

NOTES ON NEW DISEASES OF ECONOMIC CROPS
IN ILLINOIS. 1919-1921

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The presence of new diseases among our economic crops is a matter of grave concern to the agricultural interests of the state. Having found these new diseases, the question at once arises as to their importance and what measures should be taken to control them. We are far too careless today in the matter of protecting our crops by careful inspection and quarantine, and as a result of this carelessness, due in a large measure to lack of foresight of the growers themselves, there have been introduced into the state many destructive diseases which add to the already heavy toll taken by crop pests. The lack of interest due to ignorance concerning the nature of fungus and bacterial parasites makes the task of the plant pathologist all the harder when an effort is made to restrict these diseases. When a new insect is discovered making inroads, there is no lack of publicity to excite and alarm the grower. But the publicity given to fungus diseases is so pitifully inadequate that no extensive program of eradication or control can be successfully carried out.

No systematic survey has been made of economic crops to determine what new diseases occur in the state. The few new diseases here recorded have been more or less accidental discoveries. No doubt some of these have been present for a number of years and there is little question but that many have been overlooked. It is hoped that the newly organized Plant Disease Survey of the state may bring to light many more such observations as are embodied in this publication. The recent accidental discovery of flag smut of wheat in Madison and St. Clair counties is not described in these pages since adequate publicity has already been given this disease. The facts concerning the discovery of this disease, however, are of interest because of the value which a very minor survey operation may have. In the spring of 1919 while examining the wheat fields near Granite

City, Illinois, for a new disease called "take-all" or "foot rot", one of the scouts of the U. S. Dept. of Agriculture found a few stalks infested with a smut, which until then, was not known to occur in the United States. An intensive survey during the next two years revealed the presence of this disease in a number of fields in Madison and St. Clair counties, and every effort is now being made to restrict it to these counties and finally entirely eradicate it from the western hemisphere. Had this disease been unobserved for a few more years, there is little doubt but that it would have become established in an area of our wheat belt that would have rendered its eradication as hopeless as the other smuts of wheat.

In some cases new diseases may cause unnecessary alarm. It is important, therefore, to present as accurate an account as possible of the disease and estimate its importance according to the experiences of growers where the disease is prevalent. That it may behave differently, i. e., be more serious or of less importance, in its new home due to changed environments is a fact recognized by plant pathologists.

The diseases given below are of no great economic importance with the exception of the leaf scorch of strawberry which may become in a few years one of our most serious strawberry diseases. To date we have had few diseases of this delicious and valuable fruit which seriously interfered with its development. In fact, the diseases are of such minor importance that spraying strawberries is not practiced in any section of the state. Judging by the effects of the leaf scorch on our variety plantation at the University it is evident that it will be necessary to hold the disease in check on certain of the most susceptible varieties or give up hope of growing these varieties.

APPLE

Rough Bark (Phomopsis Mali Rob.)

A twig of apple showing a roughened condition of the bark was received from Ralph Wemper, Assumption, Christian County, in March, 1921. On the rough bark

many pycnidia were observed which upon examination proved to be these of *Phomopsis mali*. A fresh lot of specimens were later received. These showed the same rough character of the bark, but the type of injury on these larger branches resembled more nearly the rough bands produced by the blotch fungus (*Phyllosticta solitaria*). Scale was also evident on two branches, and since scale produces a rough bark similar to that of both blotch and the true rough bark disease it is apparent that some doubt might arise as to the true cause of this condition.

Phomopsis mali has twice been obtained on apple twigs kept in moist chambers and a number of times on blotched limbs so that it seems to be a fairly common fungus.

An examination of Mr. Wemper's tree showed the presence of numerous active blotch cankers on the young twigs so that there seems little doubt but that the rough bark condition was produced by *Phyllosticta solitaria* and not by *Phomopsis mali*. If *Phomopsis mali* were an active parasite under Illinois conditions it is apparent that it would have caused serious trouble on account of its general distribution. The mere presence of this fungus on rough bark is not sufficient evidence, therefore, that the diseased condition is due to this organism.

CHINA ASTER

Leaf spot (*Septorio callistephi* Gloyer). Destructive blighting of the lower leaves of seedling plants of the china aster (*Callistephus chinensis* Nees) was observed in the University floricultural greenhouses in the spring of 1921. Many of the plants were so stunted as to be worthless. After the plants were set in the field the disease gradually disappeared. This was aided no doubt by the dry hot weather of June and July. Collections were made of the leaf spot and a microscopic examination showed that the disease was due to a *Septoria*.

