Three Fungous Diseases of *Salix* in New Zealand, and some Saprophytic Fungi found on the same Hosts.

By B. JEAN MURRAY, B.Sc., Assistant Mycologist, Cawthron Institute, Nelson.

[*Read before the Nelson Philosophical Society, 27th August, 1924; received by Editor, 5th December, 1924; issued separately, 6th March, 1926.*]

Plates 8–11.

AMONG the commonest and most beautiful shade and ornamental introduced trees in the Nelson district are willows of both the "weeping" (*Salix babylonica*) and "crack" (*Salix fragilis*) varieties. For some time it has been noticed that several diseases, probably of fungous origin, are becoming prevalent on many of these trees. In February, 1923, an investigation was commenced upon these diseases. It was found that, though in some cases both species of willow were attacked by the same fungus, the worst disease of each host was caused by a different fungus—*e.g.*, by *Marssonina* on the weeping-willow and *Macrophoma* on the crack-willow.

On material collected for examination from many different localities from Wakapuaka to Tasman numerous saprophytic fungi were also found.

Three of the worst diseases of the willows in this district, and the fungi causing them, are described in the present paper, and notes on a number of the saprophytic fungi found on the same hosts are included.

Marssonina salicicola (Bres.) P. Magn. on *Salix*.

The most serious disease is caused by the fungus *Marssonina*, which, though it occurs on both species of *Salix*, is chiefly found on *S. babylonica*. The parasite attacks the tree with great vigour, causing considerable injury and loss, and throughout the Nelson district practically no tree of this species has escaped infection. Many have lost branches and are dying.

(In April, 1925, since this paper was in print, specimens of the disease on *Salix babylonica* were collected in Ward, Marlborough.)

The disease was also noticed by the writer in a mild form on weeping-willows at Mitcham, South Australia, in January, 1924, and at Aldgate, South Australia, in January, 1925.

Pathological Changes in *Salix babylonica*.—The effect of the parasite on this host is most noticeable. In trees which are only mildly attacked the leaves become covered, principally upon the lower surface, with pale reddish-brown spots which have a purple tinge when fresh; a few brown cankers may be seen on the twigs. When badly diseased the tree almost completely loses its "weeping" habit; the leafy branches, instead of being long and pendulous, are much shorter and tend to grow more upright, until, at a distance, the tree might almost be mistaken for one of the upright varieties (Plate 8).

This effect on the host is due to the shortening of the internodes in the diseased "weeping" branches, the average distance between any adjoining two of the ten nearest the tip in a number of diseased branches being 0·8 cm., as compared with 2·4 cm. in an equal number of healthy specimens. This leads to an increase in the number of twigs, which are produced closer

together and are shorter. Weeping branches may be 1 m., 1·5 m. long, or more, while on badly attacked trees there may be no true weeping branches, but in their place a number of small twigs, a few to 30 cm. long, bearing leaves at fairly crowded nodes. The twigs become distorted with cankers, and tend to curl upwards.

When the twig is first infected a small black elliptical spot appears upon it, which rapidly spreads (Plate 9, fig. 1). Upon this spot whitish acervuli are produced beneath the epidermis of the host, which they raise and finally rupture, setting free the hyaline two-celled spores. As the infected tissue of the twig dies, it dries, cracks, and is broken off by another layer of spores developing below. In this manner several layers may crack off in succession. The canker spreads along and round the twig, and may join other cankered areas, until a large part is involved (Plate 9, fig. 2). The infected leaves become covered with spots, described on pages 60 and 61 (see Plate 9, fig. 3). On badly diseased twigs the leaves, all of which are often infected to some extent, are usually very much smaller than those on healthy branches, averaging 5·9 cm. in length as compared with 12·5 cm. Instead of hanging pendulous against the twigs, they tend to curl and grow more at right angles to it; this is often due to infection of the petiole, causing it to blacken and shrivel. The midrib may also be infected, when elliptical or elongated black spots appear similar to those on the young twigs and petioles. The stipules are often attacked as the leaves unfold, when they drop off at a very early age, while normally they remain at the base of the leaf long after it is mature. Eventually the leaves become yellowish, and fall prematurely. It was observed in early spring that the young leaves were infected immediately on the opening of the leaf-buds (Plate 9, fig. 4), infection probably being caused by spores from cankers upon the living twigs of the tree, from bud-scales (Plate 9, fig. 5), and from dead leaves which had been diseased the season before and remained on the ground. Examination of these during the winter and early spring showed numerous acervuli still producing a large quantity of spores.

Spots similar to those on the leaves, bearing typical acervuli and spores, were also found on the catkins of the weeping-willow.

Pathological Changes in *Salix fragilis*.—The same fungus as the above occurs on the crack-willow, but much more rarely, and then with less disastrous effect. Blackened areas may be formed along the young twigs, and cankers are sometimes produced on the older ones; but the main effect is seen on the leaves, which become thickly covered on the upper surface with dark-brown or black circular or irregular spots, which differ from those on the weeping-willow by being smaller and more numerous. On the lower surface of the leaves of the crack-willow faint small reddish-brown irregular spots may sometimes be seen; these at times become confluent. The spots are more numerous on the upper surface of the leaf than on the lower. They produce acervuli and spores similar to those on the weeping-willow.

IDENTITY OF THE FUNGUS.

Genus.—The fungus under discussion was named *Marssonia* by Fischer in 1874. But, as P. Magnus (1906, p. 88) pointed out, this name had already been used for the genus *Marssonia* Karst. of the Gesneriaceae, so he altered it to *Marssonina* P. Magn., under which title the genus is now known.

Rabenhorst, Saccardo, Engler and Prantl, and other authorities classify *Marssonina* P. Magn. (= *Marssonia* Fisch.) as being "exclusively found parasitic on leaves," and thus distinguish it from the similar genus *Septomyxa*, which is "saprophytic on stems and fruit." But Diedicke (1913, p. 540) observed that this was not an accurate basis of classification, as species of *Marssonina* had been found on twigs also. He suggested that a more exact distinction would be made by limiting *Septomyxa* to those species with a stromatic conical acervulus in which the production of conidiophores occurs typically on the side of the acervulus, and by extending *Marssonina* to include twig-infecting forms with a flat subepidermal acervulus bearing conidiophores over the basal disc.

