

ELSINOE ON APPLE AND PEAR¹

By ANNA E. JENKINS

Associate Pathologist, Division of Mycology and Disease Survey, Bureau of Plant Industry, United States Department of Agriculture

INTRODUCTION

This paper deals with the morphology and taxonomy as well as the history and distribution of *Plectodiscella piri* (55),² which causes an anthracnose of considerable importance, affecting apple (*Malus sylvestris* Mill.) and pear (*Pyrus communis* L.). Reference is made also to Sphaceloma, that is, the conidial stage of *Plectodiscella*, on other plants besides those named, most of which have not heretofore been reported as attacked by this group of fungi. *Plectodiscella* is shown to be a synonym of *Elsinoe*.

HISTORICAL REVIEW

The history of *Plectodiscella piri* as then known was reviewed by Jenkins and Horsfall (31) in 1929, and the Sphaceloma or conidial stage of the organism reported. This was recognized on the basis of conidia on leaves of apple and pear from Transcaucasia,³ part of the collection on which the perfect stage of the fungus was discovered, and on conidia in a theretofore unidentified culture isolated by Osterwalder (38) from a fruit spot on Jonathan apple grown in Switzerland. He diagnosed the disease as Jonathan spot, which is ordinarily considered to be nonpathogenic. A publication of Zschokke (57) in which he mentioned the occurrence of the disease on Jonathan apple, as referred to by Osterwalder (38), was not available to Jenkins and Horsfall in 1929. Now at hand, however, it reveals that not only the Jonathan variety (pl. 1, A), but several others there illustrated show dark lesions which appear to be those of the *Plectodiscella* disease.

In the past two years the writer has diagnosed the anthracnose on fresh apples intercepted in transit⁴ from Ireland (fig. 1), Italy, Switzerland, and Hungary, and also on apples imported from Portugal. In each case isolations of the pathogene have been made. The apples from Ireland and Italy have been referred to in earlier publications (28, 52); those from Portugal, of the variety Reneta, were secured through the courtesy of Mathilde Bensaúde, of the Instituto Rocho Cabral, Lisbon. So far as the writer knows, this fungus has not been found in North America.

Although records are not available it is believed that *Plectodiscella piri* infects the twigs of apple and pear as well as the leaves and fruits. The larger lesions on the apple fruit shown in Figure 1 were brownish or

¹ Received for publication Dec. 8, 1931; issued May, 1932.

² Reference is made by number (italic) to Literature Cited, p. 697.

³ Russia, Transcaucasia, near Sotschi, Aug. 28, 1913. N. N. Woronichin. Ex Herbarium, Institute of Mycology and Phytopathology, Leningrad, U. S. S. R. Contributed by N. N. Woronichin and A. Jaczewski.

⁴ Intercepted by port inspectors of the Plant Quarantine and Control Administration, in passengers' baggage and in mail.

whitish at the center surrounded by carmine⁵ or jasper red, while those on the other fruits examined were mostly madder brown or chestnut.

MORPHOLOGY

Plates 1, B, *a* and *b*, and 2, A, show *Plectodiscella piri* on apple and pear leaves from Transcaucasia,⁶ on which conidia were found by Jenkins and Horsfall (31), and Plate 3, A and B, those of the fungus on pear leaves from Italy.⁷ Although conidia were not abundant on the Transcaucasian material, they practically covered the acervuli examined on the Italian specimens. (Pl. 3, C and D.) In all cases the conidia seen have been of the various shapes, sizes, and colorations

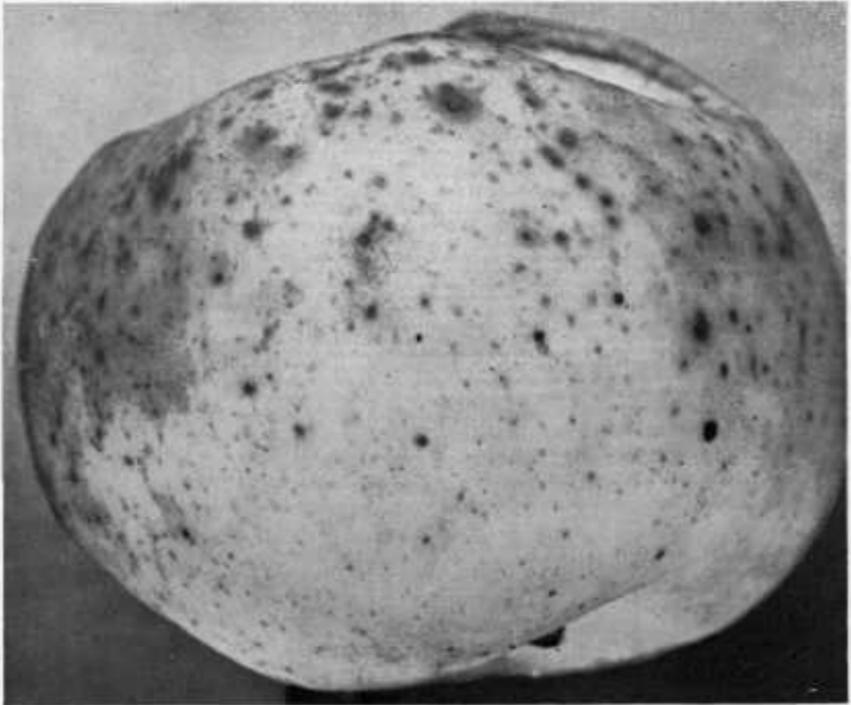


FIGURE 1.—Apple fruit from Ireland affected by anthracnose. Slightly enlarged. Photograph by J. F. Brewer

