

A geographic distribution database of *Mononychellus* mites (Acari, Tetranychidae) on cassava (*Manihot esculenta*)

Aymer Andrés Vásquez-Ordóñez¹, Soroush Parsa¹

¹ CIAT, Centro Internacional de Agricultura Tropical (CIAT), Apartado Aéreo, 6713 Cali, Colombia

Corresponding author: Aymer Andrés Vásquez-Ordóñez (a.a.vasquez@cgiar.org)

Academic editor: V. Pesic | Received 21 March 2014 | Accepted 14 April 2014 | Published 8 May 2014

Citation: Vásquez-Ordóñez AA, Parsa S (2014) A geographic distribution database of *Mononychellus* mites (Acari, Tetranychidae) on cassava (*Manihot esculenta*). ZooKeys 407: 1–8. doi: 10.3897/zookeys.407.7564 GBIF Key: <http://www.gbif.org/dataset/785cf038-7b79-4c2f-9e9e-eb940fd4c0c>

Resource citation: Vásquez-Ordóñez A.A., Parsa S. (2014-). A geographic distribution database of *Mononychellus mites* (Acari: Tetranychidae) on cassava (*Manihot esculenta*), 1513 records, online at <http://www.gbif.org/dataset/785cf038-7b79-4c2f-9e9e-eb940fd4c0c> and <http://data.sibcolombia.net/datasets/resource/93>, published on 03/10/2014, version 1.0 (update 03/10/2014).

Abstract

The genus *Mononychellus* is represented by 28 herbivorous mites. Some of them are notorious pests of cassava (*Manihot esculenta* Crantz), a primary food crop in the tropics. With the exception of *Mononychellus tanajoa* (Bondar), their geographic distribution is not widely known. This article therefore reports observational and specimen-based occurrence data of *Mononychellus* species associated with cassava. The dataset consists of 1,513 distribution records documented by the International Center for Tropical Agriculture (CIAT) between 1975 and 2012. The specimens are held at CIAT's Arthropod Reference Collection (CIATARC). Most of the records are from the genus' native range in South America and were documented between 1980 and 2000. Approximately 61% of the records belong to *M. tanajoa*, 25% to *M. caribbeanae* (McGregor), 10% to *M. mcgregori* (Flechtmann and Baker) and 2% to *M. planki* (McGregor). The complete dataset is available in Darwin Core Archive format via the Global Biodiversity Information Facility (GBIF).

Keywords

Cassava Green Mite, Cassava Green Mite Complex, International Center for Tropical Agriculture (CIAT), CIAT's Arthropod Reference Collection (CIATARC)

Data published through GBIF

<http://www.gbif.org/dataset/785cf038-7b79-4c2f-9e9e-eb940fcd4c0c>

Project details

Project title: Management of RTB Critical Pests and Diseases under Changing Climates, through Risk Assessment, Surveillance and Modeling

Project personnel: Aymer Andrés Vásquez-Ordóñez (Data Manager, Data Publisher), Rodrigo Zúñiga (Data Manager), Soroush Parsa (Principal Investigator, Data Publisher).

***Mononychellus* collectors:** Collectors who have deposited more than 50 specimens include: Julio Bonilla, Daniel González, José María Guerrero, Carlos Julio Herrera, Jorge Ivan Lenis, Nora Cristina Mesa, Jesús Antonio Reyes, César Rodríguez and Miguel Santiago Serrano.

Funding: This project was supported by the Roots, Tubers and Bananas (RTB) Research Program of the Consultative Group on International Agricultural Research (CGIAR).

Design description: The purpose of this dataset is to significantly increase the geographic distribution data publicly available for the genus *Mononychellus*. This genus includes several species of herbivorous mites that are major pests of cassava (*Manihot esculenta* Crantz), most notoriously *Mononychellus tanajoa* (Bondar). We report 1,513 distribution records of the genus, documented by the International Center for Tropical Agriculture (CIAT) between 1975 and 2012. Most of the records (53%) correspond to specimens preserved at CIAT's Arthropod Reference Collection (CIATARC). Prior to this contribution, only 30 distribution records of *Mononychellus* were accessible through the Global Biodiversity Information Facility (GBIF) data portal (accessed 1/13/2014). Accordingly, the CIATARC *Mononychellus* dataset should facilitate a much better understanding of the genus' geographic association with cassava.

Taxonomic coverage

General taxonomic coverage description: Most records were identified to species level (98%) with the help of expert input (José María Guerrero, Pilar Hernandez). Only four species of the genus are reported. Approximately 61% of the records belong to *M. tanajoa*, 25% to *M. caribbeanae* (McGregor), 10% to *M. mcgregori* (Flechtmann and Baker) and 2% to *M. planki* (McGregor).

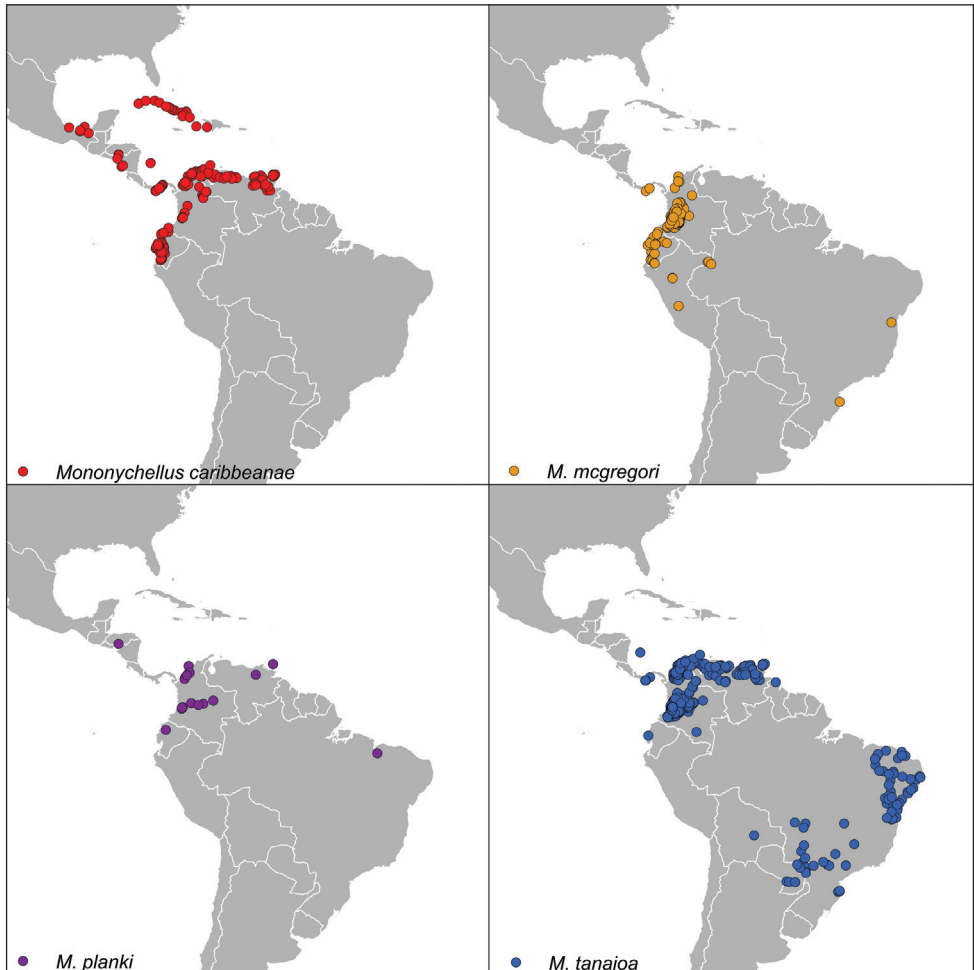


Figure 1. Native geographic distribution of records of the CIATARC *Mononychellus* dataset in the American continent.

Taxonomic ranks

Kingdom: Animalia.

Phylum: Arthropoda.

Class: Arachnida.

Order: Trombidiformes.

Family: Tetranychidae.

Genus: *Mononychellus*.

Species: *Mononychellus caribbeanae*, *M. mcgregori*, *M. planki*, *M. tanajoa*.

Common name: Cassava Green Mite (for *M. tanajoa*), Cassava Green Mite Complex (for *M. caribbeanae*, *M. mcgregori*, *M. planki* and *M. tanajoa*)

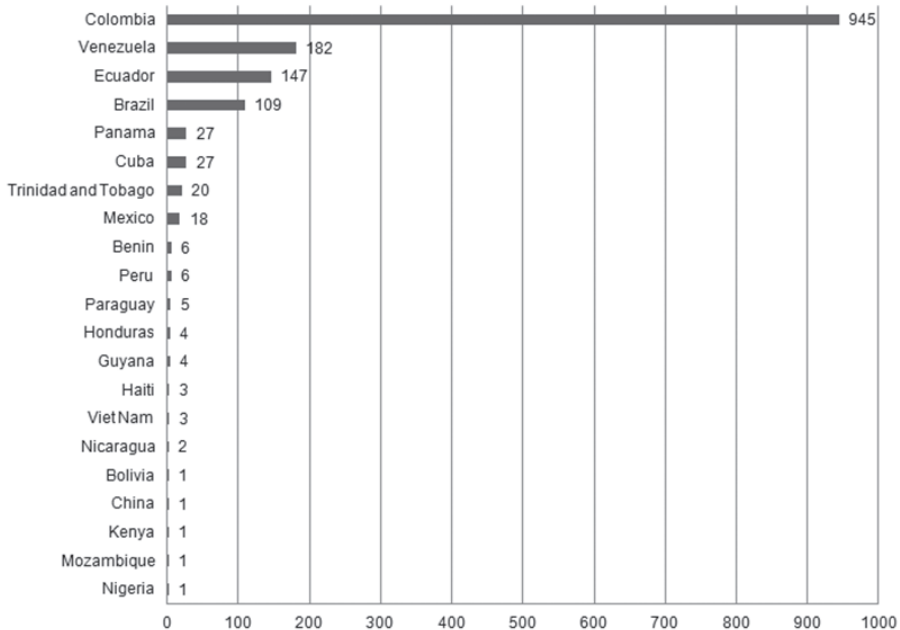


Figure 2. Records by country in the CIATARC *Mononychellus* dataset.

Spatial coverage

General spatial coverage: The *Mononychellus* specimens and observations of CIATARC are from South America (14 countries) and Central America (Cuba, Haiti, Honduras, Mexico, Nicaragua, Trinidad and Tobago), which represent the 99% of records, with Colombia and Venezuela are the best represented countries, followed by Brazil and Ecuador (Fig. 2). These countries are considered the center of origin of our focal species. The remaining records belong to Africa (0.6%; Benin, Kenya, Mozambique, Nigeria) and Asia (0.3%; Vietnam, China).

Coordinates: 22.904301 and -27.098576 latitude; -95.2174947 and 109.580811 longitude.

Temporal coverage

1975–2012.

Natural Collections descriptions

Collection name: CIAT Arthropod Reference Collection (CIATARC).

Specimen preservation method: Specimens are preserved as microslide preparations in microscope slide boxes within cabinet drawers maintained at 21.0 ± 0.4 C and 47.6 ± 8.6 relative humidity. They are sorted numerically by species and country of origin.

Curatorial unit: 3,510 with an uncertainty of 0 (microslide preparation).

Methods

Method step description: The dataset integrates two data flows: observational records and specimen-based records, identified either to genus or to species. The former were digitized from field diagnostic forms completed by personnel extensively trained in mite identification. These identifications, however, were likely conducted on site without mounting and preserving samples. Alternatively, these observations may correspond to properly-mounted but lost specimens. In either case, our confidence in the identification of observational records is high to the genus level, but moderate to the species level. On the other hand, specimen-based records belong to verifiable samples properly-preserved at CIATARC following the guidelines of Krantz (1978). Unique accession numbers were assigned to all records.

All biodiversity data available (i.e. specimen, species identification, name of determiner, sex, biological phase, locality, date, habitat, host, collector and observations) was digitized in a Microsoft Excel 2010 spreadsheet adopting the Darwin Core Archive format v1.2 (Wieczorek et al. 2012). We updated locality fields (e.g., district, municipality) using the most current names and classifications of administrative divisions used by each country (e.g. <http://www.dane.gov.co/Divipola/> for Colombia, http://www.inec.gob.ec/estadisticas/?option=com_content&view=article&id=80 for Ecuador, etc. [accessed 2013/11/14]). Based on their locality names, we then geocoded the records using Google Maps (<https://maps.google.com/>), GeoNames (<http://www.geonames.org/>) or Amézquita et al. (2013). GPS coordinates were converted to decimal degrees. The dataset with meta-data was uploaded to the Integrated Publishing Toolkit (IPT) of the Colombia node of Global Biodiversity Information Facility (GBIF) (<http://www.gbif.org/dataset/785cf038-7b79-4c2f-9e9e-eb940fcd4c0c>).

Sampling description: The records in the dataset have been documented in three ways:

- 1) Records from CIAT's initial field explorations to document pests in cassava (Guerrero and Bellotti 1981; 4.4% records, between 1975-1983).
- 2) Records documented during the "Cassava Green Spider Mite Biological Control Project," led by CIAT, International Institute of Tropical Agriculture (IITA), Commonwealth Institute of Biological Control (CIBC) and Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA) (Bellotti et al. 1987, 1996, 1998, 2000, Byrne et al. 1983, Braun et al. 1993, CIAT 1984, 1985, 1986, 1990, 1992, 1993, 1995, Guerrero et al. 1993, CIAT et al. 1998; 89.6%, 1983–1999).

Their locations were systematically selected based on their climatic homology to *M. tanajoa*-affected areas in Africa (Bellotti et al. 1987, CIAT 1993, Guerrero et al. 1993).

- 3) Records from other sources; including field inspections and collections conducted during routine farm visits by CIAT personnel, and from specimens submitted to CIATARC by fellow institutions and researchers (Bellotti et al. 2000; CIAT 2001, 2002, 2003; 6%, 2000-2012).

The sampling process typically involved scouting cassava fields for infested plants, identified by speckling of their terminal leaves, followed by a close-up inspection for green mites using a 10× magnifying glass. To collect specimens, mites were then brushed off from leaves into collection vials containing a lactophenol solution (Krantz 1978) and maintained in ice chests until reaching the laboratory for proper mounting and identification (Bellotti et al. 1987, CIAT 1993, Guerrero et al. 1993).

Quality control description: Record validation and cleaning was incorporated at several steps of the documentation process, following guideless by Chapman (2005 a,b). The scientific names on labels were checked with a taxonomic thesaurus developed by AAV. This thesaurus compiled all known synonyms and spelling variants of the scientific names used for our focal species. We assigned scientific names in accordance to current taxonomy trends. Geographic coordinates were verified using the “Check Coordinates” function in DIVA-GIS (Hitmans et al. 2001). For this last step, we relied on the Global Administrative Unit Layers (GAUL) shape file developed by the Food and Agriculture Organization of the United Nations (FAO, <http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691>, [accessed 2013/11/14]).

Datasets

Dataset description

Object name: Darwin Core Archive *Mononychellus* distribution: data of the CIAT Arthropod Reference Collection of International Center for Tropical Agriculture (CIAT).

Character encoding: UTF-8.

Format name: Darwin Core Archive format.

Format version: 1.0.

Distribution: <http://www.gbif.org/dataset/785cf038-7b79-4c2f-9e9e-cb940fcd4c0c>

Publication date of data: 2014-03-14.

Language: English.

Licenses of use: This dataset [*Mononychellus* Collection of CIAT Arthropod Reference Collection (CIATARC)] is made available under the Creative Commons Zero (CC0) 1.0.

Acknowledgements

We specially thank Rodrigo Zuñiga (CIAT) for his curatorial work and help digitizing our dataset. We are also grateful to Camila Plata, Dairo Escobar, Nestor Beltran and Danny Velez of Sistema de información sobre Biodiversidad de Colombia (SIB) for generously sharing their digitization knowledge and recommendations. The digitization of this biological collection is supported by the Research Program on Roots, Tubers, and Bananas (RTB) of the Consultative Group on International Agriculture Research (CGIAR).

