GUINEA GRASS MOSAIC VIRUS

Guinea grass mosaic virus */*:*/6:E/E:S/*, potyvirus group

Described by Thouvenel, Givord & Pfeiffer (1976).

A virus with flexuous, filamentous particles *c.* 815 nm long. It is readily transmitted by inoculation of sap to plants in a few tribes of Gramineae. It is probably restricted to tropical areas in Africa. No vector is known.

MAIN DISEASES: Causes dwarfing and light-green mosaic in *Panicum maximum* (Guinea grass) (Fig. 1) cultivated as a forage crop.

GEOGRAPHICAL DISTRIBUTION: Widespread wherever Guinea grass is grown in Ivory Coast.

HOST RANGE AND SYMPTOMATOLOGY: Host range restricted to the Paniceae, Maydeae and Bromeae tribes of the family Gramineae. Mechanically transmissible to the following:

Diagnostic species

Panicum maximum (Guinea grass). General dwarfing and light green mosaic. On some cultivars *e.g.* K189, light green eyespots are the first systemic symptom; later, they anastomose to form a striped mosaic (Fig. 2). Other cultivars *e.g.* K187 seem to be tolerant.

Setaria italica (Italian ryegrass). Systemic chlorotic elongated spots one week after inoculation, followed by mottle.

Zea mays (maize). Dwarfing; light green mosaic appearing on the new leaves.

Propagation species

S. italica is a useful host for maintaining cultures. *P. maximum* cv. K 189 is a good source of virus for purification.

Assay species

S. italica is a good systemic assay host. No local lesion host is known.

STRAINS: A strain from maize differs somewhat from Guinea grass strains in host range and is serologically distinguishable (D. Lamy, unpublished data).

TRANSMISSION BY VECTORS: Aphid transmission suspected but not established. No transmission to *Panicum maximum, Setaria italica* or *Zea mays* was obtained using *Rhopalosiphum maidis, Hysteroneura setariae, Aphis spiricola* or *A. gossypii.*

TRANSMISSION THROUGH SEED: Not seed-borne in *P. maximum* or *S. italica.*

TRANSMISSION BY DODDER: Dodder (*Cuscuta subinclusa*) did not parasitize Guinea grass.

SEROLOGY: The virus is moderately immunogenic. Rabbit antisera with titres of 1/2 048 were obtained after six intramuscular injections of purified virus emulsified with Freund's incomplete adjuvant. Microprecipitin tests were used, because intact virus particles do not diffuse in agar gel.

RELATIONSHIPS: Serologically moderately closely related to pepper veinal mottle virus (Ivory Coast and Ghana strains), to dioscorea mosaic virus (Thouvenel & Fauquet, 1977 and unpublished results) and a tobacco virus from Kenya (E. J. Guthrie, personal comm.). Not related to sugarcane mosaic virus.

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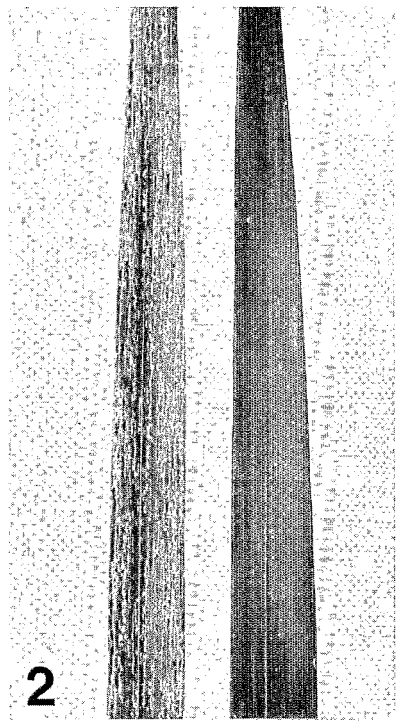

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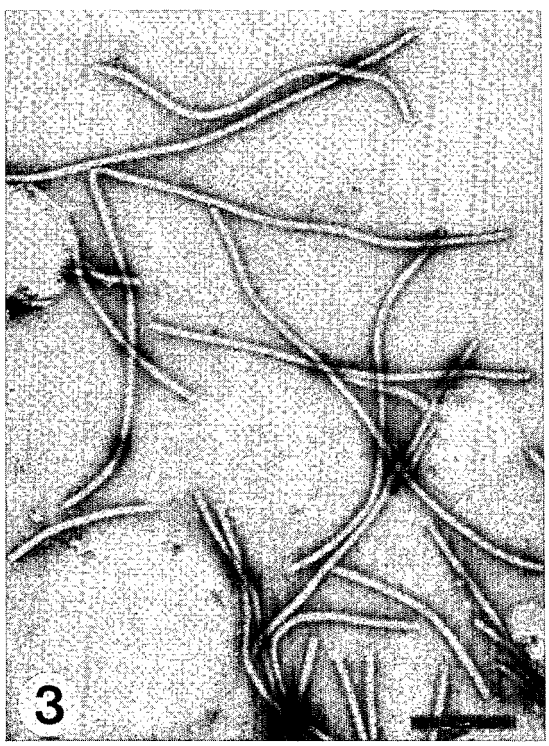

