

Axonopus Chlorotic Streak, a Leafhopper Transmitted Virus of Axonopus Affinis in New Guinea.

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ABSTRACT.

The chlorotic leaf streak condition of *Axonopus affinis* in New Guinea is due to a virus. The virus is only transmitted by the leafhopper, *Idyia fijiensis*. In the experimental studies, *Axonopus affinis* was found to be the only host of the virus.

INTRODUCTION.

In 1960, areas of *Axonopus affinis* Chase growing near the research laboratories at the Lowlands Agricultural Experiment Station at Keravat, were found to be affected by a chlorotic streaking of the lamina. Subsequent searches of *A. affinis* growing in the Gazelle Peninsula area showed most plants to be affected by the condition. The grass is of no commercial value, at the present, either as a fodder crop or turf grass. Experiments were carried out to determine the cause of the chlorotic streaking and this paper gives the details and results of the experimental studies.

SYMPTOMS.

In the field, infected plants are not stunted, but exhibit a pale chlorotic discoloration of the leaves. The lamina and stipules have pale chlorotic streaks running approximately parallel to the mid-vein from 1 mm. in length, but more often the full length of the leaf blade (Plate I). The leaf symptoms are systemic and persistent. The flowering and seed habits of the diseased plants are not affected when compared with healthy plants. In the laboratory, the chlorotic streak symptoms appeared 16 to 20 days after inoculation and were persistent.

EXPERIMENTAL STUDIES.

Attempts to transmit the condition from infected to healthy plants of *Axonopus affinis* by mechanical means, through soil from infected plants, by seed and with nymphs of *Tetraneura birsuta* were unsuccessful. Attempts to transmit the condition by mechanical means to *Triticum*

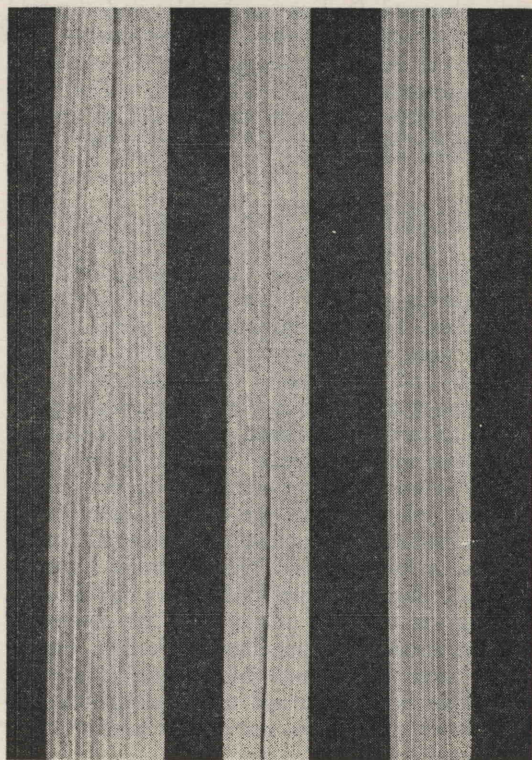


Plate I.—Two leaves of *Axonopus affinis* showing lamina streak. Healthy leaf is on the right.

vulgare variety "Minflor", *Zea mays* var. "SA5", *Andropogon sorghum* var. "Red Sorghum", *Oryza sativa* var. "Mekeo White", *Avena sativa* var. "Algerian", *Hordeum vulgare* var. "Skinless", *Secale cereale* var. "Black Winter", and *Saccharum officinale* were unsuccessful.

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Table 1.—The effectiveness of various leafhoppers in transmitting chlorotic streak virus of *Axonopus affinis* using *A. affinis* as the test plant.

Leafhopper.	No. of infections/ No. of Plants.
<i>Nisia atrovirens</i>	0/30
<i>Deltocephalus hospes</i>	0/30
<i>Idyia fijiensis</i>	30/30
Green leafhopper	0/30

From field observations, numerous leafhoppers were observed feeding on healthy and diseased *Axonopus affinis* plants. Experiments were carried out to determine whether the condition was transmissible by leafhoppers. The leafhoppers were raised as stock colonies in the greenhouse on healthy *A. affinis* grown from seed.