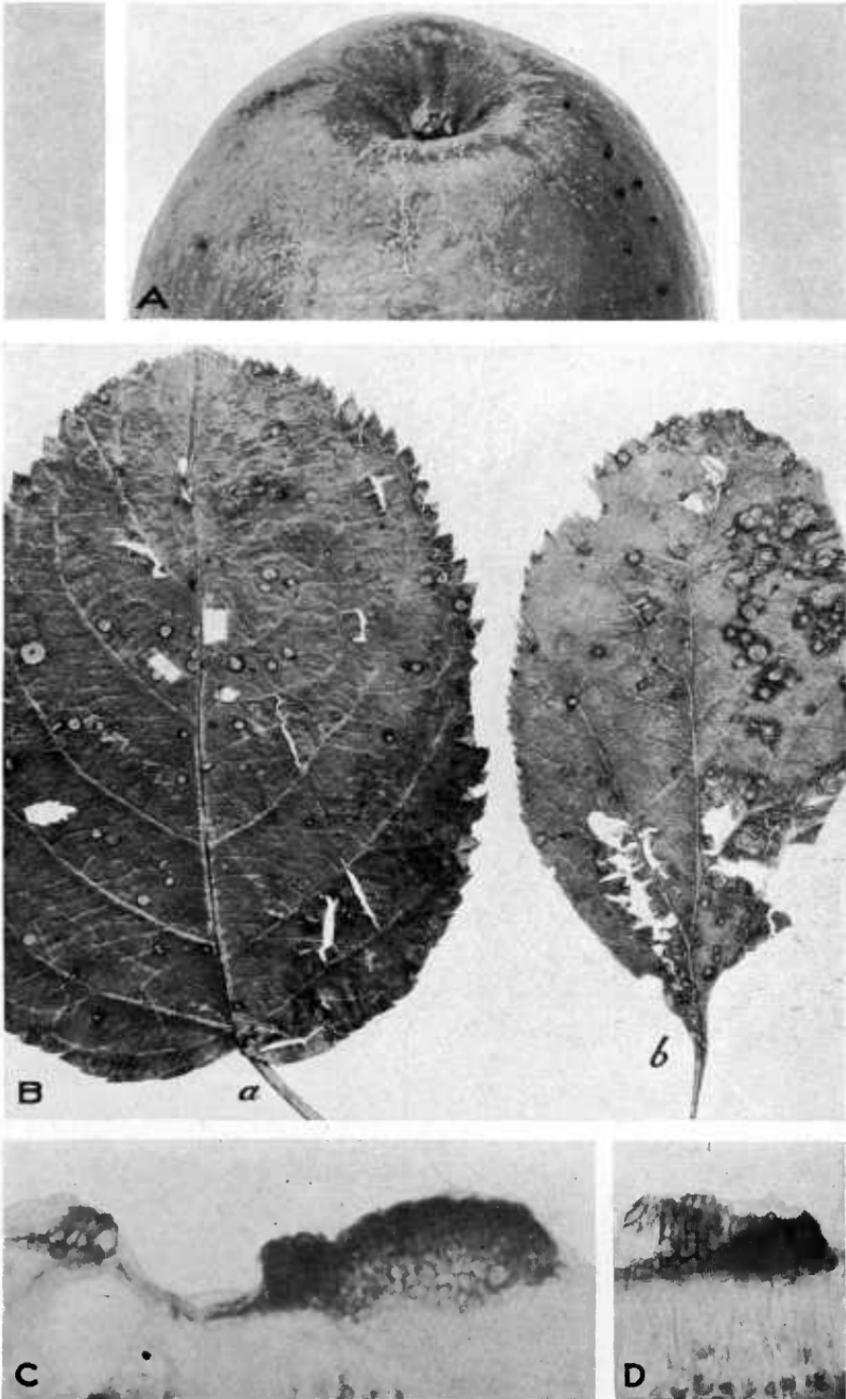
of those described for this fungus as referred to later in this paper. (Pp. 4, 5.) In addition, on one of the Italian specimens there was seen a 3-cell elongate colored body interpreted as possibly a greatly swollen conidium of this fungus. Hyaline conidia of the type illustrated in Plate 3, E and F, some of which were biguttulate, were produced in great abundance within an 18-hour period, when small masses of a young culture on potato-dextrose agar were transplanted to a corn-meal poured plate to which a few drops of sterile water

⁵ Color reading by J. Marion Shull based on the following publication: RIDGWAY, R. COLOR STANDARDS AND COLOR NOMENCLATURE. 43 p., illus. Washington, D. C. 1912.

