

JULIAN GILBERT LEACH

JULIAN GILBERT LEACH: PIONEER LEADER IN PLANT PATHOLOGY

M. E. Gallegly and H. L. Barnett

Professors Emeriti of Plant Pathology and Mycology, respectively; Division of Plant and Soil Sciences, West Virginia University, Morgantown, West Virginia 26506-6057.

If asked to list the single most important contribution to plant pathology by Julian Gilbert Leach, most plant pathologists would indicate his 1940 book, *Insect Transmission of Plant Diseases* (8). However, Dr. Leach was more than just an expert on the relationships of insects and plant diseases. He had a broad understanding of the total science of plant pathology and an extraordinary ability to apply basic principles to solutions of plant disease problems. He was recognized by his peers as one of the great teachers in plant pathology, and as a leader and administrator with much vision and foresight. In addition to his book, he had almost 90 publications in scientific journals during the period of 1919–1973.

INSECTS AND PLANT DISEASES

Classic Research

Dr. Leach first became impressed with the role of insects in the development of plant diseases, and the potential for research in this field, when he began a study in 1923 of the role of the seed-corn maggot in the development of potato blackleg. This classic study, published in 1926 (5), illustrates how insects break down natural defense barriers, such as the wound periderm, while transmitting inoculum of the pathogen to the infection court. Further studies revealed the symbiotic relationship of the causal bacterium and the maggot (7). Research on the role of insects in the development of other diseases followed: heart rot of celery and dipterous insects (6); blue stain in Norway pine timber and bark beetles (14, 15); the dissemination of fungi by ants (12); ambrosia beetles and associated fungi (13); purple top of potato and leafhoppers (10); *Nematospora phaseoli* and the green stinkbug (11); transmission of the oak wilt pathogen by species of Nitidulidae (1, 16); bacterial soft rot of iris and the iris borer (2); and cucurbit bacterial wilt and the cucumber beetle (9). The above publications, plus 15 more on insects and plant diseases, spanned the years 1925–1964.

The Book: Insect Transmission of Plant Diseases

The idea to write a book with the above title was originally suggested to Dr. Leach in 1929 by Dr. Royal Norton Chapman (17), a noted University of Minnesota ecologist and entomologist. Manuscript preparation was begun at the University of Minnesota and completed at West Virginia University. Not only did his book (8) bring together the most important contributions in this field of study, it evaluated and interpreted these contributions while weaving them together to generate principles of the relationship between insect and plant diseases.

Dr. Leach stated in the introduction that when insects are involved in plant disease, three organisms must be considered and understood: the insect, the pathogen, and the host plant. He stressed the need to blend the sciences of entomology, microbiology, and botany, and attempted to do this throughout his book. He noted that successful control measures, with few exceptions, are dependent upon a knowledge of the methods by which pathogens are transmitted and the relative significance of each method. At the time of writing the book Dr. Leach noted that transmission in general was treated casually, and the role of insects in the spread of pathogens and development of plant diseases had not received the attention it deserved. His book remained for almost 20 years as the only text in the field. When confronted with the suggestion that insects do not transmit diseases, only the pathogens that incite them, Dr. Leach would respond with "Do not quibble. To get all of this in the title of a book is too cumbersome."

ANOTHER CLASSIC CONTRIBUTION

Physiologic Races, The Nature of Parasitism, and Host Resistance

Being first a student and later a colleague of E. C. Stakman, it is only natural that J. G. Leach was among the first to recognize the existence of physiologic races of *Puccinia graminis* f. sp *tritici* (18). His second paper, also published in 1919, was on the parasitism of two biologic forms of the wheat stem rust

fungus (3). In this classic paper Dr. Leach thoroughly reviewed the existing theories on the nature of parasitism and host resistance, and discarded all of them. In their place he proposed a theory of pathogen specificity and host resistance based on specific food relations, and devoted four pages of discussion in support of this theory. Simply stated, the theory is: each biologic form of the rust fungus has its specific food requirements; when a form invades a plant that does not contain this specific food, the fungus dies of starvation; the autolytic products of death kill host cells in the invaded area to give necrotic flecks, or hypersensitivity. Dr. Leach used the word "food" in this paper, but changed it to "nutrient" in the next one.

