Variability of cattle infestation by *Amblyomma variegatum* and its possible utilisation for tick control

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De grandes différences dans l'infestation individuelle par les adultes d'*Amblyomma variegatum* ont été observées chez des zébus Goudali infestés naturellement. Certains animaux (désignés comme "attractifs pour *A. variegatum*") portaient 10 à 16 fois plus de tiques que les bovins les moins parasités du troupeau (désignés comme "non-attractifs"). L'ordre des animaux, selon l'infestation par *A.variegatum*, se maintenait lors de comptages successifs de tiques. Des expériences ont été conçues afin de savoir si les animaux "non-attractifs" restent peu infestés après que les animaux "attractifs" soient retirés du troupeau. Lorsque les deux catégories de bovins ont été mises à pâturer séparément, il a été observé que les animaux "non-attractifs" portaient moins de tiques et étaient infestés plus lentement que les animaux "attractifs". Toutefois, la différence entre les deux groupes était moins grande que lorsqu'ils étaient ensemble dans un seul troupeau. La sélection d'animaux "non-attractifs", bien que ne pouvant pas être la base unique d'un programme de lutte anti-tiques, pourrait être un des composants d'une stratégie de lutte, si ce caractère est héréditaire. Une expérience en cours étudie cette question.

Mots clés : Bovin - Zébu Goudali - Tique - *Amblyomma variegatum* - Infestation - Lutte antiacarien - Cameroun.

INTRODUCTION

Australian researchers have demonstrated the heredity of cattle resistance to the one-host tick *Boophilus microplus* (3), and have subsequently selected resistant animals (1). In Africa, the majority of the most pathogenic tick species are multi-host ticks. Several authors, working in different countries with various cattle breeds, have observed the existence of important variations of individual tick infestations between animals raised in the same herd. This was noted for *Rhipicephalus appendiculatus* (4, 7), *Amblyomma variegatum* (4) and *A. hebraeum* (8). On several occasions, it was also observed that animals heavily infested by one particular tick species were equally highly parasitized by the other species present in the area (4, 10, 5). It was then suggested that tick control could be improved by culling the most infested cattle and/or selecting the resistant ones (4, 10, 11).

In the Province of Adamawa, Cameroon, the most harmful tick is *Amblyomma variegatum* (12). Preliminary observations made at the Wakwa Animal and Veterinary Research Centre (CRZV Wakwa) showed that there was an important variability of the individual infestation by *A. variegatum* in a herd, and that the infestation rank was consistent between successive tick counts. These observations are nevertheless insufficient to envisage the possibility of an eventual selection programme. Other experiments are needed to answer the following questions :

- will lightly infested cattle continue to harbour few ticks after the culling of the most infested ones ?

- is the *Amblyomma variegatum* infestation level of an animal hereditary ?

If not, selection of the least infested cattle may not have a great impact on the status of the herd, and should not be integrated in a tick control strategy. Experiments were carried out at the CRZV Wakwa to study the first point, the persistence of a low infestation of the previously lightly parasitized cattle after the removal of the most infested ones.

MATERIALS AND METHODS

The Wakwa Animal and Veterinary Research Centre is situated 10 km from Ngaoundere at an altitude of 1,200 m on the Adamawa plateau in Cameroon. The climate is characterized by a mean annual rainfall of 1,700 mm over seven and half months, from March to October, with a mean temperature of 22 °C (9). All experiments described below took place in 1990, 1991 and 1992, during the early rainy season, between May and July, which is the peak infestation period for *A. variegatum* adults (12).

The local Gudali zebu cattle breed was used. Eleven herds were involved in the preliminary trials, which allowed the demonstration of the variability of individual infestations. They comprised eight 2-3 year old males (herd O), ten 3-4 year old males (herds V and J), twenty 1-2 year old heifers (herd G) and reproductive cows older than 4 years (in seven herds containing 12 to 24 animals).

