



Scientific Note

First record of *Chilomima clarkei* (Amsel) (Lepidoptera: Crambidae) in *Manihot esculenta* Crantz (Euphorbiaceae) in Amapá state, Brazil

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Abstract: The present study reports *Chilomima clarkei* (Amsel) (Lepidoptera: Crambidae) infesting stems of *Manihot esculenta* Crantz (Euphorbiaceae) in Amapá state, Brazil, for the first time. Considering the importance of this species as a pest, it is necessary to publicize its occurrence and provide information about the main symptoms of the attacked plants and morphological characters of development stages to identify it quickly in crops. As there are no registered products for this pest's control, producers are advised to pay attention to any sign of infestation. To avoid it from spreading, they are also recommended to remove and burn all the infested parts detected in the plantations, in addition to selecting healthy *manivas* (stem cuttings) at the time of replanting, preventing the infestation of new crops.

Keywords: Amazon; Stem borer; Infestation; Stem borer caterpillar; Moth

Cassava, *Manihot esculenta* Crantz (Euphorbiaceae), also known in Brazil as *aipim* or *macaxeira* (NASSAR *et al.* 2008), is a semi-perennial, bushy plant with tuberous root (CEBALLOS & LA CRUZ 2012). It has the physiological characteristic of storing starch in its roots (FUKUDA *et al.* 2006).

In the north region of Brazil, cassava and its varieties are widely cultivated and consumed by the population, in addition to being an important economic activity for producers, especially the family-based ones (RODRIGUES *et al.* 2007; FAZOLIN & ESTRELA 2016). In 2018, the area devoted to cassava cultivation in Brazil was 1,222,019 ha, 427,993 ha planted in the North region. The state of Amapá contributed 10,145 ha, with the three largest producing areas located in the municipalities of Oiapoque (1,685 ha), Macapá (1,015 ha), and Tartarugalzinho (870 ha). However, concerning the average yield of production, the highest productivity levels were recorded in the municipalities of Oiapoque (11,528 kg ha⁻¹), Pracuúba (11,094 kg ha⁻¹) and Itauba do Pírim (11,039 kg ha⁻¹) (IBGE 2020).

Among the insects that attack cassava in the field are a wide variety of lepidopterans, known as butterflies and moths, associated with cultivation (SILVA *et al.* 1968). Among the moths, representatives of the following families are reported: 1. Saturniidae [*Rothschildia* spp., *Bunaea alcinoe* (Stoll), *Imbrasia dione* Fabricius, *Nudaurelia petiveri* (Guérin-Méneville), *Rothschildia aurota* (Walker), *Rothschildia hesperus* (Linnaeus), *Rothschildia jacobaeae* (Walker) and *Samia cynthia* (Drury)], 2. Sphingidae [*Cocytius duponchel* (Poey), *Erinnyis alope* (Drury), *Erinnyis crameri* (Schaus), *Erinnyis ello* Linnaeus, *Manduca albiplaga* (Walker), *Manduca sexta* (Linnaeus)],

