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***IN-VITRO EFFICACY OF SOLANUM INCANUM ON RHIPICEPHALUS
APPENDICULATUS***

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DECLARATION AND APPROVAL

This dissertation is my original work and has not been submitted for an award of a degree in any other University or Institution and that all sources of materials used for developing the dissertation have been duly acknowledged.

.....


29th July 2018

Nyangoma Christine.

This dissertation has been submitted for examination with approval of my academic supervisor.

Signature.....

Date.....

Dr .Patrick Mawadri



DEDICATION

To my beloved parents, my brothers and sisters, and my friends for their invaluable support throughout the study.

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LIST OF ABBREVIATIONS

- TBD.....tick borne disease
- TTBD.....tick and tick borne diseases
- S. incanum*.....*solanum incanum*
- R.a.....*Rhipicephalus appendiculatus*
- RE.....reproductive efficiency

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ABSTRACT

Herbal remedies have a long history of use for tick control. *Solanum incanum* ripe fruits are locally used to manage ticks. In this study, the effect of *Solanum incanum* fruit extracts on egg hatchability, inhibition of oviposition and larval mortality of *Rhipicephalus appendiculatus* ticks was investigated. The Reproductive efficiency of eggs laid by the ticks was determined. The highest number of eggs laid was recorded in the untreated control, whereas the lowest was in the control treated with amitraz. The number of eggs that were laid after treatment with the plant extract increased with increase in the extract concentration, that is to say, 20%, 10% and 5% was 51.0262%, 43.774 and 36.901% respectively. The control treated with amitraz showed higher efficacy 96.6% whereas the untreated control had no effect on the ticks. *Solanum incanum* 5% showed higher efficacy of 33.488%, than 10% and 20%, which showed 19.405% and 7.833% respectively. However, there was no significant difference between the fruit extract concentrations. In the results obtained from the larval packet test (LPT), control treated with amitraz was recorded with the highest mortality of 100% whereas the untreated control showed no significant larval mortality. There was high larval mortality recorded in all the three concentrations of *Solanum incanum*, of 100mg/ml, 50mg/ml and 25mg/ml with 97.969%, 98.589% and 95.948% respectively.

CHAPTER ONE: INTRODUCTION

1.1 Background

Ticks are one of the leading vectors of diseases of economic importance to the Animal Industry in Africa. Tick-borne diseases (TBD) mainly Theileriosis/East Coast Fever (ECF), Babesiosis and Anaplasmosis present serious constraints to production and especially of exotic cattle and their crosses (Vudriko *et al.*, 2016). The above diseases also account for nearly 90 % of total disease control costs and over 60 % of total farm inputs and other associated economic losses due to a reduction in meat and milk production, as well as, a devaluation of leather due to skin lesions caused by high infestations (Souza Higa, 2015). To address tick challenge, commercial cattle farmers rely extensively on use of acaricides for chemical control of ticks. This has proved to be an effective strategy for mitigating the tick's economic impact on the Animal Industry. Thus creating a huge demand and market for acaricides in Uganda. The liberalization of the veterinary drug industry in the country has made acaricides even more accessible to farmers. Because of limited regulation, cases of uncontrolled use of acaricides by farmers have been widely reported. Wrong dilution, application methods and increased acaricide pressure are amongst factors that accelerate development of acaricide resistance. The evolution of acaricide resistance which was first reported in Uganda in 1970 is a cause of grave concern among cattle producers, government agencies and technical personnel (Andreotti *et al.*, 2011)

Acaricide failure places tremendous financial burden on the Ugandan farmers; not only does it lead to a high loss of their cattle to TBD, but the costs of the acaricides themselves account for about 90% of an average farmer's total disease control budget, making non-functional acaricides a major budgetary loss for farmers. Unless new chemical types are introduced, or highly effective alternative therapies developed, parasites are likely to cause very considerable financial problems and serious issues of welfare in the future Animal Industry.

Alternatively, exploiting plants as sources of effective tick repellents and botanical acaricides is promising. These natural products offer a cheap alternative to synthetic acaricides and are biodegradable (Parte *et al.*, 2014). Moreover, these botanicals are found to contain a mixture of active substances that can delay or prevent the development of resistance to herbal products (Ghosh *et al.*, 2015).

