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Physalis floridana, a natural host of groundnut eyespot virus

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With 4 figures

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Groundnut eyespot disease has been observed in the northern region of the Ivory Coast (DUBERN and DOLLET 1978), and in Upper-Volta (FAUQUET, personal communication). Based on its physico-chemical and serological properties groundnut eyespot virus (GEV) is a member of the potyvirus group (DUBERON and DOLLET 1980).

Physalis floridana is one of the most common weeds in contaminated groundnut fields and is easily infected with GEV by mechanical and aphid inoculation in the laboratory. Thus, this plant was considered to be probably a natural host for GEV.

The present paper reports results regarding the properties of a virus from diseased, field collected *P. floridana* and its resemblance to GEV.

Materials and Methods

Intact diseased *Physalis floridana* plants were collected from groundnut fields contaminated by GEV and kept on ice.

To test the possible presence of GEV in the samples, *Arachis hypogaea* L. cv. Te3 was inoculated with crude sap extracts from symptomatic leaves. Samples were ground in pH 7.3, 0.05 M potassium phosphate buffer (4 ml/g of tissue) containing 0.01 M sodium diethyldithiocarbamate and 12.5 mg/ml magnesium bentonite (FRANKEL *et al.* 1961). The extract obtained was rubbed manually on Carborundum-dusted leaves. Groundnut Te3 variety develops typical symptoms when inoculated with GEV. Test plants were kept in a glasshouse where the temperature is 30—35 °C and humidity reaches 90 %.

Aphid transmission experiments were done in the laboratory using *Aphis craccivora* Koch. reared on groundnut plants. Adult and late instar apterous aphids were starved for 1—3 h, then allowed an acquisition access time of about 30—60 seconds on diseased samples, and an inoculation access time of 24 h on healthy groundnut deedlings. They were then killed by applying an insecticide (dimethoate: dimethyldithiophosphorylacetic monomethylamide). Ten aphids per plant were used in each experiment. Aphids used in the tests were virus free. This was established by placing control lots of insects on healthy groundnut seedlings serving as negative controls.

Then standard procedures described by Bos, HAGEDORN and QUANTZ (1960) were used with crude extracts from young leaves of groundnut plants inoculated at least three weeks previously with extracts of GEV infected *Physalis* leaves.

Crude extracts were used as inocula for all mechanical transmission studies. The dilution end point was determined by serial dilutions in 0.05 M potassium phosphate buffer, at pH 7.3. The thermal inactivation point was tested by immersing 2 ml quantities of extracts, contained in 5 ml tubes, in a water bath at various temperatures for 10 min, and then placing the tubes in an ice bath and inoculating immediately. To test aging *in vitro*, the infectivity of extracts kept at 25 °C was checked every hour. Resistance to air-drying was determined by testing daily the infectivity from *Arachis hypogaea* leaves dried in boxes dehydrated by Silica gel.

Serological tests were made, by using the microprecipitin technique, under paraffin oil in Petri dishes (VAN SLOGTEREN 1954). The antiserum used was prepared in the laboratory with GEV collected from groundnut plants (DUBERN and DOLLET 1980). The homologous titre of GEV was 1/256.

Results

Mechanical transmission

Samples of *P. floridana* collected in GEV contaminated fields were: plants with very small leaves showing vein yellowing and crinkling, and plants nearly symptomless with light vein yellowing and mottling (Fig. 1). Groundnut seedlings mechanically inoculated with extracts of these last plants developed typical eyespots (Fig. 2). *P. floridana* inoculated with these extracts initially developed dotting and then a very light mottle. Leaves were small and lightly crinkled (Fig. 3). Symptoms were developed 5—7 days after inoculation. Extracts of these artificially infected *P. floridana* infected *Arachis hypogaea* (eyespots), *Canavalia ensiformis* (vein mosaic), *Physalis alkekingi* (ringspots), *Petunia rosea* (mosaic), *P. nana-compacta* (mosaic), *Tetragonia expansa* (ringspots), *Torenia fournieri* (ringspots), *Anthirrinum majus* (mottle), *Centrosema pubescens* (dotting), *Psophocarpus tetragonolobus* (local necrotic lesions). On the other hand, *Chenopodium amaranticolor, C. quinoa, Stylosanthes gracilis, Phaseolus vulgaris, Capsicum frutescens, C. annuum, Nicotiana glutinosa, N. tabacum* (cv. Xanthi, cv. Samsun, cv. White Burley), *Passiflora edulis, P. foetida* were not infected. Back inoculations were made from this last plants to groundnut and *P. floridana* plants. These were not infected.

Aphid transmission

Aphids that had fed on *P. floridana* samples, naturally infected and showing symptoms, transmitted GEV to groundnut seedlings. Groundnuts developed typical eyespots 7—10 days after inoculation. An acquisition access time of about 30 s on diseased samples was long enough to transmit the virus.

