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Research Paper

Commercial acaricides in pour-on formulation react differently in reducing tick numbers on cattle in extensive and intensive management systems in Bockle, North Cameroon

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Ticks are important disease vectors in cattle farms in North Cameroon and information about the efficiency of locally used acaricides to combat them is scanty. In order to suggest the best acaricide to farmers, a field trial was deemed necessary to test the efficiency of five acaricidal reference products (Ectospec ®, Cypertop ®, Deltik ®, Vectoclor ® and Topline ®) in the Extensive Management System (EMS) and Intensive Management System (IMS) in Bocklé. In total, 282 ticks were collected and identified into two species namely: *Amblyomma variegatum* and *Hyalomma truncatum.* Toplin® had the highest tick clearance effect while Ectospec® recorded the least tick clearance effect on cattle in the EMS. Toplin® protection duration was 21 days post application. All the five products tested in the IMS equally resulted in zero tick count 6 days post application. There was cross protection of cattle against ticks in the control group by those in the treated group in both EMS and IMS. Sex and color coat were the cattle risk parameters evaluated. Females (58.51%) were frequently infested than males (41.49%). Red colored cattle revealed highest tick numbers than others. Tick counts on animals in the EMS (53.19%) was greater than that in the IMS (46.80%) even though there was no statistical significant difference (t = -1.3232, df = 5, p = 0.2431). Toplin ® revealed the highest ticks number reduction effect in the EMS and can be incorporated in the Integrated Tick Management System (ITMS) in such a system, but all the acaricides tested will be equitably suitable for an ITMS in the IMS in Bocklé.

Key word: Ticks, acaricides, Pour-on, Bocklé

INTRODUCTION

For a long time, research has been focused in the eradication of certain ectoparasites which play an important role in the transmission of zoonotic diseases. Ticks belong to the family Ixodidae, common haematophagous parasites of animals. Morel and Mouchet, (1958) identified the veterinary importance of

ticks in Cameroon. About 37 species of ticks are suitable for feeding on a wide range of host species including terrestrial mammals (wild and domestic), birds, reptiles and also humans (Madder *et al*., 2014). Ticks have become a major concern of medical and veterinary research not only because of the direct effects on their host such as injuries inflicted at their attachment points, blood loss and paralysis caused by toxins in their saliva (Boyard, 2007; Pérez-Eid, 2007), but also because of the major danger of these parasites in relation to their transmission capacity of certain pathogenic germs of humans and animals (Morel, 1965).

Some field surveys were recently carried out in the Northern regions of Cameroon to identify tick species. The study of Mamoudou *et al*., (2016) in the Mayo Rey Division of the North region of this country revealed that only *Amblyomma variegatum* was present on animals sampled in the Yoko Village.

This same study also reported that the presence of poultry and children in households of herders greatly reduced tick burden. The collection of ticks by Mamoudou *et al*., (2016) in the sub-urban area of Ngaoundere showed that Tropical Bont Tick, *Rhipicephalus (Boophilus) geigyi*, *Rhipicephalus (Boophilus) annulatus*, *Rhipicephalus (Boophilus) decoloratus*, *Hyalomma truncatum*, *Hyalomma Marginatum rufipes*, *Rhipicephalus sanguineus* and *Haemophysalys laechi* were the main tick species and sub- species present in the study area with *Rhipicephalus (Boophilus) geigyi* being the most dorminant in their collections.

In the North West, the report of Awa *et al*., (2015) revealed a low representation of *H. truncatum* and lack of *Boophilus decoloratus*. The direct effect of ticks on animal health is their transmission of a group of pathogens commonly known as Tick Borne Diseases (TBD). Tick-borne diseases mainly theileriosis/East Coast fever (ECF), babesiosis and anaplasmosis present serious constraints to productivity of especially exotic cattle and their crosses. A study by Mamoudou *et al*. (2017) revealed high infection prevalence of *Babesia* spp. and *Anaplasma* spp. in cattle farms heavily infested by ticks.

