodiversity Crop rotation to build soil fertility and raising animals naturally helps promote biodiversity, which promotes greater health across all living species. As organic farms provide safe havens to wildlife, local ecosystems also improve. (https://precisionagricultu.re/8-benefits-of-organic-farming/)

Consumes Less Energy

Organic farming does not rely on the use of synthetic fertilizers as opposed to conventional techniques that are generous with these external chemicals. Avoiding fertilizers contributes to a greater cause of energy conservation. This is because manufacturing synthetic fertilizers consumes a significant amount of energy. On average, it's safe to say that the energy usage is lower by at least 30-50% in the organic farming systems. The British Department for Environment, Food and Rural Affairs in one of their reportsEuropean Journal of Molecular & Clinical Medicine ISSN 2515-8260 Volume 7, Issue 11, 2020 3027 suggested that organic crops and organic dairying use 35% and 74% less energy respectively than their conventionally grown counterparts.(https://suminterindiaorganics.com/here-are-the-5-key-environmental-benefits-of-organic-farming/)

Long-term sustainability

Organic farming is a long-term, sustainable approach to food production. Organic farming takes a proactive, preventative approach instead of dealing with problems after they emerge which can be too late.(https://www.econation.co.nz/organic-food/)

Reduced erosion and better water management Both soil improvement and the concept of keeping the ground "covered" as much as possible, either by mulches or cover crops, reduces soil erosion. Soils with improved structure and higher content of organic matter and the more compact growth of an organic crop also reduces the water consumption in agriculture.(http://grolink.se/resources/oa/benefits-of-organic-farming/)

Familiarity with the techniques Organic farming is like going back to the roots before mechanization hit the lands. Thus, the farmers can easily understand and adapt to the techniques of organic farming that deploys traditional knowledge. The farming techniques are based on how well a farmer can make the best use of his immediate natural resources.(https://www.24mantra.com/blogs/organic-lifestyle/what-if-india-goes-fully-organic-how-will-this-benefit-the-farmers/)

Conclusion

The phenomenon of 'Organic agriculture' is the only solution to nurture the land and to regenerate the soil by going back to our traditional method of farming i.e., free from chemicals, pesticides and fertilizers. This is a possible step for sustainable development by choosing not to use chemicals, synthetic materials, pesticides and growth hormones to produce high nutritional quality food and in adequate quantities (Onkar and Suryawanshi,2019) Organic farming is an option agricultural system which quickly changes farming rehearsals. It depends on composts of natural starting points, for example, fertilizer excrement, green excrement, and bone feast and so forth substantially more than deciding not to utilize pesticides, fertilizers.

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11.

Mutation breeding tool for crop improvement

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Abstract:

Plant mutagenesis is rapidly coming of age in the aftermath of recent developments in high-resolution molecular and biochemical techniques. By combining the high variation of mutagenesis populations with novel screening methods, traits that are almost impossible to identify by conventional breeding are now being developed and characterized at the molecular level. In this review paper a comprehensive overview of the various techniques and workflows available to researchers today in the field of molecular breeding.

Keywords: Mutation breeding, mutagens, applications, achievements.

Introduction:

Van Harten (1998) reviewed the history of mutation breeding. An ancient book “Lulan” says that spontaneous mutants were found in China 300 BC in cereal crops. Thereafter a number of workers reported spontaneous variation in plants from 1590 to 1968. Later, the discovery of X- rays by Rontgen in 1895 led to the application of X-rays for inducing mutations in fruit fly (*Drosophila melanogaster*) by Muller (1927) and in barley by Stadler (1928) which initiated the field ‘induced mutagenesis’. This technique later became the most important tool in locating genes on chromosomes, studying gene structure, expression and regulation and for exploring genomes.

The main objective of mutation breeding is to increase food production and provide sustainable nutrition (Goyal *et al*., 2009). Food security has been variously defined in economic jargon, but the most widely accepted definition is the one by the World Bank “access by all people at all times to enough food for an active, healthy life”. Likewise, the World Food Summit at Rome in 1996 also known as Rome Declaration on World Food Security [FAO] on food plan action observed that, "Food security at the individual, household, national and global level exists where all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’’. The mutant varieties have been grown on large scale by farmers in their fields, and increase in food production resulted from cultivation of the mutant varieties could be translated into increased food security, since this would be accessible for the people in need.

The utilization of induced mutation in crop improvement is called mutation breeding. In mutation breeding, desirable mutations are induced in crop plants with the use of physical or chemical mutagens (Raina *et al.*, 2017). The variability generated through induced mutations are either released as new variety or used as the parent for subsequent hybridization programmes. Mutation breeding programme should be clearly planned and should be large enough with sufficient facilities to screen large population (Raina *et* *al.,* 2016). Plant breeders and farmers are under pressure to sustain food production under the climatic changes. The food prices are continuously increasing up worldwide in both developed and developing countries. There is no short way to solve the world food problem. Thus, there is a need to identify the cost effective method to sustain food production.

Conventional breeding in combination with other techniques such as mutagenesis, biotechnology, genetic engineering or molecular breeding utilize local genetic resources for developing new cultivars that could handle frequent climatic changes (Amin *et al*., 2016). Mutation breeding is known to induce genetic variability in the crops that show higher yield and wider adaptability (Khursheed *et al.,* 2016).

Mutation breeding technique has played a major role in generation of climate smart varieties. These crop varieties have been shown to withstand wide range of environmental fluctuation. Globally millions of hectares of cultivated land have been devoted for the cultivation of this mutant crop varieties and intern billons of revenue have been generated (Jain, 2010).

Types of mutations

Hugo de Vries in 1900 used the term 'mutation' to describe phenotypic charges which were heritable. However, the term 'mutation' is now used in a rather strict sense to cover only those changes which alter the chemical structure of a gene at molecular level. These are commonly called gene mutations or point mutations. Structural changes in the chromosomes viz.,deletions, duplication, inversions and translocations also bring about phenotypic changes in plants and animals. These are called chromosomal mutations.

Mutations are classified into two groups depending upon the magnitude of phenotypic effect produced by them (Gaul 1964) (i) **Macro mutations**: These produce a large recognizable phenotype effect on individual plants. These are oligogenic in nature and can be easily selected in the M_2 generation (ii) **Micro mutations**: These produce a small phenotypic effect that can be identified only on the basis of a population. These are polygenic in nature and selection for such mutations can be delayed till M_3 or later generations.

The agents available for induction of mutations i.e. mutagens can be categorized into following two classes: a) Physical: X-rays, Gamma rays, UV radiations, β-particles, Neutrons and Particles from accelerations. b) Chemical: Base analogues, Antibiotics, Alkylating agents, Acridines, Azides, Hydroxylamine and Nitrous acid

Table :1. Commonly used physical mutagens

Mutagen	Source	Characteristics	Hazard
X-rays	X-ray machine	Electromagnetic radiation; penetrates tissues from a few millimeters to many centimeters	Dangerous, penetrating
Gamma rays	Radioisotopes and nuclear reaction	Electromagnetic radiation produced by radioisotopes and nuclear reactors; very penetrating into tissues; sources are ^{60}Co (Cobalt-60) and ^{137}Cs (Caesium-137)	Dangerous, very penetrating
Neutrons	Nuclear reactors or accelerators	There are different types (fast, slow, thermal); produced in nuclear reactors;	Very hazardous

		uncharged particles; penetrate tissues to many centimeters; source is ^{235}U	
Beta particles	Radioactive isotopes or accelerators	Produced in particle accelerators or from radioisotopes; are electrons; ionize; shallowly penetrating; sources include ^{32}P and ^{14}C	May be dangerous
Alpha particles	Radioisotopes	Derived from radioisotopes; a helium nucleus capable of heavy ionization; very shallowly penetrating	Very dangerous
Protons	Nuclear reactors or accelerators	Produced in nuclear reactors and accelerators; derived from hydrogen nucleus; penetrate tissues up to several centimeters	Very dangerous
Ion beam	Particle accelerators	Produced positively charged ions are accelerated at a high speed (around 20%–80% of the speed of light) deposit high energy on a target	Dangerous

Table :2. commonly used chemical mutagens

Mutagen group	Example	Mode of action
Alkylating agents	1-methyl-1-nitrosourea (MNU); 1-ethyl-1-nitrosourea (ENU); methyl methane sulphonate (MMS); ethyl methane sulphonate (EMS); dimethyl sulphate (DMS); diethyl sulphate (DES); 1-methyl-2-nitro-1-nitrosoguanidine (MNNG); 1-ethyl-2-nitro-1-nitrosoguanidine (ENNG); N,N-dimethylnitrous amide (NDMA); N,N-diethylnitrous amide (NDEA)	React with bases and add methyl or ethyl groups and, depending on the affected atom, the alkylated base may then degrade to yield an abasic site, which is mutagenic and recombinogenic, or mispair to result in mutations upon DNA replication.
Azide	Sodium azide	Same as alkylating agents.
Hydroxylamine	Hydroxylamine	Same as alkylating agents.
Hydroxylamine	Hydroxylamine	Same as alkylating agents.
Antibiotics	Actinomycin D; mitomycin C; azaserine; streptonigrin	Chromosomal aberrations also reported to cause cytoplasmic male sterility.
Nitrous acid	Nitrous acid	Acts through deamination, the replacement of cytosine by uracil, which can pair with adenine and

		thus through subsequent cycles of replication lead to transitions.
Acridines	Acridine orange	Intercalate between DNA bases thereby causing a distortion of the DNA double helix and the DNA polymerase in turn recognizes this stretch as an additional base and inserts an extra base opposite this stretched (intercalated) molecule. This results in frame shifts, i.e. an alteration of the reading frame.
Base analogues	5-bromouracil (5-BU); maleic hydrazide; 5-bromodeoxyuridine; 2-aminopurine (2AP)	Incorporate into DNA in place of the normal bases during DNA replication thereby causing transitions (purine to purine or pyrimidine to pyrimidine); and tautomerization (existing in two forms which interconvert into each other, e.g. guanine can exist in keto or enol forms).

Discussion

The concept of induced mutation for the improvement of crop forerun to the beginning of 20th century. During the past 89 years, for the crop improvement mutation breeding plays a crucial role and also support the pace made using traditional methods of plant breeding (Amin *et al.*, 2015). Due to emergence of induced mutation which plays a vital role in the development of crop varieties with desirable features all over the world, cultivation of different crop varieties has continued to be successful over the past five decades. Due to extensive use of induced mutants in the plant breeding programs across all over the world has led to official release of 3,362 mutant plant varieties from 240 different plant species in more than 75 countries throughout the world (FAO/IAEA, 2020).

Varieties developed by mutation breeding increase the biodiversity due to presence of variation among them which serves as a baseline for conventional plant breeding and directly contribute toward the conservation and use of plant genetic resources.

To induce genetic variability in various crops different mutagens have been used by various breeders. Since the discovery of mutation effect of X-rays in the 1920s Lewis John Stadler has recognized induction of mutation as a potential technique for crop improvement (Shu *et al.*, 2012). The first disease resistant mutant was reported in barley in 1942 (Usharani & Ananda Kumar, 2015). This finding leads to further work on mutagenesis and helps to develop and release different mutant of several crops.

Chemical mutagens have been successfully employed in mutation breeding programs to artificially generate variations for the development of new varieties with improved traits, such as an increased yield, reduced plant height and resistance to disease (Khursheed, *et al*., 2015, Tantray *et al*., 2017). Chemical mutagens primarily induce single point mutation so, it has been most commonly used in reverse genetic studies, and current technologies can also be easily adapted for their discovery (Jankowicz-Cieslak & Till, 2016).

