

Effects of *Metarhizium anisopliae* on sand fly populations in their natural habitats in Marigat sub-County, Baringo County, Kenya

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ABSTRACT

Leishmaniasis is one of the neglected tropical diseases that pose a threat to people in the endemic regions. In Africa, transmission is through the bite of an infected female phlebotomine sand fly. Disease control with chemotherapy is logistically difficult, toxic and expensive. Entomopathogenic fungi (EPF) hold great potential as alternative vector control for sandflies as demonstrated by their efficacy in recent laboratory experiments. The impressive results have merited testing of the effect of EPF on sand flies in their natural habitats. The goal of this study was to test the effect of EPF on sand fly populations on a small scale in a leishmania-endemic area in Kenya. Entomopathogenic fungi isolates were cultured on Sabourand dextrose agar (SDA) in Petri dishes and incubated at 22-28°C. Conidia were produced on long white rice substrate and harvested by sifting the substrate through a 295 µm mesh size sieve and stored at 4-6 °C before being used in the experiments. *Metarhizium anisopliae* isolates were selected for use in the field after showing 76.8 and 100% mortality in laboratory bred target insects. 2.0 x 10¹⁴ of dry conidia of the fungus were introduced into ten termite mounds through the shafts using a modified foot pump in Rabai, Marigat area of Baringo County, Kenya. The site harbours both *Phlebotomus martini* and *P. duboscqi* sandfly vectors. Sand fly densities, mycoses and survival after capture from the mounds were observed from week one post-treatment to week thirteen. Results indicate that the fungi in termite mounds caused three to ten-fold mortalities in the population of sand flies nine weeks after application. Longevity of sand flies collected from treated termite mounds was reduced to less than nine days after collection, whereas 90% of those from control mounds lived well over the nine days.

Sand flies collected from the treated termite mounds during week nine had 100% mortality compared to 10.7% of those from the control mounds. *Metarhizium anisopliae* infection was observed in 42% of the sand fly cadavers collected from the treated termite mounds and 0% in the control group.

The high susceptibility of sand flies to *M. anisopliae* suggests that fungi can be developed as potential vector control alternatives to synthetic chemical insecticides or preferentially be applied in integrated control strategies in order to gain maximum impact on adult sand fly populations. Further studies to determine the best methods for delivery and application in the diverse ecological settings of various leishmaniasis vectors are recommended.

Key words: Sand fly control, Entomopathogenic fungi, *Metarhizium anisopliae*

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