

A Two Years Study of Ticks infesting Goats and Sheep in Abha, Saudi Arabia*

Mohamed S. Al-Khalifa, Galila M. Khalil and Fathi M. Diab

Zoology Department, College of Science P.O. Box 2455, King Saud University, Riyadh 11451, Kingdom of Saudi Arabia

Abstract

The weather in Abha was characterized by a temperature of 11.7-23.7°C, a relative humidity of 40-92% and rainfall of 0.2-275mm during a study period of 1990 and 1991. More ticks infested the goats in 1990 than in 1991 while more ticks infested sheep in 1991 than in 1990. The tick species collected monthly from 10 goats during these years were, respectively, *Rhipicephalus turanicus* (95.1 and 67.1%), *Haemaphysalis sulcata* (4.0 and 25.8%), *Hyalomma anatolicum anatolicum* (0.2 and 1.0%) and *H. impeltatum* (0.7 and 6.1%). Goat infestation rate with *R. turanicus* was 60-100% in 1990 with peaks in January, April, July, November and December when 90-100% of the goats were infested with 6.3-8.3 ticks/goat. In 1991, goat infestation rate was 10-100% with peaks in April, July and December when all goats were infested with 5.6-9.0 ticks/goat, with a sex ratio of 0.40:1-2.00:1 in both years, respectively. The ticks collected monthly from 10 sheep during these years were, respectively, *R. turanicus* (89.2 and 86.2%), *Haem. sulcata* (5.7 and 4.9%), *H. a. anatolicum* (1.2 and 1.0%), *H. a. excavatum* (0.7 and 1.2%), *H. dromedarii* (0.9 and 0.4%), *H. marginatum rufipes* (1.4 and 4.1%), *H. m. turanicum* (0.0 and 1.2%) and *H. impeltatum* (0.9 and 1.0%). Sheep infestation rate with *R. turanicus* was 30-100% in both years with a peak in June in 1990 when all sheep were infested with 13.8 ticks/sheep and 2 peaks in April and June in 1991 when all sheep were infested with 25.0-29.6 ticks/sheep, with a sex ratio of 0.2:1-2.6:1 and 0.6:1-4.5:1 in these years, respectively. The change in *R. turanicus* infestation in goats and sheep was not correlated with temperature, relative humidity or rainfall during both years except for the infestation in sheep in 1991, which was positively correlated with rainfall. With the exception of *R. turanicus* and *Haem. sulcata*, the other tick species infest primarily animals other than sheep and goats. It is recommended that control measures be directed toward the hosts primarily infested with any of these tick species.

Key words: Saudi-Arabia, Abha, goat-parasites, sheep-parasites, ticks, population-dynamics, Ixodidae, *Rhipicephalus*, *Haemaphysalis*, *Hyalomma*.

Introduction

In a concurrent study (Al-Khalifa *et al.*, 2007), the importance of census data of arthropod pests and of the seasonal fluctuations in their population sizes on the infested animals have been discussed. The importance

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of temperature, relative humidity (RH) and rainfall as regulators of the longevity and survival of the different stages in the life cycle of ticks have been also summarized in that study. In the present work, the fluctuations in the numbers of the tick species infesting goats and sheep in Abha (Asir Region) in the Kingdom of Saudi Arabia have been studied over a period of 2 consecutive years in order to provide basic data essential for control of ticks in this region.

Materials and Methods

Animals and tick collection

Ten goats and 10 sheep were selected randomly from

the same herd in Abha, Asir Region, every month for a period of 2 years from January 1990 to December 1991. The animals were completely deticked, and ticks collected from each animal were placed in polyethylene vials (25X100mm) containing 70% ethanol. Each vial was labeled with the name of the host and date of collection. In the laboratory, the ticks were counted and identified.

Tick identification

Tick species were identified and the identifications were confirmed as described in Al-Khalifa *et al.* (2007). For confirming the identification of ticks of the *Rhipicephalus sanguineus* group, the technique of Feldman-Muhsam (1956) and Pegram (1984) using the excised female genital area was adopted. Slide preparations of the genital area were examined using the compound microscope.