3. Arctiidae [*Alpenus nigropunctatus* (Bethune-Baker), *Disparctia vittata* (Bruce), *Hypercompe hambletoni* (Schaus) and *Phoenicoprocta sanguinea* (Walker)], 4. Geometridae [*Colocleora simulatrix* (Warren) and *Hyposidra talaca* (Walker)], 5. Hepialidae [*Endoclitia sericeus* (Swinhoe)], 6. Lasiocampidae [*Pachypasa papyri* Tams], 7. Limacodidae [*Prolatoia sjostedti* (Aurivillius)], 8. Lymantriidae [*Calliteara horsfieldii* (Saunders), *Euproctis fasciata* (Walker), *Euproctis fraterna* Moore, *Euproctis luneta* Walker, *Olene mendosa* Hübner and *Orgyia basalis* (Walker)], 9. Erebidae [*Hypercompe hambletoni* (Schaus)], 10. Noctuidae [*Agrotis ipsilon* (Hufnagel), *Spodoptera eridania* (Cramer), *Spodoptera littoralis* (Boisduval), *Spodoptera litura* Fabricius, *Chrysodeixis includens* (Walker), *Tiracola plagiata* (Walker) and *Feltia subterranea* (Fabricius)], 11. Nymphalidae [*Anartia jatrophae* (Linnaeus), *Colobura dirce* (Linnaeus) and *Charaxes affinis* Butler], 12. Psychidae [*Eumeta variegata* (Snellen)], 13. Pyralidae [*Asciodes gordialis* (Guenée), *Cadra figulilella* (Gregson), *Chilozela bifilalis* (Hampson), *Chilozela trapeziana* (Sepp), *Condylorrhiza vestigialis* (Guenée), *Omiodes indicata* (Fabricius), *Ptyonocera atrifusella* Hampson and *Glaphyria* sp.], 14. Crambidae [*Chilomima clarkei* (Amsel), *Chilozela trapeziana* (Sepp) and *Condylorrhiza vestigialis* (Guenée)], 15. Uraniidae [*Urania fulgens* (Walker)] and 16. Lycaeniidae [*Eumaeus atala* (Poey)] (MÖSCHLER 1878; MÜLLER 1886; BÖNNINGHAUSEN 1899; SAUER 1943; CORSEUIL 1955; EHRlich & RAVEN 1964; SILVA *et al.* 1968; SILVA *et al.* 1981; COTO *et al.* 1995; BELLOTTI *et al.* 2002; MURILLO-HILLER 2008; VAN DER HEYDEN 2009; MONTEZANO *et al.* 2013; 2014; 2016; 2018; SPECHT *et al.* 2015; BRITO *et al.* 2019; NHM 2020).

Of all these lepidopterans, the representatives of Sphingidae, whose caterpillars voraciously attack the leaf, must be

highlighted as pests. As well as the representatives of Crambidae, due to the boring habit, whose larvae and pupae stay inside the stems (branches), protected from the weather, natural enemies, and even chemical control agents (BELLOTTI 2008). In the north region of the country, the cassava hornworm, *Erinnyis ello* (Linnaeus) (Lepidoptera: Sphingidae) is notably the key pest of the crop, due to the voracity with which the caterpillars consume the leaves and the economic losses resulting from its infestations in the region (RODRIGUES et al. 2007; FAZOLIN & ESTRELA 2016).

The record presented here refers to a technical visit made to a rural property (00°40'14.1 "N; 50°46'48.6 "W), located in the municipality of Itauba do Piririm, state of Amapá, in November 2017. There were reports of an unknown phytosanitary problem in cassava cultivation. During an inspection in the plantation, holes in the stems and sawdust-like material were verified in the plants (Figure 1A).

Nearly 30% of the stems were infested, showing sawdust-like frass. During the inspection, stems with signs of infestation were collected. Then, with a pocket knife, they were cut lengthwise, and galleries were checked. These galleries were formed by the consumption of soft tissue (medulla), and caterpillars and pupae with characteristics of lepidopterans were found inside them (Figures 1B and 1C).

Other stems were collected and taken to the Embrapa Amapá Plant Protection Laboratory, in Macapá, to be maintained in laboratory conditions until adults emergence for further identification. After approximately 40 days, 15 moths were obtained and identified as *Chilomima clarkei* (Amsel) (Lepidoptera: Crambidae) (Figure 1D). Voucher specimens from the research were deposited at the Embrapa Amapá Plant Protection Laboratory.

The adult of *C. clarkei* is 25 to 35 mm long, with the forewings

characterized by dark bronze bands. The moths are nocturnal, resting on plant stems during the day, in a head-down position. Females lay up to 200 eggs on the stems near the axillary buds. After four to six days, they hatch into larvae, which feed on the superficial layer of the stem and weave a type of capsule where they are protected. In the fifth instar, the larvae penetrate the stem to feed, completing their development and turning into pupae, which remain protected inside the stems. Depending on environmental conditions, the larval stage lasts 32 to 64 days, and the pupal stage 12 to 17 days (LÖHR 1983; BELLOTTI 2008).

In South America, there are records of *C. clarkei* in some countries such as Colombia, Venezuela, and Argentina (VIDES et al. 1996; ALMONACID et al. 2016). In Brazil, it is considered a secondary pest of cassava cultivation, which sporadically causes economic damage in some localities (RODRIGUEZ et al. 2009). In the 1990s, there was a significant infestation of this species on the Atlantic Coast of Colombia, generating a very expressive social problem (BELLOTTI et al. 2002).

