Tsetse control: How to use Tsetse traps with an odour dispenser

SUMMARY:

Tsetse flies (Glossina sp.) infest over 11 million km² of Africa, and are vectors of Trypanosomosis (or Trypanosomiasis) in both man and domestic livestock. For example, it is estimated that tsetse occur over 7 percent of Zimbabwe and 60 percent of Tanzania and Trypanosomosis has an important negative impact on livestock production in these areas. An odour dispenser is an integral component of tsetse traps. The following technology describes the use of a simple odour dispensers in addition to tsetse traps under practical field conditions.

KEYWORDS:

Tsetse flies [1]
environmental control [2]
pest control [3]
Insect control [4]
Traps [5]

CATEGORY:

Capacity development [6]
Livestock production [7]

COUNTRIES:

Botswana
Kenya
Zimbabwe

DESCRIPTION:

Background
Tsetse flies (Glossina sp.) infest over 11 million km² of Africa, and are vectors of Trypanosomosis (or Trypanosomiasis) in both man and domestic livestock. For example, it is estimated that tsetse occur over 7 percent of Zimbabwe and 60 percent of Tanzania and Trypanosomosis has an important negative impact on livestock production in these areas. In addition to the use of trypanocidal drugs, control, of Trypanosomosis has been tackled largely by control of the tsetse fly vector and a range of techniques are available, each with advantages and disadvantages. Methods include aerial spraying, sterile insect techniques, insecticide treated cattle, and odour bait traps and targets. Furthermore, it is generally considered that deployment of traps and/or targets that destroy a proportion of the tsetse population will lead to a reduction in the incidence of trypanosomosis.

A general decline in the capacity and funding of national veterinary institutions means that communities affected by Trypanosomosis are forced to control the disease themselves. Consequently, community-based initiatives to control tsetse has become one of the major methods of controlling trypanosomosis. However, despite many attempts by various communities, the results have been generally disappointing and there are very few examples of sustained control of tsetse being achieved by a rural community without significant financial and technical support from donors and/or national governments. The causes of this failure are complex, but at least part of the problem is that rural communities, and the organizations that facilitate community-based tsetse control, do not have adequate access to information on how to apply tsetse control technologies. In addition, the poorest rural communities need access to cheaper and practical tsetse control technologies.

Tsetse traps
A range of designs for tsetse traps were developed in the 1960s and earlier but these included a number of features that made them generally difficult or impractical to use. Many, for instance, were large, cumbersome, and difficult to transport. With the development of the biconical trap by (CHALLIER and LAVEISSIÈRE 1973) a trap became available that was relatively cheap, collapsible, so that many can be carried in a vehicle, and quickly and easily assembled (see in FAO, Use of Attractive Devices for Tsetse Survey and Control http://www.fao.org/AG/AGAInfo/programmes/en/paat/documents/manuals/vol4.html[8]). The biconical trap is particularly effective for species of the palpalis group of tsetse including G. pallalis and G. tachinoides, and less so for other tsetse, but widely used for sampling.
Different species of tsetse occur under and are adapted for different environmental conditions. The best design of trap depends upon the species of tsetse fly and it is important to match the trap to the species. Following the development of the biconical trap, a range of different traps have been designed. For riverine species such as *Glossina palpalis* or *G. fuscipes*, the best traps are the biconical or pyramidal traps. For tsetse living in savanna habitats, e.g. *G. morsitans* and *G. pallidipes*, the best traps have been shown to depend on the locality, or where they are to be used. In East Africa, the Ngu or Nzi traps appear to be the best, whereas in southern Africa the Epsilon trap has produced better results. For *G. brevipalpis*, the H-trap is preferred whereas the Ngu and Epsilon traps have been used successfully to catch *G. longipennis* in Kenya and Somalia. More information on can be found at [http://www.tsetse.org](http://www.tsetse.org) which has a number of useful sections, including answers to the following questions relevant to tsetse and trapping tsetse: [http://www.nri.org/tsetse/FAQ/catch.html](http://www.nri.org/tsetse/FAQ/catch.html).

- What is the best trap for tsetse?
- How do tsetse follow my car?
- Why do I need to use attractants with a tsetse trap?
- What is the chemical properties of the attractants?
- Where is the best site for a trap?
- Should I treat the trap with insecticide?
- What other types of fly are caught by tsetse traps?
- What are the problems with traps?
- What kind of cloth should I use to make targets and traps?
- What is a man fly-round?
- Most traps are black and blue. Is the particular shade of blue important?

### Basic principles of tsetse traps

Tsetse have a high metabolic rate and feed exclusively on vertebrate blood. Their survival therefore depends on detecting and encountering suitable hosts on which to feed. This principle can be exploited in the design of traps and targets which mimic key features of the normal host animals, attracting tsetse in such a way that they can then be captured or killed. With traps, the captured flies can be identified and counted, useful in sampling and monitoring tsetse populations. Tsetse targets simply use insecticide-treated surfaces to kill the tsetse by contact and are of little use in population sampling or monitoring. Both targets and traps are exposed to damage and stealing and these methods require active participation from rural communities.