To assess the variability of the infestation by adult *A. variegatum* between animals of a herd, the protocol followed was the same for all herds. Each herd was treated against ticks with an acaricide, two times at seven to ten days interval*. Two to three weeks after the second treatment, depending on the rapidity of reinfestation (estima-

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* These trials, except those involving the reproductive females, were originally designed to determine the residual effect of the acaricides used (F.STACHURSKI and E.N.MUSONGE, unpublished data).

ted by intermediate tick counts), all the animals of the herd were caught and their infestation was determined by counting *A. variegatum* adults present on the whole body. Then, they were treated again twice at about one week interval with another acaricide, and a new trial was performed, until the infestation level of the pasture was too low to allow new studies. The infestation of each herd could be checked 2 to 4 times.

The infestation level of each animal was characterized by two criteria, the infestation rank in the herd (IR) and the infestation degree (ID). This latter parameter represents the ratio between the infestation of the animal and the mean infestation of the herd in which it was kept.

A second series of experiments was then carried out to determine whether the removal of highly infested cattle would lead to an increased infestation of previously lightly parasitized animals. Two pastures of 2.25 ha (150 m x 150 m) and two of 4.5 ha (300 m x 150 m), separated from each other by 5 meters wide passages, were established as shown in figure 1.

Two groups of animals having either a low or a high infestation degree (ID) were held separately on some of these pastures after the following 14 days preparation. They were first treated with flumethrin (Bayticol®), mean residual effect of which had been previously estimated to be 9 days. Seven days later, they were treated with amitraz (Taktic®, observed residual effect 3 to 5 days). Four days later and during four subsequent days, the animals were carefully checked every morning, and all the ticks present were manually removed. When the cattle were then put into the paddocks, they carried neither acaricide (time interval since the last treatment exceeding duration of residual effect) nor aggregation-attachment pheromone (secretion of that pheromone does not start before 3 days after the fixation of the males and its persistence on the cattle is lower than 10 days (2)).

The first trial was carried out with three bulls having a high ID and three with a low ID, chosen from herds V and J. It was impossible to hold the animals separately, one per paddock, as planned (in that case, paddocks A and B would have been divided into two smaller pastures). Two groups were thus constituted, containing either animals with a high ID (group H) or animals with a low ID (group L). In a first phase, during three weeks, group H animals grazed on paddock A and group L on paddock B. Then, after the two weeks preparation described above and during three subsequent weeks, group H grazed on paddock B and group L on paddock A.

Preliminary results indicated that the initial infestation of paddock B was about two times that of paddock A. To avoid interpretation difficulties due to this situation, the protocol of further trials was modified, and groups H and L were allowed to graze successively, in rotation, on the different paddocks, in the following order: A, D, B, C. They were moved from one paddock to the next each morning, and the two groups were never on the same pasture at any moment. They were thus subjected to the same "tick pressure", but they had no influence on each other.

According to this protocol, three more trials were carried out. The first was performed with the same six bulls. The second involved four of those animals (one group with two low ID zebus, the other with two high ID bulls). The third trial was carried out with 2 groups of heifers, chosen from the herd G. The first group contained three low ID females, and the second three high ID ones.

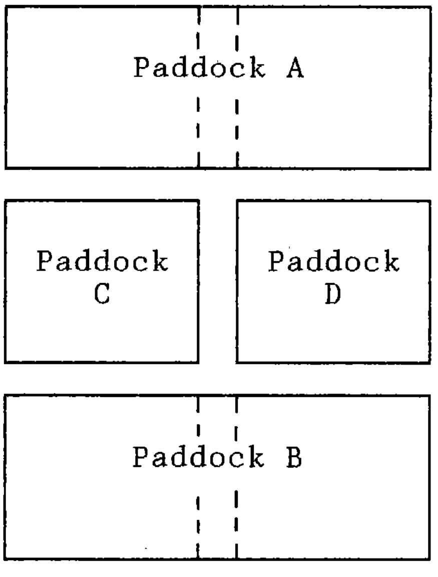

Figure 1 : Diagram of paddocks used in the second series of experiments.

