

A CROWN ROT OF STRAWBERRY CAUSED BY *PHYTOPHTHORA PARASITICA*

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SUMMARY.

Phytophthora parasitica was isolated from an unusual type of crown rot. Plants successfully inoculated showed a brown rot of the crown and a red-brown cortical rot of roots near the crown. Inoculation of green fruit produced a firm brown rot not seen in the field.

The low incidence of the disease suggests that rotation will provide adequate control.

I. INTRODUCTION.

Since February 1955 six outbreaks of an unusual type of crown rot have been detected in strawberry plants of the Phenomenal variety in Queensland. The disease has been investigated and it has been found that *Phytophthora parasitica* Dast. is responsible for the trouble. This fungus has been reported elsewhere causing a fruit rot of strawberry (Felix 1953), but apparently not a crown rot. In view of this fact, information obtained in field investigations and glasshouse experiments is now recorded.

II. SYMPTOMS.

In the field the crown rot is typified by the rapid wilting and browning-off of mature strawberry plants (Fig. I). Diseased plants occur either singly or in small scattered groups.

The symptoms on individual plants are first apparent on the older outside leaves, which become flaccid and lie prostrate instead of standing erect. Often these leaves acquire a khaki colour when they die rapidly. As the disease progresses the younger central leaves also wilt and die.

In the crown a brown rot develops at the base, and often a red-brown discoloration of vascular tissue extends away from the rot into healthy tissue. In advanced stages of attack all the crown and foliage turn brown, and on such plants the roots are invariably blackened and rotted.



Fig. 1.

Strawberry Plant Affected in the Field with Crown Rot caused by *Phytophthora parasitica*.

III. ISOLATION AND IDENTIFICATION OF ORGANISM.

Isolations were made from affected plants using various techniques. A species of *Phytophthora* was consistently isolated when rotting crown tissue was plated onto potato dextrose agar and water agar or inserted into apple fruit. The fungus was less regularly obtained from roots inserted into apple, and was never isolated when rotted roots were plated onto water agar.

A study of the species of *Phytophthora* involved showed that it readily produced papillate sporangia and spherical chlamydo-spores when host tissue or agar blocks containing the fungus were irrigated. Oogonia, however, were not produced in plate cultures on corn meal, water, and potato dextrose agars. The fungus was found to grow slightly at 36.5°C., but not at 39°C. In these features and in cultural characters the fungus was indistinguishable from isolates of *P. parasitica* obtained from other hosts in Queensland, and all evidence points to it being this species.

IV. PLANT INOCULATION EXPERIMENTS.

In a preliminary experiment in 1955 using 12 potted strawberry plants, four were inoculated without wounding, four were inoculated after scarifying the base of the crown, and two wounded and two unwounded were left uninoculated. One wounded inoculated plant wilted in 19 days and one unwounded inoculated wilted in 30 days. *P. parasitica* was reisolated from both plants.

In a second experiment plants were raised from first runners rooted in sawdust in order to ensure comparative freedom from nematodes (Colbran 1957). On February 22, 1957, six weeks after transplanting into pots of steamed soil, crown and root inoculations were performed using sterile corn meal sand (Riker and Riker 1936) on control plants and corn meal sand inoculated two weeks previously with *P. parasitica* on others. Crown inoculation was carried out by inserting lumps of inoculum into the soil on two sides of the strawberry crown. Soil was then pulled over the inoculum to avoid its rapid desiccation. Root inoculation consisted in temporarily removing the soil and plant from the pot and placing lumps of inoculum at the bottom and at four places at the circumference about half way up the pot. There were seven plants in each treatment. Results appear in Table 1.

Table 1.

DATE OF APPEARANCE OF WILT SYMPTOMS ON STRAWBERRY
PLANTS INOCULATED ON FEBRUARY 22, 1957, WITH A
CULTURE OF *P. parasitica*.

Plant.	Crown Inoculation.	Root Inoculation.
1	February 27	March 29
2	February 27	April 1
3	February 27	May 9 (partly wilted)
4	March 14	*
5	March 18	*
6	March 19	*
7	*	*

* Healthy on May 9.

Six crown inoculated plants and two root inoculated plants wilted completely before May 9, when the experiment was terminated. One root inoculated plant was partially wilted on this date. Isolations from the crowns into apple fruit and onto water agar confirmed that *P. parasitica* was responsible for the rot. Sporangia and chlamydospores typical of the fungus were obtained when rotting roots and petioles were surface sterilized for 30 seconds in 0.1% mercuric chloride and placed in water.

All fourteen control plants remained healthy except one crown inoculated plant which died from crown and root rot about March 10. On this plant there was a marginal leaf scorch which was distinct from the wilt of the entire leaf in *Phytophthora*-affected plants. Species of *Fusarium* and fungi other than *P. parasitica* were associated.

Disease symptoms exhibited by the successfully inoculated plants were foliage wilt progressing from the older to the younger leaves; collapse of the outer leaf stalks onto the rim of the pot; a dark brown rot at the base of some of the collapsed leaf stalks; a brown rot starting at the base of the crown and eventually involving the whole crown; a red-brown cortical rot of the roots in the vicinity of the crown.

V. FRUIT INOCULATIONS.

When green fruit were inoculated with a crown rot isolate of the fungus, a firm brown rot was produced. "Leather rot" of strawberry fruit caused by species of *Phytophthora* has not been recorded occurring naturally in Queensland.

VI. DISCUSSION.

The evidence from field investigations and pathogenicity experiments is that *P. parasitica* is the cause of a crown and root rot of strawberry plants. The disease has been recorded in the field from September to February when the prevailing high temperatures favour activity of the fungus. Waterlogging of the soil does not appear necessary to predispose plants to infection as outbreaks have occurred following periods of relatively dry weather.

Field outbreaks of the disease are rare and the proportion of infected plants does not usually exceed 5 per cent. However, more than 90 per cent. crown rot occurred in one planting being kept for the production of runners. In this case the only other market crop being grown on the property was rhubarb, which also was badly affected by crown rot caused by *P. parasitica*. Possibly the unusual severity of this outbreak was due to build-up of inoculum by continually growing two susceptible crops. On this property *P. parasitica* was isolated from lesions on the roots of strawberry runners; this demonstrates the danger of taking runners from affected patches.

At present the importance of the disease does not warrant the adoption of control measures other than crop rotation with resistant plants and avoidance of planting material from affected patches. Losses have occurred in the warmer part of the year after the main cropping period has passed. Furthermore, in this State the strawberry is treated as an annual, and loss of plants does not affect the following year's stand as would be the case in cooler climates where a longer period of establishment is preferred.

REFERENCES.

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