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A SURVEY OF SMALL STOCK TICK CONTROL PRACTICES IN THE EASTERN CAPE PROVINCE OF SOUTH AFRICA

A. M. SPICKETT[1] and B. H. FIVAZ[2]

ABSTRACT

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Current small stock tick control practices and producer attitudes towards tick control in the eastern Cape Province of South Africa are discussed. These were ascertained from returns to a questionnaire survey to which 31,2 % of farmers polled, responded.

In general, producers did not favour an intensive tick control policy for small stock. Angora, mutton and wool farmers had a definite preference for synthetic pyrethroid acaricides, the majority treating either less than 6 times p.a. or between 11–15 times p.a. Most producers changed acaricides because of price. All small stock producers favoured plunge dip application of acaricides while the majority of wool sheep and Angora producers utilized footbath application as a second preference. Mutton producers favoured pour-on and hand spray application as a second choice.

Producers who used plunge dip application techniques experienced the highest percentage of confirmed acaricide resistance which is in accordance with application preference. The general incidence of confirmed acaricide resistance, however, was of a low order but highest amongst mutton farmers. An average cost for acaricide treatment of R1,65 per small stock unit p.a. was calculated from data gained in this survey.

Only a small number of producers used the available heartwater vaccine. Small stock mortalities experienced by producers per production unit indicated higher mortalities at high acaricidal treatment frequencies. Farmers allowing a small number of ticks to infest their sheep experienced fewer mortalities due to heartwater than those than kept their sheep free of ticks. Angora goat farmers experienced the same, but with higher mortalities, probably due to the apparently high susceptibility of Angora goats to heartwater.

INTRODUCTION

The cost effectiveness and socio-economic and environmental desirability of intensive acaricidal treatments to control ticks and tick borne diseases has for some time been the subject of debate (Norval, 1981; Sutherst, 1981). A policy of integrated tick control, based on host resistance combined with strategic acaricidal treatments and appropriate immunisation, suited to local conditions, has been postulated as a viable alternative. The latter policy has, however, suffered the drawback of inadequate empirical data on most aspects essential for its practical utilization (Norval, Sutherst, Kurki, Gibson & Kerr, 1988). Recent research has confirmed the tick resistance potential of South African indigenous and other cattle breeds (Spickett, De Klerk, Enslin & Scholtz, 1989; Rechav, Dauth & Els, 1990; Rechav & Kostrzewski, 1991), but little quantitative data is available for small stock (Adamson, Fivaz & Petney, 1991). Research has also provided some data on the economic implications of the utilization of host resistance (Scholtz, Spickett, Lombard & Enslin, 1991; Norval *et al.*, 1988; Norval, Sutherst, Jorgenson, Gibson & Kerr, 1988). However, an aspect requiring attention is that of current tick control practices in specific regions, the effectiveness of these practices and the attitudes of producers to tick control in general.

This paper discusses the results of a questionnaire survey conducted amongst a relatively small but geoclimatically well defined sector of small stock producers in South Africa and attempts to relate specific farm management procedures and tick control practices to economic and disease control parameters.

MATERIALS AND METHODS

The survey questionnaire, soliciting direct and multiple choice answers, assessments or judgements and personal opinions, was similarly designed to one used in Australia (Elder, 1979). That survey was conducted prior to major efforts aimed at introducing tick management on an economic basis primarily through the use of tick resistant animals. Of necessity many questions in our survey were adapted from the Australian one to suit local conditions, while others were unique to South Africa.

Direct questions established the name, locality and size of the property as well as the type of farming practised. Some direct questions were purposely inserted in order to confirm or reject answers to differently phrased multiple choice questions on the same subject. Multiple choice questions were aimed at establishing:

(1) the extent and cost of tick control as regards type of acaricide used; application technique and frequency of application;

(2) the extent of immunisation procedures against tick borne disease;

(3) the extent of tick borne disease mortalities in relation to treatment procedures practised;

(4) the extent of, and producer attitudes towards acaricide resistance.

