

A WILT OF STRAWBERRY CAUSED BY A NEW FORM OF FUSARIUM OXYSPORUM

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SUMMARY

The causal organism (*Fusarium oxysporum*) of a wilt of strawberry plants recorded in Queensland in 1962 was isolated and symptoms similar to those occurring in the field were produced in glass-house pathogenicity tests. Cross-inoculation tests with pathogenic forms of *F. oxysporum* commonly found in Queensland were carried out and the strawberry pathogen was found to be specific to its host. *Fusarium oxysporum* Schlecht. ex Fr. f. sp. *fragariae* f. sp. nov., is the name proposed for the causal organism.

I. INTRODUCTION

Many records of *Fusarium* associated with root rot of strawberries have been made but there are few reports of the fungus associated with a wilt of this host. Tisdale (1931) described a strawberry wilt from Florida in which 75% of the isolations from diseased plants yielded a *Fusarium*. Camus (1935) also reported that strawberry rootstocks from Bawuio Semi-Tropical Fruit Station in the Philippines were attacked by a serious disease caused by *Fusarium*, which destroyed 95% of the plants when planted at lower altitudes. In neither case does the *Fusarium* appear to have been identified specifically or its pathogenicity established.

Early in 1962, *F. oxysporum* Schlecht. ex Fr. was consistently isolated from wilted strawberry plants collected from a farm in the Redland Bay area near Brisbane, in south-eastern Queensland. Some runners had wilted after planting out, and during the autumn months the disease spread rapidly through the plantation. With cooler weather, plants which showed early disease symptoms revived and produced some new growth. With the return of hot weather, the disease reappeared.

Since this first recording of the disease, *Fusarium* wilt has been observed on farms in most of the strawberry-growing districts in the Brisbane area. This rapid spread of the disease can be attributed largely to the use of infected planting material. In a number of cases the spread from farm to farm has been traced through the use of runners obtained from infested areas.

This disease in the field affects both of the locally grown varieties, Phenomenal and Majestic. The wilt has been observed to be more severe and to spread more rapidly during the summer months, when it causes losses of up to 50%.

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II. SYMPTOMS

The complete collapse of the plants (Figure 1) is the ultimate result of infection by this disease. Infected plants may occur at random or in adjacent positions within a row, suggesting spread of the fungus by root contact or during cultural operations. During the summer months, the disease causes sudden wilting of all the leaves of the infected plant. The leaves die rapidly without showing chlorotic symptoms. In the cooler months, the disease is less obvious and the affected plants usually maintain a few central leaves, although these are generally rolled, chlorotic and often stunted. The crown in all cases shows distinct reddish brown vascular discoloration. In plants showing advanced symptoms of the wilt, the base of the crown is usually completely decayed by a dry rot, with the vascular discoloration extending up into the leaf bases.

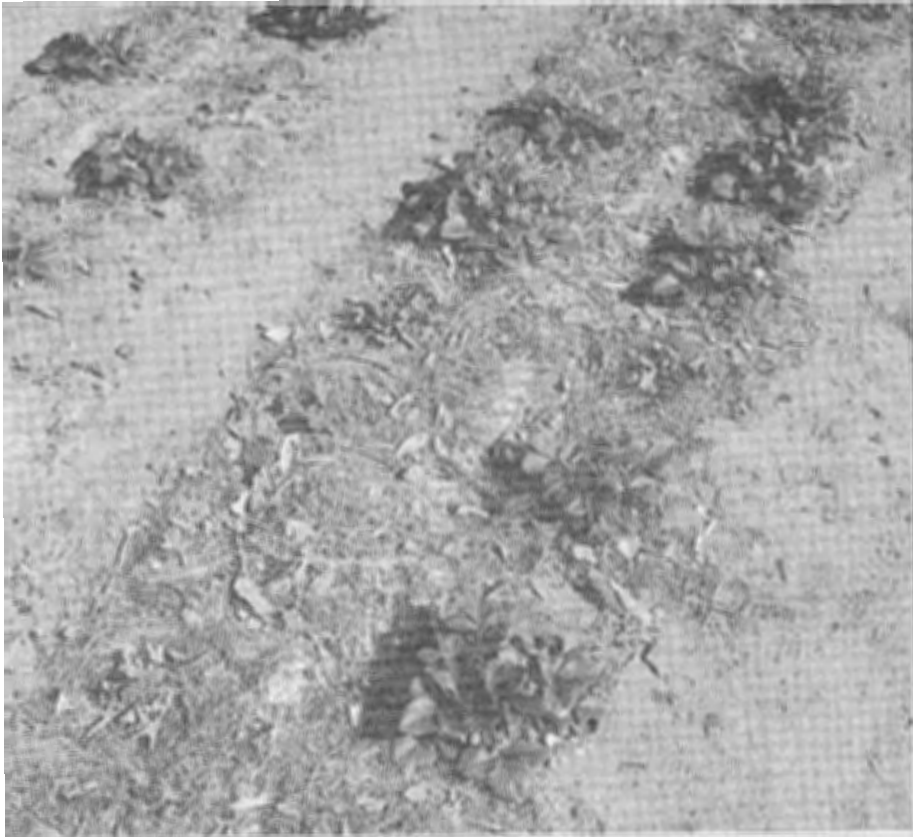


Figure 1.—Field infection of strawberries by *Fusarium* wilt.

The fungus may spread along stolons from infected parent plants into runners. Although these runners may appear to be healthy, the vascular tissue is usually discolored and isolations yield the fungus.

III. PATHOGENICITY TESTS

Glass-house experiments were carried out to establish the pathogenicity of the *Fusarium* isolates on strawberries.

A slurry of the *Fusarium* cultures grown on potato dextrose agar and macerated with water in a blender was used as the inoculum. The roots of strawberry plants, washed free of soil, were inoculated by dipping and agitating them in the slurry before replanting them in U.C. mix (50/50 sand/peat mixture).

Fourteen Phenomenal strawberry plants were inoculated in this manner, and six control plants were treated similarly, using an aqueous slurry of sterile potato dextrose agar. Ten of the inoculated plants developed typical field wilt symptoms, with vascular discolorations from which the fungus was consistently reisolated. The control plants remained healthy (Figure 2).



Figure 2.—*Fusarium* wilt of strawberry. Glass-house pot inoculation: (A) healthy; (B) inoculated.

This test was repeated at a later date, using the same methods but with different isolates of the fungus. Of the 12 inoculated plants, 10 developed wilt symptoms after 4 weeks while 12 control plants remained healthy.

IV. CROSS-INOCULATION TESTS

Cross-inoculation tests with other forms of *F. oxysporum* commonly found in Queensland were carried out. The following isolates were used:

1. *F. oxysporum* Schlecht. ex f. sp. *lycopersici* (Sacc.) Snyder & Hans., from wilted tomato plants.
2. *F. oxysporum* Schlecht. ex Fr. f. sp. *niveum* (E. F. Smith) Snyder & Hans., from wilted watermelon plants.
3. *F. oxysporum* Schlecht. ex Fr. f. sp. *conglutinans* (Wr.) Snyder & Hans., from cabbage plants with yellows disease.
4. *F. oxysporum* Schlecht. ex Fr. f. sp. *passiflorae* Purss., from wilted passion-fruit vines.
5. *F. oxysporum*, from wilted strawberry plants.

Two-week-old cultures of these fungi grown on potato dextrose agar were macerated with water and were used to inoculate 6-month-old strawberry plants and 4-6-week-old seedlings of passion-fruit, cabbage and tomato by the method described for the former tests. Watermelon seedlings were inoculated by pouring the slurry into holes made in the soil close to the plants. Control plants were treated in the same manner but without the addition of the fungus.

The results obtained are summarized in Table 1. The diseased plants in each case produced typical symptoms of *Fusarium* wilt and brown vascular discoloration was apparent in each case.

TABLE 1
RESULTS OF CROSS-INOCULATION TESTS WITH DIFFERENT FORMS OF *F. oxysporum*

Treatment	Plant Species Inoculated	No. of Plants Inoculated	No. of Plants with Wilt Symptoms
Uninoculated	Tomato	12	0
	Watermelon	12	0
	Cabbage	14	0
	Passion-fruit	14	0
	Strawberry	12	0
<i>F. oxysporum</i> f. sp. <i>lycopersici</i>	Tomato	12	12
	Watermelon	12	0
	Cabbage	14	0
	Passion-fruit	14	0
	Strawberry	12	0
<i>F. oxysporum</i> f. sp. <i>niveum</i>	Tomato	12	0
	Watermelon	12	9
	Cabbage	14	0
	Passion-fruit	14	0
	Strawberry	12	0
<i>F. oxysporum</i> f. sp. <i>conglutinans</i>	Tomato	12	0
	Watermelon	12	0
	Cabbage	14	10
	Passion-fruit	14	0
	Strawberry	12	0
<i>F. oxysporum</i> f. sp. <i>passiflorae</i>	Tomato	12	0
	Watermelon	12	0
	Cabbage	14	0
	Passion-fruit	16	10
	Strawberry	12	0
<i>F. oxysporum</i> from strawberry	Tomato	12	0
	Watermelon	12	0
	Cabbage	14	0
	Passion-fruit	14	0
	Strawberry	12	10

V. DISCUSSION

The *Fusarium* causing strawberry wilt has been grown and observed on potato dextrose agar as monoconidial cultures and its morphological characteristics fall within the range of those of *Fusarium oxysporum* as described by Snyder and Hansen (1940).

In the present study, it has been shown that a form of *F. oxysporum* causes a severe wilt of strawberry plants. This new form of *F. oxysporum* is specific, among several common crop plants, to strawberry plants in producing the strawberry wilt disease. Four other forms used were non-pathogenic to strawberries and each was specific to its own host plant.

The pathogen reported has not been previously described and therefore a new form of *F. oxysporum* is proposed and designated *Fusarium oxysporum* Schlecht. ex Fr. f. sp. *fragariae* f. sp. nov.

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