AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

PROCEEDINGS

OF THE

CARIBBEAN FOOD CROPS SOCIETY

SECOND ANNUAL MEETING

BRIDGETOWN, BARBADOS

OCTOBER 19-23, 1964

VOLUME II

PLANTAIN AND BANAN MOSAIC IN PUERTO RICO

Julio Bird, Frederick L. Wellman and Francisco Aponte[1/]

In 1946, Alvarez (1) observed cases of mosaic on plantains growing close to a cucumber plant field in the municipality of Corozal, Puerto Rico. Spread of the mosaic was reduced when the cucumber plants as well as the weeds in the vicinity of the affected plantain field were eradicated. Recently, work was undertaken on this disease after the occurrence of several outbreaks in different municipalities of the Island.

The leaves of acutely infected plants are characterized by the presence of golden yellow streaks of various lengths running parallel to the veins. In many cases the streaks coalesce with neighboring ones; in extreme cases the leaves become almost totally chlorotic but for a few islands of green tissue. Almost invariably the first noticeable symptoms are one, two, or a series of golden yellow lenticular spots. These lenticular spots were later found to be primary lesions since they always developed around the feeding sites of viruliferous insects. These lesions have been observed to appear in some cases 48 hours after inoculation via aphids. Other symptoms such as heart rot and splitting of the pseudostem were also observed in the field and later on plants inoculated by means of aphids in the greenhouse. Affected plants practically always give rise to diseased shoots. A few instances where diseased plants gave rise to healthy shoots were observed in the field and greenhouse. However, this was true only in the case of shoots which had arisen from the base of plants with apical necrosis.

Cucumber seedlings of the variety Black Diamond failed to contract disease when inoculated by mechanical means with saps extracted from young and old leaves of mosaic affected plantains and bananas. However in parallel tests seedling cucumber plants were successfully inoculated when similarly treated with saps extracted from the inner white pseudostem tissues of affected plants.

Cucumber virus isolates obtained locally from plantain, banana, Commelina, and cucumber plants were compared from the standpoint of their host range. They were also compared on the basis of their effect on two indicator plants: Luffa acutangula (L.) Roxb. and black cowpea. The virus isolates had the same host range and also produced similar local lesions on the leaves of the indicator plants.

The results of the host-range and indicator-plant studies were believed to be good evidence that the Puerto Rican Musa virus was closely related to the cucumber virus that Wellman (3) found was so severe on celery and that also infected banana plants in Florida. Also the virus from Musa in Puerto Rico

---

1/ Phytopathologist, Agricultural Experiment Station, University of Puerto Rico, Río Piedras, P. R.; Visiting Professor, N. C. State of the University of North Carolian, Raleigh, N. C.; and Horticulturist, Agricultural Extension Service, University of Puerto Rico, Río Piedras, P. R.

was believed to be similar to the banana virus described by Megee (2) in Australia.

Preliminary surveys were made to determine the geographical distribution and pattern of field occurrence of the virus disease among the musaceous crops of the Island. The malady was detected, scattered in nearly all of the fields visited where these crops are grown in Puerto Rico. No aphids, other than the common Pentalonia migronervosa Coquerel so widely seen on bananas, were found in the plantain or banana fields. Though abundant, these aphids did not seem to be specially associated with Musa virus disease.

The results of a survey made in 1963 clearly demonstrated that the mosaic disease is well distributed throughout Puerto Rico and that it is particularly destructive on plantains and bananas in the central mountainous area. Incidence is extremely high on plantains in the municipalities of Orocovis, Barranquitas, Naranjito and Corozal.

On account of the fact that it is the only aphid species normally found breeding and feeding on Musa plants in Puerto Rico, Pentalonia nigronervosa was believed by some to be the vector of the virus under our conditions. This aphid species was repeatedly employed by us in attempts to transmit the Musa virus. In all cases it failed to transmit the virus from Musa sapientum L. to M. paradisiaca L., or from Musa to cucumber plants and viceversa.