Gloyer (Phytopath. 11: 50, 51, 1921) describes a new species of *Septoria* on China aster from New York which

he names *Septoria callistephi*. He writes in regard to the disease:

"Certain commercial plantings of the china aster, *Callistephus chinensis*, in New York have been severely attacked by *Septoria callistephi* n. sp. The disease was first observed in 1915 and again in 1919 and 1920. In unsprayed plantings, all of the plants of some of the suspected colored varieties were killed. The white varieties appear less attacked, and Semple's White Branching, while not entirely immune, is resistant. The pycnidia are found in the scurf covering the seed and the disease is spread in the seed bed. The lower leaves are first diseased but later the upper leaves and floral parts are attacked. The tawny colored spots may be isolated but, finally, unite and kill the entire leaf. The plant becomes dwarfed, the size of the flower reduced, and the time of blooming is delayed. The exact control measures have not been fully worked out, although it appears to be amenable to treatment by seed disinfection and spraying with Bordeaux mixture."

Prof. Gloyer has kindly examined the material collected in Illinois and states that it is identical with his. He further states that a bulletin on this disease is in process of preparation and will soon be forthcoming (Geneva, New York Experiment Station.)

The importance of selecting seed from plants known to be free from the disease is emphasized by Gloyer's observations, and commercial growers should either produce their own seed in disease free beds or secure seed from sources where this disease does not occur.

SEDUM

Leaf spot of *Sedum spectabilis* (*Septoria Sedi* West).
A bed of *Sedum spectabilis* in the University ground showed a disfiguring leaf spot in the fall of 1921. Upon examination this was found to be due to a *Septoria*. Three species of *Septoria* have been listed on *Sedum purpureum* (*S. Telephium*), *Septoria Sedi*. West., *S. Telephii* and *S. sedicola* Peck. Two of these, *S. Sedi* and *S. sedicola*, are reported from America. These two species cause spots identical in character and differ in such

minor details that they may be regarded as synonymous. A *Septoria* has never been reported on *Sedum spectabilis* either in America or elsewhere. The spots on this host are very similar to those on *S. purpureum* and the fungus is probably identical with *Septoria Sedi* West.

Sedum spectabilis is supposedly of Japanese origin while *Sedum purpureum* was introduced from Europe. It would be of interest to attempt cross inoculation on these two hosts.

The spots while not numerous are large (5-10 mm.). Sunken, circular in outline, black above and dark grey below. The very numerous black pycnidia may be seen with the hand lens. They are somewhat more abundant on the upper surface, but are distinctly amphigenous. They measure 80-120 microns. The spores are 2 x 30-50 microns, but mostly between 35 and 45 microns. They are septate, mostly straight and needle shaped. The spores of *Septoria Sedi* on *Sedum purpureum* as represented by No. 3081 Fungi Columbiani range somewhat smaller, the most common lengths being 25-35 microns. The character of the spots, however, closely agrees with those in *Sedum spectabilis*.

It is suggested as a control measure that the plants be cut down as early in the autumn as possible and that the leaves be carefully raked from the beds. Both the plants and fallen leaves should be completely burned. I have found viable spores in the pycnidia of the fallen leaves as late as April 1st of the year following infection.

SPINACH

Blight, yellows or mosaic (cause unknown). Spinach plants having symptoms of the well-known blight of the Virginia truck region were received in November, 1921, from Belleville, St. Clair County. Since spinach blight is not known to occur in this state, specimens were sent to Dr. J. A. McClintock, Georgia Experiment Station, who has had a wide experience with this disease in Virginia. He confirmed my diagnosis and stated that, so far as he knew, this was the first report of the occurrence of the disease west of Ohio.

Spinach blight is a disease similar to many other mosaics and "yellows", in that it is caused by some virus in the juices of diseased plants which when transferred to healthy plants produces the disease just as though parasitic organisms were present. At one time it was thought to be a nutritional disease, but this has been disproved. Similar symptoms often appear, however, when there is a deficiency of certain essential elements such as potassium.

Symptoms. A typical blighted plant has mottled, malformed leaves. The leaves are curled and wrinkled, the plant is dwarfed and the general color is yellow in contrast to the dark green of the normal plant. The younger leaves near the center of the plant show the most marked symptoms. Unlike many other mosaic diseases, spinach blight results eventually in the death of the plant. The leaves finally turn yellow, become spotted with dead brown areas and the plant soon dies.

