A Review on sustainable agriculture development through organic farming.

Abstract

Sustainable agriculture development through organic farming not only provides food requirementsforthe current generation in an eco-friendly manner but also providesfood for future generations and controls our environment. Mainly, quality food is providedby organic farming without negative effectson the health of the soil and the quality of the soil side by side with the environment. Organic farming also helps to produce a larger quantity of food for a huge amount of the Indian population. In current agriculture huge number of pesticides, fertilizers and synthetic compounds are used, which causes adverse impacts on soil health, water hazards, toxic residues increasing in the food chain and animal feed in this manner increasing health problems. Theobjectiveof the review paper isto identify synthetic fertilizers and pesticides that can be replaced with natural alternatives as well as to examine how organic farming might promote sustainable agriculture.

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Keywords: Biofertilizers,Bio-pesticides,Manure,Organic farmingand Sustainable agriculture

Introduction

Approximately 187 countries are currently working on organic agriculture, with India occupying a similar position. Organic farming is rapidly gaining popularity in agriculture. India plays an important role in organic production. In total organic production, 30% of producers present in India in the world manor2.30 million hectares, 27,59,660 farmers, 1730 total producers and 745 total traders in India(FiBL survey 2021). Mainly, we can keep our nature clean, green, and rich by following organic farming. If we go to any organic farming area there, we see only the humming of birds, insects and animal movement. Research showsthat almost above 30%of plants and wildlife present in organic farming zone as compared to the conventional farming system due to less use of synthetic fertilizers and pesticides. But in modern agriculture systems, different synthetic chemicals i.e., agrochemicals compounds are extensively used for controlling pests, weeds and diseases. Contingent on the structure of chemicals, agrochemicals are classified into synthetic pyrethroids, carbamates, organochlorines, chlorophenols and organophosphates (Hamza *et al*. 2016).The World Health Organization (WHO) categorizes agrochemicals as either extremely

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hazardous, very hazardous, moderately hazardous, somewhat hazardous, or acutely harmful, according to the median lethal dose (LD_{50}) for rats (WHO survey 2009).Crop productivity increases and more closely matches human demands in greater populations when agrochemicals are used during agricultural operations. The use of agrochemicals consistently and without judgment harms human health, threatens biodiversity, and harms the ecosystem(Elahi *et al.* 2019).Our forefathers have been engaging in agriculture since the beginning of time, using farmland and natural resources as input (Nedumaran and Manida 2020). Due to the various negative effects that synthetic fertilizers and pesticides in the system of conventional farming cause, some consumers have received reimbursement(Kalyan 2005). As a result, they switched to organic farming whichproduces goods that are healthy and non-injurious to human health.Besides maintaining the soil fertility status, soil health, levels of organic matter concentration, the biological activity of fostering soil, self-sufficiency of nitrogen through the biological nitrogen fixation and use of legumes crop, use of weed, wastes of livestock and crop residues in the process of organic matter recycling and crop rotation due to the control of pest and diseases (Chhonkar2002). Ignore the use of pesticides and instead practice organic farming to reduce environmental and human problems(Sharma and Singhvi 2017). The integration of opportunity of economics and protection of the environment direction to sustainable agriculture (Ferella*et al*. 2019). Firstly, more farmers should practice organic farming, which will reduce the distribution of toxic materials and benefit human health. (Yanakittkul and Aungvaravong 2017) and secondly, soil organic matter increased by the recycling of organic wastes (Ulm *et al.* 2019).Organic farming environs the various conveniences for the representation of society such as the performance of social, environmental and economic.Some experimentsshowed that farmers who are involved in professional work and part time work are dangling to pause the organic farming (Heinze and Vogel 2017). Organic agriculture considers as a form of agriculture in which sustainable resources of natural components are used like the application of all bio-products and crop residues. In this way, natural residues and products are used by farmers oforganic farming for improving their crop yield and soil health side by side with environmental safety and producing more milk and meat in animals (Epule*et al.* 2015).Demonstrated micronutrients, the larger quantity of antioxidants, without injurious fertilizers, chemicals, pesticides, good in taste and more other things are contained in organically produced foods generally and it keeps the plant sustainable and controlling environmental balance. Eventually, 3.1 million farmers started their cultivation process

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organically on the 72.3 million hectares of farmland in the world. Ten top countries are certified in area under organic (Fig 1).

