

Short Communication

**The Cassava Green Mite in Africa: One or Two Species? (Acari: Tetranychidae)**

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ABSTRACT

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Despite a certain amount of confusion that has prevailed for several years with respect to the *Mononychellus* complex (cassava green mite = CGM; Acari: Tetranychidae) which attacks cassava plantations in Africa, strong arguments indicate that a single taxonomic unit corresponding to the species *Mononychellus progresivus* Doreste, 1981, was introduced in 1971 from South America.

INTRODUCTION

The accidental introduction of spider mites of the genus *Mononychellus* Wainstein into African cassava plantations had such an economic impact that attempts were made to solve the problem by attending to the most urgent things first and by calling in several organizations, each of which has a different competence. By approaching the question in this way, some interesting reactions were provoked, but as the situation persisted, it also resulted in a certain confusion in several areas.

The subject is complicated by the fact that for someone who is not an expert, the symptoms produced by the CGM in cassava (chlorosis of young leaves followed by defoliation of young shoots) can be confused in the field with those produced by the cassava mealybug (CM), *Phenacoccus manihoti* Matile-Ferrero, or by the African cassava mosaic virus (ACMV). At many conferences, there are still discussions to decide which of these calamities should be given priority in research.

Several species of phytophagous mites existed beforehand in Africa. They attacked cassava, but only caused slight damage. Generally their color was red (*Tetranychus* spp.) or garnet-red (*Oligonychus* spp.), and consequently they were easy to see with the naked eye. By contrast, the CGM is smaller and has a very mimetic green color, so that often it can only be seen with a hand lens.



The CGM was first collected in Africa near Kampala (Uganda) in 1971 (Lyon, 1973). At that time, *Mononychellus*, whose name had just been changed (Wainstein, 1971), only contained 17 species, of which 4 had been reported on cassava in different South American countries: *Mononychellus bondari* (Paschoal, 1970), *M. caribbeanae* (McGregor, 1950), *M. planki* (McGregor, 1950) (Paschoal, 1971) and *M. tanajoa* (Bondar, 1938). The specimens collected in Uganda were identified as *Mononychellus tanajoa*, which had just been redescribed by Flechtmann and Baker (1970). This designation was given to all the CGMs collected in Africa for several years, until the discovery in Gabon and Nigeria (Flechtmann, 1982) of another species, *Mononychellus progresivus* Doreste, 1981. Some trouble then arose, and authors began referring to the *Mononychellus* complex, and tried to analyze it, for example by comparing, without much success, the length of the dorsal setae of specimens from different areas.

The situation can be clarified to some extent by examining the parallel courses of research in South America and Africa.

#### THE COURSE OF RESEARCH IN SOUTH AMERICA

It all started in 1938 with Bondar's publication. Since his microscope slides had apparently been lost, and since the original description had been done quite inaccurately, based only on females, Flechtmann and Baker collected from *Manihot* sp., in the type-region of Bahia, a *Mononychellus* species that they described in 1970 (Flechtmann and Baker, 1970). They basically took into account the dorsum of the female (reticulation of the prodorsum, striation pattern of the opisthosoma, length and position of the dorsal setae), whereas the males remained unknown.

In the same work, Flechtmann and Baker divided the species *M. planki* (McGregor) into two taxa, i.e. *M. planki* sensu stricto (McGregor), which has reticulations on the prodorsum and the base of each of the opisthosomal setae, and *M. mcgregori* (Flechtmann and Baker), which has regular striations over the whole dorsum. Consequently, the mites collected on cassava in Brazil, and identified as *M. planki* by Paschoal (1971), should actually have been named *M. mcgregori*, since the author himself indicated that there were fewer reticulations on these specimens. Subsequently, Urueta (1975) collected *M. mcgregori* on cassava in Colombia.

In 1979, Doreste reported *M. estradai* (Baker and Pritchard, 1962) on cassava in Venezuela, and then in 1981 described two new species of *Mononychellus* collected on the same plant: *M. manihoti* and *M. progresivus*, whose aedeagi were represented, as well as that of *M. tanajoa*. In 1982, he added *M. chemosetosus* (Paschoal, 1970) to the list (Doreste, 1979, 1981, 1982).

Eight other *Mononychellus* were described elsewhere on other host plants, both in Mexico and in South Africa (Smith Meyer, 1974; Tuttle et al., 1974,

1976), so that, based on the literature, the genus *Mononychellus* would now appear to contain 27 species, 8 of which live on cassava in South America: *M. bondari*, *M. caribbeanae*, *M. chemosetosus*, *M. estradai*, *M. manihoti*, *M. mcgregori*, *M. progresivus*, and *M. tanajoa*.

