Yohannes *et al*., *Ethiop. J. Vet. Sci. Anim. Prod.* (2020),
Vol.4 (1): 31-37
ISSN: 2616-4647

Ethiopian Journal of Veterinary Sciences and Animal Production

Original Research Article **Open Access**

In vitro Study on Comparative Efficacy of Commercially Available Acaricides and Crude Extracts of *Solanum incanum* and *Nerium Oleander* against Ticks

Yohannes Talema[1], Guesh Negash*.[1], Etsay, Kebede[1] and Yohannes Hagos[1]

Abstract

This study was carried out from November 2017 to June 2018 to compare the efficacy of commercially available acaricides of Diazinon 60% and Steladone 300EC and Ethanol extracts of *Solanum incanum* and *Nerium oleander* for their acaricidal activity against *Rhipicephalus pulchellus* and *Amblyomma variegatum* engorged female ticks collected from naturally infested cattle using *in vitro* adult immersion method. Leaf of *Nerium (N.) oleandera* and fruits of *Solanum (S.) incanum* was collected from natural habitat of Mekelle city and extracted with maceration technique by 80% ethanol. Steladone 300EC exhibited highest efficacy ($p<0.05$) against both ticks than Diazinon 60%. However, there was no statistically significant difference ($p>0.05$) between both acaricides regarding oviposition inhibition effect in both tick species. The highest inhibition of oviposition (92%) and (85%) was revealed by Steladone 300EC against *A. variegatum and Rh. Pulchellus,* respectively. On the other hand, crude extract of *N. oleandera* has lowest acaricidal effect than *S. incanum.* Crude extract of *N. oleandera* inhibited oviposition within range of 18.7 to 29.6% while *S. incanum* inhibited 66.3 to 76.4%. Promising results were obtained by *S. incanum* on *A. variegatum* at low concentrations. Crude extracts of *S. incanum* fruits have acaricidal effects (67%) comparable to Diazinon (76%). Therefore, crude extract of *S. incanum* can be a potential acaricide to replace Diazinon.

Keywords: *Acaricidal efficacy, Nerium oleander, Solanum incanum, Tick,*

Affiliations and manuscript citation:
[1]Mekelle University, College of Veterinary Medicine, Mekelle, Ethiopia
*Corresponding author: negashgu@yahoo.com

Citation: Yohannes, T., Guesh, N., Etsay, K., and Yohannes, H., (2020). *In vitro* Study on Comparative Efficacy of Commercially Available Acaricides and Crude Extracts of *Solanum incanum* and *Nerium Oleander* against Ticks. *Ethiop. J. Vet. Sci. Anim. Prod*. (2020), Vol. 4 (1): 31-37

Date of publication: September 2020

1. INTRODUCTION

Ethiopia is known to have the largest livestock population in Africa. The country is a home for about 59.0 million cattle, 30.5 million sheep and 30.2 million goats, 11.1 million equines, 1.2 million camels (CSA, 2016).

Parasitic diseases are a global problem and are considered a major obstacle in the health and production performance of livestock. Among ectoparasites, tick infestation is one of the most common parasitic infestations that are known to limit the production potential of livestock in Ethiopia (Gebre *et al*., 2001). Tick species of the genera *Hyalomma, Amblyomma, Boophilus, Rhipicephalus* and *Ornithodorus* are commonly found in Ethiopia infesting farm animals. Ticks are obligate hematophagous external parasites of domestic animals. Tick is an economically important ectoparasite of livestock and creates major problem for livestock producers in tropical and subtropical countries including Ethiopia. It causes severe economic losses by blood sucking, reduction in weight gain, direct damage to skin and hide which are the row materials for the leather industry, and serve as a vector of infectious diseases (Ghosh and Nagar, 2014).