After fast neutron irradiation treatment germinability in three Nigerian sesame is improved (Falusi *et al.,* 2015). Similarly, Daudu *et al.,* (2012) found that yield of African long Pepper (*Capsicum annum var*. *accuminatum*) can be increased by fast neutron irradiation treatment. In case of lentil at lower concentration of methyl methanesulphonate, the genetic variability induced and 100 seed weight increases (Khursheed, 2014). During replication purines, especially guanine selectively alkylates by ethyl methane sulphonate causing a thymine base over a cytosine residue opposite to the 0-6-ethyl guanine, which results in random point mutation (Sikora *et al.,* 2011).

Table:3. Mutant varieties release across the various countries in world

Country	Registration date	Number of released varieties	Name of the major released crops
Albania	1996	1	Wheat
Algeria	1979	1	Soybean
Argentina	1962-1987	6	Wheat, Groundnut, Lemon, Peach, Orange
Australia	1967-2010	9	Barley, Oat, Lupin, Blue lupin, Soybean, Serradella
Austria	1959-1995	17	Barley, Durum, Apple, Faba bean
Bangladesh	1970-2018	75	Rice, Wheat, Black gram, Lentil, Mungbean, Onion, Rapeseed, Indian mustard, Chickpea, Tomato, Jute
Belgium	1967-1987	22	Barley, Potato, Red clover, Ficus, Chrysanthemum
Brazil	1974-2016	16	Wheat, Rice, Chrysanthemum, Sweet orange
Bulgaria	1972-2010	76	Maize, Wheat, Soybean, Barley, Lentil, Cotton, Green pepper, Sunflower, Peach, Pea, Tobacco
Burkina Faso	1978-1979	2	Rice
Canada	1964-2000	40	Barley, Oat, Common bean, Sweet cherry, Tobacco, Linseed, Apricot, Rose, Apple, Begonia, Rapeseed
Chile	1981-1990	2	Wheat, Barley
China	1957-2013	816	Rice, Wheat, Maize, Millet, Barley, Sorghum, Tomato, Cotton, Orange, Mandarin, Canna lilies, Chinese cabbage, Chinese garlic, Common bean, Sunflower, Pea, Dahlia, Sugarcane, Apple, Pear, Radish, Lotus, Peach, Mulberry, Tea, Foxtail millet.
Congo	1972	3	Maize, Soybean
Costa Rica	1975-1996	4	Rice, Common bean, Cowpea
Cote D'Ivoire	1976-1987	25	Rice
Cuba	1990-2015	21	Rice, Soybean, Sugarcane, Tomato, Hibiscus
Czech Republic	1965-1996	18	Barley, Apple, White mustard
Denmark	1977-1990	21	Barley
Egypt	1980-2011	9	Sesame, Common bean, Safflower, Chickpea
Estonia	1981-1995	5	Barley, Potato
Finland	1960-1981	11	Wheat, Barley, Rye, Oat
France	1970-1988	39	Rice, Barley, Durum, Dahlia, Apple, Black currant, Weigela, Forsythia, Carnation, Plum
Germany	1950-2005	171	Wheat, Rye, Soybean, Barley, Chrysanthemum, Carnation, Geranium, Rose, Faba bean, Spinach
Ghana	1997	1	Cassava
Greece	1969-1970	2	Barley, Durum
Guyana	1980-1983	26	Rice
Hungary	1969-2001	10	Rice, Wheat, Maize, Soybean, Chrysanthemum
India	1950-2019	341	Rice, Barley, Sorghum, Pearl millet, Paper flower, Rose, Chrysanthemum, Hibiscus, Okra, Bougainvillea, Castor bean, Cotton, Opium poppy, Groundnut, Chickpea, Mustard, Oriental mustard, Moth bean, Mulberry, Gladiolus, Coleus, Sunflower,
Indonesia	1982-2020	51	Rice, Wheat, Mung bean, Tobacco, Soybean, Cotton, Groundnut, Sorghum, Banana
Iran	2004-2008	4	Rice
Iraq	1992-1999	24	Rice, Wheat, Barley, Sesame, Faba bean, Tobacco, Soybean
Italy	1968-1995	35	Rice, Wheat, Durum, Olive, Sweet cherry, Potato, Pea, Eggplant Green pepper, Common bean, Vetch, Almond
Japan	1961-2009	479	Rice, Wheat, Barley, Buckwheat, Soybean, Strawberry, Wasabi, Chrysanthemum, Potato, Annual baby's-breath, Rose, Azuki bean, Begonia, Carnation
Jordan	2019	1	Barley
Kenya	1985-2001	3	Wheat, Cowpea
Korea	1970-2011	40	Rice, Barley, Soybean, Sesame, Chrysanthemum
Malaysia	1995-2015	16	Rice, Groundnut, Chrysanthemum, Orchid, Banana
Mali	1998-2000	15	Rice, Sorghum
Mauritius	2015-2019	7	Tomato, Oyster mushroom
Mexico	NA	5	Wheat, Soybean
Moldova	2007-2010	7	Soybean, Lentil, Grass pea, Faba bean
Mongolia	1984-2018	6	Wheat
Myanmar	1975-2005	8	Rice, Groundnut, Tossa jute
Netherlands	1954-1988	176	Barley, Carnation, Chrysanthemum, Dahlia, Onion, Apple, Begonia, Lily, Hyacinth, Gladiolus
Nigeria	1980-1988	3	Rice
Norway	1978-1988	2	Barley
Pakistan	1970-2017	59	Rice, Wheat, Cotton, Mustard, Rapeseed, Mung bean, Chickpea, Groundnut, Mandarin, Lentil, Sesame
Peru	1995-2006	3	Barley, Amarant
Philippines	1970-2019	20	Rice, Ti plant, Dracaena, Freycinetia, Murraya, Sansevieria, Schefflera, Ribbon dracaena
Poland	1977-1995	31	Barley, Pea, Yellow lupin, Blue lupin, Faba bean, Scarlet runner, Chrysanthemum, Gerbera
Portugal	1983	1	Rice
Romania	1992	1	Rice
Russian Federation	1965-2011	216	Rice, Wheat, Maize, Hybrid maize Barley, Spring barley, Sorghum, Millet Oat, Buckwheat, Cotton
Senegal	1968	2	Rice
Serbia	1974	1	Pepper
Slovakia	1964-1995	19	Maize, Barley, Soybean, Common bean, clover, Rose
Spain	2006-2010	3	Clementine
Sri Lanka	1971-2010	4	Rice, Groundnut, Sesame, Tomato
Sudan	2007-2018	2	Groundnut, Banana
Sweden	1950-1988	26	Barley, Rapeseed, White mustard, Pea
Switzerland	1985	1	Wheat
Syrian Arab Republic	1985	1	Wheat
Taiwan	1967-1973	2	Rice
Thailand	1977-2019	24	Rice, Mung bean, Soybean, Carnation, Portulaca/moss rose, Canna lilies, Chrysanthemum, Banana
Tunisia	2007	1	Common bean
Turkey	1994-2016	11	Barley, Soybean, Potato, Chickpea, Sesame, Tobacco
Uganda	2015	3	Wheat
Ukraine	1997-2017	14	Wheat, Barley
United Kingdom	1966-1990	34	Barley, Strreptocarpus
United States	1956-2006	139	Rice, Wheat, Barley, Oat, Common bean, Lettuce, Tobacco, Groundnut, Pepper mint, Rose, Carnation
Uzbekistan	1966-1991	9	Cotton
Viet Nam	1975-2017	58	Rice, Maize, Soybean, Groundnut, Chrysanthemum
Zambia	2009-2018	4	Finger millet, Cowpea
Zimbabwe	2017	1	Cowpea
Total		3362	

FAO/IEAE Mutant Variety Database, 2020.

Table:4. Number of mutant varieties developed by different mutagen treatments.

Mutagen treatment	Number of mutant varieties
Chemical	384
Physical	2610
Combined	37
Somaclonal variation	03
Total	3040

FAO/IEAE Mutant Variety Database, 2020.

Table : 5. Number of mutant varieties developed and their general improved characters.

General Improved Characters	Number of variety released
Agronomic and botanic traits	2981
Quality and nutritional traits	1173
Resistance to biotic stresses	557
Tolerance to a biotic stress	248
Yield and contributors	1029

FAO/IEAE Mutant Variety Database, 2020.

Table: 6. Number of officially released mutant varieties across the various continent.

Continents	Number of mutant varieties
Africa	82
Asia	2049
Australia and Pacific	10
Europe	959
Latin America	53
North America	209
Total	3362

FAO/IEAE Mutant Variety Database, 2020.

Mutation breeding has been used for improving both oligogenic as well as polygenic characters. It has been employed to improve morphological and physiological characters, disease resistance and quantitative characters including yielding ability. The various applications of mutation breeding may be briefly summarized as under.

Induction of desirable mutant alleles, which may not be present in the germplasm or which may be present, but may not be available to the breeder due to political or geographical reasons. To some extent, mutation breeding relieves the complete dependence of breeders on the natural germplasm. But it should be remembered that mutation breeding cannot minimize the necessity of germplasm collections; it only serves as a useful supplement to the available germplasm. It is useful in improving specific characteristics of a well adapted high Yielding variety. This is particularly so in the case clonal crops due to their highly heterozygous nature; in such a case, mutagenesis is the only method available to improve the specific characteristics of clones without changing their genetic makeup.

In self-pollinated species, mutagenesis is useful in improving the specific characteristics of otherwise adapted and superior varieties. However, in such species mutagenesis may not be simpler or quicker than the standard backcross procedure if the characteristic is available in a variety. This is more so because the desirable mutations are often associated with undesirable side effects due to other mutations, chromosomal aberrations, sterility, etc. As a result, one or few backcrosses with the parent variety may be necessary to bring the desirable mutant allele in
an acceptable genetic background.

Mutagenesis has been successfully used to improve various quantitative characters, including yie1d. Several varieties have been developed by this technique. However, there is no critical comparison available to show that the same improvement would not have been brought about by the conventional hybridization programmes. F1 hybrids from intervarietal crosses may be treated with mutagens in order to increase genetic variability by inducing mutations and by facilitating recombination among linked genes. But this method has not been widely used.

Limitations of mutation breeding

1. The frequency of desirable mutations is very low, about 0.1 per cent of the total mutations. Therefore, large M2 and subsequent populations have to be grown and carefully studied. This involves considerable time, labour and other resources.
2. Mutation breeding is more easily applied to such characters where quick screening techniques are available, e.g., disease resistance. But in the case of characters where elaborate tests are required, e.g., quality characteristics, mutation breeding is virtually impractical. For this reason, mutation breeding has been more successful with those characteristics where the mutant phenotype is distinct and easily detectable.
3. Desirable mutations are commonly associated with undesirable side effects due to other mutations, chromosomal aberrations.
4. Often mutations produce pleiotropic effects. The chief procedure for reducing or eliminating pleiotropic effects is to transfer the gene into different genetic backgrounds by hybridizing the mutant with a randomly selected range of elite varieties.
5. Mutations in quantitative traits are usually in the direction away from the selection history of the parent variety; this conclusion was reached by Brock in 1965 and is generally regarded as valid. This may tend to limit the degree of improvement attainable in a quantitative trait that has been the object of selection for a long period of time e.g, yield.

