

BROWN SPOT DISEASE OF FRENCH BEAN CAUSED BY PLEIOCHAETA SETOSA

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SUMMARY

Brown spot disease of French bean (*Phaseolus vulgaris* L.) caused by *Pleiochaeta setosa* (Kirchn.) Hughes is described for the first time. The fungus is shown by pathogenicity tests to be a wound pathogen, and abrasion by sand particles during cyclonic weather apparently predisposes the plants to infection.

Two alternative weed hosts of the fungus are *Crotalaria mucronata* Desv. and *Crotalaria goreensis* Guill. and Perr. On these the disease is seed-borne. The disease is also recorded on *Vigna sinensis* (L.) Endl. ex Hassk.

Introduction

There are numerous references in the literature to *Pleiochaeta setosa* (Kirchn.) Hughes as a pathogen of several species of *Lupinus* and *Cytisus*. Gadd (1937) recorded a leaf spot of *Crotalaria anagyroides* and determined the causative fungus as *Ceratophorum setosum* Kirchner (\equiv *Pleiochaeta setosa*). *P. setosa* has also been reported causing premature defoliation and spotting of pods of *Laburnum vulgare* Bercht. and Prsl. in New South Wales (Anon. 1953).

What appears to be the first record on French bean (*Phaseolus vulgaris* L.) was made by D. S. Teakle in 1958 from a farm at Palmwoods in south-eastern Queensland (Simmonds 1959, p. 49). Following cyclonic weather in July 1965, plantings of French beans at Petrie Creek, near Nambour in south-eastern Queensland, were observed by the author to be severely affected by *Pleiochaeta* brown spot. The disease was also recorded at Petrie Creek and Coolum in

June 1966, and was again associated with a cyclonic influence. It was observed that diseased plants were covered with sand particles splashed up by the wind-blown rain.

Wherever outbreaks of the disease occurred on French beans it was noticed that species of *Crotalaria* were growing in abundance on adjacent cultivation headlands. On examination, streaked rattlepod (*Crotalaria mucronata* Desv.) and Gambia pea (*Crotalaria goreensis* Guill. and Perr.) were found to be infected with the fungus. These two alternative weed hosts have become well established along roadsides and on cultivation headlands in south-eastern Queensland.

In June 1966, volunteer cowpeas (*Vigna sinensis* (L.) Endl. ex Hassk.) growing with infected French beans were also found exhibiting symptoms of infection with the organism. As in the case of the infected bean plants, the diseased cowpeas were covered with sand particles.

Symptoms

On French beans in the field, the fungus causes a severe spotting of leaves, stems, floral parts and pods.

The symptoms on the pods (Figure 1) are characterized by slightly sunken spots with dark brown to black centres, and lighter coloured rusty brown margins. These spots may occur on any part of the pod. Individual spots range from 1 to 2 mm in diameter, but infection is often so severe that lesions become confluent. Conidia are not produced on the pod lesions. The unsightly appearance of the pods considerably reduces their market value.

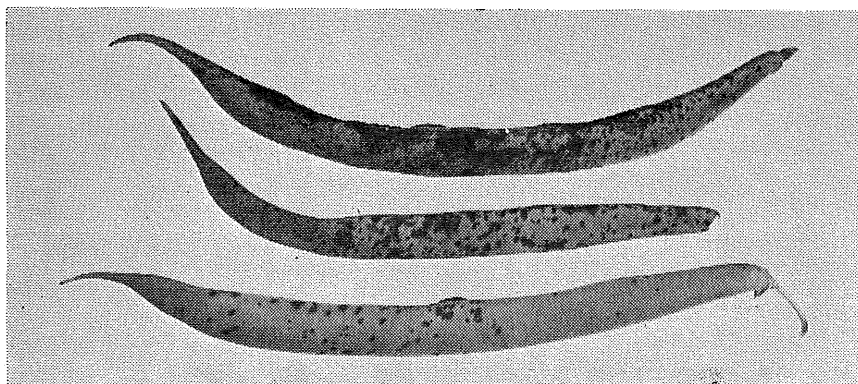


Fig. 1.—*Pleiochaeta* brown spot of bean. Natural infection of pods.

The lesions on the stems (Figure 2) and petioles range from 1 to 4 mm in length but rarely exceed 0.5 mm in breadth. Infection of the flowering parts produces very conspicuous tan spots.



Fig. 2.—*Pleiochaeta* brown spot of bean. Natural infection of stems.

