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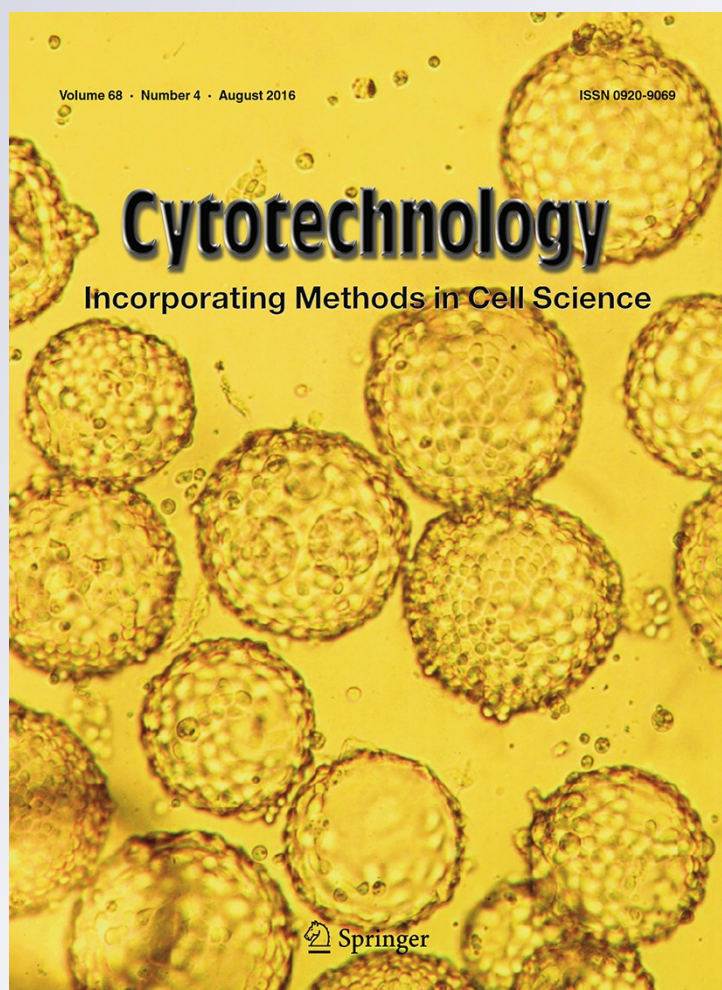
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# *Lasallia pustulata* lichen as possible natural antigenotoxic, antioxidant, antimicrobial and anticancer agent

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**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

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