Direct estimates on the extent of tick borne disease supplied by producers do not necessarily imply that all cases were clinically confirmed, but many producers included diagnoses made by pri-

[1] Onderstepoort Veterinary Institute, Onderstepoort 0110

[2] Tick Research Unit, Department of Zoology and Entomology, Rhodes University, Box 94, Grahamstown 6104, Republic of South Africa

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vate or state veterinarians. Answers to questions on the extent of confirmed acaricide resistance mainly reflect the results of tests conducted for the benefit of producers by chemical companies, usually when the field efficacy of an acaricide was under suspicion.

Questions requiring assessments/judgements were used to confirm multiple choice answers and to ascertain management regimes and producer attitudes towards tick control and tick borne disease vaccination procedures.

A total of 1 000 questionnaires were dispatched to members of the Bathurst, Albany and Alexandria farmer's Associations, through the Tick Research Unit, Grahamstown. The area surveyed is classified as Valley Bushveld interspersed with Eastern Province Thornveld (Acocks, 1975) with non-seasonal rainfall, the majority of which occurs during the spring and summer months. Animals farmed in the region are subject to a high level of challenge with most of the economically important tick species encountered in South Africa (Rechav, 1982; Horak & Knight, 1986; Petney & Horak, 1987).

The 312 returns received were entered onto database and analyzed on a relative percentage basis. The analyses included producer practices for both cattle and small stock. This paper reports on the tick control practices of small stock producers in this region.

RESULTS AND DISCUSSION

Sample Size

Results are based on a 31,2 % return of questionnaires from stock producers in the Bathurst, Albany and Alexandria districts of the eastern Cape Province.

Type of stock farming

Most producers in the region ranch beef cattle with dairy cattle of second choice. Other major stock farmed in the region surveyed, in order of producer preference are mutton sheep, mostly Dorper; Angora goats; Boer goats and wool sheep, mainly Merino (Table 1).

TABLE 1 Relative percentage of producers farming the different types of small stock and the relative percentage of each type in the eastern Cape Province

Small stock type	Percentage of producers	Relative percentage in region
Dorper sheep	34,3	15
Angora goats	26,2	42
Boer goats	20,7	7
Merino sheep	18,8	36

Mixed stock farming is common in the region and 26 % of beef producers and 45 % of dairy producers utilize cattle as the major component in combination with small stock. However, 7 % of producers farm mutton sheep exclusively, other mutton farmers showing a distinct preference to combine beef cattle with mutton sheep farming (Fig. 1). Angora producers (Fig. 2) show preferences for Angora/mutton and Angora/wool combinations and only 2 % of producers farm Angora goats exclusively. No wool producers farm wool sheep alone, the majority showing a preference for wool/Angora and wool/beef mixed farming (Fig. 3).

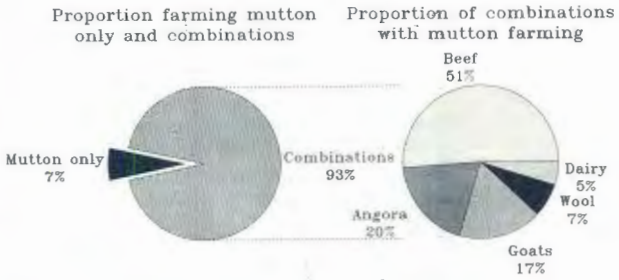


FIG. 1 The proportion of producers (%) farming mutton sheep only and those combining mutton sheep with other stock and the relative proportion of these combinations in the eastern Cape Province

