

Peanut Mottle Virus in the Sudan

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ABSTRACT

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A widespread disease of groundnut (peanut), reported for the first time in the Sudan, was induced by a virulent strain of peanut mottle virus. The virus was identified on the basis of particle morphology, host range and reaction, serology, insect transmission, and physical properties. The isolate was not related serologically to three viruses in the potyvirus group. No resistance was found in 16 cultivars of groundnut tested in the field.

Groundnut or peanut (*Arachis hypogaea*) is an important crop in the Sudan. It is grown on 2.5 million feddans (1 feddan = 1.038 acres) for local consumption and export. With the exception of *Cercospora* leaf spot (4), no diseases of this crop have been investigated in detail in the Sudan.

In 1974, symptoms resembling those caused by virus were observed on groundnut on the Gezira Agricultural Research Farm. A green-yellow mottle was most common (Fig. 1); other

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symptoms were severe leaf distortion and stunting of infected plants. In recent years, such symptoms became widespread in many groundnut-producing areas, and a preliminary survey in the Gezira Scheme (Central Sudan) showed a high incidence of the disease in many fields.

Because groundnut is an important crop in this country and peanut mottle virus (PMV) can be very important economically (5,7), the present work was initiated to confirm occurrence of PMV in the Sudan and to determine susceptibility of groundnut cultivars to the virus.

MATERIALS AND METHODS

Leaf samples were obtained from

mottled groundnut plants, triturated in 0.05 M potassium phosphate buffer (pH 7.5, containing 0.1% sodium sulphate), and the sap was inoculated onto various test plants. The virus isolate was maintained in groundnut plants (cv. Ashford).

For in vitro physical property tests, the virus was increased and assayed in beans (*Phaseolus vulgaris* 'Topcrop'). *Aphis craccivora* Koch, reared on *Lablab vulgaris*, was used in transmission tests. Back inoculations were made to the Topcrop beans.

Serologic tests were conducted in Ouchterlony double diffusion plates containing 0.8% Ionagar No. 2, 0.02% sodium azide, and 0.8% sodium chloride in distilled water. Before the tests, virus-containing sap was sonicated (8) in a B-12 ultrasonic cell disintegrator at an output of 60 W for 10 min.

Sixteen cultivars were evaluated for resistance to natural infection by PMV in fields at two locations in 1977-1978 and 1978-1979. Cultivars were arranged in a randomized block design with four replications at each site. Plants were rated

