

DEVELOPMENT AND ON-HOST EVALUATION OF CONTROLLED-RELEASE
FORMULATIONS OF OPTIMISED POTENT REPELLENTS OR BLENDS AGAINST
RHIPICEPHALUS APPENDICULATUS



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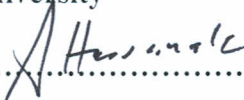
A research proposal submitted in partial fulfillment of the requirement for the award of the degree of Doctor of Philosophy in Chemistry in the School of Pure and Applied Sciences of Kenyatta University

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ABSTRACT

Tick borne diseases are major constraints to livestock productivity and food security in many developing countries. They cause high morbidity and mortality in cattle, and prevent the introduction of highly productive but disease-susceptible breeds of cattle. They are also expensive to control and place a huge economic burden on poor small holder farmers. East Coast Fever (ECF, *Theileria parva*, Theiler 1904) is one of the most serious of the theileria species. ECF is transmitted primarily by the brown ear tick *Rhipicephalus appendiculatus*. In Africa, it is estimated that 1.1 million cattle suffer from ECF resulting to losses at US dollars 168 million. In Kenya, about 50-80% of the national cattle population of about 10 million animals is exposed to tick infestations and out of this 1% die of ECF each year. Use of semiochemicals represents a strategy for the control management of the vector which is eco-friendly. On host behavior studies of adult *R. appendiculatus* shows preference to feed mainly inside and around the ear of their host. Combination of a repellent blend from the anal region and an attractive blend at the ear has been shown to play natural “push” and “pull” roles, respectively, to guide these ticks to the cattle ears. In a preliminary study, application of a crude repellent blend collected from the anal region at the ears has been shown to confuse the ticks, most of which drop off the cattle. Preliminary work showed the presence of forty three compounds in the GC-MS of the anal odour. These compounds include ketones, phenols, amines and alcohols. The major constituents comprised of 4-methylguaiacol, 4-hydroxy-4-methyl-2-pentanone, and 3-methyl-2-pentanone among others. Bioassays of blends of these and individual constituents showed varying levels of repellence, with 4-methylguaiacol showing the most repellent effect. A number of analogues of this constituent was tested and 2,4-dimethylphenol was found to be most repellent. The present research will build on these results, undertake further structure-activity studies and evaluate potent compounds individually and in blends in laboratory assays and on cattle. This will be followed by development of a controlled-release formulation of a selected repellent or blend, which can then be evaluated in a push tactic on the host animals. All data will be analyzed using Analysis of Variance (ANOVA) while the mean will be compared by Student -Newman-Keuls test at $P \geq 0.05$.