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EFFICACY OF *RICINUS COMMUNIS* LEAF EXTRACT AGAINST *RHIPICEPHALUS APPENDICULATUS* AND *AMBLYOMA VARIEGATUMM* ON ARAPAI FARM

BY

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A RESEARCH DISSERTATION TO BE SUBMITTED TO THE FACULTY OF AGRICULTURE AND ANIMAL SCIENCES IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR AWARD OF THE DEGREE OF BACHELOR OF ANIMAL PRODUCTION AND MANAGEMENT OF BUSITEMA UNIVERSIT

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ABSTRACT

Parasitic infections are one of the major problems affecting the livestock industry in many regions of the world. Ticks are considered one of the important and harmful bloodsucking species of ectoparasites of domestic animals and humans in the world after mosquitoes. Farmers generally use conventional accaricides to control ticks and tick borne diseases, however finding new, cheap and eco-friendly alternatives source of accaricides is of paramount concern. In this study, the mortality rate of *Rhipicephalus appendiculatus* and *Amblyoma variegatumm* ticks exposed to different concentrations of *Ricin's communist* leaves extract and a conventional accaricides was investigated. Among the *Ricinus communist* leaves extract, 25 % showed the highest rate of mortality of 50%, 75% and 87.5% and 62.5%, 75% and 100% in 12, 24 and 36 hours of exposure to the extract in RA and AV ticks respectively. Generally, the mortality rate increased with time of exposure to the chemicals, with highest mortality shown at 36 hours of exposure to the extract. In addition, the conventional accaricides (12.5% Amitraz) showed the highest mortality rate of 100% in RA ticks and 87.5% in AV ticks after just 2 hours after exposer. Obviously, distilled water with 0% *Ricin's communist* leaves extract showed 0% mortality in both tick species, To assess the ability to inhibit oviposition, *Ricinus communist* leaf extract showed negative results in both trials as none of the concentrations of the extract was able to inhibit the process in both RA and AV engorged ticks, therefore *Ricinus communist* leaves extracts can be used as an alternative accaricides though it could not inhibit oviposition process.

DECLARATION

I OKUDA WILLIAM declares that the work in this research dissertation is my personal and has not been submitted for the award of a degree in any other institution.

Signed date

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OKUDA WILLIAM

APPROVAL

This research dissertation was written under my supervision and will be submitted to the department of animal production and management for examination with my approval as the supervisor.

Signature. date.

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Dr. Gerald zirintunda.

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DICATION

I dedicate this work to my lovely brother, Ayepa Calvin, and to the organization of straight talk foundation for supporting me in a lot of ways that words can't explain my supervisor and mentor Dr. Gerald Zirintunda, and all my friends, may God bless you all.

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LIST OF ABBREVIATION

TBD	Tick-borne diseases
Dr	Doctor
BUAC	Busitema university Arapai campus
WHO	World health organization
FAO	Food and agriculture organization
TBDsT	ick-borne diseases
SPP	Species
AV	*Amblyoma variegatumm*
RA	*Rhipicephalus appendiculatus*

CHAPTER ONE: INTRODUCTION

1.0 introduction.

1.1 Background.

Parasitic infections are one of the major problems affecting the livestock industry in many regions of the world (Roeber *et al.*, 2013). Ticks are considered one of the important and harmful bloodsucking species of ectoparasites of domestic animals and humans in the world after mosquitoes (Kasaija *et al.*, 2021). The most economically important tick species that parasitize livestock in Africa include *Rhipicephalhus spp*, *Boophilus spp*, and *Amblyoma spp*. These vector parasites cause deadly cattle diseases such as theileriosis, babesiosis, anaplasmosis, and heartwater. The cattle tick, *Rhipicephalus appendiculatus*, and *Amblyoma variegatumm* are two of the most important species of ectoparasites of livestock and they are widely distributed in tropical and subtropical regions, including Uganda (Olds *et al*., 2018).

Rhipicephalus appendiculatus and *Amblyoma variegatumm* cause enormous economic losses in livestock production by reducing weight gain, lactation, tick worry, blood loss, skin damage, and injections of toxins. Furthermore, they are also indirectly involved in the transmission of diseases such as East Coast Fever (Manjunathachar *et al*., 2014). Remembering the impact of ticks and tick-borne diseases on individual and national livestock economies, developing countries should prioritize tick control (Kasaija *et al*., 2021). Recent discoveries that revealed the emergence of tick resistance to ivermectin, fipronil, and fluazuron suggest that care should be taken with preserving the effectiveness of existing chemicals acaricides, lest there is no choice (Vudriko *et al*., 2016). Every time the acaricide fails, the number of ticks increases exponentially resulting in ticks and tick-borne disease concerns, increased morbidity, and costs associated with the treatment of tick-borne diseases, alternatively more and more natural bioactive pesticides are being used for tick control as they have additional benefits such as low toxicity and are more environmentally friendly (Lihou *et al*., 2020).

