Hort 401 (3 credits)
Spring 2014

Medicinal and Value-Added Uses of Plants:
A Chemical, Biochemical and Ethnobotanical Perspective

Meeting Time
Tuesdays and Thursdays 11:00-12:15 PM (Shepardson 212)

Instructors
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Office hours by appointment

Summary
This is a 3-credit course offered at the 400 level, and is designed to provide a broad perspective on the development of crop agriculture and more recent value-added uses of plants. More than just conventional lecturing, this interdisciplinary course is supplemented with lively discussions, scientific paper readings, and invited speakers. This course is designed to demonstrate the alternative uses of plants in our society, with active student participation in the learning process. In addition, the course will present an introduction to agricultural sustainability. Finally, through invited presentations given by visiting professors and company scientists the student will get a perspective on the range of cutting-edge research on medicinal and value added-uses of plants, as well as on methodology, techniques and politics behind the science. Course materials will be available on RamCT.

Course Objectives
Upon completion of this course, the successful student will achieve:

1. An interdisciplinary overview of the value-added uses of plants.
2. An understanding of unique biochemical processes in plants.
3. The ability to integrate related knowledge from different disciplines.

Reflection Papers
This course will feature several guest speakers with unique perspectives and experiences. You will be asked to write two brief reflection papers, on guest presentations of your choice. A guide for these reflection papers will be provided.

Class Presentation
Because of the range of subjects covered in the class, it is difficult to conduct an in-depth critical analysis of every single topic. In order to provide hands-on experience in journal-quality data analysis and class delivery, each student will be required to prepare a critical review of current refereed journal articles and books related to a topic and conduct a 30-45 minute presentation on the topic. Examples of journals with appropriate articles are *Economic Botany*, *Journal of Ethnobiology*, *Journal of Ethnopharmacology*, *Plant Physiology, Horticulture,* etc. The student and the instructors will carefully select the topic to be covered by the student. The instructor and the student will meet at least two to three times prior to the studentôs lecture. We will aim to have student presentations cover a diversity of topics. If you are interested in a particular topic sign up for it early, or we may ask you to cover a different topic!

Class Participation
The success of this course depends on student participation in the lectures and class discussions. Students from a range of departments and academic backgrounds enroll in this course, providing a unique

opportunity for students to contribute valuable, diverse, and complementary input during class discussions. Therefore, students will be strongly encouraged to ask questions, participate in discussions, and help each other in the various activities. Additional discussion will take place outside of the classroom, on RamCT. Each student will anonymously evaluate & offer feedback on two student presentations. Required readings will be assigned for some class periods.

Grading

First exam	20%
Reflection papers (2)	20%
Final exam	25%
Class presentation	25%
Class participation	10%

Scale

A: 90-100%
B: 80-90%
C: 70-80%
D: 60-70%
F: below 60%

Prerequisites

This is a reading-intensive and discussion-oriented course which assumes basic knowledge of biology/botany (BY 103, BZ 120, BZ CC 120) and/or chemistry (CCC 107, CCC 108, CCC 111, CCC 113 or BC 351). Students with minimal background in any of these areas are strongly encouraged to consult introductory textbooks in order to become familiar with the basic concepts and vocabulary.

Recommended Readings

Buchanan, B.B., Gruissem, W., Jones, R.L. 2000. *Biochemistry and Molecular Biology of Plants*. American Society of Plant Biologists, Rockville, MD, 1367 pp. (**recommended textbook)**

Heiser, C.B., Jr. 1990. *Seed to Civilization - The Story of Food*. Harvard University Press, Cambridge, MA, 228 pp.

Hobhouse, H. 1986. *Seeds of Change: Five Plants that Transformed Mankind*. Harper & Row, New York, 252 pp.

Simpson, B.R., and M. Conner Ogorzaly. 2000. *Economic Botany: Plants in Our World*. McGraw-Hill, New York, 640 pp. (**recommended textbook**).

Smith, N.J.H., J.T. Williams, D.L. Plucknett, and J.P. Talbot 1992. *Tropical Forests and Their Crops*. Cornell University Press, Ithaca, NY, 568 pp.

Sokolov, R. 1991. *Why We Eat What We Eat.* Summit Books, New York, 254 pp.

Swerdlow, J.L 2000. *Nature's Medicine: Plants That Heal*. National Geographic Society, Washington, D.C., 400 pp.

COURSE SCHEDULE
* Readings should be done *before* the class period in which they are listed.

January 21
Class introduction and overview

January 23
The origins of agriculture, and impacts of plants on civilizations
Reading: Bernhardt. *Natural Affairs.* Chapter 3.
Diamond. Nature. 2002.
Simpson, B.R.ï Chapter 2

January 28
Domestication and the Columbian Exchange
Readings: Van Tassel. Evolutionary Applications. 2010.
Simpson, B.R.ï Chapter 1

January 30
The Green Revolution, and the International Agricultural Centers
Readings: Please review the websites of IRRI (http://irri.org/) and
CIMMYT (http://www.cimmyt.org/)
Simpson, B.R. ï Chapter 19

February 4
Biodiversity: why is important and how to preserve it.
Beyond the 21 crops that are heavily cultivated worldwide

February 6
Concepts and terminology related to medicinal plants and medicinal/health related compounds
Readings: Simpson, B.R. ï Chapter 11

February 11
Dr. Corey Broeckling
Instrumentation and applications of metabolomics in plants
Facility Manager
Proteomics and Metabolomics Facility
Colorado State University

February 13
Dr. Tiffany Weir
Phytochemicals and human health
Assistant Professor
Department of Food Science and Human Nutrition
Colorado State University
Readings: Simpson, B.R. ï Chapter 11

February 18
The 4th agricultural revolution; sustainability and biodiversity

- Plenty of examples: urban/forest gardens, improving biodiversity in local communities, restoration projects, cover crops, phytoremediation, etc.

Readings: Simpson, B.R. ï Chapter 19

February 20
Flavor and aroma of wine/grapes
Dr. Stephen Menke
CSU Western Colorado Research Center
Enology: flavor and aroma of wine
Readings: Simpson, B.R. ï Chapter 14

February 25
Dr. Dean Stull ï former owner of Hauser Inc., and consultant of plant-based products
Medicinal plants and phytochemicals: perspective from Bio-Pharma
Readings: Simpson, B.R. ï Chapter 11

February 27
Dr. Raul Urbina, CEO, Stevia One
Sugar and sugar substitutes
Readings: Simpson, B.R. ï Chapter 7

March 4
Sustainable products in agriculture
Michael Salman
Horizon Ag Products

March 6
Beneficial microbes and other sustainable products in agriculture
Dr. Daniel Van der Lelie
FMC Corporation

March 11
Dr. Terry Opgenorth
CSU Ventures
Drug Discovery and Development

March 13
First Exam

SPRING BREAK

STUDENT PRESENTATIONS BEGIN

March 25 & 27 ï Plants and traditional cultures

April 1 & 3 - Plants & the Senses: Fermentation

April 8 & 10 ï Plants & the Senses: Flavor and terroir

April 15 & 17 – Medicinal & value-added compounds from plants

April 22 & 24 ï Other uses of plants

April 29 & May 1 - Plant biochemistry / Miscellaneous presentations

May 6 & 8 - Miscellaneous presentations & Review session

May 13 ï Final exam