

A Leaf Spot of *Ginkgo biloba*

C. L. PORTER, Purdue University

Ginkgo biloba is increasingly more popular as a street, park, and specimen tree. This plant has many things to commend it. Historically, it is very ancient, having originated probably in the Permian. Ernest H. Wilson (4) says, "The ginkgo is a vertiable living fossil." At one time the family to which the ginkgo is a member was widespread throughout the northern hemisphere. During the glacial epoch, the family became restricted to the Orient and it is probable that at this time all species except *biloba* became extinct. The tree was found in China mentioned in the very earliest records from that country. According to Wilson the tree reached Japan with Buddhism in the sixth century and it is in Japan that the finest specimens are known today, some being over one thousand years old. *Ginkgo biloba* was probably introduced into Europe by traders of the Dutch East Indian service. The tree arrived in England about 1750 and the first of the species to flower in Europe was in Kew Gardens in 1795. The species was imported to North America from England in 1784, when a tree was planted at Woodlands near Philadelphia. The tree still survives as a very fine specimen. During human history *Ginkgo biloba* has not been known to exist in the wild state.

Botanically, the ginkgo presents many oddities that are appealing to the lover of plants. The fruit is a naked fruit. The egg is fertilized with a motile sperm, and according to John H. Schaffner (1) the plant does not produce flowers but sporophylls. Schaffner says, "Ginkgo is not only our only surviving, completely flowerless seed plant, but it is probably the highest flowerless seed plant that ever evolved."

Shade tree experts in the past have recognized the ginkgo tree as desirable for the following reasons:

- a) Long life.
- b) Well-shaped symmetrical tree becoming more desirable in these respects as it grows older.
- c) Odd shaped distinctive leaves which are transformed to a uniform golden color with the approach of the frosts of autumn.
- d) Leaves remain well attached until late, therefore do not produce litter.
- e) Thrives under unfavorable urban conditions.
- f) Absence of insect enemies.
- g) Absence of fungus enemies.

The last statement emphasized by Piorne, Pack and Rankin in their various works must now be revised.

In the late summer of 1939 a severe epidemic of leaf spot and blight occurred on various ginkgo trees on the Purdue campus and considerable defoliation was noted. The disease lesions frequently occur as isolated

spots on the leaf. These spots originate as water-soaked patches and develop into irregular areas that finally are ashen in the center with a dark reddish-brown border. Such spots may occur in any location on the leaf and are not limited by the radiating vascular bundles. More often the disease makes its appearance at the outer margin of the leaf and sweeps inward from the margin to the petiole. These areas thus become wedge-shaped and uniformly tan in color. Dark colored pycnidia are often found scattered rather sparsely over old leaf lesions. It is unusual for the petiole to be involved. At times so much of the leaf area is involved that the disease should properly be termed a blight rather than a spot. Often the tissues not directly involved turn golden yellow, apparently being affected by exotoxins produced by the causal organism. Many affected leaves drop early and belie the tree's reputation for tidiness. However, many affected leaves remain on the tree and are not shed earlier than normal leaves. A diseased tree then, exhibits an unsightly discoloration of the foliage in the late summer and early fall. Fruits may be spotted.

The disease has occurred each Summer since 1939 and some trees have been severely blighted each season. It is a curious fact that not all trees are attacked and those that gave no evidence of the disease this season have not done so in previous seasons. This may indicate that some trees are less susceptible, or it may be another example of "disease escape". The author is inclined to believe that there exists degrees of susceptibility in these trees because there appears to be gradations in severity of attack from complete immunity, through lightly affected trees, to specimens having almost every leaf spotted or blighted. This gradation has appeared in the same trees during the seasons of observation since 1939.

In the progressive disintegration of the leaf tissues, the parenchymatous-like tissues seem to be first involved and soon collapse. The palisade layer is somewhat more resistant but soon follows the parenchyma cells in collapse. The cells of the epidermal tissues retain a normal appearance until the final stages of the disease. This is particularly true of the cells of the lower epidermis which are characterized by having slight protuberances that are heavily cutinized. This line of heavy protuberances remains visible and intact in cross sections after other tissues have completely collapsed. The vascular bundles are but little affected; the sheath cells being first to exhibit injury. In the final stages of necrosis the leaf tissues in cross section are represented by the two heavily cutinized lines of the epidermis.

Seymour (2) in the Host Index of the Fungi of North America reports *Glomerella cingulata* isolated from *Ginkgo biloba*.

Freeman Weiss (3) in the Plant Disease Reporter (May, 1941) reports the following fungi isolated from leaves of *Ginkgo biloba*:

- a) *Glomerella cingulata*
- b) *Phyllosticta ginkgo*

Pycnidia are found in many older lesions on the ginkgo leaves and *Phyllosticta*-type spores have been obtained from the pycnidia. It seems

probable that the leaf spot of Ginkgo here described is therefore caused by *Phyllosticta ginkgo*. Efforts made to isolate the causal organism have not been altogether successful. The necrotic areas of the rather fleshy leaves support a number of saprophytes and must be separated from the causal agent in culture. If *Phyllosticta* has been isolated the cultures have not produced characteristic pycnidia and spores to date. An interesting and promising *Gloesporium* has been repeatedly isolated from necrotic areas but there exists no proof that this organism is associated with the disease.

Seedlings propagated from seeds have been growing in our greenhouse for a number of years and the leaves have never become affected in any manner. So far it has been impossible to produce leaf spot symptoms on the leaves of these seedlings from any of the organisms isolated in culture.

This disease is not serious enough to affect the vitality of the plant but it is serious enough to detract from an otherwise almost perfect tree.

References

1. Schaffner, John H. *Ginkgo* a flowerless plant. Papers from the Department of Botany. The Ohio State University, No. 177, 1926.
2. Seymour, Arthur Bliss. *Host index of the fungi of North America*. Harvard University Press, Cambridge, Mass., 1929.
3. Weiss, Freeman. Check list revision. *The Plant Disease Reporter*, 25:223, 1941.
4. Wilson, Ernest H. *Aristocrats of the trees*. The Stratford Co., Boston, 1930.