



The effect of ethylene treatment on tomato ripening. Tomatoes on the right were treated with 100 ppm (0.01% [v/v]) C_2H_4 for 3 d at room temperature, while those on the left were untreated. This demonstrates the climacteric (ethylene-responsive) nature of tomato fruit. From Rost *et al.*, *Plant Biology*, 1998 (fig. 15.16).

Biotechnology of Plants

Biology 3470 | Fall 2015

COURSE INFORMATION

Instructor D. Law

Contact info

Office: CB 4018
Email: dlaw@lakeheadu.ca (preferred contact method)
Phone: 343-8277
Office hour: Th 1:00 – 2:00 PM. Otherwise, I am available by appointment via email.

Please use the LU email address above to contact me, not the email within D2L. I will check my email daily Monday to Friday, and will try to respond to your questions as quickly as possible during those days.

Class info

AT 1007, 2:30 - 4:00 PM, T and Th. Note that the classroom may change, depending on the final class size. Last class is Th Dec. 3.

Lab info

CB 3012, 11:30 AM - 2:30 PM, T (starting Sept. 22)
Lab coordinator: Christina Richard (crichar3@lakeheadu.ca)
Lab TA: Cassandra Eckman (cleckman@lakeheadu.ca)

Course information online

Available on D2L. Check there for the latest course updates and information.

Calendar description (from

<http://navigator.lakeheadu.ca/~Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=21&topicgroupid=12718>)

Biology 3470 Biotechnology of Plants

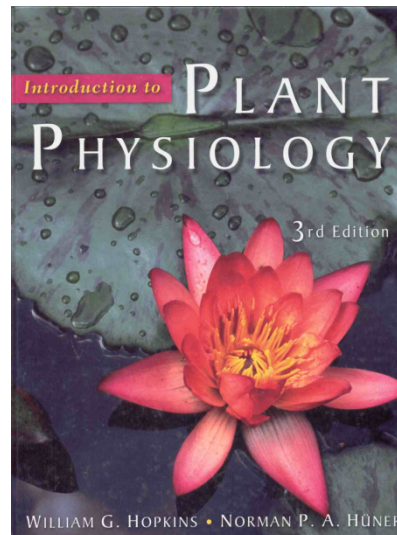
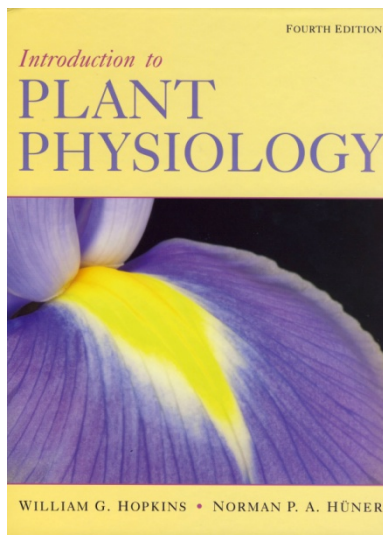
- *Credit Weight:* 0.5
- *Prerequisite(s):* Biology 2230 and 2910, or permission of the instructor
- *Description:* Facts and myths surrounding plant biotechnology, domestication of modern crop plants, photosynthesis and primary assimilation of inorganic nutrients, plant growth regulators, morphogenesis, tissue culture, water relations and transport, and plant movements and directional growth.
- *Offering:* 3-3; or 3-3
- *Notes:* An additional fee (see Miscellaneous Fees) is required for this course.
- *Course Classification(s):* Type C: Engineering, Mathematical and Natural Sciences

Textbook

Hopkins W.G. and Huner, N.P.A. *Introduction to plant physiology*, Wiley. Either:

- 4th ed. (2009), ISBN-13: 978-0-470-24766-2, or
- 3rd ed. (2004), ISBN-10: 0-471-38915-3

Available from the LU bookstore or from other retailers. There are also used copies available from former students and likely also in the bookstore.



COURSE OUTLINE

Course objectives

By the end of this course, you will possess the following knowledge:

A. Scientific concepts:

- An in-depth understanding of key processes of plant physiology and biochemistry at an advanced level. Examples may include:
 - Photosynthesis and gas exchange
 - Water and nutrient transport and utilization
 - Energy metabolism
 - Carbon partitioning
 - Flowering and reproduction
 - Plant growth regulators and their roles as signaling molecules
 - Plant responses to stress
- A practical understanding of the cardinal importance of plant metabolism in the biosphere
- Knowledge of how plant metabolism may be manipulated to make products of high agronomic value
- Comprehension of the ethics and realities of plant biotechnology
- Knowledge of techniques used for local food production, and its benefits and challenges
- Knowledge of the benefits of public education about native and exotic plants
- The ability to think critically about ethical issues surrounding food production

B. Practical scientific techniques:

The ability to perform:

- Plant culture and growth monitoring under a variety of conditions and with different species
- Statistical interpretation of results

C. Broader learner outcomes:

Comprehension of how to:

- Write a scientific paper in the proper format
- Write a “popular” article about a plant that is useful to people, based on information obtained during a field trip
- Read, interpret and extract useful information from a primary scientific journal article and discuss it with your peers

Marking scheme

The lab component will count for 35% of the course's marks and the lecture component 65%, as follows:

Component**A. Laboratory**

See mark breakdown in lab manual.

- Total for labs **35**

B. Lecture

- Participation **5**
- Midterm exam 1 **15**
- Midterm exam 2 **15**
- Final exam **30**

TOTAL MARKS **100**

Note that 5% of the course's marks are allocated to participation in lecture and will be assessed in-class using the [i-clicker](#) and other methods. Participation marks will be allocated for both:

- Class attendance, and
- Correct answers to questions

The i-clickers are available in the bookstore. You can also buy a used clicker from previous Law students, but if you do make sure that the Clicker ID is legible on the outside. Please register your i-clicker [online](#) before the first class. Additional information on the technology will be given in the first class. You may use either an original i-clicker or an i-clicker 2.

