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Phytophthora Heveae and Pythium Vexans of Hevea

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The pathogenicity of Phytophthora heveae *and* Pythium vexans *on* Hevea *has been tested and its economic significance is discussed.*

The pathogenicity of *Phytophthora palmivora* (Butl.) Butl. to *Hevea brasiliensis* Muell. Arg. has been recognised for long and adequately described (PETCH, 1921; SHARPLES, 1936). Literature on the morphologically distinct *Phytophthora heveae* and on Pythium spp on *Hevea* is, however, somewhat scattered and incomplete. It is reviewed here and new experimental findings are recorded.

LITERATURE REVIEW

P. heveae

In Malaysia, *P. heveae* is rarely encountered on *Hevea* though cited as the cause of black stripe and pod rot by THOMPSON (1929), of dieback by RUBBER RESEARCH INSTITUTE OF MALAYA (1950) and of pod rot of cacao by TURNER (1968). Extensive attempts to recover the fungus from diseased material have not been successful, but a few isolates have been obtained from soil collected under rubber (CHEE, 1969a). Records of the fungus have been confined to Malaysia until recently when it was reported from soil in the United States (CAMPBELL AND GALLEGLY, 1965); however, its pathogenicity was not tested. Further, a species closely resembling *P. heveae* has been found to be the cause of chestnut canker in Japan (KATSURA, 1969).

Pythium spp

A species of Pythium, later determined as *P.complectans* Braun. (SHARPLES, 1936), was attributed to be the cause of patch canker in Malaya (THOMPSON, 1925). The same disease and fungus association was reported in Indonesia (VAN SCHOONEVELDT, 1950). In India, the causative agent is given as *Pythium vexans* de Bary (RAMAKRISHNAN, 1963), which is synonymous with *P. complectans* (WATERHOUSE, 1967). HILTON (1959), however, considered patch canker to be an after-effect of lightning, Phytophthora and Pythium being regarded as secondary. CHEE (1968) showed that Pythium spp, including *P. vexans*, did not infect healthy *Hevea* bark in artificial inoculation. No Pythium species was mentioned by PETCH (1921) in his early description of *Hevea* diseases in Ceylon, neither has there been any report of its occurrence in more recent literature from that country known to the author. In Cambodia, a Pythium species was considered to be involved with black stripe, though the main pathogen was *P. palmivora* (DECONINCK, 1969). In Liberia, *P. vexans* was regarded as associated with black stripe in addition to *P. palmivora*, though reinoculation of the fungus on healthy panels failed to cause an infection (DARLEY AND SILVERBORG, 1952). Pythium spp are widespread in Malaysian soil and *P. vexans* is commonly found as saprophyte on panels or untapped bark affected by Phytophthora (CHEE, 1968).

Phytophthora leaf fall and pod rot, hitherto regarded exclusively as caused by *P. palmivora*, have recently been confirmed in West Malaysia, associated with *Phytophthora botryosa* Chee, a new species described for the first time (CHEE, 1969b). Though on several occasions *P. vexans* has been isolated from infected petioles, it has never before been isolated from twigs or fruits.

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PATHOGENICITY TESTS

Two isolates each of *P. heveae* (from soil and from a cacao pod) and *P. vexans* (from soil and from a *Hevea* panel) were tested for their pathogenicity to the tapping panel and bark or to leaves, green twigs and fruits. Inoculation of the bark of the panel or stem was by an adaptation of the method of FUNK (1965) which had been used successfully to infect panels with *P. palmivora* (CHEE, 1968). Two methods were used to inoculate detached petioles, twigs and green fruit pods. In the first method, agar discs or stripe-bearing mycelium were placed on the test material, which was kept in a humid chamber. The second method of inoculating petioles and twigs with zoospores was that described by CHEE (1969a). Pods were surface-sterilised with 0.05% aqueous mercuric chloride, rinsed three times in sterile distilled water, blotted dry, inoculated with drops of zoospore suspension and placed in a humid chamber.

RESULTS

The results of pathogenicity tests with Pythium are in agreement with the findings of DARLEY AND SILVERBORG (1952), but fail to confirm those of RAMAKRISHNAN (1963). None of the isolates (*P. heveae* or *P.vexans*) gave rise to infection on the panel or virgin bark of clones PB 86 and RRIM 605.

Reisolation showed petioles were susceptible to infection by both fungi, in either of the methods used. Twigs were immune to mycelium and zoospores of *P. heveae*, but susceptible to zoospores of *P. vexans*. Mycelium and zoospores of both species caused infection on undamaged young pods and wounded matured pods, but intact mature pods were resistant. Lesions on the petioles developed rather more rapidly with *P. vexans* than with *P. heveae*.

DISCUSSIONS AND CONCLUSIONS

It would appear that *P. heveae* cannot be considered to be a pathogen of *Hevea*. Moreover, its known distribution is restricted to soil, and no host is known. Its economic significance on other crops would appear to be slight; even on cacao, the fungus was unable to penetrate undamaged pods (TURNER, 1968). *P. vexans*, on the other hand, may be regarded as a weak parasite of *Hevea*, unlikely to be of any consequence. Though both *P. heveae* and *P. vexans* produce zoospores in abundance, they produce few sporangia which are the primary means of dispersal in this group.

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