Status of Dorper sheep as hosts of ectoparasites

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Abstract

Seventeen ixodid tick species or subspecies have been collected from Dorper sheep in South Africa. The diseases transmitted or the conditions caused by these ticks in sheep are discussed. Although Dorper sheep may be infested with the scab mite, \textit{Psoroptes ovis}, this does not seem to cause production losses. These sheep may, however, serve as a source of mite infestation for woolled sheep. The majority of Dorper sheep are infested with the larvae of the nasal bot fly, \textit{Oestrus ovis}, they may also be subject to myiasis caused by the larvae of two calliphorid flies. In certain regions of the country Dorper sheep are prone to serious fly worry by female \textit{Simulium chutteri}. Although Dorper sheep may be infested by various louse species these do not seem to reach large numbers or cause production losses. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Dorper sheep; Ixodid ticks; \textit{Psoroptes ovis}; Lice; Myiasis; \textit{Simulium chutteri}; Production losses

1. Introduction

Sheep form a critical component of most livestock production systems in every continent. According to recent FAO estimates the world sheep population numbers 1,070 million and with the increase in human population numbers of small ruminants are also increasing. The various sheep breeds are able to survive and be productive in a wide range of ecotypes, in many cases exploiting the scarce feed resources available. The Dorper sheep, which was recognised as a breed in 1950, has shown an unparalleled increase in numbers in South Africa. According to Marais and Schoeman (1990) this is because this breed met a very real need for a fertile and productive mutton breed for the extensive and arid grazing areas in much of the country. However, there is a continual need to improve management and reduce the impact of major limiting factors affecting productivity for every breed of livestock. One such limiting factor is ectoparasites and the diseases they transmit. Although sheep may be infested with a wide diversity of ectoparasites many of these may have no, or little influence on productivity. This paper reviews some of the ectoparasites which occur on Dorper sheep in South Africa. Some of the arthropods (flies) referred to may not fall into the traditional definition of an ectoparasite but are nevertheless included because of their potential impact on productivity. Most of the available information deals with ticks and hence the main focus of this paper is on these ectoparasites.
2. Ticks infesting dorper sheep

World-wide sheep are known to be infested by about 97 tick species belonging to 10 genera (Liebisch, 1997). These ticks and the diseases they transmit are of considerable economic and social importance to commercial enterprises and individual livestock owners. Besides the pathogens and toxins they transmit, ticks can also cause direct damage to the host including blood loss anaemia and skin wounds as well as lameness due to foot abscesses or large infestations of ticks feeding on the feet. The impact of tick infestations on production losses in sheep is, however, poorly understood and has received little attention from the scientific community (Uilenberg, 1997).

The results of tick surveys covering the major production areas of Dorper sheep in South Africa, have shown that 17 different tick species or subspecies belonging to six genera infest this breed (Horak et al., 1991a; Horak and Fourie, 1992) (Table 1). Of these all developmental stages (larvae, nymphs and adults) of six tick species (A. hebraeum, B. decoloratus, H. silacea, R. appendiculatus, R. evertsi evertsi and R. glabroscutatum) feed on Dorper sheep. In the case of A. marmoreum only immature ticks occur on the sheep and for 10 other species only the adults feed on sheep (Table 1). Seven of the species which infest Dorper sheep can either transmit pathogens or cause direct damage to sheep (Table 2).

2.1. Amblyomma hebraeum

This tick is distributed mainly in the higher rainfall regions in the northern and northeastern provinces of South Africa and also along the eastern coast as far as Humansdorp (Walker, 1991). The larvae and nymphs utilise a large variety of small and large mammals and some ground-nesting birds. The adults prefers large hosts such as cattle, kudu, eland, buffalo and giraffe (Horak et al., 1987a,b).

In South Africa A. hebraeum is the main vector of Cowdria ruminantium, the cause of cowdriosis (heart-water) in sheep, goats and cattle (Bezuidenhout, 1987). Sheep may not only act as a source of ticks but also of C. ruminantium for goats or cattle and vice versa (Horak et al., 1991a). Data on exact impact of

