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ASSESSMENT OF THE EFFICACY OF ETHANOLIC EXTRACTS OF SOME LOCAL HERBS ON ECTOPARASITES OF GOATS

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Abstract

The study was conducted to assess the efficacy of ethanolic extracts of some local herbs on ectoparasites of goats in Itu, Akwa Ibom, Nigeria. Different parts of four plants were considered in the study which were roots of *Manniophyton fulvum*, stem bark of *Costus afer*, and leaves of *Senna alata* and *Chromolaena odoratum*. The efficacy of the extract was assessed comparatively with a synthetic pesticide Diazintol used as the control. Both *in vivo* and *in vitro* experimentations were carried out. The experimental goats were cleared of ectoparasites using visual body assessment and hand-pick technique. The infested goats were treated with the plants extracts at different concentrations of 2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml. In the *in vivo*, the extract were applied on the ectoparasite preferred site and the entire body. Whereas, in *in vitro*, the ectoparasites were hand-picked into petri dishes of various extract concentrations of 2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml. *Senna alata* and *Manniophyton fulvum* showed significant ($p > 0.05$) efficacy at 1.5mg/100ml concentration compared to the Diazintol, as they recorded 100% mortality rate on the 14th day of treatment in *in vivo* experiment. In *in vitro* bioassay, the mortality rate due to the efficacy of the extract at the concentration level of 2.5 and 5.0mg/100ml were statistically significant ($p < 0.05$) at 30mins of challenge. The phytochemical constituents of the plants materials included alkaloids, saponins, tannins, anthraquinones, phlobatinnins, flavonoids and cardiac glycosides. The study suggested that indigenous plants with good acaricidal activity can provide a cheaper, more eco-friendly and effective control of ectoparasites of goats. Hence, indigenous plant therapy should be encouraged in the control of ectoparasites.

Key words: Ectoparasite, Extract, Goat, *In vivo*, *in-vitro*.

ÉVALUATION DE L'EFFICACITÉ DES EXTRAITS ETHANOLIQUES DE QUELQUES HERBES LOCALES SUR LES ECTOPARASITES DES CHÈVRES

Résumé

L'étude a été faite pour évaluer l'efficacité des extraits éthanoliques de quelques herbes locales sur des ectoparasites de chèvres à Itu, Akwa Ibom, au Nigeria. On a considéré les parties différentes de quatre plantes dans l'étude qui étaient les racines de *Manniophyton fulvum*, l'écorce de tige de *Costus afer* et les feuilles de *Senna alata* et *Chromolaena odoratum*. L'efficacité de l'extrait a été évaluée comparativement avec un pesticide synthétique Diazintol utilisé comme le contrôle. Tant *in vivo* que des expérimentations *in vitro* ont été effectuées. Les chèvres expérimentales ont été dégagées d'ectoparasites de l'utilisation de l'évaluation d'organisme visuel et choisissent la technique. Les chèvres infestées ont été traitées avec les extraits de plantes aux concentrations différentes de 2.5mg/100ml, 5.0mg/100ml et 7.5mg/100ml. Dans l'*in vivo*, l'extrait a été appliqué sur l'ectoparasite du site préféré et l'organisme entier. Tandis que, dans *in vitro*, l'ectoparasite a été choisi dans les boîtes de Petri des concentrations d'extrait diverses de 2.5mg/100ml, 5.0mg/100ml et 7.5mg/100ml. *Senna alata* et *Manniophyton fulvum* ont montré significatif ($p > 0.05$) l'efficacité à la concentration de 1.5mg/100ml comparée au Diazintol, comme ils ont enregistré le taux de mortalité de 100 % le 14^{ème} jour de traitement dans l'expérience *in vivo*. Dans bioassay *in vitro*, le taux de mortalité en raison de l'efficacité de l'extrait au niveau de concentration de 2.5 et 5.0mg/100ml était statistiquement significatif ($p \leq 0.05$) à 30mins du défi.