The reddish brown leaf spots (Figure 3) are rarely more than 2 mm in diameter and tend to be delimited by the veins and veinlets. The centres of the lesions eventually fall out, leaving ragged holes. Invasion of the veins on the underside of the leaf also occurs, producing small dark lesions. Infection of the leaves can be so severe that premature defoliation results. Numerous conidia are borne on the leaf spots.

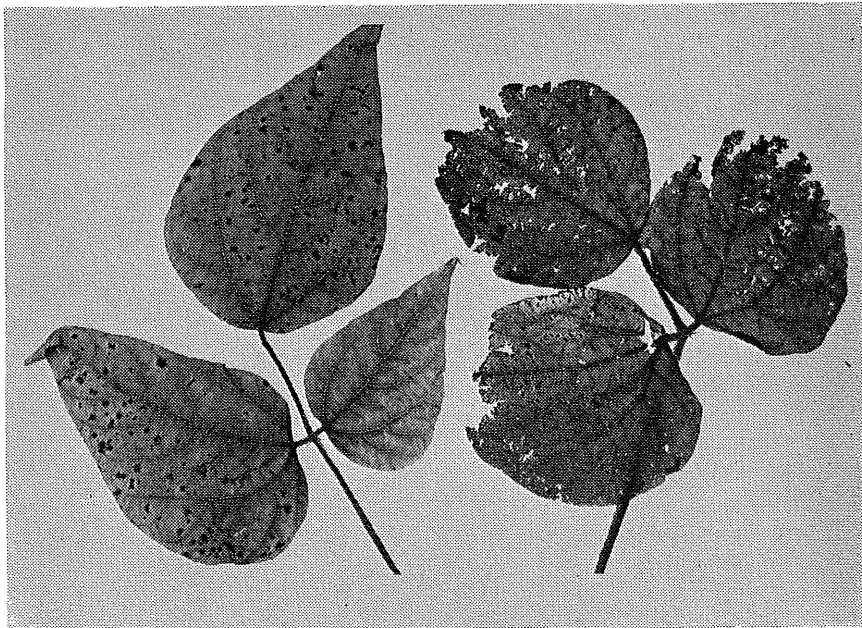


Fig. 3.—*Pleiochaeta* brown spot of bean. Natural infection of leaves.

Note ragged appearance of leaf on right.

Symptoms on streaked rattlepod and Gambia pea consist of a spotting of leaves, stems and pods. Infected pods of the former show considerable distortion (Figure 4). The symptoms exhibited by infected cowpeas are very similar to those produced on the bean.



Fig. 4.—*Pleiochaeta* brown spot on pods of *Crotalaria mucronata*.

Pathogenicity

The causal organism was isolated from typical bean pod lesions and cultured on potato dextrose agar and *Crotalaria* extract agar. In cultures the fungus produced abundant chlamydo spores but very few conidia.

An aqueous spore suspension was prepared and pathogenicity was tested on French bean, cowpea, rattlepod and Gambia pea plants. Inoculation of

uninjured and injured rattlepod and Gambia pea seedlings resulted in the development of typical leaf and stem lesions. Uninjured inoculated bean and cowpea plants were not affected. However, inoculation of bean and cowpea plants previously wounded by pricking with a needle produced typical brown spot lesions. This supports the findings of Richter (1937), who induced artificial infection of French bean pods with the fungus through wounds.

Seed Transmission

Du Plessis and Truter (1953) demonstrated that *P. setosa* is seedborne in species of *Lupinus*.

During the present investigations it was observed that seed from infected pods of rattlepod and Gambia pea were frequently discolored. When such seed was sown in steamed soil, a high percentage of infected seedlings was produced. With French bean, the causal fungus did not appear to penetrate the infected pods as far as the seed. When seed from severely spotted pods was sown in sterile soil only healthy seedlings were produced.

Discussion

In pathogenicity tests it was demonstrated that *P. setosa* is a wound pathogen of the bean. All infected plants seen in the field were covered with sand particles which had been splashed up by driving rains. It is postulated that abrasion of the host plant by these sand particles is sufficient to allow invasion by the fungus. The disease is confined to light sandy soils in the vicinity of the infected alternative weed hosts. *Pleiochaeta* brown spot has not been recorded on beans in other soil types even though infected *Crotalaria* plants are established on the cultivation headlands.

Eradication of the alternative weed hosts with a suitable herbicide appears to be the most practicable means of controlling the disease.

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