Nowadays, animal owners use synthetic acaricides. Chemical acaricides such as steladion, diazinon and amitraz are used for control of ticks. However, continuous application, misuse and abuse of these chemicals have resulted in numerous detrimental hazards to human and animal health. Some of the hazards are, affecting other non-target organism (bees), environmental pollution, residues in milk and meat, toxicity to workers and emergence of resistant

ticks (*Rhipicephalus rhipicephalus)* to these chemicals (Graf *et al.,* 2004; Rodriguez *et al.,* 2006).

Recently, extensive work has been done on plant based natural products having acaricidal activities against many species of ticks as the natural products can delay the development of resistance due to the presence of a number of active molecules having different mode of action (Rodriguez *et al.,* 2006). Moreover, there are reports of emergences of acaricidal resistance by ticks to the commercially available acaricidal drugs; however, there are no reports documented on the comparative efficacy of the commercially available acaricides with herbal extracts in Ethiopia. Therefore, the objectives the present study was to evaluate comparative efficacy of Steladone 300 EC, Diazinon 60% and plant extracts of *N. oleander* and *S. incanum* against engorged female *Rhipicephalus pulchellus* and *Amblyomma variegatum* ticks *in vitro* using Adult Immersion Test (AIT).

2. METHODOLOGY

2.1. Study Area

This study was conducted in Mekelle from November 2017 to May 2018. Mekelle is capital city of Tigray region which is located 783 kms north of Addis Ababa at 39° 29`E and 13° 30` N and at an altitude of 2000 m.a.s.l. The climate of the study area conforms to that of Ethiopian highlands. The annual minimum and maximum temperature is 11.8°C and 29.9°C, respectively. The mean annual rainfall is 619 mm, which is bimodal with short rainy seasons occurring from March to May and from mid-August to September (CSA, 2016).

2.2. Herbal Collection and Extraction Procedure

The leaves of *N. oleander* and fruits of *S. incanum* plants were collected from natural habitat of Mekelle city. Plant materials were washed thoroughly, air-dried (dried indoor without exposure to sunlight), and coarsely powdered using electric blender. The powdered specimen was then weighed by sensitive digital balance, extracted in 96% ethanol by maceration method, and concentrated according to the procedures given by Debella (2002). A 100 g of powdered plant materials were soaked in 1000 ml of 96% ethanol in Erlenmeyer flask of two-liter capacity. The flask containing dissolved plant materials and 96% ethanol mixture was plugged with cotton wool and agitated manually every four hours for 24 hours. After 24 hours, the supernatant was filtered with Whatman (No.1) filter paper. Then trace solvent was evaporated on water bath at +40 °C and dried in hot air oven. Finally, yield of extracts were stored at +4°C in airtight container throughout the study period. The crude ethanolic extracts of the two plants were diluted with distilled water to prepare 20% and 40% concentrations using the methodology described by Ismail *et al*., (2002) and distilled water was used for control study.

2.3. Selection of Commercially Available Acaricides

The choice of organophosphate acaricides used was based on their commercial availability and mostly usable by both farmers and veterinary clinics in Mekelle, Ethiopia. Commercially available organophosphate products, Diazinon 60% EC (manufactured by Shandong Luxi Anim. Med. Share CO.LTD., China) and Steladone 300 EC (manufactured by Zagro Asia Ltd) were used for this experiment. These acaricides were purchased from local veterinary drug shop and stored at room temperature until use. Both acaricides were used at manufacturers recommended concentration and guidelines on the leaflets. Diazinon 60% was used at concentration of 1:1000 while Steladone 300EC 1.6:1000 diluted in distilled water.

2.4. Collection and Preparation of Ticks

Engorged female ticks were collected from naturally infested cattle in and around Mekelle city using forceps, with intact mouth parts, into a collection vial. These samples were immediately brought to the laboratory for identification and further use. All collected ticks were examined under stereomicroscope and identified to the species level using the taxonomic key described by Alan (1994), in veterinary parasitology laboratory, College of Veterinary Medicine, Mekelle University. The ticks were washed with distilled water and dried with paper towels in group, then weighed, placed in Petri dishes (90 mm diameter×20mm high) and used for the experiment.

