

PROJECT TITLE: Bioprospecting for Phytochemical Repellents and bio-pesticides of the Jigger Flea *Tunga penetrans* from the Western Kenya Flora.

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Tungiasis is a Neglected Tropical Disease (NTD) caused by jigger flea (*Tunga penetrans*). It disproportionately affects children, disabled persons and women with up to 80% of infected being children aged between five and fourteen years, particularly boys. Further, people with disabilities are at highest risk of infection. The objectives included to:

- i. Collect ethnobotanical and baseline socio-economic information on jigger and its effects on households in the proposed study areas a
- ii. Screen plant extracts for repellent and/ or pesticidal activity against *Tunga penetrans*, isolate and identify the bioactive chemical constituents.
- iii. Develop blend formulation(s) for controlling the jigger flea from the biologically active plant extract(s) and their identified constituents.
- iv. Determine the molecular identity, epidemiology, and immunological response of *Tunga penetrans*.
- v. Isolation and characterization of bacterial isolates from jigger-inflicted lesions

In this project, we investigated the potential of essential oils and other plant organic solvent extracts from some Western Kenya flora in managing the jigger flea. In addition, we also isolated and identified the bacteria associated with the secondary infections due to the jigger-initiated wound lesions. The bacteria got tested for their sensitivity against a pool of most antibiotics and those resistant to the antibiotics got tested for their sensitivity on the essential oils and organic solvent extracts from the pool of the Western Kenya flora used in this research. The results on bacterial sensitivity to the commercially available pool of antibiotics revealed that *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Proteus mirabilis* were resistant against the entire pool of more than twenty antibiotics except for the Gentamycin. Aloe endogenous chloroform and ethyl acetate extracts (40mg/ml) inhibited the growth of the *Staphylococcus aureus* in a disc diffusion assay but were not active against *Staphylococcus epidermidis* and *Proteus mirabilis*. We further discovered and demonstrated in small-scale trials the efficacy of a bio-pesticide against the jigger flea (*Tunga penetrans*) in vivo and in vitro. Our bio-pesticide is a

phytochemical blend derivative of tobacco (*Nicotiana tabacum*) and is composed of nicotine, nornicotine, anabasine, anatabine continue and myosmine in the ratio of 85:2:4:7:1:1, respectively, added to a gram of lemon eucalyptus oil in 90% petroleum jelly base. This blend is toxic to jigger fleas and all its stages in the life cycle in a single topical application on infected persons (Omolo et al., 2022). Consequently, it can cure Tungiasis within seven days post-exposure to it, without any visible side effects on the end-user, and enhance the healing of wounds resulting from tissue damage by jigger. The bio-pesticide if up-scaled can directly benefit children, disabled persons, and women, who are amongst the disproportionately affected population in society. The commercialization and utilization of the bio-pesticide can address SDG goals 1, 2 & 3 on Poverty, food security & health as well as Africa Agenda 2063.

Reference

1. Omolo M.V., Wafula V.M., Owino J.O and Andati R (2022) Bio-pesticide composition for killing jiggers and other blood-feeding insects and arachnid pests. **WIPO International Publication Number WO 2022/045375 A1.**

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