Due to the increasing tick burden and their direct effect in the transmissibility of several diseases, there is a need to implement an efficient control method. In Cameroon, the use of acaricides has been a major component of integrated tick control methods. However, little is known about the acaricide of choice as well as tick resistance against these commonly used acaricides.

In a bit to throw more light on this subject, the present investigation developed a hypothesis that different acaricides used by farmers in this region react differently in the two common cattle management systems (extensive and intensive) of the study area. This will give an idea of an acaricide of choice that can be proposed to farmers for for ticks control in Bocklé in the North region of Cameroon.

MATERIALS AND METHODS

Study area

Our study was carried out in the Garoua National Veterinary Laboratory (LANAVET) animal farms, located in the Bocklé village which is located in Garoua 3rd District, Benoue Division of North Region. It is limited to the north by the river Benoue, to the south by the Sanguéré-Goumbai village, to the east by the Sanguéré-Ngaoundéré village and to the West by the Djalingo village (Figure 1). The LANAVET is 14 Km from the town of Garoua on the Ngaoundéré-Garoua highway. The statutory purpose of the LANAVET is three-fold that is: a division responsible for production and marketing of animal products (vaccines), animal health research, field investigations and analysis of samples of animal origin with the intentions of getting involved in therapeutic and prophylactic measures. The animal farms of this institution were chosen because the animals are kept there exclusively for experimental purposes.

Experimental phase

Thirty (30) animal heads were randomly selected to stand for animals in the extensive system group. Thirty three (33) heads were also randomly selected for the intensive system group. Five reference products were studied: Ectospec ®, Cypertop ®, Deltik ®, Vectoclor ® and Topline ®. The animals were placed in the various treatment and control groups as presented in (Tables 1 and 2). The application days were as such: D0 (pre-acaricide application and treatment day) while the others , D 7, D 15, D21 and D29 were days of surveillance after treatment in the EMS. For the IMS the application pattern was as such: D0 (pre-acaricide application and treatment day) while the others , D 6, D 14 and D19 were days of surveillance after treatment in the intensive farming system. Acaricides were prepared and applied following the manufacturer's instructions (Table 3).

Ticks collection and identification

Ticks were collected by hand-picking, the base of the rostrum (capitulum) was targeted and by rotating while pulling gently, so as not to lose the clips of the tick in the skin of the animal. They were then transferred to a tube containing 70% ethanol and labeled. Ticks Identification was carried out at the LANAVET using a stereo-microscope. The identification of ticks was made by focusing on some anatomical landmarks such as: head, ears, dewlap, back, stomach (abdomen) (Walker, 2003). Also, inter-digital region, tail and anal vulvo-vaginal area (Kaiser, 1987) was also considered during identification.