Les constituants phytochimiques des matières des plantes ont inclus des alcaloïdes, saponins, des tanins, anthraquinones, phlobatinnins, des flavonoïdes et des glucosides cardiaques. L'étude a suggéré que des plantes indigènes avec la bonne activité acaricide puissent fournir un contrôle moins cher, plus écologique et efficace d'ectoparasites de chèvres. D'où, la thérapie de plante indigène devrait être encouragée dans le contrôle d'ectoparasites.

Mots clés : Ectoparasite, Extrait, Chèvre, in vivo, in vitro-.

INTRODUCTION

Ethnoveterinary medicine is an important branch of indigenous knowledge orally transmitted from one generation to another in different parts of the world and very widespread over Africa (Gueye, 1997). It is a body of knowledge built up by a group of people through generations of living in close contact with nature (Johnson, 1992).

The importance of herbal medicine has increased in recent years and was underlined by the convention on biological diversity (Haslett, 2003). According to the World Health Organisation (WHO, 2008), about 80 percent of the developing countries rely on traditional medicine for primary healthcare (Plotkin, 1992). It is commonly recognized that further research in the ethnoveterinary area will benefit both developed and developing countries (Dano and Bogh, 1999). Consequently, scientific study of relevant traditional practices can lead to a validation of such remedies and contribute to a more effective control of ectoparasites with local ethnomedicine.

Ectoparasites in livestock are very common in Africa. They live entirely on blood and lymph of all kinds of vertebrate animals (Chungsamarnyart *et al.*, 1991). They cause irritation to the skin, scratching and rubbing, with resultant reduction in milk production and damage to the hide and fleeces. It also results in inflammation and exudation of lymph which coagulate to form crust (Butler, 1985). There is however little evidence of the effect on weight gain and haematological value except in heavy infestation with *Haematopinus emystrum* (Callinan, 1980). Ectoparasites like ticks (*Rhipicephalus spp*) play an important role as vectors of deadly pathogens of animal and man. Mites cause dermatitis, alopecia and sometimes animals are affected secondarily by bacteria causing toxæmia, septicaemia and ultimately death of the animals. However, heavy ectoparasite infestation in cold weather may predispose goats to stress-related illnesses such as respiratory disease (Butler, 1985).

The use of plants for medicine has long been in existence and widely documented (Chopra *et al.*, 1956). However, these practices have produced results of proven efficacies compared to conventional modern medicine (Saxena, 2001) therefore have become indispensable an integral part of the primary healthcare system in many nations. Herbal drugs offer an ideal alternative to conventional drugs that have produced resistant strains of parasites. A good example of a medicinal plant is Neem which can be used as a pesticidal skin cream and when combined with a shampoo forms an excellent agent against lice (Dano and Bogh, 1999). Botanical pesticides have various effects against ticks such as reducing tick feeding, molting, fecundity and viability of eggs. They are also toxic to nematodes, mites and have antifungal, antiviral and antibacterial properties against pathogens (Salwa, 2010).

Tephrosia vogelii leaf extract has been observed to be highly toxic to 1-, 2- and 3-host ticks. Cattle sprayed with this extract had a residual protection period from re-infestation by ticks for 10 days (Kaposhi, 1992). Williams (1993) and Kandill *et al.*, (1999) used extracts of *Artocarpus altilis* -park; *Azadirachta indica*; Sea anemone and *Simmondsia chinensis* against adult female ticks of *Boophilus microplus* and *B. annulatus*. There are many factors that affect the acaricidal activity of the extract including; solvent, extraction time, extract concentration, extracted plant part, target organism (ticks) and exposure time (Tho, 2003). The anti-tick properties of root extracts of *Senna italica* subsp. *arachoides* against the adults of *Hyalomma marginatum rufipes* were studied. Of the hexane, chloroform, dichloromethane, ethyl acetate and methanol extracts tested, only ethyl acetate extracts proved to be potent against adults of *H. marginatum rufipes*. Hexane, diethyl ether, ethyl acetate and ethanol extracts of six wild plants; namely, *Artemisia herba-alba*, *Artemisia*

monosperma, *Euphorbia aegyptiaca*, *Francoeuria drispa*, *Mesembryanthemus forsskalei* and *Reaumuria hirtella* were screened against the larvae of *Hyalomma dromedarii*. Petroleum ether, chloroform and ethyl acetate extracts of *P. harmala* exhibited higher toxicity than that of *S. marianum* (Abdel-Shafy *et al.*, 2007). Dautel (2004) reported that the plant extract is considered a good repellent if it prevents a tick from contacting a host at all.