Because of the obligatory nature of *Puccinia graminis* and the inability to test his hypothesis on artificial media, Dr. Leach turned to *Colletotrichum lindemuthianum* and bean anthracnose for further studies of parasitism and host resistance. This paper (4), published in 1923, likewise became a classic. Much information on the mechanisms of parasitism, physiologic races, and host resistance was generated, but definite evidence to support his hypothesis was not forthcoming. In the final paragraph of this paper Dr. Leach said that the resistant reaction "is interpreted as a nutrition phenomenon, the mycelium being destroyed by autolysis induced by starvation and the resulting products killing and staining the host cells."

TEACHING

When the senior author of this paper was offered a faculty position in plant pathology at West Virginia University, his major professor, J. C. Walker, advised him that if he went there he would continue learning because of J. G. Leach. This is an example of the esteem held for Dr. Leach's teaching qualities by his colleagues throughout the profession. Dr. Leach first taught the formal course, "Insect Transmission of Plant Diseases", at the University of Minnesota, and continued teaching it at West Virginia University until he retired. Just as importantly, throughout his career at West Virginia University he taught the beginning course in plant pathology for undergraduate students and the graduate course, "Principles of Plant Pathology", for the beginning graduate student.

Dr. Leach emphasized principles in all of his courses. He insisted that the undergraduate course should be organized on the basis of cause of plant diseases, and that the graduate course should be organized on the basis of the disease cycle. Both courses had ample laboratory periods with hands-on exercises. In the graduate course, the steps of pathogenesis were uniquely divided into inoculation, germination, ingression, infection, invasion, fructification, liberation, dissemination, and survival; special treatment of nonparasitic diseases, epiphytology, and principles of control were blended with the steps of parasitic diseases at the end of the course. Dr. Leach's philosophies on teaching of plant pathology are still followed at West Virginia University.

As students began to recognize the teaching ability of Dr. Leach, the graduate program in plant pathology began to prosper. At West Virginia University he served as the professor and research advisor to 25 graduate students, 18 of whom received the M.S. and seven the Ph.D. degree. As department head he served on the graduate committees of most of the other students in the plant pathology program.

LEADERSHIP

In 1938, Dr. Leach was appointed Professor of Plant Pathology and Head of the Department of Plant Pathology and Bacteriology at West Virginia University, succeeding C. R. Orton. Because of his leadership qualities, entomology was merged with his unit in 1952 to create the Department of Plant Pathology, Bacteriology, and Entomology. The areas of bacteriology and entomology were expanded from one to two positions, and a State Extension Specialist position was created to cover both plant pathology and entomology. After his retirement, entomology was relocated and the bacteriology discipline was renamed agricultural microbiology. Dr. Leach showed unusual foresight as an administrator in the development of a strong, well-balanced program of teaching and research as he blended the disciplines of mycology, bacteriology, virology, and nematology to backstop the science of plant pathology. He well recognized the advantages of maintaining agricultural microbiology and plant pathology in the same department.

Colleagues of Dr. Leach recognized his leadership ability early in his career. He served as President of the American Phytopathological Society in 1941, as President of the Potomac Division of APS (which he helped found) in 1956, and was elected Fellow of the Society in 1965. He was also a member of AAAS, Potato Association of America, American Association of University Professors, Sigma Xi, Alpha Zeta, Phi Kappa Phi, and Gamma Sigma Delta from which he received the Certificate of Merit in 1960. He was inducted into the West Virginia Agricultural and Forestry Hall of Fame posthumously in 1975.

Recognizing his ability as an organizer and administrator, the Rockefeller Foundation secured the services of Dr. Leach in 1953 to help initiate a potato improvement program in Colombia, South America. He served in a similar capacity in Alaska in the summer of 1955. Dr. Leach was active in development and support of the Graduate School and the University Senate at West Virginia University, and was active in community affairs such as the Boy Scout program. At one time he served as mayor of Suncrest, a suburb of Morgantown, West Virginia.

PERSONAL

Julian Gilbert Leach, Professor Emeritus of Plant Pathology at West Virginia University, died May 4, 1972. He was born in Somerville, Tennessee, on November 16, 1894. His formal education included a B.S.A. from the University of Tennessee in 1917, the M.S. from the University of Minnesota in 1918 and the Ph.D. from the University of Minnesota in 1922. He married Margaret Clare Conover; they had two daughters and one son.

