In vitro culturing of lichen-forming fungi and changes in DNA methylation level of the mycobiont

Sprawozdania

Informacje na temat projektu

INVITROLICHEN

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Projekt został zamknięty

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Final Report Summary - INVITROLICHEN (In vitro culturing of lichen-forming fungi and changes in DNA methylation level of the mycobiont)

This is the final report for the INVITROLICHEN project which received funding under the European

Commission’s Seventh Framework Programme (FP7). The report summarises the project objectives and the obtained results. The main dissemination activities are also presented.
Lichens are bi- or tripartite symbiotic systems composed of a fungus and green algae and/or cyanobacteria. Lichens are distributed worldwide and they are able to survive extreme conditions that are too harsh for most other organisms. In vitro culturing of mycobionts in aposymbiotic state is a challenge, especially due to the fact that lichens provide an excellent source of interesting secondary metabolites. These secondary products play an important role in the taxonomy and systematics of lichens and a considerable number of them has been examined for their activity in medicine and agriculture. However, we are far from knowing the set of conditions that trigger lichen fungi to produce the typical chemistry of the parent thalli.
INVITROLICHEN aimed to contribute both to an understanding of lichen survival strategies and provide answers for basic questions about in vitro culturing and secondary metabolites biosynthesis. Within the project we combined genetic, physiological and chemical analyses of lichen-forming fungi. We analysed the impact of strigolactones on the germination of fungal spores and found that artemisinin enhanced the germination of lichen-forming fungi spores at the concentration of 1mM and 0.1mM while parthenolide stimulated the growth of hyphae at concentrations of 1uM. It suggests that strigolactones could be used as potential stimulants for in vitro growth of the mycobiont. Moreover, we investigated the impact of culture conditions (including UV-light stress) on production of secondary metabolites and found that GLBM medium is optimal for the growth of the mycobiont and resulted in biosynthesis of numerous secondary metabolites including usnic acid, while secondary metabolites production was limited on PDA medium. Those metabolites exhibited antibacterial activity against Gram-positive bacteria and the activity of mycelial extracts was found to be higher than that of the lichen thallus. These results suggest that mycelia could provide as a source of interesting substances that could be potentially used for treatment of bacterial infections . Based on methylation-specific AFLP analysis, we also observed changes in DNA methylation level in mycobionts cultured on different media. Methylation may be responsible for regulation of gene expression in such cultures. Moreover, the analysis of the breeding system of a widespread lichen Protoparmeliopsis muralis was also performed using single spore cultures of the mycobiont. We used ITS rDNA sequencing for mycobiont identification and found no variation between single spore cultures obtained from the same apothecium, while the sequences differed between specimens. Microsatellite markers used for analysis showed uniformity between cultures, except for one specimen that was found to be variable in a single marker. However, we found higher variation using AFLP markers and it suggested that Protoparmeliopsis muralis is self-sterile.
The results of the project were published or submitted to scientific journals and further publications are planned. The fellow attended several national and international conferences and workshops where she gave oral and poster presentations. She was actively involved in teaching at the University of Gdansk and supervised bachelor and master students of the Faculty of Biology. The fellow also implemented experimental lichenology methods at the host institution. It was especially important as such methods have never been used in Poland. The fellow was integrated with the working group and cooperated with other researchers from the same department, as well as other working groups from Poland and abroad. During the project realization the fellow improved her skills in project management as she obtained formal training in project management at the Adam Mickiewicz University in Poznan. At the moment the fellow has long term employment as a lecturer at the University of Gdansk with a possibility to obtain assistant professor position after habilitation.
Moreover, experimental lichenology including research undertaken within the project were presented to

the public. The fellow prepared an exhibition about lichens and in vitro culturing of lichen bionts. She also gave several lectures promoting research and careers in science during Baltic Festival of Science and in several secondary schools.

Powiązane dokumenty

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