

Course Syllabus

Horticulture/Agronomy/EPWS 471(Plant Mineral Nutrition) – Spring 2021

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

Office Hours: Please email requests to instructor for telephone or Zoom meeting.

Course Description: **PLANT MINERAL NUTRITION** (Section M80, 3 cr.). Fundamental biological aspects of plant requirements for minerals and the processes whereby minerals are acquired, absorbed, translocated, and utilized within the plant body.

Class Meeting Times: 9:00 to 10:15 am (Tuesday/Thursday); Online with Zoom

Learning Objectives:

- Plant mineral function, acquisition, membrane and long-distance transport, and heritability factors.
- Plant regulation of internal mineral content.
- Crop nutrient management practice: Mineral disorders, analyses, and stress.
- Student presentations on crop mineral nutrition.

Textbook (Recommended): Epstein, E. and A.J. Bloom. 2005. Mineral nutrition of plants: Principles and perspectives. 2nd 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 (See Lecture Syllabus; Available 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, basic science, fairness in grading, willingness to help, approachable, concern about quality of students' work, training, and writing.

Electronic Resources: We will use Canvas, web tools, and online journal articles. 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, a working webcam and microphone, audio, and current versions of MS Office (Xcel, PowerPoint, Word), Adobe Reader, and Zoom in Canvas. If you are new to Zoom in Canvas, please see student quickstart guide at <https://learning.nmsu.edu/zoom-at-nmsu/zoom-in-canvas/>.

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. 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. 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

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 four lecture exams, including a final exam. 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 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 10-15 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 18 and April 1, with grading based on completeness, relevance, and visual and oral quality. Topics will be due by February 4 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:

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- 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 suitable topics (other topics are certainly acceptable, but must be 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 Zoom Lecture, Exam, and Student Presentation Schedule

Date	Lecture Topic	Recommended Reading*
Jan. 26	Course Guidelines, Introduction	---
Jan. 28-Feb. 2	Definition, Importance of Plant Mineral Nutrition Mineral Functions and Classifications Types of Root Media	Ch. 1 (Epstein/Bloom) Chs. 3, 8 (Epstein/Bloom) Ch. 2 (Epstein/Bloom)
Feb. 4-16	Arrival of Nutrients at the Root Surface	Ch. 13 (Marschner) Ch. 4 (Barber)
Feb. 18	Exam I	---
Feb. 23-Mar. 4	Transport of Nutrients into the Root	Ch. 4 (Epstein/Bloom)
Mar. 9-11	Mycorrhizae	Ch. 11 (Epstein/Bloom; pp. 312-316); Graham et al. (1981)
Mar. 16	Exam II	---
Mar. 18	Student Presentations	---
Mar. 23	Spring Break Day (no classes scheduled)	---
Mar. 25-Apr. 1	Student Presentations	---
Apr. 6-13	Translocation of Nutrients within the Plant	Chs. 5, 6 (Epstein/Bloom) Picchioni et al. (2007)
Apr. 15	Exam III	---
Apr. 20-29	Adverse Soil Conditions – Mineral Stresses	Ch. 11 (Epstein/Bloom)
May 4	Plant Mineral Analysis	Protocol, Virtual ICP Lab Tour
May 6	Genetic Basis of Plant Mineral Nutrition	Chs. 10, 12 (Epstein/Bloom); PP. 453-480 (Gerloff and Gabelman)
May 13 (Thur.)	Exam IV (Final Exam), 8:00 to 10:00 am	---

*Additional readings not listed will be available in Canvas in the relevant lecture folders. All readings will strengthen and expand information presented in lectures, improve exam performance, and maximize educational value for students.