2.5 Adult Immersion Test (AIT)

Adult immersion test (AIT) was performed as per the protocol first described by Drummond *et al*., (1973) and modified by FAO (2004). Thoroughly cleaned and weighed five engorged female ticks were immersed in the prepared concentrations of different products (10 ml) at room temperature for two minutes in a 25 ml beaker with gentle agitation. Ticks were recovered from the solution, dried using absorbent paper and transferred to the Petri dishes padded with Whatman

filter paper no.1 while control ticks were immersed in distilled water used for each product. All the Petri dishes containing treated and control ticks were kept at 26^0c in incubators for 15days and was freshly moistened every 24 hours. Two replicates of five ticks each were used for testing of single dilution of each product. Daily observations were done every day and adult tick mortality was observed up to 15^{th} day post treatment. After oviposition, the eggs laid by the female ticks were collected and weighed. Ticks treated with different concentrations of the two commercial acarisides and the two plant extracts were compared with the control. Reproductive index of egg laying (RI), percentage inhibition of oviposition (IO) and mortality of ticks were calculated as follows (FAO, 2004).

$$\text{Mortality \%} = \frac{\text{No. of female ticks} - \text{No. of dead female ticks x 100.}}{\text{No. of female ticks}}$$

$$\text{Reproductive Index (RI)} = \text{Egg masses/Engorged tick weight}$$

$$\text{\% Inhibition of oviposition (\% IO)} = \frac{\text{RI (control)} - \text{RI (treated)} * 100}{\text{RI (control)}}$$

2.6. Data Analysis

The data collected was entered and managed in a Microsoft Excel spreadsheet and analyzed using a statistical software package for social science (SPSS). Analysis of variance was done using an independent sample t- test whereas the mean mortality by different concentrations within the same plant product and between plant products were analyzed using One-way ANOVA. Results were deemed statistically significant if $p \leq 0.05$ at 95% confidence intervals.

3. RESULTS

In the present study, Steladone has higher mortality rate than Diazinon on both *A. variegatum* and *Rh. pulchellus* (Table 1). Diazinon revealed mortality of 0.50±0.14% on *A. variegatum* and 0.42±0.14% on *Rh. pulchellus*; while Steladone has 0.80±0.14% and 0.86±0.14% mortality on *A. variegatum* and *Rh. pulchellus*, respectively. However, there was no statistically significant difference ($p>0.05$) between both acaricides in both tick species. Steladone and Diazinon have higher acaricidal effect on *A. variegatum* than on *Rh. pulchellus.*

The results revealed that *S. incanum* produced mortality of 0.50±0.11% on *A. variegatum* at higher concentration (40%) and mortality 54±0.11% at lower concentration (20%) which was significantly ($p<0.05$) higher than the mortality produced by *N. oleandera* and control. In the present study, mortality rate of (11±0.10%) at a concentration of 20% and 23±0.10% mortality at a concentration of 40% produced by *N. oleandera* on *A. variegatum.* A concentration dependent increase in adult tick mortality was observed except in the control group.

The mean percentage of oviposition inhibition of Steladone 300 EC and Diazinon 60% EC against *A. variegatum* and *Rh. pulchellus* were calculated by comparison of the mean egg mass laid by each tick species after treatment with the control group. Steladone and Diazinon at recommended concentration exhibited 92% and 78.4% oviposition control on *A. variegatum* while 85% and 61% of *Rh. pulchellus.* Steladone has a higher effect on oviposition inhibition of *Rh. pulchellus* than Diazinon when applied at field recommended dose. However, there was no statistically significant difference ($p>0.05$) between both acaricides regarding oviposition inhibition effect in both tick species.

A trial to assess the oviposition inhibition response of field collected engorged adult female *Rh. pulchellus* and A. *variegatum* to *N. oleandera* has low inhibition of oviposition than *S. incanum*. Crude extract of *N. oleandera* inhibit oviposition within range of 18.7 to 29.6% while *S. incanum* inhibit 66.3 to 76.4%. No difference on inhibition of oviposition with both concentrations in *S. incanum*. This study evidenced that crude extracts of *S. incanum* fruits have acaricidal effects comparable to Diazinon.

