

# THE QUEENSLAND JOURNAL OF AGRICULTURAL SCIENCE

VOL. 8. No. 1.

MARCH, 1951.

## A WILT DISEASE OF THE PASSION VINE (*PASSIFLORA EDULIS*) CAUSED BY A SPECIES OF *FUSARIUM*.

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### SUMMARY.

*The symptoms of natural and artificial infection of passion vine with a species of Fusarium causing a wilt disease of the host are described.*

*In inoculated seedlings a vein clearing symptom in the youngest unfolded leaf is shown and leaf shedding occurs.*

*Tests with small numbers of plants showed Passiflora alba and P. suberosa to be susceptible to the fungus. Some resistance was shown by P. foetida, P. flavicarpa, and a proportion of plants of one strain of P. edulis.*

*It is suggested that a practical solution to the problem may be secured either by selecting resistant individuals of P. edulis or by top-grafting P. edulis to a root system of a suitable resistant species of Passiflora.*

*The species of Fusarium causing wilt disease is distinct from F. bulbigenum.*

### INTRODUCTION.

Fusarium wilt disease of the passion vine (*Passiflora edulis* Sims.) produces severe economic losses in plantations in south-eastern Queensland, where the greater portion of Queensland's passion vine industry is located. In one district, Mount Cotton, which was previously a prosperous passion vine area, the culture of the crop has ceased as the result of recurring epidemics of wilt disease.

The disease has so far been confined to a wilting of more or less advanced plants in the field and has not been detected in growers' seed-beds. It has, however, been demonstrated experimentally that infection with an unnamed species of *Fusarium* in the seedling stage leads to death. It is probable that infection in the field originates at or near the site of the vine, for it is unlikely that plants infected in the seed-bed would remain symptomless until they were reaching maturity.

**SYMPTOMS.**

The end point of the disease is the complete collapse of the plant (Figure 1). Plants may die in positions at random through the plantation, or several may die in adjacent positions within the row, suggesting spread of the fungus by root contact. The wilting is sudden and generally involves the whole of the plant. Occasionally a collapse of one side of the vine precedes the wilting of the whole vine. A previously symptomless plant may collapse in 24-48 hours.

In wilted plants there is a prominent browning in the vascular system of the root, crown, and leaders. The vascular discoloration in the leaders may extend as far as seven feet from ground level.



**Figure 1.**

Collapse of Passion Vine in the Field due to Infection with *Fusarium* sp.

While the symptoms of the disease in the field are more or less typical of those shown in other plants infected with species of *Fusarium*, the following symptoms of infected seedlings are worthy of note.

The youngest unfolded leaf of species of *Passiflora* inoculated with the causal *Fusarium* shows a clearing of the veins which produces "islands" of green interveinal areas. This is an early symptom of *Fusarium* wilt preceding leaf shedding and is commonly detected within seven to nine days after inoculation.

A general wilt of the seedlings, with all leaves intact, occurred only rarely in tests with seedlings. Leaf abscission is the main symptom when

seedlings are inoculated with the wilt fungus in the greenhouse. This occurs within a fortnight after inoculation, and commences with the loss of the cotyledonary leaves.

The disease commonly appears in plantations on old cultivations following various fruit and truck crops, but has also been recorded on new land. The wilt has been observed in February, May, June, July, September, October and November. The disease manifests itself before the vines are one year old; records of its occurrence have been made in vines varying in age from four to 10 months.

#### **PATHOGENICITY TRIALS.**

A *Fusarium* was isolated from the wilted passion vine shown in Figure 1 and used in inoculation experiments as isolate No. 6905B.

Inoculations were made with 4-6 weeks' old subcultures of the isolate on potato-dextrose-agar; seedlings were inoculated by either the soil-slurry method, in which the spores and mycelium were scraped from the surface of the medium and added to a mixture of soil and water, or by the water-fungus method, in which the inoculum was added to sterile water. The seedlings used for the experiments were grown in a greenhouse and generally had 1-3 true leaves. They were removed from the pots, their roots washed in tap water, dipped and agitated in the inoculum, and the seedlings then replanted. Control plants received the same treatment without the addition of the fungus.



**Figure 2.**

Inoculation of Seedlings.—Right, not inoculated; left, seedlings collapsing 15 days after inoculation.

Using the soil slurry-fungus method, of 43 seedlings of the ordinary variety of *P. edulis* inoculated, 41 wilted, and of 16 inoculated by the water-fungus method, 16 wilted.

Table 1 summarizes the results obtained from greenhouse pot experiments.

**Table 1.**  
INOCULATION OF SPECIES OF *Passiflora* WITH *Fusarium* ISOLATE 6905B.

Date of Inoculation.	Species.	Inoculated.		Not Inoculated.		Period in days for symptoms to appear.
		Negative.	Positive.	Negative.	Positive.	
4-11-47 ..	<i>P. edulis</i> .. ..	0	18	18	0	10-13
17-11-47 ..	<i>P. edulis</i> .. ..	2	23	27	0	13-22
26-11-47 ..	<i>P. edulis</i> .. ..	0	16	16	0	13
10-2-48 ..	<i>P. alba</i> .. ..	0	12	11	0	9-16
	<i>P. suberosa</i> .. ..	1	9	10	0	9-14
	<i>P. foetida</i> .. ..	11	0	10	0	..
	<i>P. flavicarpa</i> * ..	4	0	3	0	..
3-3-48 ..	<i>P. edulis</i> (Hackett's Mammoth)	3	6	10	0	12-27

\* In a subsequent trial carried out by G. Purss with *P. flavicarpa*, 29 out of 50 seedlings wilted within 29 days (Departmental records).

In areas where *Fusarium* wilt of the passion vine occurs, the most noteworthy *Fusarium* wilt diseases of other crops are that of tomato caused by *F. bulbigenum* Cooke and Masee and that of banana caused by *F. cubense* E.F.S. To determine whether any relationship existed between the passion vine and tomato wilt organisms, the cross inoculations listed in Table 2 were carried out, using the water-fungus method and 16 plants per treatment. After four weeks the condition of the plants in each treatment was as stated in the table.

**Table 2.**  
COMPARISON OF THE PATHOGENICITY OF THE PASSION VINE ISOLATE WITH *F. bulbigenum*.

Organism Used.	Passion Vine.	Tomato.
Fusarium isolate 6905B .. .. .	16 dead ..	16 healthy
<i>F. bulbigenum</i> (C.S.I.R.O. normal tomato testing strain) .. ..	16 healthy	16 dead or stunted
Uninoculated .. .. .	16 healthy	16 healthy

## DISCUSSION.

The small-scale inoculation tests have shown that there may be some resistant individual plants amongst strains of *Passiflora edulis* (e.g., "Hackett's Mammoth") and also that *P. foetida* and *P. flavicarpa* show some resistance to the fungus.

Such differential resistance suggests the commercial possibility of grafting *P. edulis* scions onto resistant stocks if interspecific compatibility can be established.