

COLLEGE OF AGRICULTURE PROGRAMS

Plant Pathology: master's and doctorate: 26.0305

Among all states, Kansas ranks second in total cropland in the US. In terms of crop production, it ranks first in wheat and sorghum, third in sunflowers, seventh in corn, eighth in alfalfa, and tenth in soybeans. Diseases are an important constraint to sustainable production for several commodities in Kansas. Management of crop diseases is of economic importance to the state and an essential component of the mission of Kansas's Land Grant University. The Department of Plant Pathology is the only such department in the state and its mission is to understand and improve plant health by gathering fundamental knowledge about pathogens and diseases and applying that knowledge for disease management. The department has a long-standing reputation of being one of the top plant pathology departments in the nation and was ranked among the top five by the most recent (1996) CSREES Review Team. Additionally, it is a campus leader in biotechnology because of its strengths in plant molecular biology and microbiology.

Since 1964, there have been only 58 professors named as "University Distinguished Professor" and three of them have come from the department; all since 1997. Even with this and other achievements, within the last seven years the department has had seven faculty members leave or retire. In fact, some of the faculty members who have recently left were outstanding, including one University Distinguished Professor. These faculty members obtained once-in-a-lifetime opportunities for career advancement, such as the "Jim Cook Endowed Chair for Wheat Research" at Washington State University. Therefore, when the department gets back to its original number of faculty members, it will have seen a 47% increase in new faculty within the past two years. These faculty members are expected to generate extramural support for their research program, including funding graduate students.

With less than 2.0 FTE devoted to instruction, the major focus of this department is research and public service. Thus, despite being one of the smaller units in the College of Agriculture, the department ranked first in the college in extramural funding over the past four years (2003-2006, \$4.2 million per year); 47% higher than the next highest department. Faculty work on applied aspects of controlling plant diseases as well as fundamental biological research. In addition, extension faculty members develop and communicate relevant research information to public and private clientele across the state. The Plant Disease Diagnostic Clinic is a key component of the department and processes about 1,000 samples a year.

Because of its strong research component, the department offers a full range of courses leading to the M.S. and Ph.D. degrees in plant pathology and also houses students in the interdepartmental genetics curriculum. Although the department focuses on training Ph.D. students, it also offers M.S. training to a small number of students (average of seven students per year for the past five years), whose career goals (e.g. laboratory manager or county agent) do not require the extra training necessary for a Ph.D. As in most graduate-level programs, offering training at the Ph.D. level enables training at the M.S. level without additional resources. At a minimum, students at the M.S. level receive coursework in two of the four major pathogen groups, molecular plant-microbe interactions, ecology and epidemiology, and present two full-length seminars. Such requirements are similar to or exceed those for other plant pathology M.S. programs in the country. Virtually all students publish at least one refereed journal article based on their Master's research. During their time at KSU, most students attend and make a presentation at a minimum of one professional meeting.

Over 80% of the department's graduate students are Ph.D. students (average of 24 students per year over the past five years). This large emphasis on research translates into cutting-edge training for graduate students. Like the masters students, most Ph.D. students attend and make a presentation at a minimum of one professional meeting. They are also encouraged and in many cases succeed in publishing at least two refereed journal articles based upon their Ph.D. research.

The limiting factor for the number of students in this program is the availability of funding to support student work (about \$25,000 per student), rather than numbers of applicants or the acceptance rate. The department does not accept graduate students unless they are fully funded (mostly by grants) because the department expects them to devote 100% of their time to their graduate training. All recent graduates have been employed in an area closely allied to their degree program.

Summarized Assessment of Student Learning – MS, Ph.D.

Student learning outcomes (SLOs) that were assessed:

1. Technical competence
2. Problem-solving abilities
3. Communication skills

Measures used to assess SLOs:

Questionnaires are given to current graduate students and committee members of recently-graduated students. Each questionnaire has 25 questions and covers aspects of all SLOs (Technical Competence, Problem Solving Abilities, Ethical Qualities, Communication Skills, Life-long Learning, Educational Breadth, and Inclusion). Grade Point Averages (GPAs) of all graduate students are being tracked to note any important trends. Data from an audience questionnaire for student seminars are also being collected. Beginning in Fall 2006, all graduate students are annually rated in several categories by their major professors.

1. Technical competence: The Questionnaire for graduate students was administered to all current graduate students in the programs in 2005 and again in 2006. In Principles of Plant Pathology, a “pre-course test” was administered during the first day of class and results compared with how students performed on the same questions after taking the course.
2. Problem-solving abilities: These abilities are primarily evaluated in a student’s coursework; therefore, the GPAs of all graduate students are being monitored. Additionally, the major professors of all recently-graduated students were polled during 2005 on their perception of the problem-solving ability of graduate students.
3. Communication skills: Graduate students annually rate themselves on their ability to present a poster, make an oral presentation, and write a scientific research article, and major professors and committee members are polled to get their impression of a student’s ability to make scientific presentations. All graduate students are required to give one (M.S. students) or two (Ph.D. students) formal, full-length seminars in addition to their thesis defense seminar. A rating form for the audience was developed that allows the audience to rate the speaker on 18 different characteristics.

Results of assessment:

1. Overall scores from student questionnaires revealed a statistically-significant ($P < 0.02$) increase in a student’s self-evaluation based upon how long they have been in the program. Thus, combining all questions covering all SLOs, students believe they are consistently increasing in their learning and abilities. However, data from the questionnaires revealed a weakness in the ability of graduate students to recognize a number of common plant diseases and pathogens by sight. Since Spring 2005, average GPAs for M.S. students are 3.86, 3.33, 3.40, and 3.57. There is no statistically-significant trend either up or down. Since Fall 2004, average GPAs for Ph.D. students have been 3.65, 3.69, 3.68, 3.68, and 3.69. Again, there is no statistically-significant trend either up or down. Finally, for Principles of Plant Pathology, the average pre-course score was 31.1% (20% would be random guessing) while the post-course average was 84.8%, indicating that significant learning took place.
2. To date, there are only a few completed questionnaires from major professors and committee members; therefore, few conclusions can be drawn.
3. Average audience seminar ratings per semester since Fall 2004 were 4.46, 4.28, 4.25, 4.45, and 4.12 on a 5-point scale. There is no statistically-significant trend either up or down. The lowest average ratings are for the question “made topic interesting” although ratings are still fairly high (3.99).

Actions:

1. Technical competence: The faculty are generally pleased with the significant increase in student perceptions of their learning the longer they are in the Department. However, data from the questionnaires revealed a weakness in the ability of graduate students to recognize a number of common plant diseases and pathogens by sight. As a result of the faculty discussion of this problem, it was decided that the best way to rectify it was to alter the curriculum requirements for the Ph.D. program. The curriculum now requires Ph.D. students to take all four of the “core” pathogen group

courses (bacteria, fungi, nematodes, viruses) instead of just two of the four. Additionally, three of the four “core” pathogen group courses were increased from 2 to 3 credits.

2. Problem-solving abilities: To date, there are no clear trends that need immediate faculty attention.
3. Communication skills: To date, there are no clear trends that need immediate faculty attention.