REFERENCES

- Abdisa, T. (2017). Review on Traditional Medicinal Plant and its Extract Effect on Tick Control in Ethiopia.
- Abebe, H., Gebre, T., & Assistant, A. H. (2014). Journal of Medicinal Plants Studies Phytochemical Investigation on the Roots of Solanum Incanum , Hadiya Zone , Ethiopia, 83–93.
- Acarology, A., Shankar, S., & Projects, T. (2015). Identification of potential plant extracts for anti-tick activity against acaricide resistant cattle ticks, Rhipicephalus (Boophilu...., (February). <https://doi.org/10.1007/s10493-015-9890-7>
- Amadi JE, Salami SO, Eze CS. Antifungal properties and phytochemical screening of the extracts of African Basil (*Ocimum gratissimum* L). *Agriculture and Biology Journal of North America*.2010; 1: 163-166
- Andreotti, R., Guerrero, F. D., Soares, M. A., Barros, J. C., Miller, R. J., & Léon, A. P. de. (2011). Acaricide resistance of Rhipicephalus (Boophilus) microplus in State of Mato Grosso do Sul, Brazil. *Revista Brasileira De Parasitologia Veterinaria = Brazilian Journal of Veterinary Parasitology: Orgao Oficial Do Colegio Brasileiro De Parasitologia Veterinaria*. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21722487>
- Apperson, M. W. (2009). *Ticks and Tick-Borne Diseases in North Carolina*. NC Cooperative Extension Service, NC State University.
- Brown Ticks (Rhipicephalus) identification, images, ecology. (2013).
- Campos, R. A., Boldo, J. T., Pimentel, I. C., Dalfovo, V., & Araújo, W. L. (2010.). Endophytic and entomopathogenic strains of Beauveria sp to control the bovine tick Rhipicephalus (Boophilus) microplus, 9(3), 1421–1430. <https://doi.org/10.4238/vol9-3gmr884>
- CFSPH. (2009). Rhipicephalus appendiculatus Rhipicephalus appendiculatus. *Genus*, (September), 1–2.
- Chalbot, M. G. (2016). Experiences in Tick Control by Acaricide in the Traditional Cattle Sector in Zambia and Burkina Faso: Possible Environmental and Public Health Implications, 4(November), 1–11. <https://doi.org/10.3389/fpubh.2016:00239>

Ethnobotanicals for management of the brown ear tick Rhipicephalus appendiculatus in western

Evaluation of Antifungal Activity and Phytochemical Analysis of Leaves, Roots and Stem Barks

Ghosh, S., Tiwari, S.S., Kumar, B., Srivastava, S., Sharma, A.K., Kumar, S., Bandyopadhyay, A., Juliet, S., Kumar, R and Rawat, A.K.S (2015). Identification of potential plant extracts for anti tick activity against acaricideresistant cattle ticks, *Rhipicephalus (Boophilus) microplus*. *Expl. Appl. Acarol*,66: 159-171.

Jongejan, F., & Uilenberg, G. (1994). Ticks and control methods, *13*(4), 1201–1226.

Kawo, a H., Mustapha, Abdullahi, B. a, Rogo, Gaiya, & Kumurya, a S. (2009). Phytochemical Properties and Antibacterial Activities of the Leaf and Latex Extracts of Calotropis Procera (Ait.F.) Ait. *Bajopas Bayero Journal of Pure and Applied Sciences*, *2*(21), 34–40. <https://doi.org/10.4314/bajopas.v2i1.58453>

Lin YI, Wang WL, Kuo YH, Chen CF. Nonsteroidal constituents from Solanum incanum L. *Journal of the Chinese Chemical Society*. 2000; *74*: 247-251.

Madzimure, J., Nyahangare, T., Hove, T., Belmain, S. R., & Stevenson, P. C. (n.d.). Efficacy of. <https://doi.org/10.1007/s11250-013-0367-6>

Mail, U. (2007). Tick control, (December), 39–41.

Mukami, N. A., & Wanzala, W. (n.d.). A Study of Bioactivity of Solanum incanum L . Fruit Extracts on Microorganisms of the Oral Cavity.

Mwaura, L., Anjarwalla, P., Ofori, D. A., Stevenson, P. C., Smith, P., & Jamnadass, R. (2015). Pesticidal plant leaflet : Solanum incanum L., 2.

No Title. (2016), (October), 1–5.

