

# ŽIVILSTVO – TEORETIČNI PREDMETI

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Antioksidanti
<b>Course title:</b>	Antioxidants

<b>Študijski programi in stopnja</b>	<b>Študijska smer</b>	<b>Letnik</b>	<b>Semestri</b>
Bioznanosti, tretja stopnja, doktorski	Živilstvo		Celoletni

**Univerzitetna koda predmeta/University course code:** 3867

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
	15	5	0	5	100	5

**Nosilec predmeta/Lecturer:** Helena Abramovič

<b>Izvajalci predavanj:</b>	
<b>Izvajalci seminarjev:</b>	Helena Abramovič
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

**Vrsta predmeta/Course type:** izbirni

<b>Jeziki/Languages:</b>	<b>Predavanja/Lectures:</b>	Slovenščina
	<b>Vaje/Tutorial:</b>	Slovenščina

<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>	<b>Prerequisites:</b>
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

<b>Vsebina:</b>	<b>Content (Syllabus outline):</b>
Dodatek snovi z antioksidativno učinkovitostjo v živilski izdelek prispeva h kakovosti in varnosti hrane, saj podaljša obstojnost ter zviša biološko vrednost živila. Antioksidanti so strukturno raznolike spojine. V okviru izbirnega predmeta bomo opisali posamezne skupine antioksidantov, ki so v živilu naravno prisotni ali dodani. Opisali bomo različne reakcijske mehanizme (redukcijska sposobnost, učinkovitost lovljenja prostih radikalov, sposobnost keliranja kovin) delovanja antioksidantov. Pokazali bomo, da je antioksidativna učinkovitost spojine	The substances with antioxidative effectiveness added to food product contribute to its quality and safety, since it prolongs shelf-life and raises the biological value of the food. Antioxidants are structurally different compounds. In the frame of the elective subject the groups of antioxidants (naturally present in food or added) will be described. Various reaction mechanisms (reducing capacity, effectiveness in scavenging free radicals, ability to chelate metals) of antioxidant's action will be described. It will be demonstrated that the

posledica ustreznih fizikalno-kemijskih lastnosti in kemijske strukture. Seznanili se bomo z različnimi metodološkimi pristopi določitve antioksidativne učinkovitosti. Živila so po svoji sestavi heterogeni sistemi. Zato vsebina predmeta vključuje primerjavo in interpretacijo delovanja antioksidantov v različnih sistemih ter razlago, kako strukturne lastnosti in specifična porazdelitev omenjenih spojin odloča o njihovi antioksidativni učinkovitosti. Ozaveščenost potrošnikov glede škodljivih vplivov sintetičnih aditivov vzpodbuja uporabo naravnih dodatkov. Zato se bomo seznanili z novejšimi metodološkimi pristopi pridobivanja in karakterizacije izvlečkov spojin z antioksidativno učinkovitostjo iz različnih naravnih virov.

antioxidative effectiveness of a compound is a consequence of corresponding physico-chemical properties and chemical structure. The students will be acquainted with various methodological approaches of antioxidative effectiveness determination. Foods are heterogeneous systems in their composition. Therefore the comparison and interpretation of the activity of antioxidants in various systems will be provided; we will show and explain how structural properties and partition of these compounds determine their antioxidative effectiveness.

Consumer awareness of the harmful effects of synthetic additives promotes the use of natural additives. Therefore, the novel methodological approaches of obtaining and characterization of extracts of compounds with antioxidant efficiency from various natural resources will be provided.

#### **Temeljna literatura in viri/Readings:**

**Zapišejo se samo glavni učbeniki, nato se lahko zapiše še besedilo: »revijalni članki s področja, tekoča periodika, druga učna gradiva...«**

#### **Temeljna literatura in viri:**

##### **Glavni učbeniki:**

ABRAMOVIČ, Helena. *Antioksidanti in metodologija določanja antioksidativne učinkovitosti : učbenik za izbirni predmet na interdisciplinarnem doktorskem študijskem programu Bioznanosti*. Ljubljana: Biotehniška fakulteta, Oddelek za živilstvo, 2011. 112 str..