RESULTS

Magnitude of the variability of the infestation by *Amblyomma variegatum* adults between animals

The weighted mean of the successive tick counts, as well as the corresponding ID, were calculated for each animal. Table I shows this latter parameter for the animals with the higher and the lower infestation in each herd. The ratio between those two IDs indicates that it was not uncommon to find animals carrying at least 10 times more ticks than the least infested zebu of the herd. In other herds however, the differences amongst the animals were much smaller.

The percentage of the herd carrying 50 % of the tick population varied from 23 to 42 % depending on the herd. On the average, about 30 % of the animals carried half of the ticks.

TABLE I ***Maximum and minimum infestation degrees observed in the experimental herds ; percentage of the herd carrying half of the tick population.***

Herds	Number of animals	Sex	Infestation degrees		M/m	Percentage of the herd carrying half of the ticks
			M	m		
V	10	M	1.68	0.45	3.7	33
J	10	M	1.39	0.65	2.1	42
O	8	M	2.87	0.38	7.6	26
G	20	F	1.77	0.11	16.1	35
E1	20	F	2.08	0.20	10.2	31
E2	19	F	2.18	0.19	11.5	33
E3	16	F	1.93	0.26	7.4	32
E5	16	F	2.07	0.46	4.5	35
R	12	F	1.82	0.39	4.7	33
V1	18	F	2.09	0.39	5.4	33
V3	24	F	2.80	0.28	10.0	23

Infestation degree (ID) : infestation of the animal / mean infestation of the herd.
M : maximum ID observed in the herd.
m : minimum ID observed in the herd.

Figure 2 shows the distribution of the ID of the 173 zebus observed during all trials. Although some animals had very high or very low infestations (the ratio between the two extreme IDs was 26), in general the distribution was not very skewed. Only 22 animals (13 %), infested by 4.7 % of the ticks, had an ID lower than 0.5 (that is they carried less than half the average infestation) and, on the other hand, 25 zebus (14 %) carrying 28.2 % of the tick population, had an ID higher than 1.5.

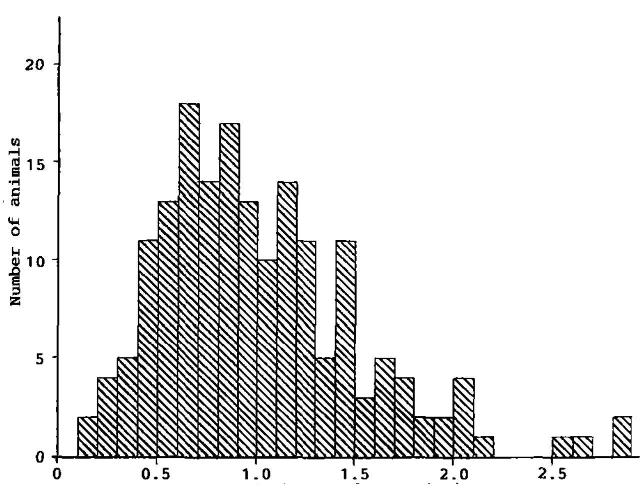

Figure 2 : Distribution of the infestation degree (ID) of the 173 cattle observed during the different trials.

Persistence of the individual tick infestation hierarchy

To assess the repeatability of the individual infestations, correlations between the infestation ranks (IR) of the successive trials were determined, by Spearman's rank correlation. Tick counts were done on four occasions for herds J and O, on three occasions for herd V and on two occasions for all the female herds. Correlations between the infestation degrees were also evaluated, by simple linear regression. The results for the male herds are presented in table II, those for the female herds in table III.

For all the herds, except one (herd J), the IRs and the IDs are correlated from one tick count to the other. The same animals are thus generally the least infested or, on the contrary, the most parasitized.

Effect of segregation of low and high ID animals on their infestation

As described above, the first experiment was carried out with two groups of three bulls : group H containing three high ID animals and group L constituted of three low ID ones. During the first phase, a tick count was done after 3 days. There were already 34 to 76 *A. variegatum* males on the animals, but only 1 to 3 females, showing that the zebus were free of pheromone when put into the paddocks. The results of the tick counts done during the two phases after 7, 14 and 21 days are reported in table IV.

TABLE II Correlations between the infestation ranks and the infestation degrees observed during the successive tick counts (TC) with the male herds.

Herds		Coefficient of correlation between					
		Infestation degrees (ID)			Infestation ranks (IR)		
		TC2	TC3	TC4	TC2	TC3	TC4
V	TC1 TC2	0.84***	0.86*** 0.86***		0.81***	0.79*** 0.83***	
J	TC1 TC2 TC3	0.88****	0.24 NS 0.51 NS	0.38 NS 0.63* 0.66*	0.87***	0.20 NS 0.49 NS	0.26 NS 0.54 NS 0.51 NS
O	TC1 TC2 TC3	0.93***	0.86*** 0.92***	0.80** 0.89*** 0.96****	0.97****	0.78** 0.74**	0.78** 0.79** 0.90***

*NS : Not significant ; * : p < 0.05 ; ** : p < 0.025 ; *** : p < 0.01 ; **** : p < 0.001.*

TABLE III Correlations between the infestation ranks and the infestation degrees observed during the two successive tick counts with the female herds.

Herds	Coefficient of correlation between	
	Infestation degrees (ID)	Infestation ranks (IR)
G	0.60***	0.52**
E1	0.72****	0.66***
E2	0.87****	0.80****
E3	0.78****	0.79****
E5	0.88****	0.85****
R	0.76***	0.67**
V1	0.74****	0.63***
V3	0.87****	0.77****

*** : p < 0.025 *** : p < 0.01 **** : p < 0.001*

It was obvious that the infestation was more important during the first phase than during the second, when the number of ticks observed was 4 to 8 times lower. It was also evident that there was an important pasture effect, the herd grazing on paddock B having consistently a higher tick burden. Because of this bias, the direct comparison of the animal infestations was impossible. To allow the comparison between the two phases, the cattle tick burden was expressed by the ratio between their own infestation and the mean infestation of the six animals, at each tick count. The results are shown in table IV, in brackets.

The trial was a 2 x 2 factorial design, the first factor being the paddock and the second the herd. Analysis of variance, done for each tick count, confirmed that there was a significant difference between the tick burden of the two paddocks ($p = 0.019$, $p < 0.001$ and $p = 0.003$ respectively for the D7 (day 7), D14 and D21 counts). On the other hand, the difference between the infestation of the two herds, significant at D7 ($p = 0.028$), later on became non significant ($p = 0.058$ at D14 and $p > 0.10$ at D21).

Figure 3 represents the evolution of the mean infestation of the two groups, H and L, during the two phases. When herd H, containing the high ID animals, was on the least infested pasture (phase 1), its infestation was, after one week, almost similar to that of herd L, which grazed on the most infested paddock. Afterwards, the difference between the two groups increased. On the other hand, when herd H was kept on the most infested pasture, its infestation was, at the beginning, 4 times higher than that of the other herd. The difference then decreased. Low ID animals were more able to limit their tick burden at the beginning of the infestation.

Because of the rapid decrease of the pasture infestation and because of the difference between the paddocks tick burden, which rendered difficult the comparison of the infestations, another protocol was used for the three further experiments (see above). The results from those trials are shown in tables V to VII. Direct comparison of the infestation of the two groups involved was possible because they were simultaneously infested and subjected to the same “tick pressure”. The same following observations were made for the three trials.

TABLE IV **Amblyomma variegatum** *adults infestation (in brackets, expressed by the ratio between the animal infestation and the mean infestation of the 6 cattle) observed 7, 14 and 21 days after the beginning of the experiment in the groups H and L, containing respectively high ID bulls and low ID ones. The two herds grazed successively on the two paddocks.*

			Animals	Infestation by *A. variegatum* adults		
				D7	D14	D21
First phase	Paddock A	Group H	10	132 (1.01)	158 (0.73)	178 (0.69)
			19	139 (1.06)	175 (0.81)	192 (0.75)
			29	111 (0.85)	172 (0.80)	201 (0.78)
	Paddock B	Group L	13	85 (0.65)	207 (0.96)	253 (0.98)
			15	183 (1.39)	315 (1.46)	406 (1.58)
			16	138 (1.05)	266 (1.23)	313 (1.22)
Second phase	Paddock B	Group H	10	30 (1.88)	55 (1.31)	70 (1.08)
			19	14 (0.88)	58 (1.39)	79 (1.22)
			29	33 (2.06)	64 (1.53)	114 (1.76)
	Paddock A	Group L	13	7 (0.44)	21 (0.50)	35 (0.54)
			15	5 (0.31)	30 (0.72)	55 (0.85)
			16	7 (0.44)	23 (0.55)	35 (0.54)

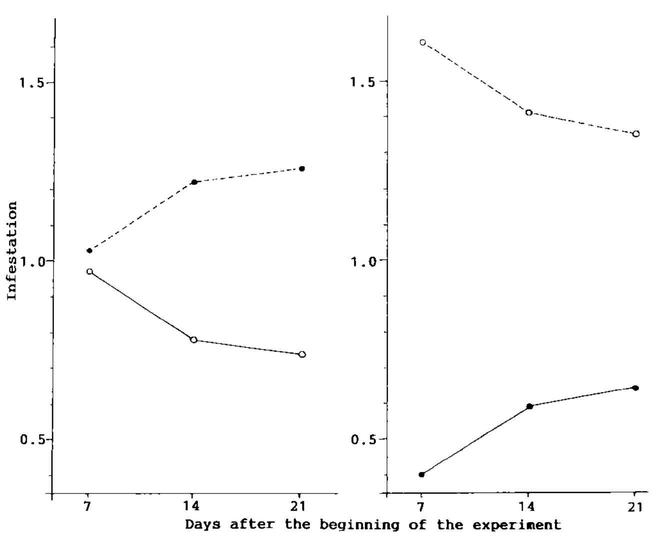

Figure 3 : Evolution of the mean infestation of the L (•) and H (o) groups, grazing on paddock A (-) or B (--), during the first (left) and second (right) phases. The infestation of each animal is expressed by the ratio between the individual tick burden and the mean infestation of the 6 zebus.

TABLE V **Amblyomma variegatum** *adults infestation (infestation degree — ID — calculated in comparison with the mean infestation of the 6 animals) observed 7, 14 and 21 days after the beginning of the experiment in the group H and L, containing respectively high ID bulls and low ID ones. The herds grazed in rotation on all the paddocks.*

Animals		Infestation by *Amblyomma variegatum* adults		
		D7	D14	D21
Group H	10	18 (1.17)	40 (1.17)	40 (0.92)
	19	18 (1.17)	48 (1.40)	51 (1.18)
	29	18 (1.17)	37 (1.08)	47 (1.08)
Group L	13	12 (0.78)	22 (0.64)	40 (0.92)
	15	17 (1.11)	36 (1.05)	48 (1.11)
	16	9 (0.59)	22 (0.64)	34 (0.78)
Means comparison		p = 0.084	p = 0.058	p > 0.10

The infestation of group L, which always contained the low ID animals, remained lower than that of group H. Because of the small number of animals involved, the difference between the mean infestation of the two groups is significant only when the standard deviations of the means are low. In the second trial for example (table VI), the difference between the groups was higher at D31 than at D28, but it was less significant because of the higher standard deviation.

The difference between the mean infestation of the two groups is lower than that observed when the animals were held in the same herd. Thus, the mean IDs observed during the last trial (table VII) were 1.30 for group H and 0.70 for group L, although they were respectively 1.55 and 0.39 when the animals were together in herd G. The same observation was made with the males involved in the other trials.

Retour au menu

TABLE VI **Amblyomma variegatum** *adults infestation (infestation degree — ID — calculated in comparison with the mean infestation of the 4 animals) observed during the course of the experiment in the group H and L, containing respectively high ID bulls and low ID ones. The herds grazed in rotation on all the paddocks.*

Animals		Infestation by *Amblyomma variegatum* adults								
		D6	D9	D12	D15	D18	D21	D25	D28	D31
Group H	19 29	59 44	76 80	106 92	122 108	139 134	142 144	161 157	159 160	182 160
Group L	13 16	24 35	49 48	74 86	98 100	92 112	114 120	118 124	126 128	118 124
Means comparison		p > 0.10	p = 0.003	p > 0.10	p > 0.10	p = 0.078	p = 0.011	p = 0.006	p < 0.001	p = 0.046

TABLE VII **Amblyomma variegatum** *adults infestation (infestation degree — ID — calculated with the mean infestation of the 6 animals) observed during the course of the experiment in the group H and L, containing respectively high ID heifers and low ID ones. The herds grazed in rotation on all the paddocks.*

Animals		Infestation by *Amblyomma variegatum* adults						
		D6	D12	D18	D21	D24	D28	D31
Group H	60 72 78	5 6 3	15 14 7	16 17 12	17 19 18	20 22 24	23 24 27	24 25 24
Group L	59 68 76	2 1 3	3 4 3	10 8 7	11 10 14	17 10 18	16 13 22	15 11 18
Means comparison		p = 0.060	p = 0.027	p = 0.018	p = 0.009	p = 0.066	p = 0.058	p = 0.009

There was a tendency, as illustrated in figure 4, for the difference between the mean IDs of the two groups to decrease during the course of the experiment. This difference was always higher during the first two weeks of the trials than during the subsequent weeks.

DISCUSSION

Because of the sometimes very variable pasture tick burden, it is impossible to directly compare the infestation levels of animals kept in various herds on different pastures. The use of the infestation degree (ID) allows such a comparison, although it is certainly not a perfect criterion, because there is no proof that the mean infestation of different herds would reach the same level on the same pasture. However, this criterion allows the identification of lightly and highly infested animals.

The variability of the infestation between animals was very high in some herds and very limited in others. The percentage of the herds carrying half of the tick population (30 %) was higher than the 25 % observed in Uganda by KAISER *et al.* (4) with the same tick species (*A. variegatum*). Nevertheless, the ID range was very large, several zebus harbouring at least 10 times more ticks than their partners, and the ratio between the two extreme IDs being 26. As soon as the variability of the individual infestation in a herd is high enough, correlations between infestation ranks and infestation degrees were observed between successive tick counts. The absence of correlation in herd J is thus in relation with the low differences observed between the individual infestations in that herd: the ratio between the two extreme IDs was only 2.1, and half of the tick population was found on 42 % of the herd.

