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Isolation and Characterization of Microorganisms Found in Garden Soil of Jijamata Campus Situated In Buldhana District Maharashtra

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Abstract*— The study has clearly described the role of microorganisms in enhancing the quality of the soil of the Buldhana district of Maharashtra. The study mainly demonstrated the characteristics of different types of gram-positive and gram-negative bacteria found in the Jijamata Campus of Maharastra. After analysing the soil of the Jijamata campus, it can be observed that Bascillus, Clostridium, and Streptococcus were found. These gram-positive bacteria are generally stained in purple and can be easily denoted in this study. On the other hand, the presence of gram-negative bacteria in the black soil of Maharashtra can also be observed.

Keywords:* Microorganisms, Jijamata campus, Gram positive, Gram negative, Nitrogen fixation.

I. INTRODUCTION

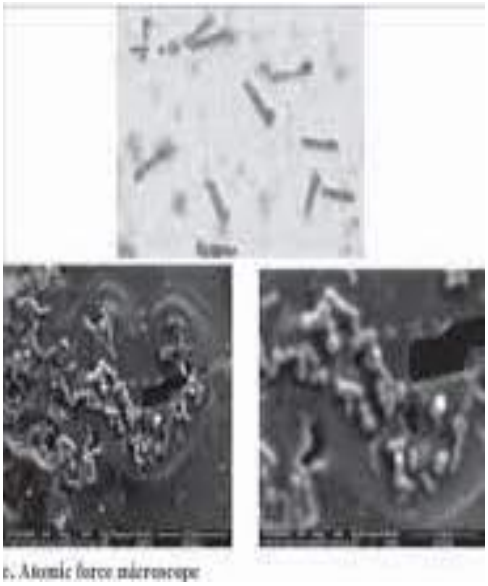
Microorganisms are generally known as microscopic living bodies that include fungi, bacteria, and also protists. The study also helps individuals to know that microorganisms do not incorporate non-living organisms such as viruses and prions. The study is going the shed light on the availability of microorganisms in the garden soil of the Jijamata Campus in Maharashtra. In this context, it can be observed that the garden soil of the Jijamata campus contains some gram-positive and gram-negative bacteria. Microorganisms are able to live in any kind of places such as soil, skin, or water. The presence of microbes in the soil is beneficial because they directly regulate the nutrient cycle inside the soil. In addition, microbes are responsible to add Nitrogen, Sulpher, Carbon, and Phosphorous to the soil. Bacteria can be denoted as one of the fundamental microorganisms of soil that keeps the soil fertile, productive, and healthy.

II. LITERATURE REVIEW

Isolation of gram-positive organisms: The Jijamata campus soil contains some gram-positive bacteria such as “Bacillus”, “Clostridium” and “Streptococcus”.

Bacillus: The species Bacillus is generally an aerobic and gram-positive bacterium, that is also found in the soil of Maharashtra. They are mainly sporulating and rod-shaped in structure, hence some of the species of Bacillus are “B lentimorbus”, “B popilliae”, “B sphaericus”, and “B thuringiensis” [3]. It can be observed that the genus bacillus is one of the predominant microbes present in the soil of the Jijamata Campus. The fundamental characteristic of the Bascillus is its tremendous capability of metabolism. They also control the nutrient cycle of soil and provide strength to plants for tolerating external stress. Therefore, plants can easily intake nutrients from the soil directly, hence the growth of plants in the Buldhana district can be observed.

Clostridium: The soil of the Jijamata Campus contains clostridium bacteria and the size of bacteria present is between 3 to 7 µm long. The clostridium bacteria are generally gram-positive and rod-shaped in nature. The cells of the bacteria have the capability of resisting heat and toxic chemicals. Some of the species of Clostridium that are found in the soil of Jijamata Campus are Clostridium perfringensand Clostridia [4]. The Clostridium bacteria have the capability to present under extreme situations in soil and also tolerate heat. Clostridium are mainly saprophytes in nature hence these species feed nonliving organisms. They take part in the decomposition process, and as a result, it causes the deterioration of dead materials. It adds nutrients to the soil of the Jijamata campus of the Buldhanda district and the presence of humus is one of the major characteristics of the soil.



