On the Life History of the Rose Blotch Fungus. Studies from the Pathological Laboratory:
VIII

Author(s): N. L. Alcock

Source: *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)*, Vol. 1918, No. 6 (1918), pp. 193-197

Published by: Springer on behalf of Royal Botanic Gardens, Kew

Stable URL: <http://www.jstor.org/stable/4118517>

Accessed: 26-06-2016 14:45 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
<http://about.jstor.org/terms>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Royal Botanic Gardens, Kew, Springer are collaborating with JSTOR to digitize, preserve and extend access to *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)*

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6]

[1918

XVIII.—ON THE LIFE HISTORY OF THE ROSE
BLOTCH FUNGUS.

STUDIES FROM THE PATHOLOGICAL LABORATORY: VIII.

N. L. ALCOCK.

(With Plate.)

The fungus *Actinonema rosae* is familiar to all rose growers in this country who know only too well the black blotches it produces on the leaves of many kinds of roses. All through the summer and autumn months it produces conidia in great abundance, infecting the new foliage of growing shoots as fast as it develops. The fungus not only greatly disfigures the rose foliage, but it actually weakens the shoots through the destruction of the leaf tissues and the premature defoliation which bad attacks bring about.

In devising methods of control there has always been a difficulty, since mycologists until recently have been without information as to its method of hibernation and the origin of the new attack each season. Recently this problem has been solved for the United States through Dr. F. A. Wolf, of Cornell University, having found an ascigerous stage on the dead leaves (Bot. Gaz. 1912, Sept. p. 218). The perithecia mature in April, discharging ascospores which infect the young foliage as it unfolds. To this form Dr. Wolf has given the generic name *Diplocarpon*. The new genus belongs to the family *Microthyriaceae* (*Perisporiales*). This family is characterised by having perithecia which are shield-shaped, flat, with a round pore at the apex and a membrane formed only on the upper side. Dr. Wolf examined other genera of this family, but came to the conclusion that the fungus was sufficiently distinct to be regarded as a distinct genus. His observations on the conidial stage show that the genus *Marsonia* (to which Professor Trail referred the fungus in 1889, see *Scottish Naturalist*, vol. iv, N.S. 1889-90, p. 73, and with which it agreed in some respects) was not altogether suitable for its reception.

The development of an ascigerous stage does not seem to take place in Great Britain, for though it has been repeatedly searched for, it has not yet been found. In 1916 leaves of roses affected with Black Blotch and collected at Lyndhurst in September were

(5440.) Wt. 196—794. 1,125. 8/18. J. T. & S., Ltd. G. 14. Sch. 12.

VI.

ACTINONEMA ROSAE.

To face page 193.]

brought to Kew and kept out of doors under fairly natural conditions. When examined in spring no ascigerous stage had appeared nor has any British botanist, as far as we know, succeeded in finding perithecia.

When pruning roses this spring patches of discoloured tissue were noticed on the young wood of the previous season, apparently caused by some fungus trouble. The variety on which they occurred was Juliet. On examination these were found to contain abundant mycelium and compact masses of fungus-tissue bearing spores of *Actinonema rosae*.

Description of infected wood.—The infected areas present a blackened, blistered appearance dotted with pustules (Plate VI), the fungus forming a stromatic cushion or pad below the cuticle (Figs. I & II). The mycelium itself is colourless, and was, as far as the material showed, confined to the cortex, where it developed considerably and killed the tissues. The spores and conidiophores of the sorus or acervulus (Fig I) stand out clearly amid the surrounding cells, the contents of which become dark, and in later stages completely disorganised. If one of the stromatic cushions be sectioned it will be found to be composed of a thick mass of closely interwoven hyphae which develops immediately beneath the cuticle and forces it upwards until it is finally ruptured (Fig. II). In spring the mycelium gives rise to numbers of short conidiophores at right angles to the cushion. The

Text fig. 1.—Section through the cortex of a one-year old shoot showing young acervulus with conidiophores and spores. $\times 200$.

