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
Dr. Jorge M. Vivanco (j.vivanco@colostate.edu), 217 Shepardson, 491-7170
Jacqueline Chaparro (Jacqueline.Chaparro@colostate.edu)
Department of Horticulture and Landscape Architecture

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 student’s
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**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First exam</td>
<td>20%</td>
</tr>
<tr>
<td>Reflection papers (2)</td>
<td>20%</td>
</tr>
<tr>
<td>Final exam</td>
<td>25%</td>
</tr>
<tr>
<td>Class presentation</td>
<td>25%</td>
</tr>
<tr>
<td>Class participation</td>
<td>10%</td>
</tr>
</tbody>
</table>

**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**


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.
          Simpson, B.R.– Chapter 2

January 28
Domestication and the Columbian Exchange
          Simpson, B.R.– 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.– 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.– 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.– 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. – 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. – Chapter 14

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

**February 27**
Dr. Raul Urbina, CEO, Stevia One  
Sugar and sugar substitutes  
Readings: Simpson, B.R. – 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** – Plants and traditional cultures

**April 1 & 3** - Plants & the Senses: Fermentation

**April 8 & 10** – Plants & the Senses: Flavor and terroir

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

**April 22 & 24** – Other uses of plants
April 29 & May 1 - Plant biochemistry / Miscellaneous presentations

May 6 & 8 - Miscellaneous presentations & Review session

May 13 – Final exam