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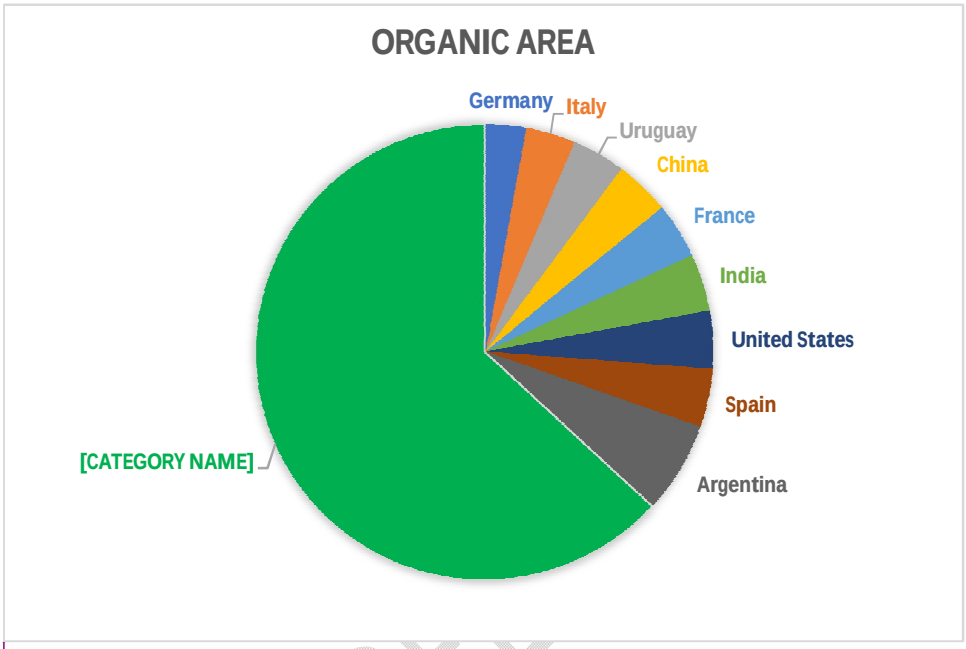

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Fig 1. (Source: FiBL survey 2021)

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S.No	Commodity Type	Goods
1.	Fruits	Pineapple, orange, banana, passion fruits, cashew and mango
2.	Plantation	Cocoa, tea and coffee
3.	Vegetables	Onion, okra, potato, tomato and brinjal
4.	Pulses	Black gram and red gram
5.	Oil seeds	Sunflower, sesame and castor
6.	Spices	Ginger, nutmug, turmeric, cardamom, chilli, black paper, vanilla and clove
7.	Nut	Walnut

8.	Others	Herbal extracts and cotton

Table 1. Exportable organic crops from India (Source: APEDA)

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Sustainable Agriculture

Incessantly, many resources and foods are supplied by agriculture for the growing population in the world (Knapp *et al.* 2018). It plays an important role in any activities of human and human existence (Gondchawar and Kawitkar 2016). However, there are a variety of issues that hamper agriculture's ability to meet the needs of people in the present and the future. These issues include land degradation, a high rate of biodiversity loss, climate change, pollution, the depletion of water resources, rising production costs, and a decline in the number of farms. (Peters 2010; Rivera-Ferre *et al.* 2013; Thrupp 2000). Agriculture is not only imperative to deal with these worries, but it is also a major contributor to them given how it has been practiced over the past few decades (Koohafkan*et al.* 2012; Goodland 1997). Sustainable agriculture is a production practice of animals and plantswith the application of site-specificity, that will progress over time i.e., satisfy the need for human food and fibre, enhance the quality of the environment, sustain the farm operational economic viability and increase the life of farmers and society as a whole (U.S. Farm Bill 1990).

