

From a history class
about the common people
by Dr. Dan C. Allen
JVC 1/11/50

The Development of Plant Pathology in Latin America

(Frederick L. Wellman*)

Primitive man in the Latin American tropics was a hunter, a gatherer of diligently sought food in the forest and an agriculturist who produced his maize and beans in plots known as "milpas". These small and shifting fields were, and some still are, carved out of jungles by hand, using archaic tools and fire to make the clearings. This was going on long before the time of Columbus. When cultivated plants in exposed and eroded soils showed weakness and disease, a new plot was readied and planted, and the abandoned field was reabsorbed into the surrounding jungle. As watched today, such rotation, although unplanned, prevents intensification of crop-plant diseases. It is probably that indigenous peoples, who as much as modern man feared crop failures and famines, have long taken such fears to their tribal gods. Friendly observers know that religious practices for protection against crop failures are still carried on by unlettered Indians in half hidden mountain situations of Central America, in secluded places on West Indian islands, and in parts of the high Andean uplifts of Ecuador, Bolivia, and Peru.

Scientists know very well how the American tropics is fully stocked with its own plant parasites. They realize also, how, from the very beginning of tropical America's modern days, from the time of expeditions under Columbus (1492-1496) to now, there has been brought from the Old World to the Americas many old European plant diseases.

Early Period (about 1492-1772)

In early days there were no plant quarantines, but there was abundant traffic in living plants and seeds, untreated for diseases, going back and forth between the east and west tropics. From the Discovery to Independence the explorers and long ago colonists of Latin America were commissioned by their governments, to send back planting materials from the New World that they might be tested in the Old. While from our shores went such priceless American gifts to Old World agriculture as beans, squashes, tobacco, potato, maize or "Indian corn", tomato, cacao, peanuts, and sweetpotato there were being received by us through contacts with Europe and Asia such classic crops as wheat, rye, cabbage and relatives, peach, orange, rice, banana along with plantain, sugarcane, and coffee.

From old records of Padre Jose Acosta, it is known that in 1571 a blight of potatoes (Phytophthora) was causing serious rot and famine--causing short supply in Peru. Also at this time numbers of dried plant disease specimens were being sent to Europe by adventuring botanists in the West Indies, and some were examined in England as early as 1660 by Robert Hooke. In 1691 wheat rust had been seen as a severe disease in Mexico.

*Acknowledgement is made here of help from Mr. John A. Stevenson, Collaborator of the National Fungus Collections, U. S. Department of Agriculture; insatiable collector of Latin American plant pathological and mycological literature, now deposited in the "John A. Stevenson Library" at the Plant Industry Station, Beltsville, Maryland, U.S.A.

In the year 1727 a destructive disease of cacao, probably pod rot, was observed in Trinidad. This caused much concern in European markets. The first collections of fungi from Argentina were secured in 1767 by the naturalist Padre Filiberto Commerson. By 1772 the much feared rust, (Puccinia) known so long in Europe and the Near East, was acknowledged among farmers as the established wheat disease in the cool cereal-growing areas of central Mexico, but it was also spreading into Baja California. In 20 more years it was in the developing province of California Norte. Rust diminished the wheat supplies and there followed the precarious business of shipping the grain to hungry people in areas where transport was difficult and rust was severe.

Era of Premier Mycologist's Influences (about 1780-1895)

Undoubtedly one of the most important phases in the development of natural science was the botany-encompassing activities (1730-53) of the great Linnaeus. During his life he received and named numerous tropical American parasitic plants and fungi from the New World. It is also important from the standpoint of our pathology in Latin America that he stimulated through his enthusiasm and example, much collecting in our tropics of plant disease organisms. These were the bases of much mycology in years to come.

The development of the Linnean method, of using Latin binomials, was adapted to mycology. Fungus students devised their own systematics and employed for critical examination selected members of large collections of tropical specimens. For an early example: Valliant described South American fungi of the genus Clavaria in 1727. In 1788 many organisms were described by O. P. Swartz (1760-1818) from Cuba, Jamaica and Haiti. Large numbers of them were from collections by naturalists and botanists, such as Spruce, Darwin, Humboldt, and Bonpland traveling in the Americas. Herbaria from them accumulated, and were received and eagerly studied by men we now recognize as among the premier mycologists of that time. Four of the most prestigious names are Persoon (1761-1838), Fries (1798-1878), Montagne (1784-1866), and L  v  ille (1796-1870). Meticulous labors by these and their colleagues, are still referred to by us after over two centuries.