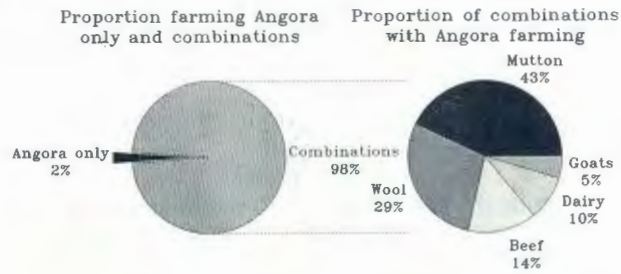


FIG. 2 The proportion of producers (%) farming Angora goats only and those combining Angora goats with other stock and the relative proportion of these combinations in the eastern Cape Province

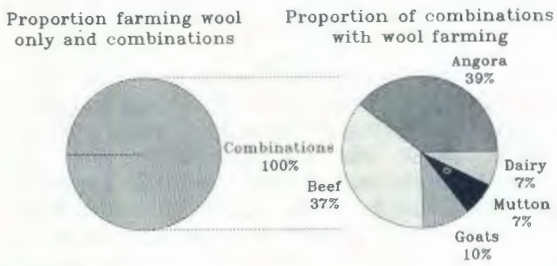


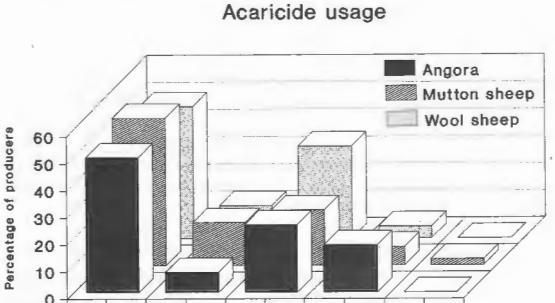
FIG. 3 The relative proportion of producers (%) farming wool sheep in combination with other stock and the relative proportion of these combinations in the eastern Cape Province

Despite the tendency to combine cattle with small stock farming, producers regard these stock types as separate entities with regard to tick control, thus allowing separate assessments of small stock and cattle tick control practices.

Acaricide usage

The synthetic pyrethroids are by far the most utilized group of acaricides by Angora, mutton and wool farmers (Fig. 4). These are followed by the organophosphates which are used to a much larger extent by wool than by Angora and mutton produc-

ers. The formamidines are the third most used acaricide group by wool and mutton producers while the pyrethroid/organophosphate combination products are a third preference with Angora farmers. The combination products available, i.e. the pyrethroid/organophosphate (PO) and organophosphate/organophosphate (OO) formulations are used to a much lesser extent or not at all by mutton and wool farmers. Of these, the OO combination formulations are not used on wool sheep and Angora goats. While the synthetic pyrethroids are used to about the same extent by mutton, wool and Angora farmers, more producers use organophosphate acaricides on wool sheep than on mutton sheep or Angora goats, probably because certain organophosphate compounds still form the mainstay of scab control, which is a prerequisite for many wool producers.



Acaricide group	Pyr.	For.	O.P.	P-O	O-O
Wool sheep	48.8	12.2	34.1	4.5	0
Mutton sheep	54.5	15.9	20.5	6.8	2.3
Angora	50	7.5	25	17.5	0

FIG. 4 Relative percentage preference of Angora, mutton and wool sheep producers for the different acaricide groups (Pyr. = synthetic pyrethroids; For. = formamidines; O.P. = organophosphates; P-O = pyrethroid/organophosphate combination; O-O = organophosphate/organophosphate combination) in the eastern Cape Province as displayed by acaricide usage

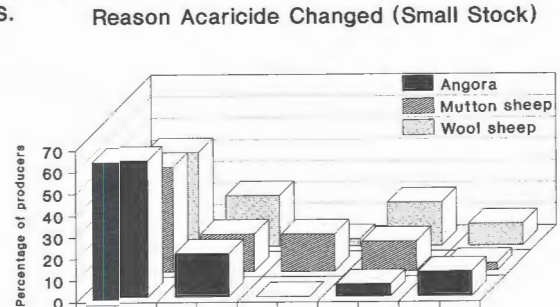
Producer preference for the synthetic pyrethroids accounted for 51,1 % of overall acaricide usage on small stock in the region, the organophosphates for 26,5 % and the formamidines for 11,9 % while the combination compounds (PO and OO) together accounted for 10,4 % of acaricide usage.