The pest limits cassava production in Colombia, both for obtaining roots and genetic material for propagation (VIDES et al. 1996). When the infestation is very high, there is a decrease in the quantity and quality of propagation material. Studies of economic damage with artificial infestations (8 to 12 larvae/plant and 16 to 20 larvae/plant) showed a 45 to 62% reduction in root production (LÖHR 1983). In Brazil, the economic impact of this species on cassava crops is still unknown.

The identification of *C. clarkei* is essential because, along with it, some other lepidopterans and coleopterans form a borer complex, such as species of *Sternocoelus* (= *Coelosternus*) (Coleoptera: Curculionidae) that occur in Brazil, whose signs and damage in plants are similar (GALLO et al. 2002; BELLOTTI 2008).



Figure 1. *Chilomima clarkei* (Lepidoptera: Crambidae). A. stem of *Manihot esculenta* with symptoms of infestation by larvae; B. larva at the end of development, removed from the inside of the cassava stem; C. pupa inside the stem; D. adult moth in dorsal view. Photos: Adilson Lopes Lima

So far, there are no products registered with the Ministry of Agriculture, Livestock and Food Supply (MAPA) to control *C. clarkei* in cassava cultivation (AGROFIT 2020). In this regard, we reinforce the importance of registering the species with potential damage to cassava crop in the regions cultivated in Brazil, so that further studies aimed at their management may be demanded. However, there are records of the parasitoids *Bracon* sp., *Apanteles* sp., *Brachymeria* sp., *Agathis* sp. (Hymenoptera: Braconidae), *Tetrastichus howardii* (Olliff) (Hymenoptera: Eulophidae) and *Trichogramma* sp. (Hymenoptera: Trichogrammatidae) in the literature, parasitizing eggs and caterpillars of *C. clarkei* and the entomopathogens *Metarhizium anisopliae* (Metchnikoff) Sorokin and *Beauveria bassiana* (Bals.) Vuill. (LÖHR 1981; BELLOTTI 2008), acting as natural enemies of this pest.

For main management methods, producers are recommended to select healthy *manivas* (stem cuttings for planting) at the time of replanting, to avoid the contamination of new crops. In plantings where the pest has been detected, producers should remove and burn all the infested parts, avoiding dissemination during regrowth. In infested areas, besides the destruction of the attacked parts, BERTORELLI *et al.* (2006) recommend using light traps with ultraviolet fluorescent lamps (model Luiz de Queiroz) for monitoring and reducing the moth population in the area.

Considering the social and economic relevance of the cassava cultivation for the Amapá state and the Brazilian Amazon, it is imperative to direct efforts towards publicizing the occurrence of *C. clarkei*, describing morphological characters of development stages and characterizing the main symptoms of the attacked plants. Thus, it will be possible to identify this pest in the crops quickly, so that decisions are made before its population levels cause economic losses. Studies should also be carried out to quantify regional damages and, specifically, develop or adapt management methods to avoid significant losses to production.