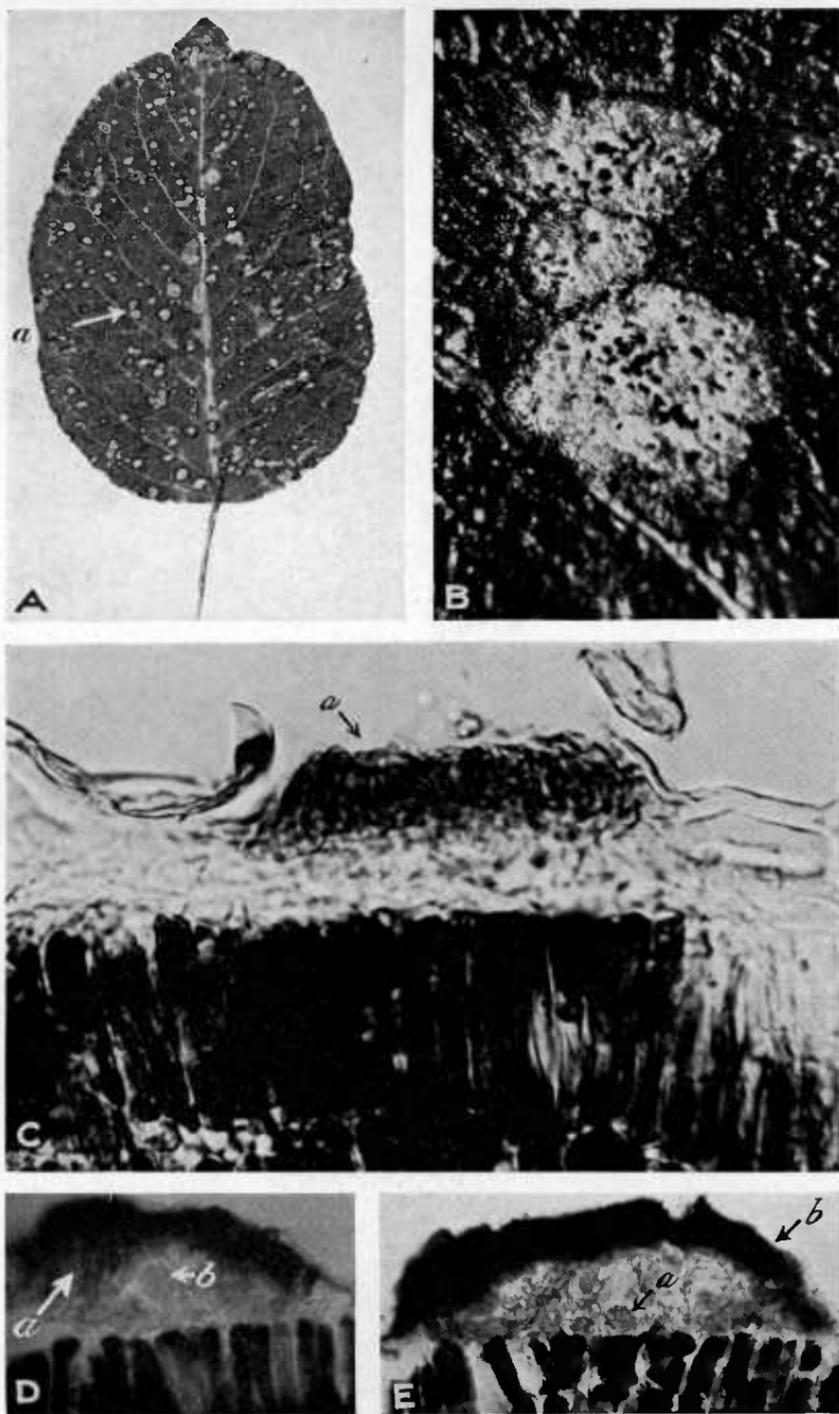
⁶ Op. cit. (See footnote 3.)

⁷ BRIOSI, G., and CAVARA, F. I FUNGHI PARASSITI DELLE PIANTE COLTIVATE OD UTILI. Fasc. 11, No. 274. Pavia, 1896. This material, labeled "*Hadrotrichum populi* Saec."⁸ consists of three specimens for which the following data are given: "Estate 1894—Sul Pero—Avellino—D. Peglion; id. 1891—id.—Orto botanico di Pavia; id. 1890—Sul Melo—id. id."