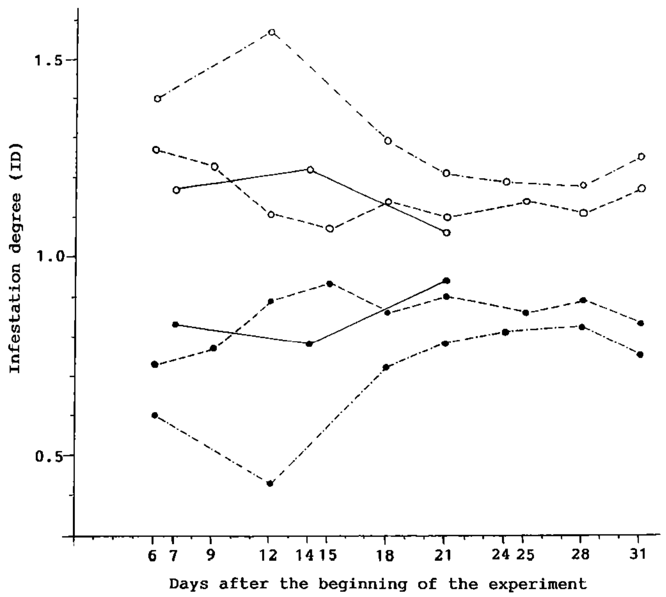

Figure 4 : Evolution of the mean degree (ID) of the L (•) and H (o) groups during the first (-), second (--) and third (-.-.-.) trials, realized following the modified protocol, the herds grazing on all the pastures in rotation.

These observations (great variability of the individual infestations and consistency of the infestation levels) are favourable for the possibility of a selection procedure to be undertaken, as already stated by KAISER *et al.* (4), PEGRAM *et al.* (10) and SPICKETT *et al.* (11). However, the consistency in infestation hierarchy observed in the present experiments may be explained by other reasons.

Tick counts were actually always done after an acaricidal treament. Although the active components were various (amitraz and pyrethroids like flumethrin, deltamethrin, cypermethrin), it is possible that the residual effect of those acaricides may be more important on certain skin types, *i.e.* on certain animals, which may have always carried fewer ticks.

Similarly, since the trials followed one another rapidly, it is possible that the pheromone produced by male *A. variegatum* attached during a trial, may be still present when the next trial started. Assuming that the attractive power of the pheromone depends on its quantity, this could explain why the most infested animals were always the same.

A third reason could be the cause of the persistence of the infestation hierarchy. NEWSON *et al.* (6) observed that the hierarchical position of an animal in a herd, in particular during grazing, influenced the number of *Rhipicephalus appendiculatus* that it carried, cattle being in the front of the herd harbouring the most ticks. The same may be true of *A. variegatum*. In that case, after the removal of the most infested zebus, other animals would graze at the front of the herd and would be in turn the most infested. The selection of the lightly parasitized animals would then be useless.

To examine these possibilities, experiments involving a group of low ID animals and a group of high ID ones were designed. Because of the 14 days preparation that the animals under-went, they were free of pheromone and of acaricide when put into the paddocks. Since they grazed on different pastures, there was no competition between the two groups, and the eventual previous hierarchical positions in the herd were modified. With these precautions, it was observed that the low ID group remained less infested than the high ID one.

But, during the experiments carried out with the two groups of three bulls, it was observed that, in group L, it was always the same animal (n°15) which harboured the highest number of ticks (tables IV and V). It was even more infested than animals of H group on certain occasions. This animal certainly had the highest initial ID of the three low ID animals. Nevertheless, the fact that it behaved like a high ID animal, after the removal of the latter, indicates that there may be an environmental component (or behavioural) to the infestation level of the animals. It also could lead one to think that the selection of lightly infested animals would not entail a great decrease of the herd infestation. Nevertheless, after the removal of that bull (table VI) and during the last trial (table VII), the infestation of L animals remained lower, showing that the infestation level also has an innate component.

It seemed that the low ID cattle were more able to limit their infestation, even on a very infested paddock, at the beginning of the experiments, and that this possibility decreased after the fixation of the first *A. variegatum* males. Once these latter produce the aggregation-attachment pheromone, low ID cattle seemed to be less able to avoid the fixation of further ticks. For this reason, the most infested cattle, those with a high ID, are called “attractive for *Amblyomma variegatum*”, and the others, with a low ID, “non-attractive for *A. variegatum*”.

The difference between the infestation of L and H groups was less important than that observed when the animals grazed together. But the higher the difference between the IDs of animals when they were in the same herd, the higher it remained when the animals were kept separately. For this reason, and despite the above reservations, selection of cattle “non-attractive for *A. variegatum*” should be useful for tick control.

