Molecular Evolution of Plants and Fungi 2016/2017

Code: 42883
ECTS Credits: 6

Degree	Type	Year	Semester
4313771 Plant Biology and Biotechnology	OB	0	2

Contact

Name: Llorenç Sáez Gonyalons

Email: Llorens.Saez@uab.cat

Use of languages

Principal working language: spanish (spa)

Teachers

Sergio Santamaría del Campo

Merce Galbany Casals

Laia Guardia Valle

Prerequisites

There are no prerequisites.

Objectives and Contextualisation

Acquisition of knowledge of the fundamentals of plant and fungal evolution and major evolutionary lineages. Learning the methodology of its study in order to develop subsequent activity in a research and professional environment.

Skills

- Apply knowledge of the evolutionary mechanisms of plants and fungi to the study of plant systematics and to the genetic improvement of plants.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Conceive, design, manage and develop a scientific, technical or industrial project in biology and biotechnology of plants and fungi, interpreting findings and generating knowledge.
- Continue the learning process, to a large extent autonomously
- Identify and use bioinformatic tools to study plant genetics, evolution and functioning.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use and manage bibliography and IT resources in the field of study.
- Use scientific terminology to account for research results and convey these in spoken and written English in an international context.
- Work in a multidisciplinary team.

Learning outcomes

1. Apply knowledge of the molecular evolution of plants and fungi to the study of the phylogeny of plant organisms.
2. Choose and apply IT tools to the reconstruction of plant and fungus phylogenies.
3. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
4. Continue the learning process, to a large extent autonomously
5. Handle different computer programmes for the reconstruction of plant and fungus phylogenies on the basis of molecular data.
6. Propose innovative projects in the field of biotechnology, on the basis of a holistic methodological perspective on the molecular evolution of plants and fungi.
7. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
8. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
9. Use and manage bibliography and IT resources in the field of study.
10. Use scientific terminology to account for research results and convey these in spoken and written English in an international context.
11. Work in a multidisciplinary team.

Content

- Plant Systematics and phylogeny: concepts. Approach to the concept of species and discussing their problems. Plant Systematics and phylogeny: concepts. Approach to the concept of species and discussing their problems. [Ll. Saez]

- Vascular Plants: characteristics and implications of the adaptation to terrestrial environment. Vascular plants: ecological and economic importance. Global patterns of biodiversity. [Ll. Saez]

- Main mechanisms of speciation in plants. Incidence of hybridization and introgression. Angiosperms: origin and evolutionary trends. [Ll. Saez]

- Plant Evolution: recognition of the major evolutionary lines and groups. Reproductive strategies in plants. Apomixis, autogamy, allogamy dispersion. Micotrophes and heterotrophic plants. [Ll. Saez]

- Fungal Genetics and Phylogeny. Origin, phylogeny and systematics of fungi. Study of Fungal Genetics: advantages and limitations. Fungi life cycles: haploid haplo-dikariotic haplo-diploid and diploid. Compatibilities and incompatibilities between individuals. Vegetative compatibility. Mating systems and genetic exchange. Homothallic and heterothallics Systems (bipolar and tetrapolar). Parasexuality. Hipothesis gen-a-gen [S. Santamaria]

- Nutritional strategies and biological interactions. Fungal parasites, endosymbiosis, mycorrhizae, etc. [L. Guardia]

- The fungi in biotechnology. Biodegradation. Production of metabolites. [L. Guardia]

- Systematics and evolution: sources of information and types of analysis. [M. Galbany]

1.Conceptes basic phylogeny. Representation.

2.Caràcters and molecular techniques in systematics and phylogeny. Databases.

3.Alineament DNA sequences.

4.Models sequence evolution.

5. Phylogenetic inference

6.Characters and techniques in molecular systematics and phylogeography. Population studies.

Methodology

Theory lectures, according to the content of the course

Practical sessions reconstruction of phylogenies (you need to have a laptop)

Reporting on issues related to the content of the course

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
practical sessions	30	1.2	1, 11, 7, 4, 2, 8, 5, 9, 10
Preparation of reports and works	90	3.6	7, 3, 4, 8, 9, 10
theory sessions	30	1.2	1, 11, 6, 7, 4, 8, 9, 10

Evaluation

A minimum score of 5 (in both reports and practices)is required to pass the course.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
class attendance and participation	10%	0	0	3, 4, 8
conducting practical sessions	50%	0	0	1, 11, 7, 4, 2, 8, 5, 9
Submission of works	40%	0	0	1, 6, 7, 3, 4, 8, 9, 10

Bibliography

References

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Avise, J.C. 2000. Phylogeography: the history and formation of species. Cambridge [etc.]. Harvard University Press.

Carrión, J.S. 2003. Evolución vegetal. Murcia. DM.

Freeman, S. & Herron, J.C. 2007. Evolutionary Analysis. 4th Ed. Upper Saddle River, NJ. Pearson Education.

Gillespie, J. H. 2004. Population Genetics: A Concise Guide. Baltimore [etc.]. The Johns Hopkins University Press.

Graur, D. & Li, W.-H. 2000. Fundamentals of Molecular Evolution. 2nd Ed. Sunderland (Mass.). Sinauer.

Hall, B.G. 2011. Phylogenetic Trees Made Easy: A How To Manual. 4th Ed. Sunderland, Mass. Sinauer Associates.

Hillis, D., Moritz, C. & Mable, B.K. 1996. Molecular Systematics. 2nd Ed. Sunderland. Sinauer Associates.

Hollingsworth, P., Bateman, R. & Gornall, R. 1999. Molecular systematics and plant evolution. London [etc.]. Taylor & Francis.

Judd., W.S., Campbell, C.S. & Kellogg, E. 2008. Plant Systematics: A Phylogenetic Approach with CDROM. 3rd Ed. Sunderland, Massachusetts. Sinauer Associates.

Rutgers, D.S. 2010. Phylogeography: concepts, intraspecific patterns and speciation processes. New York: Nova Science.

Simpson, M.G. 2010. Plant Systematics, 2nd Ed. Burlington, MA. Academic Press.

Wiley, E.O. & Lieberman, B.S. 2011. Phylogenetics: Theory and Practice of Phylogenetic Systematics. 2nd Ed. New York [etc.]. Wiley-Blackwell.

Willis, K.J. & McElwain, J.C. 2002. The Evolution of Plants. Oxford. Oxford University Press.

Web resources:

Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 13, July 2014 [and more or less continuously updated] http://www.mobot.org/MOBOT/research/APweb/

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