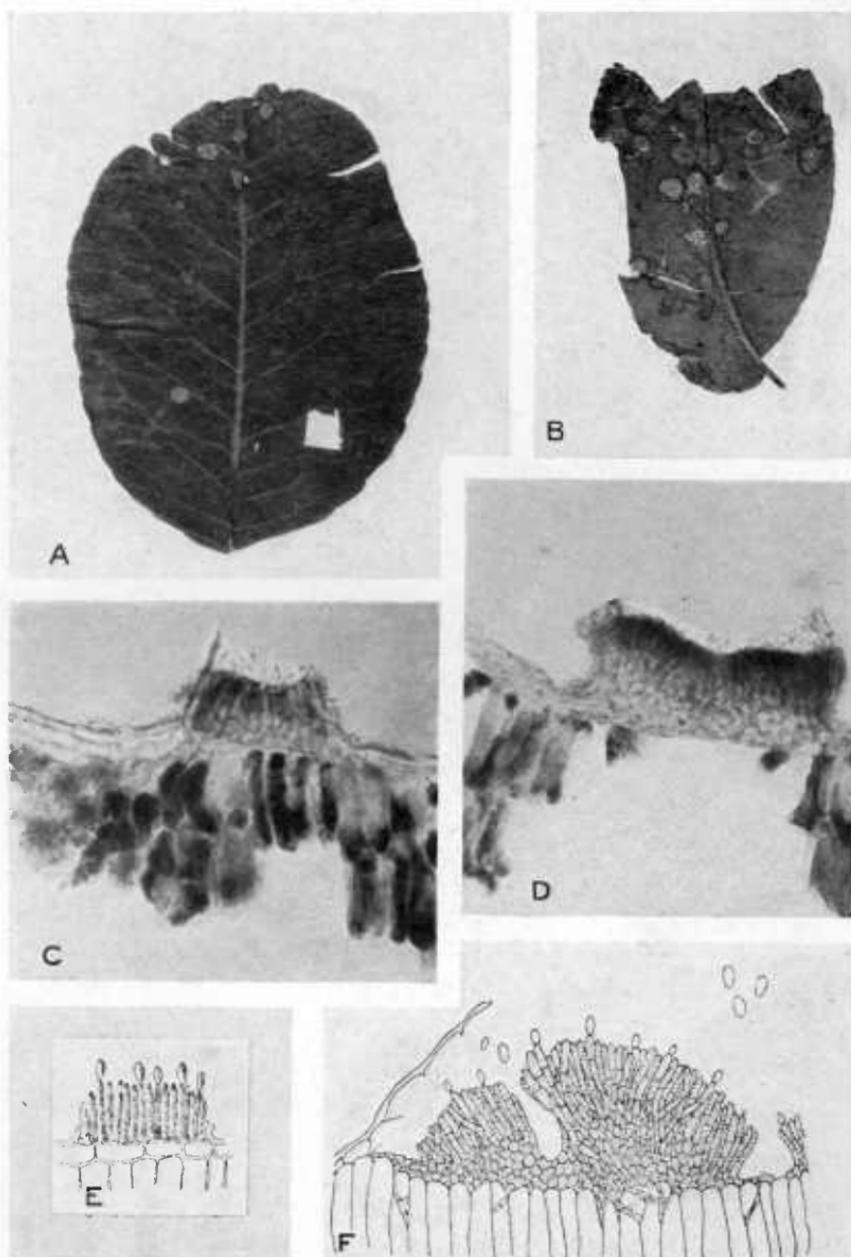
⁸ This species was originally described on black poplar (*Populus nigra* L.) as doubtfully of the genus *Hadrotrichum*, and the binomial was therefore written as *H.?* *populi* (43, p. 264). As in this instance, where the question mark has been dropped from this name in literature cited, it is also omitted in the present paper.



A, Part of Jonathan apple fruit illustrated by Zschokke, showing lesions apparently of apple and pear anthracnose ($\times 1$); B, *a* and *b*, general appearance of anthracnose lesions on upper surface of apple leaves ($\times 1$); C and D, sections of conidial fructifications on upper surface of apple leaves ($\times 380$). Material (B-D) from Woronichin, Transcaucasia, Russia, in 1913. Ex Herb. Inst. Mycol. and Phytopath. Leningrad. Photographs (A, C, and D) by J. F. Brewer and (B) by W. R. Fisher



Upper surface of pear leaves infected by *Plectodiscella piri*: A, General appearance of lesions ($\times 1$); B (enlargement of A, a), fructifications of both stages of the fungus ($\times 22$); C-E, sections through fructifications represented in B; C, a, an acervulus; D and E, ascomata, with conidiophores at one side (a) of D; D, b, and E, a, asci; E, b, epithecium or dark stroma, covering ascoma. C, \times about 600; D and E, $\times 380$. Material from same source as that shown in Plate 1, B-D. Photographs by J. F. Brewer



Plectodiscella piri: A-D, On pear leaves from Italy, identified by Brioso and Cavara as *Hadrotrichum populi* Sacc. and distributed by them as No. 274, I FUNGHI PARASSITI DELLE PIANTE COLTIVATE OD UTILI. Fasc. 11. Pavia, 1896. One of these leaf specimens of the fungus was collected at Avellino in 1894 by Peglion and is typical of his *Gloeosporium pirinum*; the other was collected in 1891, at Pavia. A, Upper leaf surface ($\times 1$); B, lower leaf surface ($\times 1$); C and D, sections of acervuli on lesions on upper surface of A and of B, respectively ($\times 350$). Photographs by J. F. Brewer. E, On pear leaves, as illustrated by Ferraris (19, fig. 174, I), under the name of *Hadrotrichum populi*. F, On apple leaves, as illustrated by Maublanc (35, Figs. XIII and XIV), under the name of *Melanobasidium mali*

had been added. Some conidia were already present in the culture from which the transfers were made. Granular masses in some sections of lesions on apple fruits were interpreted as possibly consisting of microconidia.

Plates 1, C and D, and 2, C, *a*, represent the conidial stage of the fungus; Plate 2, D, both the conidial stage (*a*) and the perfect stage (*b*); and Plate 2, E, only the perfect stage. Woronichin's (55, fig. 3, and pl. 1, fig. 1) illustrations of dark hyphae at the apex of a young pustule of this fungus, as well as of converging hyphae at the center of another pustule on the same material, are interpreted by the present writer as conidiophores of *Plectodiscella piri*. These structures, however, together with such dark hyphae or stroma covering the ascoma as are here shown in Plate 2, E, *b*, are termed by Woronichin (55) the "epithecium" or "shield." The dark hyphae or stroma are believed to have formed entirely or almost entirely within the epidermis, as is illustrated for a closely related fungus on Lima bean (*Phaseolus lunatus macrocarpus* Benth.), tentatively identified as *Elsinoe canavaliae* Rac. (30, pl. 4, C, *c*, and pl. 5, D and K, *b*). The *Elsinoe* structure illustrated in Plate 2, C, *a*, of the paper just cited seems to be a development homologous to what Woronichin (55, pl. 1, fig. 6) described in *Plectodiscella piri* as a small, cup-shaped, almost superficial ascoma practically inclosed in a coat of brown cells. In both instances the darkening of the hyphae is possibly due to oxidation following exposure, or, as explained by Woronichin (55) in the case of the apple and pear fungus, to the pronounced isolation of the ascoma from the substratum.