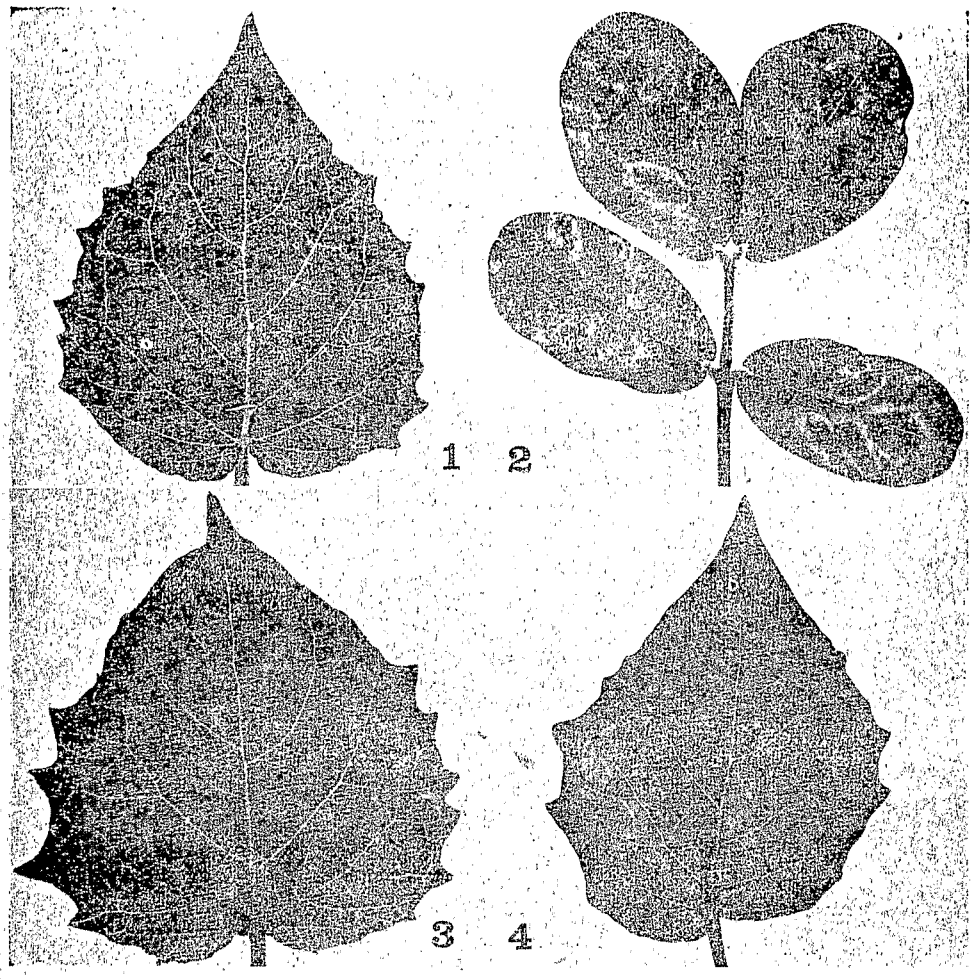

Fig. 1. Light vein yellowing and mottling on leaf of *P. floridana* collected in GEV-contaminated fields. • Fig. 2. Typical eyespot on groundnut leaf cv. Te3, 10 days after mechanical inoculation. • Fig. 3. Dotting on a mechanically infected leaf of *P. floridana*, 6 days after inoculation. • Fig. 4. Healthy leaf of *P. floridana*

In vitro properties

Dilution end point was about 10^{-3}. No infection was obtained with extract diluted 10^{-4}. Thermas inactivation point was about 42 °C. Infectivity was abolished after 10 min at 44 °C. Dried groundnut leaves were not infectious. Infectivity of *A. hypogaea* extract was abolished after three hours at 25 °C.

Serology

GEV antiserum, after absorption with clarified sap of healthy groundnut plants, reacted with artificially infected groundnut seedlings when diluted to

1/256 and with *P. floridana* samples collected in fields and showing symptoms to 1/256, but not with healthy groundnut and healthy *P. floridana* plants.

Discussion

From diseased *Physalis floridana* samples collected in GEV contaminated groundnut fields, it was possible to recover a virus. Its properties were identical with these of GEV. Groundnut seedlings, inoculated mechanically and by insect, developed typical eyespots. Host range obtained with *P. floridana* extracts was identical with GEV host range. *In vitro* properties, specially thermal inactivation point and aging, were the same, and clarified extracts reacted with GEV antiserum. So it must be considered that the virus from *Physalis floridana* is GEV and that *Physalis floridana* is a natural host plant of groundnut eyespot virus.

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Summary

Physalis floridana was found as a natural host plant of groundnut eyespot virus in Ivory Coast. The virus from *P. floridana* was characterized by its mechanical and aphid transmission to groundnut, host range, *in vitro* properties, and serological relationship with groundnut eyespot virus.

Résumé

***Physalis floridana*, hôte naturel du virus des taches ocellées de l'Arachide**

Le virus des taches ocellées de l'Arachide infecte naturellement *Physalis floridana*. Cette observation a été effectuée en champ dans le nord de la Côte d'Ivoire. Le virus isolé partir de *P. floridana* a été caractérisé par sa transmission mécanique, sa transmission par puceron, sa rangée d'hôtes, ses propriétés physico-chimiques et ses relations sérologiques avec le virus des taches ocellées de l'Arachide.

Zusammenfassung

***Physalis floridana*, ein natürlicher Wirt des „eyespot virus" der Erdnuß**

Als natürliche Wirtspflanze des „eyespot virus" der Erdnuß wurde an der Elfenbeinküste *Physalis floridana* festgestellt. Die Identifizierung des aus *Physalis* isolierten Virus erfolgte durch mechanische und Läuseübertragung auf Erdnuß, durch seinen Wirtspflanzenkreis, durch Eigenschaften *in vitro* sowie durch seine serologische Verwandtschaft zum „eyespot virus" der Erdnuß.

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