

# Studies on ticks of veterinary importance in Nigeria XV — An attempt to control tick infestation on a herd of cattle grazed on tick infested pasture through acaricide treatment alone

par O. O. DIPEOLU

Department of Veterinary Microbiology and Parasitology, University of Ibadan, Ibadan, Nigeria.

## RÉSUMÉ

**Etudes sur les tiques d'importance vétérinaire au Nigéria  
XV : Essai d'éradication des tiques par un seul traitement acaricide  
sur un troupeau de bovins entretenus sur pâturage infesté**

Des bovins ont été mis au pâturage sur des parcelles infestées expérimentalement par *Amblyomma variegatum*, *Boophilus decoloratus*, *B. geigy*, *Hyalomma rufipes* et *H. truncatum* entre janvier et décembre 1980 et chaque jour de janvier 1981 à décembre 1982. Ils ont été douchés avec de l'Asuntol, à la dose officiellement recommandée, pendant cette période. Les tiques ont été recueillies sur les animaux une fois par semaine ; les tiques libres ont été ramassées sur la végétation à la couverture. Malgré le douchage, des larves, des nymphes et des adultes de toutes les espèces de tiques ont été observées en grand nombre sur le pâturage de 1981 à 1982 ; l'infestation maximale survenant durant la saison sèche. En conclusion, le fait que l'Asuntol n'ait pas réussi à éliminer les tiques n'était pas dû à son inefficacité mais à la reconstitution de la population de tiques sur les parcelles. Un plan de lutte intégrée contre les tiques devrait permettre d'utiliser en complément d'autres méthodes adéquates de lutte.

*Mots clés* : Tiques — Acaricide — Nigéria.

DIPEOLU (O. O.). — Studies on ticks of veterinary importance in Nigeria. XV : An attempt to control tick infestation on a herd of cattle grazed on tick infested pasture through acaricide treatment alone. *Rev. Elev. Méd. vét. Pays trop.*, 1983, 36 (4) : 379-385.

**Summary.** — Cattle were grazed on plots of pasture which had been experimentally infested with *Amblyomma variegatum*, *Boophilus decoloratus*, *B. geigy*, *Hyalomma rufipes* and *H. truncatus* between January and December 1980 and grazed daily from January 1981 to December 1982. The cattle were sprayed with Asuntol<sup>(R)</sup> during the period of grazing using the officially recommended dosage regime. Ticks found on the animals were detached once a week ; by means of tick drag, ticks were sampled on the vegetation once a week. In spite of the spraying, larvae, nymphs and adults of all the tick species were found on the animals and on the pasture in large numbers throughout 1981 and 1982 ; the peak infestation occurred during the dry season. It was concluded that the inability of Asuntol<sup>(R)</sup> to control ticks on the animals was not due to inefficacy of the acaricide but to the rapid build-up of the tick population on the pasture plots. An integrated tick control policy which will allow the use of other suitable control methods to supplement the application of an acaricide is recommended.

*Key words* : Ticks — Acaricide — Nigeria.

## INTRODUCTION

In Nigeria, it has been established that tick infestation of livestock is endemic; large numbers of many tick species have been collected from different domestic animals on various occasions (29, 33, 24, 25, 26, 27, 31, 22, 30, 23, 1, 2, 3, 28). Because of the economic losses sustained in the livestock sector through the effects of tick infestation, tick control continues to be a major pre-occupation of veterinarians in the country. The official tick control policy is acaricide spraying or dipping of livestock once a week during the rains and once a fortnight during the dry season. There have been arguments among veterinary scientists for and against the sole dependence on acaricide treatment in a country like Nigeria where the climatic factors allow rapid build-up of ticks on pastures, especially during the rains (6, 7, 8). There has been, so far, no published work to show that the official spraying or dipping regime cannot cope with the rate of reinfestation of the animals with ticks on the pasture. In this paper, the results of an attempt to reduce to a controllable level the tick infestation of cattle grazed on tick infested pasture plots by the use of an acaricide alone are presented.

## MATERIALS AND METHODS

Between January and December 1980, an experimental tick-infested grazing field was created within the Teaching and Research Farm of the University of Ibadan by collecting fully engorged ticks from the trade cattle in the abattoir and spreading them on the field. The grazing field, which was tick-free divided into six plots 20 × 10 metres with an artificial gutter of about 30 cm depth separating them from one another. Each plot received engorged ticks of one species only, either *A. variegatum*, *B. decoloratus*, *B. geigy*, *H. rufipes* or *H. truncatum*. The sixth plot received no ticks and served as control. Because the seasonal abundance of the ticks varied, it was not possible to control the number of engorged ticks introduced into each plot weekly, but the total number of ticks introduced into each plot did not exceed 500 per month.

