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ART. IX.—*Pitting Disease of Bananas in Australia.*

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Introduction.

Pitting disease of bananas, known as the cause of serious wastage in Brazilian fruit, has been found to occur in Australia and to be caused by the same fungus, *Piricularia grisea* (Cke.) Sacc.

Historical.

Pitting disease was first recorded on Brazilian bananas by Tomkins (4), who isolated a species of *Pestalozzia* from the spots but failed to re-infect bananas. Wardlaw and McGuire (6) also investigated the disease on Brazilian bananas, on the Cavendish, Giant Fig, and Silk varieties, and they were more successful, isolating repeatedly from young pits the fungus *Piricularia grisea* (Cke.) Sacc. They had isolated the same fungus in 1931 from Trinidad bananas said to be suffering from fruit spotting (5) which only occurred in one consignment, in a chilling experiment. It was not until 1933 that Wardlaw and McGuire (7) recorded pitting to any extent on Trinidad bananas (on the Dwarf, Cavendish, Giant Governor, and Gros Michel varieties). The disease does not, however, cause a great deal of wastage in fruit from the West Indies, whereas it is a source of serious loss in bananas transported from Brazil to Europe.

It was suggested by both Tomkins (4), and Wardlaw and McGuire (5) that the disease might be initiated by the bite of a fruit bug, making it possible for the fungus to gain entrance through the wounds. The latter workers drew attention to a rather similar fruit-spotting recorded for Queensland by Veitch and Simmonds (8), caused by the attack of the fruit bugs, *Pendulina fuscescens* Dist. and *P. lutescens* Dist. From their illustration, the spots appear much deeper and larger than those in pitting disease, but it is possible that smaller injuries caused by these insects on more mature green fruit could provide a suitable point of attack for the fungus *Piricularia grisea*.

Pitting has been known to cause slight damage on Cavendish bananas from Queensland for several years, but, until now, the fungus had not been isolated. The first attempts, made in Brisbane in 1932 merely yielded organisms such as *Gloeosporium musarum*, *Glomerella cingulata* and *Fusarium* spp. After noting, in the account of Wardlaw and McGuire, that *Piricularia grisea* is an extremely slow-growing organism, and that secondary

organisms rapidly invade and overgrow the spots, more care was taken in selecting young spots and in removing the surface layers of the skin. Greater success resulted, and isolations were made of a fungus corresponding with the description of *Piricularia grisea* (Cke.) Sacc.

Description of the Fungus.

It is a very slow-growing organism with short, floccose aerial mycelium, at first white, but later turning grey. Colourless, pear-shaped conidia are scattered over the surface of the aerial mycelium on rather long, narrow, sparingly branched, septate, colourless conidiophores (Fig. 1). The conidia, which are non-septate when young, become usually 2-septate, occasionally

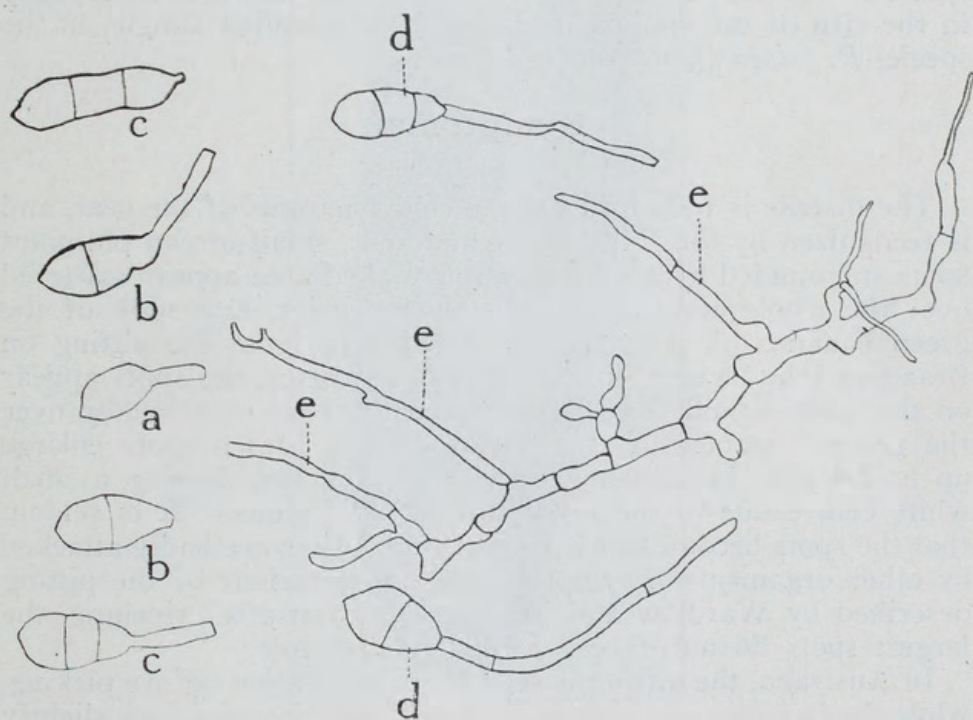


FIG. 1.—a, b, Immature conidia of *Piricularia grisea*; c, d, Mature conidia; e, conidiophore. $\times 325$.