c. Atomic force microscope

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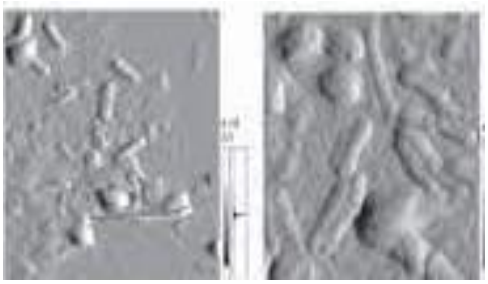

Figure 1: Clostridium
Source: [4]

Streptococcus: The bacteria streptococcus is another gram-positive bacterium that is present in the soil of Maharastra. They are mainly spheroidal in structure and under the electron microscope, anyone can observe the group of chains or beads. In the black soil of Maharashtra, there are mainly *Streptococcus sanguis*can be found and the size of the bacteria is 0.5 and 2 µm [9]. Streptococcus provides essential nutrients to plants after chemically reacting with the components of the soil. In this way, the complex structure of soil becomes simple and plants can easily utilise those components for living.

Isolation of gram-negative organisms

Nitrobacter: After collecting soil from the Jijamata campus of Maharastra, it can be found that Nitrobacter is present in that soil. Nitrobacter is a gram-negative organism with a rod-shaped structure. The soil of the Jijamata Campus contains nitrogen, carbon, phosphorus, and other nutrients. Nitrobacter plays an essential role in converting nitrogens by oxidization process and converting it into nitrate [5]. Nitrobacter also helps in the fixation process of energy formed after nitrogen fixation.

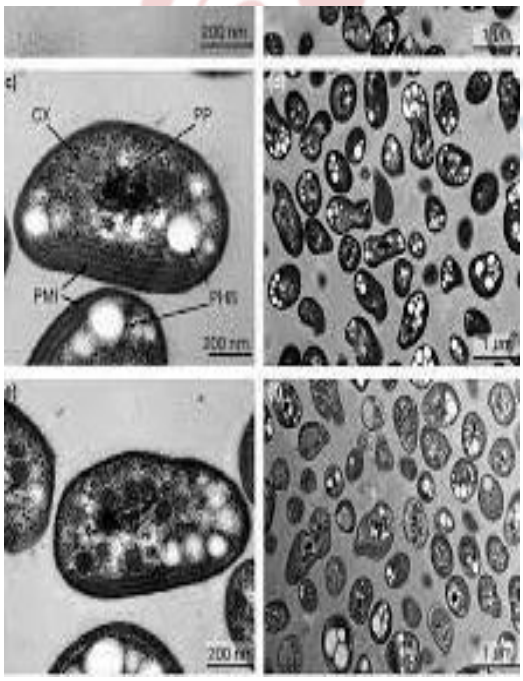

Figure 2: Nitrobactor
Source: [5]

Pseudomonas: The pseudomonas bacteria is gram-negative and generally found in water and soil. These bacteria species show a diverse range of metabolic activities therefore the presence of pseudomonas in the soil can mix lots of nutrients. Other characteristics of pseudomonas bacteria are, flagellated, rod-shaped, and sporulated. In the soil of the Jijamata Campus, the species P. putida is present in a huge range and this particular species plays an essential role in the carbon-nitrogen cycling process [6]. Hence, the Pseudomonas species help to enhance phosphatase activities in soil, which ultimately mixes natural manure in the soil of Maharashtra.

III. MATERIALS AND METHODS

Isolation process of gram-positive and gram-negative organisms 2

The isolation of gram-positive and gram-negative bacteria from the soil of the Jijamata Campus is required to evaluate different kinds of organisms. Therefore soil samples were taken from the Jijamata Campus in the Buldhana District of Maharastra. After collecting soil samples, those samples were carefully locked in zip-lock bags. In this process, samples were stored at darkness and also mixed with a 9ml solution [8]. The mixing process has been conducted in different test tubes and it can be observed that isolation is required for this process. Therefore, the Winogradsky media has utilised for the research to conduct the isolation of different organisms [7]. Sterile Petrides was another important equipment for this research and the temperature was also maintained atleast28 degree C. Those samples were stored for a minimum of 7 days and then cultured samples were taken out for identification and characteristical analysis. Bacterial identification depends on the biochemical and morphological characteristics of the species. If the soil demonstrates the extreme presence of nitrogenous components, that denotes the high presence of gram-negative bacteria in the soil of the Jijamata Campus. On the other hand, the extreme presence of the organic compound in the solid of Maharashtra demonstrates the presence of gram-positive bacteria.