It seems that since his report of the perfect stage of *Plectodiscella piri*, Woronichin (56, p. 221) has identified its conidial stage as *Hadrotrichum pirinum* (Pegl.) Sacc., which, as will be explained later, actually represents the conidial stage of this ascomycete. This identification by Woronichin was made in reporting a leaf spot on pear growing in a Caucasian nursery. His description of the lesions and of the disposition of pustules of the pathogene thereon is essentially the same as that given in connection with his (55) description of the perfect stage, i. e., *Plectodiscella piri*. The conidia are described as 4μ to 5μ in diameter (56, p. 221).

TAXONOMY

As stated earlier in this paper, Jenkins and Horsfall's (31) discovery of the imperfect stage of *Plectodiscella piri* was based upon conidia produced in a subculture of an isolation by Osterwalder and upon those found on the specimens from Transcaucasia on which Woronichin (55) had discovered the perfect stage. The recent finding of a Sphaceloma on an apple fruit from Italy (28) at once suggested that the fungus had long been known to Italian mycologists. The certainty of this is now established through the specimens from Italy identified by Briosi and Cavara as *Hadrotrichum populi* Sacc.⁹ The fungus is here unquestionably of the genus *Sphaceloma*, and a comparison of it with typical material of *Plectodiscella piri*¹⁰ shows that

⁹ Op. cit. (See footnote 7.)

¹⁰ Op. cit. (See footnote 3.)

it is this species. The Italian material represents the fungus on pear leaves from Avellino and Pavia (pl. 3, A-D) and on an apple leaf from Pavia. That on the leaf from Avellino is from the collection of *Gloeosporium pirinum* on which Peglion (39) based his description of that fungus.

The disease caused by *Gloeosporium pirinum* was termed "pear anthracnose" by Peglion (39; 40, p. 267), and this name was later employed by Briosi (13, p. 365; 14, p. 70) in reporting the disease on pear. In the present paper the disease is referred to as anthracnose of both apple and pear. Peglion (39; 40, p. 268) observed the similarity of the leaf lesions produced by this disease to those of grape anthracnose on leaves of grape (*Vitis*). He (39; 40, p. 268) made some notations on the susceptibility of pear varieties to infection by *Gloeosporium pirinum*. Recently he has written that this fungus is common in the region of Bologna, where he is now located.

Saccardo (44, p. 136), in 1915, reporting the fungus on this host in France, made the new combination *Hadrotrichum pirinum* (Pegl.), for which he gave the synonyms *Gloeosporium pirinum* Pegl. (39, p. 4), *Hadrotrichum piri* Montem. (35, p. 226), and *H. populi* Sacc. var. *piri* (Montem.) Ferr. (19, p. 875). On the basis of Maublanc's technical description (34, p. 70) and illustrations (34, figs. xiii and xiv) of *Melanobasidium mali* Maub. and an examination of a fragment of the specimen on which the description is based,¹¹ this fungus is here identified as the same as *Gloeosporium pirinum*, or *Plectodiscella piri*.

The reports of *Hadrotrichum pirinum* from France and of *Melanobasidium mali* from Spain constitute the only records at hand of *Plectodiscella piri* in these countries. Reference to its occurrence in Portugal was made in the historical section of this paper.

The illustrations of this fungus by Ferraris (20, fig. 174, I), under the name of *Hadrotrichum populi*, and by Maublanc (34, figs. xiii and xiv), under that of *Melanobasidium mali*, are reproduced in Plate 3, E and F, respectively, while the original technical descriptions of *Gloeosporium pirinum*, *Hadrotrichum piri*, *Melanobasidium*, and *M. mali*, typifying this genus, follow:

GLOEOSPORIUM PIRINUM Pegl.

Maculis initio punctiformibus, rubro-cinctis, inde effusis, rotundis, saepe confluentibus, ad centrum griseis, vel sordide brunneis amphigenis; acervulis minutis 150-300 μ diam. erumpentibus, olivaceo-chlorinis; conidiis ovatis vel subcylindraceis, continuis, eguttulatis, 6-4, hyalinis; basidiis bacillaribus, 20-25 \times 4, minute granulosis hyalinis vel dilute fumosis.

Hab. in foliis *Piri communis* prope Avellino—It. austr. —Vere 1894.

MELANOBASIDIUM nov. gen. (Tuberculariées Dématiées).

Follicolum, maculicolum; sporodochia minima, erumpentia, atra, ex hyphis ramosis, septatis, intricatis composita, sporophoris cylindricis, densis, septatis, concoloribus vestita; conidia solitaria, acrogena, ovoidea, hyalina.

MELANOBASIDIUM MALI nov. sp.

