THE IMPORTANCE OF RHIZOBACTERIA IN AGRICULTURE.

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Abstract: Diseases of cultivated crops in agriculture are developing from year to year and are developing a special immunity to fungicides, which leads to an increase in the use of fungicides in the fight against diseases. in this article you will learn the importance of fungicides derived from rhizobacteria.

Key words: Rhizobacteria, Rhizosphere Monoculture and Soil Ecology

The need for food security is becoming increasingly urgent as the world's population, currently around 7 billion, is expected to grow to nearly 10 billion or more in the next 50 years [1]. Arable land is becoming a limited resource due to urban developments and industrialization; from now on, the available agricultural land should be used more efficiently using appropriate agricultural methods [2]. Excessive use of synthetic fertilizers and other agrochemicals for higher yields is on the rise. However, this is not a sustainable strategy, as the result of these actions will have a negative impact on the environment. Soil ecology is affected by the improper use of fertilizers, as well as the use of permanent monoculture crops and pesticides (rhizosphere autotoxicity) [3]. In addition, agrochemicals cause eutrophication, which affects water ecosystems in cultivated fields [4].

Therefore, researchers are focusing on wide opportunities for efficient use of agricultural land. Bacteria present in the rhizosphere cooperate with the host plant and have a positive effect on its growth [5]. Plant growth promoters (PGPs) are supplied by beneficial bacteria living in or around plant roots, such as in the rhizosphere, "plant growth and development rhizobacteria" (Bacteria known as PGPR) protect plants from abiotic and biotic diseases and various stressful conditions, as well as improve their physiological capabilities [6]. These beneficial soil microorganisms, however abundant in the rhizosphere, are generally underutilized as bio-inoculants for crop production, especially under abiotic stress [7]. Therefore, today rhizobacteria are of great interest as a component of integrated plant nutrient management systems, while being represented as an environmentally friendly tool for increasing crop productivity among agricultural and environmental research. Rhizobacteria present in the rhizosphere are an effective alternative to agrochemicals. The rhizosphere hosts a wide range of microbes in direct contact with plant roots, and thus the rhizosphere is a hotspot of bacterial diversity. Plant roots release several organic nutrients such as sugars, amino acids, and plant effluents and send signals that stimulate microbial growth and production, so they harbor 5-10 times more fungi than normal soil. and feeds 10-50 times more bacteria [8].

The term "rhizosphere" was first defined by Lorenz Hiltner in 1904 as the soil region closely associated with plant roots [29]. The term "rhizobacteria" refers to the accumulation of rhizosphere microbes around the plant root surface. Bacteria living in the rhizosphere are the source of the formation of colonies of endophytic bacteria, and the bacteria adapted to live endophytically in the roots of plants are the most common. Endophytic bacteria are located in intracellular and intercellular spaces or in various tissues. Bacteria enter plant tissues, especially through lateral roots or root hair cells. The ability of endophytic bacterium Enterobacter asburiae JM22 to hydrolyze cellulose attached to the plant cell wall contributed to its entry into the cells of the umbilical cord. Root endophytes penetrate the lateral root epidermis below the root hair zone and in root cracks. They have the ability to establish intercellular and intracellular populations. The interaction of host plants with endophytes is facilitated by the growth of roots in plants due to the action of bacteria. Shifts at the cellular and molecular levels that occur during plant development can also affect endophytic colonization. Enzymatic mechanisms play an important role in ensuring the penetration of endophytic microorganisms into plants, which can then be transmitted through seeds. The plant root not only provides mechanical support and absorbs plant nutrients, but also contains, accumulates and releases various chemical compounds in the form of root exudates. These root exudates act as chemical attractants for different groups of soil microbial communities. Exudation of a diverse group of chemical compounds regulates soil microbial communities by altering soil physical and chemical properties. In addition, microbial interactions in the rhizosphere influence rooting patterns and enhance the supply of nutrients available to plants. Microbes use root exudates in the rhizosphere as sources of carbon and nitrogen. In return, plants receive organic molecules obtained by microbes for growth and development. Microbial communities can protect up to 15% of the root surface because they also have the metabolic flexibility to adjust the quality and quantity of root exudates for their use. The components of exudates can be called allelochemicals, phytotoxins, phytoalexins, phytohormones and ectoenzymes. Measurements of exudates vary from plant to plant, plant growth cycle, and rooting pattern.

According to the cited literature sources, the demand for agricultural crops is increasing year by year, taking this into account, the role of rhizobacteria, which are present in the soil of each field and are used as biocontrol agents that form an associative symbiosis with plants, is very important.

Microbiological biopreparations allow to reduce the consumption of drugs with various chemical properties and increase the productivity of agricultural crops, while they are used in the biological protection of plants by acquiring high activity in the ecological regeneration of the soil. Rhizobacteria, which have the ability to synthesize plant phytohormones, including auxins (indole-3-acetic acid), gibberellins and cytokinins, synthesize biopolymers that allow plants to overcome stress factors in unfavorable environmental conditions (salinity and drought).

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