References

- Amézquita E, Rao IM, Rivera M, Corrales II, Bernal JH (2013) *Sistemas Agropastoriles: Un enfoque integrado para el manejo sostenible de Oxisoles de los Llanos Orientales de Colombia*. Centro Internacional de Agricultura Tropical CIAT, Cali, Colombia, 288 pp.
- Bellotti AC, Mesa N, Serrano M, Guerrero JM, Herrera CJ (1987) Taxonomic Inventory and Survey Activity for Natural Enemies of Cassava Green Mites in the Americas. *Insect Science and its Application* 8 (4/5/6): 845–849.
- Bellotti AC, Alvarez E, Calvert L, Smith L, Lapointe S, Ospina B, El-Sharkawy M, Mueller K, Howeler R, Riss L, Bertschy C (1996) Project 7: Integrated Cassava Crop Management in Major Agroecosystems of Latin America and Asia. Annual Report 1996. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 60 pp.
- Bellotti AC, Alvarez E, Calvert L, Calatayud PA, Ospina B, Anderson P (1998) Project PE-1: IPM for a Safer Environment: Integrated Pest Management in Major Agroecosystems in the Americas. Annual Report 1996. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 135 pp.
- Bellotti AC, Calatayud PA, Dorn B, Alvarez E, Peck D, Calvert L, Buruchara R, Ampofo K, Anderson P (2000) Project PE-1: Integrated Pest and Disease Management in Major Agroecosystems in the Americas. Annual Report 2000. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 190 pp.
- Braun AR, Alvarez JM, Cuéllar ME, Duque MC, Escobar JR, Franco C, Gaigl A, Guerrero JM, Lenis JI, Melo EL, Mesa NC, Zuñiga R (1993) Inventario de ácaros fitófagos y sus enemigos naturales en el cultivo de la yuca en Ecuador. In: Braun AR (Ed) *Bases fundamentales para investigación sobre los ácaros plagas y sus enemigos naturales en el Ecuador*. Documento de Trabajo No. 126. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 52 pp.
- Byrne DH, Bellotti AC, Guerrero JM (1983) The Cassava Mites. *Tropical Pest Management* 29(4): 378–394. doi: 10.1080/09670878309370833
- Chapman AD (2005a) Principles and Methods of Data Cleaning – Primary Species and Species Occurrence Data, version 1.0. Global Biodiversity Information Facility, Copenhagen, 75 pp.
- Chapman AD (2005b) Principles of Data Quality, version 1.0. Global Biodiversity Information Facility, Copenhagen, 61 pp.

- CIAT (1984). Annual Report 1984. Cassava Program. Working Document No. 1. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 270 pp.
- CIAT (1985) Annual Report 1985. Cassava Program. Working Document No. 38. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 371 pp.
- CIAT (1986) Annual Report 1986. Cassava Program. Working Document No. 43. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 254 pp.
- CIAT (1990) Annual Report 1990. Cassava Program. Working Document No. 95. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 385 pp.
- CIAT (1992) Annual Report 1987–1991. Cassava Program. Working Document No. 116. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 473 pp.
- CIAT (1993) Annual Report 1987–1989. Cassava Program. Working Document No. 91. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 621 pp.
- CIAT (1995) Annual Report 1995. Cassava Program. Working Document No. 168. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 285 pp.
- CIAT (2001) Project PE-1: Integrated Pest and Disease Management in Major Agroecosystems in the Americas. Annual Report 2001. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 211 pp.
- CIAT (2002) Project PE-1: Integrated Pest and Disease Management in Major Agroecosystems in the Americas. Annual Report 2002. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 264 pp.
- CIAT (2003) Project PE-1: Integrated Pest and Disease Management in Major Agroecosystems in the Americas. Annual Report 2003. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 258 pp.
- CIAT, ITTA, EMBRAPA/CNPMF (1998) Ecologically Sustainable Cassava Plant Protection in South America and Africa: An Environmentally Sound Approach. 1997 Annual report of Activities in South America. Centro Internacional de Agricultura Tropical, CIAT; The International Institute for Tropical Agriculture, ITTA; Empresa Brasileira de Pesquisa Agropecuária, Centro Nacional de Pesquisa de Mandioca e Frutas Tropicais, Embrapa/CNPMF, 115 pp.
- Guerrero JM , Bellotti AC (1981) Inventario de ácaros fitófagos en la yuca en Colombia. Yuca Boletín Informativo. No. 9.
- Guerrero JM, Flechtman CHW, Duquez MC, Gaigl A, Bellotti AC, de Moraes GJ, Braun AR (1993) Biogeography and Taxonomy of *Mononychellus* species associated with *Manihot esculenta* Crantz in the Americas. Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, 54 pp.
- Krantz GW (1978) A Manual of Acarology. Second Edition. Oregon State University Book Stores, Inc. 509 pp.
- Hitmans RJ, Guarino L, Cruz M, Rojas E (2001) Computer tools for spatial analysis of plant genetic resources data: 1. Diva-Gis. Plant Genetic Resources Newsletter 127:15–19.
- Wieczorek J, Bloom D, Guralnick R, Blum S, Döring M, Giovanni R, Tobertson T, Vieglais D (2012) Darwin Core: An Evolving Community-Developed Biodiversity Data Standard. PLoS ONE 7(1): e29715. doi: 10.1371/journal.pone.0029715