



Breeding and Production of Medicinal Plants and Herbs

HOS 4932 - 3 CREDITS

MEETING TIMES AND LOCATION

Class Number 21585, Section 4F15

Monday 9th period (4:05pm – 4:55pm)

Wednesday 9th and 10th period (4:05pm – 6:00pm)

Fifield Hall room 2318 for Mon and Wed 9th period

Horticultural Sciences Teaching Garden for Wed 10th period

INSTRUCTORS

Jeongim Kim, Ph.D.

jkim6@ufl.edu

Fifield Hall 1111

Marcio Resende, Ph.D.

mresende@ufl.edu

Fifield Hall

Gerardo Nunez, Ph.D.

g.nunez@ufl.edu

Fifield Hall 1113

Tie Liu, Ph.D.

tieliu@ufl.edu

Fifield Hall 1213

COURSE DESCRIPTION

Medicinal plants are a rapidly-growing niche in horticulture. This course focuses on current and emerging breeding and cultivation practices used to produce high-value medicinal plants and herbs. Additionally, this course provides a critical analysis of health effects and therapeutic claims of plant-derived physiologically-active products.

LEARNING OBJECTIVES

Upon successful completion of this course, students will be able to:

- Discuss botany, economics, and regulation of medicinal plants and herbs
- Explain breeding strategies for manipulation of secondary metabolites
- Compare anecdotal and traditional medicine claims of efficacy against scientific literature

- Explain in general terms how hydroponic systems, soilless media, supplemental lighting, and CO₂ enrichment are used to produce high-value crops
- Discuss how physiological stress factors can be used to optimize secondary metabolite production
- Appraise the importance of the medicinal plant niche in horticulture

COURSE MATERIALS

Textbook

The following textbooks are recommended for the course. Links to peer-reviewed reading materials will be made available via canvas.

- *Ball Redbook Volume 2*, Jim Nau (Ed) 2011, 18th Edition. ISBN 978-1-883052-68-3

Course website

This course has a comprehensive mini-site in the Canvas platform. Take time to familiarize yourself with the “Start Here”, “Syllabus”, “Course Materials”, and “Grades” tabs in the navigation menu. Digital copies of this syllabus, and other learning materials can be found there.

- *E-Learning in Canvas*, www.elearning.ufl.edu

Technology

Students will need to have access to a laptop computer or tablet to complete the weekly quizzes. Additionally, students will need to have access to a video camera to record their presentation videos. Most cellular phone cameras are adequate for this task.

LECTURES, ATTENDANCE, AND MAKE-UP POLICY

You are expected to attend every lecture and complete all assignments before the deadlines. Late assignments will be graded only for documented emergencies as per UF’s attendance policy. Additional information about UF’s attendance policy can be found here:

- *Attendance policy*, www.catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

COURSE GRADE

1. Weekly quizzes

30 points

Every week on Wednesday during class, a 10-question quiz will be available in Canvas. Quizzes will consist of multiple choice and short answer questions. Each quiz will be worth 2 points, and there will be 15 quizzes during the semester. Each quiz will be timed to 10 minutes, and it can only be taken once. Students must bring a web-enabled device (laptop computer, tablet computer, phone) to take the quiz in. Only students

who are present in class are allowed to take the quiz. Make up quizzes will be provided in accordance with the policy described above.

2. Medicinal plant case study

40 points

Students will select from a list of available medicinal crops. This is an *individual* project. Do not compare or collaborate on the contents of the case study with others. All work must be your own and will be cross-checked for similarities. First, students will write a general description for their medicinal plants including the scientific name, its history, any known bioactive compounds, and impact on human health. Then, students will identify an aspect of medicinal crop cultivation that is understudied or unknown for their crop. Next, students will plan and execute a short experiment to inform cultivation practices. Following they will compose a breeding strategy to improve the medicinal attributes of this crop. Finally, students will write a harvest manual and observation reports on the time and method of collection for two different medicinal plants. There will be four partial submissions for this case study (see table below). Each partial submission will be worth 10 points. Additional guidelines and grading rubrics for each submission will be provided via Canvas.

Deliverable	Assignment opens	Submission due
General Description	Week 1	End of week 4
Breeding Strategy	Week 5	End of week 9
Production manual	Week 9	End of week 13
Harvest Manual	Week 14	Week 15

3. Presentation

30 points

The objective of this assignment is to synthesize the information gathered in the medicinal plant case study to create an informative video about a medicinal crop. Students will receive feedback on their partial submissions for the case study. Then, based on their case study information and this feedback, students will prepare and record a 5-minute video presentation where they introduce historical, biochemistry, breeding, production, and postharvest aspects of their medicinal crop. Additional guidelines and grading rubrics for each submission will be provided via Canvas.