Maculis albidis, ovoideis vel elongatis, margine brunnea, angusta cinctis; sporodochiis punctiformibus, epiphyllis, demum epidermide fissa superficialibus, 170-190 μ latis; conidiis ovoidiis, hyalinis, 4.5-5.5 \times 2.5-3 μ .

In foliis vivis *Piri Mali* ad Sevilam, Hispaniæ.

¹¹ "*Melanobasidium mali* Maublanc sur *Pirus malus* Seville 1900" (fragment of type). Ex Herbarium, Station Centrale de Pathologie Végétale, Ministère de l'Agriculture, Institut de Recherches Agronomiques, Versailles, France. Specimen received through the courtesy of G. Arnaud.

Cette espèce est nettement parasite sur les feuilles du Pommier, où elle forme de petites taches blanches, bordées d'une marge subérisée. Je n'ai pas de renseignements sur l'extension de ce champignon et les spores de l'unique échantillon reçu n'ont pas germé.

HADROTRICHUM PIRI.

Acervulis puntiformibus, atris, in maculis foliarum dealbatis, epiphyllis, sub-superficialibus: strato prolifero subcuticolare, e cellulis oblongis dense stipatis fuliginis conflato; conidiis globoso-ovoidies ($4-5 \times 4\mu$), olivaceo-fuliginis.

Hab. In foliis vivis *Piri communis*, Montubeccaria (prov. Pavia).

A few years before Peglion (39, p. 6) described *Gloeosporium pirinum*, Cavara (17, p. 184), reporting the occurrence of *Hadrotrichum populi* on *Populus nigra* L. in Lombardy, Italy, stated that a closely allied form affects "*Rosa* esp. cult." and "*Rubus corifolius*." He (18, p. 282) later asserted that this *Hadrotrichum* species affects "*Rosa*, *Rubus*, *Sorbus*" and "*Pyrus*." At about the same time Briosi reported in Italy *Hadrotrichum* sp. on wild rose (7, p. xviii), and *H. populi* (8, p. xix) and *H. populi* "forma del pero" (9, p. xxvi) on pear. He continued to refer to the pear fungus either as *H. populi* (10, p. 298; 12, p. 663; 14, p. 70) or as *Gloeosporium pirinum* (13, p. 365). He also reported *H. populi* on rose in Meaux, France (10, p. 313), and on maple (*Acer negundo* L.) (11, p. 541) in Italy. Ferraris (20, p. 875) included European mountain ash (*Pyrus aucuparia* Ehrh.) among the hosts for *H. populi* var. *piri*.

Even as late as 1920 Montemartini (36, p. 122) was apparently unaware of the nomenclatorial status of his *Hadrotrichum piri*, for, citing only Cavara (18), he recognized this binomial and *Gloeosporium pirinum* as synonyms of *H. populi*. At the same time he reported what he interpreted to be this fungus on pomegranate (*Punica granatum* L.) growing at Montubeccaria, Pavia, the type locality for *H. piri*.

More recently, Borg (5, p. 238-239) and Marchionatto (33, p. 10-11) have reported *Gloeosporium pirinum* on pear in the island of Malta and in Argentina, South America, respectively; while in the Crimea, Russia, Garbowski (21, p. 255-256) has identified *Hadrotrichum populi* on apple, pear, plum (*Prunus domestica* L.), poplar (*Populus nigra*), and white beamtree (*Sorbus aria* Crantz), and, as previously noted; in the latter country Woronichin (56, p. 221) has reported *H. pirinum* on pear in the Caucasus and *Plectodiscella piri* on both apple and pear in Transcaucasia (55).

Garbowski (21, p. 256) stated that in the Crimea *Hadrotrichum populi* causes considerable damage to fruit trees, particularly apple; he observed it on both leaves and fruits of several different varieties. He described the fruit spot as circular, with a whitish central part, and a reddish-brown border. Reaching a centimeter in diameter, the whitish area was dotted with the dark pustules of the fungus, which had ruptured the dead epidermis. He noted also the close resemblance of the fruit spot to that caused by *Phoma pomorum* Thuem., and stated that it is probable that infection due to the *Hadrotrichum* is often ascribed to this fungus.

Specimens of the so-called *Hadrotrichum* on apple leaves from the Crimea, as well as of *Gloeosporium pirinum* on pear from Argentina, recently received through the courtesy of Garbowski and Marchionatto, respectively, are of the same general appearance as those of

Plectodiscella piri from other sources, which have been examined by the writer.

Marchionatto (33, p. 11), reporting the fungus only on leaves of pear, stated that it was fairly widespread in the Province of Buenos Aires and the islands of Delta del Parma. His advice (33, p. 11) for the control of the disease is similar to that given by Peglion (39; 40, p. 269).

The reports of *Hadrotrichum* on rose presumably concern the *Sphaceloma* on rose; those on brambles, *Plectodiscella veneta* (Speg.) Burk., or the perfect stage of *Gloeosporium venetum* Speg. (16); and those of *Hadrotrichum* and *G. pirinum* on apple and pear, *P. piri*. Although these three similar fungi, occurring on rosaceous hosts, and *Hadrotrichum*? *populi*, on poplar, have been treated as comprising one and the same organism, it seems advisable to keep them, tentatively at least, as separate species, as originally described. It has been mentioned elsewhere by the present writer¹² that Alexander (1, p. 72) reported infection of apple fruits by *P. veneta*, but that he did not furnish absolute proof of such pathogenicity. This species and the other two from rosaceous hosts just mentioned were separable, as far as compared by the writer,¹² but this is not interpreted necessarily to mean that each is entitled to the rank of species.