Conclusion

Variation is among the major factor without which we cannot imagine the improvement of crop in any aspect. Among various method of breeding in crop plant mutation breeding i.e. induced mutation is one of the preeminent methods of creation of variation/genetic variation. Conventional method of breeding takes long time to improve a crop variety due to a very slow increase in genetic variation. To overcome this induced mutation play a crucial role which helps in creation of genetic variation in a short period. Over last several years' mutation breeding is getting popular and is adopted by several countries. It improves several qualitative and quantitative characters of crop plant and is successfully applied in several cereal, grain legume, oil seed, vegetable, fruits, medicinal plant, ornamental plants and fodder crops. With the advancement of various plant breeding, genetics, and biotechnological tools mutation breeding contribute toward the increase in global food and agriculture production which ultimately overcome global hunger and improve the nutritional status of the globe.

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12.

Direct impact of pesticides use in Agriculture-Benefits and hazards

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Abstract

Pesticides are often considered a quick, easy, and inexpensive solution for controlling weeds and insect pests in urban landscapes. However, pesticide use comes at a significant cost. Pesticides have contaminated almost every part of our environment. Generation of base-line descriptive epidemiological data based on area profiles, development of intervention strategies designed to lower the incidence of acute poisoning and periodic surveillance studies on high-risk groups are needed. Our efforts should include investigations of outbreaks and accidental exposure to pesticides, correlation studies, cohort analyses, prospective studies and randomized trials of intervention procedures. Valuable information can be collected by monitoring the end product of human exposure in the form of residue levels in body fluids and tissues of the general population. The importance of education and training of workers as a major vehicle to ensure a safe use of pesticides is being increasingly recognized.

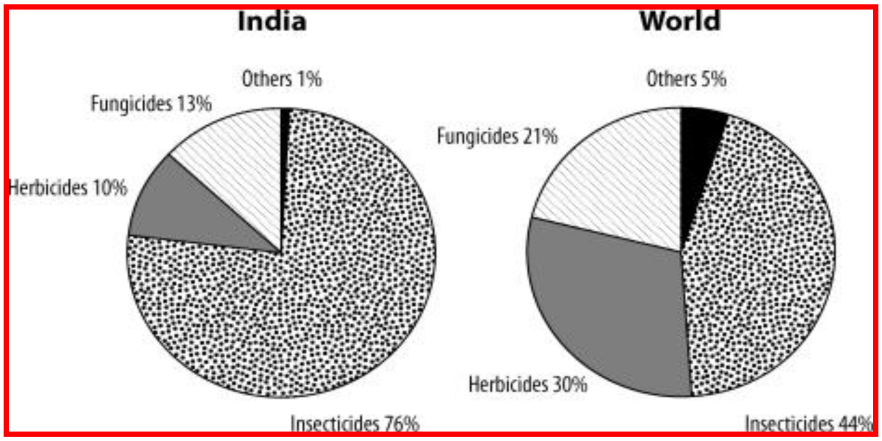
Introduction:

The term pesticide covers a wide range of compounds including insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and others. Among these, organochlorine (OC) insecticides, used successfully in controlling a number of diseases, such as malaria and typhus, were banned or restricted after the 1960s in most of the technologically advanced countries. The introduction of other synthetic insecticides – organophosphate (OP) insecticides in the 1960s, carbamates in 1970s and pyrethroids in 1980s and the introduction of herbicides and fungicides in the 1970s–1980s contributed greatly to pest control and agricultural output. Ideally a pesticide must be lethal to the targeted pests, but not to non-target species, including man. Unfortunately, this is not the case, so the controversy of use and abuse of pesticides has surfaced. The rampant use of these chemicals, under the adage, "if little is good, a lot more will be better" has played havoc with human and other life forms.

Production and usage of pesticides in India

The production of pesticides started in India in 1952 with the establishment of a plant for the production of BHC near Calcutta. India is now the second largest manufacturer of pesticides in Asia after China and ranks twelfth globally. There has been a steady growth in the production of technical grade pesticides in India, from 5,000 metric tons in 1958 to 102,240 metric tons in 1998. In 1996–97 the demand for pesticides in terms of value was estimated to be around Rs. 22 billion (USD 0.5 billion), which is about 2% of the total world market. The pattern of pesticide usage in India is different from that for the world in general. As can be seen in Figure 1, in India 76% of the pesticide used is insecticide, as against 44%

globally. The use of herbicides and fungicides is correspondingly less heavy. The main use of pesticides in India is for cotton crops followed by paddy and wheat.



Benefits of pesticides use in Agriculture:

Primary benefits are the consequences of the pesticides' effects the direct gains expected from their use. The three main effects result in 26 primary benefits ranging from protection of recreational turf to saved human lives. The secondary benefits are the less immediate or less obvious benefits that result from the primary benefits. It follows that for secondary benefits it is therefore more difficult to establish cause and effect, but nevertheless they can be powerful justifications for pesticide use. There are various secondary benefits identified, ranging from fitter people to conserved biodiversity.

Improving productivity:

Tremendous benefits have been derived from the use of pesticides in forestry, public health and the domestic sphere in agriculture, a sector upon which the Indian economy is largely dependent. Food grain production had increased almost fourfold to 198 million tons by the end of 1996–97 from an estimated 169 million hectares of permanently cropped land. This result has been achieved by the use of high-yield varieties of seeds, advanced irrigation technologies and agricultural chemicals. Increases in productivity have been due to several factors including use of fertilizer, better varieties and use of machinery. Pesticides have been an integral part of the process by reducing losses from the weeds, diseases and insect pests that can markedly reduce the amount of harvestable produce. In the environment most pesticides undergo photochemical transformation to produce metabolites which are relatively non-toxic to both human beings and the environment

Protection of crop losses/yield reduction:

In medium land, rice even under puddle conditions during the critical period warranted an effective and economic weed control practice to prevent reduction in rice yield due to weeds that ranged from 28 to 48%, based on comparisons that included control (weedy) plots. Weeds reduce yield of dry land crops by 37–79%. Severe infestation of weeds, particularly in the early stage of crop establishment, ultimately accounts for a yield reduction of 40%. Herbicides provided both an economic and labour benefit.

Vector disease control:

Vector-borne diseases are most effectively tackled by killing the vectors. Insecticides are often the only practical way to control the insects that spread deadly diseases such as malaria, resulting in an estimated 5000 deaths each day.

Quality of food:

Increasing evidence shows that eating fruit and vegetables regularly reduces the risk of many cancers, high blood pressure, heart disease, diabetes, stroke, and other chronic diseases.

Other areas – transport, sport complex, building:

The transport sector makes extensive use of pesticides, particularly herbicides. Herbicides and insecticides are used to maintain the turf on sports pitches, cricket grounds and golf courses. Insecticides protect buildings and other wooden structures from damage by termites and wood boring insects.

Hazards of pesticides use in Agriculture:

Direct impact on humans:

If the credits of pesticides include enhanced economic potential in terms of increased production of food and fibre, and amelioration of vector-borne diseases, then their debits have resulted in serious health implications to man and his environment. There is now overwhelming evidence that some of these chemicals do pose a potential risk to humans and other life forms and unwanted side effects to the environment. No segment of the population is completely protected against exposure to pesticides and the potentially serious health effects, though a disproportionate burden, is shouldered by the people of developing countries and by high risk groups in each country. The world-wide deaths and chronic diseases due to pesticide poisoning number about 1 million per year. The high risk groups exposed to pesticides include production workers, formulators, sprayers, mixers, loaders and agricultural farm workers. During manufacture and formulation, the possibility of hazards may be higher because the processes involved are not risk free. In industrial settings, workers are at increased risk since they handle various toxic chemicals including pesticides, raw materials, toxic solvents and inert carriers.

Certain environmental chemicals, including pesticides termed as endocrine disruptors, are known to elicit their adverse effects by mimicking or antagonising natural hormones in the body and it has been postulated that their long-term, low-dose exposure is increasingly linked to human health effects such as immune suppression, hormone disruption, diminished intelligence, reproductive abnormalities and cancer.

A study on workers (N=356) in four units manufacturing HCH in India revealed neurological symptoms (21%) which were related to the intensity of exposure. The magnitude of the toxicity risk involved in the spraying of methomyl, a carbamate insecticide, in field conditions was assessed by the National Institute of Occupational Health (NIOH). Significant changes were noticed in the ECG, the serum LDH levels, and cholinesterase (ChE) activities in the spraymen, indicating cardiotoxic effects of methomyl. Data on reproductive toxicity were collected from 1,106 couples when the males were associated with the spraying of pesticides (OC, OP and carbamates) in cotton fields. A study in malaria spraymen was initiated to evaluate the effects of a short-term (16 week) exposure in workers (N=216) spraying HCH in field conditions.

Impact through food commodities:

For determining the extent of pesticide contamination in the food stuffs, programs entitled 'Monitoring of Pesticide Residues in Products of Plant Origin in the European Union' started to be established in the European Union since 1996. In 1996, seven pesticides (acephate, chlopyriphos, chlopyriphos-methyl, methamidophos, iprodione, procymidone and chlorothalonil) and two groups of pesticides (benomyl group and maneb group, i.e. dithiocarbamates) were analysed in apples, tomatoes, lettuce, strawberries and grapes. An average of about 9 700 samples has been analysed for each pesticide or pesticide group. For each pesticide or pesticide group, 5.2% of the samples were found to contain residues and 0.31% had residues higher than the respective MRL for that specific pesticide.

In India the first report of poisoning due to pesticides was from Kerala in 1958, where over 100 people died after consuming wheat flour contaminated with parathion**.** This prompted the Special Committee on Harmful Effects of Pesticides constituted by the ICAR to focus attention on the problem.

Impact on environment:

Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants. Insecticides are generally the most acutely toxic class of pesticides, but herbicides can also pose risks to non-target organisms.

Surface water contamination:

Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread. The results of a comprehensive set of studies done by the U.S. Geological Survey (USGS) on major river basins across the country in the early to mid- 90s yielded startling results. More than 90 percent of water and fish samples from all streams contained one, or more often, several pesticides. Pesticides were found in all samples from major rivers with mixed agricultural and urban land use influences and 99 percent of samples of urban streams. The USGS also found that concentrations of insecticides in urban streams commonly exceeded guidelines for protection of aquatic life. Twenty-three pesticides were detected in waterways in the Puget Sound Basin, including 17 herbicides. According to USGS, more pesticides were detected in urban streams than in agricultural streams.

Ground water contamination

Groundwater pollution due to pesticides is a worldwide problem. During one survey in India, 58% of drinking water samples drawn from various hand pumps and wells around Bhopal were contaminated with Organo Chlorine pesticides above the EPA standards. Once ground water is polluted with toxic chemicals, it may take many years for the contamination to dissipate or be cleaned up.

Effect on soil fertility (beneficial soil microorganisms):

Heavy treatment of soil with pesticides can cause populations of beneficial soil microorganisms to decline. According to the soil scientist Dr. Elaine Ingham, "If we lose both bacteria and fungi, then the soil degrades. Overuse of chemical fertilizers and pesticides have effects on the soil organisms that are similar to human overuse of antibiotics. Indiscriminate use of chemicals might work for a few years, but after awhile, there aren't enough beneficial soil organisms to hold onto the nutrients". Mycorrhizal fungi grow with the roots of many plants and aid in nutrient uptake. These fungi can also be damaged by herbicides in the soil.