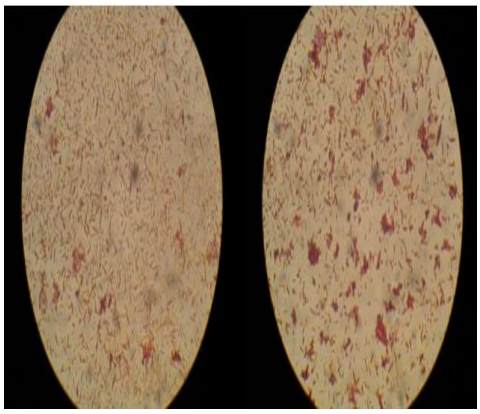

Figure 3: Gram staining process
Source:[7]

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IV. DISCUSSION

Characteristics of microorganisms found in Maharashtra

The Buldhana district of Maharastra is mainly famous for agricultural activities, hence the entire state contains black soil. Some major crops of Buldhana district are cotton, Bajra, Jowar, Wheat, and pulses. This type of black soil is extremely fertile and consists of humus, Nitrogen, Potash, carbonate, and magnesium. In this context, it can be observed that the Black soil of the Buldhana district of Maharastra mainly contains some gram-positive bacteria such as Bacillus, Clostridium, and Streptococcus [1]. On the other hand, the soil from Jijamata Campus also contains some negative bacteria "pseudomonas" and "Nitrobacter". Microorganisms are mainly responsible to fullfill the requirements of the soil by providing or adding nutrition to it. Nitrogen is one of the essential elements for soil in the both organic and inorganic states. There are 78% of free nitrogen is present in the Atmosphere, however animals or plants cannot utilise those free nitrogen directly. In that case, bacteria play a fundamental role in the transformation of nitrogen and make it usable for plants with the help of five steps "fixation", "uptake", "mineralization", "nitrification" and "denitrification". Microorganisms have the capability to metabolize protein, carbohydrates, and other organic compounds. It can be observed that microorganisms found in the Jijamata campus of the Buldhana district can grow at temperatures between 20 degree C to 40-degree C. The pH of black soil is 7.2 to 8.5 and it can be observed that the best growth of microorganisms occurs in this condition. The presence of extremely acidic or extreme basicity can hamper the growth of micro organism and also hinder the activities of microorganisms [2]. On this note, it can be stated that microorganisms react with the chemicals present in the soil of the Jijamata campus which leads to the formation of decomposed materials. As a result, the soil of the Jijamata Campus depicts the presence of a huge quantity of organic substances.

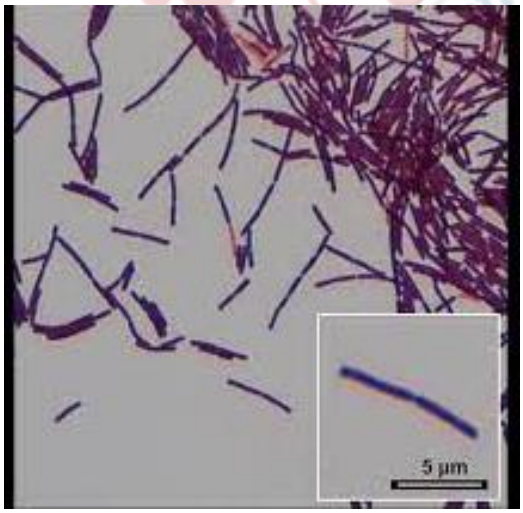

Figure 4: Bacillus
Source: [1]

V. CONCLUSION

The study helps to evaluate the types of microorganisms found in the soils of the Jijamata Campus in the Buldhana district of Maharashtra. The presence of microorganisms in soil can foster plant growth by adding nutrients to the soil. There are mainly two types of microorganisms that can be observed in this study, gram-positive bacteria and gram-negative bacteria. The soil of Maharashtra is generally rich in Humus and the color of the soil is black. In that case, high activities of microorganisms can be observed in the soil of the Jijamata campus. Bacillus and Clostridium are generally responsible for reacting with the complex components of the soil and making it simple structure so that plants can easily take those ingredients to obtain energy. On the other hand, Nitrosomonus is mainly responsible for Nitrogen fixation, which may lead to plant growth of the Buldhana district of Maharastra.

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