Acaricide preference of producers in relation to acaricide availability indicates that the older generation acaricides such as the organophosphates are still utilized in terms of specific advantages such as scab efficacy and relatively low cost. New generation acaricides such as the formamidines and combination formulations appear to be in a producer testing phase. The higher cost of the newest generation combination acaricides presents a measure of producer resistance to their use, but they are utilized if considered effective by a particular producer sector such as displayed by Angora producer usage of PO combination formulations (Fig. 4). In general acaricide usage is dependant on a combination of factors such as product promotion strategies by chemical companies, relative price and efficacy spectra of the individual acaricides concerned, traditional tick control techniques and other producer attitudes towards tick control.

Change of acaricide

Sixty-two per cent of small stock producers changed their acaricide during the past 5 years, the main reason given for the change being the price of the product (51 %). The second most important reason for changing acaricides was producer fear of resistance developing (20 %), followed by ease of administration (13 %), improved efficacy (8 %) and confirmed resistance (7 %).

Producer reasons for changing acaricides are shown separately for Angora, mutton and wool producers in Fig. 5. Price of acaricide was the main consideration with all small stock producers and of especial importance to Angora farmers. Fear of developing resistance was also important to all small stock producers, more so for mutton farmers who also indicated the highest incidence of confirmed acaricide resistance. Ease of administration is an important consideration with all sheep farmers especially since the advent of 'pour-on' formulations.



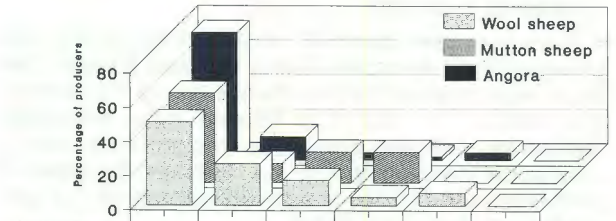
Reason	Price	F.Res	C.Res.	Admin.	Imp.
Wool sheep	43.3	23.4	3.3	20	10
Mutton sheep	48.3	17.3	17.2	13.7	3.5
Angora	62.9	20	0	5.7	11.4

FIG. 5 The reasons given by Angora, mutton and wool sheep producers in the eastern Cape Province for changing acaricides during the past 5 years (F.Res = fear of developing resistance; C.Res = confirmed resistance; Admin. = ease of administration; Imp. = improved efficacy)

This would also contribute to the high incidence of synthetic pyrethroid utilization (Fig. 4) as these comprise the active ingredients of the pour-on formulations.

Acaricide application technique

All small stock producers surveyed favoured plunge dip application of acaricides because of the widespread prevalence of infection by red biting lice, *Damalinia limbata,* blue sucking lice, *Linognathus africanus* and sheep scab mite, *Psoroptes ovis* (Fig. 6). Footbath application was a second preference with wool and Angora, but less so for mutton farmers. Increased use of pour-on compounds on sheep is confirmed by this technique being a second preference together with hand spraying with mutton farmers and a third preference with wool producers. Pour-on acaricides are used in extensive situations due to their ease of administration and as a special control measure, mostly seasonally during the winter months when plunge dipping of sheep is a risk, as well as for specific parasites where efficacy registration exists, e.g. against Karoo paralysis tick.



Technique	Plunge dip	Foot bath	Pour-on	Hand spray	Spray race	Patch
Angora	74.4	13.9	4.7	2.3	4.7	0
Mutton sheep	52.2	11.4	18.2	18.2	0	0
Wool sheep	48.8	24.4	14.6	4.9	7.3	0

FIG. 6 Acaricide application technique preference by Angora, mutton and wool sheep farmers in the eastern Cape Province

Acaricide treatment frequency

The relative percentage of small stock producers practising various acaricide treatment frequencies p.a. are shown in Fig. 7. The highest percentage of producers treat less than 6 and between 11–15 times p.a. yielding an overall trend towards low acaricidal treatment frequencies for small stock in the region (56 % of producers treat less than 20 times p.a.).