In the present instance the identity of the fungus upon the leaves of the willow with that upon the twigs, as is exhibited in the similarity of general appearance, shape of the acervulus, and shape, size, and structure of the conidia, serves to confirm Diedicke's statement as to the identity of leaf- and twig-inhabiting forms.

Species.—The only mention of a *Marssonina* on the twigs of the willow is made by Fukushi (1921, p. 1), who found a disease in Japan which he thought was "probably due to *Marssonina*." If this should prove to be so, it may be found to be the same species as that occurring on the twigs of the willow in New Zealand. Furthermore, the local species does not agree with the single species of *Septomyxa* recorded on this host. As for the species of *Marssonina* found on the leaves, the present species does not agree in all respects with any recorded on the willow, though strongly resembling three.

The Fungus on Salix babylonica.

The spots may be on either surface of the leaf, but are principally on the lower surface, where they are circular, not sharply outlined, up to 1 mm. in diameter, light purplish-brown (reddish when dry), at first scattered, then crowded and confluent until in many cases the whole lower surface of the leaf is covered (Plate 9, fig. 3). Where present on the upper surface the spots are smaller, dark-brown, and scanty. Upon the spots are numerous white acervuli. These are at first circular, often becoming confluent, varying in size from 60 to 210 mmm.,* the average size when mature being between 150 and 200 mmm., lifting up and breaking through the epidermis and exposing the conidia on very short hyaline conidiophores, which are produced over the surface of the flat acervulus. The acervulus may be slightly sunken in the centre, due to the collapse of the dead host cells below. The conidia are club- or pear-shaped, frequently curved, two-celled, the lower cell being much the smaller of the two, hyaline, contents granular or guttulate, 11–16 mmm. long by 3–7 mmm. broad (text-fig. 1). On the young twigs (text-fig. 2) the acervuli of the first layer formed subepidermally are similar to those on the leaves, but as the canker develops, splitting the cortex and producing new acervuli on the successive surfaces exposed, the acervuli are more irregular in shape and size. Throughout, however, the spores are identical with those on the leaves.

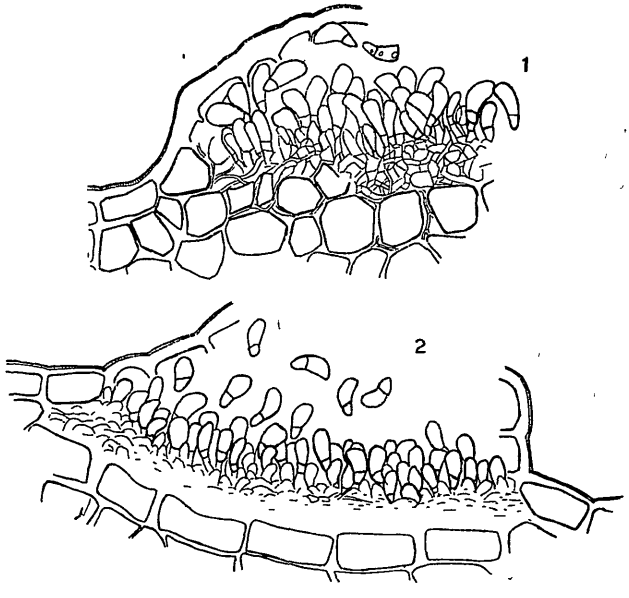
As mentioned, there are three species of *Marssonina* that distinctly resemble the species under consideration—*e.g.*, *M. salicicola*, *M. rubiginosa*,

---

* In this article the contraction "mmm." is used for micromillimetres.

and *M. nigricans*. Briefly stated, the species found differs from *Marssonina salicicola* (Bres.) P. Magn. in the spots on the leaves being amphigenous, principally hypophyllous, and in having some spores smaller; from *Marssonina rubiginosa* (Ell. & Ev.) P. Magn. in the spots on the leaves not being "more definite on the upper surface," and in often having larger spores which are not always acute below; and from *Marssonina nigricans* (Ell. & Ev.) P. Magn. in having larger spots on the leaves, the spots not being edged with a narrow tawny margin, and in the acervuli being numerous and white.

The species of *Marssonina* found upon *Salix* in Nelson agrees in all important features with *Marssonina salicicola* (Bres.) P. Magn., and is therefore referred to that species, in spite of the spots on the leaves being described as "epiphyllous," whereas in the Nelson specimens they are amphigenous.



FIGS. 1, 2.—*Marssonina salicicola* (Bres.) P. Magn. on *Salix babylonica* L. Sections through an acervulus with spores. Fig. 1, on leaf; fig. 2, on young twig. × 330.

This species has hitherto been recorded only upon the leaves of willows, but it is most probable that in the present instance the diseases of leaves, twigs, and catkins are caused by the same fungus. The acervuli and spores produced are identical on the different parts of the tree. Slight differences in the size and colour of the spores can easily be accounted for by the differences in host-tissue in the different parts of the tree.

Marssonina salicicola on the leaves in New Zealand varies according to the species of willow upon which it is found. When occurring on *Salix babylonica* it varies towards *Marssonina rubiginosa*, the reddish-brown spots being more numerous on the lower surface, though the spores are usually larger than in *M. rubiginosa* and not always acute below. When it occurs on *Salix fragilis* it varies towards *Marssonina nigricans*, the spots

being blackish and more numerous on the upper surface of the leaves, but the acervuli produced are neither scanty nor dark as they are in *M. nigricans*. However, in the two cases, on *Salix babyloninca* and *Salix fragilis*, the acervuli and spores resemble each other so closely that it is doubtless the one species of fungus occurring on both willows, the variation mentioned being due to the different hosts.