When the main organization of the fungus world could be discerned and had been decided upon, by the first mycologists, work soon followed. Carlo G. Bertero (1789-1831) collected in 1818 in Colombia, Chile, Puerto Rico, and Hispaniola, and his material was determined mostly by the famed A. deCandolle (1778-1841). Among several others, an outstanding mycological project was on Cuban fungi obtained from several workers, which came into the hands of Montagne who published about them in 1845 to 1850.

Along with old style morphological differences, after a while there were recognized variations due to physiology and pathogenicity. Parasitism became a major phase of research by plant disease specialists. This brought to mycologists specimens of multitudes of unknown organisms from struggling plant men in the Latin American tropics (known also as the Neotropics). Later mycologists, to mention only a few who worked with tropical materials, had such well known names as M. A. Curtis (1808-1872), C. E. Broome (1812-1886), M. C. Cooke (1825-1914), M. J. Berkeley (1836-1884), N. T. Patouillard

(1847-1928), G. Bresadola (1847-1929), G. E. Masee (1850-1917), and J. C. Arthur (1850-1942).

There were several circumstances in our Occidental tropics that had stimulated recognition of special need for research in plant pathology. A serious so-called "curl disease" of potatoes had been found in 1847 in Bermuda. In 1869 F. M. Draenert published, from Brazil, often overlooked studies of a sugarcane disease he proved was caused by a bacterium, the very first report in all the world of a bacterial disease of plants. There was a great stir throughout Latin American coffee countries when, in 1868, coffee rust was found in Ceylon. The potential of losses that might come from it were soon publicized and it made the tropical American agricultural people anxious as never before. The danger that it might spread to Latin America was of the utmost concern. Further, in 1870 it was seen how a similar parasite, the hollyhock rust, long confined to Chile, suddenly spread to Europe and after that to the United States.

It was a shock to Latin American plantation owners when Saenz in Colombia described the devastating coffee leaf spot in 1876, and by 1878 Ernst had identified several other coffee diseases in Venezuela. In Brazil the physician J. I. Pugiarri had collected fungi and plant disease specimens from 1877 to 1892, which were later described by Spegazzini. In that same country, A. Goeldi worked on coffee diseases during 1890 to 1896, and in that period described for the first time Meloidogyne, the root knot nematode. Berkeley and others identified numerous fungi secured in Brazil, from 1877 on for many years. During part of this period, in the years about 1876 to 1880, the lively wine industry of Chile discovered in its vineyards a serious disease. This LeFevre proved to be a grape mildew and worked out control measures for it. Shortly thereafter, 1883, Manville described a "blight" of orange trees in Florida. This disease was probably the same "foot rot" that was known in the Azores in 1834 and imported to the western tropics on orange seedlings in about 1876.

First Official South American Plant Pathologists

The first official phytopathologist for Brazil was F. A. Dafert and he found the terrifying *Phytophthora* blight of potato in that country in 1896. It had probably been there for years. It was during this period that the evolving profession of tropical phytopathology was starting in Brazil. The pathologist-mycologist Fritz Noack worked there on diseases of coffee during 1896 to 1898. Training of Brazilians was also in progress and courses in plant pathology had been started in 1893 by Prof. Garcia Redondo at the Polytechnical School in Sao Paulo. He taught the subject until 1899. A year before that, Arsene Puttemans (1892-1937) had begun his vigorous life of work in Brazil, and he was secured at the Polytechnic School to teach about plant diseases from 1903 to 1910. In that latter year he became the first Chief of the Phytopathological Laboratory started in Rio de Janeiro.