3-septate when mature, and measure $17-34\mu \times 6-10\mu$, the average being $23\mu \times 8\mu$. The submerged hyphae tend to be much branched, with short swollen protuberances.

Cooke (1) first recorded the fungus under the name *Trichothecium griseum* Cooke. Saccardo (2) however, recognized that it was wrongly placed in the genus *Trichothecium*, and created a new genus, *Piricularia* Sacc., with *P. grisea* (Cke.) Sacc., as the type species (3).

Wardlaw and McGuire have stated that their fungus agreed completely with Saccardo's description, although their measurements for the conidia were considerably larger than those of Saccardo.

Wardlaw and McGuire ..	24-29 μ x 10-12 μ .
Saccardo	18 μ x 9 μ .

The conidial measurements for the Australian fungus fall between those of Saccardo, and Wardlaw and McGuire, the range being 17-34 μ x 6-10 μ , and the average 23 μ x 8 μ .

Several other species of *Piricularia*, viz., *P. parasitica* Ell. et Ev., *P. scripta* (Bon.) Sacc., and *P. Oryzae* Cav., have been recorded, but the descriptions show only slight differences from *P. grisea*, and it is difficult to state, without examining material and cultures, why they should have been placed as different species. It seems best, therefore, in spite of the discrepancy in the size of the conidia, to place the Australian fungus in the species *P. grisea* (Cooke) Sacc.

Symptoms.

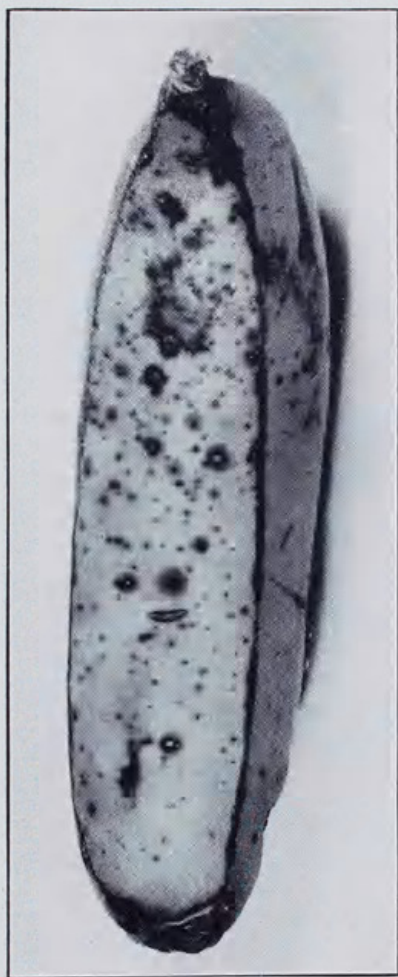
(Plate IX.)

The disease is found during the colder months of the year, and is recognized by the following symptoms: small brown pin-point spots surrounded by a narrow water-soaked area appear scattered over the whole concave surface of the finger, and stalk of the green banana. A difference is noted here from the pitting on Brazilian fruit, where, in the majority of cases, the spots appear on the cushion and finger stalk only, and very occasionally over the general surface of the banana. The brown spots enlarge up to 2-4 mm. in diameter, become sunken and develop a small white centre due to the mycelium of the fungus. It is seldom that the spots become much bigger, unless they are badly attacked by other organisms, a symptom also characteristic of the pitting described by Wardlaw and McGuire. Even after ripening, the largest spots do not exceed 5 mm. in diameter.

In Australia, the pitting is seen in the plantation before picking, while the bananas are still on the plant, and becomes only slightly exaggerated during transport and ripening. In Brazilian and Trinidad fruit, however, no sign of the spots is to be observed at picking, and they only commence to appear during the cold storage period.

Infection.

No investigations on the sources of infection have been made in Australian plantations, but it would seem probable that the spores of the fungus are washed down by the rain on to the bananas from the "transition" leaves and bracts, as is the case in Brazil and Trinidad. The fact that the pits are confined to the concave side of the banana, i.e., the side which faces upwards on the bunch, supports this view.



Pitting Disease on a
Green Banana.

Acknowledgments.

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Summary.

1. Pitting disease is found to be caused by the fungus *Piricularia grisea* (Cke.) Sacc., which produces the same disease in America
2. Previous work on the disease is discussed.
3. The fungus is described.
4. The symptoms of the disease are shown to be very similar to those on Brazilian and West Indian bananas.
5. No investigations have been carried out in the plantation in Australia.

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