Organic Farming in India

In India organic agriculture was promoted by the declaration of Sevagram in 1994, organic farming has raised more laps and this system was strong with the bits of help of initiatives at the governmental and non-governmental levels.The national standard was developed in India by the National Programme for Organic Production (NPOP) and all strategies and support for the promotion of organic farming were done by the National Project on Organic Farming (NPOF). In India, organic farming is in incipient generation and 2.30 million hectares of farmlands are cultivated under organic farming conditions. Rajasthan, Madhya Pradesh and Maharashtra – the half cultivated areas of these top three states comeunder organic cultivation. During the time of the green revolution in 1966, all scenarios in agriculture were changed by the promotion of high yielding varieties and the use of a huge number of fertilizers and pesticides for higher food production and security. Besides, decreasing soil health and increasing the toxicity of food through the application of a larger quantity of synthetic fertilizers and pesticides and makingit harmful to consumers. The reasons for

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organic farming are; firstly, the food industries of organic farming are raising quickly and assuring more

profitableness. Secondly, to maintain our environment's health and vitality, which is primarily feasible through organic farming on a social, environmental, and economic level.Thirdly, to stop using artificial fertilizers and pesticides that are harmful to human health and deteriorate soil health over time by being ingested through food. Fourthly, the walkout of the balance between the livelihood and environment turns out to be exceptionally monumental because of the harmful effects caused by thepractices of conventional agriculture.

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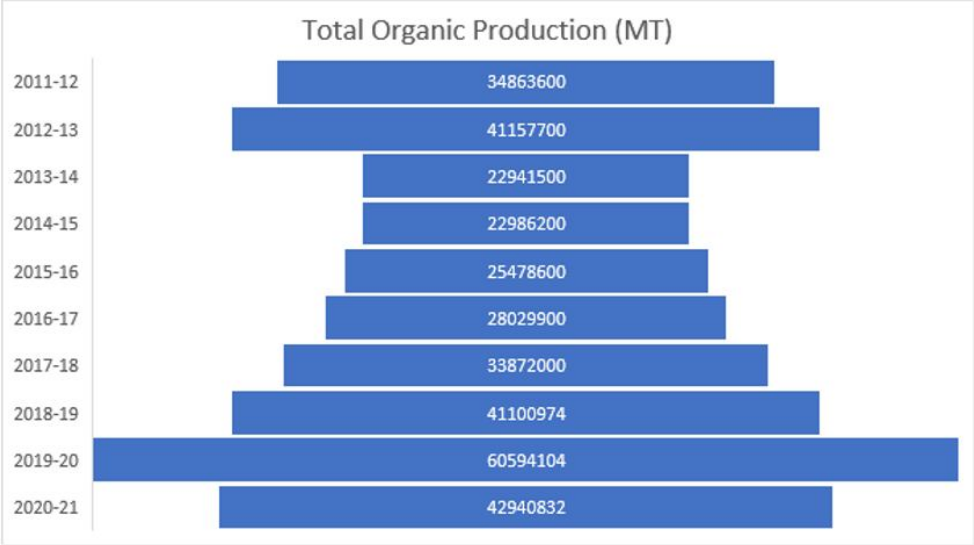

Fig 2. Last 10 years total organic production statistics in India (Source: FiBL survey 2021)

Organic components for plant nutrients

Bythe application of ahuge amount of synthetic fertilizers and pesticidesincreases the production of crops besides air, water and soil are also be polluted. Severally, this conventional farming system improved distrust in farmer's minds about a sufficient and quality food supply (Vassilev *et al.* 2015).The addition of organic matter helps maintain soil

health and fertility while also enhancing the chemical, physical, and biological characteristics of the soil in an organic agricultural system(Tejada *et al.* 2016).Because of this, farmers started using organic materials, which are explained below.

Crop rotation

Crop rotation, or cycling the crops for two or more years on the same plot of land, is the most crucial practice in the organic farming system and this practice helps to reduce pests, diseases, weeds and weed seeds while also improving soil fertility. As an example, if we cultivate leguminous crops in rotation it improves soil fertility status (Biernat *et al.* 2020).