In contrast to the synthetic pesticides, the alternative, cheapest and available source of drug is herbal therapy. Experimental investigations therefore are imperative to assess the therapeutic value of indigenous herbs as pesticides. This study was aimed therefore, at the assessment of the efficacy of ethanolic extracts of some local herbs used as pesticides of goats.

MATERIALS AND METHODS

Study Area

The study was conducted at Itu, a Local Government in Akwa Ibom State of Nigeria. It is located in the tropical rainforest belt of West Africa and lies within latitude 5° 12' 00' N and longitude 7° 59' 18''E. The climate of the area is favorable for cultivation and extraction of agricultural and forest products. There are two distinctive seasons, the wet season (between April and October) and dry season (between November to March). The rich vegetation encourages the keeping of domestic ruminants including goats.

Field Survey

A field survey and interview was conducted on randomly selected local farmers and traders in the areas to know the common infection of goats particularly ectoparasite infestation and the herbs used in treatment of the same.

Fourteen (14) villages and 68 farmers with an average of 4 goats in their pens as well as imported goats in the markets were selected for the field survey. Each village was visited once a week and for each visit an average of 20 goats were examined for presence of ticks, lice, fleas and mite from November 2011 to August 2012. *In vivo* experimentation were done in 14 villages. Six(6) of the villages including Ikot Emien, Ikot Abasi, Nung Ukot, Mbribit, Ekit Itam and Mbak Itam were in the West Itam region of Itu and eleven (11) were in East Itam region (Enen Atai, Ikot Akpan, Ikot Anie, Ntiat Itam etc). Parasite larvae, adult and skin scrapping were collected into sterile screw capped test tubes containing 70% alcohol. These were taken to the zoology laboratory for identification.

Plant Collection And Identification

With the help of a local goat farmer, Mr. Okon of the Department of Pharmacognosy and Natural Medicine laboratory, University of Uyo, plants used for the study were collected and brought to the laboratory for identification and photography. The identification was authenticated by Dr. Margaret Bassey, a plant taxonomist in the Department of Botany and Ecological Studies, University of Uyo and the voucher specimens were deposited in the herbarium. The relevant plant parts used in the formulation of the herbal cures were collected. The root and stem bark were collected for *Manniophyton fulvum* and *Costus afer* respectively, leaves were collected for *Chromolaena odoratum* and *Senna alata*. The plant materials were transported to the laboratory where they were dried.

Plant Preparation

Leaves of *Senna alata* and *Chromolaena odoratum* , stem of *Costus afer* and root of *Manniophyton fulvum* were carefully picked, dried and pulverized to fine powder and stored in a sterilized glass container at room temperature (25-30°C) until required. A mixture of 200g of the powdered plant materials and 200ml of 50% ethanol were macerated for 72hrs. The extract was dried in a water bath at a temperature of 120°C and stored in an airtight container to avoid loss of the volatile principle. It was then refrigerated at 4°C until required.

Phytochemical Screening

The photochemical screening involved the use of the methods of Trease and Evans (2009).



Plate 1 (left): *Manniophyton fulvum*
Mull. Arg. Nkunekun)



Plate 2 (Right): *Chromolaena odoratum*
(L) King and Robinson (Awolowo weed)



Plate 3 (Left): *Costus afer* Ker-gawl
Mbitem)



Plate 4 (Right): *Senna alata* (L.) Roxb.

Repellence Bioassay (In- Vivo)

The extracts of roots of *Manniophyton fulvum*, stem bark of *Costus afer*, and leaves of *Senna alata* and *Chromolaena odoratum* was dissolved in 100ml of distil water. With the aid of a brush it was thoroughly robbed over the body of infested goats. This was allowed on the body of the goats for 24 hours to determine the repellency effect. However, ectoparasite count due to mortality was done after 7days, 14days, and 28 days. The rate of mortality was determined following the reduction in the number of ectoparasite counted per 10x10cm body area. Ectoparasite prevalence was recorded after each examination period. The *in vivo* experimentation was carried out only on indigenous goats.