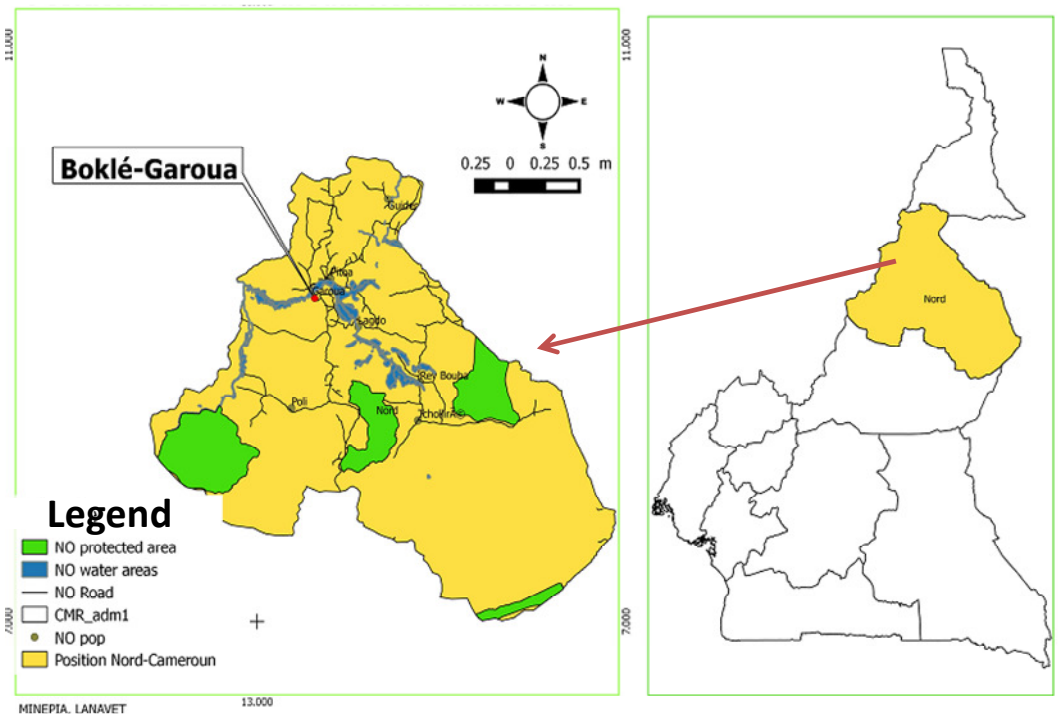

Figure 1. Map of North Cameroon indicating the study area.

Table 1. Animals in an extensive management system (30 heads)

ACARICIDES	DELTRIK ®				CYPERTOP ®				VECTOCLOR ®					ECTOSPEC ®					TOPLINE ®					CONTROL						
Group	G 1				G2				G3					G4					G5					G6						
N° Animal	442	425	416	393	392	421	433	435	444	420	438	436	415	395	398	428	408	427	414	431	403	451	430	386	452	437	9562	409	423	405

Table 2: Animals in an intensive management system (33 heads).

ACARICIDES	DELTRIK ®					CYPERTOP ®					VECTOCLOR ®					ECTOSPEC ®					TOPLINE ®					CONTROL							
Group	G3					G2					G1					G4					G5					G6							
No Animal	975	986	979	970	994	771	993	960	762	984	959	755	SB	980	985	972	964	996	998	977	968	988	976	765	966	962	989	983	753	981	965	997	764

Statistical analysis

Data analysis was carried out using XLSTAT and R (http://www.r-project.org) soft wares. XLSTAT was used to make graphical representations of the evolutionary trends of tick numbers in the different treatment groups in the different management systems. The R-software enabled us to compare the means of ticks collected in the two systems by using the student t-test.

RESULTS

In total, 282 ticks were collected from cattle under investigation and the different ticks identified were *Amblyomma variegatum* and *Hyalomma truncatum* (Figures 2 and 3). Based on the evolution of ticks by group of acaricides in an extensive system, Toplin ® highly reduced tick numbers after its application while Ectospec ® showed the least effect on clearance of ticks in this same system (Figure 4). In the intensive system, all the acaricides cleared the animals from ticks after treatment in both test and control groups (Figure 5). It was noticed after tick collections that cattle with red color coat harbored highest ticks number while those with spotted white color recorded the lowest ticks count. Tick counts based on sex revealed that males (41.49%) had low tick numbers than their female (58.51%) counterparts. Generally, high tick infestation was observed in the EMS (53.19%) was greater than in the

Table 3. List of products used, function, active ingredients and application modes

