ALTERNATIVE HOSTS OF OKRA MOSAIC VIRUS NEAR PLANTINGS OF OKRA IN SOUTHERN IVORY COAST

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ABSTRACT

Symptoms of virus diseases were observed in *Corchorus olitorius*, *Hibiscus sabdariffa*, *Urena lobata*, *Borreria intricans*, and *Blighia welwitschii* in fields of okra. Symptomatology, insect transmission, host range, electron microscopy, and serological tests revealed okra mosaic virus as the causal agent of all of these diseases. Their role as reservoirs of okra mosaic virus is discussed.

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In the southern part of Ivory Coast, around Abidjan, okra (*Abelmoschus esculentus*, formerly *Hibiscus esculentus*) is grown in nearly every village. Most of these cultivations of okra are infected by okra mosaic virus (4) (Fig. 6). Okra plants in gardens are generally mixed with other vegetables, such as *Corchorus olitorius* (Tiliaceae) and *Hibiscus sabdariffa* (Malvaceae), which sometimes show symptoms of virus disease.

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A small brown chrysomelid is a serious pest of the three species. This beetle can transmit okra mosaic virus (OMV) from one okra plant to another.

This paper presents the characteristics of a virus that infects C. olitorius (Nalta Jute) and H. sabdariffa (roselle or dah in Ivory Coast), and which appears to be OMV. The possible role of C. olitorius and H. sabdariffa as reservoirs of OMV in okra-growing areas of southern Ivory Coast is discussed. Some other species also serve as reservoirs of this virus.

MATERIALS AND METHODS

Virus and plant sources: Diseased leaves of the various species collected in the fields were ground, and okra seedlings were inoculated with the extract according to the method described by Givord and Hirth (3). All subsequent extracts were prepared in the same way.

The viruses were maintained in okra cv. Clemson Spineless or C. olitorius, H. sabdariffa, and in the other reservoir species whose seeds were found in the local market or in the fields. The plants were kept in an insect-proof house and sprayed weekly with insecticide.

Host range: Vinca rosea, Nicotiana glutinosa, and Cucumis sativus cv. Vert Long Maraicher were used to differentiate the two strains of OMV commonly found in Ivory Coast (2).

Serological tests: The double-diffusion method and the intragel cross-absorption test were used to make serological tests of infected extracts with the antisera made against the two strains of OMV as reported by Givord (2). Purified antigen preparations were made by the bentonite/n-butanol method of Givord and Hirth (3).

Electron microscopy: Observations of virus suspensions were made as reported by Givord and Hirth (3).

Insect transmission: The beetle Podagrica decolorata Duvivier (Halticinae) was used in insect transmission tests. Acquisition and inoculation periods lasted for 24 hours.

RESULTS

Observations of naturally infected plants: C. olitorius and H. sabdariffa are often found growing together with okra as vegetables. All three plant species may be mixed in the same garden, or they may be separated but growing in adjacent plots. Urena lobata (Malvaceae) and Borreria intricans (Rubiaceae) are frequently found as weeds either in the okra crop, at the edge of the fields, or in an adjoining field of another crop such as cassava.

Almost all okra, H. sabdariffa, and C. olitorius crops that were inspected were infected. Infected weeds were found less frequently. A tree-stump of Blighia welwitschii (Sapindaceae) with diseased shoots was once observed at the side of an okra field. Okra samples collected in areas of the Ivory Coast other than the South (Center, North, East, and West) were found to be infected with OMV.

Symptomatology: The descriptions of symptoms are based on the criteria proposed by Bos (1). After mechanical inoculation, new leaves of C. olitorius showed vein chlorosis, large or small diffuse chlorotic blotches in varying numbers on the lamina, and vein-banding (Fig. 2). Symptoms appeared on two or three consecutive leaves just above those inoculated, and then disappeared from subsequent leaves of the main stem. At this point, however, the small new leaves of the axillary stems showed symptoms in their turn. About 15 days after symptoms disappeared on the leaves of the main stem, they reappeared, but only on new leaves. Symptoms were therefore always visible on this species; such is not the case, however, with the Malvaceae species. The same symptoms are observed in the fields in some plants that are more than 1 year old. Plants become bushy, with some branches showing symptoms and others appearing healthy.

In H. sabdariffa plants, only the first leaf growing just above the inoculated one normally showed symptoms; in exceptional cases, these were seen on a second leaf, but never on subsequent ones. A mosaic appeared, which consisted of chlorotic blotches, irregularly distributed, with a thin dark green band between the edges of these blotches and the small leaf veins (Fig. 5).

Symptoms on U. lobata, which appeared on two leaves only, were characterized by veinal chlorosis in varying degrees, which sometimes extended into the laminal parenchyma. This resulted in scattered and irregular star-shaped light green areas, which gave a mosaic appearance (Fig. 3).

In B. intricans, discoloration of the small veins formed large diffuse chlorotic bands between the main veins (interveinal mosaic) (Fig. 4). B. welwitschii leaves showed chlorosis of the leaf veins themselves and chlorosis of the lamina, which left thin dark green bands along the small leaf veins (Fig. 1). In these last two species symptoms were observed on every leaf of the plant.

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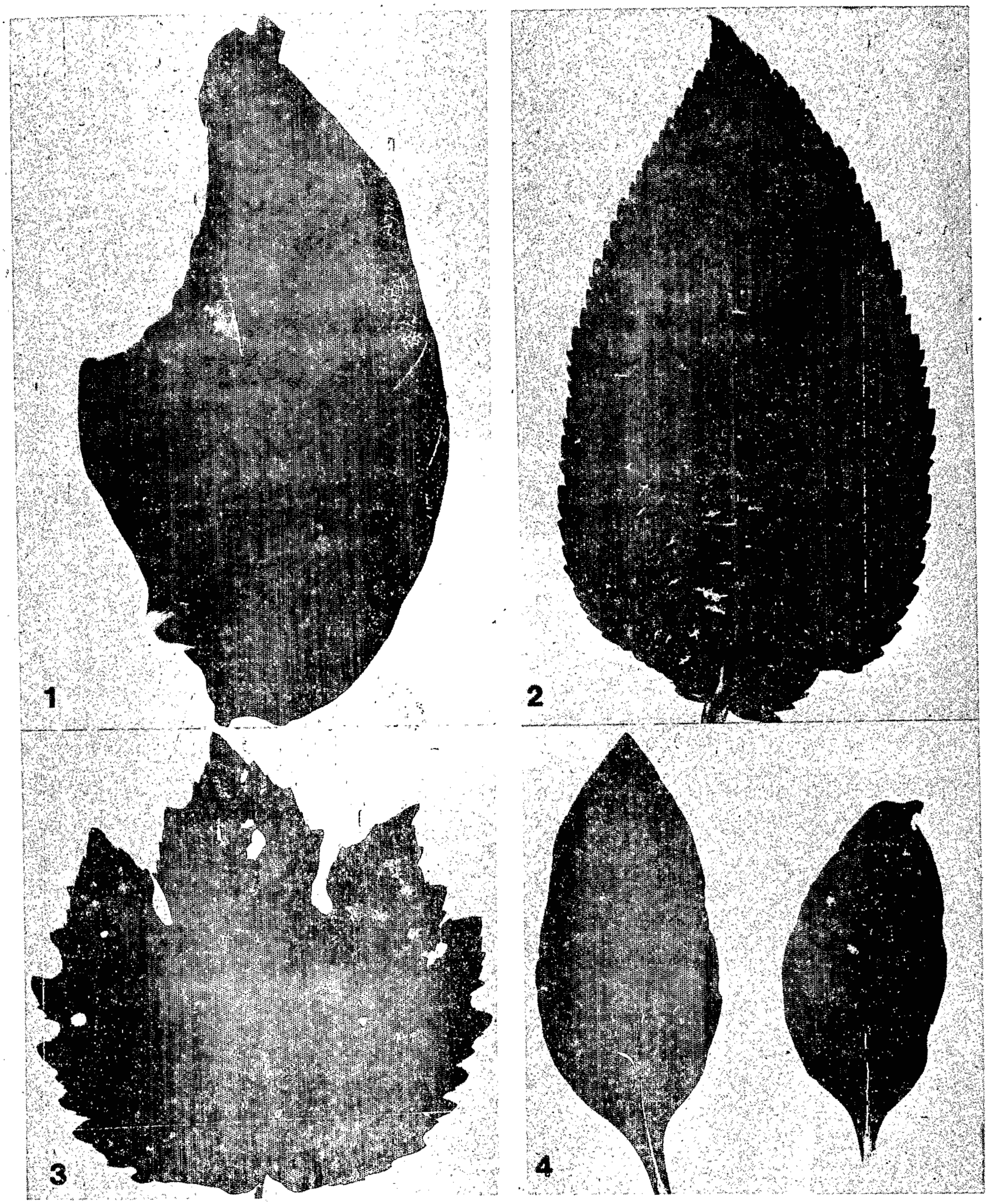
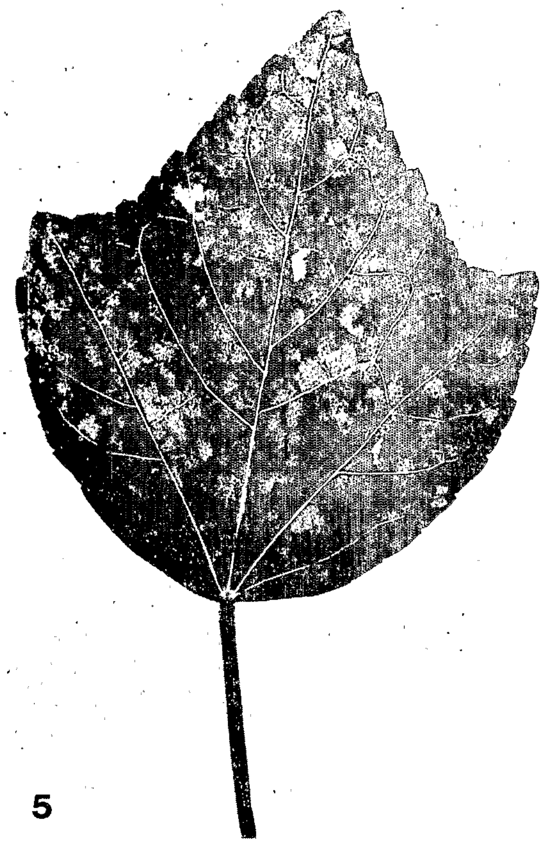


FIGURE 1. Symptoms of okra mosaic virus (OMV) on Blighia welwitschii obtained by beetle transmission.
FIGURE 2. Symptoms of OMV on Corchorus olitorius (beetle inoculation).
FIGURE 3. Symptoms of OMV on Urena lobata found in the fields.
FIGURE 4. Interveinal mosaic on Borreria intricans (natural contamination).



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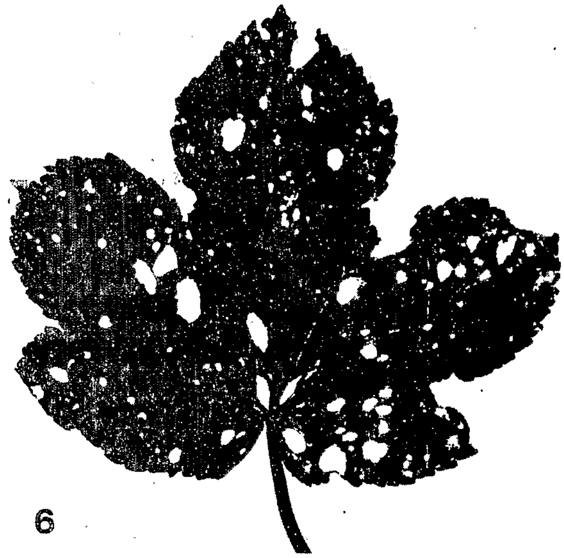

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FIGURE 5. Symptoms of okra mosaic virus (OMV) on Hibiscus sabdariffa leaves appeared after mechanical inoculation.

FIGURE 6. OMV symptoms on okra found in the field. The leaves are damaged by the beetle vector.

Mechanical transmission: Mechanical transmissions of virus collected in the fields from every species mentioned above were positive, and inoculated okra cv. Clemson Spineless seedlings had symptoms of OMV (3). Back inoculation from okra onto H. sabdariffa, C. olitorius, U. lobata, B. intricans, and B. welwitschii produced symptoms that were similar to those observed in the fields for each species respectively.

Host range: This is exactly the same as that of the Ivory Coast okra type strain (2).

Serology: Serological reactions of purified virus from each species of plants with homologous and heterologous antisera of the two strains of OMV were similar to those obtained with the purified Ivory Coast strain of OMV (2).

Electron microscopy: Electron micrographs of the virus from each species showed isometric particles identical with OMV.

Insect transmission: Transmission experiments with P. decolorata were positive in every case: from okra to H. sabdariffa, C. olitorius, U. lobata, B. intricans, and B. welwitschii, and from these species to okra.

DISCUSSION AND CONCLUSION

All properties of the viruses isolated from C. olitorius, H. sabdariffa, U. lobata, B. intricans, and B. welwitschii indicate that it is OMV (Ivory Coast strain). The five species can therefore be reservoirs of the virus.

In the southern part of Ivory Coast, okra, C. olitorius, and H. sabdariffa grow throughout the year. P. decolorata can also be observed at all times. Therefore, virus sources are always present and OMV can multiply either in one crop or in another.

The stump of B. welwitschii is an occasional host, as we found in our survey. This example of a naturally infected B. welwitschii stump indicates that there may be other occasional natural hosts of OMV. This is logical when one considers the extensive host range of OMV (3), its ready transmission mechanically, the fact that P. decolorata can feed on many species, and that other insects can transmit the virus by simple contamination through mandible contact.

Obviously, the natural host range described here is not all inclusive, especially for the other regions of Ivory Coast.

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