HORT 480A1/580A1: PLANT GROWTH REGULATORS

IN AGRICULTURE AND HORTICULTURE

Fall 2010

Credits: 3hrs 480A1 or 4 hrs 580A1.

Class schedules: HORT 480A1/58oA1- 11:00 - 11:50 M W F, Room W9 Plant Sciences building. One additional hour per week for recitation (HORT 580A1). Location will be arranged.

Course overview: Plant growth regulators, their chemical and physical properties; general principles, practices and applications in regulating plant growth and development.

Instructor: Dr. Mohamed A. Shahba, 201 Shepardson Building.
Telephone: 491-1339; e-mail: Mohamed.Shahba@ colostate.edu

Prerequisites: BZ 120 or Hort 100 or BZ 440 or permission from the instructor.

Course Materials: Lectures, supplemental handouts and class readings. Books used but not required for the course:

- Arteca RN. Plant Growth Substances: Principles and Applications. Chapman & Hall, NY, NY pp. 332. (1995).
- Basra AS (ed). Plant growth regulators in agriculture and horticulture. Haworth Press, Inc., New York, London, Oxford pp. 264. (2000).
- Davies PJ. Plant Hormones: Physiology, Biochemistry & Molecular Biology. 2nd Ed Kluwer, Norwell MA pp. 833. (1995).
- Gausman HW (ed.). Plant Biochemical regulators. Marcel Dekker, Inc. New York, Basel, Hong Kong pp. 363. (1991).
- Leopold AC & P. Kriedemann. Plant Growth and Development. 2nd Ed McGraw-Hill Book Co, NY, NY pp. 545. (1975).
- Moore TC. Biochemistry and Physiology of Plant Hormones. 2nd Ed Springer-Verlag, NY, NY pp. 330. (1989).
- Nickell LG. Plant growth regulators. Springer-Verlag, Berlin, Heidelberg, New York pp. 173. (1982).
- Ory RL and Ritting FR (eds.). Bioregulators: Chemistry and uses. American Chemical Society, Washington, D.C. pp. 283. (1984).
- Taiz L and Zeiger E. Plant Physiology. 3rd edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts PP. 690. (2002).
- Weaver RJ. Plant Growth Substances in Agriculture. W. Freeman & Co, San Francisco, CA pp. 594. (1975).

Course Objectives:

- Students will understand the historical aspects and fundamental terms/concepts for plant growth substances including: auxins, gibberellins, cytokinins, abscisic acid, ethylene, and brassinosteroids.
- Students will understand the chemistry, biological effects and mechanism of action of PGRs in plant growth and development.
- Students will understand the role of PGRs as growth retardant chemicals that are used to control plant height especially on ornamental plants.
- Students will understand the role of PGRs as a tool to improve the post production quality of many perishable ornamentals, including cut flowers and foliage, flowering potted plants, and potted foliage plants.
- Students will understand the role of PGRs as a tool to improve fruit development (climacteric vs non-climacteric), enhance ripening and desirable fruit color development, reduce fruit russetting, facilitate harvesting, prolong ripening to enhance fruit quality and reduce the acid center of ripe grapefruit.
- Students will understand the role of PGRs as a turfgrass management tool.
- Students will improve their awareness and understanding of the role of PGRs as a seed dormancy (either innate or salinity-induced) breaking tool.
- Students will increase their awareness and understanding of the commercial uses of PGRs in horticulture and agriculture using case studies and examples.
- Students will review and use the primary scientific literature as a basis for the in-depth study of PGRs (HORT 580A1 only).
- Students will develop critical thinking and problem-solving skills through class discussions (HORT 580A1 only).
- Students will analyze, critique, and discuss current literature in the field (HORT 580A1 only).

Differentiation between HORT 480A1 and HORT 580A1:
HORT 480A1 is a 3 credit class for upper level undergraduates. The requirements for HORT 480A1 follow the general aspects of other undergraduate classes (lectures and scheduled exams). HORT 580A1 is designed for graduate students and therefore, expectations are greater than that of HORT 480A1 lecture. Graduate students attend the same lectures as HORT 480A1 students and are required to participate in an hour per week in a critical thinking discussion session of current literature in the field. The extra hour session of HORT 580A1 requires reading and analyses preparation outside of scheduled HORT 480 A1 meeting times.

Exams:
There will be three in-class closed book exams during the semester and one final exam. In-class Exams will cover all materials from both lectures and reading assignments since the previous exam. Questions will be matching, short answer and some short essay. The final exam will be cumulative and will consist of a number of longer essay questions. Make-ups are primarily essay and allowed only if the student notify the instructor in advance with an acceptable excuse.