Adult leafhoppers were fed on infected *A. affinis* leaf tissue in small glass cages for 24 hours and then released onto healthy seedlings approximately 2 in. long in glass cages for four days (five leafhoppers per cage). The plants were then sprayed with 0.01 per cent. Dieldrin and kept free of insects for six weeks. From the results given in Table 1, the leafhopper, *Idyia fijiensis* was found to be a vector of Axonopus chlorotic streak. The streak symptoms on the lamina were not due to the feeding habits of *Idyia fijiensis* as all the control plants in the tests remained symptomless after being fed upon by healthy leafhoppers. The symptoms appeared 16 to 20 days after the leafhoppers had finished feeding on the test plants and the symptoms were systemic and persistent. Further experiments were carried out to determine the effect of various acquisition and test feeding times on the efficiency of transmission by adults of *Idyia fijiensis*.

Leafhopper transmitted viruses according to Bawden (1964) can be roughly classified into two groups; one group of viruses whose vectors do not become infectious until several days after acquiring the virus and the other group whose vectors become infectious a few hours after feeding. Adults of *I. fijiensis* were allowed to feed from one to six hours on infected *Axonopus affinis* leaf tissue after which they were transferred to healthy seedlings to feed from one to six

hours, in small glass cages. One adult leafhopper was placed in each cage, and 20 such cages set up with ten control cages for each test.

From the results in Table 2, it is evident that the adult of *I. fijiensis* is able to transmit Axonopus chlorotic streak after an acquisition and test feeding time of two hours, and the efficiency of transmission increased with increased acquisition feeding time. Thus Axonopus chlorotic streak virus is similar to beet curly top (Bennett

Table 2.—The effect of acquisition and test feeding times on the efficiency of transmission of chlorotic streak of *Axonopus affinis* by adults of *Idyia fijiensis*.

Acquisition Feeding Time in Hours.	Test Feeding Time in Hours.	No. Infected/ No. Treated.
1	1	0/20
1	2	3/20
1	3	4/20
1	4	3/20
1	5	5/20
1	6	4/20
2	1	5/20
2	2	8/20
2	3	8/20
2	4	10/20
2	5	11/20
2	6	15/20
3	1	15/20
3	2	13/20
3	3	15/20
3	4	20/20
3	5	18/20
3	6	20/20
4	1	18/20
4	2	20/20
4	3	19/20
4	4	20/20
4	5	20/20
4	6	19/20
6	1	17/20
6	2	20/20
6	3	18/20
6	4	18/20
6	5	20/20
6	6	17/20

1935) and maize streak (Storey 1928) viruses in that the leafhopper vectors become infectious within a few hours of acquiring the virus.

Further host range studies were conducted using adults of *Idyia fijiensis* as the vector, using an acquisition feeding time of three hours and a test feeding time of six hours. Five adults of *I. fijiensis* were used for each test plant and 40 plants of each host were used in the tests. However, none of the cereal test plants listed in the attempted mechanical transmission tests became infected. Thus it appears as if the host range of *Axonopus chlorotic streak virus* is severely restricted.

CONCLUSIONS.

The chlorotic streak condition of *Axonopus affinis* has been found to be due to a virus which is transmitted by the leafhopper, *Idyia fijiensis*, and to be confined to *Axonopus affinis*. Several other graminaceous viruses which are transmitted by leafhoppers, such as rice stripe virus (Hashioka 1951), sugar-cane chlorotic streak virus (Abbott and Ingram 1942) and sugar-cane Fiji virus (Ocfemia 1934) also have restricted host ranges.

From the experimental data, the virus was found to be only transmitted by *Idyia fijiensis*, and the efficiency of this vector in transmitting the virus was increased up to a time of three

hours by increasing the length of the acquisition feeding time. The virus is dissimilar to other reported graminaceous viruses in respect to host range and insect vector. Thus the name *Axonopus chlorotic streak* is proposed for this virus.

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The photograph in Plate I was taken by the Department of Information and Extension Services.

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DESCRIPTION AND DISCUSSION OF ISOLATIONS

Over 2 isolates. The isolates were obtained in mixed culture with *Staphylococcus aureus* from a cow with clinical mastitis.

Formerly *Staphylococcus aureus* Var. *Secretum* Lab. D-522, R14 K14