

Amylase Activity in Germinating Barley

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Experiment Overview

In this experiment, students investigate and compare amylase activity in different life stages of barley. The experiment allows students to make connections between concepts and processes previously covered in lectures and reading materials and is relevant to learning and skills development in the scientific method and related areas such as report writing and the interpretation of results. With regard to theoretical and conceptual knowledge, the practical investigates the function of an enzyme in a living organism and explores concepts around the ontogenic regulation of metabolism in an organism as it develops. Development of skills in the scientific method and the communication of science are also important components of this exercise.

Learning Experience

A knowledge and understanding of the role of enzymes in organisms underpins almost all undergraduate science courses in that it provides a threshold to the understanding of more complex processes such as cellular respiration and photosynthesis. This experiment enables students to observe metabolic regulation in a living organism, a germinating seed, commencing with a dormant seed and progressing through a young seedling, to a more mature seedling that has the capacity to generate chemical stores of energy via photosynthesis. This exercise facilitates skills development in the formulation and testing of hypotheses, aims to enhance student skills in teamwork and peer-peer communication, and provide students with the opportunity to further develop skills in numeracy and their use of technology.

Aims and Objectives

- to extract an active enzyme from biological material and use it to catalyse a specific biochemical reaction;
- to quantify the amount of enzyme activity per unit mass of tissue;
- to correlate enzyme activity with metabolic function during the development of an organism;
- to identify the product of the enzyme-catalysed reaction;
- to further develop report-writing skills in biology.

Level of Experiment

This experiment is considered most appropriate for first year students in general biology subjects or other units with a plant sciences focus.

Keyword Descriptions of the Experiment

Domain

metabolism, regulation

Specific Descriptors

germination, enzymes, regulation, growth, development

Course Context

The experiment illustrates concepts and processes regarding metabolism and metabolic regulation, which form part of a series of lectures focussed on metabolism and homeostasis in living organisms.

Prerequisite Knowledge and Skills

Students have previously completed a first semester unit that introduces enzyme structure and function, have attended unit-specific lectures on metabolism, and completed a pre-lecture module that uses activity and tutorial questions to explore the underlying concepts, explain key terms and provide students with formative assessment of their level of understanding with regard to these.

Although the overall unit primarily centres on vertebrate metabolism and homeostasis, the use of plant material in this experiment is convenient with regard to both ethics and technical requirements.

Time Required to Complete

Prior to Lab: 15 mins pre-reading of the introductory information

In Laboratory: Approximately 2.5 hours

After Laboratory: Approximately 1.5 hours

Experiment History

The experiment has been conducted in a first year, semester 2 biology unit for the past decade. During that time, slight modifications have been made to improve timing and the pre-laboratory information. A major change, instituted five years ago, was to structure student writing up of the practical as a formal laboratory report, the intention of which was to enhance student skills in report writing.