Climatic parameters

Data of the changes in temperature, RH and rainfall in the study area were obtained from The Hydrology Division, Ministry of Agriculture and Water, Riyadh, Saudi Arabia (annual reports of 1990 and 1991).

Statistical analyses

Statistical analyses of the data of the monthly changes were conducted using Chi-square test, z-tests of comparison of percents drawn from one or 2 samples, Fisher's exact test, and Pearson's correlation coefficient, wherever applicable.

Results

Weather in Abha area

Data of the changes in temperature, RH and rainfall in Abha during the study period are presented in Table 1. Abha area is located in the southwestern part of Saudi Arabia at an altitude of about 2,200m above sea level. Therefore, during both 1990 and 1991 the temperature was moderate (21-23.7°C and 21.2-23.4°C, respectively) from June to September and relatively low (11.7-19.2°C and 13.0-20.3°C, respectively) during the other months. In 1990, the RH was moderate to high (52-84%) throughout the year except for the month of September when it was relatively low (40%). In 1991, the RH was moderate to high (51-88%) during all of the months except for February-April period when it was very high (92%). Rainfall was very low to moderate (1.4-39.2mm) during 1990 with the highest precipitation being in March. In 1991, rainfall was very low to moderate (0.2-66.2mm) except for the month of April when it was

Table 1. Means of the monthly weather parameters in Abha, Asir Region, during the years 1990 and 1991.

Month	1990			1991		
	Air Temp (°C)	RH% ^a	Rainfall (mm)	Air Temp (°C)	RH%	Rainfall (mm)
Jan	12.8	78	1.4	13.0	79	14.8
Feb	11.7	84	26.4	13.8	92	66.2
Mar	15.1	74	39.2	16.1	92	12.2
Apr	16.4	69	12.8	18.7	92	275.0
May	19.2	64	3.4	20.3	88	17.5
Jun	23.7	53	0.2	23.4	51	3.2
Jul	22.3	52	31.0	22.6	86	15.6
Aug	21.2	57	2.4	22.8	86	13.0
Sep	21.0	40	4.5	21.2	88	2.6
Oct	16.0	62	17.8	18.4	66	0.2
Nov	12.9	69	2.6	15.4	84	1.2
Dec	11.8	74	10.2	13.6	82	0.3

a- Relative humidity.

Table 2. Numbers and percentages of the tick species collected from goats in Abha during the years 1990 and 1991.

Tick species	No of ticks		% of total ticks		P value ^a
	1990	1991	1990	1991	
<i>Haem. sulcata</i>	24	132	4.0	25.8	0.0001
<i>H. a. anatolicum</i>	1	5	0.2	1	0.0934
<i>H. impeltatum</i>	4	31	0.7	6.1	0.0000
<i>R. turanicus</i>	573	347	95.1	67.1	0.0000
Total	602	515			

a- Z-test of comparison of percents drawn from 2 samples was used.

relatively high (275.0mm) (Table 1).

Tick species infesting goats

Four tick species were found on goats during the study period. These were *Haemaphysalis sulcata*, *Hyalomma anatolicum anatolicum*, *H. impeltatum*, and *R. turanicus* (Table 2). Of these ticks, *R. turanicus* was the most abundant (P<0.0001-P<0.00001) and constituted 95.1 and 67.1% of the ticks collected in 1990 and 1991, respectively. The second most abundant species (P<0.0002-P<0.00001) was *Haem. sulcata* in both years,

with an average density of 0.2 and 1.1 ticks/host during 1990 and 1991, respectively. *H. a. anatolicum* and *H. impeltatum* represented a very small percentage (0.9%) of the collected ticks during 1990 and formed 7.1% of those collected in 1991. However, *H. impeltatum* was present in a higher ($P < 0.00001$) percentage than *H. a. anatolicum* during 1991 (Table 2). The average density of *H. impeltatum* was 0.03 and 0.26 ticks/host during 1990 and 1991, respectively, and that of *H. a. anatolicum* was 0.008 and 0.04 ticks/host, respectively.