From January to December of 1980, cattle were allowed to graze almost daily on the

experimental plots. Three head of cattle were devoted to each plot, and it was made sure that the same cattle grazed the same plot throughout the year. Although ticks were noticed on the cattle by the middle of February 1980, no attempt was made to spray the animals or to remove the ticks manually. As from the beginning of the dry season of 1980, in November, a new set of three head of cattle were allowed to graze each plot and, as before, the same cattle grazed the same plot until December 1981. Between January and December 1982, when the experiment was terminated, another set of three head of cattle were allowed to graze on each plot. Also, from November 1980 to December 1982, the cattle were sprayed with Asuntol<sup>(R)</sup> at recommended dosis (Remedia Veterinaria, Bayer), using mechanical spray once a fortnight during the dry season (November, December, January, February) and once a week during the rains (March-October). The animals were thoroughly examined for ticks once a week and all ticks found were preserved in 10 p. 100 formalin until their stages of development were ascertained in the laboratory. Spraying was conducted on a Saturday while the examination of the body of animals took place a day later (Sunday) of each week.

At the same time as the cattle were being sprayed with Asuntol (November 1980 to December 1982) sampling of the plots for estimation of ticks on the pasture was conducted. This was carried out with a tick drag in which a white flannelette sheet (2 × 6 m) was dragged at a slow walking pace over the grass surfaces, dislodging and collecting some of the ticks resting on the leaf tips. The plots were sampled once a week between 13.00 and 14.00 hours. The numbers of ticks collected on the sheet were counted and removed and their developmental stages ascertained.

## RESULTS

In spite of strict adherence to the spraying regime, ticks were found in substantial numbers both on the grazing animals and on the infested pasture. No ticks were found on the animals which grazed the uninfested pasture and no ticks were collected on the pasture.

**Ticks on Cattle.** Fig. 1 shows the number of ticks collected on the body of cattle from November 1980 to December 1981 and their relationship to temperature, rainfall and relative humidity. Larvae of *A. variegatum*, *B. decoloratus* and *H. truncatum* showed peaks in the dry months ; while the peaks of *A. variegatum* and *H. truncatum* were confined to November and December, that of *B. decoloratus* was prolonged until the beginning of rains in February. Larvae of

*B. geigy* and *H. rufipes* showed peaks during the rains. While the larvae of *B. geigy* exhibited peaks during the peak of rains from June to September, those of *H. rufipes* had their peaks extended from the early rains in March. The number of larvae of this species on cattle fell again until the late rain in October when it showed another peak.