Lindau (32, p. 684), in referring to the doubtful classification of *Hadrotrichum populi* in the genus *Hadrotrichum* (43, p. 264), suggested that the species be retained there until it could be investigated further. An examination of typical material of the fungus on *Populus nigra*,¹³ on which, as previously stated, it was originally described, as well as of Briosi and Cavara's¹⁴ illustration of it, shows that it possesses the characteristics of the genus *Sphaceloma* and that it is possibly a distinct species. Therefore it is here transferred to the genus *Sphaceloma* as *S. populi* (Sacc.), n. comb. The fungus is reported not only on black poplar, but also on Lombardy poplar (*P. nigra italica* DuRoi) in Italy¹⁵ and South America (46, p. 192) and on "*Pioppo canadense*" (53, p. 305) in Italy.

Isolations of *Sphaceloma* from pear, poplar, or strawberry tree, or tests to determine whether the *Sphaceloma* on apple will infect pear, and that on pear apple, seem not to have been made; nor has there been available fresh material of the pear fungus or any specimen of what may prove to be *Sphaceloma* on maple, pomegranate, plum, European mountain-ash, or white beamtree.

Brizi (15) has reported an anthracnose of almond (*Amygdalus communis* L.) in Italy, which he regards as similar to anthracnose of grape; also Von Höhnelt (26, p. 65-67) has added a species to Maublanc's genus *Melanobasidium*, but its characteristics as described (26, p. 65-67) may exclude it from this genus.

Before erecting the ascomycetous genus *Plectodiscella* and the family *Plectodiscellaceae* for the apple and pear anthracnose organism, Woronichin (55) considered placing the species in one of several genera already described with each of which it has characteristics in common.

¹² JENKINS, A. E. ROSE ANTHRACNOSE CAUSED BY SPHACELOMA. (Unpublished manuscript.)

¹³ Selva, Italy, October, 1877. (SACCARDO, P. A. MYCOTRECA VENETA, Century 8-12 (pr. p.) No. 1256.) (Cited in 43, p. 264.)

¹⁴ BRIOSI, G., and CAVARA, F. I FUNGHI PARASSITI DELLE PIANTE COLTIVATE OD UTILI. Fasc. 13-14, No. 139. Pavia, 1900.

¹⁵ Op. cit. (See footnote 14.)

One of the genera considered was *Elsinoe*, typified by *E. canavaliae* and originally reported on *Canavalia gladiata* (Jacq.) DC. According to Woronichin (55) the ascoma in *Plectodiscella piri* develops intraepidermally, whereas in *Elsinoe canavaliae* it forms subepidermally; furthermore, lesions of scab of *Canavalia* are thickened, while in apple and pear anthracnose such lesions are not found. The two species can not be separated by these criteria, for intraepidermal as well as subepidermal ascomata occur in the Lima-bean fungus tentatively identified as *E. canavaliae*; furthermore, data at present available show that lesions resulting from attack by *Sphaceloma* may be not only of normal thickness, but also of increased or (3, 27) even of less than normal thickness. The fact that hyperplastic lesions occur in the anthracnose of brambles (16, 49) and of rose¹⁶ suggests that they may be found in the apple and pear disease.

Woronichin (55) found resemblances between the perfect stage of *Plectodiscella piri* and *Molleriella* Wint. (54, p. 102) not *Moeleriella* Bres. (6, p. 292). The latter genus at the time his (55) paper was written had been removed (25, p. 349) from the family Myriangiacei Nyl. (37, p. 139) and then transferred (25, p. 349) to the discomycetous family Agyriaceae Von Höhn. (25, p. 362). If more information had been available concerning *Molleriella* it is probable that Woronichin (55) would have classified his new fungus in this genus, which is older than *Elsinoe*. He (55) compared it with the myriangioid genera *Ascostratum* Syd. and *Kusanoa* P. Henn., as well as with *Elsinoe* and *Myriangina* (P. Henn.) Von Höhn. (25, p. 372-373); of these two it resembled *Elsinoe* more than *Myriangina*. *Myriangina* was originally classified by Hennings (24, p. 55) as a subgenus of *Myriangium* Mont. and Berk. (4), on which is founded the Myriangiaceae. Upon removing *Myriangina* from this family, Von Höhn (25, p. 373) erected for this genus, as well as for *Elsinoe* until then classified in the Exoascaceae (42), the family *Elsinoeaceae* Von Höhn. He was uncertain of its systematic position, but suggested that its affinities might be with the *Plectodiscaceae* or with the *Protodiscaceae*. Woronichin (55) concluded to place his new family *Plectodiscellaceae* between the *Elsinoeaceae* and the *Discomycetes*, explaining that it was undoubtedly related to *Molleriella*, and through *Ascostratum* and *Kusanoa* to the Myriangiaceae.

