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Effect of eucalyptus oil against tick infestation in cattle

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Abstract

The study was carried out to determine the *in-vivo* effect of Eucalyptus oil on ticks of cattle. Six tick infested cattle were selected for the present study. Cattle infested with ticks were treated with Eucalyptus oil in Sesame oil as carrier which was applied topically once daily for 14 days. Therapeutic evaluation of Eucalyptus oil was done on the basis of significant variation observed in hematological and biochemical parameters, besides the reduction of tick count on the infested cattle and disappearance of clinical manifestations before and after application of the formulation. The haematological analysis revealed Hb, PCV, TEC, TLC, neutrophils and eosinophils showed significant differences ($P < 0.05$) towards normalcy in all the treated cattle at the end of therapy in comparison to pre-treatment values and were similar to values in healthy control. No significant alteration ($P < 0.05$) in lymphocytes, monocytes and basophils in comparison to pre-treatment values was observed. Biochemical profiles showed significant increase ($P < 0.05$) in glucose, total protein, albumin, globulin, A: G ratio, calcium and phosphorus; significant decrease in AST, ALP and CK and there was no significant change in ALT, BUN and creatinine at the end of therapy as compared to their values before treatment. Tick count started to reduce on day 7 post therapy. The clinical manifestations such as pruritus, erythema, scales, nodules and rough hair coat also disappeared upto day 14 of therapy.

Keywords: Cattle, ticks, eucalyptus, essential oil

Introduction

The poor health of animals due to tick infestation is a major concern for people in areas with heavy tick load [1]. Heavy tick load cause blood loss, tick bite, local skin infection and the secondary effects of tick infestation include infection of the local region, causing suppurative lesions on the ears, legs and other parts of the body, and in lambs, the local infection may lead to tick pyaemia. Another consequence is damage done to hides [2]. Tick control primarily involves prophylactic chemotherapy with a variety of synthetic acaricidal medications [3]. Some of the major classes of acaricide used against ticks are macrocyclic lactones, pyrethroids, organophosphates and formamidines [4]. Acaricides are the centre of eradication and control efforts because they offer relatively quick and effective control against tick population. However, several tick species have developed acaricide resistance as a result of irrational and long-term use of acaricides [5]; as a result, diminishing the ability to control them. Moreover, the majority of acaricides are extremely toxic in nature. They have a harmful impact on non-target species and can be lethal, even to humans [6]. The control of ticks through synthetic acaricidal agents has been gaining widespread popularity but the drawbacks associated with these systemic chemicals are their harmful residual effect on production (milk, egg and meat) of animals and also deteriorating human's health after consumption of these products [7]. Because of the high cost of developing new drugs and vaccines, the emergence of drug resistance and concerns about drug residues associated with long-term use of these chemicals, there is renewed interest in using botanicals to manage livestock parasites in a safe, reliable and cost-effective manner [8]. Insect repellents usually operate by creating a vapour barrier that prevents the arthropod from making contact with the body surface of animals [9]. Many bioactive ethno veterinary products and essential oils are being studied extensively to determine their effectiveness against ticks as well as their mechanism of action and the tick species they target [10]. Essential oil's therapeutic ability is also attributed to their unique chemistry and low molecular weight constituents, which enable them to penetrate the skin, enter the underlying tissues, and circulate in the bloodstream [11]. It has been reported that the topical treatment of animals with herbal acaricidal formulations is safe and less toxic as compared to synthetic agents [12]. Since tick infestation can adversely affect cattle in terms of body condition or production, and the conventionally used chemical acaricides have their own

adverse effects as well as there is increasing resistance against them, so the use of herbal acaricides is a potential alternative strategy for tick control in place of chemical acaricides to prevent economic losses caused due to tick infestation. The main objective of the present study was to observe the effect of Eucalyptus oil on tick infested cattle on the basis of management of clinical manifestations, reduction in tick count and management of haemato-biochemical attributes.