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Crop Residues

Crop residues are the residues of the crop left on cultivated land after harvesting the crop. They not only improved erosion control but also fixed the CO_2 in the soil, reduced the loss of evaporation, increased the concentration of organic matter, and sometimes also used it as biofuel (Laamrani*et al.* 2017; Liang *et al.* 2012). When crop residues act as green manure and supply nitrogen in the soil during the growing season of crops, it reduces the use of synthetic fertilizers (Raheem *et al*. 2019). Mainly, leguminous crops are used as green manure crops, but they are not suitable for long-duration crops due to the quick decomposition of the crop residues and the short supply of nitrogen (Rothe *et al*. 2019). Reduce the use of chemical fertilizers for the use of crop residues as green manure through nitrogen fixation and the supply of nitrogen in the process of biological decomposition (Zhou *et al.* 2020). In this process, the yield of the crop increases through the use of crop residues like green manure (Subaedah*et al*. 2016). Crop residues are not only used as manure but also to control nematodes and weeds without reducing the yield of crops (Puig *et al*. 2019).

Organic Manure

Organic manure refers to manure, which is the waste materials of animals and plants that are used to supply nutrients to the plants (Chhonkar, 2002). Utilizing organic manure, organic farming contributes significantly to the development of agricultural sustainability. (Jiang *et al.,* 2022). Directly, organic manure helps to promote the growth of the crop due to the supply of humic substances and increases the availability of microorganisms, improving soil productivity (Aisha *et al*. 2014). Depending on the concentration of nutrients, organic manure

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has two groups, e.g., bulky organic manure and concentrated organic manure (Reddy and Reddy 2021).

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Bulky organic manure

A lower percentage of nutrients are present in bulky organic manures as compared to concentrated organic manures. As a result,a huge amount of bulky organic manure is required for supplying the nutrient in the plants (Sohail *et al.* 2019). Parts of bulky organic manures are farmyard manure (FYM), compost and green manure (Reddy and Reddy 2021).

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Farmyard manure (FYM)

The nicely decomposed blend of cow dung, urine of the farm animals, litter of the farm and remnant materials of fodder or roughages of cattle are known as farmyard manure. The nicely decomposed farmyard manure contains 0.5% nitrogen, 0.2% phosphorus and 0.5% potassium (Tandon 1992). Different methods of preparation of FYM are the pit or trench method, box method and heap method.

Compost

The huge amount of waste materials like paddy straw, weeds, sugarcane trash and other waste is converted to compost manure through the decomposition of an anaerobic process. The well decomposed compost manure contains 0.5 %nitrogen, 0.15 % phosphorus and 0.5 % potassium. Different types of compost are present like town compost, sewage and sludge compost and vermicompost.

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Green manure

Green manure refers to the manure which is made by the decomposition of green plant materials. Green manure is made in two ways like green manure crops and green leaf manure. Some important crops for green manure are sunnhemp, dhaincha, sesbania and clusterbeans. Some weeds also play an important role as green manure crops like Parthenium (*Partheniumhystorophorus*), Water hyacinth (*Eichhornia crassipes*) and Cassia (*Cassia fistula*),etc.

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Concentrated organic manure

A higher percentage of nutrients are present in concentrated organic manure in comparison to bulky organic manure. As a result, a lower amount of organic manureare required to supply plant nutrients. Some important concentrated organic manure is blood meal, oilcake, meat

meal, fish meal, horn and hoof meal, steamed bone meal, raw bone meal, poultry manure and

Organic manure	Nitrogen (%)	Phosphorus (%)	Potassium (%)
Sheep and goat manure	3	1	2
Poultry manure	3.03	2.63	1.4
Fish meal	4-10	3-9	0.3-1.5
Raw bone meal	3-4	20-25	-
Meat meal	10.5	2.5	0.5
Steamed bone meal	3-4	20-25	-
Blood meal	10-12	1-2	1.0
Horn and hoof meal	13	-	-

sheep and goat manure.

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Table 2. Nutrient percentage of concentrated organic manure based on Livestock (Source: Reddy and Reddy 2016)

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Fig 3. Different kinds of organic manures