REFERENCES

- AGROFIT, 2020. Sistema de Agrotóxicos Fitossanitários do Ministério da Agricultura, Pecuária e Abastecimento (MAPA). Available on: <http://agrofit.agricultura.gov.br/agrofit_cons/principal_agrofit_cons>. [Access in: 01.ix.2020].
- Almonacid, RC, MRA Aguirre, L Velozo & S Cáceres, 2016. El barrenador del tallo, plaga del cultivo de mandioca. Bella Vista: Instituto Nacional de Tecnología Agropecuaria (Estación Experimental Agropecuaria Bella Vista, Hoja de divulgación, 48).
- Bellotti, AC, 2008. Cassava pests and their management, pp. 764-794. *In*: Capinera, JL (Ed.). Encyclopedia of entomology. Dordrecht: Springer.
- Bellotti, AC, B Arias & JA Reyes, 2002. Manejo de plagas de la yuca, pp. 220-233. *In*: Ospina, B & H Ceballos. La yuca en el tercer milenio: sistemas modernos de producción, procesamiento, utilización y comercialización. Cali: Centro Internacional de Agricultura Tropical; Consorcio Latinoamericano y del Caribe de Apoyo a la Investigación y Desarrollo de la Yuca.
- Bertorelli, M, J Montilla & CJ Luna, 2006. Estrategias para el manejo integrado de las principales plagas del cultivo de la yuca en la zona sur del estado de Anzoátegui. Revista Digital del Centro Nacional de Investigaciones Agropecuarias de Venezuela. Available on: <<https://www.engormix.com/agricultura/articulos/plagas-de-la-yuca-t26647.htm>> [Access in: 01.ix.2020].
- Böninghausen, V Von, 1899. Beitrag zur Kenntniss der Lepidopteren-Fauna von Rio de Janeiro, Tribus Sphingidae. Deutsche Entomologische Zeitschrift. Iris, 12: 107-136.
- Brito, R, A Specht, GL Gonçalves, GRP Moreira, E Carneiro, FL Santos, VF Roque-Specht, OHH Mielke & MM Casagrande, 2019. *Spodoptera marima*: a new synonym of *Spodoptera ornithogalli* (Lepidoptera: Noctuidae), with notes on adult morphology, host plant use and genetic variation along its geographic range. Neotropical Entomology, 48: 433-448.
- Ceballos, H & G la Cruz, 2012. Cassava taxonomy and morphology, pp. 1-14. *In*: Ospina, B & H Ceballos (Eds.). Cassava in the third millennium: modern production, processing, use and marketing systems. Cali: CIAT.
- Corseuil, E, 1955. Uma lagarta em batata doce e mandioca. Boletim do campo, 11: 3-7.
- Coto, D, JL Saunders, CL Vargas-S & ABS King, 1995. Plagas invertebradas de cultivos tropicales con énfasis en América Central - un inventario. CATIE: Turrialba.
- Ehrlich, PR & PH Raven, 1964. Butterflies and plants: a study in coevolution. Evolution, 18: 586-608. DOI: <https://doi.org/10.1111/j.1558-5646.1964.tb01674.x>
- Fazolin, M & JLV Estrela, 2016. Mandioca, pp. 344-363. *In*: Silva, NM, R Adaime, RA Zucchi (Eds.). Pragas agrícolas e florestais na Amazônia. Brasília: Embrapa.
- Fukuda, WMG, C Fukuda, MC Dias, JBN Xaxier & JF Fialho, 2006. Variedades, pp. 433-454. *In*: Souza, L da S, ARN Farias, PLP de Mattos & WMG Fukuda (Eds.). Aspectos socioeconômicos e agrônômicos da mandioca. Cruz das Almas: Embrapa Mandioca e Fruticultura Tropical.
- Gallo, D, S Silveira Neto, RPL Carvalho, GC de Baptista, E Berti Filho, JRP Parra, RA Zucchi, SB Alves, JD Vendramim, LC Marchini, JRS Lopes & C Omoto, 2002. Entomologia Agrícola. Piracicaba: FEALQ.
- IBGE - Instituto Brasileiro de Geografia e Estatística, 2020. Available on: <<https://sidra.ibge.gov.br/tabela/5457#resultado>> [Access in: 01.ix.2020].
- Löhr, B, 1981. Algunos aspectos sobre la biología, ecología, daño económico y control de *Chilomima clarkei* (Amsel) (Lepidoptera, Pyralidae) barrenador de la yuca. Colombia: CIAT (CIAT, Seminarios Internos).
- Löhr, B, 1983. Biología, ecología, daño económico y control de la *Chilomima clarkei* (Amsel) barrenador de la yuca, pp. 159-161. *In*: Reyes JA (Ed.). Yuca: control integrado de plagas. Cali: PNUD-CIAT.
- Montezano, DG, A Specht, DR Sosa-Gómez, VF Roque-Specht, TM Bortolin, E Fronza, P Pezzi, PC Luz & NM Barros, 2013. Immature stages of *Spodoptera albula* (Walker) (Lepidoptera: Noctuidae): developmental parameters and host plants. Anais da Academia Brasileira de Ciências, 85: 271-284. DOI: <https://doi.org/10.1590/S0001-37652013000100013>
- Montezano, DG, A Specht, DR Sosa-Gómez, VF Roque-Specht & NM Barros, 2014. Immature stages of the armyworm, *Spodoptera eridania*: developmental parameters and host plants. Journal of Insect Science, 14: 1-11. DOI: <https://doi.org/10.1093/jisesa/ieu100>
- Montezano, DG, DR Sosa-Gómez, SV Paula-Moraes, VF Roque-Specht, E Fronza, NM Barros & A Specht, 2016. Immature development of *Spodoptera dolichos* (Fabricius) (Lepidoptera: Noctuidae). Neotropical Entomology, 45: 22-27. DOI: <https://doi.org/10.1007/s13744-015-0333-2>
- Montezano, DG, A Specht, DR Sosa-Gómez, VF Roque-Specht, JC Sousa-Silva, SV Paula-Moraes, JA Peterson & TE Hunt, 2018. Host plants of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in the Americas. African Entomology, 26: 286-300. DOI: <https://doi.org/10.4001/003.026.0286>
- Möschler, HB, 1878. Exotisches - Surinamsche vlinders von J.C. Sepp en Zoon. Amsterdam 1848-1852. Entomologische Zeitung Stettin, 39: 424-443.
- Müller, W, 1886. Südamerikanische Nymphalidenraupen. Versuch eines natürlichen systems der Nymphaliden. Zoologische Jahrbücher (Systematik), 1: 417-678. DOI: <https://doi.org/10.5962/bhl.title.109410>