His broad experience during the early years of his professional career included positions as USDA Agent and Assistant in Plant Pathology at the University of Minnesota, 1918–1919; Associate Professor of Plant Pathology and Botany, Colorado Agricultural College, 1919–1920; and Instructor, Assistant Professor, Associate Professor, and Professor of Plant Pathology, University of Minnesota, 1920–1938. He studied in Europe as an International Education Board Fellow during 1927–1928. He completed his career at West Virginia University where he served as department head from 1938–1960. At that time administrators had to vacate their positions at age 65. Dr. Leach was appointed Professor Emeritus on July 1, 1965.

Dr. Leach was an avid gardener who often complained that he had more plant diseases than anyone in the country. He was a do-it-yourselfer around his house and grounds, and had a lapidarian hobby. He enjoyed hunting in the fall when the autumn coloration was at its peak, and often led graduate students and faculty to the woods early in the hunting season so they could, he kiddingly explained, "get it out of their systems and go back to work." Most of his acquaintances considered him to have a strong personality, but his family and those who knew him well experienced his soft side. Some of his grandchildren called him "Pops".

ACKNOWLEDGMENTS

We wish to thank the active and emeritus faculty in Plant Pathology and Agricultural Microbiology for their suggestions and manuscript reviews. Likewise, we thank C. F. Bishop, E. S. Elliott, F. F. Jewell, and C. L. Wilson, former Ph.D. students of Dr. Leach, for their assistance. Mrs. Billie C. Leach of Morgantown, West Virginia, daughter-in-law to Dr. Leach, and his daughters, Mrs. Robert Swan of Vienna, Virginia, and Mrs. Margaret San Filipo of Cleveland, Ohio, also contributed.

Literature Cited

- Dorsey, C. K., Jewell, F. F., Leach, J. G., True, R. P. 1953. Experimental transmission of oak wilt by four species of Nitidulidae. *Plant Dis. Rep.* 37:419– 20
- Howard, C. M., Leach, J. G. 1963. Relation of the iris borer to bacterial soft rot of iris. *Phytopathology* 53:1190-93
- Leach, J. G. 1919. The parasitism of Puccinia graminis tritici Erikss. and Henn. and Puccinia graminis triticicompacti Stak. and Piem. Phytopathology 9:59-88
- gy 9:59-88
 4. Leach, J. G. 1923. The parasitism of Colletotrichum lindemuthianum. Minn. Agric. Exp. Stn. Tech. Bull. 14. 57 pp.
- Leach, J. G. 1926. The relation of the seed-corn maggot (*Phorbia fusciceps* Zett.) to the spread and development of potato blackleg in Minesota. *Phy*topathology 16:149–76
- Leach, J. G. 1927. The relation of insects and weather to the development of heart rot of celery. *Phytopathology* 17:663–67
- Leach, J. G. 1931. Further studies on the seed-corn maggot and bacteria with special reference to potato blackleg. *Phytopathology* 21:387–406
- Leach, J. G. 1940. Insect Transmission of Plant Diseases. New York: McGraw-Hill, 615 pp.
- Leach, J. G. 1964. Observations on cucumber beetles as vectors of cucurbit wilt. *Phytopathology* 54:606-7
- 10. Leach, J. G., Bishop, C. F. 1946. Pur-

ple top wilt (blue stem) of potato. West Va. Agric. Exp. Stn. Bull. 326. 35 pp.

- Leach, J. G., Clulo, G. 1943. Association between Nematospora phaseoli and the green stinkbug. Phytopathology 33:1209-11
- Leach, J. G., Dosdall, L. 1938. Some observations on the dissemination of fungus spores by ants. *Phytopathology* 28:444-46
- Leach, J. G., Hodson, A. C., St. John, P. C., Christensen, C. M. 1940. Observations on two ambrosia beetles and their associated fungi. *Phytopathol*ogy 30:227-36
- Leach, J. G., Orr, L. W., Christensen, C. 1934. The interrelationship of bark beetles and blue-staining fungi in felled Norway pine timber. J. Agric. Res. 49:315–42
- Leach, J. G., Orr, L. W., Christensen, C. 1937. Further studies on the interrelationship of insects and fungi in the deterioration of felled Norway pine logs. J. Agric. Res. 55:129-40
- Leach, J. G., True, R. P., Dorsey, C. K. 1952. A mechanism for liberation of spores from beneath the bark and for diploidization in *Chalara quercina*. *Phytopathology* 42:537–39
- 17. National Cyclopaedia of American Biography. 1941. Vol. 29, p. 34. New York: James T. White and Co.
- Stakman, E. C., Levine, M. N., Leach, J. G. 1919. New biologic forms of *Puccinia graminis. J. Agric. Res.* 16:103–5