

Countrywide distribution of fauna associated with the cassava green mite (*Mononychellus tanajoa*) in Cameroon

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Abstract

A survey of the distribution and abundance of cassava green mite and associated indigenous natural enemies found in the cassava agroecosystem in Cameroon was conducted during the 1991 dry season (January-February). The survey area included nine of the ten provinces of the country and covered 4.2 km. The list of pests, weeds and local phytoseiids found on cassava and associated crops/weeds in 46 fields is presented. Twenty four species of phytoseiid mites were recorded, with *Typhlodromalus saltus* mostly found on cassava while *Typhlodromips shi* was more prevalent on weeds and fruit trees. The densities of *M. tanajoa* in the regions are also determined. This pest was found everywhere, with the highest densities in the Highland savannah (230 actives/leaf) and transitional zone (143 actives/leaf). These densities remained high despite the presence of local phytoseiids. The lowest densities were recorded in the forest zone (5 actives/leaf). No mites (either phytophagous or predaceous) were found in the Northern region. There is need to introduce exotic phytoseiids to control the *M. tanajoa* populations in Cameroon. A classical biological control program, combined with other compatible control methods such as cultural practices and host plant resistance, is recommended to combat this exotic pest in Cameroon.

Key words: Cassava green mite, *Mononychellus tanajoa*, fauna, Tetranychidae, phytoseiids, biological control, agro-ecosystem

La distribution nationale de la faune associée à l'acarier vert (*Mononychellus tanajoa*) du manioc au Cameroun

Résumé

Une prospection sur la distribution et l'abondance de l'acarier vert et de ses ennemis naturels locaux associés à l'agro-écosystème du manioc a été réalisée pendant la saison sèche (Janvier et Février) en 1991. Cette enquête a sillonné neuf régions du pays et a couvert une distance de 4.200km. La liste des ravageurs, des mauvaises herbes et des phytoséiides locaux rencontrés sur le manioc et autres plantes/adventices associées dans 46 champs visités est présentée. Vingt quatre espèces de phytoséiides avaient été répertoriées, avec *Typhlodromalus saltus* plus rencontré sur le manioc et *Typhlodromips shi* plus observé sur les adventices et les arbres fruitiers. Les densités de *M. tanajoa* avaient été déterminées dans toutes les zones visitées sauf dans le Nord avec ses plus fortes densités dans les savanes d'altitude (230 actifs/feuille) et dans la zone de transition (143 actifs/feuille). Ces densités sont restées fortes malgré la présence des phytoséiides locaux. Ceci nécessite l'introduction des phytoséiides exotiques pour contrôler les populations d'acariens verts. Les plus faibles densités sont observées dans les zones de forêt (5 actifs/feuille). Une lutte biologique classique, combinée à d'autres méthodes compatibles est recommandée pour combattre ce ravageur exotique.

Mots-c'és: Acarier vert du manioc, *Mononychellus tanajoa*, faune, Tetranychidae, phytoseiids, lutte biologique, agro-écosystème

Introduction

Cassava green mite (*Mononychellus tanajoa*) was accidentally introduced into Africa on cassava from the Neotropics in the early 1970s (Yaninek and Herren 1988). This exotic pest has since spread from Uganda where it was first observed throughout the African cassava belt causing an estimated 30-80% reduction in yield (Yaninek and Herren 1988). *M. tanajoa* feeds mostly on young leaves, causing sclerosis, stunted growth and under extreme population densities, premature leaf drop. *M. tanajoa* is a dry season pest. It has two peaks in a year: the first one at the end of the rainy season and the second

one at the beginning of the wet season. *M. tanajoa*-induced losses are greatest where the dry season is longer and less where the dry season is shorter (Markham and Robertson 1987). Both female and male occur together and the female lays about 70 eggs within 12-23 days. Development from egg to adult takes 8-13 days (Yaninek *et al* 1991).

M. tanajoa was first observed in Cameroon in 1981 around Garoua-Boulai in the East province (CNRCIP 1982). In a survey carried out in 1985 and 1986, it was established that this pest was present in all cassava growing areas of the country (Hammond and Tchuanyo, unpublished report). Cassava green mite has since become a major

pest of cassava in this country. In order to determine the distribution and the abundance of cassava, *M. tanajoa* and its associated indigenous natural enemies found in Cameroon, a survey was carried out from 25th January to 10th February 1991 (1990-91 dry season) through nine of the ten regions of the country. The aims of this survey were to identify sites for future releases of exotic natural enemies and determine the actual situation before the releases.

Materials and methods

Survey of cassava, cassava green mite and associated natural enemies was conducted along the major roads crossing nine of the ten provinces of Cameroon from 25th January to 10th February 1991 during the dry season (Fig. 1). The frequency of cassava in each zone was determined by recording the presence or absence of cassava fields

every 10 km intervals within a 100-m stretch on either side of the road while travelling in a vehicle. Every 50-100km, a cassava field was carefully examined for *M. tanajoa* and its associated natural enemies. A census, including incidence, abundance and damage symptoms of *M. tanajoa* was made in each field using the sampling method described by Yaninek *et al* (1989). During the survey, a detailed description of agronomic practices being used in each field was also recorded (Table 1). Specimens of *M. tanajoa*, other tetranychids and associated natural enemies were collected from cassava, food crops, fruit trees and common weeds in and around the cassava field. Mite specimens were identified at IITA Cotonou-Benin. Plant samples were identified by the National Herbarium, Yaoundé, Cameroon. Additional information on crop variety, crop age, weed occurrence and geographical data of localities visited were also recorded.

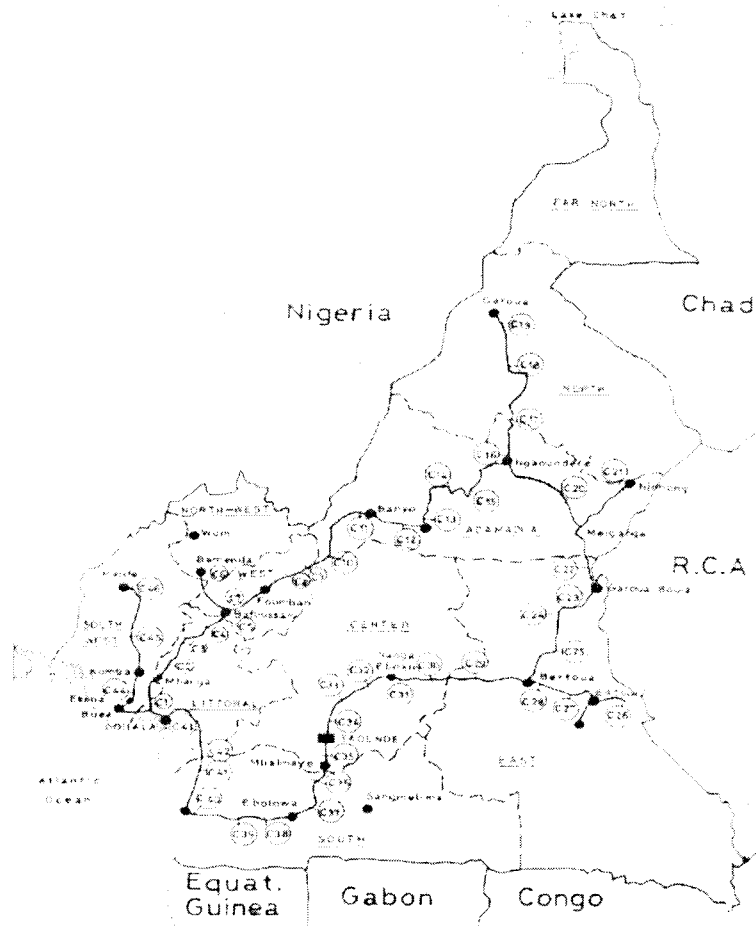


Fig 1. Map of Cameroon showing survey sites

Results and discussion

The survey covered 4,200 km of route during a two week (15 days) period between 25 January to 10 February 1991. Data were collected from 46 sites selected from nine of the ten regions of Cameroon (Fig 1). The summary of the data from each surveyed field as well as the characteristics of individual sites are shown in Table 1.

Cassava

Cassava was found in all the nine regions covered during the survey. However the frequency increased from the South to Littoral region and then decreased dramatically towards the North (Fig 1). Crop age in surveyed fields was very variable. Cassava was between 6 to 10 months old in the Southern and Eastern regions but 4 to 20 months old in the Centre region. In the Western region it was 3 to

Table 1. Occurrence of the cassava green mite (*M. tanajoa*) on cassava in different agro-ecological zones of Cameroon

Zones	Location	Infestation (%)	Density (No./plant)	Damage score	Associations
Humid forest	Nkapa	40	11.0	1.4	Red mite, white fly
	Douala	23	2.3	1.1	Red mite, white fly
	Loum	63	10.0	2.1	Red mite, grasshopper
	Nkongsamba	90	32.3	2.2	Red mite, white fly
	Muyuka	53	35.3	2.0	White fly, mealybug
	Supe	97	74.3	2.0	White fly
	Bakebe	82	61.1	2.3	-
Semi-humid forest	Minta	7	103.6	2.9	Red mite, white fly
	Nanga Eboko	100	136.6	3.1	Red mite, white fly
	Nkoteng	100	129.7	3.0	White fly
	Ndjore	93	67.3	2.5	-
	Obala	93	77.7	2.6	Red mite, white fly
	Yaounde	97	19.7	2.5	Red mite, white fly
	Mbalmayo	83	15.0	2.1	Red mite, white fly
	Ngoulemakong	50	5.0	1.6	Red mite, white fly
	Mvieng	73	7.3	1.7	White fly
	Akom II	87	15.3	2.0	White fly
	Angale	47	4.7	1.4	White fly
	Kribi	47	4.7	1.4	White fly
	Kribi	10	1.0	1.0	Red mite, white fly
Highland savannah	Kekem	100	58.0	2.3	White fly
	Bafang	100	89.3	2.6	Red mite, white fly
	Bamenda	100	116.3	2.9	White fly
	Bafoussam	100	81.33	2.8	-
	Foumban	100	138.7	4.0	-
	Manki	100	230.0	3.7	Red mite, white fly
	Bankim	100	122.0	2.6	-
Transition forest	Djohong	23	2.3	1.3	Red mite, white fly
	Gangui	97	79.7	2.7	-
	Garoua-Boulai	97	128.0	3.5	White fly
	Ndokayo	100	157.8	3.9	White fly
	Yangamou	100	66.7	3.1	White fly
	Ngoura	100	125.3	3.4	Red mite, white fly
	Batouri	100	95.0	2.8	Red mite, white fly
	Bertoua	100	143.3	3.3	Red mite, white fly
	Diang	100	91.3	2.9	Red mite, white fly
	Banyo	77	70.3	2.2	-
	Tibati	100	125.3	3.3	-
	Tibati	100	102.7	2.9	White fly
	Doualayel	100	10.0	3.2	-
Martap	100	33.1	2.4	-	
Dry savannah	Ngaoundere	92	25.8	2.7	-
	Mbe	67	30.5	2.3	White fly
	Ngouna	0	0.0	1.8	-
	Ngaoundere	67	21.5	2.3	-

19 months old while varying from 6 to 18 months in the Littoral region. Crop age was 6 to 8 months old in the Southwest and Northwest regions whereas it was 2 to 10 months in the Adamaoua and 3 to 4 months in the Northern region.

Most of the cassava was intercropped at the time of planting. The most common intercropped plant was maize accounting for 41.29%, followed by banana/plantain, accounting for 10.86%. Except fruit trees and plantains, all intercropped plants had been harvested by the time of the survey.

All cassava varieties found during the survey were local. This suggests that the distribution of improved or the so-called "Agric" varieties needs to be intensified.

Cassava green mite (*Mononychellus tanajoa*)

Cassava green mite was found in all the regions surveyed except in the Northern region. The level of infestation was not the same in all the regions. One hundred percent infestation was found in fields in the Eastern, Northwestern, Western and parts of the Adamaoua and Centre regions where annual precipitation averaged more than 1100mm (Fig 2). No *M. tanajoa* was found further North where

annual precipitation was less than 1100mm. *M. tanajoa* densities were generally moderate to heavy. The highest *M. tanajoa* densities were found in the Western, Northwestern and Eastern regions, averaging 113.4, 111.3 and 109.9 actives per leaf respectively. The highest damage scores were also observed in the three regions mentioned above, averaging 3.1, 2.3 and 3.2 respectively. The lowest *M. tanajoa* densities were encountered in the South, Littoral and the Northern regions near the limit of mite distribution, averaging 7.4, 45.2 and 0 actives per leaf, respectively.

Rainfall distribution, the length of the dry season, relative humidity and other climatic conditions are important in determining *M. tanajoa* distribution (Yaninek and Onzo 1988). Although all these parameters were not investigated during the survey, mite distribution seems to follow the rainfall pattern.

Other Phytophages

The red mite, *Oligonychus gossypii* was the other most common tetranychid mite found on cassava during this survey. It was found in 7 regions where it occurred in 37% of the cassava fields surveyed. Other tetranychid mites found in cassava and associated weeds and fruit trees included:

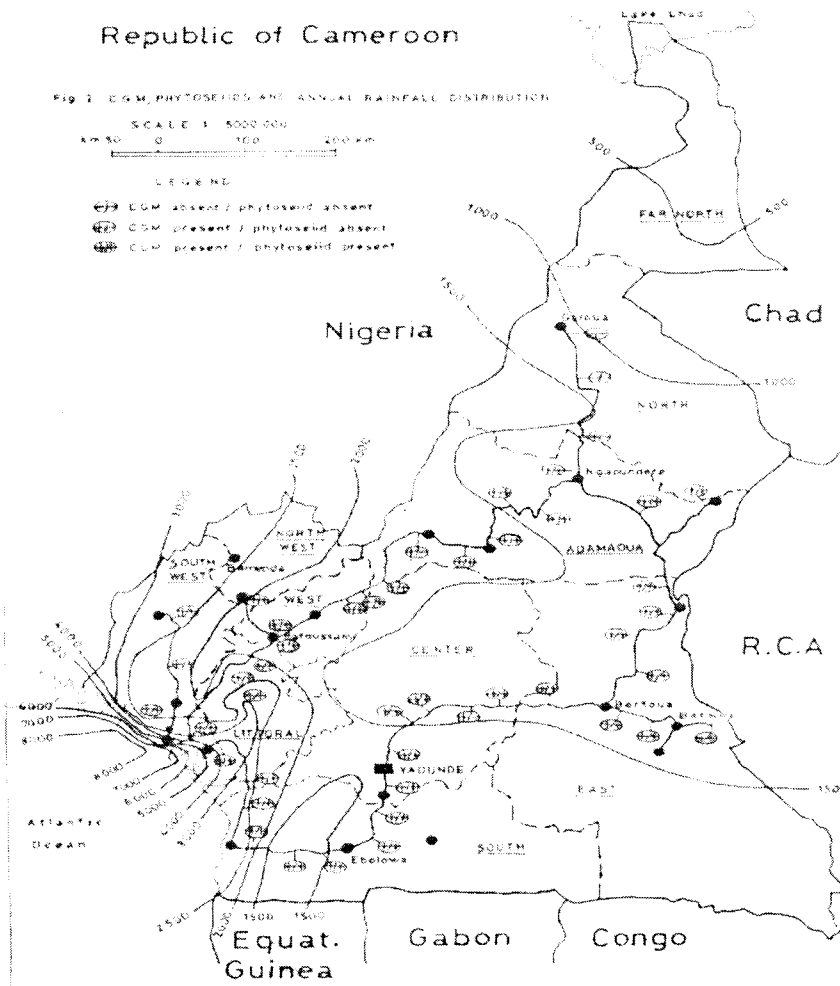


Fig2. Cassava green mite, phytophages and annual rainfall distribution

Cassava green mite fauna in Cameroon

- *Tetranychus* sp. found in 15% of fields on cassava, cocoyam (*Xanthosoma sagittifolium*) and weeds;
- *Tetranychus urticae* found in one field on cassava.

Phytophagous insects encountered on cassava included the whitefly (*Bemisia tabaci*) found in 32 fields and the cassava mealybug (*Phenacoccus manihoti*) found in only two fields near Kribi (South Province) and in Muyuka (Southwest region).