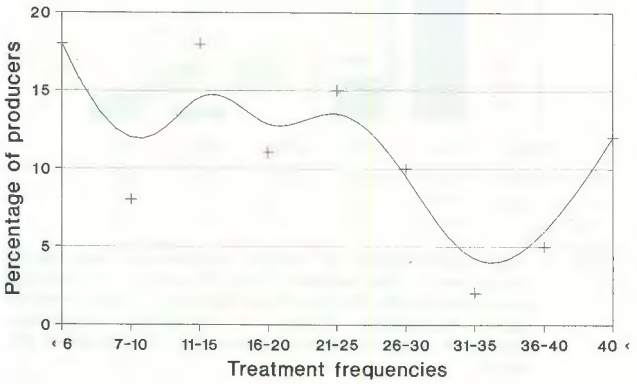


FIG. 7 Acaricide treatment frequencies practised by small stock producers in the eastern Cape Province

Fig. 8 illustrates the treatment frequencies preferred by producers utilizing the different application techniques. This confirms that by far the most producers treat their animals less than 6 times p.a. and that more producers use plunge dip application

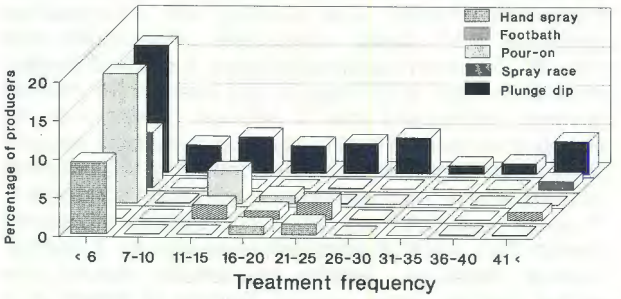


FIG. 8 Acaricide treatment frequencies for the 5 main application techniques as used by small stock producers in the eastern Cape Province

than any of the other techniques for all the treatment frequencies assessed. Notable is the relatively high usage of pour-on application at an 11–15 treatments p.a. frequency compared to the other application techniques.

In order to clarify the relationship between acaricide resistance and acaricide application technique, the relative percentage of producers that have experienced confirmed resistance are shown in Fig. 9 for the 5 main application techniques practised.

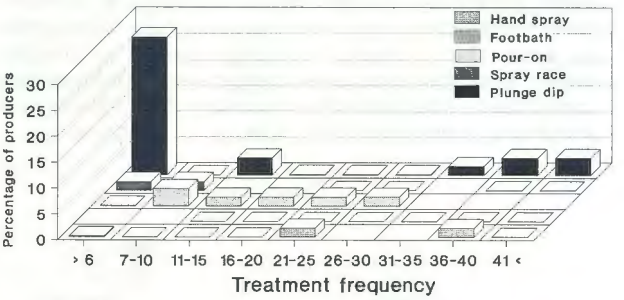


FIG. 9 Percentage of small stock producers that experienced confirmed acaricide resistance for the 5 main application techniques within the different acaricide treatment frequencies practised

The results show that the highest percentage of producers who have experienced confirmed acaricide resistance practise plunge dip application of acaricide. However, this is in accordance with the high preference for the technique and the incidence of confirmed acaricide resistance in small stock remains generally low (only 7 % of producers), a probable reflection of the low selection pressure due to the tendency of producers to practice low treatment frequencies. On the other hand, of some concern is the emerging incidence of confirmed acaricide resistance shown by the pour-on application group for treatment frequencies from 7–30 times p.a. (Fig. 9).

Cost of acaricide treatment

The annual total cost of acaricide as supplied by producers, enabled the calculation of mean acaricide cost per small stock unit p.a. Individual producer cost estimate claims with means outside 2 standard deviations of the sample mean were regarded as spurious and discarded in the final analysis. The results show an overall acaricide cost of R1,65 per small stock unit p.a.

