Tsetse control: Insecticide treatment of cattle, Zimbabwe

SUMMARY:

Insecticide treatment of cattle is an important method of tsetse control. However, insecticides applied to cattle have been shown to contaminate dung. This has a significant impact on insects using the dung as a resource, e.g. dung beetles. This reduces the recycling of dung and has a negative impact on productivity of pasture. However, applications of insecticide restricted to only the legs and belly reduce risks to dung fauna without compromising efficacy to tsetse.

KEYWORDS:
Tsetse flies [1]  
Insect control [2]  
pest control [3]

CATEGORY:
Livestock production [4]

COUNTRIES:
Zimbabwe

DESCRIPTION:

Background

Tsetse flies occur in 36 countries and a total area of between 9 and 10 million square kilometres in Africa. Throughout this area the disease transmitted by the tsetse fly, Trypanosomiasis (or Trypanosomosis), has a significant effect on large numbers of livestock. About 50 million cattle and tens of millions of small ruminants are considered to be at risk from Trypanosomiasis, and the disease is considered as an obstacle to poverty reduction and food security in Africa. In addition, according to the World Health Organization (WHO), more than 60 million people, mainly living in rural areas of sub-Saharan Africa, are at risk of human African Trypanosomiasis, or sleeping sickness.

Impacts of Insecticide Control of Tsetse

Insecticide treatment of cattle and other livestock is considered as one of the important methods for control of tsetse, the vectors of Trypanosomiasis. However, insecticides (Pyrethroids) applied to cattle for the control of tsetse fly have been shown to contaminate dung to the extent that it has a significant impact on the insect fauna utilising the dung as a resource, e.g. dung beetles. The resulting mortality and reduction of insect abundance reduces the dispersal and recycling of dung and has a negative impact on productivity of pasture.

Studies have shown that pyrethroid residues were present in dung after a range of cattle treatments and products. Within days of treatment, between 0.01 and 0.1 ppm (wet weight) of pyrethroids were present in dung and there was no detectable loss of these residues for up to 60 days in the field. These concentrations were toxic to dung fauna. Dung beetles and muscid fly larvae were susceptible to a range of pyrethroids, including formulations of deltamethrin, alphacypermethrin, cyfluthrin, cypermethrin and flumethrin. Deltamethrin was the most toxic to beetles and fly larvae. Adult muscoids and earthworms were less
susceptible.

Predictive population modelling indicated that when insecticide treatments of cattle occurred over wide-areas and for many months, the effects of insecticide residues on the abundance and distribution of dung fauna could be serious, in particular threatening the slow breeding species (large dung beetles) and cattle frequenting muscoids.

Dung beetles are important decomposers of animal dung and benefit both plants and soil by recycling nutrients, aerating the soil, improving organic matter content, water retention and plant root penetration. Broad spectrum pyrethroids in faecal residues also have the potential to disrupt a much wider fauna associated with dung, such as termite and fly species that also assist in the dispersal and incorporation of dung in soil.

A small impact on the abundance of dung fauna is likely to have a more noticeable effect on the abundance and quality of pats. If, for example, a pat is normally degraded and dispersed in six days, and a pat receiving a reduced dung fauna goes to a partially degraded state that lasts six months, the number of pats in the pasture will increase by 30 times. The impact on grazing will be significant.

Insecticides may gain entry to the animal via grooming and absorption through the skin. The presence of insecticides in the alimentary canal also raises important questions of consumer safety in the event that unacceptable residue levels in livestock products like milk and meat might accrue.

Use of Pour-ons for Parasite Control in Livestock

Pour-on treatments are applied on the surface of the skin to livestock for the control of ectoparasites and tsetse flies, to prevent transmission of the various diseases that they transmit. Pour-ons are one of several live-bait techniques and are relatively simply administered. They are purchased as a ready-to-use formulation and do not require dip tanks, spray races or hand-held pressurised spray equipment. Instead, oil based formulations are provided in sachets or bottles for pouring over the back of the animal. Recommendations are normally that this is done in a 'stripe' from the base of the neck to the tail. For the control of tsetse flies, suspension concentrates of pyrethroids are the most popular, with coconut oil acting as a "spreader". (see Livestock and Environment Toolbox: http://www.virtualcentre.org/en/dec/toolbox/Grazing/Pour_on.htm [5]).

