

A BRIEF HISTORY OF THE DEVELOPMENT
OF RESEARCH IN PLANT PATHOLOGY IN ARKANSAS

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INTRODUCTION

Although the University of Arkansas was founded in 1871, there is no evidence from the available records that either teaching or research in the field of Plant Pathology was carried out prior to the establishment of the Arkansas Agricultural Experiment Station under the Hatch Act in 1887. Records show that a limited amount of teaching and research in Plant Pathology were carried out in the Department of Horticulture during the period 1887-1909. The Department of Plant Pathology was established in 1909.

RESEARCH IN PLANT PATHOLOGY PRIOR TO 1909

The period 1887-1909 seems to have been largely a period of observation and exploration so far as plant disease research was concerned. At least three early members of the staff of the Department of Horticulture, Professors J. T. Stinson, Ernest Walker, and J. Lee Hewitt, reported in the bulletins of the Experiment Station on the presence of such diseases as apple scab, apple bitter rot, apple cedar rust, pear blight, apple sooty blotch, apple blotch, downy mildew of grapes, black rot of grapes and strawberry leaf blight (apparently largely *Mycosphaerella* leaf spot although leaf scorch seems also to have been present). During this period, large numbers of apple, grape, and strawberry varieties were planted in variety tests and the notes made regarding varietal resistance and susceptibility are of historical interest. In one of the first bulletins of the Arkansas Experiment Station, Dr. Wm. Trelease is listed as "Consulting Botanist." It seems uncertain that Dr. Trelease was ever actually in residence.

In 1896, Stinson reports submitting a new apple disease to L. H. Bailey and B. T. Galloway. The former is reported to have suggested the name "Skin Blotch" for this trouble. Galloway identified the organism present as *Leptothyrium pomi*. It seems evident that "Sooty Blotch" was the disease under consideration.

During this early period many trials were made of various spray materials including bordeaux mixture and ammoniacal copper carbonate spray. Notes on the control of apple scab, apple bitter rot, downy mildew of grapes, black rot of grapes, and strawberry "leaf blight" are given. Apple spraying on a commercial scale was reported in 1894 and it is apparent that control of fruit diseases by spraying was a well established practice in the State by 1896.

During the period 1887-1909 several other diseases are mentioned casually and mention is also made of the use of copper sulphate dips for control of smut in wheat.

PLANT PATHOLOGY SINCE 1909

The Department of Plant Pathology was established in 1909 as a teaching and research department. From the very start it is apparent that the work of the department was divided among teaching, research, and extension work. In 1917 the Arkansas State Plant Board was established with the Head of the Department of Plant Pathology as an ex-officio member of the Board.

For a brief period during World War I an Extension Plant Pathologist, M. S. Ensign, was hired and on November 1, 1949, Dr. Robert Emge (Ph. D., Illinois) became Extension Plant Pathologist. In the meanwhile all of the normal activities of an Extension Plant Pathologist have been carried out by the staff of the Department of Plant Pathology. This work has been valuable to the Department since it brought the staff more closely in contact with the economic plant disease problems of the State.

RESEARCH PROGRAM 1909-1950

As previously noted, the period prior to 1909 was one of observation and exploration with little original research in Plant Pathology. After 1909 there was a period which might be called a "period of orientation." The staff members for at least four or five years were primarily trained in Horticulture with little graduate training in Plant Pathology. Several of these men remained only one or two years and seem to have left little or nothing behind in the way of published research.

Professor J. Lee Hewitt, B.S., Missouri, was for several years prior to 1909 a member of the staff of the Department of Horticulture. In 1909 he became the first Professor of Plant Pathol-

ogy and the first Head of the Department of Plant Pathology. It appears that he was forced by the demands of the Northwest Arkansas apple growers to devote much of his time to a study of apple diseases. As early as 1911 he was joint author with the Entomologist of a publication dealing with the diseases and insects of the apple. Later he published work on apple spraying and on the fire-blight disease in Arkansas. In 1913 Hewitt and Truax published the results of their first studies of "Apple Measles", a disease whose etiology still remains comparatively obscure, although Dunegan and Isely showed that at least a part of what Hewitt had called "Measles" was the result of oviposition punctures made by certain leaf hopper species. Hewitt's work on "Apple Measles" is perhaps his most important contribution to our knowledge of plant diseases. In 1912 Hewitt also reported briefly on "Rice Blight" now known as "Straighthead" which Tisdale later showed to be of physiogenic origin.

