Baited live-trapping of triatomines in semi-arid environments

PLOS Neglected Tropical Diseases

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dx.doi.org/10.17504/protocols.io.wnpfddn

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ABSTRACT

Includes a list of materials, baits, references, and recommended procedures to capture the hematophagous bugs of the subfamily Triatominae, vectors of Chagas disease in semi-arid areas.

EXTERNAL LINK

https://doi.org/10.1371/journal.pntd.0007170

THIS PROTOCOL ACCOMPANIES THE FOLLOWING PUBLICATION

Ihle-Soto C, Costoya E, Correa JP, Bacigalupo A, Cornejo-Villar B, Estadella V, Solari A, Ortiz S, Hernández HJ, Botto-Mahan C, Gorla DE, Cattan PE (2019) Spatio-temporal characterization of *Trypanosoma cruzi* infection and discrete typing units infecting hosts and vectors from non-domestic foci of Chile. PLoS Negl Trop Dis 13(2): e0007170. doi: 10.1371/journal.pntd.0007170

PROTOCOL STATUS

Working

MATERIALS TEXT

a. Traps: the device is composed by two plastic cylindrical containers: the bottom is where the bait is located, of about 15 cm height and 10 cm in diameter (B), and the top part is where the insects are trapped of about 10 cm height, and the same diameter (T). The lower part of T includes a wire mesh to allow that volatile compounds escape from B, and to separate the captured insects from the bait. Original reference of this device is Bacigalupo A, Torres-Perez F, Segovia V, Garcia A, Correa JP, Moreno L, et al. Sylvatic foci of the Chagas disease vector *Triatoma infestans* in Chile: description of a new focus and challenges for control programs. Mem Inst Oswaldo Cruz. 2010;105(5):633-41.

b. Baits:

o *Saccharomyces cerevisiae* (yeast) (4 g), commercial sugar (100 g), and warm water (100 ml). The bait is the CO_2 emitted by the fermentation of the sugar by the yeast, which attracts triatomines. Original reference in: Lorenzo MG, Reisenman CE, Lazzari CR. *Triatoma infestans* can be captured under natural climatic conditions using yeast-baited traps. Acta Trop. 1998;70(3):277-284.

o Freezed CO_2 (dry-ice) stored in a portable cooler wrapped in newspaper. The bait is the CO_2 emitted, that attracts tratomines. Original reference in: Botto-Mahan C, Cattan PE, Canals M. Field tests of carbon dioxide and conspecifics as baits for *Mepraia spinolai*, wild vector of Chagas disease. Acta Trop. 2002;82(3): 377-380.

o Laboratory reared *Mus musculus* (over 15 g. or 4 weeks old), mouse hereafter. Original reference in: Noireau F, Flores R, Vargas F. Trapping sylvatic *Triatominae* (Reduviidae) in hollow trees. Trans R Soc Trop Med Hyg. 1999;93(1):13-14. The CO_2 emissions and other odors emitted by these micromammals attract triatomines (Noireau F, Diosque P, Jansen AM. *Trypanosoma cruzi*: adaptation to its vectors and its hosts. Vet Res. 2009;40(2):26.).

c. Material to collect captured triatomines:

o Entomological forceps. Ideally featherweight forceps, for retrieving the triatomines from the capture device.

o Plastic jars with small holes (app 1 mm) in the cap for ventilation. It can be used individual jars (one insect by jar), or communal jars

(several insects by jar). It should include a folded piece of paper for refuge of the triatomines (if the purpose is to keep them alive during transport).
o Portable cooler. To store the triatomine jars, in order to protect them from environmental conditions during transport.

d. Personal protection equipment: according to biosafety regulations, with particular emphasis in sun protection and adequate clothes to prevent insect bites (e.g., using long socks over pants).

e. Ideally, GPS device to locate the position of each trap, and notebook to register capture locations ID and other data

Triatomine trapping

1 Visually prospect the areas where is intended to collect triatomines, searching for suitable locations to find these insects; for example, rocky outcrops, bromeliads, rock piles, animals burrows, etc.

2 Set the traps with adequate bait: in the hot season during the day, yeast is more adequate; in the hot season during the night, dry-ice, mouse, or even yeast could be used, depending on the weather; during the cold season, mouse or dry-ice worked well.

3 o When using yeast as bait, the ingredients are mixed in the trapping device (B). To avoid spillover, it is recommended to add the water once reached the destination point where the trap will be set.
o In the traps that use dry-ice, obtain pieces of approximately 200 g. We use a large knife and a hammer to chop it due to its hardness. Use eye (googles) and hand protection (thick gloves) equipment for cutting and manipulating the pieces.
o The traps using mice (*M. musculus*) should be provided with wood chips for bedding at the bottom, mouse commercial pellet and a fruit slice as food source, all of which have to be introduced prior to the mouse. The trap has to be located in a place protected of extreme weather conditions (under bushes, trees, rocks or cactuses), ensuring shade during its working hours.

4 Once baited, the trap should be located in its final trapping point promptly. Locate the traps in the selected areas, checking that it is positioned straight up, and that some part the upper margin of T is adhered to the selected ecotope. That way, insects do not escape climbing the smooth surfaces of T* (so you have to ensure that T is clean, cause dust can provide support for climbing), and the contact with the ecotope facilitates that the triatomine walks inside the trap.
*Some Triatominae, like *Rhodnius prolixus* may climb even glass walls.

5 The traps have to remain activated depending on the maximum activity period of the searched triatomines. In the case of nocturnal insects, the traps can remain activated since sunset until the next morning; in diurnal triatomines, before midday until sunset; however, in the latter there is a risk of overheating of the insects, so the traps should be monitored ideally every 2-3 hours. For diurnal triatomines we have also set the traps on sunset and retrieving them around 12 am - 2 pm, which can be used as protocol when intending to collect both diurnal and nocturnal triatomines.

6 When checking the traps, inspect it completely, including the bottom, because sometimes triatomines do not enter the trap but stay in or near it. When triatomines are captured, use entomological forceps to collect the insects, grabbing their legs with the forceps and put them in the plastic jars. Register every data relevant to the survey (trap ID, date, hour, triatomine species, stage, etc.) in the notebook and in the jar (including at least trap ID and date).

7 Manage the baits according their nature:
o Discard the remaining mix of yeast to a container, or throw it to the ground.
o The dry-ice would probably have sublimated completely.
o The mice have to be removed from the trap and placed in their respective maintenance cage. Provide plenty of water and food. Protect them from extreme environmental conditions during transport.

8 Optional strategy*: to improve the triatomines capture success, a double-sided adhesive tape could be placed on the outside of the trap, particularly near to the bottom of B, so that the triatomines that intend to climb the outer walls of the trap are retained. *Required for capturing Rhodniini.