PLANT BREEDING AND PLANT GENETICS, PH.D

The program leading to the Doctor of Philosophy in Plant Breeding and Plant Genetics provides a broad exposure in the various disciplines involved with plant improvement. The program is truly interdisciplinary with faculty participants from agronomy, biochemistry, botany, entomology, genetics, horticulture, plant pathology, and statistics. Research areas include biochemical and molecular genetics, bioinformatics, biometry, cytogenetics and cytology, genealogy, genetics, plant breeding, and quantitative genetics.

The Plant Breeding and Plant Genetics Program has been designated a UW System Center of Excellence. The 50–60 students majoring in the program come from throughout the United States and all over the world. Faculty have included members of the National Academy of Sciences, endowed chair professors, and recipients of the National Council of Plant Breeders “Genetic and Plant Breeding Award.” The University of Wisconsin leads the nation in the diversity of plant breeding programs and number of graduate students trained. Graduates are found in responsible positions with academic institutions, research institutions, and private companies involved in molecular to cultivar development work.

ADMISSIONS

GRADUATE SCHOOL ADMISSIONS

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>September 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>May be required in certain cases; consult program.</td>
</tr>
<tr>
<td>English Proficiency Test</td>
<td>Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<a href="https://grad.wisc.edu/apply/requirements/english-proficiency">https://grad.wisc.edu/apply/requirements/english-proficiency</a>).</td>
</tr>
</tbody>
</table>

Other Test(s) (e.g., GMAT, MCAT) | n/a

Letters of Recommendation Required | 3

Satisfactory preparation for graduate study in plant breeding and plant genetics includes undergraduate coursework in mathematics through differential and integral calculus, general chemistry and organic chemistry, physics, and a comprehensive biology sequence that covers both plant and animal biology and includes labs. Some of this preparatory coursework may be completed during the first year of graduate study. Normally, applicants will have had undergraduate training in the biological or agricultural sciences. All applicants must fulfill the minimum entrance requirements of the Graduate School.

Application Deadlines
Spring entry: October 1
Summer entry: December 1
Fall entry: December 1

Application Checklist
A complete application should include the following items:

1. Graduate School Application: We only accept applications submitted online through the Graduate School.
2. Supplementary Application: The supplementary application will appear as a part of the Graduate School’s electronic application once the applicant selects plant breeding and plant genetics.
3. Application Fee: Instructions for paying the application fee are available through the Graduate School’s online application form.
4. Statement of Purpose: Your essay should be a concise description of your reasons for choosing to study plant breeding and plant genetics at the University of Wisconsin. Please include your research interests and career goals as well as a description of your preparation for graduate study including relevant coursework, related employment, research experience, publications, presentations, awards, and honors. The essay may be submitted electronically through the Graduate School’s online application.
5. Transcripts: We require all applicants to submit an unofficial transcript in PDF format to their online application. If an applicant is recommended for admission, then they will be required to submit their official transcript to the Graduate School. International academic records must be submitted in the original language and accompanied by an official English translation. Documents must be issued by the institution with an official seal/stamp and an official signature.
6. Three Letters of Recommendation
7. GRE Scores: Graduates of U.S. institutions must submit scores from the Graduate Record Exam (GRE). The GRE General Test is required and measures verbal reasoning, quantitative reasoning, critical thinking, and analytical writing skills. GRE Subject Tests are not required, but applicants are encouraged to take either the Biochemistry, Cell and Molecular Biology test or the Biology test. Students should contact the Educational Testing Service for the exact time and location of the examination and general information on this procedure. Results of the examination must be sent to the Graduate School. Our institution code is 1846. There is no department code. At the option of the major professor, graduates of foreign institutions may be required to submit GRE scores in order to qualify for graduate research assistantships. Any student interested in competing for fellowships or scholarships from UW–Madison or the PBPG program must submit GRE scores.
8. Proof of English Proficiency: Applicants, whose native language is not English, or whose undergraduate instruction was not in English, must follow the Graduate School’s guidelines for proof of English proficiency.

Application Process
Applications for graduate study in plant breeding and plant genetics must be submitted using the Graduate School’s online application. If you are
applying to multiple programs at the University of Wisconsin, make sure you send application materials to each program.

At this time, the graduate program in plant breeding and plant genetics does not support lab rotations. Applicants are admitted directly into a specific research program with one major professor. Admissions decisions are contingent upon the acceptance of an applicant by a faculty mentor. Because we receive many more applications from qualified applicants than we are able to admit, we highly recommend that applicants directly contact any faculty members with whom they are interested in working.

**FUNDING**

**GRADUATE SCHOOL RESOURCES**

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information ([https://grad.wisc.edu/funding](https://grad.wisc.edu/funding)) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

**PROGRAM RESOURCES**

Financial support may be available through research assistantships (RAs) or fellowships. Fellowships are granted to students with very outstanding academic records. We recommend that your application be complete by the application deadlines in order to be considered for funding. Research assistantships are awarded by individual professors through funds available to their research programs.