Name of Product	Molecules	Application Mode
TOPLINE ® Treatment and control of infestations by external parasites: ticks, horn flies, lice crushers, biting lice.	-Fipronil 10 g -Diazo red dye 0.04 g - Excipient 0.3P / 100 ml.	1ml / 10 Kg body weight, dorsal line from tourniquet to tip of tail
VECTOCLOR® (Ceva) Antiparasitic and Repellent: Ticks and flies	-Cypermetrin 5.00 g -Chlorpyriphos 7.00 g Piperonyl-butoxide 5.00 g -Citronelle 0.50 g -Excipient qsp 100.00 ml.	10 ml /100 Kg body weight, dorso-lumbar line from the withers to the base of the tail
CYPERTOP®	-Cypermetrin 5 g -Chlorpyriphos 7g -piperonylbutoxide 5 g -Citronelle 0.5g -Excipient qsp 100 ml.	Up to 100 Kg: 10 ml 101 to 200 Kg: 20 ml 201 to 300 Kg: 30 ml More than 301 Kg: 40 ml Administration throughout the back of the animal in a homogeneous manner
DELTIK ® Antiparasitic: Ticks, flies, lice, melonphages.	-Delthametrine Bp (vet) 10mg - Excipient qsp.	Less than 100 Kg: 10ml 200 kg: 20 ml 300 Kg: 30 ml 400 Kg: 40 ml 500Kg: 50 ml More than 500 Kg: 50ml Along the top line of the animal's back from the neck to the base of the tail
ECTOSPEC® w/v Control of lice and flies	Cypermethrin (93% w / w cis / trans isomer 50: 50): 2.5% w / v	Flies: 10m Lice: 10 ml.

IMS (46.80%) even though there was no statistical significant difference (t = -1.3232, df = 5, p = 0.2431). Also, it was noticed that irrespective of the experimental groups, cattle in the treated group protected the non-treated group (control group) from ticks infestation at D7 and D6 in the

Figure 2. *Amblyomma variegatum*

Figure 3. *Hyalomma truncatum*

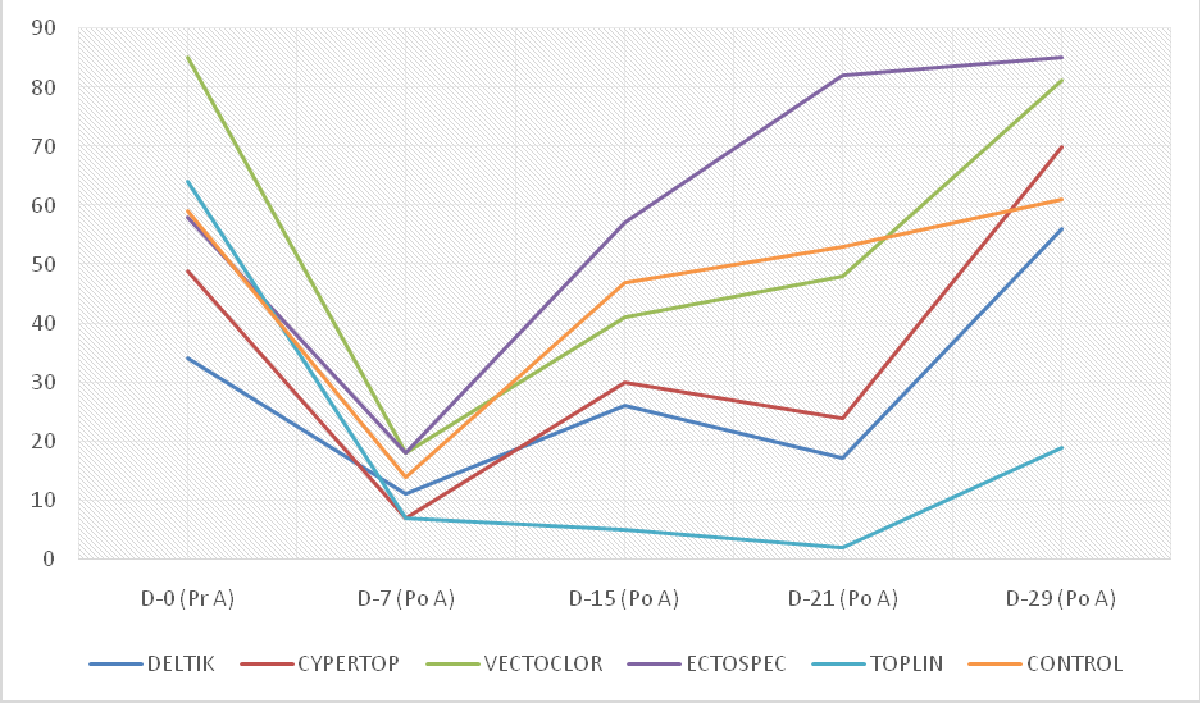

Figure 4. Evolution of ticks before and after treatment of cattle with 5 different acaricides in an extensive system.