Contamination of air, soil, and non-target vegetation:

Pesticide sprays can directly hit non-target vegetation, or can drift or volatilize from the treated area and contaminate air, soil, and non-target plants. Some pesticide drift occurs during every application, even from ground equipment. According to the USGS, pesticides have been detected in the atmosphere in all sampled areas of the USA. Herbicides are designed to kill plants, so it is not surprising that they can injure or kill desirable species if they are applied directly to such plants, or if they drift or volatilise onto them. Many ester-formulation herbicides have been shown to volatilise off treated plants with vapors sufficient to cause severe damage to other plants.

Conclusion:

The data on environmental-cum-health risk assessment studies may be regarded as an aid towards a better understanding of the problem. Data on the occurrence of pesticide-related illnesses among defined populations in developing countries are scanty. Generation of base-line descriptive epidemiological data based on area profiles, development of intervention strategies designed to lower the incidence of acute poisoning and periodic surveillance studies on high risk groups are needed. Our efforts should include investigations of outbreaks and accidental exposure to pesticides, correlation studies, cohort analyses, prospective studies and randomized trials of intervention procedures. Valuable information can be collected by monitoring the end product of human exposure in the form of residue levels in body fluids and tissues of the general population. The importance of education and training of workers as a major vehicle to ensure a safe use of pesticides is being increasingly recognized.

Because of the extensive benefits which man accrues from pesticides, these chemicals provide the best opportunity to those who juggle with the risk-benefit equations. The total cost-benefit picture from pesticide use differs appreciably between developed and developing countries. For developing countries it is imperative to use pesticides, as no one would prefer famine and communicable diseases like malaria. It may thus be expedient to accept a reasonable degree of risk. Our approach to the use of pesticides should be pragmatic. In other words, all activities concerning pesticides should be based on scientific judgement and not on commercial considerations. There are some inherent difficulties in fully evaluating the risks to human health due to pesticides. For example there is a large number of human variables such as age, sex, race, socio-economic status, diet, state of health, *etc.* – all of which affect human exposure to pesticides. But practically little is known about the effects of these variables. The long-term effects of low level exposure to one pesticide are greatly influenced by concomitant exposure to other pesticides as well as to pollutants present in air, water, food and drugs.

Pesticides are often considered a quick, easy, and inexpensive solution for controlling weeds and insect pests in urban landscapes. However, pesticide use comes at a significant cost. Pesticides have contaminated almost every part of our environment. Pesticide residues are found in soil and air, and in surface and ground water across the countries, and urban pesticide uses contribute to the problem. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms, to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment. In fact, weed killers can be especially problematic because they are used in relatively large volumes. The best way to reduce pesticide contamination (and the harm it causes) in our environment is for all of us to do our part to use safer, non-chemical pest control (including weed control) methods.

The exercise of analyzing the range and nature of benefits arising from pesticide use has been a mixture of delving, dreaming and distillation. There have been blind alleys, but also positive surprises. The general picture is as we suspected: there is publicity, ideological kudos and scientific opportunity associated with 'knocking' pesticides, while praising them brings accusations of vested interests. This is reflected in the imbalance in the number of published scientific papers, reports, newspaper articles and websites against and for pesticides. The colour coding for types of benefit, economic, social or environmental, reveals the fact that at community level, most of the benefits are social, with some compelling economic benefits. At national level, the benefits are principally economic, with some social benefits and one or two issues of environmental benefits. It is only at global level that the environmental benefits really come into play.

There is a need to convey the message that prevention of adverse health effects and promotion of health are profitable investments for employers and employees as a support to a sustainable development of economics. To sum up, based on our limited knowledge of direct and/or inferential information, the domain of pesticides illustrates a certain ambiguity in situations in which people are undergoing life-long exposure. There is thus every reason to develop health education packages based on knowledge, aptitude and practices and to disseminate them within the community in order to minimize human exposure to pesticides.

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13.

Use of Pesticides in Agriculture and their hazardous impact on Human health

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Abstract

Application of pesticide involves not only the active ingredient but also the whole formulation. Therefore, the environment and the human are exposed to both the active and inert ingredients. Although inert ingredients have no Pesticidal activity, facilitate application of the pesticides – they enhance the active compound penetration into the target organism as well as the toxic action. Hence, the inert ingredients raise the formulation toxicity even in non-target organisms. One example is the formulation of glyphosate, which is an active ingredient. It contributes a little to the total toxicity of the formulated product, particularly in the case of aquatic organisms, which are more sensitive to surface-active substances.

Keywords: Pesticides, Agriculture, human health , Environment etc.

Introduction:

Pesticides constitute any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. They can also serve as plant regulators, defoliants, or dessicants. Chemicals have long been used to control pests. Sumerians already employed sulfur compounds to control insects and mites 4500 years ago. Pyrethrum, a compound derived from the dried flowers of *Chrysanthemum cinerariaefolium*, has been applied as an insecticide for over 2000 years. Salt or sea water has been used to control weeds. Inorganic substances, such as sodium chlorate and sulfuric acid, or organic chemicals derived from natural sources were widely employed in pest control until the 1940s.

During World War II (1939-1945), the development of pesticides increased, because it was urgent to enhance food production and to find potential chemical warfare agents. Consequently, the1940s witnessed a marked growth in synthetic pesticides like DDT, aldrin, dieldrin, endrin, parathion, and 2,4-D. In the 1950s, the application of pesticides in agriculture was considered advantageous, and no concern about the potential risks of these chemicals to the environment and the human health existed. In 1962, Rachel Carson published the book "Silent Spring", in which she mentioned problems that could arise from the indiscriminate use of pesticides. This book inspired widespread concern about the impact of pesticides on the human health and the environment. In 1967, Ratcliffe noted increased incidence of raptor nests with broken eggs in the United Kingdom. This author showed that the sharp decline in eggshell thickness coincided with the beginning of the widespread use of DDT in agriculture (1945–1946). In the 1970s, pest resistance emerged which, combined with influence of the book "Silent Spring", and accumulated evidence on the effects of pesticides, culminated in banning of the use of DDT in the United States in 1972. Thereafter, other countries discontinued the use of DDT, as well.

The 1970s and 1980s saw the introduction of more selective pesticides. In the 1990s, research activities concentrated on finding new members of existing pesticides that were even more selective. Besides, pesticides with new chemical groups emerged. During this period, safer chemicals arose. In addition, Integrated Pest Management (IPM) systems, came into play – these systems used crop production methods that attracted predators or parasites that attacked pests and timed pesticide applications to coincide with the most susceptible period of the pest's life cycle, thereby reducing the amount of applied pesticides.However, IPM or related methods did not eliminate the need for pesticides. These chemicals ensure the production of adequate quantities of high quality pest-free crops, which is important for food supply, prevents human diseases transmitted by insect or rodent vectors, and positively impacts public health.

The best pesticide policies need to reconcile environmental concerns with economic realities – pest management is mandatory, and farmers must survive economically. A number of studies have described the problems that not using pesticides would cause. Without pesticides, food production would be lower, and larger cultivated farm areas would be necessary to produce the same amount of food, which would impact the wildlife habitat. More frequent cultivation of the fields would be increase soil loss due to erosion, too. Knutson et al. [7] have pictured the U.S. society without pesticides: agricultural production would decrease, food prices would rise, farmers would be less competitive in global markets, and U.S. exports would drop, leading to many job losses.

Despite their benefits, pesticides can be hazardous to both humans and the environment. Countless chemicals are environmentally stable, prone to bioaccumulation, and toxic. Because some pesticides can persist in the environment, they can remain there for years. Environmental contamination or occupational use can expose the general population to pesticides residues, including physical and biological degradation products present in the air, water, and food.

Less than 1% of the total amount of pesticides applied for weed and pest control reach the target pests. A large quantity of pesticides is lost via spray drift, off-target deposition, run-off, and photo degradation, for instance, which can have undesirable effects on some species, communities, or ecosystems as a whole, as well as on the humans. Another relevant factor is that low concentrations of many chemicals may not elicit acute detectable effects in organisms, but they may induce other damage, like genetic disorders and physiological alterations, which reduce life span in the long run.

There are various ways to group pesticides, including classification based on the pests they control. Some examples, insecticides combat insect growth or survival, herbicides act against plants, weeds, and grasses, rodenticides tight against rats and other rodents, avicides act against bird populations, fungicides attack fungi, and nematicides combat nematodes. The global pesticide market divided according to the type of pesticide is as follows: 42.48% herbicides, 25.57% insecticides, 24.19% fungicides, and 7.76% other types of pesticides.

Pesticides and human health

Many workers and residents, especially in the rural sector, are in contact with pesticides on a daily basis, so they are at high risk of poisoning by these compounds. This exposure can cause neuropsychiatric sequelae (mood disorders, depression, and anxiety), because many pesticides

Pharmacological antagonism - competes with pesticides for the target site
Physiological antagonism - reversal of a physiological effect of the pesticide
Changing distribution to tissues – e.g., competition with membrane pumps
Changing distribution to tissues – e.g., competition with membrane pumps
Modification of biochemical pathways - interferes with the biochemical response of the pesticide
Chelation of a pesticide to disable it
Treatment of pathological response to tissue injury caused by pesticides

underlie changes in the function (e.g., cholinergic crisis) of the central, peripheral, and autonomic nervous system, which are often followed by suicide attempts. In addition to being causative agents of neuropsychiatric disorders that might culminate in suicide, these effects may lead to the use of pesticides as a weapon.

According to data released by the World Health Organization (WHO), suicide by pesticides is common in many Asian and Latin American countries. Pesticides are often poorly controlled and widely available, particularly in countries of low and middle income. The first epidemiological reports of suicides involving pesticides appeared in the beginning of the 1990s. Currently, homicides and suicides involving pesticides have raised the concern of many organizations and governments as, depression and suicide clearly correlate with high exposure to pesticides. This concern has motivated and still motivates many studies into how and why exposure to pesticide occurs; researchers have also caught methods to solve this serious social problem.

Because hundreds of pesticides compositions exist, we will focus on the clinical profile and treatment of pesticides that cause major poisoning, in terms of quantity and severity of cases. In general, treatment aims to override the mechanism of action of the toxic pesticides, and many possibilities exist

An example of suicide attempt has been the case of a man aged 22 who tried to kill himself by drinking a solution of paraquat (50 mL). He underwent gastric lavage and received activated charcoal. Later, he was discharged. However, the treatment did not suffice – four days later, the man returned to the hospital with sore throat, dysphagia, retrosternal pain, hemoptysis, and blistering and ulceration of the mouth and tongue. Biochemical tests revealed elevated creatinine levels, leukocytosis, hyponatremia, and metabolic acidosis. Because the effect had become systemic, the patient had to undergo hemodialysis and immunosuppressive therapy (cyclophosphamide, methylprednisolone, and dexamethasone). The patient did not improve and presented hemoptysis. Examination of the thoracic region detected localized alveolar infiltrate, pulmonary opacities, pneumomediastinum, pneumothorax, and subcutaneous emphysema. The patient's condition worsened, and he -underwent the same immunosuppressive therapy again. The patient recovered gradually; he was discharged after four weeks. After four months, he was working again. His lungs did not return to perfect condition – the man still this place crackles in the lower lung fields, universally distributed wheezing and pleural friction in the right hemithorax, and dyspnea after physical exertion.

