REVIEW ARTICLE

ROLE OF MICROORGANISM FOR ECO-FRIENDLY AGRICULTURE

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Abstract: The cost of chemical fertilizers is much higher than bacterial compost. Bacterial composts maintain fertile ground, biological power and pollution-free environment; 5% - 10% yields can be increased. In drought-prone areas, bacterial compost is similar to nectar, where there is a shortage of water; the crop will not be good. In such a situation, the farmers do not take the risk of using expensive fertilizers. During the time of the rising sun or i.e. after noon, the utility will increase, at this time the micro-organism can be used at night by using its function and speed, to view the used farming and taken advanced benefits. Micro-organisms do not leave any toxic effects on the environment and crops; they have specific destruction characteristics of the targeted insects. With their use the development of immunity has been found to be low in insect, using these insects can also be controlled which are not destroyed by the normal pesticides they are safe for the beneficial pest of the cultivation.

Keywords: Agronomic Practice, Bacterium, Bacterial Compost, Resilient Agro-ecosystem

INTRODUCTION

Due to the minimum amount being used in production cost, there is a decrease in production cost. If the agrarian ecosystem is not manipulated continuous increase in the number of them will be helpful in controlling pest. They can be used in combination with pesticides and organic products. But Fungal-based Micro-organisms should not be used in combination with bacterial chemicals they should be stored on a cold and dry place. Sufficient moisture and humidity are required for the proper development of microbial, especially insecticides of Fungi. The number of insect pests should be above the limit for a controller of Micro-organism. Some of our friends in agriculture are pests, which have an essential role in biological control in which we get control of pests by insects. Bacterial fertilization means that bio fertilizer is a culture that contains nitrogen phosphorus and potassium drug content for the growth of farmers and potash is the most essential element. The lack of any of these plants stops the growth and the yield decreases and the yield decreases frequently in the soil. There is a deficiency of this and to take more yields, we have to put this element in the form of chemical fertilizers. The functioning of these bacteria is multiplied by their cost. But fungal based microorganisms should not be used in combination with bacterial chemicals they should be stored on a cold and dry place. Sufficient moisture and humidity are required for the proper development of microbial, especially insecticides of fungi. The number of insect pests should be above the limit for a controller of micro-organism. Some of our friends in agriculture are pests, which have an essential role in biological control in which we get control of pests by insects (Nautiyal, C.S. 1997).

General Importance of Microorganism

Microorganisms are vital to humans and the environment, as they participate in the Earth's element cycles such as the carbon cycle and nitrogen cycle, as well as fulfilling other vital roles in virtually all ecosystems, such as recycling other organisms' dead remains and waste products through decomposition. They also have an important place in most higher-order multi cellular organisms as symbiont (symbiotic organisms).They also have important uses as following: (a) in digestion (b) in food (c) in water treatment (d) in energy (e) in production of chemicals and enzymes (f)in scientific research. Importance in Human Health: a) Human digestion b) Diseases caused by microorganism (Alstrom, S. 1991).

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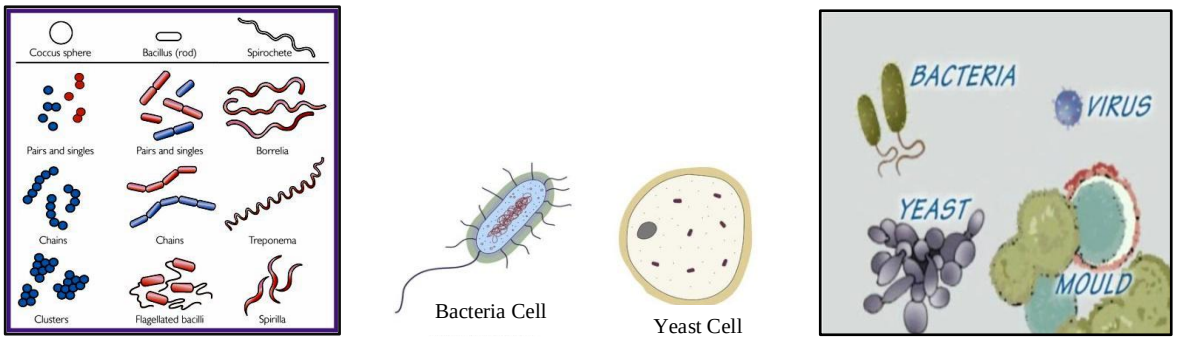

Fig. 1. Different types of Microorganisms

Importance in Ecology

Micro-organisms are critical to the processes of decomposition required to cycle nitrogen and other elements in the natural environment.

