HOS 6331, Postharvest Biology  
Instructor: D. J. Huber  
Spring, 2013

1. Class Meeting Times and Location

MWF, Period 4: 10:40 -11:30 AM. Rm 2318, Fifield Hall.

2. Office Hours

Monday and Friday 1:30 - 3:30 PM.  
Please make an appointment if you need to see me outside of these times.  
Office - Room 1213 Fifield Hall; Lab - Room 1206-1208; Phone 273.4779.  
e-mail djhuber@ufl.edu

3. General Description

HOS 6331- Postharvest Biology – (3) Prereq: BOT 3503, BOT 5505C, or equivalents.  
Physiological, biochemical, and molecular aspects of senescence and ripening of harvested fruit and vegetative organs. Literature-based discussions of current theories and research on cellular processes relevant to the storage and quality maintenance of harvested plant organs. Offered Spring semester, odd-numbered years.

4. Course Objectives

To familiarize students with the relationships between plant organ type, function, and the relevance of these attributes to anticipated postharvest behavior and predictive handling protocols for specific commodities.

To familiarize students with organ type and function, and of the cellular implications of these attributes as they influence performance in the postharvest environment.

To familiarize students with the current literature in postharvest science, exposing them to critical thinking skills required to adequately judge and evaluate the relevance of scientific findings.

5. Overview of Topics

Physiology, biochemistry, and molecular biology of fruit and vegetative senescence following harvest. Mechanisms contributing to senescence and deterioration phenomena, including apoptosis and other forms of programmed cell death (PCD). Membrane and cell wall metabolism, low-temperature injury, active oxygen species, apoptotic-driven death phenomena, ethylene biosynthesis, reception, and signal transduction, controlled-atmosphere storage, and postharvest pathology.
6. Texts

There are no required texts. Readings will focus on current postharvest-related literature. Selected readings will be distributed in class or provided via electronic means. Many of the assigned readings can be obtained on selected e-journal-based locations. Readings will be assigned at least one week in advance of scheduled in-class discussions.

Recommended reference texts for those involved with plant senescence research:

Annual Plant Reviews, Senescence Processes in Plants, Susheng Gan (ed.), 2007, Wiley-Blackwell. An excellent treatise of senescence biology, with an emphasis on biochemical and molecular aspects but heavy bias (≈80%) toward vegetative systems.

Plant Cell Death Processes, Larry Nooden (ed.), 2004, Elsevier (Academic Press). This is an excellent book addressing not only traditional concepts and views of senescence, ranging from cellular to organismic, but programmed cell death (PCD) as well.


Postharvest: An introduction to the physiology and handling of fruit, vegetables and ornamentals, 5th Edition, R. Wills, B. McGlasson, D. Graham, D. Joyce (Authors), 2007, University of New South Wales Press. A very introductory-level textbook that might be helpful to those with limited exposure to postharvest science. Emphasizes fundamental biological and technological principles important in the storage of fruit, vegetative and floral organs. Also reasonably priced, about $50.00!

Postharvest Biology and Technology of Fruits, Vegetables, and Flowers. G. Paliyath, D. Murr, A. Handa, S. Lurie (eds.). 2008. Pricey ($200.00), and individual chapters range from very good to equally bad, depending on the author(s).

Other suggested texts: (Selected chapters from these will be assigned during the semester)


Biochemistry of Fruit Ripening, Seymour and Taylor (eds.) 1993, Chapman and Hall, London. Although this has become dated, it remains an excellent source of introductory and historical information on many topics of relevance to postharvest
science. The book is fruit-oriented, with each chapter devoted to a different fruit type.

7. Course Readings

These will be assigned as needs arise. Please note that 10% of the course grade will be determined on the basis of student participation (participation in in-class discussions). Students will be expected to have read all assigned readings prior to coverage of the material in class.

8. Student Evaluation

Two midterm exams (20% each, scheduled at approximately 5 and 10 weeks into the semester), final exam (20%), class participation (20%), and an oral review/critique of a contemporary topic in postharvest science (20%). (Additional details of this assignment are described below.)

9. Exams

The dates of the exams will be announced at least one week in advance. Unless otherwise arranged, exams will be of the in-class, closed-book, short-essay type. Letter grade assignments will depend on the performance of the class as a whole, but will be no stricter than $\geq 90 = A; > 80, < 90 = B$, etc. Students missing scheduled exams due to excused absences will be permitted to perform make-up exams at a time and place arranged between the student and instructor.

10. Class Assignment and Oral Presentation

At the start of the semester, each student will be required to select a single commodity (fruit, vegetative, floral) or closely related group of commodities that will provide the focal point for a 20 min oral presentation to be delivered by the student during the latter portion of the semester. The presentation will be followed by a question/discussion session, with the student, with the assistance of the instructor, serving as discussion leader. Scheduling of the presentations will commence as early in the semester as possible, with presentations beginning at the midpoint of the semester. Topics will be selected by the student, but please confer with the instructor to avoid redundancy in topic selections. Examples of topics of interest: organ morphology, developmental status at harvest, respiratory behavior, maturity indices, ethylene production/sensitivity, storage conditions for maximum longevity, controlled-atmosphere tolerance, specific postharvest pathogen problems, pigment changes, unique secondary metabolites, etc.
11. Attendance

Class attendance is mandatory and will be used as one index of student participation and evaluation. Special circumstances necessitating absences must be arranged in advance or, in the event of an emergency, explained upon return.