CONCLUSION

It was shown that the cattle “non-attractive for *A. variegatum*” remained less infested than the “attractive” ones when they grazed separately. The difference between the infestation of the two groups was, however, lower than that observed when the animals grazed together. In addition, the ability of the "non-attractive" cattle to limit their infestation decreased during the course of the experiments. For these reasons, a tick control programme could probably not be based exclusively on the selection of such "non-attractive" cattle. Nevertheless, their selection and their breeding could be part of a tick control strategy. For example, the slower reinfestation of such zebus after acaricidal treatment would allow the increase of the interval between treatments, and would lead to less expensive tick control. In addition, it was observed during all these studies (unpublished data) that the "non-attractive" animals are less often affected by dermatophilosis lesions. Their selection would thus facilitate the control of this important disease.

But, before such a selection programme can be implemented, a last point has to be explored. Is the "non-attractivity for *Amblyomma variegatum*" a hereditary characteristic ? A study involving some of the low ID and high ID reproductive cows and bulls mentioned above has just started, and an answer to that question is expected in 1994.

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STACHURSKI (F.). Variability of cattle infestation by *Amblyomma variegatum* and its possible utilisation for tick control. *Revue Élev. Méd. vét. Pays trop.*, 1993, **46** (1-2) : 341-348

A great variability of the individual infestation by *Amblyomma variegatum* adults was observed on naturally infested Gudali zebus. Some of the animals (called "attractive for *A. variegatum*") had a tick burden 10 to 16 times higher than that of the least parasitized cattle of the herd (called "non-attractive"). Ranking of the animals based on *A. variegatum* infestation was correlated for successive tick counts. Experiments were designed to determine if the "non-attractive" cattle remained lightly infested when the "attractive" ones are removed from the herd. When these two types of cattle grazed separately, it was observed that the "non-attractive" animals had a lower tick burden and that their infestation occurred more slowly than that of the "attractive" ones. The difference between the two groups was nevertheless smaller than that existing when the animals were in the same herd. The selection of the "non-attractive" cattle, on which a tick control programme should not exclusively be based, could however be used as a component of a tick control strategy, if this characteristic is hereditary. An experiment in progress will study the question.

Key words : Cattle - Gudali zebu cattle - Tick - *Amblyomma variegatum* - Infestation - Tick control - Cameroon.

STACHURSKI (F.). Variabilidad de la infestación del ganado con *Amblyomma variegatum* y su posible utilización para el control de garrapatas. *Revue Élev. Méd. vét. Pays trop.*, 1993, **46** (1-2) : 341-348

Se observó una gran variabilidad en cuanto a la infestación individual con adultos de *Amblyomma variegatum* en cebués Gudali infestados en forma natural. Algunos de los animales (llamados "atractivos para *A. variegatum*") presentaron una carga parasitaria 10 a 16 veces superior que la de los animales de menor parasitosis en el hato (llamados "no atractivos"). Se encontró una correlación entre la clasificación de los animales, basada en la infestación con *A. variegatum* y los números sucesivos de garrapatas. Los experimentos se diseñaron para determinar si el ganado "no atractivo" permaneció ligeramente infestado cuando aquellos animales "atractivos" fueron eliminados del hato. Cuando estos dos grupos de animales estuvieron en grupos de pastoreo separados, se observó que los animales no atractivos presentaron una carga parasitaria menor y que la infestación se dió más lentamente que en los animales atractivos. Sin embargo, la diferencia entre estos dos grupos fue menor que la existente cuando estos se encontraban reunidos en un solo grupo de pastoreo. La selección del ganado no atractivo, para el cual no es necesario poner en marcha un programa específico de control de garrapatas, podría sin embargo utilizarse como una estrategia de control, siempre y cuando esta característica sea hereditaria. Este punto se estudia actualmente en otro proyecto.

Palabras claves : Bovino - Cebú Gudali - Garrapata - *Amblyomma variegatum* - Infestación - Control de garrapata - Camerún.