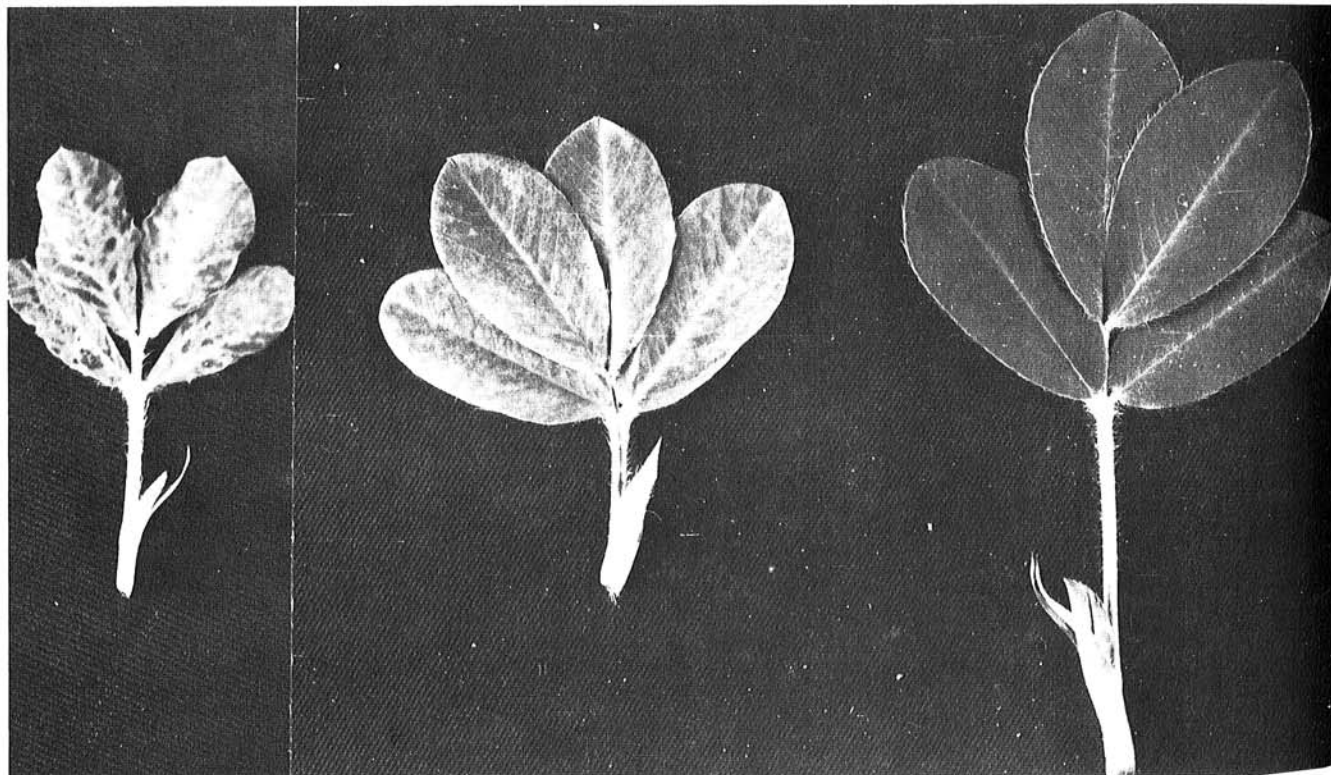


Fig. 1. Leaf distortion (left) and green yellow mottle (center) caused by a Sudanese isolate of peanut mottle virus on cv. Ashford groundnut. Healthy leaf on right.

for PMV symptoms at 10 wk after planting.

RESULTS

The host range studies included 20 plant species in seven families. *P. vulgaris* 'Topcrop' and 'Prince' reacted to sap inoculation with faint chlorotic lesions and severe systemic mottle. *A. hypogaea* 'Ashford,' 'Barberton,' 'Libian,' MH 383, and 'Nigerian'; *Cassia occidentalis*; *Glycine max* 'William'; *Medicago sativa*; and *Vigna sinensis* reacted with severe systemic symptoms without local lesions.

Plant species that did not react to inoculation included *Abelmoschus esculentus*, *Beta vulgaris*, *Brassica oleracea*, *Capsicum annum*, *Chenopodium amaranticolor*, *C. quinoa*, *Cucumis sativa*, *Datura metel*, *D. stromonium*, *Daucus carota*, *Gossypium barbadense*, *Nicotiana glutinosa*, *N. tabacum*, and *Vicia faba*. Virus was not recovered from these plants in back inoculations to Topcrop beans.

The thermal inactivation point of the virus was between 55 and 60 C, the dilution end point was between 10^3 and 10^4 , and longevity in vitro was between 1 and 2 days.

The virus was transmitted to groundnut seedlings in a nonpersistent manner by starved *A. craccivora* (10 aphids per plant) when allowed acquisition feedings of 5 min and inoculation feedings of 45 min. The aphids transmitted the virus to 38 of 80 test plants.

Partially purified virus preparations were obtained by the method described by Damirdagh and Shepherd (3). Electron micrographs of negatively stained crude sap and partially purified preparations showed flexuous particles (Fig. 2), measuring approximately 700×12 nm.

Antiserum to the East African PMV isolate (donated by K. R. Bock) reacted with our isolate in gel diffusion tests. Prominent precipitation lines developed with the sonicated virus sap but not with sonicated sap from healthy plants. Antisera prepared against bean common mosaic virus, cowpea aphidborne virus, and pea mosaic virus did not react with the Sudanese PMV isolate.

No indication of resistance to PMV was observed among 16 groundnut cultivars tested in the field.

