Antibacterial impact assessment of cyanobacteria

Vivien Vincze

vivi.vincze13@gmail.com
Bessenyei György Secondary Grammar School, Hungary

1. INTRODUCTION

Cyanobacteria (blue-green algae) are ancient microorganisms found worldwide. Cyanobacteria may be able to produce secondary metabolites of different structures and effects. *Nostoc* species [Figure 1.] belong to the group of heterocystic filamentous cyanobacteria. *Nostoc* species have long been known to produce metabolites with a wide variety of biological effects. One group of biotechnological and therapeutic significance is the group of metabolites with antimicrobial effects, especially those with antibacterial effects.

Figure 1. *Nostoc* species

2. AIMS

During our work, the antibacterial effect of *Nostoc* isolates was investigated on *Escherichia coli* (*E. coli*) cultures. Our aim was to find cyanobacterial strains with antibacterial effects and to increase the number of new antibiotics in the future. But what motivated me to start this research? Childhood illnesses sparked my interest in medicines, growing into a passion. My research not only broadened my knowledge but also moved me closer to my dream of advancing in pharmacy.

3. METHODS AND MATERIALS

During our research, extracts were prepared with 96 *V/V*% ethanol from the reserved *Nostoc* species and the effect of these extracts on *E. coli* cell growth was investigated using a conventional disk test and a more modern microplate-based photometric method. During the disc tests, the samples were pipetted onto filter paper discs, and these were placed on an *E. coli* lawn and left in a thermostat. After 24 hours, we examined the inhibition zones. (Positive control: solutions of chloramphenicol of different concentrations). In microplate experiments, ethanol extracts were pipetted onto the microplate wells. Subsequently, LB medium and *E. coli* liquid culture was added to the wells. (Controls: *E. coli*, LB medium, solvent control). The microplate assembled in this way was placed in a microplate reader.

4. RESULTS

During the disc tests, we assumed that we would see nice characteristic zones of inhibition, and in a few cases, we experienced such an effect, but relatively small. [Figure 2A] We found the results interesting, especially after re-examining the petri dishes after 48 and 72 hours. In the case of many extracts, we found that the cells grew back in the inhibition zones. Therefore, we also conducted a microplate experiment where we found that some extracts inhibited *E. coli* growth, some stimulated culture growth and some had no effect on *E. coli*. [Figure 2B] Analysing the growth data, it seemed as if these effects were often intermittent: the differences we observed at the beginning of the experiment would sooner or later disappear and the growth curves would adjust to the level of control.

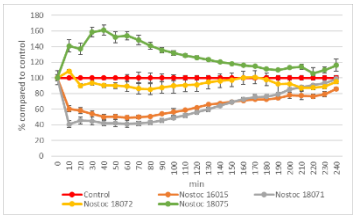

Figure 2A. Optical density (showing cell density) of cultures treated with different *Nostoc* extracts, as a percentage of *E. coli* control data.

Figure 2B. Disc test showing the effect of a *Nostoc* extract.

5. DISCUSSION

This study would further help the development of natural medicines and would later contribute to the development of new antibiotics.

6. CONCLUSIONS

Based on literature sources, we assumed that these isolates might have antibacterial properties, so we selected a basic test. The extent of the effects was difficult to see on the disc tests. Therefore, we switched to another, more modern and easily quantifiable test system, which showed the transient antimicrobial effect in several selected isolates.

7. ACKNOWLEDGEMENT

I would like to thank my teachers, Katalin Konczné Jámbrik PhD, Gábor Koncz PhD and my mentor Milán Riba PhD for all their help!

8. REFERENCES

Milán Riba (2020): Peptide pattern analysis of cyanobacteria, PhD thesis (in Hungarian)

https://en.wikipedia.org/wiki/Nostoc