##### **Revijalni članki s področja:**

Brewer M. S. 2011. Natural antioxidants: Sources, compounds, mechanisms of action and potential applications. *Comprehensive Reviews in Food Science and Food Safety*, 10: 221-247

Choe E., Min D. B. 2009. Mechanisms of antioxidants in the oxidation of foods. *Comprehensive Reviews in Food Science and Food Safety*, 8: 345-358

Robards K. 2003. Strategies for the determination of bioactive phenols in plants, fruit and vegetables. *Journal of Chromatography A*, 1000: 657-691

Suhaj M. 2006. Spice antioxidants isolation and their antiradical activity: a review. *Journal of Food Composition and Analysis*, 19: 531-537

Wright J. S., Johnson E. R., Di Labio G. A. 2001. Predicting the activity of phenolic antioxidants: Theoretical method, analysis of substituent effects, and application to major families of antioxidants. *Journal of the American Chemical Society*, 123: 1173-1183

Huang D., Ou B., Prior R. L. 2005. The chemistry behind antioxidant capacity assays. *Journal of Agricultural and Food Chemistry*, 53: 1841-1856

Frankel E. N., Finley J. W. 2008. How to standardize the multiplicity of methods to evaluate natural antioxidants. *Journal of Agricultural and Food Chemistry*, 56: 4901-4908

Chaiyasit W., McClements D. J., Decker E. A. 2005. The relationship between the physicochemical properties of antioxidants and their ability to inhibit lipid oxidation in bulk oil and oil-in-water emulsions. *Journal of Agricultural and Food Chemistry*, 53: 4982-4988

##### **Readings:**

##### **Main textbooks:**

ABRAMOVIČ, Helena. *Antioxidants and methodology of antioxidant activity determination: textbook for students at Interdisciplinary Doctoral Study Programme in Biosciences*. Ljubljana: Biotechnical Faculty, Department of Food Science and Technology, 2011. 112 pp.

##### **Review articles in the field:**

Brewer M. S. 2011. Natural antioxidants: Sources, compounds, mechanisms of action and potential applications. *Comprehensive Reviews in Food Science and Food Safety*, 10: 221-247

Choe E., Min D. B. 2009. Mechanisms of antioxidants in the oxidation of foods. *Comprehensive Reviews in Food Science and Food Safety*, 8: 345-358

Robards K. 2003. Strategies for the determination of bioactive phenols in plants, fruit and vegetables. *Journal of Chromatography A*, 1000: 657-691

Suhaj M. 2006. Spice antioxidants isolation and their antiradical activity: a review. *Journal of Food Composition and Analysis*, 19: 531-537

Wright J. S., Johnson E. R., Di Labio G. A. 2001. Predicting the activity of phenolic antioxidants: Theoretical method, analysis of substituent effects, and application to major families of antioxidants. *Journal of the American Chemical Society*, 123: 1173-1183

Huang D., Ou B., Prior R. L. 2005. The chemistry behind antioxidant capacity assays. *Journal of Agricultural and Food Chemistry*, 53: 1841-1856

Frankel E. N., Finley J. W. 2008. How to standardize the multiplicity of methods to evaluate natural antioxidants. *Journal of Agricultural and Food Chemistry*, 56: 4901-4908

Chaiyasit W., McClements D. J., Decker E. A. 2005. The relationship between the physicochemical properties of antioxidants and their ability to inhibit lipid oxidation in bulk oil and oil-in-water emulsions. *Journal of Agricultural and Food Chemistry*, 53: 4982-4988

#### Cilji in kompetence:

Izobraževalni cilji: Cilj predmeta je posredovati znanja povezana s problematiko antioksidantov in osvojiti ustrezno metodologijo določitve antioksidativne učinkovitosti.

Kompetence: Sistematična obravnava in razumevanje različnih dejavnikov, ki so povezani z antioksidanti je potrebna zato, da bi lahko predvideli in nadzorovali kakovost in varnost živilskega izdelka.

#### Objectives and competences:

Educational aims: The aim of the subject is to provide the knowledge associated with antioxidants and to get familiar with appropriate methodology of antioxidative effectiveness determination.