Since the three species resemble one another so closely, it will probably be found that *M. rubiginosa* and *M. nigricans* are merely variant forms of *M. salicicola*, the variation being dependent, as in the species under discussion, upon the species of *Salix* upon which they occur.

The fungus found in Nelson upon the different parts of both *S. babylonica* and *S. fragilis* is therefore referred to *Marssonina salicicola* (Bres.) P. Magn.

Macrophoma Salicis Dearn. & Barth. on *Salix fragilis*.

One of the more important fungus diseases of the crack-willow (*Salix fragilis*) in this district is caused by a species of *Macrophoma*. It was first noticed on the 8th February, 1923, at Appleby, and subsequently at Wakapuaka, Atawhai, and Nelson.

Effect on Host.—The infected leaf becomes discoloured at the tip. This discoloration, reddish-brown in hue, soon spreads over the upper end of the leaf, being somewhat sharply limited by a straight or semicircular line from the adjoining tissue, which, however, becomes rather yellow, showing that the fungus is encroaching and the cells dying. Examination of this brown tip shows very minute blackish-brown swellings, which indicate the position of the pycnidia (Plate 11, fig. 2). The tip of the leaf dies and becomes dry, as later does also the whole of the infected area, the remainder of the leaf becoming yellow, falling prematurely. Trees with this disease lose all their leaves when uninfected trees are still green (Plate 10).

It was noticed that the leaves on trees infected with *Macrophoma* were as a rule much smaller than those on uninfected trees, frequently being only from one-half to one-third the size. This may be due directly to the presence of the fungus, or indirectly to premature defoliation due to the disease weakening the vigour of the tree in previous seasons. It is quite common to see a branch every leaf of which has a reddish-brown tip (Plate 11, fig. 1).

On some of the tips of both living and dead leaves infected with *Macrophoma*, *Pleospora herbarum* was also found.

Identity of the Fungus.

The pycnidia of the fungus are distributed more or less densely, are very minute, 100–170 mmm. broad, globose or flattened-globose, deeply sunken in the tissue of the leaf, amphigenous, having a short broad papilla, which slightly raises the epidermis and opens by a circular pore, wall somewhat thin, concolorous with the dying tissue of the leaf, hyaline inside; spores (pycnospores) oblong with rounded ends, continuous, hyaline, granula, 16–20 × 6–8 mmm. (most 20 mmm. long), sporophores short, about 6 mmm. long, filiform. Parasitic on living leaves of *Salix fragilis*.

No record has been found of any species of *Macrophoma* parasitic on any part of the willow or saprophytic on the dead leaves. Of the

several species recorded as saprophytic on dead wood of various *Salix* sp., the one found here most resembles *Macrophoma Salicis* Dearn. & Barth., in the description of which, quoted below, the points of dissimilarity to the *Macrophoma* in question are printed in italics.

"*Macrophoma Salicis* Dearn. & Barth., *Myc.*, vol. 9, 1917, p. 352.

"Pycnidia thickly distributed, sometimes gregarious or seriate, cortical, rupturing the epidermis in *a cleft or stellate manner*, 0·25–0·5 mm. in height and diam. Ostiola thick, short *or longer up to 0·3 mm.* Conidia hyaline, continuous, *ovoid* to oblong or *fusoid*, 12–16 mmm. × 6–9 mmm. *On dead twigs of Salix exigua* Nutt., Billings, Montana."

It will be seen that the species found in Nelson differs from *Macrophoma Salicis* chiefly in the smaller size of its pycnidia, in lacking the (only occasionally) greater length of ostiole, and in the manner in which the pycnidia rupture the epidermis of the host. But in many cases in which a fungus occurs on different parts of a tree it is usual to find considerable variation in the size of the fungus fructifications according to the part in which they are formed, the pycnidia formed on leaves being smaller, as a rule, than those on twigs or branches of the same tree. Similarly, in pycnidia in which the ostiole is developed only until it reaches the surface of the host, as in

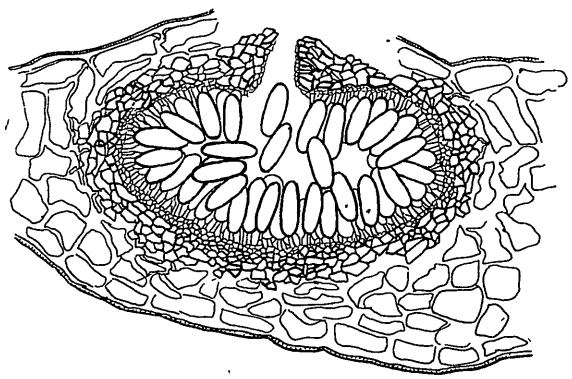


FIG. 3.—*Macrophoma Salicis* Dearn. & Barth. on leaf of *Salix fragilis* L. Section through a pycnidium with spores. × 300.

the present case, it is to be expected that the length of the ostiole would, on the whole, be shorter in pycnidia formed on thin leaves than in those formed on a branch, where they may occasionally be more deeply buried. The manner of the rupture of the host surface as the pycnidia push through is again largely a local peculiarity, dependent chiefly on the arrangement of the resistant or less-resistant kinds of host-tissue in the immediate vicinity of the pycnidia, and also to a certain extent on the manner of grouping of the latter—*i.e.*, whether they are in groups or series, and whether scattered or dense.

Of greater significance is the difference in size, and sometimes in shape, of the spores; but as spore sizes in common occur in the two sets of material, and as there is no other species of *Macrophoma* on the willow

which resembles so closely that found in Nelson, the latter is regarded as *Macrophoma Salicis* Dearn. & Barth. occurring parasitically, instead of saprophytically, as previously recorded.

Gloeosporium Capreae Allesch. on *Salix fragilis*.

A species of *Gloeosporium* on *Salix* was found by the writer in Nelson on the 21st February, 1923. This is the commonest fungus growing parasitically on the crack-willows (*Salix fragilis*) in this district, and it also occurs infrequently on *Salix babylonica*.