Text fig. 2.—Section through dormant cushion on a one-year old rose shoot showing compact mycelial tissue commencing to give rise to spores in spring. $\times 200$.

conidiophores bear spores which are precisely similar to those formed on the leaves, namely, hyaline, 2-celled, and oval to elliptic in shape. In size they vary a good deal, being 17-26 μ long by 5-6 μ . They are somewhat constricted at the septum, and occasionally the two cells separate and function as two distinct spores. The spore-bearing layers were found not only in the outer cortical tissues, but also in cavities situated deep in the cortex, and formed apparently by the development of mycelium. The fungus produces spores in profusion in these spaces, the conidiophores in many cases lining both sides of the spaces, and thick mycelial cushions may even occasionally be developed. When the spores mature, they are apparently liberated into the central cavity.

In the case of rusts, internal sori are not uncommon, and have been found in *Uromyces caryophyllinus*, *U. caladii*, *Puccinia graminis*, *P. glumarum*, and others. *Cronartium ribicola* occasionally forms teleutospores deep in the tissue of the petiole, and the teleutospores have been found to be living after a considerable time, even in comparatively dry conditions (*see* Colley, Journ. Agric. Research, vol. viii, 1917, pp. 329-332; Adams, Mycologia, vol. viii, 1916, pp. 181, 182).

A feature of interest in connection with the above discovery is the fact that the difference in the methods of hibernation in England and the United States is exactly comparable to that which occurs in these two countries in the case of the Apple Scab fungus (*Venturia inaequalis*).

In Germany and America the scab fungus has been found to produce perithecia in the dead tissues of the leaves and to liberate ascospores in spring (Aderhold, Ber. Deut. Bot. Gesell., vol. xii, pp. 338-342; Wallace, Cornell University Bulletin No. 335, 1913). In England the ascigerous stage, though often sought for, has never been found. In 1906, however, Mr. Salmon discovered that the *Fusicladium* stage formed mycelial cushions on the young wood which remained dormant till spring, when they produced and liberated spores (Gard. Chron., July 14, 1906, p. 21; Journ. S.E. Agric. Coll., Wye, 1907, p. 291). The cushions produced by *Actinonema rosae* are precisely comparable to those of *Fusicladium*, and function in the same manner. It should however, be mentioned that since Mr. Salmon's paper appeared, specimens of apple and pear twigs bearing the same cushions have been found in some of the Atlantic States (Maine Agric. Expt. St. Bulletins No. 223, 1914; No. 252, 1916; Phytopathology, vol. iii, p. 265, 1913).

Varieties Attacked.—The season was well advanced (April) when the infection on the young wood of Juliet was first observed, consequently roses in most gardens had already been pruned and it was not possible to obtain much further material, or a full list of varieties which are infected in this manner. The fungus is scarce in the Royal Botanic Gardens, Kew, and soon apparently dies out if introduced in the neighbourhood. A visit was therefore paid to the Royal Horticultural Society's Gardens at Wisley where, thanks to the kind help afforded by the Superintendent,

Mr. S. T. Wright, the following varieties were found to be attacked on the wood, Madame Ravary, La Tosca, Mrs. David Jardine, Gruss an Teplitz, which are all hybrid teas, and Juliet. The last named is an Austrian Briar—tea hybrid, and it apparently inherits from the Austrian Briar a great tendency to black blotch.

Control Methods.—The discovery of the winter stage on the wood necessitates a modification in the methods of control. Up to the present, owing to lack of information as to its behaviour in Britain and from the fact that ascospores are produced in America on the old leaves in spring, stress has always been laid on the collecting and burning of diseased leaves. As far as is known, however, this is not of avail for this country,* and the attention of the cultivator should be turned to the use of the pruning knife. The plate shows the close proximity of the delicate young foliage to the spore pustules, and demonstrates the ease with which it would be infected. Pruning, however, will need to be carried out with care as the requirements of the different groups of roses will have to be studied in addition to the necessity of removing all affected wood. As far as has been observed the old pustules on the two-year old wood become effete, and do not bear spores. Attention need therefore only be concentrated on the wood of the previous season. It should, however, be remembered that not all brown specks and spots on rose wood are due to *Actinonema*, and in case of doubt specimens should be examined microscopically.