During the period from 1909-1917 when J. Lee Hewitt was head of the Department of Plant Pathology several young men were associated with the Department for brief periods. Ashleigh P. Boles, B. S., Arkansas 1908, was Adjunct Professor of Plant Pathology 1909-1910 and for many years since has been prominent in the Agricultural Service of the Missouri Pacific Railroad John S. Stahl was Adjunct Professor during the year 1910-1911 and was succeeded by Harold E. Stevens, B. S., Kentucky State, M. S., Illinois, who was Adjunct Professor during the year 1911-1912. He was followed by Hartley E. Truax, Instructor of Plant Pathology 1912-1913.

In 1913 Walter S. Fields, B. S., Michigan Agricultural College, became Instructor of Plant Pathology and in 1916 he became Assistant Professor of Pathology. He resigned in 1918. All of the above listed men were apparently young and just starting their careers. Generally speaking their time at the Arkansas Experiment Station was too short to allow them to complete much in the way of research.

Dr. John A. Elliott, A. B., Fairmont College, A. M., Kansas, Ph. D., University of Illinois came to the headship of the department in 1917, succeeding Hewitt who went to the employ of the Arkansas State Plant Board. Elliott was the first well-trained Plant Pathologist to be employed by the University. His work on the genus Alternaria prior to his arrival in Arkansas is recognized as an important contribution to our knowledge of this important genus of plant pathogens. Elliott's training under F. L. Stevens and others at Illinois had prepared him for a long and useful career in Plant Pathology which was cut short by his untimely and tragic death at the height of his career early in January 1923.

During the five and a half years that Elliott was Plant Pathologist of the Arkansas Agricultural Experiment Station, he was interested principally in diseases of cotton and tomatoes. Elliott applied himself principally to the control of angular leaf spot, seedling blights, and Fusarium wilt. He was one of the pioneers in cottonseed treatment research and showed conclusively that angular leaf spot can be controlled on a commercial basis by the sulfuric acid delinting method.

Having been well-trained in Mycology under Stevens, Dr. Elliott was greatly interested in discovery of new disease-producing organisms. The Ascochyta disease of cotton which he first reported in this country and which under the favorable weather conditions that existed for a few years, caused serious local damage, interested him greatly. His work on cotton is summarized in two bulletins entitled "Arkansas Cotton Diseases" and "A New Ascochyta Disease of Cotton."

During his brief time at Arkansas, Elliott selected and developed several wilt-resistant tomato strains which were grown and highly regarded by a number of Arkansas tomato growers long after his death. This work was summarized in his Bulletin 194, "Tomato Wilt and Its Control in Arkansas."

At the time of his death Elliott was engaged in a study of the organism causing black rot of the sweetpotato. His careful studies of the evanescent asci of the pathogen led him to the conclusion that the pycnidia of Sphaeronema fimbriata were in reality perithecia and that what had for so many years been considered to be conidia were in reality ascospores. That Elliott's conclusions were sound is attested to by the fact that Ceratostomella fimbriata Elliott is now everywhere recognized as the correct name for the black rot of sweetpotato pathogen.

A year after J. A. Elliott took charge of the Department of Plant Pathology Harry Robert Rosen (B. S., Pennsylvania State College, M. S., University of Wisconsin) joined the staff with the rank of Assistant Professor. During the year 1921-1922, Professor Rosen was on leave of absence at Washington University, St. Louis, where he completed the work for his Ph. D. under Dr. B. M. Duggar.

With service at the Arkansas Station from 1918 up to the present, Dr. Rosen has more than thirty years with the Department, thus exceeding by several years any other member of the Plant Pathology staff.

During this long period Professor Rosen has naturally interested himself in many phases of Plant Pathological research. During the first ten years at Arkansas his titles include two publications on the Bacterial Stalk Rot of Corn, A Bacterial Disease of Foxtail (dissertation for the

doctorate), two bulletins on the Mosaic Diseases of Sweetpotato and one on the Septoria Glume Blotch of Wheat.

During the next few years, Dr. Rosen worked especially on the fireblight disease of apples and pears. Overwintering of the fireblight bacillus in the beehive and the first clearcut explanation of blossom infection through the stomata-like "nectarthodes" of the apple and pear blossoms were among the highly significant contributions to our knowledge of the fireblight disease. Dr. Rosen's work on fireblight was summarized in numerous shorter journal publications and in four extensive bulletins of the Arkansas Agricultural Experiment Station.