Table 1
Ticks infesting Dorper sheep in South Africa

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Larvae</th>
<th>Nymphs</th>
<th>Male</th>
<th>Female</th>
<th>Province</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amblyomma hebraeum</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>E.C.</td>
<td>Horak et al. (1991a)</td>
</tr>
<tr>
<td>A. marmoreum</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>E.C.</td>
<td>Horak et al. (1991a)</td>
</tr>
<tr>
<td>Boophilus decoloratus</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>E.C.; W.C.; F.S.</td>
<td>Horak et al. (1991a); Horak and Fourie (1992)</td>
</tr>
<tr>
<td>Haemaphysalis silacea</td>
<td></td>
<td></td>
<td>E.C.</td>
<td></td>
<td>E.C.; F.S.</td>
<td>Horak et al. (1991a); Horak and Fourie (1992)</td>
</tr>
<tr>
<td>Hyalomma m. rafipes</td>
<td></td>
<td></td>
<td>E.C.; F.S.</td>
<td></td>
<td>Horak et al. (1991a); Horak and Fourie, 1992; Fourie and Kok, 1995</td>
<td></td>
</tr>
<tr>
<td>H. m. turanicum</td>
<td></td>
<td></td>
<td>E.C.; N.C.</td>
<td></td>
<td>Horak and Fourie (1992)</td>
<td></td>
</tr>
<tr>
<td>Rhipicephalus appendiculatus</td>
<td></td>
<td></td>
<td>E.C.</td>
<td></td>
<td>Horak et al. (1991a)</td>
<td></td>
</tr>
<tr>
<td>R. exophthalmosb</td>
<td></td>
<td></td>
<td>E.C.</td>
<td></td>
<td>Horak et al. (1991a); Horak and Fourie (1992)</td>
<td></td>
</tr>
<tr>
<td>R. glabroscutatum</td>
<td></td>
<td></td>
<td>E.C.; W.C.</td>
<td></td>
<td>Horak et al. (1991a); Horak and Fourie (1992)</td>
<td></td>
</tr>
<tr>
<td>R. neumanni</td>
<td></td>
<td></td>
<td>N.C.; E.C.</td>
<td></td>
<td>Horak and Fourie (1992)</td>
<td></td>
</tr>
<tr>
<td>R. simus</td>
<td></td>
<td></td>
<td>E.C.</td>
<td></td>
<td>Horak et al. (1991a)</td>
<td></td>
</tr>
</tbody>
</table>

b: R. sp. near oculatus.
cowdriosis on Dorper sheep production are lacking. When viewed against the geographical distribution of *A. hebraeum* it is likely to be limited. It has been reported (Alexander, 1931) that Persian crossbred sheep have a strong natural resistance to *C. ruminantium*.

### 2.2. Hyalomma spp

The two species of this genus found in South Africa prefer the drier regions of the country (Howell et al., 1978). The immature stages prefer scrub hares as hosts (Horak and Fourie, 1991) whereas the adults prefer large herbivores, such as cattle, eland and zebras (Horak et al., 1991a, b). Where sheep are farmed in regions in which these ticks abound they are also good hosts for the adults (Horak and Fourie, 1992). *H. marginatum rufipes* and *H. truncatum* attach mainly to the anogenital/inguinal region of Dorper sheep (>63%) (Fourie and Kok, 1995) and clusters of ticks in excess of 50 are not uncommon (Kok and Fourie, 1995). In the case of *H. truncatum* a significant proportion of the ticks may also attach to the feet (Fourie and Kok, 1995). *Hyalomma* spp, because of their long mouthparts, cause wounds that may be invaded either by the larvae of blowflies (*Chrysomya* spp) or by bacteria, resulting in the formation of abscesses, lameness and footabscess.

### 2.3. Ixodes rubicundus

This tick, known as the Karoo Paralysis tick, is widespread in the southern, central and eastern Free State, the Karoo regions of South Africa and in a number of districts in the Western Cape Province. In other provinces its distribution is more confined (Walker, 1991). The preferred hosts of the immature stages are rock elephant shrews, red rock rabbits and caracals (Fourie et al., 1992; Horak and Fourie, 1992). Sheep, goats and cattle (Spickett and Heyne, 1988; Fourie et al., 1989) as well as wild ungulates (Fourie and Horak, 1987) can be paralysed by a toxin produced by *I. rubicundus* females. Of all the tick species infesting Dorper sheep the Karoo paralysis tick is most likely to cause the greatest production losses. If no prophylactic measures are taken during years of high abundance, in excess of 50% of a flock may become paralysed and suffer mortality if not treated (Fourie; unpublished data). The chances of a sheep becoming paralysed is related to infestation density (Fourie et al., 1989). In a comparative study it was shown that Dorper sheep are more at risk of becoming paralysed than Merino sheep (Fourie and Kok, 1996). This is not necessarily related to a greater susceptibility to the toxin but rather to generally higher tick burdens on the Dorper sheep. The differences in tick burdens between the two sheep breeds are possibly related to differing grazing patterns and diet selection. The feeding behaviour of the host plays a major role in determining tick/host sympatry and hence the chances of a host becoming infested with *I. rubicundus* (Fourie and Kok, 1992). *I. rubicundus* is confined mainly to hilly or mountainous terrain (Fourie et al., 1991).