Lecture schedule and important dates

Note that the schedule is tentative and subject to change.

Class #	Lecture	Day	Date	Subject	Text ref, 4th edn
1	1 2	T	15-Sep	Introduction History of agriculture	slides
2	3	Th	17-Sep	Walking tour of plants on campus	notes
3	4	T	22-Sep	Examples of plant biotechnology	slides
4	5	Th	24-Sep	NWO food production	slides
5	6	T	29-Sep	Water and water relations	1; 2.1 to 2.3
6	7	Th	1-Oct	Food crop in focus: bananas	slides
7	8	T	6-Oct	Case study: Schmeiser vs. Monsanto	slides
8		Th	8-Oct	Midterm exam 1 (lectures 1-7)	
9	9	T	13-Oct	Mineral nutrition	3.1 to 3.3; 4
10	10	Th	15-Oct	N assimilation	11
11	11	T	20-Oct	Food crop in focus: the potato	slides
12	12	Th	22-Oct	Organic agriculture	6, 22
13	13	T	27-Oct	The business of plant biotech	slides
14	14	Th	29-Oct	Photosynthesis - light-dependent reactions	7
15	15	T	3-Nov	Photosynthesis - light-independent reactions	8
16		Th	5-Nov	Midterm exam 2 (lectures 8-14)	
17	16	T	10-Nov	Starch and sugar synthesis	9.1 to 9.3
18	17	Th	12-Nov	Food crop in focus: maize	slides
19	18	T	17-Nov	Plant biotech ethics	Slides
20	19	Th	19-Nov	Flowering and reproduction; Terminator technology	25.1 to 25.2; pdf handout
21	20	T	23-Nov	Stress responses	14, 15
22	21	Th	26-Nov	Plant productivity	12
23	22	T	1-Dec	Secondary metabolites	27.1 to 27.4
24	23	Th	3-Dec	Case study: StarLink corn	slides

Material placed on reserve

The following plant science and biotechnology textbooks have been placed on 1-day reserve in the library for this course. The Hopkins and Huner text is intended as a general introductory textbook and can lack detail in certain areas. The other texts below are useful for their depth on certain plant science topics.

1. *Introduction to plant physiology*. William G. Hopkins and Norman P.A. Hüner, 4th edition. (course textbook) QK 711.2 H67 2009
2. *Introduction to plant physiology*. Hopkins and Huner 3rd ed. (previous edition of course textbook) QK 711.2 H67 2004
3. *Biochemistry & molecular biology of plants*. Bob B. Buchanan, Wilhelm Gruissem, Russell L. Jones, eds. QK 861 B45 2000
4. *Plant physiology*, Hans Mohr. QK 711.2 M6413 1995
5. *Plant biology*. Thomas L. Rost ... [et al.], 2nd ed. QK 47 P57 2006
6. *Plant biotechnology : current and future applications of genetically modified crops*. edited by Nigel G. Halford. SB 106 B56P582 2006
7. *Plant development and biotechnology*. edited by Robert N. Trigiano, Dennis J. Gray. QK 725 P58 2005
8. *Plant biology*. Linda E. Graham, James M. Graham, Lee W. Wilcox. QK 47 G68 2006
9. *Plant biochemistry and molecular biology*. Edited by Peter J. Lea and Richard C. Leegood. QK 861 P59 1999
10. *Biology of plants*. Peter H. Raven, Ray F. Evert, Susan E. Eichhorn. QK 47 R25 2013

Note also that I have many other texts that I am willing to lend out; see me to discuss.

Midterm exams (dates indicated above)

These cover the lectures as indicated above. They are written in class and are 1 h long. Other details will be given in class.

Final exam (date TBA)

Covers material between last test and the end of the course. However, any material that students had difficulty answering on the midterm test may be included on the final. I will let you know what this material is in advance.

Classroom policies

1. *Arriving/departing from class:* If you arrive late or must leave during class time, please make sure that you close the classroom door quietly.
2. *Computer/cell phone usage:* I recognize that many students use their laptops/tablets to take notes electronically. These are permitted, but as a courtesy to me and your peers, I ask that there is **no texting or IMing** in class, please. They are distracting for both students and instructor.
3. *Talking:* Please refrain, unless you're collaborating (e.g., on i-clicker answers) or asking or commenting on questions. Comments or questions are always very welcome during lecture; please raise your hand first.

Statement on academic dishonesty

The full version of Lakehead University's policy on academic dishonesty is available here: <http://vpacademic.lakeheadu.ca/?display=page&pageid=46>. This policy makes up part of the Code of Student Behaviour and Disciplinary Procedures (<https://www.lakeheadu.ca/faculty-and-staff/policies/student-related/code-of-student-behaviour-and-disciplinary-procedures>). All students in this course should read this policy and become familiar with it.

In summary, the penalty for plagiarism or cheating on any part of this or any other course is zero for the work where the student is caught. Serious or repeated plagiarism, including cheating on an examination or test, will result in a mark of zero for the course and may result in expulsion from the University.

For the purposes of this course, there are in particular two places where cheating may occur:

- (a) using written or electronic notes or conferring with another person in a test or examination, and
- (b) handing in a written lab report that is in whole or in part not the student's own work.

Academic dishonesty for any of these areas will result in a mark of **zero** for the work concerned. Rest assured that the course instructors will take **every precaution** to ensure that potential cheaters are caught and subjected to the appropriate penalty.