12. Academic Honesty, Software Use, Services for Students with Disabilities, UF Counseling Services

The University of Florida requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and other acts diminish the process of learning. When students enroll at UF they commit themselves to honesty and integrity. Your instructor fully expects you to adhere to the academic honesty guidelines you signed when you were admitted to UF.

As a result of completing the registration form at the University of Florida, every student has signed the following statement:

“I understand the University of Florida expects it students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.”

Furthermore, on work submitted for credit by UF students, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

It is to be assumed all work will be completed independently unless the assignment is defined as group project, in writing by the professor.

This policy will be vigorously upheld at all times in this course.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Campus and Community Resources

Students experiencing crisis or personal problems that interfere with their general well-being are encouraged to utilize university and community counseling resources. Both the Counseling Center and Student Mental Health provide confidential counseling
services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career and academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health is located on the second floor of the Student Health Services in the Infirmary.

Alachua County Crisis Center: (352) 264-6789. Crisis line phone counseling is available 24 hours a day. 218 SE 24th Street, Gainesville 32641. http://www.alachua.fl.us/government/depts/css/crisis/

University Counseling Center, 301 Peabody Hall, 392-1575; personal and career counseling. http://www.counsel.ufl.edu

Student Mental Health, Student Health Care Center, 392-1171. A mental health counselor is on-call 24 hours a day to respond to emergencies. Monday through Friday, 8:00am - 4:30pm. Room 245, Infirmary Bldg. Fletcher Drive, UF campus: http://www.shcc.ufl.edu/smhs

Student Health Services. 392-1161 Student Health Care Center (1 Fletcher Driver) Monday - Friday, 8:00am - 4:30pm. http://www.shcc.ufl.edu

Center for Sexual Assault/Abuse Recovery and Education (CARE) 392-1161, ext. 4265. A counselor is on-call 24 hours a day to assist with sexual assault issues. Student Health Care Center. http://shcc.ufl.edu/care/

Career Development Assistance and Counseling. (352) 392-1601 Career Resource Center M-F; 8:00am - 4:30pm Reitz Union-1st Floor Career Resource Center, Reitz Union, 392-1601. http://www.crc.ufl.edu

Campus Alcohol and Drug Resource Center. 392-1161, ext. 4281. Information on drug and alcohol counseling. P202 Peabody Hall Monday - Friday, 8:00am - 4:30pm. http://www.shcc.ufl.edu/smhs/asap.shtml

International Student Services. 392-5323, ext. 600. Assistance is provided for international students at the University. 123 Grinter Hall Monday - Friday, 8:00am - 4:30pm. http://www.ufic.ufl.edu/iss.htm

Dean of Students Office, formerly Office for Student Services. 392-1261. A staff member is available to assist students. P202 Peabody Hall. Monday - Friday, 8:00am - 4:30pm. http://www.dso.ufl.edu
Students with Disabilities Act

The Dean of Students Office coordinates the needed accommodations of students with disabilities. This includes the registration of disabilities, academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services, and mediating faulty-student disability related issues.

TOPICS (Order and priority subject to change. Topics may be substituted depending on student interests).

Overview of postharvest biology

Definitions and terminology – Senescence, apoptosis, programmed cell death, mitotic and post-mitotic senescence and aging

Quality and maturity/harvesting indices
  subjective vs. objective
  destructive vs. nondestructive

Growth kinetics, sink activity, and consequences of harvest
  single-sigmoid growth
  double-sigmoid growth

Senescence of plants and plant organs - general features
  protein and carbohydrate changes
  ultrastructural changes

Membrane structural/functional changes in senescing organs
  Concepts of fluidity, microviscosity, lateral phase separation, membrane fusion
  Membrane conformation: lamellar, hexagonal\textsubscript{I}, hexagonal\textsubscript{II}

Active oxygen species: generation, control and signaling in senescence and aging

Ethylene biosynthesis

Regulation of ethylene biosynthesis
  ACC synthase, ACC oxidase

Genetic modification of ethylene biosynthesis

Ethylene binding, mode of action, signal transduction
  ethylene analogs – antagonistic vs. active

Patterns of ripening/senescence
  climacteric organs
  nonclimacteric organs
  System I/System II ethylene biosynthesis
Respiration climacteric
  relevance to ripening: detached versus attached organs

Fruit softening

Cell wall changes in ripening fruit

Chilling injury
  symptoms
  mechanism
  control in the postharvest environment

Fresh-cut fruits and vegetables – problems and solutions

Controlled-atmosphere storage

Postharvest pathology
  latency, quiescence, appressoria-cuticle interactions,
  infection progression and host responses
  symptom expression

Factors influencing pathogen development
  pathogen enzymes
  host defense-mechanisms (phytoalexins/elicitors)
    constitutive
    inducible
Please provide the following information

Name: 

Gatorlink User Name: 
(Please write legibly)

Major and degree program (MS, Ph.D.) and research advisor:

Department:

Office number, phone, and e-mail address:

Research interests:

Physiology/biochemistry/molecular/developmental, etc. courses that you have taken:

Your class schedule:

Reason for enrolling in Postharvest Biology: