

# CASSIA MOSAIC, A PLANT VIRUS OF CASSIA SPP. IN NEW GUINEA

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## SUMMARY.

*Experimental data on the host range and physical properties are recorded of cassia mosaic, a previously undescribed virus disease of Cassia occidentalis L. in New Guinea. The virus is readily transmissible to Cassia occidentalis, C. tora L. and Crotalaria anagyroides H.B. et K. The dilution end point lies between 1:1,000 and 1:2,000, thermal inactivation point between 60 and 62 degrees C. for an exposure of ten minutes and longevity in vitro less than 168 hours.*

*To date no insect vector has been located and the virus is not seed transmitted in Cassia occidentalis nor C. tora.*

**S**HAW (unpublished) first recorded mosaic symptoms on *Cassia* spp. in Papua and New Guinea in 1956. In 1959, a mosaic disease was located on *Cassia tora* and *C. occidentalis* growing wild at Ulaveo Plantation at Kokopo on New Britain. Diseased cassia plants have since been located widespread on the Gazelle Peninsula and on ornamental cassias growing at Lae and Aiyura on the New Guinea mainland. *Cassia tora* and *C. occidentalis* have been found growing as weeds in coconut plantations and along the roadside throughout the Gazelle Peninsula and, due to the extensive use of leguminous crops in this area both as food source and shade plants for plantation crops, the disease was investigated to determine its identity and host range. The following investigations were carried out at the Lowlands Agricultural Experiment Station at Keravat, New Britain.

## INVESTIGATIONS.

Throughout the host range and physical property tests, the sap source was *Cassia occidentalis* growing at Keravat, and the indicator plant used in all tests was *C. occidentalis*.

## Host Range Studies.

The test plants were inoculated with sap expressed from ground diseased leaves of *Cassia occidentalis*. The plants were then grown in sterilized forest soil and kept under observation for 28 days. They were then ground up and indicator plants of *C. occidentalis* were inoculated with the sap. The indicator plants were kept under observation for a further 28 days.

The results (Table 1) indicate that cassia mosaic virus has a very limited host range, and does not infect any important leguminous food, shade or cover plants. Although *Crotalaria anagyroides* is used as a temporary shade plant, the disease does not affect the agronomic features of this plant as a shade plant.

## Symptoms on Susceptible Plants.

*Cassia occidentalis* and *C. tora*.

Pronounced mosaic symptoms appeared on leaves seven to ten days after the inoculation of the cotyledons of the test plants (see Plate). The leaves were slightly twisted, compared with healthy leaves and as they matured the mosaic symptoms became less pronounced. The mosaic symptoms were systemic.

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Table I.—Host range of *Cassia mosaic virus*.

Test Plant.	Reaction.	Proportion of Plants Infected.	Test Plant.	Reaction.	Proportion of Plants Infected.
<i>Cassia tora</i> L. (a) ....	Mosaic	20/20	<i>Crotalaria spectabilis</i> Roth (c)	Nil	0/20
<i>Cassia occidentalis</i> L. (a)	Mosaic	20/20	<i>C. mucronata</i> Desv. (c) ....	Nil	0/20
<i>Crotalaria anagyroides</i> H. B. & K. (a)	Mosaic	3/20	<i>Trifolium hybridum</i> L. (b)	Nil	0/20
<i>Centrosema pubescens</i> Benth. (c)	Nil	0/20	<i>T. repens</i> L. (b) ....	Nil	0/20
<i>Calopogonium mucunoides</i> Desv. (c)	Nil	0/20	<i>T. subterranean</i> L. (b) ....	Nil	0/20
<i>Desmodium distortum</i> (Aubl) Macbride (c)	Nil	0/20	<i>T. pratense</i> L. (b) ....	Nil	0/20
<i>Arachis hypogaeo</i> L. (b)	Nil	0/20	<i>Medicago sativa</i> L. (b) ....	Nil	0/20
<i>Canavalis ensiformis</i> DC. (a)	Nil	0/20	<i>Nicotiana tabacum</i> L. var. "White Burley" (b)	Nil	0/20
<i>Phaseolus vulgaris</i> L. "Brown Beauty" (a)	Nil	0/20	<i>N. glutinosa</i> L. (b) ....	Nil	0/20
<i>P. lunatus</i> L. (a)	Nil	0/20	<i>N. rustica</i> L. (b) ....	Nil	0/20
<i>P. mungo</i> L.	Nil	0/20	<i>N. sylvestris</i> Speggazzini and Comes (b)	Nil	0/20
<i>Vigna sinensis</i> Savi. var. "Xape" (b)	Nil	0/20	<i>Solanum nigrum</i> L. (b)	Nil	0/20
<i>V. sinensis</i> var. "Poona Pea" (c)	Nil	0/20	<i>S. dulcamara</i> L. (b) ....	Nil	0/20
<i>V. sinensis</i> var. "Black Eye" (c)	Nil	0/20	<i>Lycopersicon esculentum</i> Mill var. "Grosse Lisse"	Nil	0/20
<i>V. sesquipedalis</i> Frurwirth (c)	Nil	0/20	<i>Petunia hybrida</i> Vilm. var. "Rosy Morn" (b)	Nil	0/20
<i>Dolichos lablab</i> L. (c)	Nil	0/20	<i>Datura stramonium</i> L. (b)	Nil	0/20
<i>Stizolobium deeringianum</i> Bort. (c)	Nil	0/20	<i>Capsicum annuum</i> L. (c)	Nil	0/20
<i>Vicia faba</i> L. (c)	Nil	0/20	<i>Physalis floridana</i> Rydt. (b)	Nil	0/20
<i>Pisum sativum</i> L. var. "Earlicrop" (b)	Nil	0/20	<i>Cucumis sativus</i> L. (c) ....	Nil	0/20
			<i>Chenopodium amaranticolor</i> Coste et Reyn (b)	Nil	0/20

(a) inoculated when cotyledons present.