Soon after he came to Arkansas, Rosen became interested in the diseases of oats and other cereals and in the possibility of breeding oats for winter hardiness, rust resistance and as a winter pasture crop. Research along this line has resulted in the release of the Traveler variety of oats which has proven its value particularly in the northern part of the winter oat belt because of its high productivity, winter hardiness, and resistance to all common races of the crown rust organism and to common races of loose and covered smut. Several selections of oats, wheat, and barley, primarily bred for disease resistance, are now in the process of development by him.

In addition to the work outlined above, Professor Rosen has been very much interested in the development of new disease-resistant varieties of roses, one of which, Stephen Foster, a hardy climbing rose, has been released to nurserymen for propagation. Improved fungicides for the control of black spot and powdery mildew of roses are another development from this work.

Some months after the death of Dr. J. A. Elliott, which took place in Washington, D. C. where he was for a brief leave of absence with the Plant Disease Survey, the headship of the department was assumed by V. H. Young, Ph. B., Ph. M., Ph. D., University of Wisconsin. Young came from the University of Idaho where he had spent the five previous years as head of the Department of Botany and Plant Pathology.

Professor Young, like his predecessor, has devoted his attention largely to the diseases of cotton and particularly to the Fusarium wilt -- root knot -- potash hunger disease complex. His first publication presented the results of soil temperature studies of the Fusarium wilt disease of cotton. Later studies dealt with soil moisture relationships (with W. H. Tharp) and with the relation of potash deficiency, fertilizer balance, and varietal resistance to the Fusarium wilt disease of cotton. Much of this work was in cooperation with J. O. Ware, George Janssen, and L. M. Humphrey of the Department of Agronomy, and with W. H. Tharp of the Division of Cotton and Other Fiber Crops and Diseases of the U. S. Department of Agriculture. Other phases of the cotton disease problem, especially cotton seedling blights and their control by cottonseed treatment, have been studied more recently. Minor problems have dealt with grape, apple, and strawberry spraying and with cereal seed treatments.

During the year 1921-1922, Raymond F. Crawford, B.S. and M.S. Iowa State, took H. R. Rosen's place while the latter was on leave for graduate studies and in 1928, Dr. Edgar C. Tullis, A.B. and A.M. Nebraska, Ph. D. Michigan State, was added to the staff with the title of Assistant Professor and Assistant Plant Pathologist. Tullis, who was employed jointly by the University of Arkansas and the Division of Cereal Crops and Diseases of the U. S. Department of Agriculture devoted all of his time to rice diseases. In 1930 Dr. Tullis transferred completely to the U. S. Department of Agriculture but continued to carry on his studies of rice diseases in the Department of Plant Pathology until about 1936 when he was transferred to the Rice Branch Station at Beaumont, Texas. During the time that Dr. Tullis was employed by the Arkansas Experiment Station he discovered both the conidial and ascigerous stages of the organism causing stem rot of rice which had previously been assigned to the genus Sclerotium.

Dr. E. M. Cralley, B.S., McKendree, Ph. D., Wisconsin, came to the department in 1931 in a cooperative arrangement with the U. S. Department of Agriculture but shortly was employed full time by the University. For several years, he devoted himself entirely to diseases of rice, but in more recent years he has divided his time between rice disease studies and diseases of alfalfa and soybeans. From December 1946 to February 1948 Dr. Cralley was employed by the U. S. Army to study agricultural problems, especially those connected with rice-growing in Japan and Korea. He returned to the Plant Pathology Department in 1948 with the rank of Professor and Plant Pathologist.

Dr. Cralley was one of the first in this country to demonstrate the value of rice seed treatments for the control of rice seedling diseases and as a result of his work a substantial percentage of the rice sown in Arkansas at present is treated. Control of stem rot of rice through cultural practices, relation of rice fertilization to disease control, the development of rice varieties resistant to disease, and various other rice disease problems have engaged his attention since he came to the Arkansas Station.

Since returning from Korea Dr. Cralley has devoted part of his attention to the "White Tip"

disease of rice. Recently he has shown that this disease is caused by seed-borne nematodes which develop in the terminal bud of the rice plant and produce the typical "white tip" symptoms. Seed treatment studies designed to control this disease are a part of the current rice disease program.

