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A BLIGHT OF THE MESQUITE

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Introduction—During the past three years a diseased condition of the mesquite (*Prosopis glandulosa* Torr.) has been observed in the vicinity of Austin, Texas, but the true nature of the trouble was not determined until the past season when the writers made this blight the subject of special study. Specimens of the blighted mesquite were collected during the prosecution of "A Plant Disease Survey in the Vicinity of San Antonio" and a brief statement concerning the character of the disease was included.[1] The rusts collected during the survey were sent to Dr. F. D. Kern, Lafayette, Indiana, for determination, and specimens of the blighted mesquite were included. The reply was received that the blight was not due to a rust, and a statement followed that similar collections were in Prof. Farlow's herbarium at Harvard. The Harvard collections were not assigned to any definite species of fungus. Specimens from our collections have been sent to Professor Farlow and this information has been confirmed.

Geographical Distribution.—The blight is very abundant in the vicinity of Austin wherever the mesquite is found. It has also been observed at all points distant from Austin where the mesquite grows which have been visited at the proper season of the year. It is not known at present whether the prevalence of the disease is coextensive with the range of the mesquite, but it seems highly probable that the trouble is widely distributed.

1. Heald, F. D. and Wolf, F. A. A Plant Disease Survey in the Vicinity of San Antonio, Texas. Bull. Bureau of Plant Ind., 226:72. 1912.

Symptoms and Effects.—The blight affects the leaves and produces an effect which has been popularly designated "rust," on account of the resemblance of color to the true rusts and a slight superficial similarity of structure. It first becomes evident during the early part of the growing season, and the trouble is generally well advanced by the last of April or the first part of May. This is very soon after the young leaflets have reached mature size. The blight is very conspicuous on account of the pronounced yellow color which is assumed by the affected leaves. The diseased branches are not generally distributed uniformly throughout the tree but the leaves of certain branches are much more severely attacked than others. The clusters of affected leaves are frequently so abundant that the foliage of the tree presents a marked yellow color even from a distance.

In the early stages of the disease the affected leaflets show a chlorosis which begins at the margin and tip and advances until the midrib is reached. The midrib and some of the larger veins frequently retain the normal green color until somewhat later in the progress of the disease. Very soon minute, golden-yellow nodules make their appearance within the leaflet and they increase in size until they raise the epidermis and then they show on both surfaces as slightly elevated, golden-yellow papillae embedded in the lemon yellow leaf tissues. These pustules represent immature pycnidia. As the disease advances the leaflets begin to shrivel and turn brown at the tip; this discoloration advances until the whole leaflet is involved. Many of the affected leaflets fall before they have been killed and have turned brown, while others are retained until the disease is farther advanced. By the time the leaf tissue has become brown and dead many of the pycnidia are mature, and a careful examination even with the naked eye will show that they have opened at the surface by a narrow slit or a slightly irregular fissure. By midsummer or earlier all of the diseased leaflets have disappeared and the affected branches are completely defoliated. There is no evidence of a *direct* attack of the leaf rachis or young twigs. The casual organism appears to be confined to the leaflets. Our observations indicate that many of the seriously affected branches are killed.

This is borne out by the presence of many dead twigs upon diseased trees which we have had under observation for several years.

Etiology.—The blight of the mesquite described above is caused by a parasitic fungus which we have not been able to refer to any described species. A superficial examination might lead one to refer the causal organism to the Uredineae, but a careful study has revealed its true nature.

Fresh or dried material gave very poor results. The material for the detailed study of the fungus was prepared according to the methods employed in modern morphological investigations. Small pieces of leaflets showing both young and advanced stages of the disease were fixed in both picric and chrom-acetic acid fixing solutions, imbedded in paraffin and cut into sections of varying thickness. The stain employed was the triple stain of Fleming. The tissue fixes readily and no difficulty was experienced in securing excellent series of sections. The sections were supplemented in study by teasing out the fresh pycnidia in water.

The pycnidia in their young stages consist of dense aggregates of fungous cells embedded in the mesophyll of the leaflets. They are globular or elongated and finally reach a diameter almost equalling the thickness of the leaflet. Up to this time they consist of an undifferentiated mass of closely compacted, fungous cells, without the appearance of any pycnidial cavity, and hence resemble small sclerotia. There is a slight hypertrophy of the host tissues adjacent to the pycnidia and this together with the growth of the pycnidia gives the leaflet its characteristic papillate appearance. These aggregates of fungous cells have a pronounced orange yellow color (Fig. 3). The leaf tissue is apparently destroyed and replaced by the aggregates of fungous tissue. The mycelium does not extend generally through the leaf tissue but appears to be confined entirely to the pycnidial nodules.

