Contributions Towards the Knowledge on the Biology, Behavior and Distribution of the Cassava Stem Borer, *Chilomima clarkei* (Lepidoptera:Pyralidae) in Tolima, Colombia

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Introduction

In the department of Tolima, like in most departments of Colombia, cassava is mostly grown as a marginal crop. It yields better than many other crops under poor environmental conditions (Lopez, et al. 1996) due to its adaptability to, i.e., poor soil and drought. Pests are threatening cassava yields in this and other departments. One of them, the cassava stem borer (*Chilomima clarkei*), has been spreading over the country since its was first reported in the eastern planes during the 80's. Data from the northern coast have shown that *C. clarkei* may reduce yield up to 85%. Knowing the biology and behavior of *C. Clarkei* is fundamental in the search for corrective methods to control the pest expansion.

Damage

Yield reduction may reach 61% in plants with 8 to 12 perforations (holes), 65.6% broken stems and 34.4% healthy cuttings ("seeds"). Control, healthy plants show 11.1% broken stems and 85% healthy cuttings (CIAT,1980). A 41% average infestation is considered high since the stem borer destroys most internal stem tissues (Lopez, et. al. 1996).

In the department of Cesar, 9-month old and older plants were checked for stem borer damage. Up to 37 perforations were registered in 80cm-long cuttings. Larval infestation was up to 63.7%, with 92% infected plants, of which 62% corresponded to old damage and 38% to fresh damage (Suarez, et. al. 1995).

Biological Cycle

Newly emerged larvae take three days to cover themselves with a larval capsule (figure on left), and about 4 days before they initiate perforating the stem. They stay 71 days inside the stem until they emerge again as adults (Ramirez C. et al. 2001).

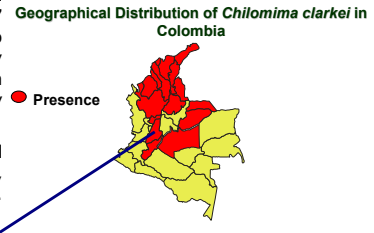
Ovipositing

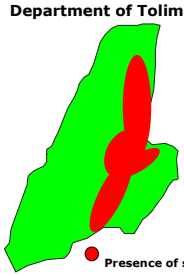
Under lab conditions in Tolima, adults live 7,5 days. As an average, the pre-ovipositing period extends for 1,16 days, ovipositing goes for 5,5 days, and post-ovipositing lasts 1,58 days. Data from Carimagua (Eastern Planes of Colombia; Löhr 1983), show that longevity varies from 3 to 9 days for males and 5 to 7 days for females. These differences are probably due to environmental conditions differences between the areas where data were collected (Ramirez, C. et. al. 2001).

Geographical Distribution

In the departments of Cesar and Magdalena *C. clarkei* is found in 7 municipalities, which belong to *Creced Provincia del Río*. They are: Plato, El Banco, Guamal, San Sebastián, Santana, Tenerife y Chimichagua (López et al. 1996).

Currently *C. clarkei* is also found in Bolívar, Atlántico, Meta, Caldas, Huila y Tolima. (Ramírez C. et al. 2001).





Chilomima clarkei is present in 16 departments of Colombia, and in several municipalities of Tolima. It was not found in places higher than 900 m.a.s.l. Infestation varies between locations and total area planted with cassava. In Tolima, the towns that more consistently showed higher degrees of infestation were Coyaima (85%), Ambalema (70%) and Espinal (55%) (Ramírez C. et al. 2001).

Integrated Pest Management

The stem borer is usually more susceptible during the first four larval instars when it stays out of the stem. Although the larval capsule may provide some protection, high temperatures cause high mortality during these stages (LÖHR, 1983). Control of the stem borer after the fifth instar is more difficult since it bores into the stem. IPM becomes then an alternative for an effective control of the insect. CIAT currently works on genetic transformation of cassava to introduce *cry* genes (from *Bacillus thuringiensis*) to obtain transgenic, insect-resistant plants that may be integrated ton IMP strategy to control the stem borer.

Biological Control

During the first three days of the life cycle larvae are more susceptible to attacks for bio-control with parasitoids and entomo-pathogens (Ramírez C. et al. 2001). We have collected natural enemies of the stem borer in Tolima. Dead larvae with uncommon color and odor, and sometimes even covered with spores, were sent to the pathology lab in CIAT where we isolated microorganisms of the genera *Metarhizium*, *Beauvería* and *Aspergillus*.

In Coyaima, Natagaima and Espinal we found insects of the order Hymenoptera, family Braconidae, genus Bracon, species *Bracon* sp. parasiting pupae. Löhr also reported it in 1981. Similarly in Covaima, we isolated a pupa parasitoid that belongs to the order Hymenoptera, family Eulophidae (Ramírez C. et al. 2001).

Advances in Transgenic Plants with *cry* genes

We have developed transgenic lines of cassava (four lines), cultivar TMS60444 (a model cultivar for transformation), that most probably carry the *cry*1Ab gene. These plants were selected on antibiotic containing media, and they express one marker gene (blue color from *gus* gene) very strongly, which is linked to the *cry* gene (Figure on the right). Confirmation of the molecular status of these plants (presence and expression of gene of interest) is underway. Bioassays, to test their effectiveness to control the stem borer will also be carried soon. We are also introducing the gene in at least three commercial cultivars, two of which are for the Northern Coast of Colombia.

Conclusions

The life cycle of *Chilomima clarkei* takes about 91.91 days under lab conditions (CORPOICA-NATAIMA), Tolima, Colombia.

The stem borer is found in fields in Tolima, under 900 m.a.s.l., where cassava is one of the main crops cultivated year-round.

We found in the department of Tolima two larval parasitoids of the stem borer, belonging to the order Hymenoptera, families Braconidae and Eulophidae.

References

LOHR B.1981. Untersuchungen zur Biologie, Okologie, wirtschaftlichen Bechutung and Bekampfung des Moniokzunslens *Chilomima clarkei* (Lepidoptera:Pyralidae). Isertation, zur Erlangung des Doktorgrades im Fachbereich Angewandte Biologie und Unweltscherung der Justs-Liebig-Univ. Giessen. Giessen. 1. p. 3-4.
CHAVARRIAGA, P.; ESCOBAR, R. y TOHME, J. 2000. El potencial de la Biotecnología para contribuir al manejo de plagas en la yuca. En: Memorias XXVII Congreso Sociedad Colombiana de Entomología, SOCOLEN. Medellin. p. 261-262.
CIAT. 1980. Centro Internacional de Agricultura Tropical. Informe Anual de Yuca. Cali. Colombia. p. 93.
CIAT. 1999. Centro Internacional de Agricultura Tropical. Integrated Pest and Disease Management in Major Agroecosystems. Annual Report. Cali, Colombia. p. 136.
LOPEZ, O.1996. El barrenador del tallo de la yuca, *Chilomima clarkei* (Lepidoptera : Pyralidae) en el Creced Provincia del Río. Boletín CORPOICA Regional 3. Santa Fe de Bogotá, Colombia. 1996. p. 3-9.
RAMIREZ C. 2001. Aportes al estudio de la biología, comportamiento y distribución del barrenador del tallo de la yuca, *Chilomima clarkei* A. (LEPIDOPTERA:PYRALIDAE) en el departamento del Tolima. Tesis de grado. Ingeniería Agronómica. Universidad del Tolima (In press).