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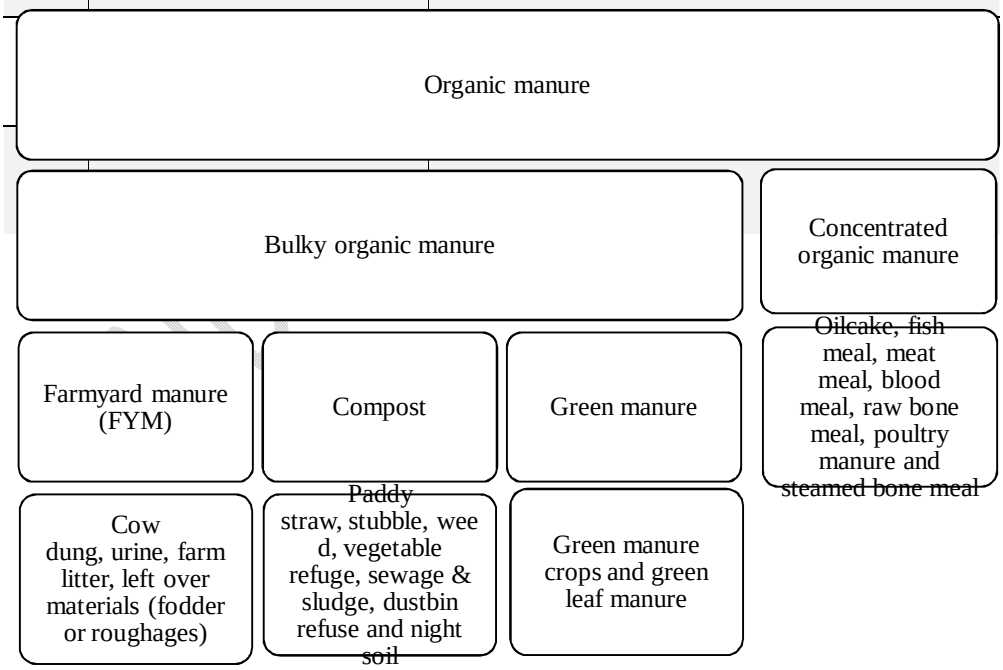
Biofertilizers

S.No.	Kinds of Bacteria	Example
1.	Aerobic nitrogen-fixing bacteria	• Non-photosynthetic: *Azomonas, Azotobacter* • Photosynthetic: *Chromatium, Chlorobium*
2.	Anaerobic nitrogen-fixing bacteria	• Non-photosynthetic: *Clostridium* • Photosynthetic: *Rhodospirillum*
3.	Chemosynthetic bacteria	• Heterotrophic: *Desulfovibro*



Biofertilizers refer to biological substances which act as fertilizers and have the ability to increase soil fertility by the fixation of atmospheric nitrogen through the activity of mycorrhizal fungi and bacteria. They not only fix the nitrogen but also increase the growth of

the crop and produce biomass. Two types of biofertilizersare present in the soil e.g., Non-symbiotic nitrogen fixationOrganisms freely present in the soil or stay out of the plant cell are known as non-symbiotic nitrogen.

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Table3. Non-symbiotic nitrogen fixing bacteria (Source: Plant Physiology and Metabolism by Dr. H.N. Srivastava)

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Nitrogen fixation

These bacteria come into close contact with the roots of grasses and cereals and fix nitrogen. This loose mutualism association is known as associative nitrogen fixation. The associative bacteria in a root are *Beijerinckia*, *Azospirillumbrasilense,* and *Azotobacterpaspali*. whereas symbiotic nitrogen fixation refers to the fixation of nitrogen symbiotically and the building of a mutualistic relationship between plants and bacteria. This symbiotic nitrogen fixation occurs in three processes: fixation of nitrogen through the formation of nodules in leguminous crops; fixation of nitrogen through the formation of nodules in non-leguminous crops; and fixation of nitrogen through the non-nodulation process.

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Bio-pesticides

When pests are controlled and managed by the application of biological products and bio-organisms,those pesticides are known as bio-pesticides. Disturbancesoccur in ecology due to the bad effects onnon-targeted insects through the regular application of synthetic pesticides. And developed resistance power in insects due to the continuous application of the same synthetic pesticides (Azeem *et al.* 2019).

