



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 | Winter 2020

Course objectives

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

A. Scientific concepts:

- 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
- 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

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

Lectures

Held in the telepresence facility in Orillia (OA 2020) and Thunder Bay.(AT 5041).
M and W, 1:00 – 2:30 PM.

Instructor David Law
Office: OA 3004 (in Orillia)
Email: dlaw@lakeheadu.ca (preferred contact method). Please use this email address 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.
Phone: 705-330-4008 x2646
Office hour: We can talk in person any time you like; just email me in advance to set up a date and time that works for both of us. Orillia students can see me in person; TB students can talk to me after class or make an appointment to talk on the phone or via Zoom or FaceTime.

Labs

F, 11:30 AM - 2:30 PM (starting Jan. 16)

Orillia:	Location:	OA 3002
	Lab coordinator:	Victoria Te Brugge (vtebrug@lakeheadu.ca)
Thunder Bay:	Location:	CB 3012
	Lab coordinator:	Christina Richard (crichar3@lakeheadu.ca)
	TA:	Jessie McFadden (jmcfadd3@lakeheadu.ca)

MyCourseLink/D2L

All course information is available on the course website.

Calendar description (from

<http://csdc.lakeheadu.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&topicgroupid=25226&entitytype=CID&entityid=57921&loadusercredits=True>)

Biology 3470 Biotechnology of Plants

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.

Credit Weight: 0.5

Prerequisite(s): Biology 2230 and 2910 or permission of the instructor

Offering: 3-3; or 3-3

Notes: An additional fee (see Miscellaneous Fees) is required for this course.

Course Classifications: Type C: Engineering, Mathematical and Natural Sciences

Textbook

No required textbooks, but see the **Supporting material** list below for reference material that should help you understand the course material.

Marking scheme

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

A. Laboratory

See mark breakdown in lab manual.

● Total for labs **35**

B. Lecture

● Participation **5**

● Midterm exam 1 **15**

● Midterm exam 2 **20**

● Final exam **25**

TOTAL MARKS 100

Student participation

All course participation will be done using a “clicker” system. You will need to [buy from i>clicker](#) an i>clicker/REEF app for your smartphone (choose your portable device’s operating system under “Student Apps”; this will take you to the Android or iOS app stores). Bring your device with the app on it to each class. You will use it to answer questions in class and receive participation marks.

To link your app to the course, search for the course under my name at Lakehead-Orillia: “BIOL 3470 2020W”, then add it to your list of courses. The cost is around \$21 for a 6-mo subscription, which is cheaper than a physical remote.

Five percent of your final mark is allocated to participation. In each lecture, you will use the clicker to answer questions that are based on the course material using the i>clicker during my lectures. The 5% participation mark will be equally weighted for

- attendance (2.5%), and
- correct answers (2.5%).

Therefore, to receive a high participation mark, you have to be both physically and mentally present in class!

You may miss a maximum of 3 lectures without penalty. Additional information on the technology will be given in the first class.

Lecture schedule and important dates (tentative and subject to change)

Week of:	Topics	Reading
Jan. 6	Introduction	slides
	History of agriculture	slides
Jan. 13	Examples of plant biotechnology	slides
	Local food production	slides
Jan. 20	Water and water relations	H&H chp 1; 2.1 to 2.3
	Food crop in focus: bananas	slides
Jan. 27	Case study: Schmeiser vs. Monsanto	slides
	Midterm exam #1: Fri. Jan. 31	
Feb. 3	Mineral nutrition	H&H chp. 3.3 to 3.3; 4
	N assimilation	H&H chp. 11
Feb. 10	Food crop in focus: the potato	slides
	Organic agriculture	slides
Feb. 17	Study break	
Feb. 24	The business of plant biotech	slides
	Midterm exam #2: Fri. Feb. 28	
March 2	Photosynthesis - light-dependent reactions	H&H chp. 7
	Photosynthesis: the light-independent reactions	H&H chp. 8
March 9	Starch and sugar synthesis	H&H chp. 9.1 to 9.3
	Food crop in focus: maize	Slides
March 16	Plant biotech ethics	slides
	Flowering and reproduction; Terminator technology	H&H chp. 25.1 to 25.2; handout
March 23	Student presentations session 1	
	Student presentations session 2	
March 30	Secondary metabolites	H&H chp. 27.1 to 27.4
	Case study: StarLink maize <i>Last day of class: Friday April 3</i>	slides

Supporting material

There are no required textbooks, but the following textbooks will likely be useful. Note that even if a physical textbook is on the Thunder Bay campus, Orillia students can check it out; see Orillia library staff for more information.

