

Studies within the Genus Cercospora.

To the Plant Pathologist the genus *Cercospora* is of interest for its large size and variability, for its wide range of hosts, for the stage which its component species have reached in the evolution of parasitism, and for its economic importance, both actual and potential. The first mentioned character, size and variability, is shown by the large number of species described by the older workers towards the end of the last century. Since then the description of new species has continued with decreasing frequency, and very little "lumping" has been effected, so that well over 500 species are recognised by modern morphologists. Recent attempts have been and are being made to construct keys for the separation of these species on morphological characters, but the usefulness of these attempts has been questioned on the grounds that much if not most of the variation observed is due entirely to the influence of the host plant and of the environment. Welles<sup>6</sup> in particular has questioned the validity of spore measurements in helping to determine species, and has shown that very wide variations in length of spore can be induced by varying the humidity of the atmosphere in which they are produced. He has, moreover, performed cross inoculation experiments, some of which seem to throw doubt on the rigid specialisation which is usually assumed for species of the Genus. He appears to pay no attention, however, to other morphological characters which are used by modern workers for the separation of the species.

The great morphological variability observed within the genus *Cercospora*, argues great activity of the evolutionary

process, and it would be reasonable to expect similar variability in the stage which different species have reached in the evolution of the parasitic habit. This is confirmed by observation, since a series of gradations between almost pure saprophytism and true parasitism can be observed within the Genus. C. eruenta, C. Stizolobii Syd., and C. Nicotianae E. & E. for instance, are recognised as occurring only on leaves which are already dying of old age, whereas C. roaaecola Pass. C. Sesami Zimm. and C. atricineta H. & W. are found also on comparatively young leaves. The occurrence of *Cercospora* may even serve as a useful index of the physiological state of the host tissue; thus the abnormal abundance of C. coffeicola B. & C. on Coffea arabica is often taken as evidence of bad cultural conditions, and particularly of over-exposure. An alternative explanation of the non-occurrence of *Cercospora* on the younger leaves of many of its hosts in the presence of abundant sources of infection may be sought in structural causes preventing infection. Thus the presence of a waxy covering on the leaves, which wears off with age, may preclude the possibility of infection by preventing the adherence of the necessary drops of water to the surfaces of the younger leaves. Some evidence on the question of stomatal or cuticular infection must be obtained before this point can be pursued further. Thus if infection is stomatal, size of stoma may be the determining factor, and the physiological state of the leaf tissues will only be important in so far as it affects the degree of stomatal opening. The resistance of the cuticle to penetration, however, may be more profoundly influenced by the physiological state (e.g. turgidity) of the tissue. It may be further suggested that a study of the physiology of parasitism within the genus *Cercospora* would help to throw light on the broader question of whether there is any interdependence between efficiency

and specialisation in the evolution of parasitism.

From the extremely localised and restricted nature of the lesion caused by a single infection of *Cercospora*, it is evident that it is only in conditions particularly favourable to its multiplication and spread that a species can become of serious economic importance. *C. beticola* is the only species against which large scale control measures are employed in the temperate and subtropical countries, and perhaps *C. Musae* which causes the "Sigatoka" disease of Bananas in Australia is the only tropical species of comparable importance. The presence of abundant spots on leaf such as those caused by *C. personata* on *Arachis hypogea*, undoubtedly reduces the effective photosynthetic area considerably, but in most cases the growth of the host plant keeps pace with any premature defoliation which may be caused. Horticultural plants may be weakened and rendered unsightly in a few cases (e.g. *C. atricineta* on Zinnias). *C. Nicotianae* is one of the few which may become important in Agriculture under special conditions, but it is usually effectively controlled by stripping off the lowest leaves at topping time. On a cover crop, such as *Stizolobium atterimum*, *Cercospora* may even be considered to be beneficial, hastening as it does the early stages of decay of the old leaves. On the College Farm *C. Sesami* has been observed to be particularly destructive in wet conditions. By the rapidity of its spread through a small plot of *Sesamum indicum* on Field 8 in January, it was at first thought to be the bacterial disease caused by *B. solanacearum*, which has recently been reported to occur in Trinidad. This organism was not encountered either in isolation or microscopic work, however, but only the spores and conidiophores of a *Cercospora*, with which successful inoculations have been performed from cultures. (see below).