The importance of alfalfa in Arkansas as a crop which is to be processed in dehydrating plants has brought the problem of the longevity of alfalfa plantings to the fore. The failure of alfalfa stands, especially in the Eastern Delta area of Arkansas where the principal dehydrating plants are located, threatens to wipe out a prosperous industry unless these problems are solved. Much of Dr. Cralley's time is now being devoted to this important problem.

Dr. Leslie M. Weetman, A. B. Simpon, M.S. and Ph. D. Iowa State, was a member of the Plant Pathology staff during the period 1936-1942. Dr. Weetman, whose training was largely in Genetics and Plant Breeding, was engaged almost entirely in a cooperative project with Prof. H. R. Rosen designed to develop better disease resistant varieties of oats. This work has been considered previously in connection with the discussion of Dr. Rosen's research. Dr. S. B. Locke, B.S. Oregon State, M.S. and Ph. D. Wisconsin, came to the Department of Plant Pathology in 1939 to initiate a program of vegetable disease research. He was with the Arkansas Station from 1939-1943 and left the department to engage in emergency war work in the U. S. Department of Agriculture. Dr. Locke studied primarily resistance to early blight and Septoria leaf spot of tomatoes and succeeded in securing a number of promising hybrids with South American species of Lycopersicon which showed marked resistance to these diseases. Other crosses which Dr. Locke developed showed promise from the point of view of resistance to the Fusarium wilt of the tomato. Control of tomato leaf spots through use of fungicidal applications was also a part of the tomato disease program upon which he was working.

From 1943-1945 Dr. J. R. Shay, B.S. Arkansas, M.S. and Ph. D. Wisconsin, continued Dr. Locke's work with tomato diseases and also began a study of spinach diseases. One important result of the latter work was a demonstration of the fact that much of what had been called cold weather injury to spinach was in reality "Spinach Blight" caused by one or more strains of the cucumber mosaic virus and that the Old Dominion and Virginia Savoy varieties of spinach possesses a high degree of resistance to several of the strains of this virus. Shay also secured some very interesting preliminary results with the use of eradicator sprays for the control of black rot of grapes.

Dr. Joseph P. Fulton, A.B. Wabash, M.A. and Ph. D. Illinois, succeeded Dr. Shay in 1947. Dr. Fulton has been especially interested in the virus diseases of spinach and other vegetables and in tomato diseases. His discovery of a strain of cucumber mosaic virus capable of attacking blight resistant varieties of spinach in a highly destructive manner demonstrates that the spinach blight problem may become much more severe than it is at present. Recently Dr. Fulton has published the results of his preliminary studies of the spinach virus problem and has with Neil Fulton a report of a tomato root rot caused by the pathogen of buckeye rot of tomato. Dr. Fulton is also studying the virus diseases of strawberries and the red stele disease of strawberries.

Dr. Curtis L. Mason, B.S. and M.S. Texas A. & M. and Ph. D. Illinois, came to the Department with the rank of Assistant Professor and Assistant Pathologist in 1948. Dr. Mason's research at present is very largely confined to a study of bacterial spot and brown rot of peaches and their control by improved spraying techniques. Among the new materials being tried by Mason are calcium and sodium hypochlorite which in preliminary trials reported in 1949 seemed to offer considerable promise for use in the peach spray schedule.

Dr. Albert Miller, B.S., M.S., and Ph. D. Cornell, who was Instructor in Plant Pathology and Entomology from 1938-1940, and Mr. Neil D. Fulton, B.S. Arkansas, who joined the staff in 1949, were hired primarily as members of the teaching staff. Dr. Robert G. Emge, Ph. D. Illinois, was hired as Extension Specialist in Plant Pathology in 1949. Although Dr. Emge is not strictly speaking, a member of the staff of the Department of Plant Pathology, he continues to interest himself so far as time permits, in research matters, and is already proving his value to our department through his field contacts with practical problems which he encounters throughout the State. Dr. T. C. Liu, Ph. D., Oregon State, a native of China, joined the staff in 1942 and continued for approximately three years as research assistant in connection with studies of the cotton wilt disease.

