ADVANCED VITICULTURE

Coordinator: Carlos M. A. Lopes (Associate Prof., DCEB, Viticulture)

Office: main building, 1st floor, "Secção de Horticultura"

Contacts: Tel. 21 3653450

Email: carlosmlopes@isa.ulisboa.pt

Timetable:

Monday: 14:30-17:30, classroom 27 (main building)

Thursday: 14:00-18:00 (mainly by ZOOM)

Program and calendar 2020/21 (12/10/2020 to 18/12/2020)

Week	Date/ classroom	Module (*Lecturer)*
1.1	October 12 (Room 27)	Introduction to Advanced Viticulture Program and Calendar Bibliography Assessment
1.2	October 15 (ZOOM)	I**. Vineyard mechanization** 1.1. Introduction 1.2. Mechanization of plantation 1.3. Mechanization of fertilization and soil management 1.4. Mechanization of canopy management 1.5. Vineyard spraying equipment.
2.1	October 19 (Room 27)	1.6. Mechanical harvest 1.7. Mechanical pruning
2.2	October 22 (vineyard)	Vineyard spraying equipment - field demonstration of the calibration of a sprayer at the ISA vineyards
3.1	October 26 Room 27	**VI- Sustainable Viticulture** - Introduction to Sustainable Viticulture - Types of Sustainable Viticulture – an overview - Low Carbon wine – a case study in Alentejo Practical reports: list of topics
3.2	October 29 ZOOM	II. **Yield Estimation and control** 2.1. Introduction 2.2. Yield components and the period in which they are determined. Factors affecting yield components 2.3. Yield variability and it's causes 2.4. Yield forecast 2.4.1. Advantages of Yield forecast 2.4.2. Main techniques for Yield forecasting

		2.4.2.1. Aeropalynological forecast models; 2.4.2.2. Estimation of yield components; 2.4.2.3. Agrometeorological models; 2.4.2.4. Remote sensing; 2.4.2.5. Measuring trellis tension; 2.4.2.6. Image Analysis
4.1	November 2 Room 27	II. **Yield Estimation and control (conc)** 2.5. Yield control by viticultural practices. 2.5.1. pruning level; 2.5.2. shoot thinning; 2.5.3. shoot tipping or hedging during flowering; 2.5.4. early leaf removal; 2.5.5. spraying growth regulators; 2.5.6. inflorescence thinning; 2.5.7. berry thinning; 2.5.8. cluster thinning.
4.2	November 5 (ZOOM)	III. ***Workshop*** **on Implications of climate change for viticulture and wine production – part 1** 3.1 Introduction 3.2 Climate Change & Viticulture – observed and estimated impacts 3.3 Climate changes and risk of berry sunburn 3.4 Thermal imaging as a tool to monitor the impact of climate change on modern viticulture 3.5 Effects of heat stress on berry color - Impact of irrigation 3.6 Evaluation of climate change impacts on viticulture using simulation models
5.1	November 9	**VI- Sustainable Viticulture** Free day for PR preparation
5.2	November 12 (ZOOM)	III. ***Workshop*** **on Implications of climate change for viticulture and wine production. (part 2)** 3.5 Effects of heat stress on berry color - Impact of irrigation 3.6 Evaluation of climate change impacts on viticulture using simulation models 3.7 Adaptation measures
6.1	November 16 (Room 27)	IV. **Precision Viticulture** 4.1. Introduction. The concept of precision agriculture/viticulture 4.2. Technologies in Precision Viticulture 4.2.1. Geolocation 4.2.2. Geographical Information Systems; 4.2.3. Variable Rate Technology; 4.2.4. Remote Sensing 4.2.5 Proximal Sensing 4.2.5.1. Soil monitoring 4.2.5.2 Yield monitoring 4.2.5.3 Berry composition monitoring 4.2.5.4. Wireless sensor network 4.2.5. Robotics.
6.2	November 19 (ZOOM)	IV. **Precision Viticulture (conc)** 4.3. Main Applications of PV - Case-studies (invited speakers) 4.3.1. Yield estimation using image analysis 4.3.2. Precision Irrigation 4.3.3. Remote Sensing in Vineyards

		4.3.4. VRT applied to mechanical pruning 4.3.5. Robotic Applications in Precision Viticulture
7.1	November 23	**VI- Sustainable Viticulture** Free day for PR preparation
7.2	November 26 (Zoom)	**VI- Workshop on Sustainable Viticulture** - Metrics to calculate carbon footprint in wine. - Sustainable Use of Pesticides - Challenges for Water Protection - Sustainable water use in viticulture - What can arbuscular mycorrhiza do for us in sustainable viticulture? - Reducing pesticides in the vineyards by using resistant varieties - Wines of Alentejo Sustainability Plan (WASP) - Organic Viticulture: A case study at Quinta do Monte d'Oiro; General Discussion: Round Table on Organic Viticulture with several experts
8.1	Nov 30	**VI- Sustainable Viticulture (cont.)** **Practical Report – Students Presentations – part I**
8.2	Dec 3	**VI- Sustainable Viticulture (cont.)** **Practical Report – Students Presentations – part II**
9	Dec 7 & 10 (Room 27 /ZOOM)	**V. Workshop on Grapevine Biotechnology: main applications in viticulture.** -Applications of biotechnology: what is currently being done. - Non-conventional approaches to solve recalcitrant grapevine and wine problems. - Grapevine genome organization: the role of bioinformatics. Grapevine epigenetics. -Using Molecular Biology tools to identify grapevine varieties and study Phylogeny - Grapevine: evolution under domestication -Acclimation and tolerance to abiotic stress of grapevine portuguese varieties. - Grapevine aquaporins: understanding the water, glycerol and atypical substrates transport in *Vitis vinifera* through heterologous expression in a aqy-null *Saccharomyces cerevisiae* strain. – General Discussion
10	Dec 14 &19 (ROOM 27 or ZOOM)	**Practical Report – discussions with professor**

Assessment

Evaluation by a final examination (60%) and a written report (40%) based on a literature review of a Sustainable Viticulture topic. The report should be formatted as a paper and presented and discussed at the end of the semester. A minimum of 75% presences in the classes is needed for being accepted to the final exam.