An example of homicide involving pesticides is the case of a 52-year-old entrepreneur that was killed by injections of poison in his abdomen, conducted by their business rivals. Soon after he was attacked, the man was taken to a private clinic to receive primary treatment, and later he was taken to a hospital, where hours later he was pronounced dead. The body was sent to the morgue for post-mortem examination. Necropsy revealed distended abdomen and two punctures by needles in this region; necrotic changes appeared in the tissue around these two holes. Analysis of the organs revealed congested and edematous brain and lungs, as well as congested stomach with hemorrhagic spots. The toxicological analysis report described the presence of organochlorine pesticides in the region of the piercings and all viscera. This suggested that the man died due to cerebral and pulmonary edema after organochlorine poisoning. On the basis of these results, health professionals administered high dose of Levophed (Hospira, Lake Forest, Illinois) and vasopressin to provide pressure support and continuous veno-venous hemofiltration. After 24 h, the patient's conditions improved. Treatment was discontinued, and renal and cerebral functions were fully recovered.

Finally, cases of poisoning due to occupational exposure exist. Some pesticides can cause topical damage when they come in contact with the skin, as in the case of two farm workers admitted to the hospital in great pain due to extensive chemical burns in the perineal and scrotal regions, caused by Ducatalon (a dipyridyl herbicide containing a mixture of diquat and paraquat). The men suffered burns due to a leak in the equipment they used to spray the herbicide. Lesions reduced upon topical treatment with silver sulfadiazine associated with systemic administration of antibiotics. Fortunately, in a few days, the damaged skin recovered without scars. After replacement of the faulty equipment, no more injuries occurred.

6. Pesticides and environmental health:

Pesticides reach the environment primarily during preparation and application. Application can take place via different techniques, depending on factors such as the formulation type, the controlled pest and, the application timing. In agriculture, it is possible to apply pesticides to the crop or to the soil. Liquids sprays are commonly used in crops; for example, boom sprayers, tunnel sprayers, or aerial application. Systemic pesticides can also be employed. As for soils, pesticides can be applied as granules, injected as a fumigant, or sprayed onto the soil surface, which is possibly followed by pesticide incorporation into the soil top layer. Seeds are sometimes treated with pesticides prior to planting.

Adsorption depends on the chemical and also on the soil type. The volatility of pesticides indicates their tendency to become a gas; the higher the volatility (high vapor pressure), the larger their loss to the atmosphere. Environmental conditions such as temperature and humidity impact volatility, which can occur from soil, plants, or surface water, and may continue for several days or weeks after pesticide application. In the atmosphere, the chemicals can be transported over long distances. Subsequent atmospheric deposition can contribute to surface water pollution. Finally, the degradation of pesticides that also determines the behavior and fate of these compounds in the environment. Degradation (their brake down into other chemical forms) can occur by photodecomposition, microorganisms, and a variety of chemical and physical reactions. Pesticides with low biodegradation are called persistent, they can remain in the environment for a long time.

Soil properties can also affect the movement of pesticides. In relation to the soil texture, coarse-textured sands and gravels have high infiltration capacities, and water tends to percolate through the soil and reach groundwater. Fine-textured soils such as clays generally have low infiltration capacities, so water tends to run off, reaching streams and lakes. Moreover, soil containing more clay in its composition bears larger surface area to adsorb pesticides. Regarding permeability, highly permeable soils allow water to more easily. This water may contain dissolved pesticides, which will reach groundwater. Texture influences soil permeability. Ultimately, soils with high organic matter content can absorb pesticides and retain water with dissolved chemicals. Moreover, these soils possess a larger population of microorganisms that can degrade the pesticides.

Once pesticides reach non-target organisms, they may undergo biotransformation via reactions like hydrolysis, oxidation, reduction, or conjugation catalyzed by liver enzymes. Biotransformation is an effort of the organism to detoxify and eliminate xenobiotics, but this process can also produce metabolites that are more toxic than their parent compound, a phenomenon called bioactivation. An example of bioactivation is the biotransformation of DDT, which is not highly toxic to birds, into DDE, which causes thinning of eggshells because it disrupts calcium metabolism.

In organisms, the absorption of a pesticide with high lipid solubility and low elimination rate can lead to bioaccumulation of this chemical in the fatty tissue, and the final concentration of the chemical in the organism will be higher than its concentration in the environment. When the bioaccumulated chemical passes from lower to higher trophic levels through the food chain, successively greater pesticide concentrations emerge in animals of higher trophic level. This phenomena is called biomagnification. The offspring of top predators can also become contaminated, mainly in the case of marine mammals, because they can consume milk with extremely high fat and pesticides content.

Conclusion:

Application of pesticide involves not only the active ingredient but also the whole formulation. Therefore, the environment and the human are exposed to both the active and inert ingredients. Although inert ingredients have no pesticidal activity, facilitate application of the pesticides – they enhance the active compound penetration into the target organism as well as the toxic action. Hence, the inert ingredients raise the formulation toxicity even in non-target organisms. One example is the formulation of glyphosate, which is an active ingredient. It contributes a little to the total toxicity of the formulated product, particularly in the case of aquatic organisms, which are more sensitive to surface-active substances.

The categorization of pesticides commonly relies on their persistence in the environment. Organochlorine pesticides are persistent, whereas organophosphates, carbamates, phenoxyacid derivatives, chloroacetanilides, pyrethroids, and others are non-persistent. Compared with persistent pesticides, non-persistent chemicals have much shorter environmental half-lives and do not tend to bioaccumulate. Nevertheless, because of the heavy agricultural use of these chemicals, exists concern about their presence in the environment.

Herbicides are often benign with regard to impacts on animals; however, these compounds can have toxic effects at concentrations found in the environment. Furthermore, indiscriminate use of this herbicide, careless handling, accidental spillage, or discharge of untreated effluents into natural water ways can harm the fish population and other aquatic organisms and may contribute to long-term effects in the environment. Atrazine, a triazine herbicide, is one of the most often detected pesticides in streams, rivers, ponds, reservoirs, and groundwater. Therefore, a huge amount and variety of pesticides exist in the environment. Many chemicals that exist at low concentrations may not cause acute detectable effects in organisms, but they may induce other kinds of damage, like genetic disorders and physiological alterations that, in the long run, reduce the organisms life span.

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14.

Efficacy of Medicinal Plants Leaf Extract on Seed-borne mycoflora, Seed Germination and Seedling Health of Brinjal

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ABSTRACT

Abstract: Brinjal seed samples collected from *Marathwada* region have been used for the detection of seedborne mycoflora. Nine seed-borne fungi have been identified *viz. Aspergillus flavus, Aspergillus niger, Alternaria alternata, Fusarium oxysporum, Fusarium solani, Rhizopus stolonifer, Penicillium digitatum, Curvularia lunata* and *Mucor* mucedo. These seed borne fungal pathogen affects the seed health quality, reduce germination, transmit diseases in the field and consequently hamper the yield of the crop. Ten different medicinal plant extracts *viz. Azadirachta indica* A. Juss, *Aegle marmelos* Corr., *Calotropis procera* L., *Catharanthus roseus* L., *Datura metel* L., *Moringa oleifera* Lam., *Murraya koenigii* L., *Polyalthia longifolia* Sonn., *Ocimum sanctum* L. and *Tridax procumbens* L. were selected and tested for seed treatment at 10.0 % concentration. Treatments with leaf extracts of all plants showed significantly increased percentage seed germination over control (63.3 % to 93.3 %). The germination failure significantly decreased with increased vigour index and seedling health. Seed treatments were also improve vigour index over the control. Maximum vigour index (503.82) was recorded with *Azadirachta indica* A. Juss extract.
***Key words* – Leaf extracts, seed-borne mycoflora, seedling health**

1.0 Introduction

Vegetables are an essential element of a healthy diet since they provide a variety of nutrients such as potassium, fibre, foliates, and vitamins A, B, and C. Because vegetables produce more per unit time than grains and other crops, they are a major source of agricultural revenue. Brinjal, also known as eggplant belonging to the family Solanaceae. Brinjal (*Solanum melongena*) is the most important and widely consumed vegetable crop in India. In the year 2021, the volume of brinjal production in India was estimated to be around 13.15 million metric tons. Over 750 thousand hectares of agricultural land in the country was used for the vegetable in the country in the year 2021.

The association of various fungi with vegetable seeds has been reported all over the world (Summiaya and Dawar, 2015). It has been documented that much of the vegetable seeds failed to germinate and rotted because it was attacked by various seed-borne fungi (Ismail *et al.*, 2012). Brinjal production is hampered by the early blight disease, leaf spots, anthracnose, leaf blights and root rot diseases which is particularly prevalent in subtropical and tropical areas.

Fungi, which are an important category of microorganisms, are also responsible for brinjal seed-borne illnesses, which result in a significant loss of output. Several seed-borne fungi, such as *Fusarium solani*, *Aspergillus flavus*, *Rhyzopus stolonifer*, and *Curvularia* spp., induce problems in brinjal seeds, including seed toxification, seed rotting, necrosis, and seed abortion (Neergard, 1977; Fakir and Khan, 1992).

It is crucial to know whether a seed lot contains propagules of diseases and is contaminated with a pathogenic organism because infected seeds may not germinate or may infect developing plants and seedlings. Healthy seed is therefore regarded as a crucial component of effective crop development. The current study's goal was to examine the impact of various seed mycoflora on brinjal cultivars' seed germination and seedling vigour. Seed pathologists are using several seed health detection tests to screen and remove contaminated seed lots before planting, owing to the economic relevance of seed-borne fungus and their influence on seed vigour (ISTA, 1976). Farmers are encountering financial difficulties as a result of significant crop losses caused by seed-borne mycoflora on their crops. Control of seed-borne infections via diverse ways is a crucial element in every agricultural crop production and protection programme. As a result, single or combined techniques of mechanical, physical, biological, and chemical treatments may be used to effectively manage seed-borne diseases.

During this investigation, ten medicinal plant leaf extracts were used for seed treatment and the results were found very promising with all treatments responsible to reduce seed mycoflora, seed germination failure and with enhanced seed germination, vigour index and seedling health. Kadam *et al.* (2008) studied the efficacy of leaf extract of *Azadirachta indica* against seed borne fungi of groundnut. Their results indicated that the longer duration of seed treatment with plant extract was effective in controlling the growth of all surface borne seed mycoflora. Telang (2010) worked on similar lines with Chilli seed mycoflora and found that the seed treated with leaf extracts of *Azadirachta indica*, leaf and root extracts of *Ocimum sanctum* and leaf extracts of *Murraya koenigii* showed reduced incidence of seed mycoflora and maximum seed germination. By considering these facts the present investigation was carried out to assess the effect of selected medicinal plant extracts on seed borne mycoflora, seed germination and seedling health of Brinjal.

2.0 Materials and Methods

The experiment was carried out at Aerobiology research center of Mahatma Gandhi Mahavidyalaya, Ahmedpur, Dist: Latur, Maharashtra. Randomly selected seed samples (250 gm each) were collected using method described by Neergaard (1973). The seeds were collected from local farmers and marketplaces of *Marathwada* region of Maharashtra state of India.