Toxicity Bioassay (*In- Vitro*)

In the toxicity bioassay, 2ml of each of the extracts at concentrations of 2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml was poured into Petri dishes containing live ectoparasites collected by scraping and hand-picking. The mortality rate was recorded after 30minutes, 1hour and 2hours intervals. Ectoparasites were considered dead when they did not move again.

Statistical Analysis

Percentage distribution was employed in analyzing the prevalence of ectoparasite infestation. The prevalence significant test was done using student *t*-test, also ANOVA was adopted in assessing the efficacy of the extract.

RESULT

The summary of the result for the study of the efficacy of ethanolic extracts of some local Herbs on ectoparasites of goats is presented as follows:

Efficacy Of Plant Extract

Table 1: *In vivo* efficacy of *Senna alata* leaf extract

Extract Concentration (mg/100ml)	No. of Goats	Total No. Of live Ectoparasites counted (10x10cm ²)	Percentage mortality (mean $\bar{x} \pm$ SD) 7 th day	14 th day	28 th day
2.5mg/100ml	5	103	66.00 \pm 3.74	93.00 \pm 4.00	100.00 \pm 3.00
5.0mg/100ml	5	173	88.00 \pm 3.74	98.06 \pm 8.06	100.00 \pm 1.51
7.5mg/100ml	5	93	90.32 \pm 1.30	100.00 \pm 1.14	100.00 \pm 1.14
Control (Diazintol)	5	112	100.00 \pm 0.98	100.00 \pm 0.98	100.00 \pm 0.98

$$F=4.68, df(3,2), p<0.05$$

The result of *in vivo* experimentation to assess the efficacy of *Senna alata* enthanolic extract as presented in Table 1 showed that the extract at 7.5mg/100ml concentration recorded the fastest rate of mortality even from the 7th day of application. Complete mortality was observed after 28 days of application. The control set up gave 100% mortality from the 7th day of treatment. Therefore the efficacy of the *Senna alata* extract at different concentration was statistically significant ($f=4.65$, $P<0.05$).

The efficacy of *Manniophyton fulvum* root extract against ectoparasites of goats in table 2, revealed that the concentration of 7.5mg/100ml was most effective and 100% mortality was recorded on the 14th day of application comparable to control. The result also revealed that there was significant difference ($P< 0.05$) in ectoparasite mortality. In Table 3, the efficacy activity of *Chromolaena odoratum* leaf extract against ectoparasites of goats indicated that, non of the concentration of the extract (2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml) completely eradicated ectoparasites from the goats even after the 28th day of application. However, the concentration of 7.5mg/100ml did show the highest rate of mortality of 77.14 \pm 1.78%; 88.51 \pm 1.34% and 94.29 \pm 0.84% for 7 day, 14 day and after 28 days of application respectively. The result was however statistically significant ($P<0.05$).

Table 2: *In vivo* Efficacy of *Manniophyton fulvum* root extract

Extract Concentration (mg/100ml)	No of Goats	Total No. of live Ectoparasite counted (10x10cm ²)	% Mortality (X ⁺ -SD) 7 th day	14 th day	28 th day
2.5mg/100ml	5	123	62.60±3.05	86.18±1.79	98.37±1.92
5.0mg/100ml	5	131	75.57±1.0	91.60± 1.58	99.23±1.22
7.5mg/100ml	5	141	84.40±1.79	100.00±.90	100±1.92
Control (Diazintol)	5	138	100.00± 0.98	100.00±0.98	100.00± 0.98