Aphids are the main and only important agents of transmission. The disease is probably not transmitted either through the root or by seed. The aphids which attack the spinach feed upon many other plants, and the disease virus not only lives in the insects when they are feeding on other plants, but is transmitted through several generations. For this reason when the disease is once established in a region it is extremely difficult to eradicate it. Attempts to control the disease by destroying the aphids have so far failed on account of the habits of the insects and their enormous breeding power.

The seriousness of this disease is indicated by the statement of Dr. McClintock that the *annual* loss to the truck growers of Virginia alone is between \$200,000 and \$400,000. Since there are large areas devoted to spinach growing in Illinois it is important that this disease be not allowed to become prevalent.

It is suggested that a survey be made of the truck regions of the state to determine the extent of the disease. If it is limited in its distribution to a few fields it may be possible to abandon the growth of spinach in the neighborhood of these fields until the disease had disappeared. If the disease is widely distributed the only re-

course is to develop disease resistant strains. Fortunately the growers in Virginia have at present a strain of savoy spinach which is highly resistant under their conditions. This should be tried in Illinois, and if at all resistant should be exclusively grown in the regions where the disease occurs. A number of the growers should organize to grow and improve the seed of this strain and keep it pure.

BLACKBERRY

Powdery Mildew (*Sphaerotheca humuli* (D. C.) Burr.). On May 13, 1921, a number of mildewed wild blackberry bushes were found near Odin, Marion County, Illinois. Since no surface mildew had ever been observed on cultivated blackberry the specimens were carefully examined to determine the species. It was evident that they were *Rubus alligheniensis*. No perithecia of the mildew were found at this time.

An examination of the literature revealed the fact that no powdery mildew had ever been described on the common blackberry although reports of *Sphaerotheca humuli* on the dewberry and other species of *Rubus* are common. Burrill states that he collected a powdery mildew on *Rubus strigosus* (dewberry) at Champaign and that Earle had collected it on this host in Union County. They did not find perithecia.

It is probable that this mildew will never become a serious menace to blackberry production under Illinois conditions. The summer of 1921 was exceptionally favorable for powdery mildews.

OAK (QUERCUS.)

Strumella canker (*Strumella coryneoidea* Sacc. & Wint). This canker was found abundantly on oak at Tonti, Marion County, in 1919. It caused girdling and death of the twigs. It is not a very destructive disease so far as the oaks are concerned, but since it also attacks the chestnut and since this tree is grown extensively for commercial purposes in southern Illinois, the disease may assume considerable economic importance in the future.

This canker is common in the northeastern states, and is reported as especially destructive in Pennsylvania where it occurs on the white, red, yellow and chestnut oak and on the American chestnut.

The canker caused by the fungus resembles that of the European apple-tree canker. They are oval to elliptical in outline with concentric folds about the slightly sunken central area. On the surface of the cankers are numerous small black pustules, the fruiting bodies of the fungus.

RASPBERRY

Dodder (*Cuscuta gronovii*. Willd.) Specimens of red raspberry canes encircled by dodder were received from S. I. Talbot of DeKalb. He wrote that this started on a single bush in 1920 and had spread to six or eight since. He stated that it was evidently sapping the life out of the plants. The species of dodder was kindly determined by Prof. T. S. Yuncker. Clinton reports dodder as occurring on raspberry in Connecticut. (Plant Dis. Bul. Suppl. 14:101, 1921.)

Since this species of Dodder is very common and occurs on a large number of hosts it may easily be introduced into berry patches. For this reason dodder growing on wild plants in the neighborhood of berry patches should be destroyed.

CALENDULA

(*Calendula officinale*)

Rust (*Puccinia recedens* Sydow). The calendula has become a popular annual flower for the home flower garden and is extensively grown in greenhouses for cut flowers during the winter. Therefore, any disease which threatens this plant is of considerable economic importance.

In the summer of 1920 a rust was observed on a number of these plants grown in a home garden at Urbana. Specimens were sent to Dr. H. S. Jackson of Purdue University who identified the rust as *Puccinia recedens* Sacc. He stated that it had never been reported on this

host but had been collected by J. M. Bates in 1907 at Lincoln and St. Paul, Nebraska. Later it was learned that Dr. Lehenbauer had also collected it on a single plant in the University of Illinois Floricultural Greenhouse in 1919. The rust was again found in 1921 on calendulas grown in the same garden where it was observed in 1920.