When the data of the 2 years were compared, the total number of ticks collected in 1990 was found to be greater ($P < 0.00001$) than that collected in 1991 (Table 2). This difference was due to the greater number ($P < 0.00001$) of *R. turanicus* collected during 1990 than that collected in 1991. On the other hand, greater numbers ($P < 0.0001$ - $P < 0.00001$) of *Haem. sulcata* and *H. impeltatum* were collected in 1991 than in 1990 and no significant change ($P > 0.05$) occurred in the numbers of *H. a. anatolicum* (Table 2). However, the numbers of *Haem. sulcata*, *H. a. anatolicum* and *H. impeltatum* were small which did not allow for appropriate statistical analysis of their monthly dynamics on the host.

Tick species infesting sheep

Eight tick species and subspecies sheep were found on sheep during the study period. These were *Haem. sulcata*, *H. a. anatolicum*, *H. a. excavatum*, *H. dromedarii*, *H. impeltatum*, *H. marginatum rufipes*, *H. m. turanicum* and *R. turanicus* (Table 3). Of these ticks, *R. turanicus* was the most abundant on sheep ($P < 0.0001$ - $P < 0.00001$) and constituted 89.2 and 86.2% of the total ticks collected in 1990 and 1991, respectively. The second most abundant species ($P < 0.0001$) was *Haem. sulcata* during both years with an average density of 0.2 and 0.4 ticks/host in 1990 and 1991, respectively. However, *H. m. rufipes* was equally ($P > 0.125$) the second most abundant in 1991. In 1990, *H. m. turanicum* was not found on sheep and the remaining species represented only 5.1% of the total collected ticks. In 1991, *H. a. anatolicum*, *H. a. excavatum*, *H. dromedarii*, *H. impeltatum* and *H. m. turanicum* constituted only 4.8% of the collected ticks. The average density of the collected tick species in 1990 and 1991, respectively, with *H. a. anatolicum* was 0.04 and 0.08 ticks/host, with *H. a. excavatum* was 0.025 and 0.09 ticks/host, with *H. dromedarii* was 0.03 and 0.03 ticks/host, with *H. m. rufipes* was 0.05 and 0.03 ticks/host, with *H. m. turanicum* was 0.0 and 0.09 ticks/host and with *H. impeltatum* was 0.03 and 0.08 ticks/host.

When the data of the 2 years were compared, the

Table 3. Numbers and percentages of the tick species collected from sheep in Abha during the years 1990 and 1991.

Tick species	No of ticks		% of total ticks		P value ^a
	1990	1991	1990	1991	
<i>Haem. sulcata</i>	25	47	5.7	4.9	0.5410
<i>H. a. anatolicum</i>	5	10	1.2	1.0	0.7436
<i>H. a. excavatum</i>	3	11	0.7	1.2	0.3464
<i>H. dromedarii</i>	4	4	0.9	0.4	0.3130
<i>H. m. rufipes</i>	6	40	1.4	4.1	0.0015
<i>H. m. turanicum</i>	0	11	0.0	1.2	0.0006
<i>H. impeltatum</i>	4	10	0.9	1.0	0.8567
<i>R. turanicus</i>	390	834	89.2	86.2	0.1058
Total	437	967			

a- Z-test of comparison of percents drawn from 2 samples was used.

total number of ticks collected in 1991 was found to be greater ($P < 0.00001$) than that collected in 1990 (Table 3). Although *R. turanicus* and *Haem. sulcata* were collected in greater numbers ($P < 0.0001$ - $P < 0.00001$) in 1991 than in 1990, the percentages of these species in relation to the total number of ticks did not significantly change in these years (Table 3). *H. m. rufipes* and *H. m. turanicum* were also present in greater numbers ($P < 0.0001$) and constituted greater percentages of the collected ticks in 1991 than in 1990 (Table 3). No significant change ($P > 0.05$ - $P > 0.9999$) occurred in the numbers or percentages of *H. a. anatolicum*, *H. a. excavatum*, *H. dromedarii* or *H. impeltatum* (Table 3). However, the numbers collected of all species other than *R. turanicus* were small which did not allow for appropriate statistical analysis of their monthly dynamics on the host.