By the time the sclerotial mass has nearly reached mature size a cresentic cleft or fissure, the beginning of a pycnidial cavity, may be seen in transverse sections. The cells adjacent to the cleft elongate and assume a palisade-like arrangement, and later develop the spores. The cavity is always longer than deep, and even when completely developed retains more or less of a cresentic form in

transverse section. The cleft appears in an excentric position and is generally nearer the outer surface, so that a mature pycnidium shows a dome-shaped mass of tissue which rises into the pycnidial cavity (Fig. 5). The pycnidial wall is many cells thick, and uniform in structure, but thins out somewhat above where it breaks to form a more or less elongated or irregular fissure (Figs. 2 and 5).

The conidiophores line the entire interior of the pycnidial cavity forming a continuous layer of cylindrical, pointed filaments from which the spores are constricted. The spores are unicellular, continuous, hyaline, slender thread-like, 25-30x2-2.3μ, and either straight or tortuous. No definite ostiole is developed but when the pycnidium reaches maturity the external wall ruptures and a linear or irregular fissure is formed through which the spores are extruded. The pycnidia may reach maturity while the leaflets are still hanging on the tree or not until they have fallen, but the leaf tissues are generally brown and dead before they are perfectly developed. Many of the pycnidia fail to develop a pycnidial cavity and remain as sclerotia-like masses of fungous tissue. Many of these aborted pycnidia may be found upon the fallen leaves. The fact that many pycnidia are aborted and that perfect maturity is not reached until a comparatively late stage in the progress of the disease, made the determination of the character of the trouble more difficult.

All attempts to grow the blight fungus in cultures have given only negative results. Poured plates made from pycnidia which had been teased apart in sterile bouillon gave no growth of a fungus. In a number of cases pycnidia were carefully dissected out from the leaf tissue and planted in glucose agar plates, but no growth resulted from any of the plantings. In all culture work carried out the spores have failed to germinate.

The manner of primary infection, and the time when this infection takes place have not been determined. It seems that a perfect stage upon the fallen leaves later in the season might be produced. Old fallen leaflets from the preceding season, collected from beneath trees which show an unusual amount of infection, frequently show perithecia. A single species appears to be fairly constant. The ascospores from these fruits grow readily in cultures on the common media, but in all cultures the colonies have failed

to produce either pycnidia or perithecia. It is impossible to state definitely at the present time that a relationship exists between the ascogenous form on the fallen leaves and the blight fungus. Work is in progress which it is hoped will throw some light on this point.

Technical Description.—An examination of mycological literature has failed to yield any known genus to which our fungus can be referred. Although the material studied represents only a conidial stage it seems advisable to describe it at present as belonging to a new genus and species, even tho later study may reveal a connection with a known perfect stage.

Scleropycnium.—Heald and Lewis, n. gen.

Pycnidia when young sclerotium-like, immersed in tissues of host, golden or orange colored and becoming hysteroid and erumpent with maturity, and less conspicuous; pycnidial cavity appearing as a cleft, always surrounded by wall many cells thick. Parasitic. Mycelium obsolete.

Scleropycnium aureum Heald & Lewis, n. sp.

Pycnidia numerous, globular or oblong, separate, smooth, immersed in the mesophyll, later becoming slightly erumpent, and amphigenous, orange yellow, hysteroid, 225-250x250-400μ. Wall many cells thick, cavity generally excentric. Basidia simple, cylindrical, 15-18x4-5μ, forming a palisade-like layer lining the pycnidial cavity. Conidia not catenulate, continuous, hyaline, narrow cylindric, 25-30x2.3μ, straight or tortuous.

On living leaves of mesquite, (Prosopis glandulosa Torr.) and causing a characteristic blight.

This fungus appears to be related to the *Scolecosporeae* of the *Nectrioidaceae*.

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EXPLANATION OF PLATE

Fig. 1. An enlarged leaflet of the mesquite, showing the distribution of the pycnidia.

Fig. 2. Small portion of an affected leaflet, showing several mature pycnidia which have opened by a linear or irregular fissure.

Fig. 3. Transverse section of a young pycnidium before the appearance of a pycnidial cavity. x 300.

Fig. 4. Transverse section of a nearly mature pycnidium. This does not show the typical excentric position of the cavity. x 110.

Fig. 5. Transverse section of a mature pycnidium from which spores are being extruded. x 460.

Fig. 6. Conidophores and spores. x 600.