

From Water to Land – Algae, Mosses and Ferns

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Experiment Overview

The organisms on Earth have a bewildering diversity of types. The aim of the lectures and practical classes on plant diversity, including this one, is to show students the variety of photosynthetic organisms from algae through to land plants. Students will also be introduced to the scientific ideas of classification and evolution that make this diversity understandable.

In this practical in particular students make observations of a variety of different algae from the three main phyla – reds, browns and greens – as well as mosses and ferns. With mosses and ferns the focus is on a comparison of the lifecycles and dispersal mechanisms as well as overall morphology. The prac aims to reinforce concept presented in lectures (the evolution of land plants from green alga) by direct observation of features of the lower land plants that support this hypothesis.

Learning Experience

This experiment was submitted as a prac requiring “significant improvement” based on a certain level of negative feedback from students (i.e. they find it boring). It is likely that it does not meet all the educational objectives that would be desirable and it is hoped that it can be improved based on feedback from this workshop.

Aims and Objectives

The aim of this class is to introduce students to the diversity of algae, mosses and ferns, especially in relation to their evolutionary development from water to land. In this class students will also see the diversity of structures and sexual life cycles of what are regarded as the two main ‘primitive’ groups of land plants, focusing on how the life cycle changes from one in which the gametophyte is the ecologically dominant stage (in mosses) to one in which the sporophyte is the ecologically dominant stage (in ferns, and subsequently in all seed-forming plants). This class, together with the next one on seed-forming plants, should be treated as an investigation of the evidence for the evolution of land plants from primitive (mosses and ferns) to advanced types (flowering plants) that now dominate Earth's vegetation.

Level of Experiment

First Year Plant Biology. Could be suitable for 2nd year botany.

Course Context and Prerequisite Knowledge and Skills

This prac is part of a first year course in Plant Biology. It is taught early in the course and requires little prior knowledge other than a basic understanding of biological concepts such as mitosis, meiosis, fertilization, photosynthesis etc. as well as basic use of microscopes. In the complete lab manual a more extensive introduction which covers many of these concepts is provided to both this and the following, related, prac. Enough background is provided in the lab manual for students to be able to complete this prac. Also some background reading from the prescribed text (Knox et al.) is suggested. In reality the prac could be run with either very little background and be treated as an introduction to diversity in algae and early land plants, or for more advanced (e.g. 2nd year students) as a prac which develops some of the concepts of the evolution of land plants from green algae.

Time Required to Complete

Prior to Lab: 30 mins to one hour reading (ideally)

In Laboratory: 3 hours allowed (usually does not take all 3 hours)

After Laboratory: Revision for pre-prac test the following week. No report required.

Experiment History

This prac has been run by the Botany Department, La Trobe University for many years as part of the first year course in Plant Science. It was originally a more extensive prac running for two or more classes, and looked in some depth at lifecycles of algae as well as lower land plants (bryophytes and ferns). It has been cut back to one prac (another related prac on gymnosperms and angiosperms runs the following week) which now has only parts of the algae prac and the moss prac taught.

Whilst the authors listed in section 1.9 are responsible for the educational analysis of this experiment, it was submitted to ASELL on behalf of staff of the Botany Department, La Trobe University.
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References

Knox, B, Ladiges, P. Y., Evans, B. and Saint (2005). *Biology: an Australian focus*, 3rd Ed., McGraw-Hill Book Company, Australia
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