Dynamics of *R. turanicus* on goats

During the first year, a total number of 573 ticks including 266 males and 307 females were collected from goats (Table 4). The peak of infestation ($P < 0.05$ - $P < 0.0004$) occurred in November and December when all goats were infested with a mean of 8.3 ticks/host (Table 4). Three insignificantly ($P > 0.524$ - $P > 0.756$) lower peaks occurred in January, April and July when 90-100% of the goats were infested with a mean of 6.3-7.6 ticks/host. The lowest ($P < 0.0001$ - $P < 0.00001$) tick

Table 4. Monthly records of *Rhipicephalus turanicus* collected from 10 goats in Abha during the years 1990 and 1991.

Month	No of Ticks ^a			Male: Female			Goat infestation %		
	1990	1991	P value ^b	1990	1991	P value	1990	1991	P value ^d
Jan	63	24	0.0533	1.17:1	0.50:1	0.1345 ^b	90	90	0.9999
Feb	18	14	0.5954	2.00:1	0.40:1	0.0747 ^b	80	60	0.3306
Mar	10	5	0.9325	1.00:1	1.50:1	0.8548 ^b	60	60	0.9999
Apr	68	56	0.0820	0.78:1	0.60:1	0.5742 ^b	90	100	0.3059
May	22	14	0.9781	0.83:1	1.30:1	0.7324 ^b	100	60	0.0188
Jun	47	32	0.6792	0.51:1	1.00:1	0.2361 ^b	100	100	0.9999
Jul	76	90	0.0000	1.30:1	1.10:1	0.6855 ^b	100	100	0.9999
Aug	48	38	0.2368	0.92:1	1.70:1	0.2333 ^b	100	80	0.1313
Sep	19	3	0.0327	0.90:1	2.00:1	0.5000 ^c	60	20	0.0608
Oct	29	1	0.0083	0.85:1	1.00:0	0.0327 ^c	70	10	0.0028
Nov	83	8	0.0000	1.18:1	1.60:1	0.4736 ^c	100	50	0.0054
Dec	83	58	0.7660	0.40:1	1.01:1	0.9987 ^b	100	100	0.9999
Total	573	347							

a- No of ticks /host is No of ticks divided by 10.

b-Chi-square test was used.

c-Fisher's exact test was used.

d-Z-test of comparison of percents drawn from 2 samples was used.

infestation occurred in March and September when only 60% ($P < 0.0188$) of the goats were infested with a mean of 1.0 and 1.9 ticks/ host, respectively (Table 4).

During the second year, a total number of 347 ticks including 171 males and 176 females were collected from goats (Table 4). The peak ($P < 0.001$ - $P < 0.00001$) of infestation occurred in July when all goats were infested with a mean of 9.0 ticks/host (Table 4). Two insignificantly lower ($P > 0.078$ - $P > 0.099$) peaks occurred in April and December when all goats were infested with a mean of 5.6 and 5.8 ticks/host, respectively. The lowest ($P < 0.025$ - $P < 0.0035$) infestations occurred in September and October when 20 and 10% of the goats were infected with a mean of 0.3 and 0.1 ticks/host, respectively. Other low ($P < 0.0196$ - $P < 0.0034$) infestations occurred in February, March, May and November when 50-60% of the goats were infested with a mean of 0.5-1.4 ticks/host (Table 4).