Material and Methods

The present investigation was carried out to determine the effect of Eucalyptus oil on ticks of cattle. Tick infestation cases presented to Teaching Veterinary Clinical Complex, GBPUA&T, Pantnagar, Instructional Dairy Farm and surrounding farms of Pantnagar, Uttarakhand, India were included in the present study. Ticks on the skin surface of infested cattle were observed with naked eyes [13]. Tick infested animals were clinically examined to perform the tick count. Hair parting was done in direction opposite to the natural direction of hair. There was no random distribution of ticks on the body surface of infested animals, rather they were limited to few predilection sites, so the counting of ticks was performed on one half of the body [14]. The estimation of tick count of infested animal was done by searching the ticks by moving hands on the animal body from head to tail on their right plane of body and the number of ticks counted was multiplied by two [15]. The therapeutic evaluation of

Eucalyptus oil against tick infestation in cattle was conducted. A combination of 10 drops *Eucalyptus* oil in 10 ml Sesame oil was prepared. The Sesame oil was used as carrier oil. The Eucalyptus essential oils were procured from Medicinal Plants Research and Development Center, G.B.P.U.&T., Pantnagar and Sesame oil (manufactured by G.M Pharmacy) was procured from local market. Cattle infested with ticks were treated with Eucalyptus oil in Sesame oil as carrier applied topically once in a day for 14 days.

Statistical analysis of data was performed using software SPSS-16.0. Data pertaining tick count, haematological and biochemical profiles was analysed by t-test and ANOVA technique to test the significance of means and $P < 0.05$ was accepted as statistically significant. [16]

Results and Discussion

Therapeutic efficacy of Eucalyptus essential oil was evaluated in tick infested cattle at an interval of 7 days. The results of clinical observations after treatment with Eucalyptus oil are presented in Table 1. On day 7 of therapy the tick population was noticeably reduced in two animals and ticks were significantly reduced on day 14 of the therapy in all the animals. On day 7 of the start of therapy pruritus, erythema, nodules, rough hair coat and scaling started to reduce and there was complete disappearance of erythema, pruritus, scaling, rough hair coat and nodules on day 14 of the start of therapy.

Table 1: Therapeutic assessment of topical Eucalyptus oil on the basis of disappearance of clinical manifestations against tick infestation (n=6)

Clinical examination	0 th day	7 th day	14 th day
Presence of ticks	++++	++(4)	-
Pruritus	+++	+	-
Erythematous lesions	++	+(3)	-
Scales	++(3)	+(3)	-
Rough hair coat	+++ (2)	+(2)	-
Nodules	++	+	-

(Figures in parenthesis indicate the number of cattle affected)

Mean tick count in the cattle before treatment was 46.56 ± 3.66 and a significant reduction in total tick count was observed on day 7 i.e. 23.67 ± 2.30 and day 14 i.e. 7.33 ± 0.88 after the

treatment. Percent reduction in tick count was 49.16% on 7th day of treatment and 84.25% reduction on 14th day after treatment (Table 2).

Table 2: Acaricidal potential of Eucalyptus oil on the basis of tick count

Area of tick infestation	Total tick count		
	Before treatment	After treatment	
	Day 0	Day 7	Day 14
Ear pinna	34.00 ± 3.40^a	22.33 ± 1.79^b	8.00 ± 1.56^c
Neck	65.00 ± 10.21^a	33.67 ± 6.54^b	6.67 ± 1.31^c
Dewlap	43.00 ± 4.59^a	20.67 ± 1.99^b	8.33 ± 0.85^b
Udder	57.00 ± 9.44^a	30.67 ± 7.71^b	12.00 ± 3.40^b
Perineal region	51.33 ± 8.99^a	24.67 ± 4.68^b	4.67 ± 1.31^b
Under Tail	29.00 ± 4.21^a	10.00 ± 0.47^b	4.33 ± 0.87^b
Mean tick count	46.56 ± 3.66^a	23.67 ± 2.30^b (49.16%)	7.33 ± 0.88^c (84.25%)

(Figures having different superscripts across the rows are significantly different upto 5% level of significance)

Hb, PCV, TEC, TLC, neutrophils and eosinophils showed significant differences ($P < 0.05$) towards normalcy in all the treated cattle on day 14 in comparison to pre-treatment values and were similar to values in healthy control. No significant

alteration ($P < 0.05$) in lymphocytes, monocytes and basophils in comparison to pre-treatment values was observed (Table 3).

Table 3: Therapeutic assessment (Mean±SE) of Eucalyptus oil against tick infestation on the basis of hematological and biochemical attributes of the treated cattle