Most useful...

On one-day [overnight] reserve at both the Thunder Bay and Orillia libraries:

1. Plant Biotechnology and Genetics : Principles, Techniques, and Applications. Neal C. Stewart, 2nd edition. Available as an ebook through the Lakehead library:
<http://eds.a.ebscohost.com/eds/detail/detail?vid=11&sid=dcf48b00-99d3-4de2-93f8-4dca3f4acdee%40sessionmgr4010&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=1194558&db=edsebk>
2. Plant biotechnology: the genetic manipulation of plants. Adrian Slater, Nigel W. Scott, Mark R. Fowler. TP 248.27 P55S59 2008
3. Introduction to plant physiology. William G. Hopkins and Norman P.A. Hüner, 4th edition. QK 711.2 H67 2009

Also useful...

Not on reserve, but in the stacks in the Thunder Bay (TB) or Orillia (OR) libraries, or available as ebooks:

4. Introduction to plant physiology. Hopkins and Huner 3rd edition. QK 711.2 H67 2004 (TB)
5. Biochemistry & molecular biology of plants. Bob B. Buchanan, Wilhelm Gruissem, Russell L. Jones, eds. QK 861 B45 2000 (TB).
Second edition (2012) available as an ebook through the Lakehead library:
<http://eds.a.ebscohost.com/eds/detail/detail?vid=14&sid=dcf48b00-99d3-4de2-93f8-4dca3f4acdee%40sessionmgr4010&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=1021695&db=edsebk>
6. Plant physiology, Hans Mohr. QK 711.2 M6413 1995 (TB)
7. Plant biology. Thomas L. Rost ... [et al.], 2nd ed. QK 47 P57 2006 (TB)
8. Plant biotechnology : current and future applications of genetically modified crops. edited by Nigel G. Halford. SB 106 B56P582 2006 (TB)
Available as an ebook through the Lakehead library:
<http://eds.a.ebscohost.com/eds/detail/detail?vid=1&sid=7667ef20-d6b0-4e15-b564-5bf14909c0a5%40sessionmgr4009&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=159671&db=edsebk>
9. Plant development and biotechnology. edited by Robert N. Trigiano, Dennis J. Gray. QK 725 P58 2005 (TB)
Available as an ebook through the Lakehead library:
<http://eds.a.ebscohost.com/eds/detail/detail?vid=1&sid=86d80e45-15af-445b-bab9-6f4f5da3d235%40sessionmgr4007&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=110791&db=edsebk>
10. Plant biology. Linda E. Graham, James M. Graham, Lee W. Wilcox. QK 47 G68 2006
Second edition (2014) available as an ebook through the Lakehead library:
<http://eds.a.ebscohost.com/eds/detail/detail?vid=3&sid=86d80e45-15af-445b-bab9-6f4f5da3d235%40sessionmgr4007&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=1418760&db=edsebk>
11. Biology of plants. Peter H. Raven, Ray F. Evert, Susan E. Eichhorn. QK 47 R25 2013 (TB)

12. Botany : an introduction to plant biology. James D. Mauseth QK 47 M38 2017. (OR)
The BIOL-1130: Plant biology textbook in Orillia.
13. Introductory plant biology. Kingsley R. Stern, James E. Bidlack, Shelley H. Jansky. 11th edition.
QK 47 S836 2008. (TB)
The BIOL-1130: Plant biology textbook in Thunder Bay.

Note also that I have many other plant biotech 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** in class, please. It's distracting for both students and me.
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 integrity:

The full version of Lakehead University's policy on academic integrity is available online at <https://www.lakeheadu.ca/faculty-and-staff/departments/services/provost-vice-president-academic/academic-integrity-plans-policies/academic-dishonesty-regulations>.

This policy makes up part of the Student Code of Conduct – Academic Integrity, available online at <https://www.lakeheadu.ca/students/student-life/student-conduct/academic-integrity>.

All students in this course should read these policies and become familiar with them.

In summary, the penalty for plagiarism or cheating on any part of this or any other course is a mark of **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 several places where cheating may occur:

1. using written or electronic notes or through conferring with another person in a test or examination;
2. voting electronically in place of another person for the participation component of the course;
3. handing in written work that is in whole or in part not your own.

Note that the presence of a student's iClicker REEF polling device app in the classroom when the student is not present will result in a participation mark of **zero**.

To ensure academic fairness for students who work hard, rest assured that the course instructors will take **every precaution** to ensure that potential cheaters are caught and subjected to the appropriate penalty.