With regard to spraying, liver of sulphur has been recommended in this country, but in many cases without much success. This was probably partly due to its being applied late in the season, when the fungus had obtained a firm hold on the tree. Experimental work on spraying has been carried out in America, and a series of trials conducted by Mr. L. M. Massey at Ithaca (Phytopathology, vol. viii, no. 1, Jan. 1918, p. 20) showed that dusting repeatedly with a powder composed of 90 parts finely ground sulphur and 10 parts powdered arsenate of lead was very effective in controlling blotch. In these trials the trees were dusted eight times during the season. The next most effective agents were found to be Bordeaux mixture 5-5-50, and lime sulphur, but both of these much disfigured the trees.

In gardens which suffer severely from black blotch it would be advisable to spray or dust the trees with fungicide, even though they had been carefully pruned, since some pustules are almost certain to escape attention, and spores might moreover be carried by the wind from neighbouring gardens. It is most important to commence spraying early so as to prevent the fungus obtaining an entry into the leaves, as when once this has been effected the mycelium continues to grow between the tissues and the blotches inevitably follow. To keep the bushes absolutely clean it will,

* Since the above was written infected leaves which had remained green throughout the winter have been observed on various kinds of roses bearing abundant conidia. The collecting and burning of such leaves remains, therefore, a valuable control measure.

judging from the American experiments, probably be necessary to spray at intervals of about a month.

EXPLANATION OF PLATE VI.

Actinonema rosae. Portion of one-year old rose shoot "Juliet" in April, showing the winter infection of the stem.

XIX.—THE OIL PALM IN THE CAMEROONS.

The "Ergänzungsheft" No. 13 of "Mitteilungen aus den Deutschen Schutzgebieten," Berlin, 1917, is occupied by an exhaustive account of the grass highlands of the North-west Cameroons, by Kurt Hassert, illustrated by two maps and some plates of photographs. This, which is only the first part and consists of 144 pages, deals with the physical geography of the region and its plant formation. Under the heading useful wild plants, accounts are given of rubber, kola, cotton and oil palm.

The section dealing with the Oil Palm in the Cameroons (pp. 115-120), includes some information not previously published in this *Bulletin*. One of the maps shows the distribution of the different types of flora and in addition the localities where oil palm and kola are abundant are clearly indicated.

The oil-palm (*Elaeis guineensis*) occurs in the Cameroons principally in the lowlands occupied by primeval forest. Districts economically important for its produce near the coast are Duala, Jabassi, Edea and Rio del Rey, while further inland the territories of Bakundu, Kabo and Bangwa produce this palm in remarkable abundance. Extensive areas of grassy highlands are also rich in oil-palms, and the trees form a marked feature of declivities where a transition from grassland to forest takes place, the palms occurring in such quantity on the edge of the slope as to form woodlands.

Forest of nearly pure growth of oil-palm occupies large stretches of ground in various localities, e.g., on declivities of the Bambuto Range, and in valleys of the Mbo Mountains.

There is a striking paucity of oil-palms in the Southern highlands of Dschang, and this feature becomes more and more pronounced as one follows the grassland eastward.

The mode of occurrence of the palm varies greatly. Thus it grows wild or half-wild, and scattered as numerous isolated specimens in primary or secondary forest or on farmlands. It is also found forming groups in valleys and on slopes of mountains, or, as mentioned above, it may constitute almost pure palm-forest. Another mode of occurrence is as a dense zone around a village, being kept in this case in a state of semi-cultivation. The Banyang villages are encircled by oil-palms in this way.

Besides a high temperature, the special requirement of the tree is sufficient moisture, only scanty produce being yielded when the rainfall is less than 100 or 150 cm. The tree is fairly sensitive to drought, when the latter is somewhat prolonged; but otherwise it is relatively adaptable. Thus it not only grows in abundance in the forest-lowlands, which are warm and damp, being subject to much rain, but it also occurs on the grasslands