Nyahangare, E. T., Mvumi, B. M., & Stevenson, P. C. (2012). Tick control measures from nature. *Afgiland*, 76–77. Retrieved from http://www.afgriland.co.za/pageflip/2012_05_mei_june/index.html

Nyigo, V. A., Mdegela, R. H., Malebo, H. M., Mabiki, F. P., & Fouche, G. (2016). Evaluation of acaricidal efficacy of Synadenium glaucescens (Euphorbiaceae) against boophilus species. *10*(21), 278–285. <https://doi.org/10.5897/JMPR2016.6099>

- O, O. A. (2016). An Ethnobotanical, Phytochemical, toxicity and efficacy study of selected antiblue-tick (*Boophilus decoloratus*) herbal remedies for cattle of Suba sub-county, Kenya.
- Premalatha, K., Sij, N., Vishnupriya, R., & Balakrishnan, S. (2018). Acaricidal activity of plant extracts on two spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae), 6(1), 1622–1625.
- Rahuman, A. A. (2011). *Efficacies of Medicinal Plant Extracts Against Blood-Sucking Parasites*. <https://doi.org/10.1007/978-3-642-19382-8>.
- Regassa, A. (2000). The use of herbal preparations for tick control in western Ethiopia. *Journal of the South African Veterinary Association*, 71(4), 240–243. <https://doi.org/10.4102/jsava.v71i4.722>
- Repellent Activities of Essential Oils of Some Plants Used Traditionally to Control the Brown Ear
- Rosenkranz V. and Wink M. (2007). Induction of apoptosis by alkaloids, non-protein amino acids and cardiac glycosides in human promyelotic HL-60 cells. *Zeitschrift für Naturforschung*, 62: 458-466.
- Saganuwan, S. A. (2017). Ethnoveterinary Values of Nigerian Medicinal Plants: An Overview, 18(4), 1–35. <https://doi.org/10.9734/EJMP/2017/29321>
- Sahle, T., & Okbatinsae, G. (2017). Phytochemical investigation and antimicrobial activity of the fruit extract of *Solanum incanum* grown in Eritrea. *Ornamental and Medicinal Plants*, 1(1), 15–25.
- Soliman, M. M. M., & Habeeb, S. M. (2018). In vitro acaricidal effect of some crude extracts and essential oils of wild plants against certain tick species, 58(Volume 58).
- Souza Higa, L. de O. (2015). Acaricide Resistance Status of the *Rhipicephalus microplus* in Brazil: A Literature Overview. *Medicinal Chemistry*. <https://doi.org/10.4172/2161-0444.1000281>
- Srikanta Ghosh, B. K. (2015). *Identification of potential plant extracts for anti-tick activity against acaricide resistant cattle ticks, Rhipicephalus (Boophilu....* : <https://www.researchgate.net/publication/272837504>.

- staab, H. (2006). *what failure to control ticks in Uganda teaches everyone global lyme alliance.*
- Stafford, K. C. (2001). Tick Control. *The Connecticut Agricultural Experiment Station*. Retrieved from <http://www.caes.state.ct.us>
- Stafford III, K. C. (2007). Tick management handbook. *The Connecticut Agricultural Experiment Station, Bulletin, 1010*(1010), 9–18. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.138.2651&rep=rep1&type=pdf>
- Turton, J. . (2003). Methods of Tick Control, 1–3. Retrieved from http://www.nda.agric.za/docs/Infopaks/Methods_tick.pdf
- Umar, A. (2016). *Evaluation of anti – aphids properties of the aqueous crude fruit sap extract of Solanum incanum. nairobi kenya.*
- Vudriko, P., Okwee-Acai, J., Tayebwa, D. S., Byaruhanga, J., Kakooza, S., Wampande, E., ... Suzuki, H. (2016). Emergence of multi-acaricide resistant Rhipicephalus ticks and its implication on chemical tick control in Uganda. *Parasites and Vectors*. <https://doi.org/10.1186/s13071-015-1>
- wanyangu. (1998). *drug-resistant parasites of sheep: an emerging problem in UK.*
- Wanzala, W. A. (2014). *Repellent Activities of Essential Oils of Some Plants Used Traditionally to Control the Brown Ear Tick, Rhipicephalus appendiculatus. Central Canada and U.S.*
- Yanar, D., Kadio, I., & Gökçe, A. (2011). Acaricidal effects of different plant parts extracts on two-spotted spider mite (Tetranychus urticae Koch), *10*(55), 11745–11750. <https://doi.org/10.5897/AJB11.132>
- Zahid Iqbal Rajput, †. S.-h.-j.-w. (2006). *Review Importance of ticks and their chemical and immunological control in livestock. Zhejiang Province, China.*