Effect on Host.—The fungus occurs only upon the leaves, forming upon the upper surface small round or irregular somewhat raised spots, greyish-white with a narrow dark-brown margin, varying from 0·5 mm. to 2 mm. in diameter, very often confluent and forming large irregular patches often up to 1·5 cm. long and exceptionally to 3·5 cm.; sometimes, especially when large and near the margin or tip of the leaf, a large part of the diseased area may drop away from the leaf; there is a tendency for the blotches to follow the veins of the leaf, so that long narrow patches may frequently be found along the midrib and larger veins (Plate 11, fig. 3). The spots are covered with minute black dots where the acervuli break through the cuticle. The under-surface of the leaf becomes discoloured with dark-brown areas corresponding to the spots above, but the acervuli are borne principally upon the upper surface.

Identity of the Fungus.

The acervuli are crowded, brown, small, 80–120 mmm. in diameter, often confluent, in which case they are larger, erumpent, lifting up and breaking through the cuticle; conidiophores light-brown, 15–20 × 1–2 mmm., bearing small oblong to oval, hyaline, one-celled conidia, 5–12 × 3–6 mmm., often 2-guttulate (text-fig. 4).

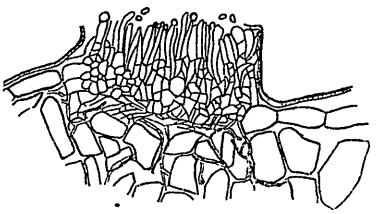


Fig. 4.—*Gloeosporium Capreae* Allesch. on leaf of *Salix fragilis*. Section through an acervulus with spores. × 330.

Gloeosporium Salicis West. is the most common species on the willow occurring in America and Europe. The descriptions of this species given by Saccardo (*Syll. Fung.*, 3, p. 711) and Rabenhorst (Bd. 1, Abt. 7, p. 500) are very scanty, but Potebnia (1910, p. 77) published a more detailed account describing two kinds of spores, macroconidia 14–16 × 5–7 mmm. and microconidia 4–5 × 0·5–1 mmm., while Dearness (1917, p. 360) gives the spore range as 15–23 × 7·5–10 mmm. The spores are usually slightly

[Face p. 64.]

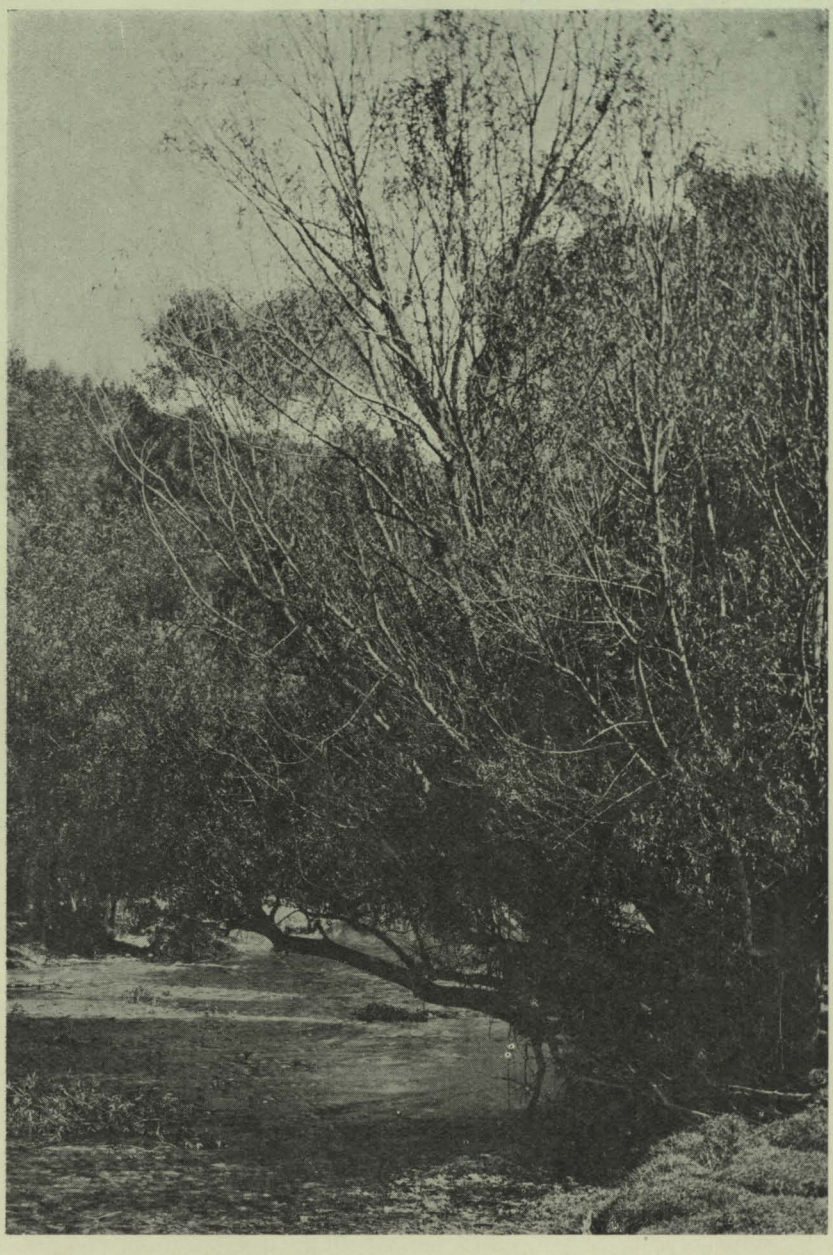
[*W. C. Davies, photo.*

Weeping-willow (*Salix babylonica* L.) badly diseased with *Marssonina salicicola* (Bres.) P. Magn. Note loss of "weeping" habit, except in branch at top right hand, which is still more or less normal.