2.1 Treatment of medicinal plant extracts on tomato seeds:

Ten common plants namely *Azadirachta indica* A. Juss, *Aegle marmelos* Corr., *Calotropis procera* L., *Catharanthus roseus* L., *Datura metel* L., *Moringa oleifera* Lam., *Murraya koenigii* L., *Polyalthia longifolia* Sonn., *Ocimum sanctum* L. and *Tridax procumbens* L. were selected. The identification of plants was confirmed using the flora of Marathwada (Naik, 1998). These plants were surface sterilized with 0.1% $HgCl_2$ and washed repeatedly with sterile distilled water for three times. Vegetable seeds were treated by soaking the seeds in 10.0% concentration for 30 minutes with each of the plant extracts. Treated seeds were dried on blotter paper sheet in sun light for 30 minutes. The treated seeds were grown and incidence of fungi, rate of germination, vigour index and seedling health were studied by using blotter paper method as described by International Seed Testing Association (ISTA, 1966)

Table 1: Plants used for seed treatment

Sr. No.	Local Name	English Name	Scientific Name	Family
1	Neem	Indian lilac	*Azadirachta indica* A. Juss	Meliaceae
2	Bel	Indian quince	*Aegle marmelos* Corr.	Rutaceae
3	Ruchki	Rubber bush	*Calotropis procera* L.	Asclepiadaceae
4	Sadafuli	Periwinkle	*Catharanthus roseus* L.	Apocynaceae
5	Dhotara	Thorn apple	*Datura metel* L.	Solanaceae
6	Shevga	Drumstick	*Moringa oleifera* Lam.	Moringaceae
7	Kadhipatta	Curry leaves	*Murraya koenigii* L.	Rutaceae
8	Ashok	Mast tree	*Polyalthia longifolia* Sonn.	Annonaceae
9	Tulsi	Holy basil	*Ocimum sanctum* L.	Lamiaceae
10	Tantani	Coat buttons	*Tridax procumbens* L.	Asteraceae

Preparation of aqueous extracts:

Green leaf samples (100gm) were collected and washed very carefully with distilled water. Then plant parts were ground with conventional grinder called '*Mortar and pastel*' which is available and popular in every Indian farmer's house. Then grounded material were dipped in to 100 ml distilled water for 48 hours for complete extraction of the active ingredient from the extracted samples (Ahmed et al., 2013). After that the water and ground material were filtered with the help of muslin cloth. This extract filtered with the help of Whatman's grade filter paper no. 1. Then crude extracts were preserved in glass bottles and kept in refrigerator at 4 +/- 2^0C for further use.

2.2 Formulas used

For observations and results, following formulas were used:

$$\text{Percentage incidence of fungus} = \frac{\text{No. of seeds containing particular fungus}}{\text{Total Seeds}} \times 100$$

$$\text{Percentage incidence of seed mycoflora} = \frac{\text{No. of seed infected by fungi}}{\text{Total no. of Seeds}} \times 100$$

$$\text{Percentage germination} = \frac{\text{No. of seeds germinated}}{\text{Total no. of Seeds}} \times 100$$

$$\text{Vigour Index} = \text{Percentage germination} \times \text{Length of seedling}$$

2.3 Data Analysis

The experiment has been conducted in completely randomised design with three replications. All the observation data were compiled, tabulated and put to statistical computation for the presentation and interpretation of the results. Analysis of variance (ANOVA) was prepared for each study. Standard error between the means (SEm), critical difference (C.D.) and coefficient of variation (C.V.).

3.0 Experimental Results

3.1 Effect of plant extracts on incidence of seed borne mycoflora, seed germination and vigour index of Brinjal:

The effect of selected plant extract on seed germination and vigour index of Brinjal is presented in Table 2, Fig. 1 and Plate I. All medicinal plant extracts with 10.0% concentration were found to be effective in controlling seed mycoflora and enhancing the percentage of seed germination and vigour index significantly over the control. Incidence of seed mycoflora seems to be completely controlled by treatment of *Azadirachta indica* A. Juss. (0.0%) followed by *Murraya koenigii* L. (3.3%), *Aegle marmelos* Corr. (6.7%), *Ocimum sanctum* L. (10.0%) and *Polyalthia longifolia* Sonn. (10.0%). All plant extract treated seed were recorded minimum percentage of incidence of seedborne mycoflora compared to untreated (46.7%) seeds. Data also revealed that, with the application of seed treatment, incidence of mycoflora significantly decreased with improving the growth characteristics *viz.* seedling length, germination percentage and vigour index of Brinjal. The percentage seed germination ranged from 63.3% in control to 93.3% under the influence of *Azadirachta indica* A. Juss., as well as *Ocimum sanctum* L.

Treatment with leaf extracts of all plants were significantly increased percentage seed germination over control. Highest percentage of seed germination was recorded by seeds treated with extract of *Azadirachta indica* A. Juss. and *Ocimum sanctum* L. (93.3% each) followed by *Catharanthus roseus* L. and *Murraya koenigii* L. (90.0% each). Control seeds recorded 63.3% seed germination. The seedling length ranged from 3.8 to 5.4 cm. Highest length was recorded in (5.4 cm.) *Azadirachta indica* A. Juss extract treated seed followed by 5.3 cm. in *Aegle marmelos* Corr., *Moringa oleifera* Lam. and *Ocimum sanctum* L. treated seeds. The rest leaf extract showed intermediate seedling length.

Seed treatments were also improved vigour index over the control. Maximum vigour index (503.82) was recorded with *Azadirachta indica* A. Juss extract followed by *Ocimum sanctum* L. (485.16), *Aegle marmelos* Corr. (450.86). Seeds treated with *Calotropis procera* L., *Moringa oleifera* Lam. and *Catharanthus roseus* L. also gave statistically identical results (433.5, 433.16 and 432 respectively) for vigour index. Rest of plant extracts showed significant results in an increased vigour index over the control.

The seedling length was 3.8 cm. in control. It was increased within the range of 4.2 to 5.4 cm. The increase in seedling length was statistically significant at p=0.05. The vigour index also significantly increased under the influence of leaf extracts from 240.54 in control to within the range of 322.14 to 503.82 under the influence of leaf extracts of various plants. The results obtained clearly indicated that treatment with leaf extracts significantly improved seed germination, seed length and vigour index of along with significant decrease in percentage fungal incidence. Among all the leaf extracts tested the leaf extracts of *Azadirachta indica* A. Juss. and *Ocimum sanctum* L. were found to be most effective.

Table 2: Efficacy of plant extracts on seed borne mycoflora, seed germination and vigour index of Brinjal.

Sr. No.	Leaf Extract	Incidence of mycoflora (%)	Seed germination (%)	Seedling length (cm.)	Vigour index
1	Control	46.7	63.3	3.8	240.54
2	*Azadirachta indica* A. Juss.	0	93.3	5.4	503.82
3	*Aegle marmelos* Corr.	6.7	86.7	5.2	450.84
4	*Calotropis procera* L.	16.7	86.7	5	433.5
5	*Catharanthus roseus* L.	13.3	90	4.8	432
6	*Datura metel* L.	20	80	5.1	408
7	*Moringa oleifera* Lam.	13.3	83.3	5.2	433.16
8	*Murraya koenigii* L.	3.3	90	4.4	396
9	*Polyalthia longifolia* Sonn.	10	76.7	4.2	322.14
10	*Ocimum sanctum* L.	10	93.3	5.2	485.16
11	*Tridax procumbens* L.	13.3	86.7	4.4	381.48
	Mean	16.6636	84.5455	4.7909	407.8764
	SD	9.9626	8.3222	0.4907	70.7695
	CV	59.7864	9.8435	10.2432	17.3507
	SE	3.0038	2.5092	0.1480	21.3378
	CD 5%	6.6986	5.5956	0.3300	47.5833
	CD 1%	9.5222	7.9543	0.4690	67.6409

3.2) Effect of plant extracts on seed germination, seedling health and germination failure of Brinjal:

The effect of ten medicinal plant extracts on seed germination, seeding health and germination failure of Brinjal has been depicted in Table 3.0. and Fig. 1. All plant extract used for the study showed good antifungal activity with enhanced rate of seed germination and healthy seedling formation over the control. The percentage increase in seed germination ranged from 30.35 to 66.07%. The germination failure significantly decreased due to the treatment with leaf extracts. Highest seed germination of Brinjal was recorded with the application of aqueous *Azadirachta indica* A. Juss. and *Ocimum sanctum* L. (93.3% each), which was 66.07% higher over untreated seeds. Lowest seed germination recorded in control. With the application of *Murraya koenigii* L. leaf extract recoded 60.07% increase of seed germination over the control followed by *Aegle marmelos* Corr., *Calotropis procera* L. and *Tridax procumbens* L. (53.57% each). Treated seeds by remaining plant extracts also showed good results in respect of increased seed germination. Thus, all plant extracts showed decreased germination failure. Lowest germination failure was observed when the seeds were treated with *Azadirachta indica* A. Juss and *Ocimum sanctum* L. (6.7% each) followed by *Catharanthus roses* L. and *Murraya koenigii* L. (10.0% each).

The highest (92.85%) healthy and lowest (7.15%) infected seedling recorded with *Azadirachta indica* A. Juss. and *Ocimum sanctum* L. leaf extracts. Next to these, *Murraya koenigii* L. extract treated seed gave 92.59% healthy and 7.41% infected seedling. However, in case of untreated seeds, approximately half (52.94%) seedlings were found healthy and 47.06% were infected. Treated seeds from *Aegle marmelos* Corr. and *Catharanthus roses* L. extract also showed good effect with 92.3% and 91.3% healthy seedling and 7.7% and 8.7% least infected seedling respectively. Rest of plant extracts showed significantly good effect with healthy and less infected seedlings.

The overall results indicated that the seeds of Brinjal got influenced due to the leaf extract in higher proportion.

Table 3.0: Efficacy of plant extracts on seed germination, seedling health and germination failure of Brinjal.

Sr. No.	Leaf Extract	Seed germination (%)	Germination % over control (+)	Germination failure (%)	Healthy seedlings (%)	Infected seedlings (%)
1	Control	63.3	0	36.7	52.94	47.06
2	*Azadirachta indica* A. Juss.	93.3	66.07	6.7	92.85	7.15
3	*Aegle marmelos* Corr.	86.7	53.57	13.3	92.3	7.7
4	*Calotropis procera* L.	86.7	53.57	13.3	88.46	11.54
5	*Catharanthus roseus* L.	90	35.71	10	91.3	8.7
6	*Datura metel* L.	80	42.85	20	87.5	12.5
7	*Moringa oleifera* Lam.	83.3	48.21	16.7	84	16
8	*Murraya koenigii* L.	90	60.71	10	92.59	7.41
9	*Polyalthia longifolia* Sonn.	76.7	30.35	23.3	90.9	9.1
10	*Ocimum sanctum* L.	93.3	66.07	6.7	92.85	7.15
11	*Tridax procumbens* L.	86.7	53.57	13.3	84.61	15.39
	Mean	84.5455	46.4255	15.4545	86.3909	13.6091
	SD	8.3222	18.2745	8.3222	11.0148	11.0148
	CV	9.8435	39.3631	53.8495	12.7499	80.9369

	SE	2.5092	5.5100	2.5092	3.3211	24.4034
	CD 5%	5.5956	12.2872	5.5956	7.4060	54.4196
	CD 1%	7.9543	17.4666	7.9543	10.5278	77.3588