Instances were seen in which few acute cases of infection occurred on Musa plants of different species near pure stands of Vinca rosea L. covering the ground. These periwinkle plants were generally infested with aphids and most often exhibited were found on apprently mosaic-free periwinkle, and were multiplied on known virus-free Vinca seedlings. As these remained free of virus symptoms the stock cultures of the aphid were presumed to be virus-free. Specimens from the stock culture were forwarded to Clyde Smith at the University of North Carolina, who identified them as Aphis correopsidis Thomas. When tested under controlled conditions, this aphid was found capable of spreading the Musa virus from Musa to Musa and from Musa to cucumber. However, on the whole it was not a very efficient vector. This aphid is believed to be a vector of little importance under natural conditions in Puerto Rico. The tobacco aphid Myzus persicae was found to be incapable of transmitting the virus under our conditions.

Another aphid tried was Aphis gossypii Glover, because it has a wide host range, it is abundant on its hosts in the Island, and it is well known as an efficient vector of the cucumber virus (the Musa virus is a strain of this virus). Extensive transmission studies were carried on with A. gossypii under carefully managed greenhouse conditions. This aphid proved to be an excellent vector of the virus from cucumber plants to Musa. The aphid spread the virus within plants belonging to the genus Musa, and also transmitted it successfully from Musa to various weed and cultivated plant hosts.

Plantains become affected and often die as a result of acute infection. In other less common instances plantains enter a mosaic stage after acute infection. Many times complete recovery occurs after acute infection and the causal agent cannot be isolated from the plant tissues. In other cases after acute infection no outward symptoms of disease are evident on the plants

but the causal agent can be isolated from the inner tissues. On some of these plants the disease may flare up again, the plant entering the mosaic stage. Not infrequently symptomless plants produce deformed fruits with signs of internal necrosis.

In a series of susceptibility tests effected in the greenhouse using Aphis gossypii as vector, all of the common varieties of plantains and bananas that are known to be grown in Puerto Rico, were successfully inoculated with the Musa virus. In addition, two species allied to the bananas and plantains, namely Musa rosacea Jacq. and Canna cocinea Mill. also developed severe symptoms of mosaic.

Parallel inoculations of cucumber plants, through the rubbing technique, were carried out employing what we consider a mild strain of virus from M. paradisiaca, a severe strain from M. sapientum, and known strains of the Puerto Rican Commelina and cucumber viruses. These 4 strains induced different symptoms on Black Diamond cucumber. No symptom other than a characteristic mild mottling developed on cucumber plants diseased with the so-called mild strain of the Musa virus. Somewhat more severe effects resulted from infections induced on cucumber by what we called the severe strain of Musa virus, and the typical Puerto Rican Cucumber virus. Extremely severe mottling accompanied by ringspotting, as well as extensive necrosis resulted form inoculations with the Commelina virus.

The cucumber seedlings diseased with these 4 strains of virus were kept in different insect cages and colonized with aviruliferous Aphis gossypii. In each case, after an acquisition feeding period of 4 days about 100 aphids were transferred from the diseased cucumber plants to healthy separately grown plantain shoots of the variety Maricongo. All of the shoots thus infested with virus-containing aphids, developed very similar symptoms of mosaic.

The disease can be successfully controlled. Farmers should eliminate affected plantain and banana stock as soon as symptoms of mosaic become evident. Seemingly healthy shoots arising from the base of affected plants should not be used for propagation. Plantain and banana fields should be kept free of solanaceous, cucurbitaceous and commelinaceous plants. Many species within these families often harbor the casual agent and/or the agent that spreads the malady.

LITERATURE CITED

(1) Alvarez, L. A. - Unpublished data. 1946.

(2) Magee, C. J. P. - Transmission of infectious chlorosis or heart rot of the banana and its relationship to cucumber mosaic, Australian Instit. Agric. Sci. 6 44-47. 1940.

(3) Wellman, F. L. - A disease of banana, markedly similar to bunchy top produced by celery virus 1 in U.S.A., Phytopath. 24 1032-1034. 1935.