Importance of microorganisms in agriculture

Agricultural microbiology is concerned with the relationship between microbes and crops with an emphasis on improving yields and combating plant diseases. In agriculture microorganisms have many uses. Some microorganisms are beneficial, some are harmful. Soil microbes (bacteria and fungi) are essential for decomposing organic matter and recycling old plant material. Some soil bacteria and fungi form relationships with plant roots that provide important nutrients like nitrogen or phosphorus. Fungi can colonize upper parts of plants and provide many benefits, including drought tolerance, heat tolerance, resistance to insects and resistance to plant diseases. The main importance of microbes in agriculture is the involve of microbes in nutrient transformation processes, such as- (1) Nitrogen cycling (2) Carbon cycling (3) Sulphur cycling (4) Phosphorus cycling (5) Bio-fertilizers (Lampkin, N. 1990).

Microorganism

A microorganism is a living organism that can only be seen using a microscope. Microorganisms are incredibly diverse and include bacteria and fungi as well as archaea, protists, plankton and some amoebae. Viruses are not considered to be living organisms but are often considered to be microorganisms because of their extremely small size. The invention of the microscope allowed humans to look into the tiny world of microorganisms. Since their discovery, microorganisms have been found to inhabit almost every environment on earth including those thought previously to be uninhabitable, such as hot springs and acidic pools. Humans had long used microorganisms to make bread, cheese, yoghurt, wine and beer but without knowing how these processes worked. We are also discovering that microorganisms are vital to the health of the planet by being an important part of nutrient cycling.

Role of microorganism

The atmosphere around us is approximately 80,000 tonnes of nitrogen per hectare of land, this nitrogen was not prepared to directly receive the plant that vaccine bacteria such as *Rhizobium, Azotobacter, Pseudomonas,* nitrogen to take roots of plants. Some bacteria that are capable of making the phosphorus found in the soil or insoluble phosphate of single super phosphate. The change juice insoluble phosphorous some bacteria by mold and formula personnel spread by roots prevents the spread of diseases. In view of the growing world population and its growing food grain production requirement, dependence on chemical fertilizers and pesticides has to be reduced and it is necessary to harness many beneficial relationships between plants and microorganisms to achieve this objective. Microorganism Beneficial activities such as nitrogen stabilization, nutrient compilation, intake of nutrients are more important due to disease control, better soil structure and help in plant development etc., in general, the microorganisms used in agriculture *Rhizobium, Bacillus* is comprised of *Mycorrhiza, Pseudomonas, Tricoderma, Streptococcus* and many other microorganisms etc. Lotter, D.W. (2003).

Uses of microorganism

Friends insect conservation of insects in agriculture and in natural biological form, we can control insects by pest free of agriculture in which our assistive insect consists of a mite insect circle mainly in the *Trichoderma* which is a microorganism, which helps to free the disease by eating mildew.

- *Pseudomonas fluorescens* an antibiotic bacterium, which has the ability to consume the main diseases such as epidemic diseases, root mucus, and fungal infection in vegetables.
- *Bacillus subtilles* is also an antibiotic bacterium, which mainly comes in the process of barley seed treatment, which increases the germination percentage by reducing the seeds.
- *Rhizobium bacteria* the name of a particular type of bacterium that forms pink coloured glands on the roots of leguminous plants and converts nitrogen into the ammonia together with the plant, thus this bacterium not only meets the requirement of nitrogen of leguminous plants. Instead, they also provide nitrogen for sowing wheat, mustard, millet, paddy etc.

- *Bacillus thuringiensis*is a bio control agent that can be introduced in order to control butterfly caterpillars by this bacterium. They are available as dried spores which are mixed with water and sprayed into vulnerable plants such as *Brassica* and fruit trees.
- *Mycorrhiza*fungi also form symbiotic association with plants. The fungal symbiotic absorbs phosphorus from soil and passes it to the plant.
- *A cyanobacterium in paddy field serves* as an important bio fertilizer.
- *Escherichia coli* (*E. coli*) is a rod-shaped bacterium that lives in the gut of warm-blooded animals. It is a crucial tool in modern biotechnology and often used in molecular biology laboratories due to its ease of culture and rapid growth.

If we use biological products in the preparation of all these experiments their effect will increase their quality, whatever components are the elements, it is a part of organic farming, more qualified matter will be ready, as well as some point in the system of experiment be attentive like whenever we use these biological pesticides, keep in mind that whatever solution is made, it should be prepared in the shade, at the cool place. No microorganism can lead to difficulties in life, so that there will be no adverse effects on their growth, save the other directly from the sunlight, so that the matter is not hot, microorganisms can die due to sunlight, as well as the use of ready slurry crop. During the time of the rising sun or i.e. after noon, the utility will increase, at this time the micro-organism can be used at night by using its function and speed, to view the used farming and taken advanced benefits.

