

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Metabolomika v živilih
Course title:	Foodomics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekotehnologije, 3. stopnja	/	1	1
Ecotechnologies, 3 rd cycle	/	1	1

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

EKO3-610

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Druge oblike Other	Samost. delo Individ. work	ECTS
15	15		15	105	5

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

Nosilec predmeta / Lecturer:

Prof. dr. Urška Vrhovšek

Jeziki /

Predavanja / Lectures: slovenski, angleški / Slovene, English

Languages:

Vaje / Tutorial: slovenski, angleški / Slovene, English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Splošni pogoji za vpis na doktorski študij.

Prerequisites:

General conditions for enrolment in doctoral studies.

Vsebina:

Metabolom živil je celota spojin z nizko molekulsko maso v posameznem živilu in je lahko zelo kompleksen, saj pogosto obsega več tisoč kemijskih spojin. Živilska metabolomika se danes lahko šteje kot dragoceno orodje za ocenjevanje kakovosti, varnosti in porekla hrane ter učinkov na zdravje, povezanih s hrano. Študenti se bodo srečali z različnimi metabolomskimi pristopi v analizi različnih kemijskih skupin metabolitov hrane. Dobili bodo znanje, kako pravilno načrtovati poskus za študije metabolomike. Seznanili se bodo z različnimi tehnikami priprave vzorcev in kontrolo kakovosti primernih v metabolomskih študijah. V okviru predmeta se bodo seznanili z različnimi analitskimi tehnikami, ki se uporabljajo tako v tarčni in kot netarčni metabolomiki: tekočinsko kromatografijo, plinsko kromatografijo v povezavi z

Content (Syllabus outline):

The food metabolome - i.e. the entirety of all low molecular weight compounds in a specific food. It can be extremely complex, often comprising several thousand chemical species. Food metabolomics can nowadays be considered as a valuable tool for the assessment of food quality, food safety, food tracability and food-related health effects. Students will meet with different metabolomic approaches in the analysis of diverse classes of food metabolites. They will get a knowledge how to properly design an experiment for metabolomics studies. They will learn about different sample preparation techniques, and quality control for metabolomics studies. In the frame of the course, several analytical technologies applied in the untargeted and targeted metabolomics studies: liquid chromatography, gas chromatography coupled to

masno spektrometrijo in tudi nekaj osnovnih informacij o principu NMR metabolomike. Študenti bodo spoznali osnove metodologije podatkovnega rudarjenja kompleksnih podatkovnih nizov in pridobili znanje, kako iz njih pridobiti biološko pomembne informacije.

mass spectrometry and also some basic information about NMR based metabolomics will be introduced. The students will learn the basics about the data mining methodologies of a complex data sets and the knowledge how to extract biologically meaningful information.

Temeljna literatura in viri / Readings:

- 1) Saito K, Dixon RA, Willmitzer L. 2006 Plant Metabolomics: 57 (Biotechnology in Agriculture and Forestry) Kindle Edition, Springer, 347 p
- 2) Villas-Bôas SG, Roessner U., Hansen MAE, Smedsgaard J, Nielsen J (2007) Metabolome Analysis: An Introduction, John Wiley & Sons, Inc., 311 p.
- 3) Weckwerth, W. 2007 Metabolomics: Methods in Molecular Biology 2007, Humana press, 293 p.
- 4) Robert D. Hall. 2011. Annual Plant Reviews, Volume 43, Biology of Plant Metabolomics, 420 p.
- 5) Pregledni članki iz revije Metabolomics

Cilji in kompetence:

Cilj tega predmeta je dati študentom znanje, kako izvesti metabolomsko študijo od začetka do konca.

Študent pridobi kompetence potrebne za načrt eksperimentalnega poskusa, pripravo vzorcev, uporabo masne spektrometrije za globalno profiliranje (netarčna metabolomika) in ciljno usmerjene metodologije (tarčna metabolomika) ter znanja o analizi podatkov.

Objectives and competences:

This course aims to give to the students a knowledge how to perform a metabolomic experiment, from start to finish.

The competences covers study design, sample preparation, the use of mass spectrometry for global profiling and targeted methodologies and data analysis.

Predvideni študijski rezultati:

Predmet usposobi študenta za izvedbo celotnega poskusa, ki temelji na metabolomskem pristopu.

Intended learning outcomes:

This course prepares the student to carry out the entire experiment, based on the metabolomic approach.

Metode poučevanja in učenja:

Predavanja, priprava seminarjev - timsko delo in debate

Learning and teaching methods:

Lectures, seminars – team work and discussions

Načini ocenjevanja:

Seminar
Ustni zagovor seminarske naloge

Delež (v %) /

Weight (in %)

Assessment:

Seminars
Oral defence of seminar work

Reference nosilca / Lecturer's references:

- Beckner Whitener, M.E., Stanstrup, J., Panzeri, V., Carlin, S., Divol, B., Du Toit, M., Vrhovsek, U. Untangling the wine metabolome by combining untargeted SPME–GCxGC–TOF–MS and sensory analysis to profile Sauvignon blanc co-fermented with seven different yeasts (2016) Metabolomics, 12 (3), art. no. 53, pp. 1-25.
- Fontana, A., Copetti, M., Di Gangi, I.M., Mazza, T., Tavano, F., Gioffreda, D., Mattivi, F., Andriulli, A., Vrhovsek, U., Paziienza, V. Development of a metabolites risk score for one-year mortality risk prediction in pancreatic adenocarcinoma patients (2016) Oncotarget, 7 (8), pp. 8968-8978.
- Gasperotti, M., Masuero, D., Guella, G., Mattivi, F., Vrhovsek, U. Development of a targeted method for

twenty-three metabolites related to polyphenol gut microbial metabolism in biological samples, using SPE and UHPLC-ESI-MS/MS (2014) *Talanta*, 128, pp. 221-230.

- Vrhovsek, U., Lotti, C., Masuero, D., Carlin, S., Weingart, G., Mattivi, F. Quantitative metabolic profiling of grape, apple and raspberry volatile compounds (VOCs) using a GC/MS/MS method (2014) *Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences*, 966, pp. 132-139.
- Vrhovsek, U., Masuero, D., Gasperotti, M., Franceschi, P., Caputi, L., Viola, R., Mattivi, F. A versatile targeted metabolomics method for the rapid quantification of multiple classes of phenolics in fruits and beverages (2012) *Journal of Agricultural and Food Chemistry*, 60 (36), pp. 8831-8840.