Heartwater vaccination

Low numbers of sheep and goat producers used the available Onderstepoort Ball 3 heartwater vaccine (Table 2). The development of a more efficacious vaccine, would do much to overcome the

TABLE 2 The percentages of producers vaccinating sheep and goats against heartwater in the eastern Cape Province

Animal vaccinated	Percentage of producers
Sheep only	5,0
Goats only	3,6
Sheep + goats	2,2

obvious producer resistance to its use. A high percentage (26,7 %) of Angora producers indicated that they practise a regime of fortnightly block treatment of their animals with tetracycline during summer against heartwater challenge. High intensity treatment with acaricide is insufficient to limit losses due to heartwater. Acaricide and block treatment is expensive and reflects the susceptibility of Angora goats to the disease and the lengths producers will go to to prevent it.

Mortalities

Mean small stock mortalities from heartwater per production unit are illustrated in relation to treatment frequency in Fig. 10.

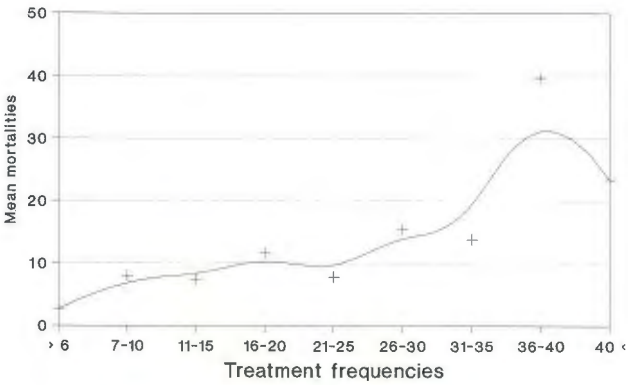


FIG. 10 Mean heartwater mortalities per production unit experienced by small stock producers practising different acaricide treatment frequencies

In general the results indicate that the higher the treatment frequency favoured, the higher the mortalities due to heartwater. The highest mortalities were experienced by producers treating from 36–40 times p.a. In addition, the 48,8 % of sheep farmers who allow a degree of tick infestation on their sheep (a mean of 3,5 ticks per animal) before treatment with acaricides, experienced a mean mortality of 9,73 due to heartwater. Producers who claimed that no ticks were allowed on their sheep (also 48,8 % of producers), and practised high treatment frequencies to establish this, experienced a mean mortality of 11,72 due to heartwater. The 44,8 % of producers who allowed a degree of tick infestation on Angora goats (a mean of 2,32 ticks per animal), experienced a mean mortality of 11,75 due to heartwater, while those who attempted to keep their animals free of ticks (36,6 % of producers), lost a mean of 19,82 animals to heartwater. The higher Angora losses compared to those of sheep, again illustrate the apparent susceptibility of these animals to heartwater. These results strengthen arguments for the establishment and maintenance of a stable enzootic situation as regards heartwater (Howell, De Vos, Bezuidenhout, Potgieter & Barrowman, 1981; Norval & Lawrence, 1979; Bezuidenhout & Bigalke, 1987). Continued immunity against heartwater and the absence of clinical disease seems insured only by immunisation and the application of judicious low frequency acaricidal treatments.

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REFERENCES

ACOCKS, J. P. H., 1975. Veld types of South Africa with accompanying veld type map. 2nd edn. *Memoirs of the Botanical Survey of South Africa,* No. 40, 128 pp.

ADAMSON, D. A., FIVAZ, B. H. & PETNEY, T. N., 1991. Acquisition of resistance to the bont-tick *Amblyomma hebraeum* (Acarina: Ixodidae) by goats. *Veterinary Parasitology,* 38, 312–326.