D, day; Pr A, Pre-application; PoA, Post-application.

EMS and IMS post acaricide treatment respectively.

DISCUSSION

Based on our current findings, two species of ticks were identified notably *Amblyomma variegatum* and *Hyalomma truncatum.* Toplin® showed highest tick detachment from animals in the EMS with an overall protection period of 21 days post application. It was rather noticed in the IMS that all the acaricides tested resulted in zero tick count 6 days post treatment. This finding showed that Toplin ® which offered highest tick detachment in the EMS had the same treatment outcome like the other five acaricides in the IMS. It was noticed that tick numbers were high in animals in the EMS than those in the IMS even though statistically there was no significant difference. The reason behind the differences in tick numbers in the two systems can be due to the fact that animals in the EMS system always mingle with those of the Fulani herdsmen, sharing the same pasture surface and consequently getting infested by ticks. There is restricted movement and contact of animals in the IMS with those in the same area in order to avoid the issue of

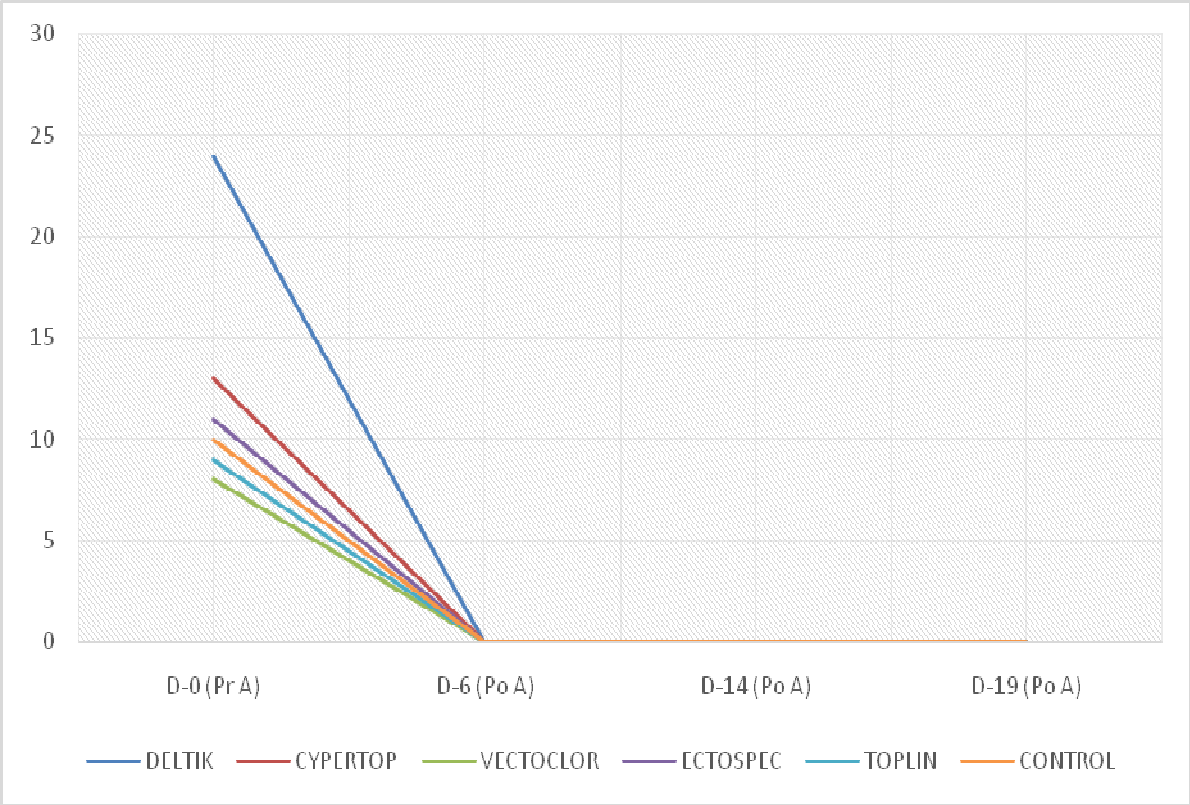

Figure 5. Evolution of ticks before and after treatment of cattle with 5 different acaricides in an intensive system. *D, day; Pr A, Pre-application; PoA, Post-application.*

infestation and re-infestation. All these can be coined to one saying "consequences of poor management practices in EMS leads to high vectors and diseases burden". However, adequate scientific knowledge currently exists to support changes in the philosophy behind tick control. The general principles on which future strategies should be based were summarized by Tatchell, (1986 and 1987) and one of these principles was "the modification of animal husbandry, for example, by allowing the more susceptible cattle to be grazed and treated together". This means that poor husbandry methods in the EMS must have led to high tick burden on the animals. Cross protection of the control group by the treated group was noticed. Similarly, synergistic effect of all the acaricides did occur. This phenomenon of cross protection and synergistic effect of acaricides was expected since animals in all groups in each management system shared the same pasture surface where they feed, mate, fight and also pass the night in the same enclosure. These various forms of close-contacts noticed permitted us to suspect mixed-reaction effect (leading to a synergistic effect) of the various products applied to cattle (due to cattle-cattle constant contact) and this contact was between animals of different treatment