Soon afterwards the Myriangiaceae were treated as an order by Theissen (50, p. 311), i. e., as the Myriangiales Starb. (42), and the families *Elsinoeaceae* and *Plectodiscellaceae* were placed in this order by Theissen and Sydow (51, p. 437). For these families they created the suborder *Protomyriangieae* and distinguished them by the presence of an epithecium or shield in the *Plectodiscellaceae* and its absence in the *Elsinoeaceae*. It has been shown earlier in the present paper that this is not a valid criterion for the separation of the type species of the genera *Elsinoe* and *Plectodiscella*; it follows, therefore, that it is not a valid criterion for the separation of the two genera or of the families created for them. In 1925 Arnaud (2) merged the two families and transferred *Elsinoe*, *Plectodiscella*, and *Myriangina* to Hennings's (22) genus *Uleomyces*. *Uleomyces*, *Myriangium*, *Kusanoa*, *Ascostratum*, and a few others fall in the *Eumyriangieae* of Theissen

¹⁶JENKINS, A. E. Op. cit. (See footnote 12.)

and Sydow (51), the only other suborder in the Myriangiales as classified by them (51). Arnaud, who (2) explains that the order is only imperfectly known, thus seems to disregard the two suborders of Theissen and Sydow. As a matter of fact, in the orientation of their stroma, Myriangina, as discussed by the writer (29) and by others, and some other related genera (48) actually partake of both suborders.

Arnaud (2, p. 678) transferred *Plectodiscella piri* and *P. veneta* to what he termed "the *Elsinoe* section" (2, p. 688) of the genus *Uleomyces*. Shear (45) did not agree with this transfer, because "*Uleomyces* has a superficial stroma and many-septate, muriform, brown ascospores, instead of 3-septate hyaline spores as in the type of *Plectodiscella*." Citing Arnaud's (2) account of *Elsinoe canavaliae*, Shear (45) stated:

It is very clear that *Elsinoe* is a synonym of *Plectodiscella*, unless [here apparently following Theissen and Sydow (51) and not Woronichin (55)] the dark-colored superficial cover in *Elsinoe* be considered a distinctive character * * *.

These statements were made by Shear (45) in connection with his report of *Elsinoe ampelina* (D By.) Shear, recently found by him in the United States, the fungus being possibly the same as *E. viticola* Rac. (31, 45), originally reported from Java.

As previously mentioned in the present paper, the writer (30) has shown that a superficial cover like that in *Plectodiscella* is found in *Elsinoe* on Lima bean. In other respects also the two genera are identical. Colored muriform spores occur in *Elsinoe canavaliae* (30), so that in this particular *Elsinoe*, or *Plectodiscella*, agrees with *Uleomyces*. Colored ascospores occur also in the genus *Myriangium*, as already reported by Petch (41, p. 62-63). Had this characteristic of *Myriangium* been known to Hennings, according to his own statement, he (23) would have treated his genus *Uleomyces* as a synonym of *Myriangium*. Theissen (50, p. 312) and Theissen and Sydow (51, p. 439), on the other hand, separate *Uleomyces* and *Myriangium* on the basis of the distribution of asci in the ascoma; i. e., in *Uleomyces* the asci occur throughout the ascoma, whereas in *Myriangium* the lower part of the ascoma is sterile. Arnaud (2) recognizes the same distinction. Of these two genera only *Myriangium* has been cultured by the present writer, no living material of *Uleomyces* being available. It is evident that further investigation of *Uleomyces*, including a study of its growth in culture, is essential to a satisfactory comparison of this genus with the others just mentioned.

As previously stated, Woronichin (55) has suggested that *Plectodiscella* may be identical with *Mollerella*. It appears to be more closely related to this genus than to *Uleomyces*, but actual material of *Mollerella* is not available with which to make a direct comparison. The genus, which is older than *Uleomyces*, is included in the Myriangiales by Arnaud (2).

It is convenient here to treat *Elsinoe* as a distinct genus, with *Plectodiscella* and *Melanobasidium* as synonyms. *Plectodiscella piri* and *P. veneta* are referred to *Elsinoe* as *E. piri* (Wor.), n. comb., and *E. veneta* (Speg.), n. comb. In addition to *P. piri* and *Uleomyces piri*, synonyms of *E. piri* are, of course, *Gleosporium pirinum*, *Hadrotrichum piri*, *H. populi* var. *piri*, *H. pirinum*, and *Melanobasidium mali*.

SUMMARY

Plectodiscella piri Wor., which causes apple and pear anthracnose, a disease of considerable economic importance, is widely distributed in Europe. It occurs also in South America, but is not known to be established in North America, although it has recently been intercepted at ports of entry in the United States.

The morphology, taxonomy, and history of the fungus are discussed. Structures termed the "epithecium" or "shield" by Woronichin in describing its perfect stage are interpreted as the conidiophores of its Sphaceloma or conidial stage. The data presented show that Woronichin's reasons for not placing this fungus in the genus *Elsinoe* are invalid, as is also Theissen and Sydow's basis for separating the families *Elsinoeaceae* and *Plectodiscellaceae*. Although Arnaud has transferred *Plectodiscella* to the genus *Uleomyces*, with consequent nomenclatorial changes, it is suggested that *Uleomyces* be investigated further before this transfer is accepted. *Elsinoe*, which Arnaud also treats as a synonym of *Uleomyces*, is here regarded as a distinct genus, and *Plectodiscella* and also *Melanobasidium* are considered as synonyms; *Plectodiscella piri* and *P. veneta* are referred to *Elsinoe*. *Melanobasidium mali*, the type of *Melanobasidium*, is regarded as a synonym of *Elsinoe piri*.

Hadrotrichum populi, on poplar, is transferred to the genus *Sphaceloma*.

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