Among natural products, plant extracts and essential oils have been shown to have significant activities against economically important tick species (Adenubi *et al*., 2016). Some plant extracts with significant acaricidal activity include; *Azadirachta indica, Annonas quamosa*,

REFERENCES

1. Abbas, R. Z., Zaman, M. A., Colwell, D. D., Gilleard, J., & Iqbal, Z. (2014a). Acaricide resistance in cattle ticks and approaches to its management: the state of play. *Veterinary Parasitology*, *203*(1–2), 6–20. https://doi.org/10.1016/J.VETPAR.2014.03.006
2. Abbas, R. Z., Zaman, M. A., Colwell, D. D., Gilleard, J., & Iqbal, Z. (2014b). Acaricide resistance in cattle ticks and approaches to its management: The state of play. *Veterinary Parasitology*, *203*(1–2), 6–20. https://doi.org/10.1016/J.VETPAR.2014.03.006
3. Abdullah, H. H. A. M., El-Molla, A., Salib, F. A., Allam, N. A. T., Ghazy, A. A., & Abdel-Shafy, S. (2016). Morphological and molecular identification of the brown dog tick Rhipicephalus sanguineus and the camel tick Hyalomma dromedarii (Acari: Ixodidae) vectors of Rickettsioses in Egypt. *Veterinary World*, *9*(10), 1087. https://doi.org/10.14202/VETWORLD.2016.1087-1101
4. Adenubi, O. T., Fasina, F. O., McGaw, L. J., Eloff, J. N., & Naidoo, V. (2016). Plant extracts to control ticks of veterinary and medical importance: A review. In *South African Journal of Botany* (Vol. 105, pp. 178–193). Elsevier B.V. https://doi.org/10.1016/j.sajb.2016.03.010
5. Agelu, C. (2006). *Assessing Factors Influencing Hygiene and Sanitation Practices in Soroti District: A Case Study of Arapai Sub-County*. http://ir.umu.ac.ug/xmlui/handle/20.500.12280/596
6. Apari, P., & Földvári, G. (2021). Harm or protection? The adaptive function of tick toxins. *Evolutionary Applications*, *14*(2), 271–277. https://doi.org/10.1111/eva.13123
7. Bennett, G. F. (1974). Oviposition of Boophilus microplus (Canestrini) (Acarida : Ixodidae). I. Influence of tick size on egg production. *Acarologia*, *16*(1), 52–61.
8. Brites-Neto, J., Duarte, K. M. R., & Martins, T. F. (2015). Tick-borne infections in human and animal population worldwide. *Veterinary World*, *8*(3), 301–315. https://doi.org/10.14202/VETWORLD.2015.301-315
9. Dantas-Torres, F. (2010). Biology and ecology of the brown dog tick, Rhipicephalus

sanguineus. *Parasites & Vectors*, *3*, 26. https://doi.org/10.1186/1756-3305-3-26

10. Dantas-Torres, F., & Otranto, D. (2022). Ixodid and Argasid Ticks. In *Encyclopedia of Infection and Immunity* (pp. 1049–1063). Elsevier. https://doi.org/10.1016/b978-0-12-818731-9.00013-6
11. De La Fuente, J., & Kocan, K. M. (2006). Strategies for development of vaccines for control of ixodid tick species. *Parasite Immunology*, *28*(7), 275–283. https://doi.org/10.1111/j.1365-3024.2006.00828.x
12. De Meneghi, D., Stachurski, F., & Adakal, H. (2016a). Experiences in tick control by acaricide in the traditional cattle sector in Zambia and Burkina Faso: Possible environmental and public health implications. In *Frontiers in Public Health* (Vol. 4, Issue NOV). Frontiers Media S. A. https://doi.org/10.3389/FPUBH.2016.00239
13. De Meneghi, D., Stachurski, F., & Adakal, H. (2016b). Experiences in tick control by acaricide in the traditional cattle sector in Zambia and Burkina Faso: Possible environmental and public health implications. In *Frontiers in Public Health* (Vol. 4, Issue NOV, p. 239). Frontiers Media S. A. https://doi.org/10.3389/FPUBH.2016.00239
14. Dpi, N. S. W. (2020). *Cattle tick – identifying the life cycle stages*. *April*.
15. Fernández-Salas, A., Alonso-Díaz, M. A., Acosta-Rodríguez, R., Torres-Acosta, J. F. J., Sandoval-Castro, C. A., & Rodríguez-Vivas, R. I. (2011). In vitro acaricidal effect of tannin-rich plants against the cattle tick Rhipicephalus (Boophilus) microplus (Acari: Ixodidae). *Veterinary Parasitology*, *175*(1–2), 113–118. https://doi.org/10.1016/J.VETPAR.2010.09.016
16. Garcia, M. V., & Andreotti, R. (2022). *Parasites & Vectors Contributions of the hair sheep breed Santa Ines as a maintenance host for (Acari : Ixodidae) in Brazil*. 1–17.
17. Ghosh, S., Azhahianambi, P., & Yadav, M. P. (2007). Upcoming and future strategies of tick control: a review. *Journal of Vector Borne Diseases*, *44*(2), 79–89. https://europepmc.org/article/MED/17722860
18. Grech-Angelini, S., Stachurski, F., Lancelot, R., Boissier, J., Allienne, J. F., Marco, S., Maestrini, O., & Uilenberg, G. (2016). Ticks (Acari: Ixodidae) infesting cattle and some other domestic and wild hosts on the French Mediterranean island of Corsica. *Parasites and Vectors*, *9*(1), 1–11. https://doi.org/10.1186/s13071-016-1876-8

