

# *Lasallia pustulata lichen as possible natural antigenotoxic, antioxidant, antimicrobial and anticancer agent*

**Marijana Kosanić, Branislav Ranković,  
Tatjana Stanojković, Ivana Stošić, Darko  
Grujičić & Olivera Milošević-Djordjević**

## **Cytotechnology**

Incorporating Methods in Cell Science  
International Journal of Cell Culture and  
Biotechnology

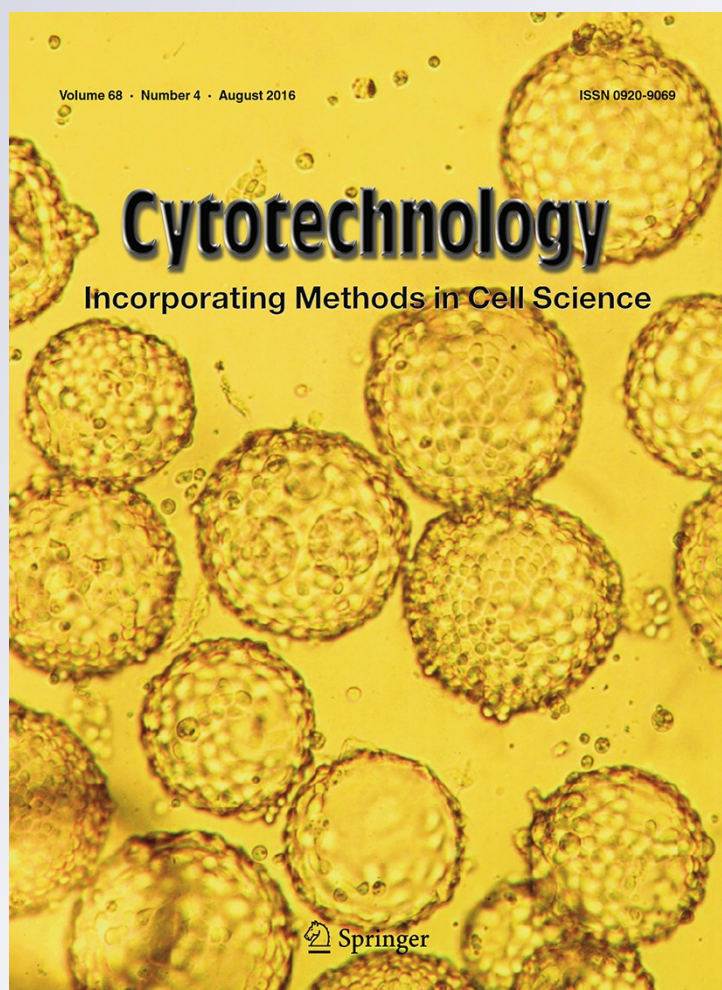
ISSN 0920-9069

Volume 68

Number 4

Cytotechnology (2016) 68:999-1008

DOI 10.1007/s10616-015-9856-y



**Your article is protected by copyright and all rights are held exclusively by Springer Science +Business Media Dordrecht. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at [link.springer.com](http://link.springer.com)".**

# *Lasallia pustulata* lichen as possible natural antigenotoxic, antioxidant, antimicrobial and anticancer agent

Marijana Kosanić · Branislav Ranković ·  
Tatjana Stanojković · Ivana Stošić ·  
Darko Grujić · Olivera Milošević-Djordjević

Received: 6 June 2014 / Accepted: 9 February 2015 / Published online: 15 February 2015  
© Springer Science+Business Media Dordrecht 2015

**Abstract** The methanol extract of the lichen *Lasallia pustulata* was tested for genotoxic, antioxidant, antimicrobial and anticancer activities. We did this using a cytokinesis block micronucleus (MN) assay on peripheral blood lymphocytes, by measuring free radical and superoxide anion scavenging activity, reducing power, determining of total phenolic compounds and determining the total flavonoid content, measuring the minimal inhibitory concentration by the broth microdilution method against five species of bacteria and five species of fungi and by using the microculture tetrazolium test on FemX (human melanoma) and LS174 (human colon carcinoma) cell lines. As a result of this study, we found that the methanol extract of *L. pustulata* did not modify the frequency of the MN and nuclear division index in comparison to untreated cells ( $p > 0.05$ ). These results revealed that the methanol extract had moderate free radical scavenging activity with  $IC_{50}$  values of 395.56  $\mu\text{g/mL}$ . Moreover, the

extract tested had effective reducing power and superoxide anion radical scavenging. The values of the minimum inhibitory concentration against the tested microorganisms ranged from 0.625 to 20  $\text{mg/mL}$ . In addition, the extract tested had strong anticancer activity against both cell lines with  $IC_{50}$  values of 46.67 and 71.71  $\mu\text{g/mL}$ .

**Keywords** *Lasallia pustulata* · Methanol extract · Genotoxic · Antioxidant · Antimicrobial · Anticancer activities · In vitro

## Introduction

Lichens are complex symbiotic associations between a fungus (mycobiont) and photobiont which can be either an alga or cyanobacteria (Bates et al. 2011). They have been proven to be the earliest colonizers of terrestrial habitats on the earth with a worldwide distribution from arctic to tropical regions and from the plains to the highest mountains. Their specific, even extreme, range of habitats, slow growth and long life are the reason for their being able to produce numerous protective secondary metabolites against different physical and biological influences (Mitrović et al. 2011).

Lichens exert a wide variety of biological actions including antibiotic, antimycotic, antiviral, anti-inflammatory, analgesic, antipyretic, antiproliferative and anticancer effects (Kosanić et al. 2013; Ranković

M. Kosanić (✉) · B. Ranković · I. Stošić ·  
D. Grujić · O. Milošević-Djordjević  
Department of Biology, Faculty of Science, University of  
Kragujevac, 34000 Kragujevac, Serbia  
e-mail: marijanakosanic@yahoo.com

T. Stanojković  
Institute of Oncology and Radiology of Serbia,  
11000 Belgrade, Serbia

O. Milošević-Djordjević  
Faculty of Medical Sciences, University of Kragujevac,  
34000 Kragujevac, Serbia



