Table 1: Mortality and Mean oviposition of engorged female *A. variegatum* and *Rh. pulchellus* immersed in Diazinon 60% EC and steladone 300 EC.

Ticks	Acaricide	Dil.	Mortality % (mean ± SD)	ETW	EMW	IO%
A. variegatum	Diazinonee	1 ml/l	0.50±0.14	0.76±0.09	0.039±0.02	78.4; ***p>0.09**
	Steladone	1.6 ml/l	0.80±0.14	0.87±0.09	0.011±0.02	92
	Control	-	0.00±0.00	0.83±0.01	0.37±0.01	0.0
Rh. pulchellus	Diazinone	1ml/l	0.42±0.14	0.35±0.02	0.033±0.01	61 ***p>0.12**
	Steladoneee	1.6ml/l	0.86±0.14	0.36±0.02	0.025±0.01	85
	Control	-	0.00±0.00	0.31±0.02	0.27±0.02	0.0

p-value between group

***Dil.** =dilutions, **Exp**. =exposed, **ETW**=mean of engorged tick weight,*

***EMW**=mean egg mass weight (g,), **IO%**= mean inhibition of oviposition percentage*

Table 2: Mortality and mean inhibition oviposition of engorged female *A. variegatum* and *Rh. pulchellus* immersed in crude extract of *N. oleander* and *S. incanum*.

Tick	Crude plant extract	Conc.	M	ETW	EMW	IO%	p-value
A	*N. oleander*	*20%*	*0.11±0.10*	*0.93±0.03*	*0.040±0.01*	*18.7*	*0.29*
		40%	*0.23±0.10*	*0.87±0.03*	*0.036±0.01*	*21.1*	*0.14*
	S. incanum	*20%*	*0.54±0.11*	*0.91±0.02*	*0.030±0.01*	*76.4*	*0.001*
		40%	*0.50±0.11*	*0.90±0.02*	*0.031±0.01*	*74.5*	*0.007*
	Control		*0.00±0.00*	*0.88±0.03*	*0.341±0.01*	*0.0*	
Rh	*N. oleander*	*20%*	*0.26±0.09*	*0.24±0.01*	*0.034±0.01*	*27.0*	*0.08*
		40%	*0.34±0.09*	*0.26±0.01*	*0.031±0.01*	*29.6*	*0.06*
	S. incanum	*20%*	*0.43±0.09*	*0.32±0.02*	*0.026±0.01*	*67*	*0.01*
		40%	*0.44±0.09*	*0.33±0.02*	*0.023±0.01*	*66.3*	*0.02*
	Control		*0.00±0.00*	*0.30±0.02*	*0.32±0.01*	*0.0*	

***Conc**. =concentration, **Exp.** =Exposed, **M**=mortality (mean±sd), **ETW**=mean of engorged tick weight, **EMW**=mean egg mass weight (g,), **IO%=**Inhibition of Oviposition Percentage*

4. DISCUSSION

Use of natural products, mainly acaricides from the botanical source used for the control of ticks has been the focus of research in many countries, principally to withstand the noticeable increasing frequency of acaricides resistant tick strains. In line with this trend, this preliminary study evidenced that crude extracts of *S. incanum* fruits have acaricidal effects almost comparable to Diazinon, a conventional acaricide. In the present study, Steladone 300 EC showed higher mean percentage of oviposition inhibition than Diazinon 60% EC on both tick species. As an effective acaricide prevents the female ticks from laying eggs or the eggs do not hatch (Mekonnen *et al.*, 2004). This agrees with Bafi-Yebo (1974) and Rawlins and Mansinga (1981) who compared chlorfenvinphos (Steladone) with lindane and dioxanthione on *Rhipicephalus species*, respectively. Natala *et al.*, (2012) revealed that chlorfenvinphos (Steladone) has a higher acaricidal effect on all the stages of *A. variegatum* than Coumaphos and Diazinon. The highest acaricidal effect of Steladone is in agreement with the efficacy study conducted earlier by Regassa, (2000) on oviposition inhibition in *A. variegatum* and Silva *et al.* (2000) on *Boophilus microplus*.