When the monthly data of the 2 years were statistically compared, the percentages of goat infestation were found

to be similar except for May, October and November when 1990 infestations were higher than those of 1991 (Table 4). Higher tick densities were also observed in October and November in 1990 than in 1991. On the other hand, a higher tick density (9.0 ticks/host) occurred in July in 1991 than in 1990 (7.6 ticks/host) (Table 4)

The sex ratio varied throughout both years. In 1990, the smallest male: female ratio was in June and December ($P < 0.0247$ - $P < 0.0012$) and the largest ($P < 0.0247$) was in February (Table 4). In 1991, the sex ratio did not change significantly ($P > 0.2998$ - $P > 0.3584$). Such insignificance was probably owing to the small numbers collected during most of the months. When the monthly data of both years were compared, no significant difference was observed between the sex ratios of 1990 and of 1991.

Effect of climatic conditions on *R. turanicus* infesting goats

During both years, the changes in tick density (ticks/host) were not correlated with rainfall ($r = -0.281$,

Table 5. Monthly records of *Rhipicephalus turanicus* collected from 10 sheep in Abha during the years 1990 and 1991.

Month	No of Ticks ^a			Male: Female			Sheep infestation %		
	1990	1991	P value	1990	1991	P value	1990	1991	P Value ^d
Jan	15	33	0.9482 ^b	1.5:1	1.5:1	0.7806 ^b	70	70	0.9999
Feb	6	5	0.1002 ^c	0.2:1	1.5:1	0.1970 ^c	30	30	0.9999
Mar	43	12	0.0001 ^b	2.6:1	0.7:1	0.0551 ^c	100	60	0.0188
Apr	9	296	0.0000 ^b	0.8:1	1.2:1	0.3987 ^c	50	100	0.0054
May	40	8	0.0000 ^b	1.3:1	1.7:1	0.5576 ^c	100	30	0.0001
Jun	138	250	0.0674 ^b	1.9:1	1.3:1	0.1128 ^b	100	100	0.9999
Jul	2	24	0.0139 ^b	2.0:1	1.7:1	0.4185 ^c	10	60	0.0131
Aug	9	22	0.8828 ^b	0.5:1	4.5:1	0.0152 ^c	50	40	0.6568
Sep	9	74	0.0000 ^b	0.5:1	1.6:1	0.0975 ^c	60	100	0.0188
Oct	27	29	0.1100 ^b	2.4:1	0.6:1	0.0305 ^b	90	80	0.5350
Nov	72	18	0.0000 ^b	2.6:1	1.0:1	0.1279 ^b	100	50	0.0054
Dec	20	63	0.1468 ^b	1.2:1	2.1:1	0.4971 ^b	70	100	0.0531
Total	390	834							

a- No of ticks/host is No of ticks divided by 10.

b- Chi-square test was used.

c- Fisher's exact test was used.

d- Z-test of comparison of percents drawn from 2 samples was used.

$P = 0.188$ and $r = 0.296$, $P = 0.175$, respectively), air temperature ($r = -0.164$, $P = 0.306$ and $r = 0.252$, $P = 0.215$, respectively) or RH ($r = 0.087$, $P = 0.394$ and $r = 0.066$, $P = 0.419$, respectively).

Dynamics of *R. turanicus* on sheep

During the first year, a total number of 390 *R. turanicus* ticks were collected from sheep including 248 males and 142 females (Table 5). A peak ($P < 0.00001$) of infestation occurred in June when all sheep were infested with a mean of 13.8 ticks/host. Lower ($P < 0.00001$) tick densities occurred in March, May and November when all sheep were infested with a mean of 4.0-7.2 ticks/host. In October, a lower ($P < 0.025$) infestation was observed when 90% of the sheep were infested with a mean of 2.7 ticks/host. The lowest ($P < 0.0026$) infestations occurred in February and July when 10-30% of the sheep were infested with a mean of 0.6-0.9 ticks/host.

During the second year, a total number of 834 *R. turanicus* ticks were collected from sheep including 477

males and 357 females (Table 5). Two insignificantly different ($P > 0.05$) infestation peaks occurred in April and June when all the sheep were infested with a mean of 29.6 and 25.0 ticks/host, respectively. Lower ($P < 0.00001$) tick densities occurred in September and December when all of the sheep were infested with a mean of 7.4 and 6.3 ticks/host, respectively. The lowest ($P < 0.0188$ - $P < 0.0001$) infestations occurred in February, May, August and November when 30-50% of the sheep were infested with a mean of 0.5-2.2 ticks/host.