In reality, however, this group should be completely revised. Examinations of recently collected specimens, especially from Africa (personal observations; H.R. Bolland, pers. commun., 1986; C.H.W. Flechtmann, pers. commun., 1986; I.C.I.P.E., 1986) have made it clear that in the genus *Mononychellus*, as for example in the genus *Eutetranychus* Banks (Gutierrez, 1985), the length of the dorsal setae, which has been used for years as a criterion for distinguishing the species, varies considerably from one strain to another, and even between specimens of the same strain.

Moreover, it is generally necessary to rely on the author's original descriptions, since the microscope slides are not available, or can only be examined on location in each country. These publications are often incomplete, and even contain certain errors. The chaetotaxy of the legs differs from one author to another, e.g. that of the legs of one female is based on a specimen that is clearly masculinized, which is a frequent phenomenon in the Tetranychidae, or the number of ordinary setae is not the same in the two sexes. The shape of the peritremes appears to be homogeneous in this group. Other morphological characters (empodia, shape of the spinning eupathidium of the palpal tarsus) have been studied in some species, but not in others. The presence or absence of reticulations on the dorsum of the body is a constant specific character (Flechtmann and Baker, 1970), but this element is difficult to illustrate reliably.

Curiously enough, the form of the aedeagus has only been used very recently, whereas the majority of the Tetranychinae species are rather easily distinguished on this basis, since the work of Ewing (1913).

Figure 1 shows the aedeagi of eight *Mononychellus* species that live on cassava. The discovery of the male of *M. caribbeanae* by Livschitz and Salinas Croche (1968) has gone unnoticed, or has not been taken into account by other authors.

Examination of these aedeagi elicits several remarks:

- The knob of the aedeagus of *M. progresivus* is small and slender, and very different from that of *M. tanajoa*, which is globular.
- There is a striking resemblance between the aedeagus of *M. estradai* and that of *M. tanajoa*, and both of them are close to that of *M. caribbeanae*. Moreover, *M. estradai* and *M. tanajoa* have the same reticulation of the prodorsum and nine ordinary setae on the tibia I, whereas *M. caribbeanae* has only eight (Tuttle et al., 1976; Livschitz and Salinas Croche, 1968). Consequently, I consider that *M. estradai* (Baker and Pritchard, 1962) is a synonym of *M. tanajoa* (Bondar, 1938).
- There is also some doubt about the validity of *M. chemosetosus* (Paschoal, 1970), whose aedeagus resembles that of *M. planki* sensu stricto (McGregor,

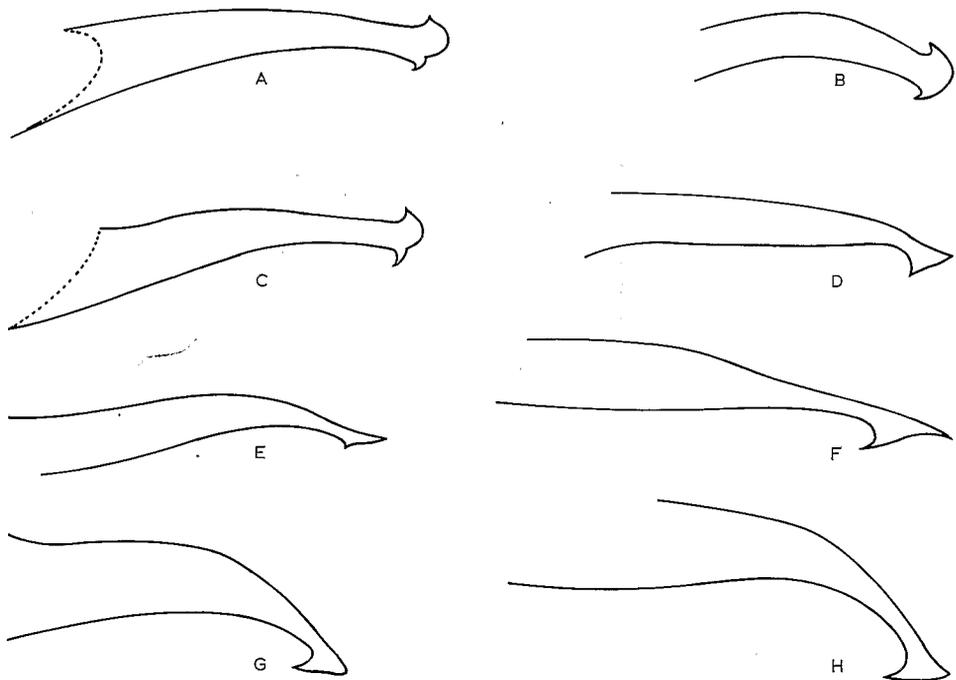


Fig. 1. Aedeagi of the different *Mononychellus* species recorded on *Manihot* spp. throughout the world. (A) *Mononychellus estradai* (Baker and Pritchard, 1962); (B) *M. caribbeanae* (Mcgregor, 1950); (C) *M. tanajoa* (Bondar, 1938); (D) *M. bondari* (Paschoal, 1970); (E) *M. progresivus* Doreste, 1981; (F) *M. manihoti* Doreste, 1981; (G) *M. chemosetosus* (Paschoal, 1970); (H) *M. mcgregori* (Flechtmann and Baker, 1970).