Solanum incanum produced a higher level of mortality compared to *N. oleandera* at both tested concentrations (20% and 40%). A concentration

dependent increase in adult tick mortality was observed for *N. oleander* while the lowest concentration of *S. incanum* was the most effective than highest concentration that was similar to (Hoet *et al.,* 2004). Manase *et al.,* (2012) reported a similar trend in which anti-feed antazadirachtin plant had the higher efficacy of oviposition inhibition at lower concentration than higher concentration of *S. incanium*. It could be that the plant chemicals that are biologically active are not very water soluble (Hoet *et al.,* 2004). However, both preparations could not produce 100% mortality even at the highest concentration tested. Regassa, (2000) reported 42% mortality of engorged female *Boophilus decoloratus* exposed to *S. incanum* which is similar to present study.

The acaricidal effects of *S. incanum* could be due to the presence of toxic glycoalkaloids such as solasonine, alkamines such as nitrosamines and carcinogenic glycosides (Manase *et al.,* 2012). Other compounds isolated from the fruits include the alkaloids solasodine and solamargine, and the steroidal sapogenins, diosgenin and yamogenin. Manase *et al.* (2012) also isolated a new spirostanol saponin, along with four known saponins, dioscin, protodioscin, methyl-protodioscin, and indioside D and one known steroid glycoalkaloid solamargine from *Solanum species*. The current findings agree with *in vitro* efficacy tests on *R. decoloratus*, where solamargine resulted in 30 to 100 % mortality. These results are also consistent with the pesticidal properties of *Solanum species* that were confirmed against the vegetable aphid, Brevicoryne brassicae (Katsvanga *et al.* 2006; Muzemu *et al.,* 2011). While the present studies confirm that *S. incanum* is effective in controlling tick egg oviposition, further laboratory experiments with isolated compounds are required to determine if the plant extracts can reduce tick feeding, moulting and viability of eggs and whether the extracts repel or kill the adults.

Nerium oleandera produced lowest mortality and inhibition of oviposition against engorged female ticks of *A. variegatum* and *Rh. pulchellus;* which disagree with Kumar *et al*, (2008) there were no hatching of eggs (100%) at 100 and 200 mg/ml concentration in extract of *N. oleander* against egg of *A. variegatum***.** This difference may be because of concentration and stages of the ticks. Literature review reveals that *N. oleander* exhibits insecticidal activity against insects. Amr, and Marei, (2001) reported insecticidal activity of *N. oleander* leaf extract against the green lacewing, Chrysopacarnea. Ethanolic extracts of *N. oleander* showed insecticidal and feeding deterrent properties against rice weevil, Sitophilus oryzae infesting stored wheat and rice (Satpathi *et al.,* 1992). Exposure of leaf moths (*Spodoptera littoralis*) with *N. oleander* extract induced remarkably increase mortality (Hussain *et al.,* 1996). Moastafa *et al*, (2018) provided new data focusing on insecticidal efficacy of *N. oleander* extracts on *P. gossypiella. N. oleander* inhibits oviposition in *P. gossypiella.*

Steladone 300 EC has highest acaricidal effect than other tested products. From Crude Plant Extracts *S. incanum* produced higher efficacy than *N. oleandera*. Therefore, it is advisable to use Steladone over Diazinon at field to control tick infestation.