It seems probable that this rust is seed borne. While it occurs on Senicio this host is not common in the region about Urbana and has never been observed to harbor a rust when observed. The fact that the disease was observed on a greenhouse plant also indicates seed as a source of infection. The soil used in the pots is not a likely source of infection. The rust also occurs on *Dimorphotheca cuniata*, a common ornamental plant, but this had not been grown in the region about Urbana for a number of years.

Seed sterilization is suggested as a remedy for this rust. To date it has not been general enough to warrant expensive control measures nor has the injury on individual plants been severe since the spots are few and scattered.

GOURD

Anthracnose (*Colletotrichum lagenarium* (Pass.) Ell. and Hals.). A variety of an edible gourd known as the Australian Bean has been grown in the University vegetable garden during the past two years. On account of the prolific production of fruit on this plant there has been some thought of recommending it as a desirable cucurbit for the garden. It is of interest, therefore, to know something concerning the diseases which attack it.

In the autumn of 1921 a number of fruits of this gourd were stored in one of the University buildings. When examined in October several were observed to be in a rotting condition and many more were covered with lesions of a disease which resembled watermelon anthracnose. Some of the spots were small and quite numerous while others were several inches across. In the cases where rotting had set in, the fungus had extended through the outer hard rind into the pulpy interior where it often

produced a solid mat of mycelium with numerous sclerotial bodies. The spore masses on the exterior were light yellow or salmon colored, or in some cases where the surface was dry they had turned black, due to the presence of numerous dark cells (not setae).

An examination of the literature revealed the fact that *Collectotrichum lagenarium* (Pass) Ell. and Hals. (*Gloeosporium lagenarium* (Pass.) Sacc.) was originally described in this country as occurring on old gourds in the vicinity of Philadelphia in 1882.

This disease has always been regarded as one of the most destructive diseases of watermelons and is occasionally serious on canteloupes and cucumbers. Since gourds have not previously been grown in the region where this disease occurred so abundantly it is probable that it was transferred from one of the above hosts which were growing in the neighborhood of the gourds, or was in the soil in which the gourds were planted. Its virulence on this particular gourd variety is so marked that it will evidently play an important part in the future development of this vegetable.

STRAWBERRY

Leaf scorch (*Mollisia earliana* (E. & E.) Sacc. *Marssonina potentillae* (Desm.) Fish. *Marssonina potentillae* var *fragariae* Sacc.) This disease was first observed in the University variety plantings in 1921. An examination of many berry beds in the vicinity of Champaign and Urbana and in other sections of the state failed to reveal any of the disease. It seems evident, therefore, that it was introduced on the plants and has not become widely disseminated. The plants were received in 1917 from Kellogg's Nursery, Three Rivers, Michigan, where the disease is known to occur. It is quite probable that other introductions of the disease have occurred in other sections of the state since it is the practice of growers to obtain their plants from Michigan nurseries. The disease is more destructive than the ordinary leaf spot and efforts should be made to prevent its general spread. So far as is now known the most popular varieties of strawberries in Illinois, Dunlap and Burrill, are not very

susceptible. This statement is based on the fact that these varieties have been growing in close proximity to the diseased varieties for several years and were received from Kellogg's Nursery along with the diseased varieties.

Bederana is by far the most susceptible variety. Other varieties showing the disease are Eresko, Sionilli, Kelloggs Prize, Kelloggs Big Late, Superb (everbearing), Glen Mary, Lady Corneille and Gibson.

Leaf scorch is common in Canada and has been reported from a number of eastern states. It is also known to occur in Louisiana, Indiana, and Michigan.

Symptoms. The spots are usually much more numerous than those of the common leaf spot, often giving a blotched purple appearance to the entire leaf. The individual spots are small, at first, (as compared with *Myco-sphaerella fragariae* spots), usually two to five mm. in diameter, somewhat irregular and deep purple on the upper surface of the leaf. The centers of the spots appear slightly raised above the surface of the leaf and are black. The coal black, slightly wrinkled fruit bodies of the fungus may be seen with a hand lens. On the lower surface of the leaf the spots are much lighter in color and much less distinct. The spots are in evidence also on the petioles of the leaves and on the fruit stalks.