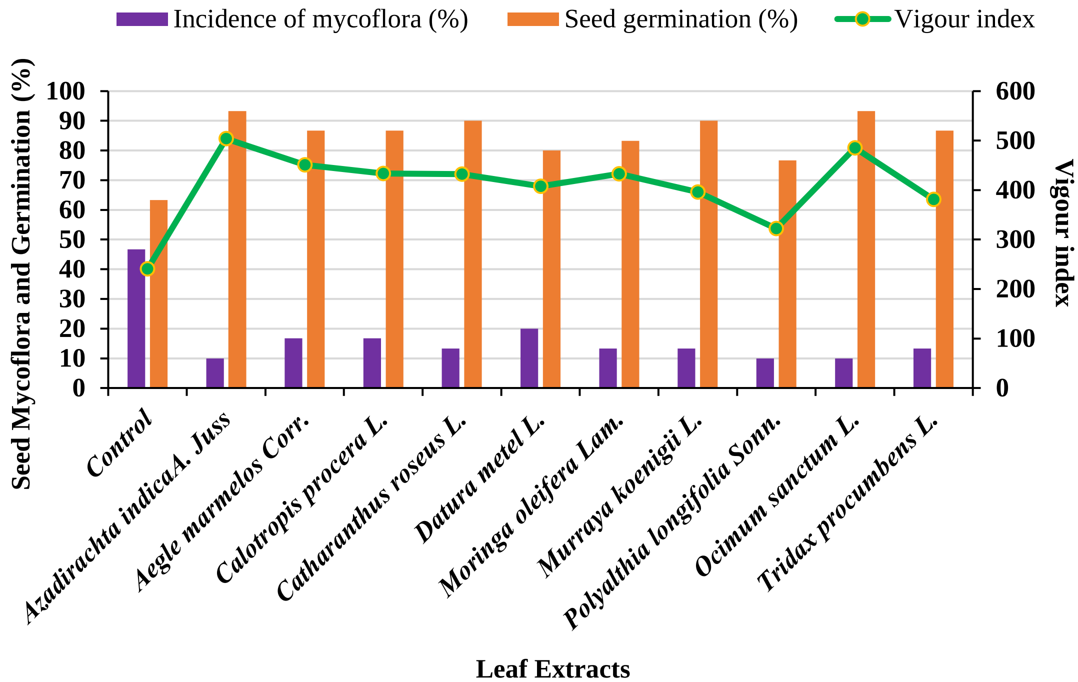

Fig. 1: Efficacy of plant extracts on seed mycoflora, germination and vigour index of Brinjal.

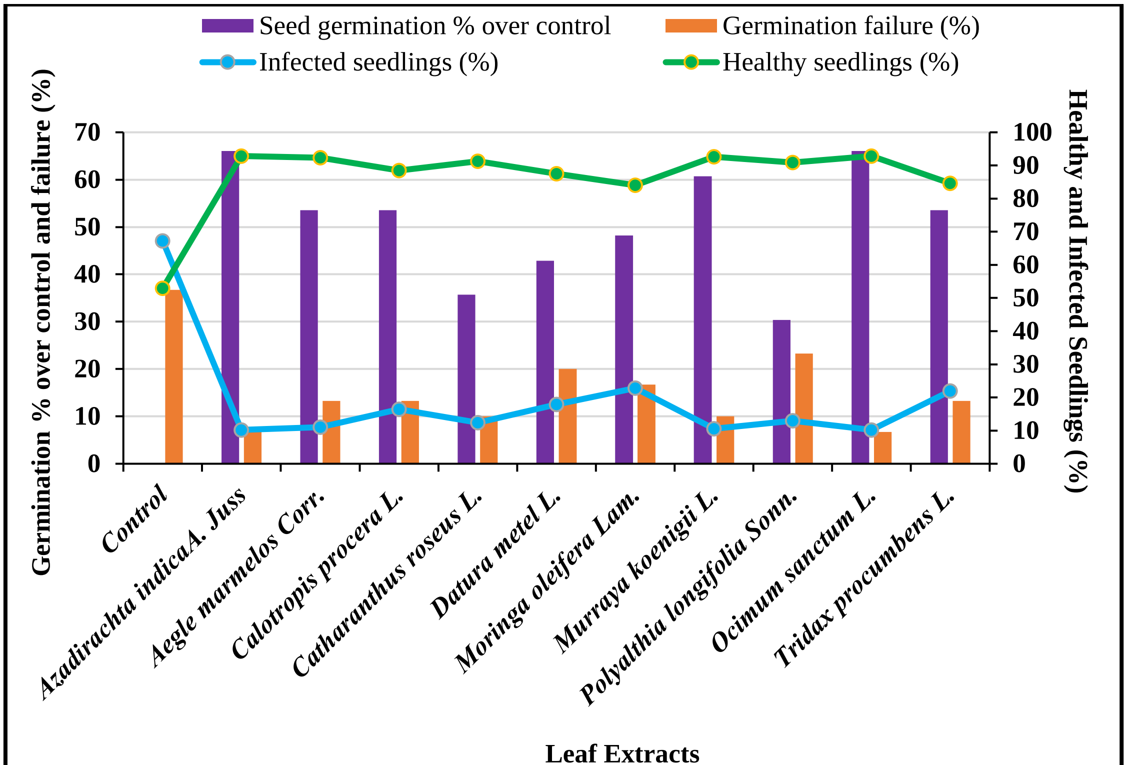

Fig. 2: Efficacy of plant extracts on seed germination % over control, seedling health and germination failure of Brinjal.

4.0 Discussion

The seed germination and seed health were influenced by seed mycoflora revealed significant differences (Table 2.). The effect of selected plant extract on incidence of seed borne mycoflora, seed germination and vigour index of brinjal were found to be effective. Incidence of seed mycoflora seems to be completely controlled by the treatment of *Azadirachta indica* A. Juss. (0.0%) followed by *Murraya koenigii* L. (3.3%), *Aegle marmelos* Corr. (6.7%), *Ocimum sanctum* L. (10.0%) and *Polyalthia longifolia* Sonn. (10.0%). The highest (92.85%) healthy and lowest (7.15%) infected seedling recorded with *Azadirachta indica* A. Juss. and *Ocimum sanctum* L. leaf extracts. Next to these, *Murraya koenigii* L. extract treated seed gave 92.59% healthy and 7.41% infected seedling. However, in case of untreated seeds, approximately half (52.94%) seedlings were found healthy and 47.06% were infected.

Previously, Ahmad et al. (1993) discovered 15 fungi, while Perveen and Ghaffar (1995) discovered 22 new species of seed-borne mycoflora on tomato in Pakistan. *Fusarium solani*, *Fusarium moniliformae*, *Alternaria alternata*, and *Drechslera australiensis* were the most common fungi. Similar fungi such as *Alternaria solani*, *Fusarium oxysporum*, *Aspergillus flavus*, and *Aspergillus fumigatus* have been found on tomato in Bangladesh, causing significant seed damage (Fakir, 2001). Similarly, *Bipolaris* spp., *Curvularia lunata*, *F. moniliformae*, and *F. semitectum* were found in tomato seeds by Bhatti et al. (2010).

In medicinal plants, secondary metabolites are present. Phytochemical analysis of medicinal plants worked by Chiejina and Ukeh (2012) reported the presence of Tannins, Phlobatannins, Steroids, Tarpenes, Saponins, Flavonoids and Alkaloids. The presence of these phenolic compound in the extracts indicates that these plants can serve as antimicrobial agents. Survase (2012) evaluated the effect of medicinal plants leaf extract of ten plants on the seed mycoflora, seedling emergence and growth of seed borne fungi of methi. He reported that leaf extract of all the test medicinal plants were found to be inhibitory in more or less degree for incident of seed mycoflora. All the selected plants plant except Vitex negundo were found to be stimulatory for the seed germination and seedling emergence of methi. The leaf extract of *Semecarpus ancardium* (88.0%), *Solanum xanthocarpum* (79.0%), *Abrus precatorius* (81.0%), *Aegle marmelos* (84.0%), were found to be more inhibitory for incidence of seed mycoflora and more stimulatory for the seed germination and seedling emergence of methi. Telang and Chillawar (2021) reported that the root stem and leaf extracts of all the test plants were found to be inhibitory in more or less degree for the incidence of seed mycoflora some exceptions. They further reported that plant extracts were found to be stimulatory for seed germination. The seeds treated with leaf extracts of *Azadirachta indica*, leaf and root extracts of *Ocimum sanctum* and leaf extracts of *Murraya koenigii* showed very reduced incidence of seed mycoflora and maximum seed germination while, the seeds treated with the stem and root extracts of *Lawsonia inermis* and *Acacia nilotica*, leaf extract of *Curcuma longa* showed maximum incidence of seed mycoflora and reduced seed germination.

Plants create a vast range of environmentally benign secondary metabolites and are the richest source of organic compounds (Okigbo and Nmeka, 2005; Jamil *et al.*, 2007; Riaz *et al.*, 2010). Botanicals, rather than chemical fungicides, are one of the most modern techniques of managing seed-borne and other plant diseases (Howlader, 2003; Islam et al., 2006). The seed borne fungal pathogen affects the seed health quality, reduce germination, transmit diseases in the field and consequently hamper the yield of the crop. Identical results were recorded in the present study.

5.0 Conclusions:

Seed treatment refers to the exposure of seeds to certain biological agent, which are not employed to make the seeds disease free only but treated to provide the possibility of pest and disease control also when needed during germination and emergence of young plant and early growth of plant. During present investigation, selected plant extracts showed encouraging effect on vegetable seeds when used for treatment. Leaf extract was found to be most effective with increasing seed germination, seedling length and seedling health with inhibition in the proliferation of seed borne moulds.

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Control

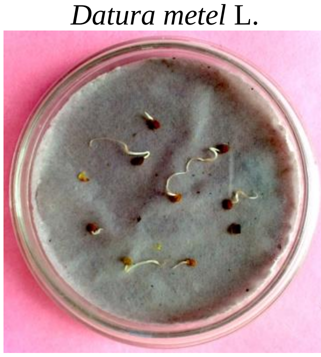
Azadirachta indica A. Juss

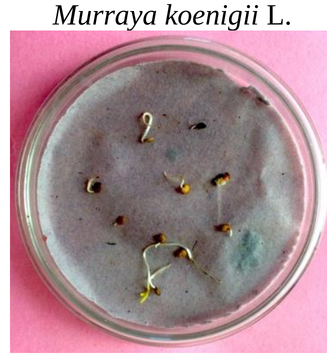
Aegle marmelos Corr.


Calotropis procera L. *Catharanthus roseus* L.



Datura metel L. *Moringa oleifera* Lam. *Murraya koenigii* L.





Polyalthia longifolia Sonn. *Ocimum sanctum* L. *Tridax procumbens* L.

Plate I - Efficacy of plant extracts on seeds of Brinjal

Summiaya, R. and Dawar, S. 2015. Seed-borne mycoflora associated with okra [*Abelmoschus esculentus* (L.) Moench]. *Pak. J. Bot.*, 47(2):747-751.

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15.

Goat Farming: An Agro-based Secondary Business for control of Farmers' Suicide

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Abstract:

India is distributed in seven lakh villages. Agriculture is the vertebral column of Indian economy. Increase in food production and agro based secondary business motivation depends on these two things. In future by these two ways, we can fulfil our employment and accept the challenge of food safety (Dr. R. P. Fadke, 2021). Farmers facing number of problems, agriculture companies and distributers in chain by powerful linking mediators harass farmers. Due to favorable decision for corporate and anti-agriculture decision of government, the cost of agriculture yield production has increased. During purchasing of demandable fertilizers and insecticides the distributors linking this make more margined other non-demandable fertilizers compulsory. It's just like a doctor giving compulsory Typhoid medicine to a patient who is suffering from malaria otherwise malarial patient will not get medicine of Malaria. It is never acceptable making compulsory tension linking like agriculture shop and medical store (Dr. Ajit Nawle, 2021).