Name of organic pesticides	WHO class	Plant genera	References
Eucalyptol (1,8-Cineole)	III	Blumea, Alpina, Eugenia, Piper, Zingiber, Salvia, Laurus	FAO: Rome, Italy, 1999
Allyl sulfide	III	Allium	Musk *et al.* 1997
Citronella	U	Cymbopogon,Corymbia, Citrus,	Opdyke 1979
Citral (Geranial + Neral)	III	Thymus, Lippia, Piper, Eucalyptus, Zingiber	Isman 2006

Zingiberene	U	Zingiber	Koul2016; Lis-Balchin 2006
Menthol	III	Thymus, Mentha	FAO: Rome, Italy, 1999
Thymol	II	Carum, Ocimum, Anabasis, Thymus	Isman 2006

Table 4. Different name of organic pesticides

Pesticides from plants are phytochemically diverse

Ahmad *et al.* (2017) reported that secondary metabolites with antifungal, antioxidant, antibacterial, or insecticidal effects, including alkaloids, steroids, terpenes, tannins, phenols, resinsand flavonoidsmake up the majority of the prevalent bioactive chemicals in botanical pesticides.The growing demand for natural plant products in the food, agriculture, and medical fields has prompted research into the chemical makeup of substances in many plant families (Jnaid*et al.* 2016; Plata-Rueda *et al.* 2017). For instance, *Jatropha carcus* seed kernels are rich in esters, flavonoids andphenolics (Oskoueian*et. al.*2011)While tannins and flavonoids are the main bioactive compounds in the leaves of *Mentha piperita*(Pramila *et al.* 2012).Given plant species are effective against a particular class of pests due to the specific compounds found in those species (Table 5)

Plant name	**Target pathogen**	**principal active chemical component**	**References**
Allium cepa	*Escherichia coli*	2,2-diphenyl-1- picrylhydrazyl	Abdel-Salam *et. al.* 2014
Mentha piperita	*Staphylococcus aureus, Enterococcus faecium , Bacillus subtilis*	neomenthol, menthone, menthol, methyl acetate, acetylmenthol	Sokovic*et al.* 2010; Pramila *et al.* 2012; Al-Taweil 2014
Origanum spp.	*Micrococcus luteus, Basillusspp, Serratia marcescens, Saprophyticus*	Terpinen, alpha-Terpinen,o-Cymene, alpha-Terpieol, Thymol, p-Cymene	Sharoba*et al.* 2015; Plant and Stephens, 2015;

			Saaed and Tariq, 2009
Lantana camara	*Escherichia coli Klebsiella pneumoniae*	9,12,15-octadecatrienoicacid, caryophyllene oxide, Hexadecanoic acid, Phytol	Pawar *et. al.*, 2013; Swamy *et. al.*, 2015
Citrus spp.	*Staphylococcus aureus, Salmonella enterica, Escherichia coli, Pseudomonas putida*	*Neoeriocitrin, Neohesperidin, Eriodictyol, Hesperetin, Naringin, Limonene, Naringenin, Tetrazin, Coumarin*	Dhanavade*et. al.* 2011; Mandalari*et. al.* 2007

Table 5. A few examples of plants with antibacterial properties, together with the target disease and their active components

Effect of synthetic fertilizers and synthetic chemicals on plants and soil

Contamination of the surface area of water bodies in conjunction with soil fertility and groundwater,reduces crop production and increasesthe hazard of human inanition due to the use of higheramounts of nitrogen fertilizers (Narayan 2005). Excessiveuseof synthetic fertilizersthat are not uptaken by the plant remains in the soil and may result inwater pollution and be harmful to living beings (Rashmi *et al.* 2020).Increases nitrification besides increased soil acidity.Excessive use of synthetic fertilizers causes the deficiency of micronutrients like zinc and manganese (Ojeniyi 1981).The increased decomposition rate of organic matter due to the application of inorganic fertilizers as a result ofhuge amounts of nutrients lost by gas emission, leaching and fixation from soil (Alimi *et al*. 2007).Use of excessive amounts of inorganic fertilizers results in shatteringthe soil organisms, decomposersand environment in the soil (Gruhn *et al*. 2000).Nutrient imbalance occurs due to the excessive use of synthetic fertilizersresulting in less production of crops(Ojeniyi 2002). Soil health is disintegrated by the over cropping ona long-term basis and continuous use of synthetic fertilizers and synthetic chemicals without the input of organic matter and environmental pollution also

occurs (Albiach*et al*. 2000).Long-term use of synthetic fertilizers can change the soil pH, increase acidification, causes pests and crusting problems in the soil which are influenced by the low amount of organic matter and humus in the soil, as a result of decrease the microbial activity and stunted growth of the plants (Pahalvi*et al*. 2021).