groups (treated and non-treated) (leading to acaricide cross protection). This phenomenon is advantageous in that treated animals can always protect non-treated counterparts in nature, but can also be risky if such free roaming animals (treated) (like in the EMS in our case) can still be contaminated if they pasture with non-treated animals in a tick infested pasture. Cattle risk parameters against tick infestation were sex and coat of color. Concerning sex, females were highly infested than males; this finding is parallel to that reported by Jelalu *et al*. (2016). Coat colour of animals help ticks to camouflage well (Machado *et al*., 2010). Investigations relating to coat of color resulted in that red-colored animals were the most vulnerable to tick infestation than those with other colors. This finding is contrary to that of Jawale *et al*. (2012) who rather stated that mixed color cattle were most attractive to ticks. Payne *et al*. (2017) reported that various coat of colors of horses will differentially attract the various species of ticks. Ticks control using the same acaricides in an area will vary with the livestock management system. The application of Ectospec ®, Cypertop ®, Deltik ®, Vectoclor ® and Topline ® in the EMS should be supplemented with good husbandry practices to avoid rapid re-infestation of ticks. However Toplin ® was the acaricide of choice for the EMS and for it to be most efficient it should be applied

monthly in such a system to ensure thorough protection of cattle and this should be applied during periods of high ticks burden (July and August) in order to minimize the risk of acaricide resistance. All the acaricides studied will be equally efficient in the IMS 6days post application.

Conclusion

In total, 282 ticks were collected during the experiment. The species identified were *Amblyomma variegatum* and *Hyalomma truncatum*. Deltik® resulted in the highest tick clearance effect on animals in the EMS as compared to Ectospec® with lowest tick clearance effect in the same management system. All the 5 tested acaricides resulted in zero tick on animals in the IMS post application. Female and red colored cattle are highly vulnerable to tick infestation than their corresponding counterparts. Cattle in the IMS were least infested with ticks than those in the EMS even though there was no statistical significant difference. Toplin® according to our field trial is the acaricide of choice for tick control in the EMS, but such a conclusion cannot apply in the IMS since all the five products tested reacted excellently (zero tick) 6 days post application.

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