### 2.4. Rhipicephalus evertsi evertsi

Of all the tick species infesting Dorper sheep *R. evertsi evertsi* most probably has the widest distribution. The preferred hosts of all stages of development are equids and eland (Horak et al., 1991b) but sheep

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**Table 2**

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Disease</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Amblyomma hebraeum</em></td>
<td>Heartwater, foot abscess</td>
<td>Bezuidenhout (1987); MacIvor and Horak (1987)</td>
</tr>
<tr>
<td>Hyalomma spp</td>
<td>Foot abscess and lameness</td>
<td>Fourie and Kok (1995)</td>
</tr>
<tr>
<td><em>Ixodes rubicundus</em></td>
<td>Karoo paralysis</td>
<td>Fourie and Kok (1996)</td>
</tr>
<tr>
<td><em>Rhipicephalus evertsi evertsi</em></td>
<td><em>Theileria separata</em> (as <em>T. ovis</em>), spring lamb paralysis</td>
<td>Jansen and Neitz (1956); Hamel and Göthe (1987)</td>
</tr>
<tr>
<td><em>Rhipicephalus glabroscutatum</em></td>
<td>Foot abscess</td>
<td>MacIvor and Horak (1987)</td>
</tr>
<tr>
<td><em>Rhipicephalus neumanni</em></td>
<td>Lameness</td>
<td>Walker (1990)</td>
</tr>
<tr>
<td><em>Rhipicephalus sp. near punctatus</em></td>
<td>Brown tick paralysis</td>
<td>Fourie et al. (1988)</td>
</tr>
</tbody>
</table>
are also efficient hosts of the adults (Horak et al., 1991a). Engorging female ticks can cause paralysis in adult sheep (Hamel and Göthe, 1987), but this usually occurs in young, spring-born lambs, hence the name spring-lamb paralysis (Howell et al., 1978). *R. evertsi evertsi* is also a vector of *Borrellia theileri* causing *Borrelia* theileriosis in sheep (Howell et al., 1978) and of *Theileria separata* (as *T. ovis*) causing theileriosis in sheep (Jansen and Neitz, 1956).

2.5. Rhipicephalus glabroscutatum

This species occurs in the Eastern Cape Province as well as in areas of the Western Cape Province (Walker, 1991). Kudu are the preferred hosts of all stages of development of *R. glabroscutatum* while cattle and Angora goats are better hosts than are Dorper sheep (Horak and Knight, 1986). Large numbers of larvae appear to die or detach before moulting to nymphs on these sheep (Horak et al., 1991a). Adult *R. glabroscutatum* attach around and between the claws of their host’s hooves and are a major contributory cause to foot abscesses, and hence, lameness in small livestock (MacIvor and Horak, 1987).

2.6. Rhipicephalus neumanni

This tick occurs in scattered localities in the Karoo (Walker, 1991) and sheep are one of its most commonly recorded hosts (Walker, 1990; Horak and Fourie, 1992). Adults attach between the claws of the hooves and are a contributory cause of lameness (Walker, 1990).

2.7. Rhipicephalus sp. near punctatus

This species has only been recorded in the central, southern and southwestern Free State and adjacent regions of the Northern Cape Province. The preferred hosts of all stages of development are scrub hares, while the immature stages also feed on rock elephant shrews and the adults on goats (Fourie and Horak, 1991; Horak and Fourie, 1991; Fourie et al., 1992).

This tick has been associated with paralysis in Angora goat kids in the southwestern Free State (Fourie et al., 1988). It is not known whether this tick can cause paralysis in lambs of Dorper sheep.

3. Sheep scab

Sheep scab is caused by the non-burrowing, astigmatid mite *Psoroptes ovis*. It is one of the oldest sheep diseases known to man, and was regarded as a serious disease as early as 180 B.C. Feeding mites causes intense irritation and the sheep become pre-occupied with scratching, cease to feed and rapidly become emaciated (Kirkwood, 1986). Mite feeding is not the direct cause of lesion formation, but sheep scab is a form of allergic dermatitis initiated by the mites faeces. The heat and humidity produced by the inflammatory reaction results in the micro-climate needed for mite survival and the leakage of serous exudate the basis of the mites nutrition (Bates, 1996).

The disease, which occurs commonly in South Africa, is believed to be out of control. Although sheep scab was previously thought to be a winter disease only, recent research (Fourie, unpublished data) has shown that it can occur in South Africa during winter and summer on both Merino and Dorper sheep. There is, however, a profound difference in the scab symptomatology between Dorper and Merino sheep. Comparative studies have shown that lesion size is significantly greater in Merino sheep, while the growth of the lesion is significantly slower in Dorper sheep (Fourie and Meintjes, unpublished data). Whereas infested Merino sheep lost 30% of their initial body mass over a 16 week period Dorper sheep maintained or increased their body mass. These differences are believed to be related to the fact that the density of hair follicles is less in Dorper compared to Merino sheep resulting in a less favourable micro-climate for the propagation and survival of the mite (Fourie and Meintjes, unpublished data).

As is the case with ticks the ability of sheep to develop resistance to *P. ovis* has been poorly studied. From a control perspective the slow growth of lesions and the sub-clinical nature of sheep scab on many Dorper sheep, make detection difficult. Because of this it is thought that Dorper sheep could be important disseminators of the disease in non-infested flocks or regions.

4. Flies and bot flies

Metallic blowflies belonging to the genera *Lucilia* and *Chrysomya* are the most important species caus-
ing myiasis in sheep in South Africa (Howell et al., 1978). *Lucilia cuprina* is a primary blowfly and is mainly responsible for myiasis in woolled sheep breeds (Leipoldt, 1996). Blowfly strike in Dorper sheep caused by *L. cuprina* is very rare and has only been observed in those sheep with a high wool component, most probably the result of previous crossings with Merino sheep. Myiasis caused by the secondary blowfly *Chrysomya albiceps* has been observed more frequently in Dorper sheep and is related to abscesses caused by tick feeding or wounds resulting from other factors (Fourie, unpublished data).

Female blackflies (*Simulium chutteri*) are known to annoy livestock along the Orange River system. It has been conjectured that at certain times of the year the annoyance levels can be such that the condition of especially small livestock can be detrimentally affected. Decreased lambing percentage and occasional deaths have also been reported ( Jordaan and Van Ark, 1990). In a comparative study between Dorper and Merino sheep there were no significant differences in the attraction of blackflies to either breed. However, significantly fewer females engorged on Dorper than on Merino sheep (Kok et al., 1994).

The sheep nasal bot fly (*Oestrus ovis*) has a worldwide distribution wherever sheep and goats are kept and occurs in most parts of South Africa (Howell et al., 1978). It has previously been shown that infestations with the larvae of *O. ovis* retards the live mass gains of Merino lambs (Horak and Snijders, 1974). In a comparative study between Merino and Dorper sheep it was found that the percentage of sheep infested and the level of infestation is practically the same for the two breeds (Horak, 1977). It can, therefore, be presumed that infestation of Dorper lambs with the larvae of *O. ovis* will affect live mass gain.

### 5. Lice

Sheep in South Africa may be infested with three sucking louse species (*Linognathus africanus, L. pedalis* and *L. ovillus*) and two biting louse species (*Damalinia ovis* and *D. peregrina*) (Howell et al., 1978). Biting lice (*D. ovis*) can cause production losses in wool sheep breeds (Howell et al., 1978). It is, however, perceived that lice infestation may have little or no effect on the production of Dorper sheep, and reports of heavy louse infestations are lacking. Besides the above mentioned lice Dorper sheep may also carry small burdens (nymphs and adults) of the Angora goat louse *D. limbata*, specifically where these two breeds are farmed together and are in close contact (Horak, unpublished data). Previous observations, have, however, shown that such infestations are not permanent.

### 6. Host resistance

Numerous reports on the resistance of sheep to various ectoparasitic infestations are based on anecdotal evidence and adequately quantified studies are generally lacking. Although it has been reported that certain sheep breeds can develop resistance to the feeding of particular tick species (Tatchell, 1997) few well documented reports are available. Experimental infestations of crossbred Dorper and Merino sheep with *A. hebraeum* adults over a 23 period produced a small reduction (20%) in tick numbers form acquired resistance (Norval et al., 1988). With specific reference to *I. rubicundus* field observation have also shown that Dorper sheep may become paralysed more than once within a specific season (Fourie, unpublished data) indicating that acquired resistance to tick feeding may not be well established. Clearly more research is required to quantify host resistance in Dorper sheep against diseases and the feeding of ticks. Through selection, it should, however, be possible to breed Dorper sheep displaying a high degree of resistance to certain diseases and ectoparasitic infestations.

### References


