



UNIVERSITÀ DI PISA

GENERAL AND WINE MICROBIOLOGY

ANNITA TOFFANIN

Anno accademico	2020/21
CdS	VITICULTURE AND ENOLOGY
Codice	006GG
CFU	6

Moduli	Settore/i	Tipo	Ore	Docente/i
MICROBIOLOGIA GENERALE ED ENOLOGICA	AGR/16	LEZIONI	64	ANNITA TOFFANIN

Learning outcomes

Knowledge

The course has the objective to introduce to general and applied microbiology, specifically in relation to the wine sector. The student will learn important concepts concerning the microbial cell, its structure and metabolism, the microbial contribution to the wine field, wine yeasts and bacteria, wine fermentation for high quality wine production.

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Assessment criteria of knowledge

The assessment of existing knowledge will be performed by a self evaluation entry test on general and wine microbiology. The assessment of acquired knowledge will be performed by two written tests (ongoing for attendant students), the first on General Microbiology, the second on Wine Microbiology, and a final oral exam.

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Skills

At the end of the course the student is able to describe a microbial cell and to identify metabolic aspects of eucariotic and procariotic microbial cells; he knows the microbial growth and the main methods for its evaluation; he knows the main wine yeasts and bacteria, he can describe the biochemistry of main wine fermentations and he knows the main microbial analytical methods to assess the quality of musts and wines.

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Assessment criteria of skills

The verification of the abilities is effected through compilation of individual documents during lessons, activity of laboratory and exercises, besides the tests in itinere and the entry test.

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Behaviors

At the end of the course the student will acquire the ability to utilize the basic instruments for microbiological studies and awareness of enological problems.

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Assessment criteria of behaviors

The behaviour verification will be performed by individual written documents about laboratory and practical works.

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Prerequisites

There are not Prerequisites.

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Co-requisites

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Prerequisites for further study

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Teaching methods

Lectures, laboratory activities and exercises are held with teaching material and individual documents available on e-learning web-site. Communication with students takes place through e-learning web-site, meetings and e-mail.

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Syllabus

PART 1 General Microbiology

Introduction in the course with some features on wine microbiology. History of the microbiology. Eukaryotic and prokaryotic microbial cell. Biodiversity and classification of microorganisms. Form and dimensions of the microbial cell. Structures and functions of the bacterial cell, membrane, cell wall, other surface structures. Gram. Structure of the eucaryotic cell -> *Saccharomyces cerevisiae*. Classification and evolution of *Saccharomyces cerevisiae*. Genetics of the microorganisms: structure of the genome of bacteria and the yeasts. The microorganisms and the environment: temperature, conditions of oxygenation, pH. microbial growth and methods for control. Microbial nutrition. Aspects of microbial metabolism: respiration, fermentations.

Part 2 Wine Microbiology

Wine Yeasts: general aspects, historical features of yeast classification, *Saccharomyces* spp. not-*Saccharomyces* yeasts: characteristics of the main wine species, contribution to wine making. Microorganisms on the grapes; spontaneous and guided fermentation. Alcoholic fermentation: biochemistry; thermal raise and ethanol production. Employment and characteristics of selected yeasts; wine yeast characteristics; genetic improvement of wine microorganisms; glycerol pyruvic fermentation; malolactic fermentation; effect of the air on the population of yeasts during fermentation. *Dekkera* / *Brettanomyces* spp: general characteristics and effects on wine, prevention and care. Malolactic fermentation; general characteristics of LAB and malolactic bacteria; LAB and acetic bacteria biochemistry and biotechnology. Molecular techniques of identification and characterization of wine microorganisms.

EXERCISES

Introduction to methods in microbiology: media preparation and microbial growth - Isolation of microorganisms in pure culture - Microscopy applied to wine yeasts and bacteria - Dilution and inoculation of solid and liquid media - Determination of wine characteristic – Wine yeast rehydration and microbial analysis - wine yeast PCR-ITS identification.

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Bibliography

GENERAL MICROBIOLOGY

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- MARTINKO BEN MADIGAN 2016 - BROCK BIOLOGIA DEI MICRORGANISMI. EDIZ. MYLAB.
- DEHÒ GALLI – 2014 BIOLOGIA DEI MICRORGANISMI. CON CONTENUTO DIGITALE (FORNITO ELETTRONICAMENTE) EDITORE CEA

WINE MICROBIOLOGY

- RAFFAELE GUZZON, ILARIA PERTOT, 2016 -MICRORGANISMI DELLA VITE E DEL VINO, ORIGINE, FUNZIONI E APPLICAZIONI ENOLOGICHE. CASA EDITRICE TECNICHE NUOVE
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- VINCENZINI, ROMANO, FARRIS, 2005 - MICROBIOLOGIA DEL VINO - CASA EDITRICE AMBROSIANA
- ZAMBONELLI C. 2003 - MICROBIOLOGIA E BIOTECNOLOGIA DEI VINI. EDAGRICOLE, BOLOGNA
- CARROZZA GIAN PIETRO 2014 - MANUALE DI ENOLOGIA - POSEIDONIA SCUOLA
- RIBERAU-GAYON, DUBOURDIEU, DONECHE, 2017 - TRATTATO DI ENOLOGIA VOL. 1 MICROBIOLOGIA DEL VINO E VINIFICAZIONI, EDAGRICOLE-NEW BUSINESS MEDIA

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Non-attending students info

The whole teaching material is present on e-learning web-site. The laboratory activities and exercises are reassumed in cards available on e-learning web-site in order to allow not-attendant students to be informed about. The teacher is available for integrations.

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Assessment methods

The exam will be performed by two written tests (ongoing for attendant students), the first on General Microbiology, the second on wine



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microbiology), and a final oral exam.

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Work placement

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Additional web pages

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Notes

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