Parameters	Healthy group (n=6)	Animals treated with Eucalyptus oil (n=6)		
		Before treatment	After treatment	
Hb (gm/dl)	12.03±0.18 ^a	7.65±0.48 ^b	11.66±0.41 ^a	
PCV (%)	41.03±0.25 ^a	36.41±0.93 ^b	40.46±0.51 ^a	
TEC (×10 ⁶ /mm ³)	8.09±0.22 ^a	6.73±0.31 ^b	7.79±0.46 ^a	
TLC (×10 ³ /mm ³)	9.76±0.20 ^b	11.86±0.47 ^a	10.29±0.35 ^b	
DLC (%)	Neutrophils	45.17±0.36 ^a	31.66±1.11 ^b	41.50±0.95 ^a
	Eosinophils	1.83±0.21 ^b	6.16±0.70 ^a	2.16±0.47 ^b
	Lymphocytes	47.16±0.38 ^b	59.33±0.66 ^a	58.16±1.37 ^a
	Monocytes	1.66±0.15 ^a	1.83±0.47 ^a	1.50±0.34 ^a
	Basophils	1.33±0.19 ^a	1.83±0.40 ^a	1.66±0.42 ^a
Glucose (mg/dl)	62.33±0.68 ^a	45.26±1.56 ^b	60.93±0.84 ^a	
Total protein (g/l)	68.43±0.98 ^a	44.07±0.69 ^b	66.77±1.04 ^a	
Albumin (g/l)	32.73±0.85 ^a	17.09±0.69 ^b	31.85±0.87 ^a	
Globulin (g/l)	35.70±1.43 ^a	26.98±0.80 ^b	34.92±1.27 ^a	
A: G	0.93±0.05 ^a	0.64±0.04 ^b	0.90±0.05 ^a	
ALT (IU/l)	31.03±1.95 ^a	36.76±3.82 ^a	32.51±1.20 ^a	
AST (IU/l)	86.90±6.57 ^b	111.01±6.40 ^a	74.28±5.97 ^b	
ALP (IU/l)	135.16±3.67 ^b	150.13±4.50 ^a	136.26±2.75 ^b	
Creatinine (mg/dl)	1.07±0.10 ^a	1.12±0.17 ^a	0.99±0.15 ^a	
BUN (mg/dl)	21.87±0.93 ^a	20.88±1.23 ^a	18.93±1.20 ^a	
Calcium (mmol/l)	2.90±0.11 ^a	1.76±0.11 ^b	2.67±0.14 ^a	
Phosphorus (mmol/l)	1.93±0.04 ^a	1.26±0.20 ^b	1.75±0.08 ^a	
CK (IU/l)	8.32±0.66 ^b	53.61±2.26 ^a	9.20±0.96 ^b	

(Figures having different superscripts across the rows are significantly different upto 5% level of significance)

Biochemical profiles of group B showed significant increase ($P<0.05$) in glucose, total protein, albumin, globulin, A: G ratio, calcium and phosphorus; significant decrease in AST, ALP and CK and there was no significant change in ALT, BUN and creatinine on 14th day after start of therapy as compared to their values before treatment (Table 3).



Before Treatment

After Treatment



Before Treatment

After Treatment

Fig 1: Tick infested cattle treated with Eucalyptus oil

Tick count started to reduce on day 7 post therapy by 49.16%. Two animals were recovered upto day 7 of the start of therapy. Four animals were left with ticks on day 7 of start of

therapy and were recovered by day 14 post therapy and tick count reduced by 84.25% on day 14 post therapy. The clinical manifestations such as pruritus, erythema, scales, nodules and rough hair coat also reduced significantly on 14th day of therapy. Hb, PCV, TEC, TLC, glucose, total protein, albumin, globulin, AST, ALP and CK showed significant improvement at the end of therapy. Anti-tick activity of essential oil of *Eucalyptus globulus* against *Rhipicephalus bursa* with 54% and 76% of acaricidal and repellent activity. ^[17] Acaricidal effect of Eucalyptus essential oil against tick is reported ^[18]. Essential oil of Eucalyptus have a wide spectrum of antifungal, antibacterial and antiacarid property and thus provides a cost effective, eco-friendly and simple alternative control method ^[19].

Conclusion

Ticks and tick-borne diseases cause great economic losses to the farmers in a tropical country like India so to prevent this there is non-judicious use of acaricides that has led to development of resistance to many classes of acaricides and which may also lead to toxicity if applied in higher concentrations than the recommended doses. So here comes the emerging importance of the herbal acaricides and on the basis of results of present study, the selected herbal formulation of Eucalyptus essential oil and sesame oil was found effective against tick infestation in cattle of the area under study and showed no adverse effects in the treated animals.

Due to this proved efficacy of Eucalyptus oil against ticks it can be used successfully for therapeutic management of tick infestation in cattle and to overcome the reported acaricidal resistance in ticks. Efficacy of Eucalyptus essential oil is also reported against bacteria, fungus, mites, flies and mosquitoes along with ticks so it can also be used for development of commercial products against the ectoparasites of veterinary importance.

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