# PRIMARY AND SECONDARY SPREAD OF AFRICAN CASSAVA MOSAIC VIRUS

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At the field level, disease spread from outside (primary spread) is often distinguished from internal spread within a site (secondary spread) and different methods of control are advised according to which one is predominant (2). Three approaches were applied to study the primary and secondary spread of African cassava mosaic virus (ACMV) transmitted by the whitefly, *Bemisia tabaci*, under the Ivorian conditions.

*ACMV dispersal from a source*. Dispersal of ACMV was followed in healthy cassava fields from centrally located, internal sources of 9, 25, 50 and 100 infected plants, which were propagated by cuttings. Fig. 1 indicates the positions of new infections around a 50-plant source 6 months (left) and 7 months (right) after planting. This local spread occurred up-wind, down-wind and laterally. The spread decreased as distance increased from the source. Although the disease incidence increased from the 6th to 7th month, its extent was limited to the first eight rows surrounding the source. This pattern of local spread, which expands somewhat independently from the wind direction, differs from the distant spread originating from outside sources which is strongly down-wind oriented ("Spatial pattern of ACMV spread," same issue). Detailed studies of whitefly movements indicate that, within the canopy, the wind speed is much lower than above. This allows the insects to control their flight somewhat independently of the wind direction ("Field dispersal of *Bemisia tabaci*, vector of ACMV," same issue).

Spread from internal sources indicates that infected plants in a field contribute to the infection of other plants. So, it is likely that the spread from outside sources leads to establishment of internal sources which themselves contribute to further spread.

*Distribution of the diseased plants; aggregated vs random distribution*. An attempt to distinguish primary and secondary spread was carried out by studying the distribution of diseased cassava plants. In a 1.0-ha healthy cassava field (100 plots of 100 plants each) the position of the diseased plants was assessed and the date of contamination recorded each fortnight in 18 plots. Nine plots were located in positions where inoculum pressure was high (near the up-wind border) and the other nine where inoculum pressure was low (near the down-wind border). Three methods of analysis which discriminate aggregative from random distribution were applied to study the diseased plant distribution: the number of doublets (3); the binomial distribution; and the convolution method (1). According to the results of these methods, the distribution of the diseased plants is predominantly of the random type.

Disease progress curves. We compared the disease incidence in plots with and without internal sources. This method, although suffering some limitations, indicated that the secondary spread contributes to infection, that its rate is variable from one month to another, and that both spreads are linked to the size of the whitefly population 6 weeks earlier. However, the primary spread was predominant and contributed to over 70% of the disease incidence.

## CONCLUSION

Secondary spread does occur and may occur preferentially between adjacent plants. The predominant random primary spread may mask this aggregative spread. From a practical standpoint, the rapid primary spread in the coastal region of the Ivory Coast implies that removal of diseased cassava, although limiting secondary spread, would not suffice to maintain virus-free plantations. This situation is not typical of the entire Ivory Coast, and in areas such as Toumodi ("Development of ACMV at the regional level," same issue) adequate cultural practices including eradication of diseased cassava allowed us to maintain virus-free fields for years.

## REFERENCES

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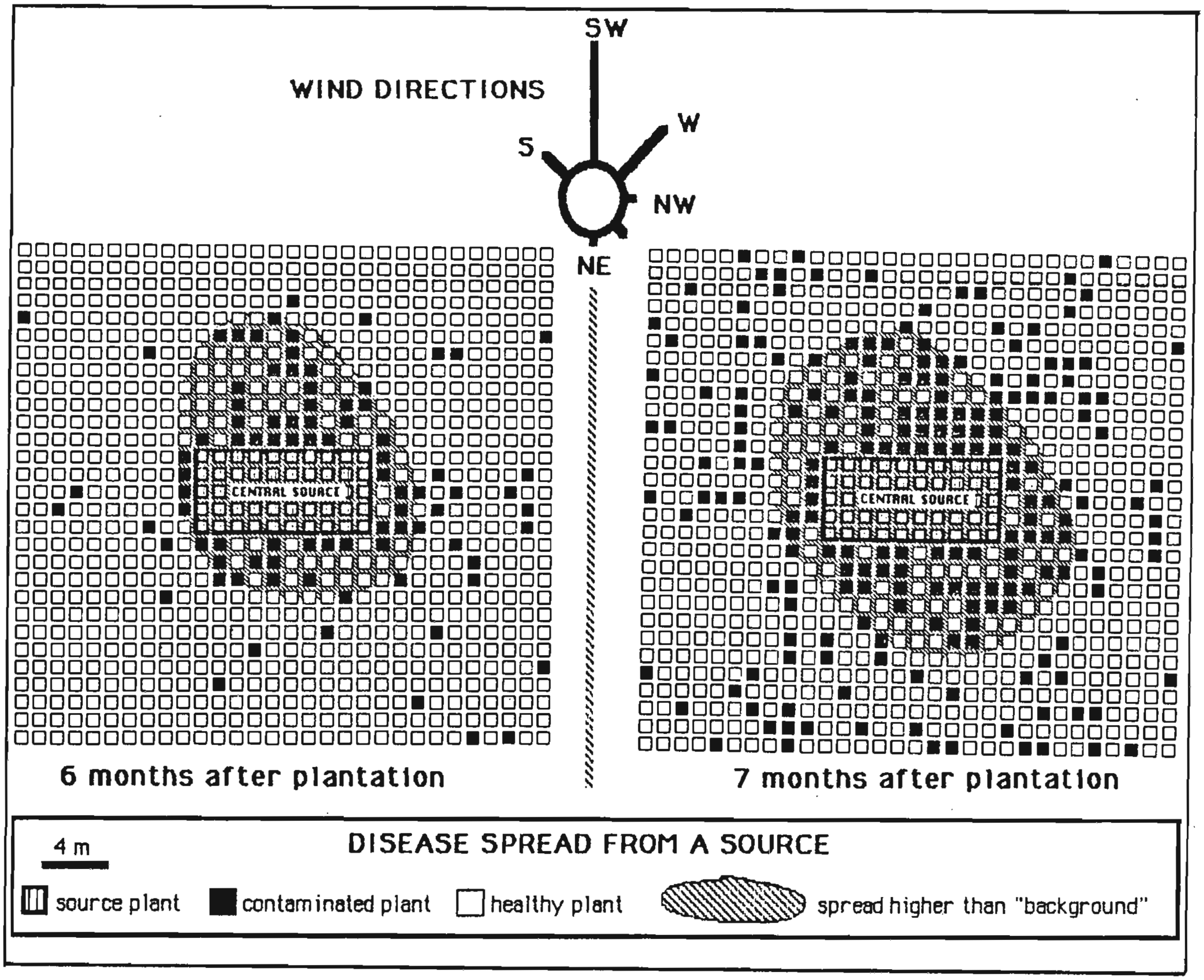


Fig. 1. Dispersal of ACMV from a source, 6 and 7 months after planting. Directions of the winds are indicated.