The nymphs of *A. variegatum* and *H. rufipes* showed peaks during the early

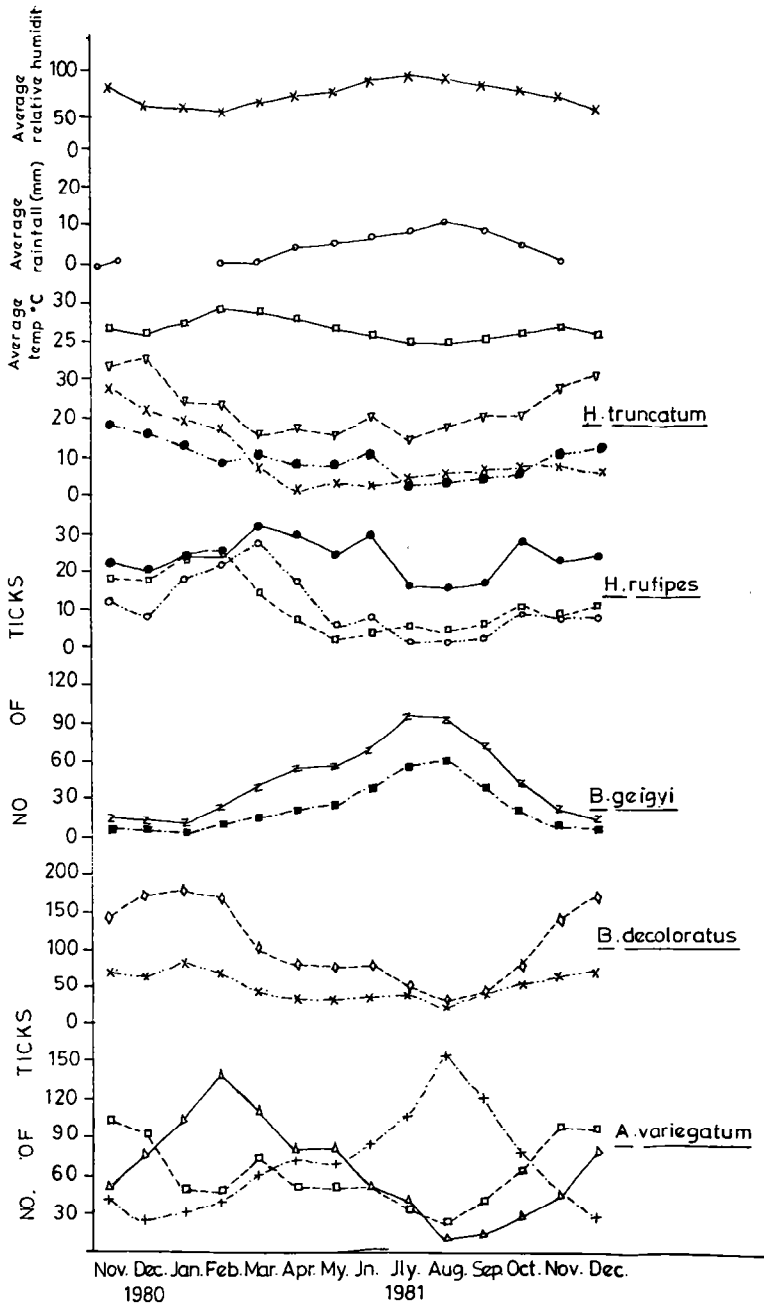


Figure 1.

rains ; the numbers fell gradually until they became lowest in August and September. For *H. truncatum*, the peak number found on cattle was during the dry month of November and the number decreased progressively to reach its lowest in July. Adults of *A. variegatum* and *B. geigy* had peak numbers during the heavy rains of August and were in general higher during the rainy than during the dry season. Adults of *B. decoloratus* and *H. rufipes*, on the other hand, were collected in peak numbers on cattle at the end of dry season and the beginning of rains, while their numbers were relatively low during the wet season. The number of adults of *H. truncatum* collected on cattle were most numerous during the dry month of November and decreased progressively at the beginning of rains until the high rains when it became very low. The tick density on the body of the experimental animals from January to December 1982 was very similar to that of 1981. There was no appreciable reduction in the number of ticks infesting the animals in 1982. The seasonal variation of the occurrence of adults, nymphs and larvae of each tick species on the animal was very similar to what is presented for 1981 (Fig. 1).

*Ticks on Pasture.* Fig. 2 shows the population density of different stages of ticks on the grazing plots. The larvae of *A. variegatum* showed peaks during the dry months of December 1980 to February 1981. The population fell sharply and reached a minimum in August 1981. Similarly, the nymphs were collected in large numbers during the dry months and reached their peak during the early rains of March 1981. The lowest population was also found in August during the peak of rains. The adults, on the other hand, had a high population during the heavy rains of July to October, with a peak in September. Because the adults of *Boophilus* species found on pastures were very few, their numbers were not shown in Fig. 2. Larval population of *B. decoloratus* was highest during the dry season (December and January) and the numbers decreased progressively until the lowest population was reached in August. The larval population of *B. geigy*, on the other hand, was highest during the rains and reached a peak in May. Its population in the dry season was low. Compared with other species, very small numbers of some stages, especially nymphs and adults, of *H. rufipes* and

*H. truncatum* were found on the plots. The density of larvae of both *Hyalomma* species was similar to that of *A. variegatum* except that the peak of larval population of *H. truncatum* was prolonged from January to March, whereas that of *H. rufipes* was only in February. Results very similar to Fig. 2 were obtained during the pasture sampling of January to December, 1982.

## DISCUSSION

The results of this investigation show that acaricide treatment alone cannot reduce the tick population on animals and pasture to levels low enough to control the infestation. In spite of applying spray according to the officially recommended regime, large numbers of immature and adult ticks were found on the animals and on the pasture for two consecutive years. This was not due to the inefficacy of Asuntol<sup>(R)</sup> in killing ticks ; indeed, this acaricide was recently found to be one of the most efficient of those being marketed in Nigeria and there has been so far no indication of development of resistance to it by ticks in any part of Nigeria (10). The probable reason for failure was the very rapid build-up of ticks on the vegetation because of their high fecundity (21, 8, 11, 15) under the favourable tropical climatic conditions which ensure multiple generations of ticks per annum, the massive hatching of eggs and the rapid development of immature stages (6, 7), the all-year-round activity (8), and the availability of dispersal hosts through the trade cattle (1). All these factors cause the massive tick populations characteristic of Nigeria ; even an acaricide as efficient as Asuntol<sup>(R)</sup> cannot cope with their control if used without supplementation by other methods. Indeed the officially recommended regime of acaricide application itself works against successful acaricide control in Nigeria. The recommendation to spray once a week during the rains and once per fortnight during the dry season was based on the observation that engorged adult ticks are most numerous on animals during the rainy season. However, an examination of Fig. 1 shows that ticks, especially the immature stages, are in fact most abundant on cattle during the dry season ; it is their smaller size which conceals them between the hairs of

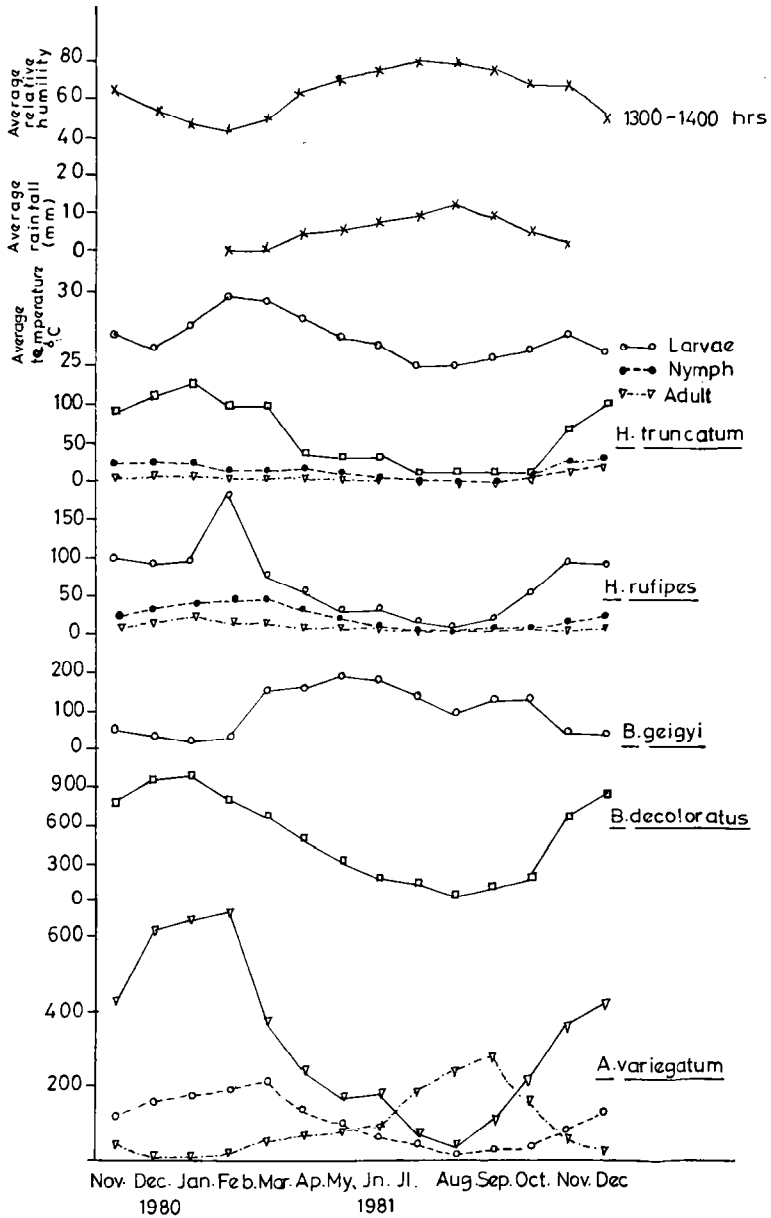


Figure 2.

the coat until they engorge and drop. With the decreased frequency of dipping and spraying in the dry season, the tick numbers are too large to be dealt with by the acaricides alone. Since it has been shown that there is a correlation between tick activity on the animals and on the pasture on which they are graze (8), the pasture continues to be the reservoir of ticks and the tick numbers on it are relatively unaffected by the insignificant number of ticks killed by the acaricide on the grazing animals.

For the successful control of livestock ticks in Nigeria, an integrated method should be adopted as has been suggested (5). Such a tick control method involves the use of several procedures of which acaricide treatment is only one. Integrated methods require a full knowledge of the biology and ecology of ticks to provide information which can be used to formulate an integrated tick control policy for ticks on livestock in Nigeria (18, 20, 19, 21, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17).

DIPEOLU (O. O.). — Estudios sobre las garrapatas de importancia veterinaria en Nigeria. XV. Ensayo de lucha contra las garrapatas por un solo tratamiento acaricida en bovinos mantenidos sobre pasto infestado. *Rev. Elev. Méd. vét. Pays trop.*, 1983, **36** (4) : 379-385.

**Resumen.** — Bovinos fueron mantenidos al pastoreo sobre parcelas infestadas experimentalmente por *Amblyomma variegatum*, *Boophilus decoloratus*, *B. geigy*, *Hyalomma rufipes* y *H. truncatum* entre enero y diciembre de 1980 y cada día de enero de 1981 a diciembre de 1982. Fueron duchados con Asuntol, a la dosis oficialmente recomendada, durante este periodo. Se recogieron las garrapatas sobre los animales una vez por semana ; y las garrapatas libres sobre la vegetación con el método del trazo. A pesar de la aspersión, se observaron larvas, ninfas y adultos de todas las especies en gran número sobre el pasto de 1981 a 1982 ; ocurriendo la infestación máxima durante la estación seca. En conclusión, el mal éxito del Asuntol para eliminar las garrapatas no fué causado por su ineficacia sino por la reconstitución rápida de la población de garrapatas sobre las parcelas. Un plan de lucha integrada debería permitir la utilización complementaria de otros métodos adecuados de lucha.

**Palabras claves :** Garrapatas — Acaricido — Nigeria.

#### REFERENCES

- DIPEOLU (O. O.). Survey of tick infestation in the trade cattle and sheep and goats in Nigeria. *Bull. anim. Hlth. Prod. Afr.*, 1975, **23** (2) : 165-172.
- DIPEOLU (O. O.). The incidence of ticks of *Boophilus* species on cattle, sheep and goats in Nigeria. *Trop. anim. Hlth. Prod.*, 1975, **7** ; 35-39.
- DIPEOLU (O. O.). A survey of the ectoparasitic infestations of dogs in Nigeria. *J. sm. Anim. Pract.*, 1975, **16** : 123-129.
- DIPEOLU (O. O.). Ectoparasites of local pigs in Western Nigeria. *Niger. J. anim. Prod.*, 1975, **2** : 222-226.
- DIPEOLU (O. O.). The need for the adoption of integrated control system to tick control in Nigeria. Proc. nat. Symposium on control of ticks and tick-borne diseases in Nigeria, 1981.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. XII. The oviposition of adult ticks and eclosion of their eggs in natural environment. *Environm. Ent.*, 1982.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. XIII. The development of ixodid ticks under natural conditions in Nigeria. *Trop. anim. Hlth. Prod.*, 1982.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. XIV. Seasonal variation in the population of ticks on experimentally and naturally infested pastures in the forest zone of Nigeria. *Ecol. Ent.*, 1982, **7**.
- DIPEOLU (O. O.). Survey of resistance of ticks of livestock to acaricides commonly marketed in Nigeria. Federal Livestock of Nigeria Publications, 1982, 150 p.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. VII. The comparison of some aspects of bionomics of *Boophilus decoloratus* and *Boophilus geigy*. *J. med. Ent.*, 1982.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. VI. Comparative Notes on the biology of *Hyalomma* species. *Vet. Parasitol.*, 1982.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. IV. Microscopic observations on embryonic development of eggs of some ticks. *Insect. Sci. Appl.*, 1982, **3** (2-3) : 219-226.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. V. The size, hatching patterns and mortality rate of eggs of *Amblyomma variegatum* (Fabricius, 1794). *Insect. Sci. Appl.*, 1982, **3** (2-3) : 227-231.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. IX. The size changes of adult ticks during engorgement and oviposition. *Bull. anim. Hlth. Prod. Afr.*, 1982, **30**.
- DIPEOLU (O. O.). Studies on ticks of veterinary importance in Nigeria. X. Notes on the biology of ticks of dogs. *Rhipicephalus sanguineus sanguineus* and *Haemaphysalis leachi leachi*. *Bull. anim. Hlth. Prod. Afr.*, 1982, **30**.
- DIPEOLU (O. O.) and ADEYEFA (C. A. O.). Studies on Ticks of Veterinary Importance in Nigeria. VIII. Differences observed in the biology of ticks which fed on different animal hosts. *Fol. Parasit.*, 1982, **29**.
- DIPEOLU (O. O.) and AKINBOADE (O. A.). Studies on ticks of veterinary importance in Nigeria. XI. Observations on the biology of ticks detached from red-flanked duiker (*Cephanophus rufulatus*) and notes on parasites encountered in the blood of the animals. *Vet. Parasit.*, 1982, **11**.
- DIPEOLU (O. O.) and OGUNJI (F. O.). Studies on ticks of veterinary importance. I. On the development of the ixodid ticks *Amblyomma variegatum* Fabricius 1794 and *Hyalomma rufipes* Koch, 1844 under quasi natural conditions in Nigeria. *J. Pharm. med. Sci.*, 1977, **1** (6) : 245-248.
- DIPEOLU (O. O.) and OGUNJI (F. O.). Studies on ticks of veterinary importance in Nigeria. II. Laboratory studies on the oviposition and eclosion patterns of *Amblyomma variegatum* in relation to their state of engorgement and maintenance temperature. *Bull. anim. Prod. Afr.*, 1980, **28** (4) : 260-280.
- DIPEOLU (O. O.) and OGUNJI (F. O.). Studies on ticks of veterinary importance in Nigeria. III. The changes in the blood picture of sheep experimentally infested with the ticks *Amblyomma variegatum* and *Hyalomma rufipes*. *Bull. Anim. Hlth. Prod. Afr.*, 1977, **25** (1) : 25-32.
- DIPEOLU (O. O.) and OGUNJI (F. O.). Laboratory