Besides the members of the Plant Pathology staff enumerated above there have been considerable numbers of graduate and undergraduate students who have gone on to a career in Plant Pathology elsewhere. Some but not all of these men have served either as graduate or undergraduate research assistants in the Department of Plant Pathology. Among those who have either Bachelor's or Master's degrees or both from this institution may be listed the following:

John C. Dunegan, M.S., Arkansas, now Senior Pathologist, U. S. Department of Agriculture
 A. B. Groves, M.S., Arkansas, now Plant Pathologist Virginia Experiment Station
 John R. Large, M.S., Arkansas, Assistant Plant Pathologist, U. S. Department of Agriculture
 Albert L. Smith, M.S., Arkansas, Pathologist, U. S. Department of Agriculture
 Luther Shaw, M.S., Arkansas, Agronomist, U. S. Department of Agriculture
 A. B. Wiles, M.S., Arkansas, Graduate Student, University of Wisconsin
 Ollie D. Burke, B.S.E., Arkansas, Extension Plant Pathologist, Pennsylvania
 Glenn S. Pound, B.S., Arkansas, Associate Professor, University of Wisconsin
 J. Ralph Shay, B.S., Arkansas, Assistant Professor, Purdue University
 George W. Bruehl, B.S., Arkansas, Associate Pathologist, U. S. Department of Agriculture
 Mannon Gallegly, B.S., Arkansas, Assistant Professor, University of West Virginia
 Harlan Smith, B.S., Arkansas, Graduate Student, University of Wisconsin.
 James. G. Horsfall, B.S., Arkansas, Director Connecticut Agricultural Experiment Station

Besides the men listed above, who were either employed by the Arkansas Experiment Station or were students at the University of Arkansas, there should be mentioned three members of the staff of the U. S. Department of Agriculture who were stationed at the University of Arkansas in a cooperative relationship with the Department of Plant Pathology.

Mr. John C. Dunegan, now Senior Pathologist, in charge of Deciduous Fruit Disease Investigations, U. S. Department of Agriculture, Beltsville, Maryland, was stationed with the Department of Plant Pathology from 1928-1945. Mr. Dunegan was concerned primarily with apple spraying investigations but found time to investigate a number of fruit diseases, among which may be mentioned bacterial spot disease of stone fruits and rusts of the genus Prunus.

E. C. Tullis, now Plant Pathologist, Division of Cereal Crops and Diseases, after leaving the staff of the Department of Plant Pathology in 1930 to join the staff of the U. S. Department of Agriculture, was stationed with the Plant Pathology Department for several years and continued his work with diseases of rice.

W. Hardy Tharp, now Senior Physiologist, Division of Cotton and Other Fiber Crops and Diseases, was stationed at the University of Arkansas from 1936-1950 and carried out cooperative studies on cotton diseases with members of the Plant Pathology Staff during part of this time.

ACTIVITIES OTHER THAN RESEARCH

Although these notes are concerned primarily with the research in Plant Pathology, the record would be incomplete without some mention of other activities of the Plant Pathology Staff. These are discussed here briefly.

Extension Work. Except for a very brief period during World War I there was no Extension Plant Pathologist in Arkansas until Dr. Robert G. Emge came here in November 1949. During this time the staff carried out all of the ordinary functions of an Extension Plant Pathologist which need not be enumerated here.

Arkansas State Plant Board. The regulatory work of the State with respect to nursery stock, seeds, fertilizers, feeds, etc. is in charge of the Arkansas State Plant Board of which the head of the Department of Plant Pathology is an ex-officio member. In this capacity he attends all formal meetings of the Board and acts as a consultant in matters pertaining to plant diseases. He does not, however, take part directly in the regulatory activities of the Board. Since 1924 the present head of the department has also served as secretary of the Board.

Teaching Activities. While not all members of the Experiment Station Staff in Plant Pathology have teaching duties, most of them do some teaching and in recent years between 300 and 400 students have enrolled in classes each year in Plant Pathology. The curriculum of the College of Agriculture requires that every graduate in Agriculture complete the introductory course in Plant Pathology and that in addition he take an advanced course in either Plant Pathology or Entomology. Courses are offered in Diseases of Southern Field Crops and in Diseases of Southern Fruit and Vegetable Crops. At least half of the student body elect an advanced course in Plant Pathology. In recent years many students have elected to take both of the advanced courses in Plant Pathology and the corresponding advanced courses in Entomology. Since a very large part of the graduates in the College of Agriculture become either County Agents or Teachers of Agriculture, it is felt that this program, which provides a limited training in the subject for all students rather than a considerable amount of advanced work for a limited group, best serves the interests of the State.