Please be advised that you do not need to make a separate application for financial support as your admission application will also serve as an application for assistantships and fellowships.

**REQUIREMENTS**

**MINIMUM GRADUATE SCHOOL REQUIREMENTS**

Review the Graduate School minimum academic progress and degree requirements ([http://guide.wisc.edu/graduate/ #policiesandrequirementstext](http://guide.wisc.edu/graduate/#policiesandrequirementstext)), in addition to the program requirements listed below.

**MAJOR REQUIREMENTS**

**MODE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Mode of Instruction</th>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

- **Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.
- **Online:** These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules.

- **Accelerated:** These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

**CURRICULAR REQUIREMENTS**

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
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<tbody>
<tr>
<td>Minimum Credit Requirement</td>
<td>51 credits</td>
</tr>
<tr>
<td>Minimum Residence Credit Requirement</td>
<td>32 credits</td>
</tr>
<tr>
<td>Minimum Graduate Coursework</td>
<td>Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (<a href="http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle">http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle</a>).</td>
</tr>
<tr>
<td>Overall Graduate GPA Requirement</td>
<td>3.00 GPA required.</td>
</tr>
<tr>
<td>Other Grade Requirements</td>
<td>Ph.D. candidates should maintain a 3.0 GPA in all core curriculum courses and may not have any more than two Incompletes on their record at any one time.</td>
</tr>
<tr>
<td>Assessments and Examinations</td>
<td>Doctoral students must pass both the oral preliminary and final thesis exams.</td>
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<tr>
<td>Language Requirements</td>
<td>No language requirements.</td>
</tr>
<tr>
<td>Doctoral Minor/Breadth Requirements</td>
<td>The doctoral minor is not required for students in the plant breeding and plant genetics degree. Students who wish to complete a cohesive body of work outside the major may wish obtain a doctoral minor, and should declare the minor at the certification meeting. Minor requirements are determined by the minor department or program.</td>
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</table>

**REQUIRED COURSES**

The specific program of study toward a doctoral degree is developed by the student and their major professor. Considerable flexibility in the selection of courses is permitted to meet the needs and interests of the candidate. Of the 51 credits required, students must complete a minimum of 17 credits of coursework (not research credit) and at least 11 credits must come from the Core Curriculum, including at least 2 credits in each of Sections A, B, and C. Students must also complete 3 credits of Plant Breeding seminar (HORT/AGRONOMY/GENETICS 957 Seminar-Plant Breeding).
PRIOR COURSEWORK

Course Curriculum

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Plant Breeding</td>
<td></td>
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<tr>
<td>HORT/ AGRONOMY 501</td>
<td>Principles of Plant Breeding</td>
<td></td>
</tr>
<tr>
<td>HORT/ AGRONOMY 502</td>
<td>Techniques of Plant Breeding</td>
<td></td>
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<tr>
<td>HORT/ AGRONOMY 812</td>
<td>Selection Theory for Quantitative Traits in Plants</td>
<td></td>
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<tr>
<td>B. Genetics</td>
<td></td>
<td></td>
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<tr>
<td>HORT/ GENETICS 550</td>
<td>Molecular Approaches for Potential Crop Improvement</td>
<td></td>
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<tr>
<td>GENETICS 631</td>
<td>Plant Genetics</td>
<td></td>
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<tr>
<td>GENETICS 701</td>
<td>Advanced Genetics</td>
<td></td>
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<tr>
<td>GENETICS/BIOCHEM/BOTANY 840</td>
<td>Regulatory Mechanisms in Plant Development</td>
<td></td>
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<tr>
<td>HORT 875</td>
<td>Special Topics (Polyploid Genetics; Genetic Analysis with R)</td>
<td></td>
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<tr>
<td>C. Quantitative Genetics and Biometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HORT/F&amp;W ECOL/STAT 572</td>
<td>Statistical Methods for Bioscience II Plant Breeding and Plant Genetics, Ph.D</td>
<td></td>
</tr>
<tr>
<td>HORT/ AGRONOMY 811</td>
<td>Biometrical Procedures in Plant Breeding</td>
<td></td>
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<tr>
<td>AGRONOMY 771</td>
<td>Experimental Designs</td>
<td></td>
</tr>
<tr>
<td>&amp; AGRONOMY 772 and Applications in ANOVA</td>
<td></td>
<td></td>
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<tr>
<td>D. Additional Core Courses</td>
<td></td>
<td></td>
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<tr>
<td>BIOCHEM/BOTANY 621</td>
<td>Plant Biochemistry</td>
<td></td>
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<tr>
<td>PL PATH/BOTANY/ENTOM 505</td>
<td>Plant-Microbe Interactions: Molecular and Ecological Aspects</td>
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<tr>
<td>PL PATH 517</td>
<td>Plant Disease Resistance</td>
<td></td>
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<tr>
<td>GENETICS 633</td>
<td>Population Genetics</td>
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<tr>
<td>BOTANY 500</td>
<td>Plant Physiology</td>
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</tbody>
</table>

Policies

GRADUATE SCHOOL POLICIES

The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK

The Graduate Program Handbook (http://plantbreeding.wisc.edu/current-students/program-requirements) is the repository for all of the program’s policies and requirements.