- Murillo-Hiller, LR, 2008. Notas sobre el comportamiento y la migración de *Urania fulgens* (Lepidoptera: Uraniidae) en Costa Rica. Acta Zoológica Mexicana (n.s.), 24: 239-241.
- Nassar, NMA, DYC Hashimoto & SDC Fernandes, 2008. Wild *Manihot* species: botanical aspects, geographic distribution and economic value. Genetics and Molecular Research 7: 16-28. DOI: <https://doi.org/10.4238/vol7-1gmr389>
- NHM - Natural History Museum, 2020. Hosts - a database of the world's Lepidopteran hostplants. Available on: <<https://www.nhm.ac.uk/our-science/data/hostplants/search/list.dsml?searchPageURL=index.dsml&Familyqtype=starts+with&Family=&PFamilyqtype=starts+with&PFamily=&Genusqtype=starts+with&Genus=&PGenusqtype=starts+with&PGenus=Manihot&Speciesqtype=starts+with&Species=&PSpeciesqtype=starts+with&PSpecies=esculenta&Country=&sort=Family>> [Access in: 01.ix.2020].
- Rodriguez, MAD, RS Carvalho, AAC Alves & MS Diniz, 2009. Armadilha CNPMF: nova técnica para o controle de brocas-da-haste da mandioca. Cruz das Almas: Embrapa Mandioca e Fruticultura Tropical (Circular Técnica, 91).
- Rodrigues, RV, ER de Castro & EC Teixeira, 2007. Avaliação de uma política de estabilização de renda para a agricultura familiar. Revista de Economia e Sociologia Rural, 45: 139-162. DOI: <https://doi.org/10.1590/S0103-20032007000100007>
- Sauer, HFG, 1943. Notas sobre a biologia de *Epantheria hambletoni* Schaus (Lepid.: Arct.). Arquivos do Instituto Biológico, 14: 73-80.
- Silva, AB, BP Magalhães & MS Costa, 1981. Insetos e ácaros nocivos à mandioca na Amazônia. Belém: Embrapa CPATU (Boletim de Pesquisa, 31).
- Silva, AGA, CR Gonçalves, DM Galvão, AJL Gonçalves, J Gomes, MN Silva & L Simoni, 1968. Quarto catálogo dos insetos que vivem nas plantas do Brasil: seus parasitos e predadores. Parte II, 1º tomo, Insetos, hospedeiros e inimigos naturais. Rio de Janeiro: Ministério da Agricultura.
- Specht, A, SV Paula-Moraes, DR Sosa-Gómez, 2015. Host plants of *Chrysodeixis includens* (Walker) (Lepidoptera, Noctuidae, Plusiinae). Revista Brasileira de Entomologia, 59: 343-345. DOI: <https://doi.org/10.1016/j.rbe.2015.09.002>
- Van der Heyden, T, 2009. Ergänzende anmerkungen zur biologie und zur ökologie von *Urania fulgens* (Walker, 1854) in Costa Rica, Zentralamerika (Lepidoptera: Uraniidae). Atalanta, 40: 406-408.
- Vides, OL, OD Sierra, HS Gómez & AT Palomino, 1996. El barrenador del tallo de la yuca *Chilomima clarkei* (Lepidoptera: Pyralidae) en el Creced Provincia del Río. Corporación Colombiana de Investigación Agropecuaria.

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