BEZUIDENHOUT, J. D. & BIGALKE, R. D., 1987. The control of heartwater by means of tick control. *Onderstepoort Journal of Veterinary Research,* 54, 525–528.

ELDER, J. K., 1979. Cattle tick control survey results. *Veterinary Services and Pathology branches Technical Bulletin No. 1.* Department of Primary Industries, Queensland, Australia. 66 p.

HORAK, I. G. & KNIGHT, M. M., 1986. A comparison of the tick burdens of wild animals in a nature reserve and on an adjacent farm where tick control is practised. *Journal of the South African Veterinary Association,* 57, 199–203.

HOWELL, C. J., DE VOS, A. J., BEZUIDENHOUT, J. D., POTGIETER, F. T. & BARROWMAN, P., 1981. The role of chemical tick eradication in the control or prevention of tick-transmitted diseases of cattle. *In:* WHITEHEAD, G. B. & GIBSON, J. D. (eds). *Proceedings of an International Conference on Tick Biology and Control,* 27–29 January 1981, Rhodes University, Grahamstown, South Africa, 61–66.

NORVAL, R. A. I., 1981. A reassessment of the role of dipping in the control of tick-borne diseases in Zimbabwe. *In:* WHITEHEAD, G. B. & GIBSON, J. D. (eds). *Proceedings of an International Conference on Tick Biology and Control,* 27–29 January 1981, Rhodes University, Grahamstown, South Africa, 87–90.

NORVAL, R. A. I. & LAWRENCE, J. A., 1979. The control of heartwater in Zimbabwe/Rhodesia. *Rhodesian Journal of Agricultural Research,* 76, 151–165.

NORVAL, R. A. I., SUTHERST, R. W., KURKI, J., GIBSON, J. D. & KERR, J. D., 1988. The effect of brown ear-tick *Rhipicephalus appendiculatus* on the growth of Sanga and European breed cattle. *Veterinary Parasitology,* 30, 149–164.

NORVAL, R. A. I., SUTHERST, R. W., JORGENSON, O., GIBSON, J. D. & KERR, J. D., 1988. The effect of the bont tick *(Amblyomma hebraeum)* on the growth of Africander steers. *Veterinary Parasitology,* 33, 329–341.

PETNEY, T. N. & HORAK, I. G., 1987. The effect of dipping on free-living and parasitic populations of *Amblyomma hebraeum* on a farm and on an adjacent nature reserve. *Onderstepoort Journal of Veterinary Research,* 54 529–533.

RECHAV, Y., 1982. Dynamics of tick populations (Acari: Ixodidae) in the eastern Cape Province. *Journal of Medical Entomology,* 19, 679–700.

RECHAV, Y., DAUTH, J. & ELS, D. A., 1990. Resistance of Brahman and Simmentaler cattle to southern African ticks. *Onderstepoort Journal of Veterinary Research,* 57, 7–12.

RECHAV, Y. & KOSTRZEWSKI, M. W., 1991. The relative resistance of six cattle breeds to the tick *Boophilus decoloratus* in South Africa. *Onderstepoort Journal of Veterinary Research,* 58, 181–186.

SCHOLTZ, M. M., SPICKETT, A. M., LOMBARD, P. E. & ENSLIN, C. B., 1991. The effect of tick infestation on the productivity of cows of three breeds of cattle. *Onderstepoort Journal of Veterinary Research,* 58, 71–74.

SPICKETT, A. M., DE KLERK, D., ENSLIN, C. B. & SCHOLTZ, M. M., 1989. Resistance of Nguni, Bonsmara and Hereford cattle to ticks in a bushveld region of South Africa. *Onderstepoort Journal of Veterinary Research,* 56, 245–250.

SUTHERST, R. W., 1981. Is the Australian pest management approach to tick control relevant to Africa? *In:* WHITEHEAD, G. B. & GIBSON, J. D. (eds). *Proceedings of an International Conference on Tick Biology and Control,* 27–29 January 1981, Rhodes University, Grahamstown, South Africa, 79–85.