Phytoseiids

Approximately 200 phytoseiid species found associated with the cassava agro-ecosystem in Africa have been reported with about 30 undescribed (Yaninek, unpublished data). Phytoseiid mites found in the cassava agro-ecosystems in Cameroon are presented in Table 2. All phytoseiids present in this country were indigenous since no release of exotic phytoseiids has been made so far. A new species, not yet described, (*Amblydromella* n. sp),

was found in four fields on *Erigeron floribundus*, *Cassia* spp, and *Chromolaena odorata*. *Typhlodromalus saltus* was the most abundant species found on cassava whereas *Typhlodromips shi* was the species mostly found on weeds and fruit trees.

The indigenous phytoseiid predators found on cassava and surrounding vegetation were concentrated in their distribution to the Southern Provinces of the country and in the southern part of the Adamaoua region. This phytoseiid distribution corresponds to the geographical zones where relative humidity is high and where surrounding vegetation is dense. This distribution corresponds in like manner as described in Benin by Yaninek and Onzo (1988). The fact that phytoseiid predators were present only in the southern part of the country where the relative humidity is high and abundant on vegetation other than cassava suggests that indigenous phytoseiid found on cassava in Cameroon are species that may have moved from surrounding vegetation.

Table 2. Phytoseiids in cassava fields and surrounding vegetation in different agro-ecological zones of Cameroon

Phytoseiids species	Host plants						
	Cassava	Other roots and tubers	Cereals	Bananas/ plantains	Weeds	Fruit trees	Other tree crops
1. <i>Amblydromella gutierrez</i>						c*	
2. <i>Amblydromella</i> spp.					bc		
3. <i>Amblyseius largoensis</i>						c	
4. <i>Amblyseius herbicolus</i>							
5. <i>Amblyseius spinosa</i>							
6. <i>Amblyseius sundi</i>				d	abce	ab de	abcc
7. <i>Amblyseius tamatavensis</i>					ab		
8. <i>Euseius beninensis</i>				a	e	a	a
9. <i>Euseius dossei</i>				c e	a e	bcde	
10. <i>Euseius fusti</i>	abce			e	bc	e	
11. <i>Euseius lokele</i>	de	d		b d	cde	cd	d
12. <i>Euseius rotundus</i>				e			
13. <i>Euseius tutsi</i>				e			
14. <i>Iphiseius degenerans</i>	de	d	d	d	d e	a d	a c
15. <i>Neoseilus insignitus</i>					b		
16. <i>Paraphytoseius multidentatus</i>					acde		
17. <i>Paraseiulus relenta</i>					bc		
18. <i>Phytoseius amba</i>					bde		
19. <i>Propriseiopsis pelatus</i>			ab		ab		
20. <i>Typhlodromalus havu</i>					c		b
21. <i>Typhlodromalus saltus</i>	abcde	d	abcde	ab de			
22. <i>Typhlodromips rykei</i>					a		
23. <i>Typhlodromips shi</i>	a		b	ab	abc	ab	abc

*a: humid forest; b: sub-humid forest; c: highland savannah; d: transition forest; e: dry savannah

Other predators

Other predatory mites of *M. tanajoa* were rare. The most common families recorded were Cunaxidae (found in 13 fields), Erythraeidae (found in three fields), and Anystidae (found in a single field). Mites of the families Cheyletidae and Trombidiidae were each found in two fields.

Conclusions

Cassava was found throughout the country but at different frequencies. *Mononychellus tanajoa* was found in all cassava growing areas except in the Northern region where the average annual precipitation is less than 1100 mm. *M. tanajoa* densities remained high despite the presence of indigenous phytoseiids. This indicates that phytoseiid predators found in Cameroon are not as efficient in controlling *M. tanajoa* populations as they are in Latin America. The gap in natural enemy fauna can only be filled by introducing efficient and well adapted biological control agents from the Neotropics where they keep *M. tanajoa* in check. This is the basis of the classical biological control presently executed by the Biological Control Centre for Africa at IITA Benin Station in Cotonou. This classical biological control program should be extended in Cameroon in combination with other control methods such as cultural practices and host plant resistance in order to combat this exotic mite of cassava.

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