- studies on factors influencing the oviposition and eclosion patterns of *Amblyomma variegatum* (Fabricius, 1794) females. *Fol. Parasit.*, 1980 **27** (3) : 257-264.
22. GAMBLES (R. M.). Tick survey. Rep. Vet. Dept. Nigeria, 1950-51, p. 39.
  23. IKEME (M. M.). *Haemaphysalis hoodi hoodi* (Warbuton and Nuttall, 1909) on domestic chickens in Eastern Nigeria. *Vet. Rec.*, 1972, **90** (2), 33.
  24. JOHNSTON (J. E. L.). A summary of an entomological survey of Kaduna District, Northern Nigeria. *Bull. ent. Res.*, 1916, **7** (1) : 19-28.
  25. METTAM (R. W. M.). Annual Report of the Veterinary Laboratory. Rep. Vet. Dept. Nigeria, 1947 : 12-20.
  26. METTAM (R. W. M.). Annual Report of the Veterinary laboratory. *Ibid.*, 1948 : 15-24.
  27. METTAM (R. W. M.). Annual Report of the Veterinary Laboratory. *Ibid.*, 1952 : 32-36.
  28. MOHAMMED (A. N.). The seasonal incidence of Ixodid ticks of cattle in Northern Nigeria with particular reference to their role in the transmission of bovine piroplasms. Ph. D. Thesis. Ahmadu Bello University, 1974.
  29. NEUMANN (L. G.). Revision de la Famille des Ixodides. 1<sup>er</sup> mémoire, Argasines. *Mém. Soc. Zool. Fr.*, 1899, **12** : 107-294.
  30. STRICKLAND (K. L.). Studies on the ticks of domestic animals of Northern Nigeria : A preliminary to disease investigation. M. Sci. Thesis ; Dublin, Trinity College, 1961.
  31. UNSWORTH (K.). Sub-Division of Parasitology. Rep. Vet. Dept. Nigeria, 1949 : 71-72.
  32. UNSWORTH (K.). The ixodid parasites of cattle in Nigeria with particular reference to the Northern territories. *Ann. trop. Med. Parasit.*, 1952, **46** : 331-336.
  33. ZIEMANN (H.). Beitrag zur Verbreitung der blutsaugenden Tiere in West Afrika ; *Arch. Schiffsh. Tropenhyg.*, 1905, **9**, 114-119.