When the monthly data of the 2 years were statistically compared, tick density and the percentage of sheep infestation were found to be higher in 1990 than in 1991 during March, May and November, and to be higher in 1991 than in 1990 during April, July and September (Table 5). During the remaining months, tick density and the percentage of goat infestation were nearly similar in both years.

Males outnumbered females during most of the months of 1990 except for February, April, August

and September (Table 5). However, the relatively high sex ratios during March, July, October and November were not significantly different ($P > 0.0936$ - $P > 0.5204$) from those of the other months. In 1991, the males outnumbered the females during the whole year except for March and October (Table 5). However, the high sex ratio of August was not significantly different ($P > 0.0512$ - $P > 0.2602$) from those of the other months; such insignificance was probably owing to the small number of ticks found during these months. When the monthly sex ratios of 1990 were compared with those of 1991, they were found to be insignificantly different during both years except for August when the sex ratio was higher in 1991 than in 1990 (Table 5).

Effect of climatic conditions on *R. turanicus* infesting sheep

During both years, the changes in tick density (ticks/host) were not correlated with air temperature ($r = 0.262$, $P = 0.205$ and $r = 0.311$, $P = 0.163$, respectively) or RH ($r = -0.143$, $P = 0.328$ and $r = -0.352$, $P = 0.131$, respectively). Tick density was not correlated with rainfall during 1990 ($r = -0.319$, $P = 0.156$) but was positively correlated with rainfall during 1991 ($r = 0.657$, $P = 0.010$, respectively).

Discussion

Research programs undertaken to determine the tick species infesting animals in Saudi Arabia (Al-Asgah *et al.*, 1985, 1990; Al-Khalifa *et al.*, 1983, 1984, 1987, 2006; Diab *et al.*, 1985, 1987, 2006; Hussein *et al.*, 1988, 1991) have shown that studies on the dynamics of these tick species were required for planning control measures against these ticks. The size and seasonality of tick populations depend on the survival of ticks through the different life cycle processes (Sutherst *et al.*, 1979). The gross climatic features affect such survival in the different geographical areas (Sutherst and Maywald, 1985). Local microclimatic conditions are also important and depend upon the topography and the type and amount of the vegetation cover. Asir Region is one of the most densely populated parts of Saudi Arabia. Abha weather, as shown from the data obtained during the present work was generally characterized by low to moderate temperatures, moderate to high RH and little to high rainfall with no association between the RH, temperature and rainfall during both years. The periodical rainfall was probably caused by the monsoon winds which also provided the RH favorable for tick survival in this region; the RH was proven to be an important limiting factor of the geographical distribution of various tick

species (Theiler, 1969; Branagan, 1970).

Goats and sheep are very common in Saudi Arabia especially in areas rich in green pastures such as Asir Region. These animals were found to be infested with several tick species (Diab *et al.* 1987, 2006). During surveys made in nationwide tick programs, almost all adult *R. turanicus* were collected from sheep and goats (Al-Khalifa and Diab, 1986; Al-Khalifa *et al.*, 1987; Diab *et al.*, 1987, 2006; Hussein *et al.*, 1988). However, host-parasite records of *R. turanicus* suggest that this species has the most diverse range of hosts in the *R. sanguineus* group (Pegram *et al.*, 1987). In the present work, *R. turanicus* was found to be the most abundant species infesting sheep and goats, although it seemed to prefer sheep. This species thrived on goats and sheep in nearly all weather conditions with no particular season favoring peak infestation. Although in April 1991 a peak of tick infestation on sheep coincided with the relatively high rainfall in that month, another nearly equal peak occurred in June when the rainfall was very low. Pegram *et al.* (1987) reported that the majority of the known records of this species indicated that the adults were active mainly in the late rainy to early dry season periods. Furthermore, Le Riche *et al.* (1974) reported that the adults were active from March to July (spring and summer) in Cyprus. Also, Mitchell and Spillett (1968) reported that adult *R. turanicus* were present throughout the year on dogs in West Bengal while Pegram *et al.* (1982) collected this species from Ethiopia, northern Somalia and Tanzania in the dry season. The higher densities of this species on sheep during 1991 strongly suggested that sheep infestation might have increased with time, which probably have been accompanied with infestation of other farm animals; *R. turanicus* adults were reported to feed on a wide variety of large-sized and medium-sized domestic and wild carnivores and herbivores (Pegram *et al.* 1987). This species may act as a vector of many diseases of man and his livestock (reviewed by Diab *et al.* 1987) and control measures are needed for its eradication.