$F=7.25$, $df(3,2)$, $p<0.05$

Table 3: *In vivo* Efficacy of *Chromolaena odoratum* leaves extract

Extract Conc. (mg/100ml)	No. of Goats	Total No. of live Ectoparasites counted (10x10cm ²)	% Mortality (X ⁺ -SD) 7 th day	14 th day	28 th day
2.5mg/100ml	5	78	23.08±1.95	42.31±1.52	55.13±2.07
5.0mg/100ml	5	143	76.93±141	78.32±2.30	76.22±2.39
7.5mg/100ml	5	105	77.14±1.78	88.57±1.34	94.29±0.84
Control (Diazintol)	5	132	100.00±1.82	100.00±1.82	100.00±1.82

$f=16.80$, $df(3,2)$, $p<0.05$

The efficacy of *Costus afer* stem bark extract at the concentration of 2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml treated against ectoparasite of goats in table 4 shows a correspondence increase in mortality rate. The extract at 5.0mg/100ml and 7.5mg/100ml recorded 100% mortality from 14th day and 28th day of treatment respectively. However, the rate of the extract effectiveness was not statistically significant. ($F_{cal}=0.46$ $df(2,9)$, $f_{crit}=4.26$)

The result of *in vitro* efficacy of the plant extracts against ectoparasites of goats are as presented in Table 5. A total of 15 different ectoparasites were immersed in different concentrations (2.5mg/100ml, 5.0mg/100ml and 7.5mg/100ml) of the extract. Extracts of *Senna alata* and *M. fulvum* recorded 100% mortality after 30mins of treatment, *Manniophyton fulvum* root and *costus afer* bark extracts showed 100% efficacy after 1hours of treatment. The mortality of the ectoparasites treated with *Chromolaena odoratum* leaf extracts had the least mortality rate and showed 100% efficacy at 7.5mg/100ml concentration in 1hr. This result was statistically significant ($P<0.05$). The ectoparasites were completely dead 1hour after treatment. However, the *in vivo* efficacy of the plant extracts was not statistically significant ($p>0.05$).

Table 4: *In vivo* Efficacy of *Costus afer* stem bark extract

Extract conc. (mg/100ml)	No. of goats	Total N ^o Of live Ectoparasites counted (10x10cm ²)	% Mortality (X ⁺ -SD) 7 th day	14 th day	28 th day
2.5mg/100ml	5	121	85.12±0.8	94.20±1.10	100.00±0.84
5.0mg/100ml	5	116	93.10±1.14	100.00±0.84	100.00±0.84
7.5mg/100ml	5	178	92.37±0.84	97.46±0.71	100.00±1.14
Control (Diazintol)	5	97	100.00±1.14	100.00±1.14	100.00±1.14

$f=0.46$, $df(2,3)$, $p<0.05$

Table 5: *In vitro* Efficacy of Plant Extracts

Time	30min			1hr			2hr		
	Extract conc. Plant Sample	2.5mg/ 100ml (%)	5.0mg/ 100ml (%)	7.5mg/ 100ml (%)	2.5mg/ 100ml (%)	5.0mg/ 100ml (%)	7.5mg/ 100ml (%)	2.5mg/ 100ml (%)	5.0mg/ 100ml (%)
<i>S. alata</i> leaves		26.67	93.33	100	60.00	100	100	86.69	100
<i>M. fulvum</i> root		53.33	80.00	100	93.33	100	100	100	100
<i>C. odoratum</i> leaves		20.00	46.67	60.00	46.67	73.33	100	86.67	93.00
<i>C. afer</i> stem bark		33.33	86.67	86.67	100	100	100	100	100
Control (Diazintol)		100	100	100	100	100	100	100	100

Result of Phytochemical Screening

Table 6: Phytochemical Properties of the Studied Plants

Characteristics	Alkaloids	Flavonoid	Cardiac glycosides	Tannins	anthraquinones	Phlobatannins test	Saponins
<i>Costus afer</i> stem bark	++	-	-	+++	-	-	+
<i>Senna alata</i> leaves	+++	++	-	++	-	+++	+++
<i>Maniophyton fulvum</i> root	++	++	-	++	-	++	+++
<i>Chromolaena odoratum</i> leaves	++	++	+++	+++	++	+++	+++

The chemical analysis of *Maniophyton fulvum* in Table 6 showed the presence of alkaloids, saponins and tannins. The extract of *Chromolaena odorata* showed the presence of alkaloids, saponins, tannins, anthraquinones, flavonoids and cardiac glycosides while *Costus afer* extract showed the presence of alkaloids, saponin and tannins and *Senna alata* showed the presence of flavonoids, saponins, tannins, alkaloids, and phlobatannins.