5. CONCLUSION AND RECOMMENDATIONS

In the present study, commercially available acaricides of Diazinone 60% and Steladone 300EC and Ethanol extract of *S. incanum* and *N. oleander* was compared for their acaricidal activity against engorged females *Rh. pulchellus* and *A. variegatum.* Steladone 300 EC at field recommended concentration provided relatively a higher inhibition oviposition response ($p<0.05$) on *Rh. pulchellus* and *A. variegatum* than Diazinon 60%EC*;* but it is not statistically significant variation. However, both acaricides showed relatively less effect against the oviposition of *Rh. pulchellus* than *A. variegatum.* Crude extract of *S. incanum* has higher acaricidal effect against *Rh. pulchelus* and *A. variegatum* than *N. oleandera.* Therefore, from the present study it is recommended that further *in-vitro* test using different tick species or other efficacy evaluation methods involving larval and nymphal stage; and *in-vivo* efficacy trial (trial at field level) should be conducted to assess the residual effect of these acaricides. Moreover, further study is also recommended on toxicity to assure safety and effectiveness, and identification of active phytochemical constituents is required.

6. REFERENCES

Alan, W. (1994). Textbook of 'The arthropods of humans and domestic animals' (1stedn.). Centre for tropical veterinary medicine, University of Edinburgh, London.

Amr, M. and Marei, S. (2001). Effect of Nerium oleander leaf extract on the green lacewing,

chrysoperla Carnea Steph. (Neuroptera: Chrysopidae). *Journal of Biological Pest Control*, **11**:(1/2) 39-44.

Bafi-Yebo, M. (1974). Observations on the effectiveness of certain insecticides in cattle tick control in Ghana. Ghana Animal Science Proceeding of the 7th Animal Science Symposium, *pp: 60-62*.

CSA, (2016). Agricultural sample survey. Report on livestock and livestock characteristics: Volume II: Addis Ababa, Ethiopia.

Debella, A. (2002). Manual for phytochemical screening of medicinal plants. Ethiopian Health and Nutrition Research Institute, Addis Ababa, Ethiopia, Pp 35-47.

Drummond, R., Ernst, E., Trevino, J, Gladney, J., and Graham, H. (1973). *Boophilus annulatus* and *B. microplus*: laboratory tests of insecticides. *Journal of Economic Entomology*, **66(1):** 130-133.

Gebre, S., Nigist, M., and Kassa, B. (2001). Seasonal variation of ticks on calves at Sebeta in western Shewa Zone. *Ethiopian Veterinary Journal.*, **7**(2): 17-30.

Ghosh, S. and Nagar, G. (2014). Problem of ticks and tick-borne diseases in India with special emphasis on progress in tick control research: a review. *Journal of vector borne diseases.*, ***51***(4): 259.

Graf, J., Gogolewski, R., Leach-Bing, N., Sabatini, A., Molento, B., Bordin, L., and Arantes, G. (2004). Tick control: an industry point of view. *Parasitology.*, **129(**1): 427-442.

Hoet, S., Opperdoes, F., Brun, R., Adjakidjé, V., and Quetin, J. (2004). *In vitro* anti trypanosomal activity of ethno pharmacologically selected Beninese plants, *Journal of Ethnopharmacology*, **91:** 37–42

Hussain, M., Makkar, W., Sokkar, L., Allam, M., and Mostafa, S. (1996). The bioactivity of certain benzoylphenylureas on the cotton leaf worm "Spodopteralittoralis (Boisd) moth's survival, longevity and fecundity. *Annals of Agricultural Sciences Moshtohor Journal*, **34:** 1263-1276.

Ismail, H., Chitapa, K., and Gebre, S. (2002). Toxic effect of Ethiopian neem oil on larvae of cattle tick, Rhipicephalus pulchellus Gerstaeker. Kasetsart *Journal of Natural Sciences*, **36:** 18-22.

Katsvanga, T., Tafirei, R., Nyakudya, W., and Moyo, M. (2006). Effect of extraction temperature and dilution of Solanum panduriforme in aphid (Brevicoryne brassicae) control: Agricultural Research Council. Accessed 20/04/2018.