Some years prior to this, in 1879, Carlos Spegazzini (1858-1926), the star student of the great mycologist and compiler Saccardo, had arrived in Argentina. Spegazzini was young and well trained, had boundless energy, an insatiable mycological interest, enjoyed the challenge of collecting fungi

from diseased crops and describing them, and liked helping solve disease problems. He became a noted citizen of his adopted country serving it well, and soon earned the confidence of specialists not only of nearby Paraguay, Chile, and Brazil, but those in Central America, in the U.S.A. and in Europe too. He described and made lists of thousands of tropical American fungi, many new and a large proportion of them pathogenic, during the years 1880 to 1923.

Spegazzini drew about him many followers and colleagues in Argentina, and he started formal teaching of mycology and pathology in the 1880s. There was developing an ever-increasing realization of the importance of plant diseases in South America and he helped, unstintingly, where he could. His publications became world recognized, and workers sent him specimens from such far away subtropical and tropical places as the southern parts of the United States, the West Indies islands, lands in Central America, localities in the northern sector of South America, and the growers poured problems into his laboratory from Argentina and all the neighboring countries of Peru, Paraguay, Chile, and Brazil. During his life he was the greatest single influence in mycology and pathology in the American tropics. His accomplishment for plant pathology still remains one of the brightest for us in our tropics, and in Argentina a research institute bears his illustrious name.

The Later Era of Pathology-Mycology (about 1884-1940)

Under the strong influence of Spegazzini workers were trained in Argentina. Names of a few of notable personalities of that country, besides Spegazzini, are Hauman, Sanzín, Huergo, Renaco, Zeman, Baez, Fernandez-Valiela, Singer, and Marchionatto. These and their colleagues make up a select army of diagnosticians and specialists in pathology who carried on the impulse resulting in plant disease controls which in the past and in the future will insure agricultural production in Argentina.

Illustrations may be given of some early examples of Argentine disease work. Huergo, during 1897 to 1902 made many general surveys of plant diseases. He did some special work on cereal diseases in 1897 to 1903, on a severe grape anthracnose in 1899, on diseases of orange in 1902, and on peach in 1908. In addition to a host of other duties, Spegazzini carried on detailed studies on tobacco, tomato, sugarcane, and coffee diseases from about 1880 to 1887. In 1897 he became part of a plant disease laboratory established in Argentina in connection with its Oficina Químico.

There were other parts of the American tropics where plant pathologists made significant early studies, of which only a few outstanding examples will be given. A devastating colocasia tuber rot was causing widespread hunger in Jamaica, and in 1887 a commission studied it and suggested practical control measures. Severe maize rust was investigated in Venezuela by Ernst, and his first results were published in 1891. There was an increasing interest at this time in the large numbers of other tropical American plant rusts, along with other leaf-spotting organisms, and two mycologists, Paul Sydow (1851-1925) and his son Hans Sydow (1879-1946) worked on collections and described a multitude of such organisms during the years 1884 to 1941.

The Oriental coffee rust, accidentally sent to Puerto Rico in 1903, was eradicated there before it could establish itself in Latin America, and after a year of continuous watching the disease could be certified as absent from the western hemisphere. From about 1895 to 1920 many official pathologists were hired for long and short terms by governments and planters organizations throughout the Neotropics. In 1904 the U. S. government formed the Agricultural Experiment Station in Mayaguez, Puerto Rico; there was also established around that time the Imperial Department of Agriculture for the West Indies and also one for the British Guiana. In these organizations major pathological work was carried on from the beginning.

The nematode-caused red ring disease of coconuts was seen in the British West Indies long before 1905, but the causation was not determined positively for many years. In 1910 Bancroft published the first handbook of West Indies plant diseases and in 1914 the Colombian diseases on coffee were described by Carradine. A "cancro" of potatoes was studied in Brazil in 1914; in 1915 something similar was seen in Cuba and the same year Stahel described the pathogen causing cacao witches' broom.

During a period of from about 1890 to after 1910 various and many Latin American, or Neotropical, plant disease organisms were determined from specimens sent from one American worker to another, and to Europe. Names of some researchers making determinations are Rehm, Stevens, Dafert, Bresadola, Saccardo, Earle, Rick, Spegazzini, Swingle and Webber, Ellis, and P. Hennings.