DISCUSSION

Control of ectoparasites with chemical acaricides has become difficult due to resistance development. Toxicity and resistance problem of insecticides have resulted in the search for alternate control using plants as acaricides (Nolan, 1989). The chemicals also cause environmental pollution due to the prolonged time needed for biodegradability and is a health hazard owing to residue in milk and meat. Pesticides are known to exert side effects in hosts including immunotoxicity and delayed neuropathy at low dose (Kumar *et al.*, 2011) This was the essence of the present study; to consider plants used by local people as pesticides for their pesticidal activity.

In this study, it was revealed that ethanolic extracts of 3 of the 4 plants investigated were effective on ectoparasites of goats although the chemical pesticide (Diazintol) used as control, was more active. This could be dependent on the concentration of the extract used in the study. The acaricidal effect of the extract increased with increased concentration in both *in vivo* and *in vitro* experiment conducted. The effect was both on the adult and nymph state of the pest. In the case of Natala, (1997) the different stages of ticks were affected differently by different acaricides. The fastest and highest mortality rate was on the *in vitro* process which was in accordance with the findings of Bittencourt *et al.*, (1989) and Khurana *et al.*, (1992) who observed that ticks are more susceptible to acaricidal effects when applied directly than application on the body of host.

Table 7: List of Ectoparasites

Ectoparasite	No.of ectoparasite (%)	Male (%)	Female (%)	Adult (%)	Nymph (%)
Ticks:					
Ixodidae					
<i>Amblyomma Variegatum</i>	23(2.24)	10 (1.93)	13(2.24)	20(2.33)	3(2.59)
<i>A. cohaerens</i>	328(31.94)	133(33.15)	195(33.68)	315(36.63)	13(11.21)
<i>Hyalomma truncatum</i>	146(14.22)	72(19.34)	74(12.78)	144(16.74)	2(1.72)
<i>H. impeltatum</i>	13(1.27)	5(1.38)	8(6.56)	13(1.51)	-
Total	510(49.66)	220(43.14)	290(56.86)	492(96.47)	18(3.53)
Argasidae					
<i>Boophilus microplus</i>	89(8.67)	39(10.77)	50(8.64)	89(10.35)	-
<i>B. decoloratus</i>	201(19.57)	76(20.99)	125(21.48)	98(23.02)	3(2.59)
<i>Aponomma Spp</i>	24(2.34)	8(2.21)	16(2.76)	24(2.79)	
Total	314(30.57)	123(39.17)	199(71.21)	311(99.04)	3(0.96)
Mite					
Microgynidae					
<i>Microgynium incium</i>	1(0.10)	-	1(0.17)	-	-
<i>Railliatia auris</i>	176(17.14)	71(19.61)	105(18.04)	81(9.42)	95(81.90)
Total	177(17.23)	71(40.11)	106(59.83)	81(45.76)	95(53.67)
Flea					
Pediculidae					
<i>Phthirus pubis</i>	26(2.53)	11(3.04)	15(2.59)	26(3.02)	-
Total	1027	425(41.38)	602(58.62)	860(83.74)	16(11.30)

The efficacy in *in -vivo* of different plant extracts on ectoparasites and variation in percentage reduction was dependent on the number and type of pests harboured by the animals and the treatment time. Compared to the synthetic drug Daizintol, the herbal extracts of *Senna alata*, *Manniophyton fulvum* and *Costus afer* in the present study were comparatively effective in eliminating the adult ticks, mites and fleas *in vivo*. *Chromolaena odorata* was found not to be as effective

Furthermore, the study showed that various concentration levels (2.5mg, 5.0mg and 7.5mg) of the plant extracts sprayed weekly on the specific body area of the animal preferred by ticks, mites and fleas can be successfully used to control pests of goats. These are cheap, natural and locally available products which are effective against the ectoparasites. According to Ngomuo and Kassuku (1995), their mode of action may not be fully understood, but they can play a significant role in reducing the indiscriminate use of synthetic chemicals used for external parasites control in livestock. Therefore these plant extracts can be used with fewer ecological side effects than current synthetic insecticides.