[*W. C. Davies, photo,*

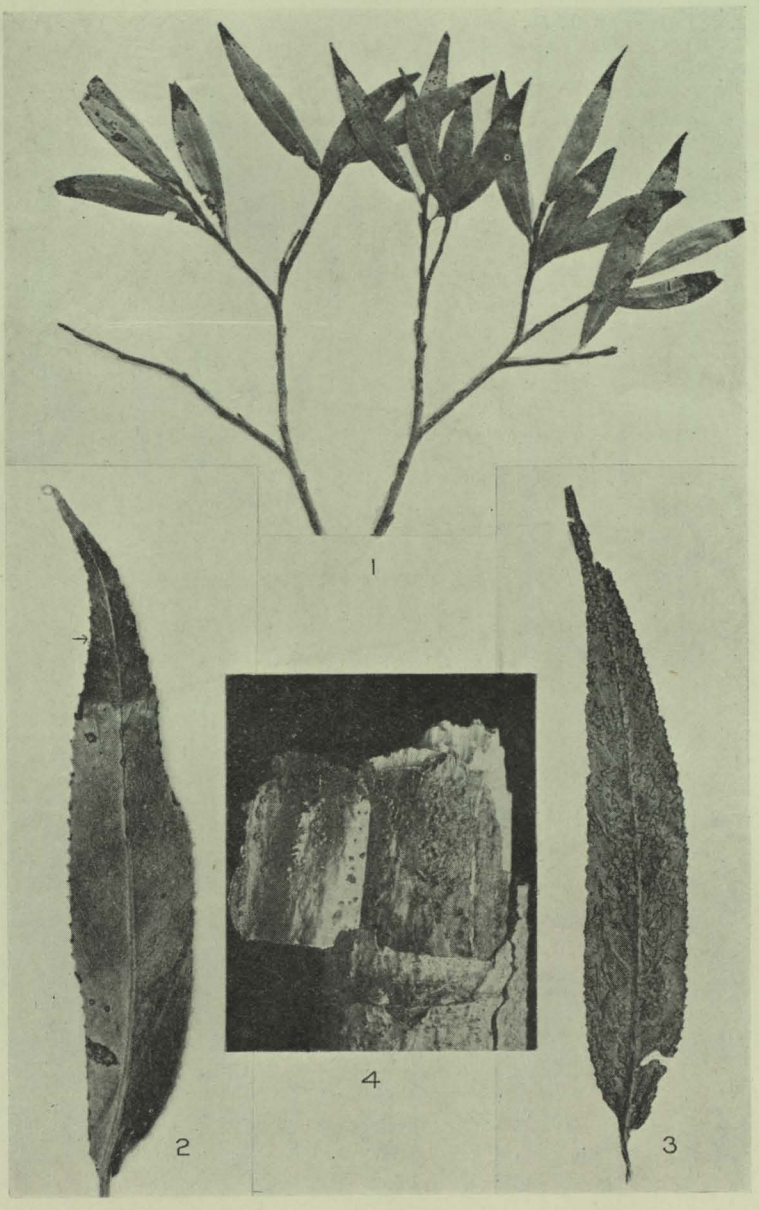
Marssonina salicicola (Bres.) P. Magn. on *Salix babylonica* L.

FIG. 1.—Dark spots on young twig producing the first acervuli.
FIG. 2.—Older twig covered with cankers.
FIG. 3.—Lower side of leaf covered with spots.
FIG. 4.—Young twig showing the stage of first infection, which takes place immediately after the opening of the buds.
FIG. 5.—Part of twig in fig. 4 enlarged to show infected bud-scales and canker on the stem, from which infection of the young leaves has probably taken place.



[*W. C. Davies, photo.*

Macrophoma 'Salicis Dearn. & Barth. on a crack-willow (*Salix fragilis* L.) which is losing all its leaves early, while a healthy crack-willow in the left background is still green.



[*W. C. Davies, photo.*

FIG. 1.—*Macrophoma Salicis* Dearn. & Barth. killing tips of leaves of *Salix fragilis* L. The small round spots scattered over the leaves are caused by *Gleosporium Capreae* Allesch.

FIG. 2.—*Macrophoma Salicis* Dearn. & Barth. on tip of leaf of *Salix fragilis* L. An arrow indicates the position of some of the numerous small pycnidia in the infected area.

FIG. 3.—*Gleosporium Capreae* Allesch on leaf of *Salix fragilis* L. Note the tendency of the pustules caused by the fungus to follow the veins of the leaf, and of the diseased areas to fall away from the leaf. The minute black dots on the blotches indicate the acervuli.

FIG. 4.—*Gnomonia bullata* n. sp. on dead twig of *Salix babylonica* L. On the surface of the twig may be seen the pustules caused by the beaks of the perithecia raising and piercing the epidermis. The round bases of the perithecia, some of which are dry, showing the concave manner of collapsing, are exposed on the underside of the bark, which has been partially stripped off; while the depressions left by them may be seen on the wood.

curved and form short curved white cirri. In all these points this common species differs from that which occurs in the Nelson district, while, on the other hand, a less common species, *Gloeosporium Capreae* Allesch., is very similar.

Gloeosporium Capreae Allesch. (Sacc., *Syll. Fung.*, 14, p. 1010.)

Spots epiphyllous, large, indeterminate, covering almost the whole leaf, brownish-grey then becoming pale; acervulus epiphyllous, minute, in dense clusters of various shapes, covered by the epidermis, fairly often confluent, black; conidia oblong, straight or slightly curved, obtuse at both ends, hyaline, continuous, often guttulate, varying in size, 6–16 × 2–4 mmm.; conidiophores narrowed above, hyaline, continuous, 15–20 × 1–1·5 mmm.

On still-attached or fallen leaves of *Salix Capreae*, Munich, Bavaria.

If this diagnosis is compared with that given for the local species it will be seen that they differ in two points. In the first place, the conidiophores in the local species are light-brown in colour; and, in the second place, while the measurements of conidia of average size coincide in the two cases, those at the extreme of the range tend to be longer and narrower in *Gloeosporium Capreae*. The fact that the latter species occurs on *S. Capreae*, while the local species was found on *S. fragilis* and *S. babylonica*, suggests that the difference may be due to the effect of the different hosts. The coincidence in the size of the average conidia of the fungus in the two cases, and the fact that, although there is colouring in the conidiophores of the local species, it is not deep, suggest that these variations are not sufficient to justify the exclusion of the local species from *Gloeosporium Capreae*.