After independence of India all people do not get sufficient food, due to this situation. The then Prime Minister Lalbahadur Shastri recommended that, all Indians should fast on every Monday. The aim of this is to get food to every Indian. This was successful in collaboration by agricultural scientists, farmers and acceptance of new technology (Suresh Patil, 2021). But today's situation is that many Indians are starving and farmers are committing suicide. So, to change this situation, I would like to suggest farmers have to do any agro-based secondary business. Goat farming is one of the best agro based businesses.

Key words: Farmers' suicide, Goat farming, Agro-based business.

Introduction:

In Marathwada region i.e., in eight districts of Maharashtra State farmers' suicides still continue. It is happening due to natural disasters with economic problems. During 2021 from January to June, in these six months 466 farmers suicide cases are noted and registered. Out of that 306 are eligible for government compensation and remaining 44 are not eligible and 116 matters are in waiting list of inquiry as per Review Administration Department (2021).

Whereas farmers are rulers, the Members of Parliaments (M.P.) are farmers, representative of farmers are children of farmers, leaders are from farmers and Government is of farmers. In such a nation farmers' suicide is paradox. Almost all institutions agree that farmers' suicides are caused by bankruptcy.

Farmers are said to be a king. Maharashtra is a leading state in developing economy of the country. The economy of Maharashtra is agro-based. Out of the total income of the state 1/3 income is from agriculture sector. In such a state the farmers should be happy and well content (Jadhwar et. al., 2008)

Material and Methods:

Farmers' suicide cases are registered in 2021 as 59 in January, 73 in February, 101 in March, 47 in April, 78 in May and 108 almost more in June. Farmer's suicide cases are 466 out of which 306 are eligible for government support. Out of them, month wise are as follows:

In January 50, February 61, March 86, April 33, May 49 and in June it is 27. Meanwhile 44 farmers' suicide cases are non–eligible for government support. Out of them 7 cases of January, 8 of February 11 of March, 5 of May and 10 of June and 116 farmers' suicide cases are included under inquiry. Month wise it is 2 in January, 4 of each February and March, 9 of April, 26 of May and 71 of June which is much more.

Farmers' suicide cases which happened within six months are 186 and they received government help. Out of them farmers' suicide cases 49 are in January, 51 are in February, 45 are in March, 18 are in April, 22 are in May and 1 is in June.

Table 1: Farmers' suicide cases from January 2021 to June 2021

District	Total Suicide cases	Eligible for Govt. help	Non-eligible for Govt. help	Received Govt. help	Under inquiry
Aurangabad	72	57	2	23	13
Jalna	55	45	10	14	--
Parbhani	36	14	01	14	21
Hingoli	17	13	--	13	04
Nanded	59	46	06	11	07
Latur	32	23	03	23	06
Osmanabad	57	31	03	11	23
Beed	138	77	19	77	42
Total:	466	306	44	186	116

Source: Revenue Administration Department (2021).

Result and Discussion:

In Maharashtra, National Record Bureau (NRB) recorded dangerous information about farmers' suicide. In India 1, 64,033 farmers' suicides took place during 2020. Out of them 22,207 are in Maharashtra, 18,925 are in Tamilnadu which is the second in ratio and 14,935 in Madhya Pradesh which is third in position.

As per the recent report of National Crime Record Bureau (NCRB) farmers suicide cases are increasing in India. In all India level during 2020 farmers' suicide cases are 1, 64,033. During 2019 it was 1, 53,052. In 2020 in comparison to 2019 the cases have increased by 7.2 %. Here, important thing is to note that is in economic kingdom India i.e., in Maharashtra farmers suicide cases are more. About this, Maharashtra is in first position, Tamilnadu is in second position and Madhya Pradesh is in third position.

In Maharashtra, farmer's suicides are 22,702, in Tamilnadu 18,925 and in Madhya Pradesh 14,965, in West Bengal 13,500 whereas in Karnataka 13,056.

According to the report of NCBR, in India out of total farmer's suicide cases 50.4% are in these 5 states, remaining 49.6% are in 23 states and 8 are in central union territories. Meanwhile in the country the more populated area of Uttar Pradesh, the ratio of farmers' suicide cases has decreased. In Uttar Pradesh this percentage of the farmers' suicide is comparatively only 3.6%. Different things mean that the population of Uttar Pradesh in comparison to our country is 16.9%.

Conclusion:

The **c**auses of farmers' suicide are bankruptcy, minimum yield of crop, loans used for unproductive purposes, natural disasters, more price of seeds, fertilizers, insecticides, less germinated seeds, loan from moneylenders, non-productivity of crops, increased expenditure in productivity, failure in crop insurance etc. (Dr. Dhage S.K.,2013).

The Banks do not lend loans to farmers that are why they are entrapped in the murky net of money lenders who charge them enormous rates of interests, ultimately, leading to farmers' suicides. In modern agriculture farmers have to invest in hybrid seeds, fertilizers, pesticides at large prices. Sometimes bogus seeds, fertilizers, pesticides, weedicides ultimately lead them to suicide (Prof. Dr. Chavan N.L., 2009).

So, after present investigation I would like to recommend some remedies to curb farmers' suicide. If farmers have to survive naturally or independently, they must adopt certain agro based side businesses. And goat farming would prove to be a powerful remedy to overcome the farmers' suicides.

1. Goat farming needs small capital comparatively to other agro based side businesses.
2. Farmers can provide fodder easily and without any cost from their own farm.
3. They have their own plot of land for goat farming.
4. It reduces the cost of business.
5. Goat farming farmers can get lot of income within short duration by selling meat.
6. Goat milk production will provide some income as it has medicinal properties.
7. Manure of goats used in farming will increase the crop yield.

In this way agro based secondary business, i.e. **goat farming** can ultimately curb and even prevent farmers' suicides, when they get extra income from it.

Acknowledgement:

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16.

Stomatal Studies of Genus *Cyperus* L. of cyperaceae from Marathwada

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Abstract :

The Genus cyperus L. (Cyperaceae) is represented by 37 species in Marathwada region. It shows heterogenous assemblage of ill-defined species. Therefore, there is no satisfactory set of characters which can be employed for the characterization of any one species.

Critical study of the family has been neglected by most of the taxonomists due to minute and greatly reduced floral structures, least economic importance, due to narrow generic and specific delimitation and extreme variations in vegetative as well as floral parts leads to polymorphism and species complexes.

Therefore, author focused on micro morphological study as a stomatal study of interesting species of Genus cyperus L. to clear the taxnomic ambiguities.

INTRODUCTION

The Genus cyperus L. of cyperaceae is the second largest genus of family cyperaceae represented by 37 species in Marathwada region. It shows polymorphism, specific and infraspecific variations leading into species complexes and intergeneric complexes within the family. Most of the species are ill defined, showing extreme variations in the vegetative as well s floral structures. Therefore, there is no satisfactory set of characters employed for the characterization of any one species. Therefore, there is urgent need of detail diagnosis of morphological characters. Author focused on detail study of stomata structure, stomatal index of some interesting species of Genus cyperus L.

Stomata are the natural microscopic pores occurs in the epidermis of plants they leaves and stands of herbs are mostly present in leaves but they for exchange of gases and transpiration are also present in other parts except root, stomata is made up of two Guard cells which are kidney shaped and which modified epidermal cells showing abundant chatroplast and it differs distinctly from other epidermal cells, taxonomically stomatal study has much importance the shape, size of stomata and stomatal index provide the micromorphological data of characters which support for diagnosis of species within the Genus cyperus L.

MATERIAL AND METHODS

For the stomatal studies the fresh material from the different localities are collected and deposited in Dept. of Botany, Sant Tukaram College of Arts and Science, Parbhani as a vaucher specimen. The collected specimens are diagnosed and identified. difficult specimens are identified by experts.

The peel for the dermal studies were taken from the fresh as well as preserved material. Epidermal peels were stained with 1% Safranin and mounted in the glycerin and made semi-permanent by ringing with paraffin wax. The micro photographs were taken on the olympus research microscope without blue filter.

The stomatal index was calculated by using formula

$$S.I. = \frac{S}{E+S} \times 100$$

Where S.I. = Stomata index

S = No. of sotmata per unit area

E = No. of epidermal cells in the same area

RESULT AND DISCUSSION

Cyperus alulrtus Kern :

Cypurus alulatus shows the leaves with hypostomatic stomata are present on abaxial surface. The stomata pracytice type lying parallel in rows. The stomatal index is 9.93. The average size of stomata is 48.81 x 26.6 um.

Cyperus difformis L :

Stomata in cyperus difform is are paracytic type leaves hypostomatic, stomatal index is 22.41. The average size of stomata is 50.54 x 22.61 um.

Cyperus flavidus Retz ;

The leaves are isostomatic stomata are more in number and equally distributed on both surfaces. Stomata paracytic type. The stomatal index is 7.75. The average size of stomata is 45.35 x 39.9 um.

Cyperus laevigatus L :

The leaves are isostomatic. Stomata are uniformly distributed on both the surfaces. The stomata are paracytic type. The stomatal index is 22.50. The average size of stomata is 53.20 x 21.28 um.

CONCLUSION

From the above investigation,the stomata are one of the important microscopic structures, it shows variations in the number, size and differs. in the stomatal index, stomatal study much useful to prefer one of important tools for clearing taxonomic ambiguities within the species as well as standardization of species.

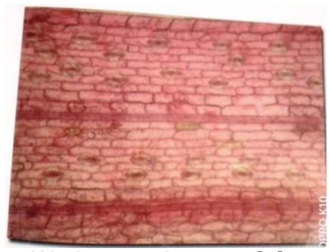

Fig. (A) Stomata ***Cyperus alulatus*** **Kern.**

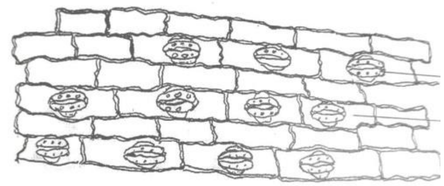

Fig. (B) Illustration of Stomata ***Cyperus alulatus*** **Kern.**

Fig. (A) Stomata ***Cyperus difformis L.***

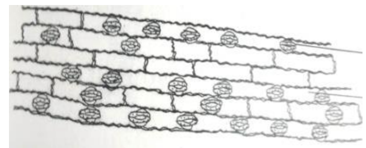

Fig. (B) Illustration of Stomata ***Cyperus difformis L.***

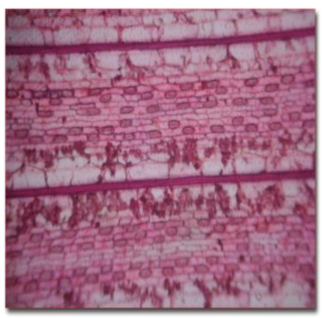

Fig. (A) Stomata ***Cyperus laevigatus*** **L.**

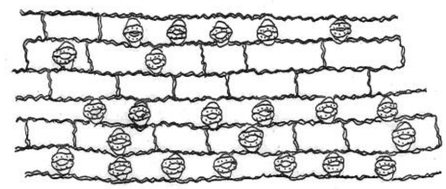

Fig. (B) Illustration of Stomata ***Cyperus laevigatus*** **L.**

Fig. (A) Stomata ***Cyperus flavidus Retz.***

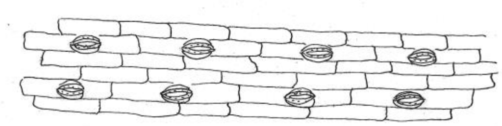

Fig. (B) Illustration of Stomata ***flavidus Retz.***

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