19. Guglielmone, A. A., Robbins, R. G., Apanaskevich, D. A., Petney, T. N., Estrada-Peňa, A., Horak, I. G., Shao, R., & Barker, S. C. (2010). The argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: A list of valid species names. *Zootaxa*, *2528*(2528), 1–28. https://doi.org/10.11646/zootaxa.2528.1.1
20. Jaime Betancur Hurtado, O., & Giraldo-Ríos, C. (2019). Economic and Health Impact of the Ticks in Production Animals. In *Ticks and Tick-Borne Pathogens*. IntechOpen. https://doi.org/10.5772/intechopen.81167
21. Junker, K., Horak, I. G., & Penzhorn, B. (2015). History and development of research on wildlife parasites in southern Africa, with emphasis on terrestrial mammals, especially ungulates. *International Journal for Parasitology: Parasites and Wildlife*, *4*(1), 50–70. https://doi.org/10.1016/j.ijppaw.2014.12.003
22. Kasaija, P. D., Estrada-Peña, A., Contreras, M., Kirunda, H., & de la Fuente, J. (2021). Cattle ticks and tick-borne diseases: a review of Uganda's situation. *Ticks and Tick-Borne Diseases*, *12*(5), 101756. https://doi.org/10.1016/J.TTBDIS.2021.101756
23. Kay, B. H., & Kemp, D. H. (1994). Vaccines against arthropods. *The American Journal of Tropical Medicine and Hygiene*, *50*(6 Suppl), 87–96. https://doi.org/10.4269/AJTMH.1994.50.87
24. Keirans, J. E., & Durden, L. A. (2014). Tick Systematics and Identification. *Tick-Borne Diseases of Humans*, 123–140. https://doi.org/10.1128/9781555816490.CH7
25. Lachin, J. M. (2005). Sample Size Determination. *Encyclopedia of Biostatistics*, *25*, 1–9. https://doi.org/10.1002/0470011815.b2a15138
26. Levin, M. L., Schumacher, L., & Thangamani, S. (2015). *Laboratory colonies of ticks*. *Cdc*, 1–30. https://www.beiresources.org/Portals/2/VectorResources/Methods in Tick Research.pdf
27. Lihou, K., Rose Vineer, H., & Wall, R. (2020). Distribution and prevalence of ticks and tick-borne disease on sheep and cattle farms in Great Britain. *Parasites and Vectors*, *13*(1), 406. https://doi.org/10.1186/s13071-020-04287-9
28. Londt, J. G. (1977). Oviposition and incubation in Boophilus decoloratus (Koch, 1844) (Acarina: Ixodidae). *Onderstepoort Journal of Veterinary Research*, *44*(1), 13–20.
29. Manjunathachar, H. V., Saravanan, B. C., Kesavan, M., Karthik, K., Rathod, P., Gopi,

M., Tamilmahan, P., & Balaraju, B. L. (2014). Economic importance of ticks and their effective control strategies. *Asian Pacific Journal of Tropical Disease*, *4*(S2), S770–S779. https://doi.org/10.1016/S2222-1808(14)60725-8