Fukushi (1921, p. 1) has recorded a disease of *Salix purpurea* var. *angustifolia* in Japan due to *Physalospora Miyabeana* n. sp. and its conidial form *Gloeosporium*. No *Physalospora* has been found in connection with the local species, nor have any twigs been seen here with the cankers which are so marked a feature of the disease in Japan. The appearance of the spots on the leaves caused by the Japanese species differs from that of the species found here. Also, the latter, on the whole, agrees more closely with *Gloeosporium Capreae* Allesch., as which species, therefore, it is, in the opinion of the writer, to be regarded.

Gnomonia bullata n. sp.

Perithecia black, scattered or more often gregarious (occasionally two perithecia may be found with the beaks united), sunken in the bark, which when wet may be stripped off the wood, carrying with it the globose perithecia, the round shining black bases of which are then exposed, the bases contracting inwards when drying (Plate 11, fig. 4); beak straight or bent, 100–390 mmm. long × 230–330 mmm. broad, narrowed above, perforating the periderm and raising the epidermis to form a little round pustule through which the tip of the beak projects (text-fig. 5), thickened and swollen flask-shaped below, consisting of small blackish compressed angular cells which are smaller and arranged in parallel-fibred structure bordering the central canal, which is usually bent spirally or may be straight; wall of the perithecia of two layers, the outer consisting of several rows of blackish angular thick-walled cells, the inner of several

rows of thin-walled hyaline parenchymatous cells which are often compressed laterally (text-fig. 6).

Asci 70–100 × 12–17 (most 14–16) mmm., clavate, narrowed at the apex, sharply attenuate below, having in the young ascus a long filiform stalk which in the mature stage breaks off or becomes swollen and shortened though usually still basally attenuate; wall of ascus very thin, except at the apex, where it is thickened and opens by a pore, 8-spored, distichous; paraphyses absent (text-fig. 7).

Spores oblong-elliptical, some obtusely rounded at both ends, others somewhat rounded-fusoid, straight, more often unequal-sided or slightly curved, uniseptate, slightly constricted by the septum which is at or near the centre, hyaline, 16–23 × 5–7 mmm., contents granular or guttulate.

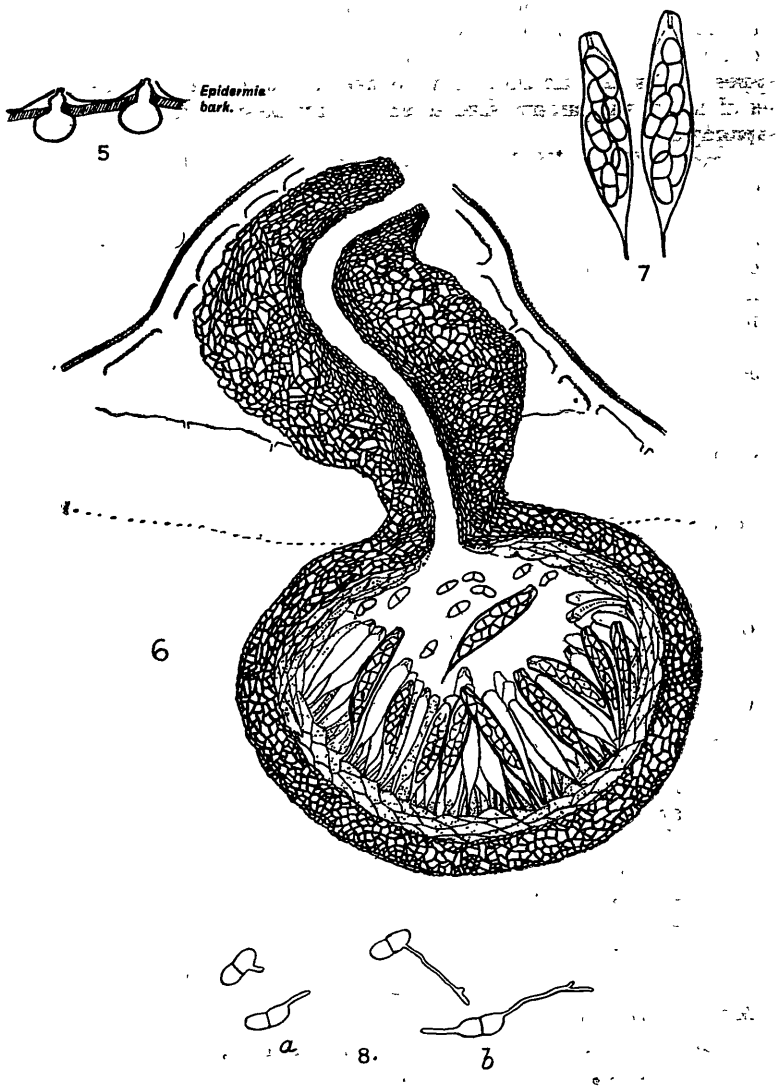
On dead twigs and branches, still attached, of *Salix babylonica* and *Salix fragilis*, Nelson, 15th September, 1923.

Throughout the district this is one of the commonest saprophytes occurring upon dead twigs and branches still attached to the trees, particularly on those twigs which have died the season before It occurs more frequently and abundantly upon the weeping-willow than on the crack-willow.

Species. — The species differs markedly from *Gnomonia pleurostyla* Auersw., the one species of *Gnomonia* recorded by Saccardo (*Syll. Fung.*, vol. 1, p. 569) for the willow. *G. pleurostyla* is found on dead leaves; the asci are six-spored, the spores filiform lance-shaped, 50–55 × 2 mmm. Winter, in Rabenhorst's *Krypt. Fl.* (1887, p. 589), gave *G. apiculata* (Wallr.) Wint. on the willow, but expressed a doubt as to whether the species really belonged to this genus; and later Petrak (1921, p. 176) showed that it was identical with a species of *Cryptodiaporthe* on *Populus*, and that it should therefore be called *Cryptodiaporthe apiculata* (Wallr.) Petr. Petrak (1921, p. 180) has also transferred *G. salicella* (Fr.) Shroet. to *Cryptodiaporthe salicella* (Fr.) Petr. E. M. Doidge (1924, p. 56) records *Gnomonia* sp. upon *Salix* sp. in South Africa, but gives no diagnosis and does not state the species. Moesz (1918, p. 60) describes *G. salicina* n. sp. upon dead branches of *Salix alba*. Unfortunately, this paper is not available. These are the only records of species of *Gnomonia* found upon *Salix*, and a comparison with the other species of *Gnomonia* found on different hosts shows that the species found here does not agree entirely with any of them, and in the absence of Moesz' paper it seems justifiable to separate it as a new species.

Relationship to other Fungi.—As this fungus so frequently occurs on dead still-attached twigs which were infected with *Marssonina* the season before, the question arises whether this may be the ascigerous stage of the fungus of which *Marssonina* is the conidial stage. This is not unlikely, as Klebahn (1905, p. 336) has demonstrated by cultures and ascospore infection the connection between *Gnomonia leptostyla* and *Marssonina juglandis* (on the bitter-nut *Juglans cinerea*). On the other hand, other species of *Gnomonia* have been shown to have different conidial forms, chiefly *Gloeosporium*, *Asteroma*, and *Leptothyrium*. Of these genera, *Gloeosporium Capreae* has been found on Nelson willows. According to Klebahn (1918, p. 317), the conidial forms of *Gnomonia* belong to the Melanconiaceae, so either *Marssonina salicicola* or *Gloeosporium Capreae* may prove to be the conidial form of *Gnomonia bullata*.

The fungus germinates very readily in water (four hours), (text-fig. 8), in nutrient agar (turnip, willow, &c.), and in a solution of soluble substances



FIGS. 5–8.—*Gnomonia bullata* n. sp.

5. Perithecia. × 10.
6. Perithecium (type with bent beak); epidermis and bark indicated. × 120.
7. Asci. × 330.
8. Spores germinated in water—(*a*) after four and a half hours; (*b*) after eight and a half hours. × 330.

from the willow. Healthy cultures of vegetative growth were readily obtained and watched to see if conidial stages would be produced, with a view to proving whether or no this *Gnomonia* were connected with the *Marssonina* so common on the same trees, or with the *Gloeosporium* common on *Salix fragilis*. So far none of the cultures have produced spores. It is also intended to undertake inoculation experiments to see if one of the parasitic diseases may be produced by this common saprophyte.

Petrak (1921, pp. 176, 180) has proved that several recognized species of *Gnomonia* belong to the genus *Cryptodiaporthe*, and the question arises whether the one under consideration may also belong to the latter genus, as in some cases two perithecia were found with their beaks partially or completely joined and having a common mouth, and there is always a marked thickening round the beak, which suggests the possibility of a rudimentary stroma, of which, however, there is no other sign. A great quantity of material has been available, and careful examination has not furnished any evidence in favour of this view. Except in the instances mentioned, perithecia were separate, although crowded; the type of perithecium and the structure of the ascus have the marked characteristics of *Gnomonia*, in which genus the fungus has been placed.

SOME SAPROPHYTIC FUNGI FOUND ON THE WILLOWS IN THE NELSON DISTRICT.

Sphaeriales.

Cryptodiaporthe salicella (Fr.) Petr.

Dead twigs of *Salix fragilis*. Toitoi Valley, Nelson, 25th October, 1923.

(?) *Leptosphaeria Salicinearum* (Pass.) Sacc.

Dead leaves of *Salix babylonica*. Nelson, 20th June, 1923.

Leptosphaeria Salicinearum is the only species of this genus recorded on willow-leaves, but no measurements of asci or spores are given in its description. The specimens found here agree essentially with Saccardo's description on such points as he mentions. The spores are distichous, 3-septate, not or hardly constricted, fusoid, mostly curved, 16–29 × 4–7 mmm., yellowish or light olive. The local species is placed tentatively under *Leptosphaeria Salicinearum* (Pass.) Sacc., although lack of detail in the description given by Saccardo prevents final confirmation.

Metasphaeria orthospora Sacc.

Dead wood, *Salix babylonica*. Wakapuaka, 3rd July, 1923; Maitai Valley, 10th August, 1923.

Dead wood, *Salix fragilis*. Maitai Valley, 17th August, 1923.

The spores of the local specimens are more constricted at the median septum, but not at the other two septa, than in those described by Saccardo.

Pleospora herbarum (Pers.) Rabh.

Dead fallen leaves, *Salix babylonica* and *Salix fragilis*. Common throughout the Nelson district.

Dead tips of living leaves of *Salix fragilis*, the tips having been first killed by *Macrophoma Salicis*. Appleby, 8th February, 1923.

SPHAEROPSIDALES.

Macrophoma Salicaria (Sacc.) Berl. & Vogl. (Text-fig. 9.)

Common on dead twigs, *Salix babylonica.* Wakapuaka, 12th February, 1923.

Common on dead twigs, *Salix fragilis.* Maitai Valley, Nelson, 12th September, 1923.