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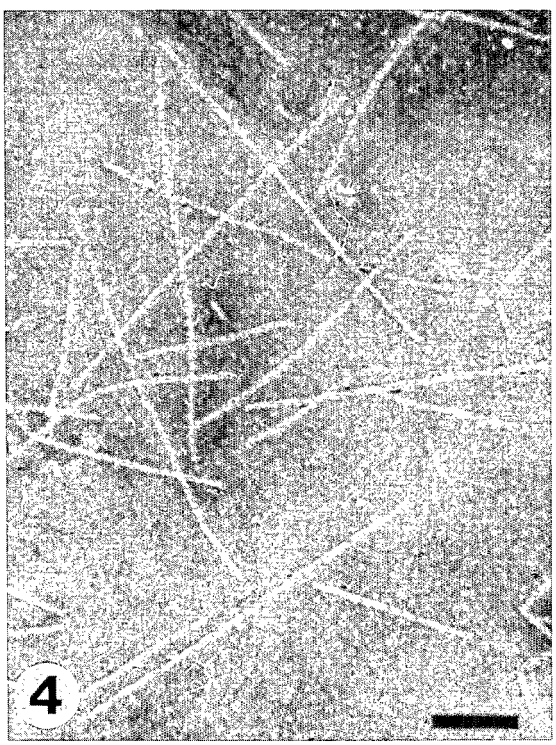

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STABILITY IN SAP: Infectivity in Guinea grass sap is lost after 10 min at 50°C; dilution end-point is 10^{-3}. Sap stored at 24°C lost infectivity within a few h; it remained infective at 4°C for 24 h. Frozen diseased leaves of Guinea grass remained infective for 2 weeks.

PURIFICATION: A combination of the methods described by Damirdagh & Shepherd (1970) and Van Oosten (1972) is useful. Grind Guinea grass leaves in phosphate buffer (pH 7.5) containing 1M urea and 1% sodium bisulphite and clarify by treating with 5% Triton X-100 for 30 min.

Purified virus is obtained after one cycle of high and low speed centrifugation, followed by ultracentrifugation through 8 ml of 20% sucrose. Finally resuspend the pellet in 0.05M borate buffer (pH 8.2). Preparations can be further purified by centrifuging in 10–40% sucrose density gradients in which the virus forms a single light-scattering zone. Infected *P. maximum* leaves yield *c.* 25 mg virus per kg.

PROPERTIES OF PARTICLES:

Isoelectric point: about pH 4.7; the virus is precipitated at this point (unpublished data).
A260/A280: 1.22 $\pm$ 0.02 (not corrected for light-scattering).
A max(260)/A min(247): 1.10 $\pm$ 0.02.

PARTICLE STRUCTURE: Particles are flexuous filaments about 815 nm long and 15 nm in diameter (Fig. 3). After exposure to 0.05M $MgCl_2$ the particles become straighter (Fig. 4), a feature characteristic of several viruses in the potyvirus group (Govier & Woods, 1971).

PARTICLE COMPOSITION:

Nucleic acid: comprises *c.* 6% of particle weight (estimated spectrophotometrically).
Protein: A major protein of M.Wt 35,000, estimated by SDS-polyacrylamide gel electrophoresis, with a minor component of M.Wt 32,000 (unpublished results). Probably the second component is a degradation product as observed for other potyviruses (Huttinga, 1975).

RELATIONS WITH CELLS AND TISSUES: No information.

NOTES: Although no aphid vector has been found, Guinea grass mosaic virus has been classified in the potyvirus group on the basis of the size and morphology of its particles and its serological relationship to pepper veinal mottle virus and other members of the potyvirus group.

REFERENCES: Damirdagh & Shepherd, *Phytopathology* **60**: 132, 1970; Govier & Woods, *J. gen. Virol.* **13**: 127, 1971; Huttinga, *Neth. J. Pl. Path.* **81**: 58, 1975; Thouvenel & Fauquet, *C.r. hebd. Séanc. Acad. Sci., Paris* **284**: 1947, 1977; Thouvenel, Givord & Pfeiffer, *Phytopathology* **66**: 954, 1976; Van Oosten, *Neth. J. Pl. Path.* **78**: 33, 1972.

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Fig. 1 Naturally infected Guinea grass (*Panicum maximum*) cv. K 189.
Fig. 2 (*Left*) Infected leaf of Guinea grass cv. K 189 showing the characteristic mosaic. (*Right*) Healthy leaf.
Fig. 3 Particles from a purified preparation, negatively stained with 1% uranyl acetate. Bar represents 200 nm.
Fig. 4 Particles in 0.05 M $MgCl_2$, stained with 1% uranyl acetate. Bar represents 200 nm.

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