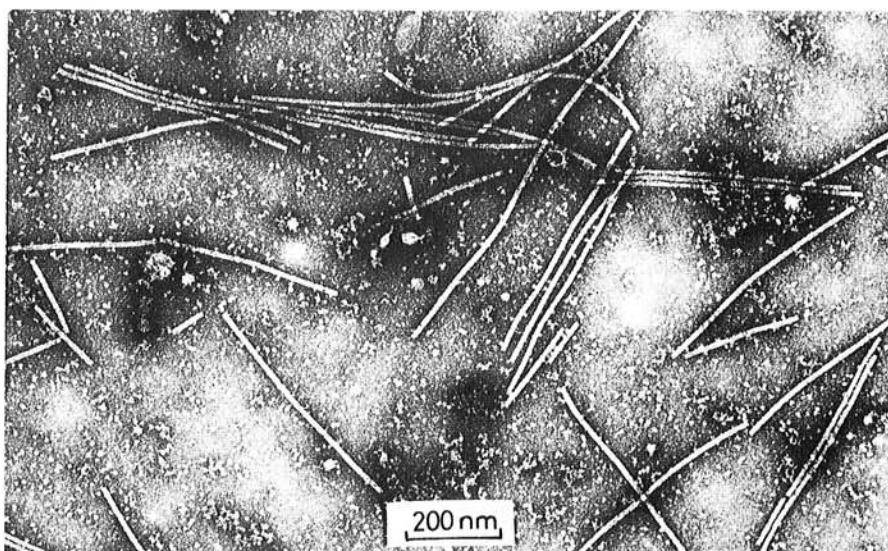


Fig. 2. Electron micrograph of partially purified preparations of a Sudanese isolate of peanut mottle virus stained with phosphotungstate.

DISCUSSION

PMV has been identified for the first time in the Sudan by host range and reaction, serology, aphid transmission, particle morphology, and physical properties. These results support observations that the virus is common in this country. Previous work showed that PMV is also widespread in East Africa (2). Host range, serologic reactions, and physical properties of our isolate resemble those described for the East African isolate (2). It differs from the common East African isolate, however, in that it causes a severe systemic reaction in *P. vulgaris* and has shorter particles. In this respect, it is similar to a virus that induces mottle in groundnuts in East African coastal regions (2). As pointed out by Behnchken (1), differences in particle lengths may be attributable to measurement methods.

The Sudanese isolate induced various symptoms in field groundnuts, ranging from mild mottle to severe leaf distortion and stunting. It is not known whether variation in symptoms is due to the cultivar or to strains of the virus. PMV was isolated from plants with varied symptoms.

None of the groundnut cultivars commonly grown in the Sudan is resistant to PMV. Soybean production was begun very recently in this country.

Because soybeans are very susceptible to PMV (6), resistance to PMV in both groundnut and soybeans must be sought in future research programs.

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LITERATURE CITED

1. Behncken, G. M. 1970. The occurrence of peanut mottle virus in Queensland. *Aust. J. Agric. Res.* 21:465-472.
2. Bock, K. R. 1973. Peanut mottle virus in East Africa. *Ann. Appl. Biol.* 74:171-179.
3. Damirdagh, I. S., and Shepherd, R. J. 1970. Purification of tobacco etch and other viruses of the potato Y group. *Phytopathology* 60:132-143.
4. El Nur, E., and Ibrahim, G. 1968. A note on the relative susceptibility of some groundnut (*Arachis hypogaea*) varieties to *Cercospora personata*. *Plant Dis. Rep.* 52:405-408.
5. Kuhn, C. W. 1965. Symptomatology, host range and effect on yield of a seed-transmitted peanut virus. *Phytopathology* 55:880-884.
6. Kuhn, C. W., Demski, J. W., and Harris, H. B. 1972. Peanut mottle virus in soybeans. *Plant Dis. Rep.* 56:146-147.
7. Sun, M. K. C., and Hebert, T. T. 1972. Purification and properties of a severe strain of peanut mottle virus. *Phytopathology* 62:832-839.
8. Tomlinson, J. A., and Walkey, D. G. A. 1967. Effects of ultrasonic treatment on turnip mosaic virus and potato virus X. *Virology* 32:267-278.