(b) inoculated when 6 leaves present.

(c) inoculated when first true leaf present.

*Crotalaria anagyroides*.

Mosaic symptoms appeared 14 to 21 days after inoculation of the cotyledons with infective sap. The leaves were reduced in size compared with healthy leaves and symptoms were persistent and systemic.

**Physical Properties.***Dilution end point.*

Sap was expressed from mosaic infected leaves of *C. occidentalis* and serially diluted with distilled water. Indicator plants of *C. occidentalis* were then inoculated with sap on a muslin pad with 500 grit carborundum powder. After 28 days observations were recorded (Table II). Results show that the dilution end point lies between 1:1,000 and 1:2,000.

Table II.

Dilution end point of *Cassia mosaic virus*, using *Cassia occidentalis* as the test plant.

Dilution.	Proportion of Plants Infected.
Undiluted	20/20
1:10	17/20
1:100	9/20
1:1000	2/20
1:2000	0/20
1:3000	0/20
1:4000	0/20
1:5000	0/20



Plate.—Left—"Witches Brooming" on diseased shoot. Right—healthy shoot.

[Photo by A. E. Charles]

#### Longevity in vitro.

Bulk solution of sap was obtained from mosaic infected leaves of *C. occidentalis* and stored at 1 degree C. Every 24 hours an aliquot of 10 ml. was removed and warmed to room temperature (28 degrees C.) and indicator plants inoculated.

Results (Table III) indicate that the virus is inactivated at 168 hours when stored at 1 degree C.

#### Thermal Inactivation Point.

Sap was extracted from *C. occidentalis* and 5 ml. was placed in each of 10 thin-walled glass tubes. Each tube was then maintained at a selected temperature for ten minutes. At the end of each period the tube was removed and cooled rapidly by plunging into cold water.

Results (Table IV) show that the thermal inactivation point lies between 60 and 62 degrees C. for an exposure of ten minutes.

Table III.  
Longevity in vitro, of Cassia mosaic virus, using *Cassia occidentalis* as the test plant.

Exposure in Hours.	Proportion of Plants Infected.
0	20/20
24	17/20
48	12/20
72	6/20
96	3/20
120	2/20
144	1/20
168	0/20
196	0/20

Table IV.

Thermal inactivation point of *Cassia mosaic virus* at an exposure of 10 minutes, using *Cassia occidentalis* as the test plant.

Temperature in degrees Centigrade.	Proportion of Plants Infected.
28	20/20
30	14/20
40	8/20
50	6/20
60	2/20
62	0/20
64	0/20
66	0/20
68	0/20

### Attempted Seed Transmission.

One thousand seeds were collected from diseased *C. occidentalis* and *C. tora* plants which had been mechanically inoculated. Of the 948 *C. occidentalis* and 957 *C. tora* seeds which germinated none showed evidence of seed transmission.

### Insect Transmission.

No evidence has yet been obtained of the virus being insect transmitted, although widespread incidence and rapid dissemination of the disease in the field suggests that it is.

Table V.  
A comparison of *Cassia mosaic* (van Velsen) *Cowpea mosaic* (Anderson, 1957), *bean yellow mosaic* (Corbett, 1957) and *pea mosaic* (Norris, 1943).

Hosts.	<i>Cassia Mosaic.</i>	<i>Cowpea Mosaic</i> <i>Cucumber Mosaic Str.</i>	<i>Bean Yellow Mosaic.</i>	<i>Pea Mosaic.</i>
<i>Phaseolus vulgaris</i> .....	—	+	+	—
<i>Pisum sativum</i> .....	—	+	+	+
<i>Vigna sinensis</i> .....	—	+	NR	NR
<i>Cassia tora</i> .....	+	+	+	NR
<i>Cassia occidentalis</i> .....	+	NR	NR	NR
<i>Cassia sp.</i> .....	+	NR	NR	+
<i>Nicotiana tabacum</i> .....	—	+	—	—
<i>N. glutinosa</i> .....	—	+	—	—
<i>Lycopersicon esculentum</i> .....	—	NR	—	—
<i>Datura stramonium</i> .....	—	NR	—	—
<i>Cucumis sativus</i> .....	—	+	—	—
Physical properties				
Dilution end Point .....	1:2000	10 <sup>-2</sup> —10 <sup>-3</sup>	1:300—10 <sup>-3</sup>	1:5000
Thermal inactivation Point .....	60°—62°C.	NR	56°—60°C.	60°—64°C.
Longevity <i>in vitro</i> .....	144—168 hrs.	6—24 hrs.	24—32 hrs.	48—72 hrs.
Insect Vectors—				
<i>Aphis fabae</i> .....	NR	NR	+	NR
<i>Macrosiphum pisti</i> .....	NR	NR	+	+
<i>M. gei</i> .....	NR	NR	+	NR
<i>Myzus persicae</i> .....	NR	NR	NR	+
<i>Aphis rumicis</i> .....	NR	NR	NR	+

NR = No results.

+ = Transmission.

— = No transmission.

## DISCUSSION.

The following plant viruses have been reported to cause mosaic symptoms on *Cassia* spp: Black eye cowpea mosaic (Anderson, 1958), bean yellow mosaic (Corbett, 1957) and pea mosaic (Norris, 1943).

From a comparison of the above viruses with *cassia mosaic virus* (Table V), it is evident that the virus investigated has not been recorded previously, nor is it related to any of the legume virus diseases investigated at Keravat. The virus is thus considered to be a new record and the name *cassia mosaic virus* is suggested.

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