PRIOR COURSEWORK

Graduate Work from Other Institutions

With program approval, students are allowed to count no more than 9 credits of graduate coursework from other institutions.

coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

No credits from a UW–Madison undergraduate degree are allowed to count toward the degree.

UW–Madison University Special

With program approval, students are allowed to count no more than 9 credits of coursework numbered 300 or above taken as a UW–Madison University Special student. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PROBATION

A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time enrollment (or 12 credits of enrollment if enrolled part-time) the student may be dismissed from the program or allowed to continue for one additional semester based on advisor appeal to the Graduate School.

ADVISOR / COMMITTEE

Every graduate student must have a faculty advisor (Major Professor) who is a member of the PBPG faculty. The Major Professor advises the student about course work and supervises the student’s research. The major professor must approve the student’s coursework and research direction.

A PhD Committee is composed of at least 5 members, the major professor and four more who must be UW–Madison graduate faculty or former UW–Madison graduate faculty up to one year after resignation or retirement. The Graduate School requires that at least three committee members are designated as readers. Readers are committee members who commit themselves to closely reading and reviewing the entire dissertation. The committee is empowered by the Program to advise and evaluate the student with regards to certification, administer the preliminary examination, oversee progress meetings, approve thesis composition, and conduct the final PhD examination.

The student, in consultation with their Major Professor(s), should select four additional members of the UW-Madison faculty to serve on their PhD Committee prior to the end of the second semester of graduate study in order to convene a meeting to discuss the student’s coursework and plan for certification. Certification is the process by which the PhD Committee certifies that the student has completed the formal coursework requirements of the PhD. This coursework plan must be approved by the student’s PhD Committee, and for this reason it is important for the student to convene a meeting of their PhD committee prior to the end of their second semester so that additional courses suggested by the committee may be taken during the student’s second year of graduate study. The Graduate School requires at least one member of the PhD Committee to be from outside the academic department of the major professor. Students choosing Minor Option A typically include their minor professor as a member of their PhD Committee. It is the student’s responsibility to seek and obtain (verbal) approval from the faculty members selected to serve on this committee.

CREDITS PER TERM ALLOWED

15 credits
TIME CONSTRAINTS
A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

OTHER
Financial support may be available through research assistantships (RAs) or fellowships. Fellowships are granted to students with very outstanding academic records. We recommend that your application be complete by the application deadlines in order to be considered for funding. Research assistantships are awarded by individual professors through funds available to their research programs.

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

PROGRAM RESOURCES
Close working relationships between plant breeding and plant genetics (PBPG) students and faculty with companies, commodity groups, and NGOs allow for exposure to various work environments and potential employers. Opportunities exist for students to complete short-term internships with companies depending on research interests and progress towards the graduate degrees. The Plant Science Graduate Student Council (PSGSC) (http://psgsc.wisc.edu) fosters communication and social interactions among the graduate students in the plant sciences.

LEARNING OUTCOMES
1. Articulates research problems, potentials, and limits with respect to knowledge within the field of plant breeding and plant genetics.
2. Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of plant breeding and plant genetics.
3. Creates research that makes a substantive contribution.
4. Demonstrates breadth within their learning experiences.
5. Advances contributions of the field of plant breeding and plant genetics to society.
6. Communicates complex ideas in a clear and understandable manner.
7. Fosters ethical and professional conduct.

PEOPLE

FACULTY
Agronomy
Jean-Michel Ane
Natalia De Leon (program chair)
Lucia Gutierrez
Heidi Kaeppler
Shawn Kaeppler
Bill Tracy

Biochemistry
Rick Amasino
Sebastian Bednarek

Botany
Hiroshi Maeda
Edgar Spalding
Donald M. Waller

Entomology
Johanne Brunet

Genetics
Patrick Masson
Xuehua Zhong

Horticulture
John Bamberg
Paul Bethke
Julie Dawson
Jeff Endelman
Irwin Goldman
Michael Havey
Shelley Jansky
Patrick Krysan
Jim Nienhuis
Jiwan Palta
Sara Patterson
Phillip Simon
David Spooner
Yiqun Weng
Juan Zalapa

Plant Pathology
Andrew Bent
Doug Rouse

Statistics
Karl Broman
Brian Yandell