As techniques for tsetse control, both traps and targets function by removing individuals from the tsetse population. Their efficiency depends on the length of time the devices remain operational, and the likelihood that an individual fly will encounter the device and be killed by it. The length of time each device remains operational depends on a number of factors including resistance to environmental damage (e.g. wind and/or damage by large animals), theft of all or part of the device, and component degradation (particularly colour fade, depletion of odour baits, and loss of insecticidal activity in the case of targets). The likelihood that an individual fly will encounter and be killed or captured by the device depends also on the number of traps or targets relative to the local abundance of tsetse, and on the particular foraging and dispersal behaviour of the target tsetse species. For more information see (KUZOE and SCHOFIELD 2004) [http://www.who.int/tdr/publications/publications/pdf/tsetse_traps.pdf](http://www.who.int/tdr/publications/publications/pdf/tsetse_traps.pdf).

Insecticide-treated traps can be used to control tsetse. The insecticide treatment means that the trap will still kill tsetse even if it is badly ripped. However, if the intention is only to kill tsetse then it is probably cheaper to use a simple insecticide-treated target for control and just use the traps for survey and monitoring purposes.

An integral part of these tsetse traps is a mechanism for dispensing the odours from the baits used to attract tsetse.

### Chemical attractants

When tsetse flies seek a host, they use a variety of sensory perceptions, including movement of the host and odours that assist the tsetse in locating the host. The odours of hosts act on the flies in several ways. Some odours, for example carbon dioxide, stimulate tsetse to fly and start searching for the host. However, carbon dioxide is impractical for use in the field. Others will induce flight toward the host, whilst others promote a landing response. Chemicals that are known to be of use in sampling and/or control measures include three main components, namely:

- ketones (butanone and acetone)
- octenol
- urine (cow urine) or phenol mixtures.

### Odour dispensers

A good odour dispenser should ensure a steady release of the chemical attractant at the correct rate for as long as there is odour in the dispenser. It should also be robust enough to operate under field conditions for long periods. Ideally the release rate should be independent of environmental conditions such as temperature and wind strength. For practical field use the materials also need to be cheap and easy to obtain. The commonly used chemical attractants include:
Glass Jars and Bottles as Odour Dispensers: These are most frequently used for the ketones and for urine of various host animals. The volume of the bottle does not affect the release rate, which is determined by the size of the aperture. This should be set by using a lid drilled with a hole of the correct diameter.

Acetone is normally used at dose rates varying from 150?750 mg/h. At temperatures varying from about 20 degrees Centigrade at night to about 35 degrees in the afternoon, a hole of 2 mm diameter will give an average release rate of about 150 mg/h; one of 6 mm will give about 500 mg/h whilst one of 22 mm will give 2 500 mg/h.

For cow urine a release rate of about 1 000 mg/h is required. This can be obtained using an aperture of about 45 mm diameter. If the aperture is exposed to the rain, some form of cover must be provided to prevent the dispenser from filling with water. Alternatively a plastic container, or empty tin covered with polythene, can be used, with a 2 x 4 cm aperture cut in the side and near to the top. The advantage of this approach is that a rain cover is not required.

Polythene sachets as odour dispensers
Polythene film of about 125-175 µm thickness can be used to make sachets. These have the advantage that the release rate remains reasonably constant with age and they are cheap and easy to make. Flexible lay-flat polythene tubing can be obtained as a roll, and the sachets are made by hand using a heat sealer. These are commercially available in a variety of models. Sachets can either be flat and rectangular, or pyramidal in shape. A sachet made of 125 µm polythene film will need to be about 5 x 4 cm to give an octenol release rate of 0.5 mg/hour, depending on temperature.

Usually two seals are made across each end. The more expensive sealers enable the sachets to be filled first and then sealed. Alternatively the completed sachet can be injected with the chemical by syringe and the resulting small hole sealed. Presence of chemical in the area of the seal will increase the sealing time required. Care should be taken when handling phenols and protective clothing should be worn.

References and further reading


Contact details for DFID research project teams
To view table [click here].

Evidence of validation
To view table [click here].

e-Resources
http://www.tsetse.org[9]. Programmes and information to assist in the planning and implementation of tsetse control operations. Web site created by Steve Torr, Glyn Vale and David Hall as an output of research Project R7173 funded by the Animal Health Programme of the UK Department for International Development (DFID).

- Butanone and acetone. These are dispensed using open bottles of glass or plastic. The bottle can be round or square in cross-section and the height of the bottle, excluding the neck, should be about twice the width. The bottle should be made from stout glass, such as that used with a beer bottle. Plastic is also suitable, provided the polymer is impermeable to butanone. This means that polycholoroethylyene is acceptable whereas polyethylene is not. Clear material is preferable to coloured. The bottle should be sealed with a perforated lid, the size of the perforation being 2.5?3.8 mm.

- Butanone can also be dispensed using a large (capacity = 500 ml; wall thickness = 1 mm) bottle of low density polyethylene but acetone cannot be dispensed using this type of dispenser.

- Octenol and the phenols. These are dispensed using sealed bottles made from low density polyethylene: the attractants diffuse through the polyethylene rather than through a hole. The release rate of the attractants is controlled by the size of the bottle and the thickness of its wall. If the dispenser is too small, or the walls are too thick, or if the bottle is made from high density polyethylene, then the dispenser will not work. Typical bottles which would be effective have a surface area of 160?320 cm² and wall thickness of 0.5 to 1.0 mm.

- Cattle urine. This can be dispensed using glass or plastic bottles but require a far larger opening than that used for acetone or butanone. In general, the apertures need to have a surface area of 25 cm².

- The correct diameter.

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FURTHER READING:


SOURCE(S):

UK Department For International Development (DFID) [19]

Source URL: http://teca.fao.org/technology/tsetse-control-how-use-tsetse-traps-odour-dispenser

Links: