Name of the subject: PHARMACEUTICAL BIOLOGY AND CHEMISTRY OF FUNGI AND LICHENS Teacher(s): Dr. Maja Karaman, Dr. Boris Pejin

Status of the subject: Elective course

Number of ECTS points: 15

Condition: There are no requirements.

Goal of the subject Students will be introduced to morphoanatomical, physiological and basic metabolic characteristics of fungi and lichens as the producers of bioactive natural products (primary and secondary metabolites).

Outcome of the subject Students will master the fundamentals of Pharmaceutical Biology and Chemistry. They will be capable to recognise specific genera of fungi and lichens known to contain bioactive substances; to preliminarily determine their pharmacological potential applying standard experimental procedures; to design experiments focussing on the natural products from these organisms; to understand the principles of their isolation, chemical characterisation (both of nonvolatile and volatile substances) and determination of stereo- and computational parameters – SAR (Structure Activity Relationship) studies.

Content of the subject

Theoretical lectures Students will be introduced to modern trends in this particular field. The emphasis will be put on the chemistry, biosynthesis, isolation (including different extraction techniques) and identification (by structural instrumental methods such as NMR, IR, UV-VIS, GC, MS, GC-MS and HPLC) of the natural products from fungi and lichens; their ecological role and importance – Chemical and Biochemical Ecology; bioactive substances of pharmaceutical significance possessing antiradical, antioxidant, antimicrobial, anti-acetylcholinesterase (along with other pharmacological targets of relevance for Alzheimer's disease) and anti-hypertensive activities. Also, the cultivation of these organisms will be thoroughly discussed mainly due to the potential application of their bioactive natural products (substances) in pharmacy, medicine and cosmetics.

Practical classes Isolation of fungal mycelia and principles of submerged cultures; Electrophoresis techniques; FTIR (Infrared spectroscopy with Fourier transform); GC-MS (Gas Chromatography – Mass Spectrometry); EPR (Electron Paramagnetic Resonance spectroscopy); Polarography (new methods).

Theoretical classes Stereochemistry and Computational Chemistry, selected examples of SAR studies.

Recommended literature

- 1. P. Stanforth. Natural Product Chemistry at a Glance. Blackwell Publishing Ltd, 2006.
- 2. *New Trends in Natural Product Chemistry*. eds. Atta-ur-Rahman & M. Iqbal Choundhary. Harwood Academic Publishers, 1998.
- 3. Lichen Biology. ed. T. H. Nash III. Cambridge University Press, 2008.
- 4. J. Mann. Secondary Metabolism. Oxford Chemistry Series, 1980.
- 5. P. L. Graham. An Introduction to Medicinal Chemistry. Oxford University Press, 2005.
- 6. E. L. Eliel, S. H. Wilen. Stereochemistry of Organic Compounds. Wiley, 1994.
- 7. Novel review articles published in leading international journals (*Natural Product Reports, Medicinal Research Reviews, Journal of Medicinal Chemistry, Journal of Natural Products, Phytochemistry*, etc.)
- 8. CRC Handbook of Lichenology. ed. M. Galun. CRC Press, Boca Raton, 1988.
- 9. D. K. Arora. Handbook of Fungal Biotechnology. Marcel Dekker, Inc., New York, USA, 2004.
- 10. G. M. Muller, G. F. Bills, M. S. Foster. *Biodiversity of Fungi, Inventory and Monitoring Methods*. Elsevier Academic Press, Burlington, San Diego, London, 2004.
- The Mycota. A comprehensive Treatise on Fungi as experimenta; System for Basic and Applied Research. eds. K. Esser, J. W. Bennett & H. D. Osiewacz. Vol X. Industrial applications. Springer-Verlag Berlin Heidelberg, 2002.

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Number of active classes	Theory: 5	Practice: 5
Methods of delivering lectures		
Lectures, Practical Classes, Term Paper, Student Consultations (Tutorial)		
Evaluation of knowledge (maximum number of points 100)		
Term Paper – 10 points, Written Exam – 40 points, Oral Exam – 50 points		