GRADING SCALE

A =	95 - 100 points	C+ =	< 80 - 77 points
A- =	< 95 - 90 points	C =	< 77 - 73 points
B+ =	< 90 - 87 points	C- =	< 73 - 70 points
B =	< 87 - 83 points	D+ =	< 70 - 67 points
B- =	< 83 - 80 points	D =	< 67 - 63 points

D- = < 63 - 60 points

E = <60 points

Additional information on current UF grading policies for assigning grade points can be found here:

- *Grading policy*, www.catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

COURSE POLICIES

Attendance and Make-up Policy

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

- *UF Attendance policy*, <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, 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 assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action.

- For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>

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 when appropriate.

Services for Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

- *Disability Resource Center*, 0001 Reid Hall, (352) 392-8565, www.dso.ufl.edu/drc/

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *Counseling and Wellness Center*, 3190 Radio Road, 392-1575, www.counseling.ufl.edu

Counseling Services

Groups and Workshops

Outreach and Consultation

Self-Help Library

Wellness Coaching

- *U Matter We Care*, www.umatter.ufl.edu
- *Sexual Assault Recovery Services (SARS)*, Student Health Care Center, 392-1161.
- *University Police Department*, 392-1111 (or 9-1-1 for emergencies), www.police.ufl.edu

Additionally, if you would like orientation on choosing a major, finding an internship, or planning your career, I encourage you to use the university's on-campus resources.

- *Career Connections Center*, CR-100 Reitz Union, 392-1601, <https://career.ufl.edu/>

Course Evaluation Process

Student assessment of instruction is an important part of the effort to improve teaching and learning. At the end of the semester, you are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at:

- *Course evaluations*, www.evaluations.ufl.edu

Evaluations are typically open during the last two or three weeks of the semester. You will be notified of the specific times when evaluations for this course are open. Summary results of these assessments are available to students at:

- *Evaluations summary*, www.evaluations.ufl.edu/results

Student Complaints

You can file and resolve any complaints about your experience in this course in the following site:

- *Student complaints in residential courses*, <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>

Open field production

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3 CREDITS

Week	Date	Lecture Topics	Activity-Project
Week 1	Jan 6 (Mon)	Class introduction	Kim/Resende/Nunez/Liu Introduce the course Divide groups for the project
	Jan 8 (Wed)	Introduction to the course practicum	Nunez
Week 2 Kim	Jan 13 (Mon)	Botany and Central Dogma	
	Jan 15 (Wed)	Historical uses of Plants as medicines	Quiz 1 & 2
Week 3 Kim	Jan 20 (Mon)	No Class _Holiday	
	Jan 22 (Wed)	Medicinal Plants and Human Health	Quiz 3
Week 4 Kim	Jan 27 (Mon)	Plant based medicines, Present and Future	
	Jan 29 (Wed)	Omics and metabolic engineering	Quiz 4 Due for project outline1- 10 points
Week 5 Resende	Feb 3 (Mon)	Review of genetics	Kim/Resende
	Feb 5 (Wed)	Domestication	Quiz 5
Week 6 Resende	Feb 10(Mon)	Breeding methods	
	Feb 12(Wed)	Breeder's equation	Quiz 6
Week 7 Resende	Feb 17(Mon)	Breeding for therapeutic compounds: anti-inflammatories, anti-microbials, antioxidants, psychoactives;	
	Feb 19 (Wed)	Invited speaker	Quiz 7
Week 8 Resende	Feb 24 (Mon)	<i>Cannabis breeding</i>	
	Feb 26(Wed)	Breeding "orphan" crops: modern plant breeding in crops with limited genetic and genomic resources	Quiz 8
Week 9	Mar 9(Mon)	Propagation and cloning	Resende/Nunez

Nunez	Mar 11(Wed)	Case study: perennials (Scutellaria)	Quiz 9
Week 10	Mar 16(Mon)	Seed based propagation	
Nunez	Mar 18 (Wed)	Case study: scarification (Nasturtium)	Quiz 10
Week 11	Mar 23 (Mon)	Hydroponic production	
Nunez	Mar 25 (Wed)	Case study: leaf-derived extracts (Basil)	Quiz 11
Week 12	Mar 30 (Mon)	Light and light effects	
Nunez	Apr 1 (Wed)	Case study: flower/inflorescence-derived extracts (Chamomile)	Quiz 12
Week 13	Apr 6 (Mon)	Temperature control and CO2 enrichment	
Nunez	Apr 8 (Wed)	Case study: high-value crops (Cannabis)	Quiz 13
Week 14	Apr 13 (Mon)	Guide to harvesting medicinal plants: Developmental stages of harvest	Nunez/Liu
Liu	Apr 15 (Wed)	Techniques to harvest varies with the species and plant parts. Herbal tea tasting event	Quiz 14
Week 15	Apr 20 (Mon)	Postharvest case study: postharvest issue and medicinal properties of quinoa	
Liu	Apr 22 (Wed)	Postharvest for processed Case Study Presentation (10 th period)	Quiz 15 Kim/Resende/Nunez/Liu