Benefits of Organic farming

Increasing soil health due to the application of organic manures (Mensik *et al*. 2018).Reducing environmental pollution and maintaining the health of the environment through the use of organic manures and followed through organic farming (Panhwar*et al*. 2019).Increasing the production of agricultural products with the help of organic farming in a sustainable way (Timsina 2018).Enhancing soil fertility and productivity by maintaining the C:N ratio in the soildue to the application of organic materials (Yu *et al*. 2020).Organically produced products generated attention in both consumer's and producer's minds due to their nutritional quality (Magnusson *et al.* 2003).The larger dry matter contained in the organically produced tuber and leafy vegetables as compared to a product of conventionally produced (Bourn and Prescott 2002).Lesser protein is contained in the organically produced cereals but lysine contained in wheat is higher over the conventionally produced cereals and wheat (Brandt*et al*. 2000).Organically produced products contained higher dry matter, antioxidants and minerals but no presence of residue parts of pesticides as compared to conventionally produced products (Lairon 2010).Organically produced tomatoescontain high amount of salicylic acid as compared to conventionally produced tomatoes (Rossi *et al*. 2008).Organically produced products are produced without the use of pesticides so, no pesticide residue is present in these products(Lung *et al*. 2001).In addition to not having any negative effects on environmental contamination, organic agricultural systems have a protective aspect for the preservation of the environment(Oquist *et al*. 2007).Higher water holding capacity and good soil health and produced higher yield due to the following of organic farming system (Pimentel *et al*. 2005).Much labouris required for the cultivation of organic farming and the job of income generating create in farms (Halberg 2008).Costs of organic products are 10-40% extra as compared to conventional products (Winter and Devis 2006).30 % more jobsare generated in organic farming systems in rural areas and gain higher output (Pandey and Singh 2012).The balance and interdependence of plants, nutrients, soil microbes, the environment, and humans are the primary goals of the organic farming system(Berova*et al*. 2010).

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Effect of organic materials on crop productivity

A recent meta-analysis in the coverage of global data displays that crop yield of organic farming is on the mean of 60-65% (Seufert *et al*. 2012), 80% (De Ponti *et al*. 2012) and 81% (Ponisio*et al.*2015) yield of conventional.Organic materials in liquid form contain fewer growth stimulants and nutrients, which serve as a foundational element for reviving the growth cycle by reducing chemical, physiological, and physical imbalances(Natarajan 2002).The grain output of rice and chickpea significantly increased by the application of Dhaincha (*Sesbaniaaculeata* L.) in organic farming (Singh *et al*. 2001). As reported by a number of researchers, earthworm activity is higher in organically managed fields than it is in inorganic agriculture (Edwards and Lofty 1974).Earthworms and microbes interact during the biodegradation process to produce vermicompost, which is worm faeces mixed with worm castings. Microelements including Fe, Mo, Zn, and Cu, as well as macroelements like N, P, K, Ca, and Mg, were provided by vermicompost (Amir and Fouzia 2011). Nitrogen, phosphorus, and potassium, in that order, made up 0.74, 0.97, and 0.45 percent of the vermicompost (Kumar *et al*. 2021). In low-potential areas, compost and liquid manure top dressing practices for growing maize performed much better than the practices used by conventional farmers today, which mix the application of manure and mineral fertilizers and the grain yields of maize were 11–17% greater than those produced using traditional methods (Onduru*et al*. 2002). According to Tamaki *et al*. (2002),continuous organic farming resulted in superior rice growth than conventional farming. Chan et al. (2008) proposed that in three distinct places, the input for growing organic rice was 46, 25, and 22% higher than for growing conventional rice, yet the resulting yields were only 55, 94, and 82% of conventional rice output, respectively. However, the higher premium prices of organically grown crops in the markets make up for the cost of lower yield with higher inputs.With the usage of organic fertilizers throughout time, a steady rise in grain output was seen (Surekha 2007).

Crop	Nutrients	Reaction	References
Cowpea (*Vigna unguiculata*)	N, P, K, Ca^{2+}, Mg^{2+}, Fe, Zn and Cu	Enhanced the availability of P, K, Fe and decreased total nitrogen in the organic farming systems over the conventional	Suja *et al.* (2017)

		farming systems.	
Rice (*Oryza sativa*)	N, P, K and micronutrients	The higher straw yield was obtained by the application of organic materials as compared to apply of only chemical fertilizers.	Khursheed*et al*. (2013)
Wheat (*Triticum aestivum*), Potato (*Solanum tuberosum*) and Clover (*Trifolium sp*.)	P, K, Mg^{2+} and Ca^{2+}	The larger Mg^{2+} and Ca^{2+} availability in the farming systems of organic farming as compared to conventional farming.	Mader*et al*. (2002)
Cashew (*Anacardium occidentale*)	Nitrogen	Availability of nitrogen was high (435 kg ha^{-1}) in case of organic farming over conventional farming (402 kg ha^{-1}).	Mangalassery*et al.* (2019)
Citrus (citrus x sinensis)	Nitrogen	2 ton ha-1 more nitrogen present and 0-100 cm stocked in organic farming system than in the system of conventional farming.	Escanhoela*et al*. (2019)

Table 6. Effect of organic materials on crops productivity

Effect of organic materials on soil fertility and biological properties

Organic carbon in soil, deposition of heavy metals, depletion of nutrients and soil compaction are affected by the pressures which is made by humans in agricultural soil (Smith*et al*. 2016).

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Organic carbon in the soil is mainly present in higher amounts in case of organic farming systems as compared to the conventional farming systems and side by side recycling of the organic matter and crop rotation with the leguminous forage crops in organic agriculture (Gattinger*et al*. 2012). Researchwork was completed by Diacono and Montemurro (2010) and they reported that levels of organic carbon in the soil increased by enhancing yield which leading to an increase in crop residue and organic waste. Increasing the production and yield of crops by the application of organic materials as fertilizers and these materials increased the soil organic matter and long term sustainability of nutrients in soils (Oelofse*et al*. 2013). Rural and urban waste materials are used as compost making materials but waste materials in urban areas are toxic due to containing heavy metals which createsproblemsfor living beings (Rupani *et al*. 2019).Ansari and Kumar (2010) reported that organic carbon in soil increaseswith the application of vermicompost and vermin-wash in soil. N, P, K, Ca, Mg, Cu, Zn and Fe nutrients are contents highly in use of chemical fertilizers treatments followed by vermicompost and vermin-wash treatments (Ramesh *et al*. 2010). According to Tharmaraj*et al.* (2011) proposed that enhanced the chemical properties (EC and PH), physical properties (moisture content, porosity and water holding capacity) and soil fertility (N, P, K, Mg and Ca)of soil by the application of vermicompost along with spraying of vermiwash as compared to the application of chemical fertilizers. An experiment was done by Dubey *et al*. (2014) and they reported that in the case of 100 % organic farming system soil contains a good amount of nitrogen and organic carbon side by side controlling the content of potassium and phosphorus in soil in the initial stage. On but another hand, 100 % inorganic farming system soil contains enough amount of nitrogen and organic carbon besides less amount of potassium and phosphorus seen in the initial stage. A higher number of bacteria is present in the case of organic farming soil (Kumari*et al*. 2017). Trialwork was carried out by Baishya *et al.* (2015)and they proposed that momentous enhancement in soil nitrogen, organic carbon, potassium and phosphorus after harvesting the crop due to the application of 2.5 ton ha^{-1} poultry manure. The higher amount of organic matter in the soil, the biomass of microbes and activity of enzymes on saline soil were increased by the application of compost, prepared by municipal solid waste and palm wastes but some activity was reduced in case of higher application of compost(150 ton ha^{-1}) (Ouni *et al*.2013).

Conclusion

The posture problem of the environment is due to the excessive use of synthetic or chemical fertilizers and pesticides in the conventional farming system for supplying the food demanded

by the present generation. Due to this reason, many countries reduced their use of chemical fertilizers and started to practice organic farming. Organic farming requires more effort and time for adoption as compared to conventional farming. The physical, chemical, and biological properties of soil increase with the application of organic materials in the long term and farmer's income also increases. For developing sustainable agriculture, organic farming is the most important factor. I want everyone to practice organic farming.

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