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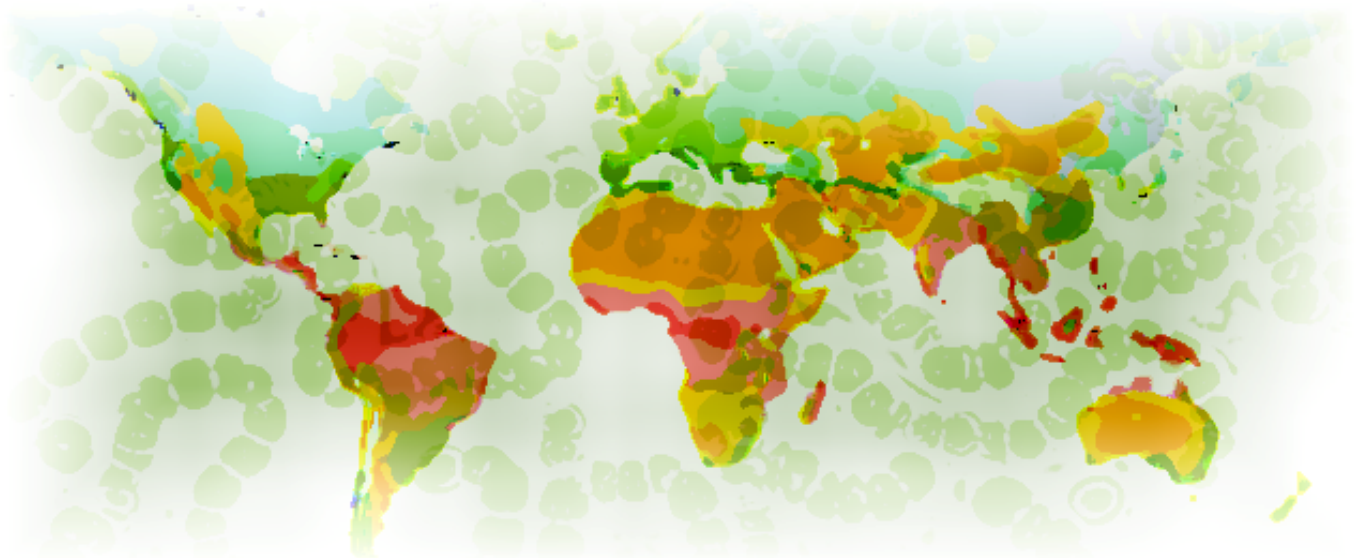


**FACULTY OF
SCIENCE**

*rigorous thesis
(shortened version)*

P E T R T O M E K

**CYTOTOXICITY AND SECONDARY METABOLITES PRODUCTION
IN TERRESTRIAL *NOSTOC* STRAINS, ORIGINATING FROM
DIFFERENT CLIMATIC/GEOGRAPHIC REGIONS AND HABITATS:
IS THEIR CYTOTOXICITY ENVIRONMENTALLY DEPENDENT?**



TOMEK, P., 2010: Cytotoxicity and secondary metabolites production in terrestrial *Nostoc* strains, originating from different climatic/geographic regions and habitats: Is their cytotoxicity environmentally dependent? Rigorous Thesis, in English. – 14 p., *Faculty of Science, The University of South Bohemia, České Budějovice, Czech Republic.*

Annotation:

82 *Nostoc* isolates originating from different climatic/geographic regions and habitats have been screened for their secondary metabolites content and cytotoxic activity. Frequency and distribution of cytotoxicity among the strains were compared and evaluated according to microsite (habitat) and geographical location. Furthermore, it was examined whether there is any connection between occurrence of particular secondary metabolites and geographical/climatic origin of isolates.

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I hereby declare that this thesis was created solely by myself only by using the sources summarized in the list of cited references.

I affirm that in accordance with the Czech legal code § 47b law No. 111/1998 in valid version, I agree to publish this thesis by faculty, in an edition made by removing actual article archived by Faculty of Science, via electronic means in publicly accessible section of STAG database located on the web page run by The University of South Bohemia.

In České Budějovice, 12.5.2010

Petr Tomek

Authors' acknowledgement:

We hereby declare that **Petr Tomek** contributed with a substantial part to this publication:

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Contribution of aspirant:

Petr Tomek carried out about half of cyanobacterial strains' extractions, HPLC-MS analyses (interpretations) and cytotoxic screenings. He participated in activity-guided fractionation of some strains, interpreting the results and writing the article.

At the time of writing this thesis the article was accepted for publication and published online in advance of print.

Letter of acceptance:

Dear Mr. Hrouzek,

I am pleased to inform you that your paper entitled "Cytotoxicity and secondary metabolites production in terrestrial Nostoc strains originating from different climatic/geographic regions and habitats: Is their cytotoxicity environmentally dependent?" has been accepted for publication in Environmental Toxicology.

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CYTOTOXICITY AND SECONDARY METABOLITES PRODUCTION IN TERRESTRIAL *NOSTOC* STRAINS, ORIGINATING FROM DIFFERENT CLIMATIC/GEOGRAPHIC REGIONS AND HABITATS: IS THEIR CYTOTOXICITY ENVIRONMENTALLY DEPENDENT?

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Extensive selection of cyanobacterial strains (82 isolates) belonging to the genus *Nostoc*, isolated from different climatic regions and habitats, were screened for both their secondary metabolite content and their cytotoxic effects to mammalian cell lines. The overall occurrence of cytotoxicity was found to be 33%, which corresponds with previously published data. However, the frequency differs significantly among strains, which originate from different climatic regions and microsites (particular localities). A large fraction of intensely cytotoxic strains were found among symbiotic strains (60%) and temperate and continental climatic isolates (45%); compared with the less significant incidences in strains originating from cold regions (36%), deserts (14%), and tropical habitats (9%). The cytotoxic strains were not randomly distributed; microsites that clearly had a higher occurrence of cytotoxicity were observed. Apparently, certain natural conditions lead to the selection of cytotoxic strains, resulting in a high cytotoxicity occurrence, and vice versa. Moreover, in strains isolated from a particular microsite, the cytotoxic effects were caused by different compounds. This result supports our hypothesis for the environmental dependence of cytotoxicity. It also contradicts the hypothesis that clonality and lateral gene transfer could be the reason for this phenomenon. Enormous variability in the secondary metabolites was detected within the studied *Nostoc* extracts. According to their molecular masses, only 26% of these corresponded to any known structures; thus, pointing to the high potential for the use of many terrestrial cyanobacteria in both pharmacology and biotechnology.