The pyrethroids are irritating to the skin, especially when in the concentrated pour-on formulations intended to make good contact with the body. It is not clear whether the vegetable oil in pour-ons is itself a licking stimulus, nor whether other chemicals might be added to inhibit licking. The licking is not only a threat to dung fauna, it also means that a significant portion of the costly insecticides used extensively throughout the cattle industry, can soon be removed from their point of contact with target pests.

The use of sprays or dips, as alternatives to the pour-ons, would reduce substantially the risks to dung fauna without affecting much their effects on tsetse, and it was shown that SpotOn and other pour-ons are about as potent as Decatix and other sprays or dips against G. pallidipes.

Improved Methods for Insecticide Treatment of Cattle to Control Tsetse

Options to reduce the toxicity and level of contamination in dung included the investigation of alternative insecticides, formulations and applications.

Most of the tsetse tend to feed on either the legs or the belly of cattle. Treating only these areas and by using Decatix instead of Spot-on, or by applying either of these to restricted areas of the body, the environmental risks of treated cattle to dung fauna were reduced. The optimum strategy was considered to be the application of Decatix (shallow dipped or sprayed) only to the legs or belly, where the majority of the tsetse feed. Experimental results indicated that that licking could account for about half of all insecticide entering
the dung after normal flank treatment with insecticides.

**Advantages**

Restricted applications of insecticide to only the legs and belly reduce risks to dung fauna without compromising efficacy to tsetse.

The restriction of treatments to the legs only promises to reduce yet further the insecticide costs as well as the risks to dung fauna. It also requires relatively little water and might be achieved by comparatively inexpensive leg-baths, small hand-sprayers or even brushes. As legs-only treatments require so much less insecticide than the whole body applications, it means that substantial savings in insecticide costs can be made, possibly at intervals of a fortnight or a month. Such increased frequency of application could well improve the efficacy against tsetse, it being known that the normal intervals are too long to produce a high and steady rate of kill at all seasons.

**Health Risks**

The contamination of animal blood and milk may not be at a level that is deleterious to health, but may nevertheless be of concern where long-term and frequent exposure to and licking of insecticides occurs.

**Costs**

Cost is a major factor affecting the extent of uptake and adoption of insecticide treatment of livestock to control ectoparasites, including ticks and tsetse. Significant cost savings (of up to 90%) would result from reduced insecticide use and the switch from expensive pour-on formulations to water-based dip and spray products.

**Further reading**


**e-Resources**

Use of Pour-on Technology to Control Ectoparasites.


Training in Tropical Diseases (TDR). TDR/IDE/TRY/05.1. [9]


Health and safety

The researchers, their institutions or this website cannot be held responsible for any damage resulting from the use of the materials or methods described here. The application or use of treatments, processes and technologies is the sole responsibility of the user.

DFID disclaimer

This technology is an output from the Renewable Natural Resources Research strategy funded by the UK Department for International Development (DFID), for the benefit of developing countries. The views expressed are not necessarily those of DFID.

Acknowledgements

Technology selected and record compiled from original project documentation by Natural Resources International Ltd, with funding from DFID's Central Research Department (Communications). Implementing and advising on this process were: Karen Wilkin and Tina Rowland (joint project leaders), Andy Frost, Vino Graffham, Jody Sunley, Liz McVeigh, RNRRS programme staff, FAO's Research and Technology Development Service, FAO's LEAD programme, DFID's Central Research Department, Ken Campbell, Graham Farrell (Plant Clinic), Simon Eden-Green, Peter Golob, John Esser, Liz Betser (360º Responsibility). Validation domain reviewed by the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Simon Eden-Green and Peter Golob. Uploading by Random X Solutions Ltd. For more information, please contact Karen Wilkin, NR International Ltd or Tina Rowland, Random X Solutions Ltd.

SOURCE(S):