SOME ASPECTS OF THE EPIDEMIOLOGY OF OKRA LEAF CURL IN COTE D'IVOIRE

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INTRODUCTION

Okra leaf curl virus (OLCV) is a serious disease that limits the culture of numerous okra varieties (*Abelmoschus* spp.) in Côte d'Ivoire. The characteristic symptoms include curling of the leaves, vein thickening and a decrease of leaf area. It can lead to a severe stunting and for some varieties to the death of the plant. In the field, the disease is transmitted by the whitefly *Bemisia tabaci* Genn; experimentally, it can be transmitted by grafting. Virus particles of the geminate type have been observed associated with the disease (Fauquet & Thouvenel, 1987). In 1986 and 1987, experiments were conducted to study some aspects of the epidemiology of the disease in Côte d'Ivoire, its transmission, prevalence in the country and development in space.

TRANSMISSION OF THE DISEASE

In preliminary experiments, it was established that the disease could not be transmitted through the seeds or by mechanical inoculation : Fifty seeds from infected okra plants were grown in insect-proof glass-houses. The experiment was repeated three times. No symptom of OLCV was noticed in any of the plants. Extracts of infected okra were inoculated to okra, cassava and *Nicotiana benthamiana*. In total, 75 plants of each species were tested. However, no symptoms were observed in any of the inoculated plants. These experiments suggest that mechanical inoculation to these plants is unlikely and confirm that there is no transmission through the seed. Consequently, field spread only depends on whitefly transmission.

The percentage of viruliferous whiteflies in the field was assessed by transferring groups of 20 whiteflies originating from okra-infected fields onto healthy okra plants (cv. Clemson spineless) in the glass-house. In total, 75 okra were tested and the number of plants showing symptoms was recorded. The percentage of viruliferous whiteflies was deduced from the formula of Gibbs and Gower (1960) and was found to be c. 4%. Transmission from okra to cassava, from okra to *Nicotiana benthamiana* and from cassava to okra were also tested but no sucessful transmission was observed. No pupae were found on the tested plants, suggesting that whiteflies did not adapt sucessfully when transferred to these species.

PREVALENCE OF THE DISEASE

Previous observations have shown that Okra leaf curl occurred in numerous regions of Côte d'Ivoire. In 1987, experiments were conducted to assess in more details the prevalence of the disease in the country. Along a north-south transect in Côte d'Ivoire, four sites were selected and two varieties, one known to be susceptible (Clemson spineless), the other known to be resistant (ORS 520) were planted in a 20 x 20 m plot in early April. Sites were Sinematiali (north of Cote d'Ivoire in the savanna area; one rainy season from June to October; 1200 mm), Marabadiassa (centre of Côte d'Ivoire; savanna and forest, one rainy season from April to October, 1500 mm), Go-hermankono (South of Côte d'Ivoire, forest region, double rainy seasons, March to July and September to November, 2000 mm) and Adiopodoumé (same region as Go-hermankono but further south and along the coast). Disease incidence was assessed and the number of whiteflies was estimated weekly.

OLCV and whitefly vectors seem to be widespread in Côte d'Ivoire although marked differences did occur between the four sites. Disease incidence in the susceptible variety reached 91% in Sinematiali, 69% in Marabadiassa, 5% in Go-hermankono and 36% at Adiopodoumé. Not only the final disease incidence but also the course of infection varied between sites, the epidemics in the north sites began later than in the south. Dynamics of whitefly populations also varied and higher populations were observed in the north than in the south. Other factors are likely to influence the epidemiology of OCLV as differences in disease incidence cannot be fully explained by corresponding differences in whitefly populations: In particular, average number of whiteflies per plant was similar in Adiopodoumé and in Go-hermankono although disease incidence was five times greater in the former than in the latter. Thus, further information is needed in order to understand better the epidemics, especially about the nature and the prevalence of the virus reservoirs.

DISTRIBUTION OF THE DISEASE IN SPACE

Disease incidence and whitefly distribution were recorded in a 0.5 ha okra field planted in late March 1986. Infection was not homogenous within the field and strong border effects were observed. In particular, higher disease incidence was noticed on the south-west border, which is regularly exposed to the prevailing south-west wind. Disease incidence gradually diminished towards the centre of the field forming a decreasing gradient of infection. This gradient was apparent 30 days after planting and persisted during the rest of the experiment, although it tended to become less obvious with time. Whitefly distribution was not homogenous either and showed similar patterns characterised by higher populations on the south-west wind-exposed border. Modifications of the wind characteristics at the edge of the field may explain the greater concentration of whiteflies and the subsequent higher disease incidence on the wind-exposed borders (N'Guettia et al., 1986).

DISCUSSION

Spatial distribution of okra leaf curl shares some similarities with that of African cassava mosaic virus (ACMV) with gradients of infection from the wind-ward border to the center of the field (Fargette, 1985). Temporal patterns of spread also showed some similarities with ACMV with period of high disease incidence at the begining of the rainy season and only very low levels in the short dry season (N'Guessan, unpublished results). These common characteristics of the epidemiology are likely to be explained by features of the biology of their commun vector, *Bemisia tabaci*

Difficulty of mechanical inoculation and low percentage of transmission by the whitefly vector may be characteristics of the geminiviruses and further work on the relationship between virus, host plant and vector is needeed. Further information is also required on the nature and the prevalence of the virus reservoir for a better understanding of the epidemiology. However, the pathogen agent should be identified and specific and sensitive means of detection should be developed before progress can be made in this direction.

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