1950) (see Flechtmann and Baker, 1970). Moreover, the two species have the same dorsal reticulation and nine ordinary setae on the tibia I.

#### THE CASSAVA GREEN MITE IN AFRICA

All the samples I have been able to collect or receive from Africa are related to *M. progresivus*. They originate either from Kenya, where they were collected in 1985 and 1986 by W. Helle in the context of the I.C.I.P.E., or from the Republic of Congo, where they were collected in 1984 and 1985 (Gutierrez et al., 1985) and then in 1986, in different localities belonging to several biotopes, or from the Ivory Coast (new record) where I collected them in both forest and savanna areas in 1985.

Despite my requests, no one has been able to provide me with a specimen of *M. tanajoa* from Africa.

The confusion that prevailed for several years in the designation of *Mononychellus* has led certain authors to speak of a *Mononychellus* complex attack-

ing cassava in Africa, which has added to the mystery surrounding the famous CGM, but I consider that only a single species was in fact introduced into Africa. It was named *M. tanajoa* for about 8 years (1973–1981), but since the description of *M. progresivus* in 1981 it should have been designated by this name. The determination of the first African *Mononychellus* specimens was based only on a study of the female dorsum, but when the description of the two sexes became available, and when it became possible to compare the male aedeagi, it was clear that there was only one species, *M. progresivus*. This provides a simple explanation to the remarks of Macfarlane (1984), who noted in his key to spider mites recorded on cassava in Africa that “the first records of *Mononychellus* from Africa were determined as *M. tanajoa*” and that “the majority of records are probably *M. progresivus*”.

If there is a complex, it is only an intraspecific one and not an interspecific complex, as was suggested. The morphological variations between strains – represented, for example, by the length of the dorsal setae – correspond to a genetic variability common to several species of Tetranychidae. The genetic divergences of populations, which arise especially from the haplo-diploid nature of spider mites, have been extensively studied in the temperate zone in *Tetranychus urticae* Koch (Helle and Pieterse, 1965; Dupont, 1979; De Boer, 1980, 1981) and in the tropics in *Tetranychus neocaledonicus* André (Gutierrez and Van Zon, 1973). In these two species, genetic variability is not expressed by clear morphological variations, but crosses between strains result in different levels of incompatibility. Crosses between strains of CGM from different African countries would probably lead to similar results and would show a gene flow between the various African morphs of *Mononychellus progresivus*.

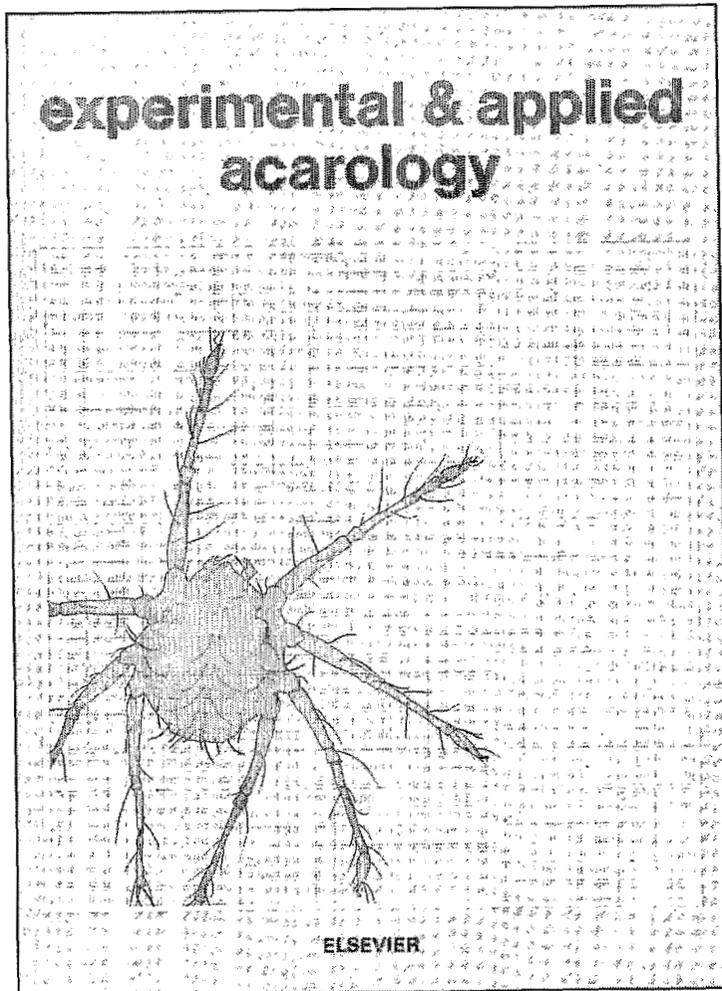
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