University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
Phone: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Grape ripening (296627)

Course coordinator

Assoc. Prof. Željko Andabaka, PhD

Course description

The module Grape Ripening introduces students to the dynamics of biosynthesis and accumulation of the main groups of primary and secondary metabolites in grapes during ripening through several program units. Within the grape berry, many biochemical and physiological processes take place which therefore result in the accumulation of water, minerals and sugar in the berry. The same processes affect the biosynthesis of amino acids, organic acids, and phenolic and aromatic compounds. In terms of content, the largest part of the module is dedicated to the most important groups of secondary grape metabolites, namely phenolic and aromatic compounds, and carotenoids. Special emphasis will be placed on defining the impact of various agrotechnical and ampelotechnical interventions (vineyard management) on the modification of environmental conditions with the aim of influencing the content and composition of phenolic and aromatic compounds in grapes.

ECTS: **3.00**

E-learning: **L1**

Teaching hours: 30
Lectures: 20
Laboratory exercises: 6
Seminar: 4

Lecturer

- Prof. Marko Karoglan, PhD
- Prof. Darko Preiner, PhD
- Assoc. Prof. Zvjezdana Marković, PhD

Associate teacher for seminars

- Iva Šikuten, PhD

Grading

Sufficient (2): Sufficient (2): 60 – 69,9%
Good (3): Good (3): 70 – 79,9%
Very good (4): Very good (4): 80 – 89,9%
Excellent (5): Excellent (5): 90 – 100%

Type of course

- Graduate studies / MS Courses taught in English (Elective course, 1 semester, 1 year)

Developed by Superfluo d.o.o. • www.superfluo.hr

University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
Phone: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Types of instruction

- Lectures
- Assessments
- Laboratory practice/exercises
- Seminars
- Exercises

Learning outcomes

Learning outcome	Evaluation methods
Identify and explain the main biochemical processes that affect the water relations in the grape berry during ripening.	
Define main mineral compounds in the grape berry and their impact on the quality of grape must.	
Identify and describe biosynthesis pathways of main groups of phenolic, carotenoids and aromatic compounds in grape berry.	
Explain impact of environmental conditions on biosynthesis pathways and content of main groups of phenolic and aromatic compounds in grape berry.	
Explain impact of vineyard management on biosynthesis pathways and content of main groups of phenolic and aromatic compounds in grape berry.	
Understand and explain the physiological processes that affect the change in the composition and content of phenolic and aromatic compounds and carotenoids during grape ripening.	
Define and select technological practices in the vineyard to achieve optimal polyphenolic and aromatic maturity of grapes.	

Working methods

Students' obligations

Regular attendance at lectures, exercises and seminars. Preparation and presentation of seminars.

Developed by Superfluo d.o.o. • www.superfluo.hr

University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
Phone: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Weekly class schedule

1. General introduction to the course, its goals, and the envisioned outcomes of the program units.
2. Students are introduced to the water relations within the grape berry, which is extremely important as water is the main solvent for all primary and secondary metabolites of grapes.
3. The second program unit presents the mineral composition of grape berry and the influence of major mineral compounds on physiological and biochemical processes in grapes.
4. Phenolic compounds are important compounds in grape berry due to the impact on the future quality of wine. The main groups of these compounds as well as their biosynthesis pathways will be addressed with special reference to grape phenolic maturity.
5. Carotenoids are known as precursors of C13-norisoprenoid compounds, which have been identified in grapes and wines and are responsible for the typical aroma of some varieties.
6. In grape berry, the biosynthesis of many groups of compounds that contribute to the aroma of the future wine takes place. We will learn about their role and importance in this program unit.
7. Introduction to basic analytical methods of phenolic, carotenoids and volatile compounds determination is envisioned.
8. First partial exam
9. Environmental factors that include all external stimuli (e.g., temperature, UV radiation) have large impact on these secondary metabolites. Studying their impact will be the topic of this program unit.
10. Determination of different group of phenolic compounds, particularly flavanols, using analytical methods like HPLC.
11. Interpretation of the results obtained by research of the content of secondary metabolites in autochthonous grapevine varieties.
12. Topic of the program unit will be the large-scale impact of the ampelotehnical and agrotechnical practices on the content of phenolic and aromatic compounds.
13. Interpretation of the results obtained by previous research projects which focused on the impact of vineyard management on the secondary metabolites of grapevine.
14. Interpretation of the obtained results of the composition and content of polyphenols after the performed research with the topic of canopy management.
15. Second partial exam

Obligatory literature

1. Kalliopi A. Roubelakis-Angelakis (2009.) Grapevine Molecular Physiology & Biotechnology. Springer,London
2. Sandra Thomas (2017.) Polyphenolic composition, antioxidant characteristics and health benefits.Nova, New York
3. Markus Keller (2015.) The Science of Grapevines - Anatomy and Physiology. Elsevier, Amsterdam. New York
4. Gerós H., Chaves, M.M., and Delrot, S. (2012.) The Biochemistry of the Grape Berry. Bentham eBooks, Sharjah.

Developed by Superfluo d.o.o. • www.superfluo.hr