Presentation:
The presentation topic will be related to the course objectives and will be student choice. The length of the presentation should be 15 minutes in length plus 5 minutes allowed for questions. The presentation must use visuals and be presented in a way that notes can be readily taken. A variety of topics will be available for students to pick from. Each student must work on a different topic. Topics must be approved by the instructor. Students are expected to submit a well written review of their topic (Word format) with a complete list of the literature they reviewed one week before their class presentation is due. A suggested topics list will be provided. Students may choose one of the suggested topics or choose a topic of their own as long as it will be related to the course objectives.

Grading Policy:

HORT 480A1:

3 in class exams	300 pts (100 each)
Class presentation	50 pts
Final exam	100 pts

Final grade = (Total points earned/450) x 100

HORT 580A1:

3 in class exams	300 pts (100 each)
Discussion leadership and participation	150 pts
Class presentation	50 pts
Final exam	100 pts

Final grade = (Total points earned/600) x 100

Grading scale:

≥ 90%	**= A**
80 – 89 %	**= B**
70 – 79 %	**= C**
60 – 69 %	**= D**
< 60%	**= F**

***Tentative Course Schedule (Fall 2010):**

Date	Topic	Discussion Topic
Aug. 23	Introduction and Course Administration	
Aug. 25	Historical aspects and fundamental terms/concepts for plant growth substances.	
Aug. 27	Plant Growth Regulation Society of America (purpose, organization, annual meetings and up to date reports).	
Aug. 30	Auxins	
Sep. 1	Gibberellins	
Sep. 3	Cytokinins	
Sep. 6	Labor day – No classes	
Sep. 8	Abscisic acid	
Sep. 10	Ethylene	
Sep.13	Ethylene	
Sep. 15	Brassinosteroids: biological activity and proposed mode of actions, practical applications in agriculture, proposed functions and proposed biosynthesis	
Sep. 17	Plant growth-promoting brassinosteroids: problems and prospects associated with brassinosteroids.	
Sep. 20	Exam1	
Sep. 22	Methods for plant growth substance analysis	
Sep. 24	Methods for plant growth substance analysis	
Sep. 27	Synthetic plant growth regulators.	
Sep. 29	Effect of plant growth regulators on juvenility, maturity and senescence.	
Oct. 1	Manipulation of growth and photosynthetic processes by plant growth regulators.	
Oct. 4	Manipulation of growth and photosynthetic processes by plant growth regulators.	
Oct. 6	Physiology of fruit Set, growth, development, ripening, premature drop and abscission.	
Oct. 8	Physiology of fruit Set, growth, development, ripening, premature drop and abscission.	
Oct. 11	Plant growth retardants in ornamental horticulture.	
Oct. 13	Role of growth regulators in the postharvest life of ornamentals.	
Oct. 15	Role of growth regulators in the postharvest life of ornamentals.	
Oct. 18	Manipulating fruit development and storage quality using growth regulators.	
Oct. 20	Manipulating fruit development and storage quality using growth regulators.	
Oct. 22	Exam 2	

Oct. 25	Growth movements- Phototropism- geotropism	
Oct. 27	Photomorphogenisis - photoperiodism	
Oct. 29	Effect of plant growth regulators on seed dormancy, germination and seedling growth.	
Nov. 1	Effect of plant growth regulators on rooting, flowering, abscission, tuberization, postharvest physiology.	
Nov. 3	Effect of plant growth regulators on rooting, flowering, abscission, tuberization, postharvest physiology.	
Nov. 5	Effect of plant growth regulators on rooting, flowering, abscission, tuberization, postharvest physiology.	
Nov. 8	Effect of plant growth regulators on rooting, flowering, abscission, tuberization, postharvest physiology.	
Nov. 10	Plant growth regulators and drought tolerance.	
Nov. 12	Plant hormones and plant growth regulators in plant tissue culture.	
Nov. 15	Plant growth regulators as a turfgrass management tool.	
Nov. 17	Plant growth regulators as a turfgrass management tool.	
Nov. 19	Exam 3	
Nov. 22	Thanks giving break – No class	
Nov. 24	Thanks giving break – No class	
Nov. 26	Thanks giving break – No class	
Nov. 29	Creative uses for PGRs- PGRs and the environment.	
Dec. 1	Students's presentations (more case studies).	
Dec. 3	Students's presentations (more case studies).	
Dec. 6	Students's presentations (more case studies).	
Dec. 8	Students's presentations (more case studies).	
Dec. 10	Students's presentations (more case studies).	
Dec. 13-17	Final Exam	

*The schedule and assignments above are subject to change.