Microorganisms play an important role in our life; helps us to digest our food, decompose wastes and participate in various life cycles. Microorganisms has great beneficially effects other than causing disease and damage to life. Different kinds of microorganisms that have been carried out many biotic processes beneficial for biotechnology, agriculture and industry and moreover necessary for sustaining life and our surrounding environment like soil, water and atmosphere as well. Essential uses of microorganisms are seen in the environment, as they play a vital role in many of the nutrient cycles. In addition, microorganisms are vital participants of the food chain since they act as decomposers. Involvement of microorganisms in the nitrogen cycle demonstrates that they are not just beneficial for humans, but are significant to plants as well. Moreover, microorganisms digest harmful chemicals, such as pollutants and chemical wastes produced by the industry through a process known as bioremediation, thus protecting the environment and human health. Applications of microorganisms in the food industry, mainly in the production of dairy products are another example where microorganisms are beneficial to humans. Application of microorganisms in the medical industry is beneficial to human health, but also to the economy because huge amount of medicines being produced using microorganisms. Overall, microorganisms are vital for life on Earth and are more than disease causing agents Lotter, D.W. (2003).

Some important groups of Bio-Fertilizers

Bio-fertilizers are of different types (Table-1) that helps in increase in soil microbial activity and thereby improve the soil nutrient cycling. Some of beneficial bio-fertilizers has described below:

a) Azolla-Anabena symbiosis: Azolla is a small, eukaryotic, aquatic fern having global distribution. Prokaryotic Blue Green Algae (BGA), Anabena & Azolla resides in its leaves as a symbiont. Azolla is an alternative nitrogen source.

b) Rhizobium: Symbiotic nitrogen fixation by Rhizobium with legumes contributes substantially to total nitrogen fixation. Rhizobium inoculation is a well-known agronomic practice to ensure adequate nitrogen.

c) Mycorrhiza: Mycorrhiza is a group of fungi that include a number of types based on the different structures formed inside or outside the root. These are specific fungi that match with a number of favourable parameters of the host plant on which it grows. This includes soil type, the presence of particular chemicals in the soil types, and other conditions. These fungi grow on the roots of these plants. In fact, seedlings that have mycorrhizal fungi growing on their roots survive better after transplantation and grow faster. The fungal symbiont gets shelter and food from the plant which, in turn, acquires an array of benefits such as better uptake of phosphorus, salinity and drought tolerance, maintenance of water.

d) Legume-rhizobium relationship: Leguminous plants require high quantities of nitrogen compared to other plants. Nitrogen is an inert gas and its uptake is possible only in fixed form, which is facilitated by the rhizobium bacteria present in the nodules of the root system. The bacterium lives in the soil to form root nodules (i.e. outgrowth on roots) in plants such as beans, gram, groundnut, and soybean.

e) Blue-green algae: Blue-green algae are considered the simplest, living autotrophic plants, i.e. organisms capable of building up food materials from inorganic matter. They are microscopic. Blue-Green Algae (BGA) are widely distributed in the aquatic environment. They adapt to extreme weather conditions and are found in snow and in hot springs, where the water is 85 °C. Certain Blue-Green Algae live intimately with other organisms in a symbiotic relationship. Some are associated with the fungi in form of lichens. The ability of Blue-Green Algae to photosynthesize food and fix atmospheric nitrogen accounts for their symbiotic associations and also for

their presence in paddy fields. (Panse, V. G & Sukhatme, P. V. 1989)

Table 1. Bio-fertilizers can be grouped in different ways based on their nature & function

S.N.	Groups	Examples
N2 fixing Biofertilizers		
1	Free-living	Azotobacter, Clostridium, Anabaena, Nostoc,
2	Symbiotic	Rhizobium, Frankia, Anabaena azollae
3	Associative Symbiotic	Azospirillum
P Solubilizing Biofertilizers		
1	Bacteria	Bacillus megaterium var. phosphaticum Bacillus circulans, Pseudomonas striata
2	Fungi	Penicillium sp, Aspergillus awamori
P Mobilizing Biofertilizers		
1	Arbuscular mycorrhiza	Glomus sp., Gigaspora sp., Acaulospora sp., Scutellospora sp. & Sclerocystis sp.
2	Ectomycorrhiza	Laccaria sp., Pisolithus sp., Boletus sp., Amanita sp.
3	Orchid mycorrhiza	Rhizoctonia solani
Biofertilizers for Micro nutrients		
1	Silicate and Zinc solubilizers	Bacillus sp.
Plant Growth Promoting Rhizobacteria		
1	Pseudomonas	Pseudomonas fluorescens

Future prospects:

- Increased diversity, long-term soil fertility, high food quality, reduced pest/disease, self-reliant production system, stable production.
- Reduced pollution, reduced dependence on non-renewable resources, negligible soil erosion, wildlife protection, resilient agro-ecosystem, compatibility of production with environment.
- Improved health, better education, stronger community, reduced rural migration, gender equality, increase employment, good quality work.
- Stronger local economy, self-reliant economy, income security, increase returns, reduced cash investment, low risk (Paulland John 2006).

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