

## Course Syllabus

Horticulture/Agronomy/EPWS 471(Plant Mineral Nutrition) – Spring 2023

Instructor: Dr. Geno A. Picchioni, Skeen Hall 344N, 646-1820 ([gpicchio@nmsu.edu](mailto:gpicchio@nmsu.edu))

Office Hours: MWF from 8 to 10 am. Other times are available by appointments.

Course Description: **PLANT MINERAL NUTRITION** (3 cr.). Fundamental biological aspects of how plant mineral nutrients are acquired, absorbed, transported, and used throughout the plant; mycorrhizal/plant associations; plant mineral stress and mineral adaptation; live plant demonstrations; student presentations.

Class Meeting Times: 9:00 to 10:15 am (Tuesday/Thursday); Skeen Hall W139

### Learning Objectives:

- Plant mineral function, acquisition, membrane and long-distance transport, and heritability traits.
- Plant regulation of internal mineral content.
- Crop nutrient management practice: Mineral disorders, analyses, and stress.
- Student presentations on crop mineral nutrition.
- Occasionally we will work with live plants for demonstration purposes.

Textbook (Recommended): Epstein, E. and A.J. Bloom. 2005. Mineral nutrition of plants: Principles and perspectives. 2<sup>nd</sup> Edition. Sinauer Associates, Inc., Sunderland, Mass. Check NMSU Bookstore (on campus), Campus Bookstore (across campus in Pan Am Plaza), Amazon, etc., for new, used and rental options. Textbook and other recommended reading (see below) will strengthen and expand information presented in lectures, improve exam performance, and maximize educational value for students.

### Other Recommended Reading in Canvas Lecture Folders

Marschner, H. 1995. Mineral Nutrition of Higher Plants, Chapter 13. Academic Press, New York.

Barber, S.A. 1984. Soil nutrient bioavailability – A mechanistic approach, Chapter 4. Wiley and Sons, New York.

Gerloff, G.C, and W.H. Gabelman. 1983. Genetic basis of plant mineral nutrition, pp. 453-480. In: Läuchli, A. and R.L. Bielecki (Eds.). Encyclopedia of Plant Physiology New Series, Vol. 15B. Springer-Verlag, New York.

What I expect from students: I expect students to enjoy the subject, attend class regularly, to be on time, to meet all deadlines, to avoid turning in any work late, to participate in discussions, and to demonstrate that they want to be here. I expect the students to read the suggested textbook readings as well as the extra readings in canvas lectures. I expect students to keep up with the syllabus and all assignments. Finally, I ask that students be focused on our meetings and to turn off any device that does not relate to the class.

What Students Can Expect from Me: Data analysis opportunities, research applications, live plant demonstrations, basic science, fairness in grading, willingness to help, approachable, concern about quality of students' work, training, and writing.

Electronic Resources: Class information, lectures, web resources, and various documents will be posted on Canvas. Canvas email will be used by students and instructor as necessary outside of class. Please

check your system (Windows, Mac, IPAD, etc.) and make sure that you have a stable internet connection, and current versions of MS Office (Xcel, PowerPoint, Word), Adobe Reader.

Class Attendance and Excused Absences: Good attendance is defined as not missing more than three lecture meetings. Attendance will be recorded and may affect borderline course grades. WHAT IS AN EXCUSED ABSENCE FOR MISSING AN EXAM OR ASSIGNMENT DUE DATE? 1) Physician-verified medical reason (i.e., Campus Health Center) in writing with e-copy emailed to instructor by the first day returning to class, and 2) participating in a NMSU-sponsored activity that is verified by a written note from university sponsor with e-copy emailed to instructor prior to event. Any other absences will not be considered excused absences. For medical attention, the Aggie Health and Wellness Center is operated by licensed physician and nursing staff, and can be reached at (575)646-1512.

Discrimination and Disability Accommodation: Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADA) covers issues relating to disability and accommodations. If a student has questions or needs an accommodation in the classroom, they should contact Student Accessibility Services (SAS), Corbett Center Student Union Room 208, 575-646-6840 (V/TTY), [sas@nmsu.edu](mailto:sas@nmsu.edu). All medical information is treated confidentially.

New Mexico State University, in compliance with applicable laws and in furtherance of its commitment to fostering an environment that welcomes and embraces diversity, does not discriminate on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, serious medical condition, sex (including pregnancy), sexual orientation, spousal affiliation, or protected veteran status in employment, admissions, and educational programs and activities. Inquiries may be directed to the Office of Institutional Equity, O'Loughlin House, 1130 E. University Avenue, Las Cruces, NM 88003; (575)646-3635; (575)646-7802 (TTY); [equity@nmsu.edu](mailto:equity@nmsu.edu). Title IX prohibits sexual harassment, sexual assault, intimate partner violence, stalking, and retaliation. For more information on discrimination or Title IX, or to file a complaint, contact the Office of Institutional Equity.

Other NMSU Resources:

NMSU Police Department: (575) 646-3311, [www.nmsupolice.com](http://www.nmsupolice.com)

NMSU Police Victim Services: (575) 646-3424

NMSU Counseling Center: (575) 646-2731

NMSU Dean of Students: (575) 646-1722

NMSU Aggie Health and Wellness Center: (575)646-1512

For Any On-campus Emergencies: 911

Academic and non-academic misconduct. The Student Code of Conduct defines academic misconduct, non-academic misconduct, and the consequences or penalties for each. The Student Social and Academic Codes of Conduct, including plagiarism, are available and explained in the NMSU Student Handbook online at <http://studenthandbook.nmsu.edu/>.