Kumar, A., Vihan, S., and Mahour, K. (2008). Effect of plant extracts on eggs hatchability of tick Boophilus microplus. *Journal of Pharmcy and Therapy*, **1:** 29.

Manase, J., Mitaine, C., Pertuit, D., Miyamoto, T., Tanaka, C., Delemasure, S., Dutartre, P., Mirjolet, F., Duchamp, O., and Lacaille, M. (2012). *Solanum incanum* and S. heteracanthum as sources of biologically active steroid glycosides: Confirmation of their synonymy, *Fitoterapia*, **83:** 1115–1119.

Mekonnen, S., Kgasi, A., Mureithi, W., Getachew, Z., Tilahun, T., Solomon, G., Yilma, J., and Bryson, N. (2004). *In vivo* and *In vitro* Evaluation of the Efficacy of Cypermethin High-Cis (Ecotomin®) Against Cattle Ticks in Ethiopia. *Ethiopian Veterinary Journal*, **8 (1):** 29-38.

Moustafa, Z., Al Shater, H., and Yousef, H. (2018). Toxicity of Nerium oleander extracts against Pectino phoragossypiella (Saunders) (Lepidoptera: Gelechiidae). *International Journal of Advanced Research in Biological Sciences.*, **5(3)**: 163-168.

Muzemu, S., Mvumi, M., Nyirenda, M., Sileshi, W., Sola, P., Chikukura, L., Kamanula, F., Belmain, R., and Stevenson, P. (2011). Pesticidal effects of indigenous plants extracts against rape aphids and tomato red spider mites, African Crop Science Conference Proceedings, **10:** 169 – 171.

Natala, J., Ahembe, R., Gberindyer, A., Danbirni, S., and Ubani, A. (2012). Acaricidal Efficacy of Three Organophosphates on Different Stages of" Amblyomma variegatum". *International Journal of Animal and Veterinary Advances*, **4(2):** 76-79.

Rawlins, C. and Mansinga, A. (1981). Susceptibility of engorged adults of cattle tick *B. microplus* to acaricides. *Insect Science and its Application*,**1:** 377-378.

Regassa, A. (2000). The use of herbal preparations for tick control in Western Ethiopia, *Journal of South African Veterinary Association*, **71(4):**240-243.

Rodriguez-Vivas, I., Alonso-Díaz, A., Rodríguez-Arevalo, F., Fragoso-Sanchez, H., Santamaria, M., and Rosario-Cruz, R. (2006). Prevalence and potential risk factors for organophosphate and pyrethroid resistance in *Boophilus microplus* ticks on cattle ranches from the State of Yucatan, Mexico. *Veterinary Parasitology*, **136**(3-4): 335-342.

Satpathi, R., Ghatak, S., and Bhusan, T. (1992).: Insecticidal properties of some plant extracts against rice weevil, Sitophilus oryzaeL. (Cuclionidae: Coleoptera). *Environment and Ecology*, **10:** 79-100.

Silva, L., Neves, S., and Linhares, C. (2000). *In vitro* evaluation of the efficiency of Chlorfenvinphos and Cyhalothrin for the control of *B. microplus* on cattle in dairy farms in the micro region of Goinna-Goias. *Ciencia-Animal- Brasileira*, Pp 143-148.

Acknowledgements
We would like to extend our gratitude to the College of Veterinary Sciences for all facilitation and to all contributor of this work.

Contribution of Authors
YT collected data. GN project initiator and advisor. EK identified tick species. YH analyzed the data.

Authors Declaration
We hereby declare that this work entitled *"IN VITRO* STUDY ON COMPARATIVE EFFICACY OF COMMERCIALLY AVAILABLE ACARICIDES AND CRUDE EXTRACTS OF *SOLANUM INCANUM* AND *NERIUM OLEANDER* AGAINST TICKS*" submitted to EJVSAP is the result of our original research work. we also declare that this research work or part thereof has not been published earlier elsewhere in any manner.* Authors have declared that they have no competing interest.

Funding: Mekelle University has covered the financial costs of this project.