In connection with rusts an especially helpful worker was J. C. Arthur (1850-1942). He gave during 1913 to 1928, a singularly large amount of effort and time to clarifying questions from many rust workers in the American tropics. He worked on what was sent to him by others but made many collections himself in Latin America and drew up results that established the conclusion that certain rusts are specifically adapted to tropical conditions in their parasitism.

Citrus canker was introduced from Japan into Florida in 1911. E. F. Smith described a wilt of bananas caused by a *Fusarium* in Cuba in 1912. J. B. Rorer during 1914-15 reported control of South American cacao diseases by spraying. Sugarcane stripe (common mosaic) was described and studied in 1910 to 1915, by Rosenfeld in Argentina and by John A. Stevenson in the island of Puerto Rico. Stevenson also published, among other things, a critically important list of diseases from Puerto Rico, and Guimaraes reported a disease list in 1914, from Mexico. Work of many others began to swell literature in scattered journals.

In 1923 there was established the Laboratorio de Patologia Vegetal in Brazil. In the same year Nowell published his text on plant diseases of the Lesser Antilles, and shortly thereafter, from the steadily intensified growing of tropical crops, plant disease losses brought such extreme concern to planters that it resulted in plantation associations, privately developing modern pathological work in citrus, tobacco, cotton, coconut, bananas, coffee, sugarcane, and cacao.

At great expense, the citrus canker in Florida was proved eradicated by 1927, and soon the same state had eradicated coconut budrot. Training of Latin American mycologists was popular then and at about this time there began as mycological explorer, pathologist and administrator the fruitful

life in Puerto Rico of the late Carlos Chardon. Meanwhile, there have appeared many new diseases such as grass mildews, maize virus stunt, sugarcane smut, orange tristeza, sugarcane ratoon stunt, potato smut, some new bean leafspots, hoja blanca of rice, Sigatoka on banana and plantain, cushion gall of cacao, blister spot of coffee, and many others.

References

- Cooke, M. C. 1881. The coffee disease in South America. J. Linnean Soc. Bot. 18:46-467.
- Delacroix, G. 1911. Maladies des plantes cultivées dans les pays chauds. A. Challamel, Paris. 595 pp.
- Ellis, J. B., and B. M. Everhart. 1888. New species of fungi from various locations. J. Mycol. 4:9-10.
- Fernandez-Valiela, M. V. 1952. Chapter 1, pp. 19-27. In M. V. Fernandez-Valiela, Introducción a la fitopatología. Gadola, Buenos Aires.
- Marchionatto, J. B. 1943. La contribucion de Carlos Spegazzini a la fitopatología Argentina. Rev. Fac. Agron. Argentina 25:11-20.
- Molfino, J. F. 1929. Carlos Spegazzini, su vida y su obra. Casa Editoria Coni, Buenos Aires. 7 pp.
- Montagne, C. 1839. Voyage dans l'Amerique Méridionale, exécuté pendant les années 1826...1833. Chez P. Bertrand, Paris.
- Murrill, W. A. 1924. Doctor Carlos Spegazzini. Mycologia 16:200-201.
- Puttemans, A. 1940. Some data concerning the history of plant pathology in Brazil and the first notice of diseases of plants in the country. (English transl. by A. E. Jenkins). J. Agr. Univ. Puerto Rico 24:77-107.
- Rorer, J. B. 1911. Preliminary list of Trinidad fungi. Board. Agr. Trinidad and Tobago, Circ. 4:37-44.
- Saenz, N. 1895. Memoria sobre el cultivo del cafeto. Casa Editorial, J. J. Perez, Bogota, Colombia. 185 pp.
- Segura, C. B. de. 1965. Enfermedades de cultivos tropicales y subtropicales. Editorial Juridica, S. A., Lima, Peru, 439 p. (See especially p. 5-6).
- Stevenson, J. A. 1918. Check list of Porto Rican fungi and host index. J. Dept. Agr. Puerto Rico 2:125-264.
- Wellman, F. L. Tropical American Plant Disease. Vol. I, In Chapter 2, is a much fuller, detailed historical discussion, and more references. To be published by Scarecrow Press, Inc., New York and London.