General Literature

Besides the slides of each lecture presentation, specific literature for each chapter will be upload to the FENIX platform. Below are some examples of general bibliography to be consulted:

Bramley, R. G. V, & Hamilton, R. P. (2004). Understanding variability in winegrape production systems 2. Within vineyard variation in quality over several vintages. Australian Journal Of Grape And Wine Research, 10(1), 32–45.

Chaves MM, Costa JM, Zarrouk O, Pinheiro C, Lopes CM and Pereira JS 2016. Controlling stomatal aperture in semi-arid regions - The dilemma of saving water or being cool? Plant Science, 251, 54–64.

Chaves MM, Santos TP, Souza CR, Ortuño MF, Rodrigues ML, Lopes CM, Maroco JP, Pereira JS, 2007. Deficit irrigation in grapevine improves water-use efficiency while controlling vigour and production quality. Ann Appl Biol., 150: 237-252.

Chaves, MM;. Zarrouk, O.; Francisco, R.; Costa, JM; Santos, T.P.; Regalado, AP; Rodrigues, ML; Lopes, CM 2010. Grapevine under deficit irrigation: hints from physiological and molecular data. Annals of Botany 105: 661–676.

Clingeleffer, P., Dunn, G., Krstic, M., Martin, S. (2001). Crop Development, Crop Estimation and Crop Control to Secure Quality and Production of Major Wine Grape Varieties: A National Approach. Final report to Grape and Wine Research and Development Corporation, CSIRO Plant Industry, Austrália. pp. viii, 148, [17] http://hdl.handle.net/102.100.100/201731?index=1

Costa, J.M, Vaz, M., Escalona, J., Egipto, R., Lopes, CM., Medrano, H., Chaves, M.M. 2016. Modern viticulture in southern Europe: Vulnerabilities and strategies for adaptation to water scarcity. Agricultural Water Management 164, (1), 5–18.

Gerós, H. et al. 2015. Grapevine in a Changing Environment. A Molecular and Ecophysiological Perspective. *Wiley & Sons Ltd.*

Gladstones, J. 2011. Wine, Terroir and Climate Change. Wakefield Press, Adelaide, South Austrália.

Iland, P. et al. 2011. The Grapevine: from the science to the practice of growing vines for wine. Patrick Iland Wine Promotions Pty, Austrália.

Jones, G. 2012. Climate Assessment for the Douro Wine Region: An Examination for the Past, Present and Future Conditions for Wine Production. ADVID, Régua, Portugal.

Lopes CM, Costa J., Egipto R., Zarrouk O., and Chaves, Maria MM. 2018 Can Mediterranean terroirs withstand climate change? Case studies at the Alentejo Portuguese winegrowing region. In. *E3S Web of Conferences **50**, 01038. XII Congreso Int. Terroir.* Zaragoza, 18-22 Junio, 2018. https://www.e3s-conferences.org/articles/e3sconf/ pdf/.

Lopes CM, Egipto R. Zarrouk. and Chaves MM. 2020. Carry-over effects on bud fertility makes early defoliation a risky crop-regulating practice in Mediterranean vineyards. Australian Journal of Grape and Wine Research 26, 290–299.

Lopes, C.M., Santos, T., Monteiro, A.; Rodrigues, M.L, Costa, J.M. & Chaves, M.M. 2011. Combining cover cropping with deficit irrigation in a Mediterranean low vigor vineyard. Scientia Horticulturae , 129:603-612.

Meissner G, Athmann M., Fritz, J., Kauer R., Stoll M. and Schultz HR 2019. Conversion to organic and biodynamic viticultural practices: impact on soil, grapevine development and grape quality. OENO One 4, 639-659.

Monteiro, A.; Lopes, C.M. 2007. Influence of cover crop on water use and performance of vineyard in Mediterranean Portugal. Agri. Ecosyst. Environ., 121:336-342.

O.I.V. 2008. Guidelines for Sustainable Vitiviniculture: Production, processing and packaging of products. International Organisation of Vine and Wine, Resolution CST 1/2008, Paris, 2008.

Pedneault K., Provost C. 2016. Fungus resistant grape varieties as a suitable alternative for organic wine production: Benefits, limits, and challenges. Scientia Horticulturae, 208, 57-77

Profit, T. et al. 2006. Precision Viticulture. A new era in vineyard management and wine production. Winetitles, Ashford, South Australia.

Seng, K. P., Ang, L. M., Schmidtke, L. M., & Rogiers, S. Y. (2018). Computer vision and machine learning for viticulture technology. IEEE Access, 6, 67494–67510.

Willer H, Lernoud J, 2019. Organic agriculture worldwide: current statistics. In: IFOAM Fa, editor editors. The World of Organic Agriculture Statistics and Emerging Trends 2014 Frick and Bonn.