The investigations on acaricidal activity of herbal products is a major alternative approach for the control of ectoparasite infection (Arvind *et al.*, 2011). The presence of alkaloids, tannins saponins and other phytochemicals in the plants used in this study made the plant extracts important in causing mortality of external parasites. Arvind *et al.*, 2011, Sule *et al.*, (2011) and Momoh *et al.*, (2011), made similar findings in their work.

In conclusion, the ethanolic extracts of *Manniophyton fulvum*, *Costus afer* and *Senna alata* were effective against ectoparasites of goats both in the *in vitro* and *in vivo* investigations. The most effective was *M. fulvum* root extract even at 5mg/100ml. The study reported the presence of phytochemicals such as saponin, tannin, flavonoid, anthraquinones, phlobatannins and cardiac glycosides in the extracts from the three plants. The extracts from these three plants compared favourably with the synthetic pesticide Daizintol. In eliminating the ectoparasites of goats. Therefore the following recommendations were reached;

- Ethanolic extracts of the plants used in this work, exception of *C. odoratum* can be sprayed regularly on the head, trunk, neck, leg/tail of goats.
- As indigenous plants, they are cheaper, natural products and available for use instead of synthetic insecticides which are potentially dangerous to man and the environment.
- Sanitary conditions, adequate nutrition and proper housing should be provided for goats to reduce infestation to an economic level.
- Personal hygiene of animal handlers is also recommended to avoid zoonotic transmission of arthropod borne disease.
- An investigation of the efficacy of aqueous extract of the herbs on ectoparasites should also be carried out.

REFERENCES

- Abdel-Shafy, S., M.M.M. Silliman and S.M.Habeeb, (2007). In vitro Acaricidal Effect of Some Crude Extracts and Essential Oils of Wild Plants Against Certain Tick Species. *A carol XL VII* (1-2): 33-42.
- Arvind K., Sadhana S., Kanhiya M., Vihan V.S., and Gururaj K. (2011). Phytochemical Analysis of some Indegenous Plants Potent Against Ectoparasite. *Asian Journal of Experimental Biological Science* 2(3): 506-509.
- Bittencourt V.R., Massard C.L., and Grisi L., (1989). In -vitro activity of Some Pyrethroid Acaricides Against the Ticks *Amblyomma cajennense*. *Pesquisa Agro Pecuarial Beasileira.*, 24: 1193-1199.
- Butler J. F. (1985). Lice Affecting Livestock. In: Williams, R.E., Hall R.D., Broce A. B., Scholl, P.J., (Eds): *Livestock Entomology*. Wiley, New York, pp. 101-127.
- Chungsanmnyart N., Jiwajinada S. and Janasawan W. (1991). Larvicidal Effect of Plant Crude-Extract on the Tropical Cattle tick. *Kasetsart Journal of Natural Science*. 25:80-90.
- Callinan A.P.L. (1980): Effects of artificially induced infestations of the cattle louse, *linognathus vituli*. *Australian Veterinary Journal*. 56: 484-486.
- Chopra R. N, Naygar S. L, Chopra I. C (1956). Glossary of Indian medicinal plants. *Council of Science and Industrial Researcher*. New Delhi, p. 160.
- Dautel, H., (2004). Test Systems for Tick Repellents. *J. Med. Mic.*, 293: 182-188.
- Dano A. R. and Bogh H. O. (1999). Usage of Herbal Medicine Against Helminthes in Livestock. *Veterinary Parasitology.*, 84: (3-4). 241-245.
- Gueye E.H.F. (1997). Diseases in Village Chickens: Control Through Ethnovetinary Medicine. *ILEIA Newslett. Low Ext. Input Sustain. Agric.* 13(2): 20-21.
- Haslett, J. R., (2003). Handbook of the Convection on Biological Diversity. *Biological Conservation*. 144(3): p.147.