30. Mathewos, M., Welamu, W., Fesseha, H., Aliye, S., & Endale, H. (2021). Study on Prevalence of Hard Ticks and Their Associated Risk Factors in Small Ruminants of Boloso Sore Districts of Wolaita Zone, Southern Ethiopia. *Veterinary Medicine : Research and Reports*, *12*, 293. https://doi.org/10.2147/VMRR.S336467
31. Mathinya, V., Franke, A., Van De Ven, G., & Giller, K. (2022). Productivity and constraints of small-scale crop farming in the summer rainfall region of South Africa. *Outlook on Agriculture*, *51*(2), 139–154. https://doi.org/10.1177/00307270221091839
32. Miyama, T., Byaruhanga, J., Okamura, I., Uchida, L., Muramatsu, Y., Mwebembezi, W., Vudriko, P., & Makita, K. (2020). Effect of chemical tick control practices on tick infestation and Theileria parva infection in an intensive dairy production region of Uganda. *Ticks and Tick-Borne Diseases*, *11*(4). https://doi.org/10.1016/j.ttbdis.2020.101438
33. Nava, S., Venzal, J. M., González-Acuña, D., Martins, T. F., & Guglielmone, A. A. (2017). Morphological Keys for Genera and Species of Ixodidae and Argasidae. In *Ticks of the Southern Cone of America* (pp. 323–336). Elsevier. https://doi.org/10.1016/b978-0-12-811075-1.00004-2
34. Ndava, J., Mapuwei, T. W., & Madoma, C. (2018). *Tephrosia vogelii Publication*. *6*(1), 1145–1150.
35. Njaa, B. L. (2017). The Ear. In *Pathologic Basis of Veterinary Disease Expert Consult* (pp. 1223-1264.e1). Elsevier Inc. https://doi.org/10.1016/B978-0-323-35775-3.00020-5
36. Nyahangare, E. T., Mvumi, B. M., & Mutibvu, T. (2015a). Ethnoveterinary plants and practices used for ecto-parasite control in semi-arid smallholder farming areas of Zimbabwe. *Journal of Ethnobiology and Ethnomedicine*, *11*(1), 30–30. https://doi.org/10.1186/S13002-015-0006-6
37. Nyahangare, E. T., Mvumi, B. M., & Mutibvu, T. (2015b). Ethnoveterinary plants and practices used for ecto-parasite control in semi-arid smallholder farming areas of Zimbabwe. *Journal of Ethnobiology and Ethnomedicine*, *11*(1).

https://doi.org/10.1186/S13002-015-0006-6

38. Nyamushamba, G. B., Mapiye, C., Tada, O., Halimani, T. E., & Muchenje, V. (2017). Conservation of indigenous cattle genetic resources in Southern Africa's smallholder areas: Turning threats into opportunities - A review. In *Asian-Australasian Journal of Animal Sciences* (Vol. 30, Issue 5, pp. 603–621). Asian-Australasian Association of Animal Production Societies. https://doi.org/10.5713/ajas.16.0024
39. Olds, C. L., Mason, K. L., & Scoles, G. A. (2018). Rhipicephalus appendiculatus ticks transmit Theileria parva from persistently infected cattle in the absence of detectable parasitemia: Implications for East Coast fever epidemiology. *Parasites and Vectors*, *11*(1), 1–11. https://doi.org/10.1186/S13071-018-2727-6/FIGURES/7
40. Quadros, D. G., Johnson, T. L., Whitney, T. R., Oliver, J. D., & Chávez, A. S. O. (2020). Plant-derived natural compounds for tick pest control in livestock and wildlife: Pragmatism or Utopia? In *Insects* (Vol. 11, Issue 8, pp. 1–25). MDPI AG. https://doi.org/10.3390/insects11080490
41. Radhakrishnan, S., Agarwal, M. D. C., & Marigeri, M. V. (2016). Missed retained tick: "look for the legs." In *Medical Journal Armed Forces India* (Vol. 72, Issue 1, pp. 94–95). Medical Journal Armed Forces India. https://doi.org/10.1016/j.mjafi.2015.08.005
42. Rhipicephalus appendiculatus. (2022). *CABI Compendium*, *CABI Compend*. https://doi.org/10.1079/CABICOMPENDIUM.65995
43. Roeber, F., Jex, A. R., & Gasser, R. B. (2013). Impact of gastrointestinal parasitic nematodes of sheep, and the role of advanced molecular tools for exploring epidemiology and drug resistance - An Australian perspective. *Parasites and Vectors*, *6*(1), 1–13. https://doi.org/10.1186/1756-3305-6-153
44. Romano, D., Stefanini, C., Canale, A., & Benelli, G. (2018). Artificial blood feeders for mosquitoes and ticks—Where from, where to? *Acta Tropica*, *183*, 43–56. https://doi.org/10.1016/J.ACTATROPICA.2018.04.009
45. Rosado-Aguilar, J. A., Arjona-Cambranes, K., Torres-Acosta, J. F. J., Rodríguez-Vivas, R. I., Bolio-González, M. E., Ortega-Pacheco, A., Alzina-López, A., Gutiérrez-Ruiz, E. J., Gutiérrez-Blanco, E., & Aguilar-Caballero, A. J. (2017). Plant products and secondary metabolites with acaricide activity against ticks. In *Veterinary*