Adult *Haem. sulcata*, the second most abundant species collected during the present study, parasitize mainly wild and domestic sheep and goats (Hoogstraal and Valdez, 1980; Hoogstraal and Kim, 1985). This species was found to infest sheep and goats in Asir, Al-Baha and Makkah Regions from October to April with an activity peak in December and January (Al-Asgah *et al.*, 1990). During the present study, *Haem. sulcata* was found in relatively small numbers monthly which did not allow for appropriate statistical analysis to determine peak infestation periods. However, this species has

exhibited a significant increase in numbers during the second year of the study. Control measures should be undertaken against this species which is a potential vector of many diseases of man and his domestic animals (reviewed by Al-Asgah *et al.*, 1990).

During the present study, *H. a. anaticum* was found on sheep and goats while *H. a. excavatum* was found on sheep only. Both species were found in very small numbers since they are primarily parasites of cattle and camels (Hoogstraal and Kaiser, 1959a, b; Hoogstraal and Tatchell, 1985). Also *H. impeltatum* was collected from sheep and goats during the present study in very small numbers. This species very commonly infests camels although Hoogstraal (1956) reported that it did not exhibit a definite host preference. *H. dromedarii*, which usually infests camels and cattle (Hoogstraal, 1956, Hoogstraal and Kaiser 1959a), was also found in very small numbers on sheep during the present work. *H. m. turanicum*, which usually infests camels cattle and sheep (Hoogstraal, 1956), was found on sheep during the second year of this study and *H. m. rufipes*, the parasite of cattle (Hoogstraal, 1956; Hoogstraal and Kaiser, 1959a; Pegram *et al.* 1982) was found during both years of investigation on sheep.

The medical and veterinary importance of the tick species found on sheep and goats during the present study has been reviewed by Diab *et al.* (1987) and they were previously reported to infest many animals in Saudi Arabia (Diab *et al.*, 1987, 2006; Al-Khalifa *et al.* 1987). Thus, it is necessary to consider the adoption of control measures against them. To be effective, such control measures must be directed toward the hosts primarily infested with each species.

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دراسة لمدة عامين علي القراد المتطفل علي الماعز والأغنام في أبها بالمملكة العربية السعودية

محمد الخليفة وجلييلة خليل و فتحي مسلم

قسم علم الحيوان - كلية العلوم - ص.ب. ٢٤٥٥ - جامعة الملك سعود - الرياض ١١٤٥١ - المملكة العربية السعودية

الملخص

تميّز الجو في مدينة أبها خلال عامي الدراسة ١٩٩٠ و ١٩٩١ بدرجة حرارة تراوحت بين ١١,٧ و ٢٣,٧ درجة مئوية ورطوبة نسبية تراوحت بين ٤٠ و ٩٢٪ وأمطار تراوحت بين ٠,٢ و ٢٧٥ مم. وقد كان عدد القراد الذي جمع من الماعز في عام ١٩٩٠ أكبر من ذلك الذي جمع في عام ١٩٩١، بينما كان عدد القراد الذي جمع في عام ١٩٩١ من الأغنام أكبر من ذلك الذي جمع في عام ١٩٩٠. وقد كوّن القراد من النوع ريبيسيفلاس تورانيكاس (*Rhipicephalus turanicus*) نسبة ٩٥,١ و ٦٧,١٪ من جميع القراد الذي جمع من ١٠ ماعز شهريا في عامي ١٩٩٠ و ١٩٩١ علي التوالي، بينما كانت نسبة هيموفيساليس سولكاتا (*Haemophysalis sulcata*) ٤,٠ و ٢٥,٨٪ و نسبة هيالوما أناتوليكام أناتوليكام (*Hyalomma anatolicum anatolicum*) ٠,٢ و ١,٠٪ و نسبة هيالوما إميلتاتام (*H. impeltatum*) ٠,٧ و ٦,١٪ في هذين العامين علي التوالي. وفي عام ١٩٩٠ تراوحت نسبة الإصابة في الماعز بالنوع ريبيسيفلاس تورانيكاس (*R. turanicus*) بين ٦٠ و ١٠٠٪ مع ذروة في الإصابة في أشهر يناير وأبريل ونوفمبر وديسمبر حيث كان ٩٠-١٠٠٪ من الماعز مصابا بعدد ٦,٣-٨,٣ قراة/ماعز بينما في عام ١٩٩١ تراوحت نسبة الإصابة في الماعز بين ١٠ و ١٠٠٪، وكانت ذروة الإصابة في أشهر أبريل ويوليو وديسمبر حيث كانت جميع الماعز مصابة بعدد ٥,٦-٩,٠ قراة/ماعز. وقد كانت نسبة الإناث إلى الذكور: ٤:١ - ١:٢، وفي كلا العامين. وقد كانت نسبة القراد من النوع ريبيسيفلاس تورانيكاس (*R. turanicus*) من جميع القراد الذي جمع من ١٠ أغنام شهريا في عامي ١٩٩٠ و ١٩٩١ هي ٨٩,٢ و ٨٦,٢٪ علي التوالي، بينما كانت نسبة هيموفيساليس سولكاتا (*H. sulcata*) ٥,٧ و ٤,٩٪ و نسبة هيالوما أناتوليكام أناتوليكام (*H. a. anatolicum*) ١,٢ و ١,٠٪ و نسبة هيالوما أناتوليكام إكسكافيتام (*H. a. excavatum*) ٠,٧ و ١,٢٪ و نسبة هيالوما دروميداري (*H. dromedarii*) ٠,٩ و ٠,٤٪ و نسبة هيالوما مارجيناتام روفيس (*H. marginatum rufipes*) ١,٤ و ٤,١٪ و نسبة هيالوما مارجيناتام تورانيكاس (*H. m. turanicum*) ٠,٠ و ١,٢٪ من جميع القراد علي التوالي. وقد تراوحت نسبة إصابة الأغنام بالنوع ريبيسيفلاس تورانيكاس (*R. turanicus*) بين ٣٠ و ١٠٠٪ في كلا العامين مع ذروة في الإصابة في شهر يونيو في عام ١٩٩٠ حيث كانت جميع الأغنام مصابة بعدد ١٣,٨ قراة/خروف، وفي شهري إبريل و يونيو عام ١٩٩١ حيث كانت جميع الأغنام مصابة بعدد ٢٥,٠ - ٢٩,٦ قراة/خروف. وقد كانت نسبة الإناث إلى الذكور ١:٠ - ٢:١ و ٢:١ - ٠:١، وفي العامين علي التوالي. ولم توجد علاقة بين درجة الإصابة بالنوع ريبيسيفلاس تورانيكاس (*R. turanicus*) في الماعز والأغنام وكل من درجة الحرارة أو الرطوبة النسبية في كلا العامين، إلا أنه وجدت علاقة إيجابية بين درجة الإصابة في الأغنام و كمية المطر في عام ١٩٩١ فقط. وتتخذ جميع الأنواع التي وجدت في هذا البحث - عدا النوعين ريبيسيفلاس تورانيكاس (*R. turanicus*) و هيموفيساليس سولكاتا (*H. sulcata*) - عوائل أساسية غير الماعز والأغنام، لذا توصي هذه الدراسة بأنه من الأفضل أن توجه المقاومة ضد كل نوع على عائله الأساسي.