- Johnson M., (1992). Lore Capturing Traditional Environmental Knowledge. IDRC, Ottawa Canada. p. 122.
- Kandill, O. M., S. M. Habbeeb and M. M. M., Nasser, (1999). Adverse Effect of *Sorghum bicolor*, Sea anemone, *Cynobacteria spp* and *Simmondsia chiinensis* (Hohoba) Extracts on Reproductive Physiology of the Adult Female Tick, *Boophilus annulatus*. *Veterinary Medical Journal*. 42: 29-37.
- Kaposhi, C. K. M., (1992).The Role of Natural Products in Integrated Tick Management in Africa. *Insect Science and its Application*., 13(4): 595-598.
- Kumar A., Sadhana S., Kanhiya M., Vihen V.S., (2011). *In vitro* and *In vivo* Acaricidal Activity of Some Indigenous Plants Under Organized and Farmers Ticks. *Pharmacologyonline*., 3: 361-369.
- Khurana K.L Chabra M.B., and Samantray S., (1992). Comparative Efficacy of Some Acaricides Against *Hyalomma spp*. Ticks *in Vitro*. *Journal of Veterinary Parasitology*., 6:7-10.
- Momoh S.,Yusuf O.W., Adamu M.M., Agwu O.C., and Atanu F.O. (2011). Evaluation Pf The Phytochemical And Hypoglycaemic Activity of *Custus afer* in Albino Rats. *British Journal of Pharmaceutical Research*. 1(1):1-8.
- Nolan J. (1989). New Approaches to the development and Management of Drugs used in Ectoparasite Control. *Veterinary Parasitology*. 25: 135-145.
- Ngomuo A. J., and Kassuku L.D.,(1995). Gastrointestinal Helminth and their Seasonal occurrence in Goats and Sheep in Morogoro, Tanzania. *Tanzania Veterinary Journal*., 15: 1-9.
- Natala, A. J., (1997). Studies on the Biological and Chemical Control of *Amblyomma variegatum* (Fabrecus 1974) Ticks on the Accra Plains of Ghana. A Thesis Submitted to University of Ghana, Legon in Partial Fulfillment of Requirement for the Award of Masters Degree. p. 64.
- Plotkin, M.. J. (1992). Ethnomedicine: Past, Present and Future. Natural Resources and Human Health: *Plants of Medical and Nutritional Value Proceedings*. Amsterdam the Netherlands, Elservier. pp. 79-86.
- Salwa M. H. (2010) Ethno-Veterinary and Medical Knowledge of Crude Plant Extracts and its Methods of Application (Traditional and Morden) for Ticks control. *World Applied Science Journal* 11(9): 1047-1054.
- Saxena M. J. (2001). Revevance of Herbs in Improving Health Index of Livestock Animals. An invited Paper for the 38th Annual Congress of the Nigerian Vetenary Medical Association Held in Topo, Badagry, Lagos State, Nigeria. pp. 1-5.
- Sule W. F., Okonko I. O., Joseph T. A., ofezele M. O., Nwause J. C., Alli J. A., Adewde oc., ojezele O. J. (2011) Invitro antifungal activity of *Senna alata* Crude Leaf Extract. *Advances in Applied Science Research*., 1(2):14-26.
- Tho, B.T., (2003). Study on Pharmaceutical Effects of Stemone Extract on Animal Ectoparasites and Clinical Trial Results. *Veterinary Association of Hanoi*, Vietnam, 10(1): 58-63.
- Trease G. E, Evans W. C,(2009). Pharmacognosy 10th Edition, Bailiere Tindal Limited, London, ; p541.
- WHO (2008). World Health Organization Technical Series. Medicinal Plant in Africa. World Health Organization: Geneva, pp.199-205.
- Williams, L. A. D. (1993). Adverse Effect of Extracts of *Artocarpus altilis* park and *Azadirachta indica* (A. Juss) on the Reproductive Physiology of the Adult Female Tick, *Boophilus microplus* (canest). *Invertebrate-Reproduction-Development*., 23(3): 159-164.