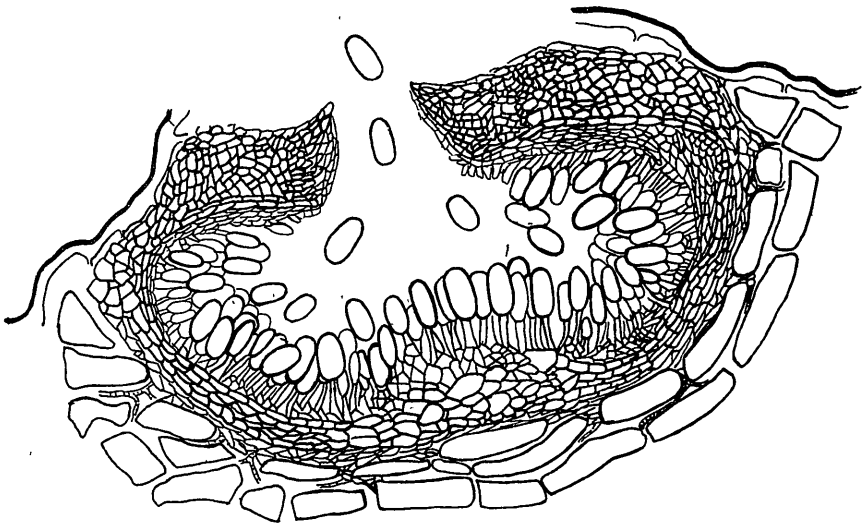


FIG. 9.—*Macrophoma Salicaria* (Sacc.) Berl. & Vogl. on dead wood of *Salix babylonica.* Section through pycnidium with spores. × 240.

Diplodia salicina Lev.

Dead twigs, *Salix babylonica.* Maitai Valley, Nelson, 21st September, 1923.

Dead twigs, *Salix fragilis.* Toitoi Valley, Nelson, 19th September, 1923.

The range of spores was 20–28 × 10–13 mmm. The *Sphaeropsis* stage was often present.

MELANCONIALES.

Coryneum Salicis Togn.

Decaying leaves, *Salix fragilis.* Appleby, 1st July, 1923.

Dead twigs still attached to the tree. Toitoi Valley, 19th September, 1923.

The specimens found differ from the type in having in most cases only the lower cell pale, the upper being the same colour, fuliginous, as the middle cells.

Hyaloceras Saccardoi (Speg.) v. Hoehn. (Text-fig. 10.)

Dead twigs and leaves of *Salix babylonica.* Appleby, 8th October, 1923.

As the only species of this genus recorded on *Salix* is *Hyaloceras excipuliformis* Bubak, which differs from the species found in Nelson in general appearance and in having only three septa and smaller spores, while the local species agrees with the description of

Hyaloceras Saccardoi (Speg.) v. Hoehn. upon *Quercus* except in the smaller details of measurement of cilium and stalk, the local species is therefore referred provisionally, because of the lack of relationship between the two hosts, to *Hyaloceras Saccardoi* (Speg.) v. Hoehn.

The measurements of the Nelson specimens are as follows: Conidia 16–22 × 6–7 mmm. (most 18–20 mmm. long), 4-septate, constricted; one cilium 12–24 × 0·5–1 mmm. on upper cell; persistent conidiophore 20–30 × 0·5–1 mmm.

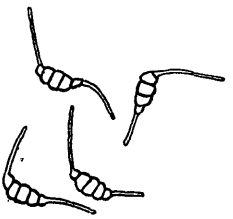


FIG. 10.—Spores of *Hyaloceras Saccardoi* (Speg.) v. Hoehn. on *Salix babylonica*. × 330.

Pestalozzia funerea Desm.

Dead twigs, *Salix babylonica*. Nelson, 19th September, 1923.

As the local specimens of *Pestalozzia* differ markedly from the species of that genus already recorded for the willow, while they have all the characteristics of the common species *Pestalozzia funerea* Desm., they are referred to that species, which, although occurring on a wide range of hosts, has not hitherto been recorded on *Salix*.

The writer's thanks are due to Dr. Curtis, of the Cawthron Institute, for assistance and advice, and to Mr. Davies, of the Cawthron Institute, for the photographs.

LITERATURE CITED.

DEARNESS, J., 1917. North American Fungi. *Mycologia*, vol. 9, pp. 345–64.
DIEDICKE, H., 1913. Noch einige "Leptostromaceen," die Nectroideen, Excipulaceen, und Melanconieen. *Ann. Myc.*, vol. 11, pp. 528–45.
DOIDGE, E. M., 1924. A Preliminary Check-list of Plant-diseases in South Africa. *Bot. Surv. S. Africa, Memoir No. 6*, pp. 1–56.
ENGLER, A., UND PRANTL, K., 1897. *Die naturlichen Pflanzenfamilien*, 1 Teil, 1 Abt.*
—— 1900. *Die naturlichen Pflanzenfamilien*, 1 Teil, 1 Abt.**
FUKUSHI, T., 1921. *Physalospora Miyabeana* n. sp. and its Conidial Form (*Gloeosporium*) injurious to *Salix purpurea* var. *angustifolia* in Japan. *Ann. Phytopath. Soc. Japan*, vol. 1, No. 4, pp. 1–11. (Reference consulted: *Int. Rev. Sci & Pr. Agr.*, 1921, vol. 12, p. 1492.)
KLEBAHN, H., 1905. *Cent. Bak.*, vol. 15, p. 336.
—— 1918. *Haupt- und Nebenfruchtformen der Askomyzeten*, pp. 178–317.
MAGNUS, P., 1906. Notwendige Umänderung des Namens der Pilzgattung *Marssonia* Fisch. *Hedw.*, vol. 45, pp. 88-91. (Reference consulted: *Ann. Myc.*, 1907, vol. 5, p. 294.)
MOESZ, —, 1918. (*Botanikai közlemények*, p. 60.)
PETRAK, F., 1921 Mykologische Notizen, 3, *Ann. Myc.*, vol. 19, pp. 176-223.
POTEBNIA, A., 1910. Beiträge zur Micromycetenflora Mittel-Russlands. *Ann Myc.*, vol. 8, pp. 42–93.
RABENHORST, L., 1887. *Kryptogamen Flora von Deutschland, Oesterreich, und der Schweiz:* Ascomycetes, vol. 1, Abt. 2.
—— 1901–3. *Kryptogamen Flora von Deutschland, Oesterreich, und der Schweiz:* Fungi Imperfecti, vol. 1, Abt. 6–7.
SACCARDO, P. A., 1882–1911. *Sylloge Fungorum*, vols. 1–20.