



BIOLOGY AND BIOTECHNOLOGY OF ENDOPHYTE MICROORGANISMS

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Article history:

Received: November 24th 2022

Accepted: December 26th 2022

Published: January 30th 2023

Abstract:

Today, endophytic microorganisms are widely studied around the world, and scientists have collected a lot of information about it. The role and properties of endophytic microorganisms in the growth and development of plants are of great practical importance. In particular, endophytic microorganisms were first described by the German botanist John Link in 1809. Although its role in plants was unknown at first, later French scientist Beecham proposed to call it "microorganism", and finally in 1887, Victor Galipp discovered bacteria found in plant tissues. Endophytic microorganisms, like other biological concepts, are based on many scientific studies that have been confirmed over time. The term "endophyte" means "endo" means inside and "phyton" means plant.

Keywords: Endophyte, endophytic archaea, viruses, viroids, and protozoa in trees, endofungal bacteria, mycoviruses, and bacteriophages.

INTRODUCTION

The term "endophyte" was first used by Henry Anton De Bary in 1866, in which endophytes were defined as any microorganisms living in plant tissues, i.e. fungi, bacteria. In 1986, Carroll described endophytic organisms as fungi that live in plant tissues and cause various infections. In 1991, Petri defined endophytes as fungi, bacteria, actinomycetes, and mycoplasmas that can live in plant tissues. He defined it as any micro-organisms that do not harm the host plant and showed the symbiotic relationship of endophytes with the plant. He mentioned that sometimes endophytes can be weak pathogens that harm plants. However, it has been confirmed that most endophytes are not pathogenic. Endophytic microorganisms are hidden companions of plants, living a mutually beneficial life inside the plant. Although these endophytes are thought to have evolved and associated with land plants, endophytes were only recognized in the last century. The beneficial effects of endophytes are gaining importance due to the possibility of obtaining new medicinally important compounds, as well as their role in increasing productivity, because they produce various compounds and interact with other pathogenic and non-pathogenic microorganisms. does. With the development of modern tools and methods of molecular biology, it became possible to determine the correct identification of these microorganisms and to know their interactions with the host and other microorganisms.

LITERATURE ANALYSIS AND METHODOLOGY

The biology and biotechnology of endophytes has become a hot topic in recent research in modern biology, but a complete understanding of the nature of endophytes and endophytism is still not fully formed. However, further studies are needed to investigate possible endosymbionts of endophytic microorganisms such as endophytic archaea, viruses, viroids, and protozoa in trees, as well as endofungal bacteria, mycoviruses, and bacteriophages. Understanding microbe-microbe interactions between these communities and host-plant microbes and their implications for plant health can be of great value in evolutionary and applied sciences. Furthermore, systematic approaches are needed to further characterize the domain of bioactive chemicals produced by these endophytic and endofungal communities [5]. Today, one of the requirements of the developing part of biotechnology is the use of desirable endophytes in biotechnological fields. In addition to biologically active secondary metabolites, endophytes produce certain substances such as plant metabolites [7]. The fact that plants have a different chemical composition and the complexity of their endophytes, the isolation of secondary metabolites from them determines their biotechnological potential. This increases its pharmaceutical value. To use endophytes in the biotechnology industry, it is first necessary to identify the desired microorganism from the community



of plant endophytes. The selection of such bacteria is one of the first steps in the synthesis of valuable secondary active biological substances from the necessary endophytes. Based on this, stable production of substances with high pharmaceutical value is achieved [26]. However, it is known that the production of substances through the necessary microorganism has not yet been fully established, which is hindered by a number of problems.

In the research, generally accepted methods in microbiology and biotechnological, microbiological, statistical methods were used.

RESULTS

In the biotechnology of endophytic microorganisms, it is possible to list several of their clearly defined features. 1. Prospects of using endophytes as biofertilizers 2. Production of enzymes from endophytes, their purification and their application. 3. Isolation and use of secondary metabolites from endophytes 4. Biotechnological potential of endophytes in creation of new biopreparations by means of endophytes and their use in pharmaceutical applications. 5. The potential of endophytes in biodegradation, metal extraction, bioaccumulation 6. Scope of use of endophytic microorganisms in the production of nanomaterials with different properties such as nanobiopreparations, non-pesticides, nanofertilizers 7. Genetic material of endophytes, their functional genomics and its application. These above are considered to be the main means of determining the potential of endophytes in biotechnology.

DISCUSSION

The rapid growth of antibiotic resistance of microorganisms that cause various human infectious diseases requires the search for new natural sources of effective antimicrobial compounds. The results of isolation of endophytic actinobacteria from twelve medicinal plants growing in the Republic of Tatarstan and evaluation of their activity against five types of gram-positive bacteria associated with respiratory tract infections were obtained, which also shows its importance in biotechnology. 68 isolates of actinobacteria were isolated from the roots, stems and leaves of the plants, the main number of endophytes was in the roots (38.24%), and the least in the leaves (29.41%). 14 isolates were found to have antimicrobial effect against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterococcus faecalis*, *Corynebacterium striatum*, *Bacillus subtilis* isolated from the respiratory tract of patients. The pharmaceutical potential of endophytes lies in the synthesis of substances that can

be used as a cure for various human diseases. In this, their antimicrobial ability is highlighted as the factor that reveals the main biotechnological potential. Today, endophyte biology and biotechnology are widely studied by world scientists, and based on their research, they are creating the basic ground for the industrialized "endophyte biotechnology" network.

CONCLUSION

Researches include the composition of the community of endophytes isolated from different parts of the *Cichorium intybus* plant, their interactions, and the importance of endophytic microorganisms. In addition, the production of secondary metabolites, biologically active substances by endophytes, the study of specific aspects of their physiological and morphological properties, and their use in the endophyte biotechnology industry are considered.

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