

Post-Doctoral Plant Breeder Opening

For the Hazelnut Breeding Program at the University of Minnesota in Collaboration with the Upper Midwest Hazelnut Development Initiative (UMHDI)

Background

The University of Minnesota (U of M) began its hazelnut breeding and evaluation program in 2008 with the goal of improving the nut processing quality and agronomic characteristics of hybrid hazelnuts while retaining their high levels of winter hardiness, disease resistance and yield potential. These are hybrids between domesticated large-seeded European hazelnuts, which are the basis of the world hazelnut industry but not hardy or disease-resistant in the Upper Midwest, and wild smaller-seeded American hazelnuts, which are both disease resistant and hardy here. Our impetus is to diversify Midwestern agriculture, which is currently over-reliant on just a handful of annual row-crops, with long-lived woody perennials in integrated agroforestry systems to enhance the social, ecological and economic resilience of our region.

In phase one of our project, starting in 2008, we selected top individuals from on-farm plantings of open-pollinated seedlings located on farms and put them into replicated trials, from which we have identified five that we are now working to release to the public. In phase two, from 2014 through 2016, we crossed our putative best selections of hybrid germplasm with pollen of advanced selections of European hazelnuts shared from Oregon State University, to produce a population of about 7,000 F₁ seedlings that are now mature. Colleagues at the University of Wisconsin have developed genomic prediction models for nut and kernel size and shape using the largest families in this population, but these models need validation and must be expanded to include a greater array of traits. Since 2020 we have made additional crosses, from which we have planted an additional 3,000 F₁ seedlings in Minnesota and 1,700 in Wisconsin, with more seedlings and seeds in the pipeline.

This work is part of the [Upper Midwest Hazelnut Development Initiative](#), a collaboration with the University of Wisconsin, Ohio State University, and others. At the University of Minnesota, this work is housed in the [Forever Green Initiative](#) and the [Department of Agronomy and Plant Genetics](#).

The person hired for this position will

1. Help improve the plant evaluation and data management systems for our traditional breeding program, and
2. Expand the program by integrating genomic data, including
 - a. Validating the genomic prediction models developed for nut traits by our partners at the University of Wisconsin and using them to plan future crosses and screen progeny families.
 - b. Developing more efficient strategies for phenotyping traits that are difficult to quantify and developing genomic prediction models for these traits. Possible traits include Eastern Filbert Blight canker incidence, flower density, bush architecture, and husk morphology.
3. Play a critical role in the future of the U of M hazelnut breeding program and the development of a hazelnut industry in the Upper Midwest.

Essential Qualifications:

- PhD in plant breeding or a related science
- Experience in evaluation of plant traits in a plant breeding program, including but not limited to disease responses, plant architecture, and nut characteristics
- Experience with breeding database software and/or familiarity with software for fitting mixed effect linear models
- Fundamental understanding of 2- and 3-D remote sensing data
- Proficiency using an interpreted programming language (e.g., Python; R; JavaScript) to conduct data analysis
- Experience with digital imaging applications for high-throughput phenotyping for field traits
- Demonstrated experience in design, conduct, and statistical analysis of experiments
- Demonstrated experience in management of large data sets
- Demonstrated skill in scientific writing, with a publication record in plant breeding and genetics
- Excellent interpersonal communication and organizational skills
- Documented ability to work independently and as part of a team with diverse perspectives

Desirable Qualifications

- Experience using GIS software (e.g., ArcGIS, QGIS) and Python computer vision packages (e.g., OpenCV; scikit-learn; PyTorch, GDAL; Pandas/Geopandas) to develop image processing pipelines for high throughput phenotyping
- Demonstrated experience growing plants in greenhouse or field settings
- Project management experience including field and lab-based projects
- Evidence of ability and willingness to effectively mentor undergraduates

Specific duties include but are not limited to the following:

75% Conduct research aimed toward development of genomic prediction models for important target traits. Research may use existing genomic and phenotypic data in the program or may involve designing and conducting experiments to obtain new data, and leveraging newly available genomic resources to improve upon existing sequencing and genotyping methods. Incumbent will conduct thorough literature review, consult with appropriate collaborators and industry experts in designing the experiments and participate in grant-writing activities. Research activities include data collection, data analysis, and publication of research findings at academic conferences and in peer-reviewed journals. Participate in professional development activities.

25% Participate in routine operations of the hazelnut breeding program, including planning and executing pollinations, planting, propagation, harvest, evaluation of plants and nuts of seedlings and advanced selections, and coordinating with hosts of on-farm plantings.

Special Requirements: Willingness to live in the Minneapolis/St. Paul area. Ability to drive to research plantings which are located at Rosemount, Becker, Lamberton, Waseca and Staples MN in addition to those on the St. Paul campus. This position will include greenhouse and agricultural fieldwork, which will require the ability to spend extended time in the research fields in all kinds of weather, walking on uneven terrain, digging and shoveling. It will also include lab and office-based work requiring the ability to sit or stand and work at a laboratory bench or computer workstation for extended periods. Occasional overnight travel to research sites within Minnesota or other domestic travel may be required.

To apply:

Internal University of Minnesota applicants: <https://hr.myu.umn.edu/jobs/int/359837>

External applicants <https://hr.myu.umn.edu/jobs/ext/359837>