Competences: Systematic treatment and understanding of the various factors connected with antioxidants is necessary for anticipating and controlling the quality and safety of food products.

#### Predvideni študijski rezultati:

Educational aims: The aim of the subject is to provide the knowledge associated with antioxidants and to get familiar with appropriate methodology of antioxidative effectiveness determination.

Competences: Systematic treatment and understanding of the various factors connected with antioxidants is necessary for anticipating and controlling the quality and safety of food products.

#### Intended learning outcomes:

Knowledge and understanding the mechanisms of antioxidant action.

Capacity to predict the quality, effectiveness, usefulness and suitability of individual antioxidants in given food matrices.

Capacity to interpret research results.

#### Metode poučevanja in učenja:

Seminar, vaje, konzultacije.

#### Learning and teaching methods:

Seminar, tutorial, consultation.

#### Načini ocenjevanja:

Priprava seminarske naloge  
Predstavitev seminarske naloge

#### Delež/Weight

70,00 %  
30,00 %

#### Assessment:

Preparation of seminar  
Presentation of seminar

#### Reference nosilca/Lecturer's references:

##### Abramovič Helena

1. NIČIFOROVIĆ, Neda, ABRAMOVIČ, Helena. Sinapic acid and its derivatives : natural sources and bioactivity. *Comprehensive reviews in food science and food safety*, ISSN 1541-4337, 2014, vol. 13, str. 34-51, doi: [10.1111/1541-4337.12041](https://doi.org/10.1111/1541-4337.12041). [COBISS.SI-ID 4286840]
2. TERPINC, Petra, ČEH, Barbara, POKLAR ULRIH, Nataša, ABRAMOVIČ, Helena. Studies of the correlation between antioxidant properties and the total phenolic content of different oil cake extracts. *Industrial*

*crops and products*, ISSN 0926-6690, 2012, vol. 39, str. 210-217, doi: [10.1016/j.indcrop.2012.02.023](https://doi.org/10.1016/j.indcrop.2012.02.023). [COBISS.SI-ID [4048248](#)]

3. TERPINC, Petra, POLAK, Tomaž, ŠEGATIN, Nataša, HANZLOWSKY, Andrej, POKLAR ULRIH, Nataša, ABRAMOVIČ, Helena. Antioxidant properties of 4-vinyl derivatives of hydroxycinnamic acids. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2011, vol. 128, str. 62-69, doi: [10.1016/j.foodchem.2011.02.077](https://doi.org/10.1016/j.foodchem.2011.02.077). [COBISS.SI-ID [3884664](#)]
4. TERPINC, Petra, ABRAMOVIČ, Helena. A kinetic approach for evaluation of the antioxidant activity of selected phenolic acids. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2010, vol. 121, str. 366-371, doi: [10.1016/j.foodchem.2009.12.037](https://doi.org/10.1016/j.foodchem.2009.12.037). [COBISS.SI-ID [3731320](#)]
5. KATALINIĆ, Višnja, SMOLE MOŽINA, Sonja, SKROZA, Danijela, GENERALIĆ, Ivana, ABRAMOVIČ, Helena, MILOŠ, Mladen, LJUBENKOV, Ivica, PISKERNIK, Saša, PEZO, Ivan, TERPINC, Petra, BOBAN, Mladen. Polyphenolic profile, antioxidant properties and antimicrobial activity of grape skin extracts of 14 *Vitis vinifera* varieties grown in Dalmatia (Croatia). *Food chemistry*, ISSN 0308-8146. [Print ed.], 2010, vol. 119, str. 715-723, doi: [10.1016/j.foodchem.2009.07.019](https://doi.org/10.1016/j.foodchem.2009.07.019). [COBISS.SI-ID [3652216](#)]
6. TERPINC, Petra, BEZJAK, Miran, ABRAMOVIČ, Helena. A kinetic model for evaluation of the antioxidant activity of several rosemary extracts. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2009, issue 2, vol. 115, str. 740-744, doi: [10.1016/j.foodchem.2008.12.033](https://doi.org/10.1016/j.foodchem.2008.12.033). [COBISS.SI-ID [3553144](#)]