Lecture Exams: There will be three midterm exams and a final exam. All will be assigned as Canvas "quizzes" and conducted online, and not in class. The midterms will be available for most of the day and students will have 120 minutes to complete them. The final exam (May 11) will also be online but synchronous from 800 to 1000 am. Each exam will be generally noncumulative although students should be prepared to apply concepts learned throughout the course. No makeup exams will be available. In case of an excused absence on the day of an exam, a student will be given the opportunity to makeup the missed exam by taking a comprehensive final exam on the day of the final.

Problem Set Assignments: Students will be given graded problem sets as Canvas “assignments” relating to lecture topics to practice solving problems that may later appear on examinations. Due dates will be announced. No makeups will be available for missed or late assignments unless the student has an excused absence.

Student Presentations. All students will individually create and present a powerpoint presentation to the class on a chosen topic related to plant mineral nutrition. The presentation must be no longer than 20 minutes, with time allowed for questions from class. Examples from the previous class are available on canvas. Any picture or data from the literature (including internet) must be cited within slides and in full bibliography at the end of the presentation. A conventional flow of title, introduction/overview, body, summary, and references list is suggested. Presentations will be made in class between March 21-30, with grading based on completeness, relevance, and visual and oral quality. Topics will be due by February 2 and a sign-up sheet will be developed for talk dates. Attendance will be counted in presentation grades. Suggested topics include but are not limited to the following:

- Fertilizer management of a crop species (fertilizer needs and rates, leaf nutrient values, nutrient disorders, and other practical aspects).
- Roles and functions of a specific mineral element (e.g., nitrogen metabolism in plants; physiological roles of phosphorus in plants; calcium in plant cell walls, membranes, and signaling; or similar approach for another mineral nutrient).
- Environmental sustainability issues (nitrates in the groundwater, salinity stress, heavy metal toxicity, drip fertigation, organic fertilizers, etc.).
- *Other topics may be selected if they are directly related to plant mineral nutrition.*

<u>Grading Criteria:</u>	<u>Category</u>	<u>% of Total Grade</u>
	Four Exams (15% each)	60
	Problem Set Assignments	20
	Student Presentation	20
	Total	100

Grading Scale: 90-100%=A, 80-89%=B, 70-79%=C, 60-69%=D, ≤59%=F

Fractional Grading: Students with good attendance (missing no more than three lectures without an excuse) and whose final grade is borderline (i.e., 59%, 69%, 79%, etc.) may be rewarded the next higher fractional grade (i.e., B- for 79%, A- for 89%, etc.). Students who do not have good attendance will not receive a higher fractional grade.

Graduate Student Performance and Evaluation. Graduate students are expected to perform highly in the class, actively participate during class meetings, and present scientific peer-reviewed literature for their presentation. They should also show a sincere interest in spending extra time studying scientific peer-reviewed literature related to the topics covered during the semester, which reflects in exam performance, class participation, and scientific quality of presentation. Their course work will be evaluated under more rigorous standards than that of undergraduate students.

Online Contingency Plan: This course is designed for in-person instruction at the time of this writing (14-January, 2023). If pandemic restrictions mandate that the class pivot to online instruction, we will pivot to online instruction. Students will be carefully instructed on how to engage in online lectures and labs, should the need materialize.

## Online Zoom Lecture, Exam, and Student Presentation Schedule

Date	Lecture Topic	Recommended Reading*
Jan. 19	Course Guidelines, Introduction	---
Jan. 24-26	Definition, Importance of Plant Mineral Nutrition Mineral Functions and Classifications Types of Root Media Solution culture	Ch. 1 (Epstein/Bloom) Chs. 3, 8 (Epstein/Bloom) Ch. 2 (Epstein/Bloom)
Jan. 31-Feb. 9	Arrival of Nutrients at the Root Surface	Ch. 13 (Marschner) Ch. 4 (Barber)
Feb. 14	Exam I Online (no class)	---
Feb. 16-28	Transport of Nutrients into the Root	Ch. 4 (Epstein/Bloom)
Mar. 2-7	Mycorrhizae	Ch. 11 (Epstein/Bloom; pp. 312-316); Graham et al. (1981)
Mar. 9	Exam II Online (no class)	---
Mar. 13-27	Spring Break	---
Mar. 21-30	Student Presentations	---
Apr. 4-11	Translocation of Nutrients within the Plant	Chs. 5, 6 (Epstein/Bloom) Picchioni et al. (2007)
Apr. 13	Exam III Online (no class)	---
Apr. 18-27	Adverse Soil Conditions – Mineral Stresses	Ch. 11 (Epstein/Bloom)
May 2	Plant Mineral Analysis	Protocol, ICP Lab Tour
May 4	Genetic Basis of Plant Mineral Nutrition	Chs. 10, 12 (Epstein/Bloom); pp. 453-480 (Gerloff and Gabelman)
May 11 (Thur.)	Exam IV (Final Exam), 8:00 to 10:00 am	---

\*Additional recommended readings will be available in Canvas in the relevant lecture folders. The readings will strengthen and expand information presented in lectures, improve exam performance, and maximize educational value for students.