**CZU 579.87 : 574.5 : 579.22**

# ACTINOBACTERIA OF THE RARE GENERA *ACTINOMADURA* AND *ACTINOPLANES* ISOLATED FROM THE LA IZVOR LAKE SYSTEM (CHISINAU) AND THEIR ENZYMATIC ACTIVITY

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**Summary.** Capacitatea de a produce astfel de enzime precum amilaza, catalaza, lipaza și celulaza a fost determinată la tulpini de actinobacterii din genurile rare de *Actinomadura* și *Actinoplanes* izolate din sistemul de lacuri La Izvor. Noi tulpini de actinobacterii

cu activitate înaltă și medie vor fi deponate la Colecția Națională de Microorganisme Nepatogene.

**Key-words:** enzymatic activity; actinobacteria; aquatic ecosystems; *Actinomadura*; *Actinoplanes*.

## INTRODUCTION

Currently, the problem of biodiversity conservation is receiving increasing attention. This is evidenced by the world congresses, projects to create various nurseries, banks and collections, which are needed as repositories of the largest possible set of various genetic resources. The biological diversity of plants, animals and microorganisms is a factor of fundamental importance for the survival of mankind [1].

Aquatic ecosystems in the form of lakes in various regions provide irreplaceable water resources to humans. The microbiomes of lake ecosystems are suitable bioresources for agriculture, industry and related sectors. In recent years, the assessment of microbial richness on Earth has changed. For example, Mora et al. in 2011 estimated about 611.000 fungal taxa, 36.400 protists, and 9.680 bacteria on Earth (including the oceans), based on a predictable pattern of diversity at the highest taxonomic level [2, 3]. It is clear that microorganisms play a central role in global ecological processes, being the most important component that in aquatic ecosystems is responsible for the processes of organic matter mineralization and nutrient cycling [2, 4, 5].

Microorganisms enter biogeocenoses as components of a heterotrophic block, occupying the level of decomposers of organic matter, mainly of plant origin. Microorganisms play the main role in the decomposition and mineralization of organic matter in the soil, water sources, which is a necessary stage in soil formation and biogenic purification of water bodies. The specificity of the enzyme systems of microorganisms contributes to a wide area of their distribution and development of new ecological niches [6]. So, for example, when studying the inhabitants of Lake Baikal and their characteristics, it was found that actinobacteria found in the water of the lake are characterized by high enzymatic activity. More than 70.0% of streptomycete strains exhibit phosphatase, protease and lipase activity, and about 60.0% of representatives of the *Micromonospora* genus exhibit phosphatase,

lipase, amylase and cellulase activity. Many of the detected strains (up to 93.0%) assimilated starch and destroyed cellulose (up to 63.0% of the studied strains) [7].

## MATERIALS AND METHODS

Enzymatic activity was determined by next methods: starch-iodine (amylase); glass-drop (catalase); carboxymethyl cellulose (cellulase); Tween 80 (lipase).

The purpose of the research was to determine the ability of new strains of actinobacteria of the rare genera *Actinomadura* and *Actinoplanes*, isolated from the La Izvor lake system, to synthesize such enzymes as amylase, catalase, cellulase and lipase.

## RESULTS AND DISCUSSION

Experiments have shown that strains of the genera *Actinomadura* and *Actinoplanes* exhibited enzymatic activity in different ways, depending on belonging to the genus and species, as well as on the location (water column, biofilm, silt) (Table 1).

Thus, out of 2 strains of the genus Actinomadura isolated from the water column, only one strain A 1.2 showed low (+) activity in amylase, catalase, and cellulase. In 3 strains assigned to the genus Actinoplanes isolated from water, low (+) amylase activity was noted, as well as catalase activity of an average level (++) in strains A 2.1 and A 2.3, and low (+) catalase activity in strain A 2.2.

One strain of the genus *Actinoplanes* was isolated from the biofilm, which showed high (+++) catalase activity, medium (++) for lipase, and low (+) for amylase.

Five strains of the genus *Actinomadura* and 5 strains of the genus *Actinoplanes* were isolated from the bottom silt sediments of the La Izvor lake system. It was found that these strains equally showed low amylase activity (with the exception of strain N 2.1 of the genus *Actinoplanes* with no amylase activity). A wide variety of catalase activity levels was observed in representatives of both rare genera. Thus, out of 5 strains of the genus *Actinomadura*, 2 strains (N 1.3 and N 1.5) had medium (++) activity, strain N 1.2 had low (+) activity, while out of 5 strains of the genus *Actinoplanes*, 1 strain (N

2.1) showed high (+++) catalase activity, strain N 2.5 – medium (++), and 3 strains (N 2.2; N 2.3; N 2.4) – low (+) catalase activity. Out of 5 strains isolated from bottom silt sediments and assigned to the genus *Actinomadura*, 2 strains differed in lipase activity: in strain N 1.1 it was high (+++), and in strain N 1.4 it was medium (++), while out of 5 strains of the genus *Actinoplanes*, only 2 strains (strains N 2.3 and N 2.4) showed low (+) lipase activity.

**Tab. 1. Enzymatic activity of actinobacteria isolated from the La Izvor lake system (Chisinau).**

| Genus | Strain № | Amylase | Catalase | Cellulase | Lipase |
|---|---|---|---|---|---|
| | **Strains isolated from water column** | | | | |
| ***Actinomadura*** | A 1.1 | - | - | - | - |
| | A 1.2 | + | + | + | + |
| ***Actinoplanes*** | A 2.1 | + | ++ | - | ++ |
| | A 2.2 | + | + | - | - |
| | A 2.3 | + | ++ | - | - |
| | **Strains isolated from biofilm** | | | | |
| ***Actinoplanes*** | B 2.1 | + | +++ | - | ++ |
| | **Strains isolated from silt** | | | | |
| ***Actinomadura*** | N 1.1 | + | - | - | +++ |
| | N 1.2 | + | + | - | - |
| | N 1.3 | + | ++ | - | - |
| | N 1.4 | + | - | + | ++ |
| | N 1.5 | + | ++ | - | - |
| ***Actinoplanes*** | N 2.1 | - | +++ | - | - |
| | N 2.2 | + | + | - | - |
| | N 2.3 | + | + | - | + |
| | N 2.4 | + | + | - | + |
| | N 2.5 | + | ++ | - | - |

Thus, the conducted studies have shown that new actinobacteria of the rare genera *Actinomadura* and *Actinoplanes* isolated from the La Izvor lake system have the ability to produce enzymes such as amylase, catalase, lipase and cellulase with different levels of activity. Two strains with high catalase activity, 1 strain with high lipase activity, 5 strains with medium catalase activity and 2 strains with medium lipase activity were identified. These strains of actinobacteria will supply the National Collection of Non-pathogenic Microorganisms.

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*The research was funded out within the project 20.80009.7007.09 (ANCD).*