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SEASONAL DYNAMICS OF *RHIPICEPHALUS TURANICUS* (ACARI: IXODIDAE) ON SHEEP AND GOATS IN THE AL-SARAWAT MOUNTAINS OF MAKKAH PROVINCE, SAUDI ARABIA

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Nasser A. Al-Asgah (1990) Seasonal dynamics of *Rhipicephalus turanicus* (Acari: Ixodidae) on sheep and goats in the Al-Sarawat Mountains of Makkah province, Saudi Arabia. *Bull. Inst. Zool., Academia Sinica* 29(2): 113-120. The seasonal dynamics of adults *Rhipicephalus turanicus* on sheep and goats, and the immatures on rodents were studied in two valleys in Al-Sarawat mountain range of Makkah province, Saudi Arabia, from December 1985 through November 1987. Adults *R. turanicus* were found on sheep throughout the year in both valleys with two speak in January and September. The infestation on goats showed marked seasonal variations, and the tick was found in both valleys in winter, spring and early summer (December-June). During late summer and fall (July-November) adults were rarely found on goats. Adults of *R. turanicus* were found more often on sheep than on goats, while the immature stages were found on *Meriones rex*, *Acomys dimitiatus* and *Gerbillus dasyurus*.

Key words: Seasonal dynamics, Adults *Rhipicephalus turanicus*.

The Tuanian rhipicephaline *Rhipicephalus turanicus* Pomerantsev, 1936 has a wide range of distribution extends from southern U.S.S.R., China and India through the Middle and Near East, into southern Europe and northern Africa (Hoogstraal, 1985, Morel and Vassilides, 1963, and Pegram *et al.* 1987a). Within this overall range, *R. turanicus* occurs in widely differing ecological habitats. In Africa it has been found in arid and semi-arid steppe and tropical and subtropical savannah in areas with annual rainfall ranging from 100-1,000 mm. In Europe it occurs in southern and eastern temperate zones, and in Asia in tropical and subtropical zones (Pegram *et al.*, 1987a). The adults *turanicus* feed on all livestock and on large and medium-sized wild herbivores and carnivores. Immatures are found chiefly on rodents, hedgehogs and hares (Hoogstraal 1985, Hoogstraal and Tatchell, 1985). *Babesia* and *Theileria* infecting domestic animals, as well as several viruses of medical importance were isolated from the tick (Achuthan 1980, Chow *et al.* 1983, Hoogstraal 1979 and Pegram *et al.* 1987a). Recently, the tick has been found in abundance in two main regions in the Kingdom; Makkah and eastern provinces (Al-Khalifa *et al.*, 1987; Diab *et al.*, 1987). The present study is a part of a 5-year nationwide

progeramme on the Saudi Arabia tick fauna and concerned with the seasonal dynamics of *R. turanicus* in the Al-Sarawat mountain range of Makkah province.

MATERIALS AND METHODS

Study sites

The study was conducted on two sheep and goats herds in two valleys (Liyah and Al-Sayl) within the Al-Sarawat mountain range of Makkah province. The distance between the tow valleys is 150 km. The mountains extend, parallel to the Red Sea, from Al-Hijaz in the north to Asir in the south and reaches its highest peak (3,960 m) at Sana'a in Yemen Arab Republic. Liyah valley is 1,530 m altitude and is mostly wooded with relatively rich growth of *Acacia* trees and scattered large *Ficus pseudosycamorus* trees, as well as, bushes and percennial shrubs including *Delonix* spp., *Tamarindus* spp., *Angyris* sp., and *Ziziphus* spp. Al-Sayl valley is 1,230 m altitude and is relatively rich growth *Acacia* trees, and scattered large *Ficus pseudosycamorus* trees, as well as, bushes and prennial shrubs including *Euphorbia* spp., *Calotropis procera, Citrullus colocynthis.* Annual plan are common following good rains, but after drought period the valley is extremely dry. A full list of vegetation of the area is given by Migahid (1978). For other details of the area see Buttiker (1980).

Host of adult ticks

The study was carried out on two sheep and goats herds that were previously found heavily infested with *R. turanicus* (Al-Khalifa *et al.*, 1986). The herd grazes in an areas 6 km in radius around the pens where the herd is kept at night. The animals have free range to these areas but are collected in pens each night. Twenty sheep and 20 goats from each herd were selected randomly and examined for tick monthly from December 1985 to November 1987. Ticks found attached to each animal were collected into polyetheylene vials (25× 100 mm) containing 70% ethanol in water.

Hosts of immature stage ticks

Lizards were caught by hand and small mammals were trapped using ordinary house rat-traps. During the first week of each month and for two nights, 20 traps were randomly placed close to where the animals were confined. The captured animals where brought to the laboratory and placed in plastic cages (63×28×36 cm) covered with cloth. Each cage was inspected daily for engorged ticks and these were collected into vials (25×100 mm) covered with muslin cloth secured with rubber bands. The vials were maintained in incubators at 27°C and 75% relative humidity until ticks molted.

Ticks were identified using the keys of Feldman-Musham (1956, 1967), Hoogstraal (1956), Hoogstraal *et al.* (1981), Matthysee and Colbo (1987), Morel and Vassiliades (1963), Pegram *et al.* (1987a, b). The identification was confirmed by the late Dr. Harry Hoogstraal and by Mrs. Hilda Y. Wassef of the Medical Zoology Department, United States Naval Medical Research Unit No. 3, Cairo, Egypt.

Climatic data were obtained from Hydrology Division, Ministry of Agriculture and Water, Riyadh, Saudi Arabia.

RESULTS

The climatic parameters during the study period are summarized in Table 1. The climate in the study area is very mild and these mountains constitute the main summer resorts of the Kingdom. The mean maximum and minimum air temperatures ranged from 21.5 and 7.3°C in winter to 35.3 and 16.5°C in summer in

Table 1
Climatic parameters during the study period (December 1985-November 1987) in the Al-Sarawat mountain range of Makkah province, Saudi Arabia

Month	Mean Air temperature (Maximum/minimum) (°C)		Mean relative humidity (%)		Rainfall (mm)	
	Liyah valley	Al-Sayl valley	Liyah valley	Al-Sayl valley	Liyah valley	Al-Sayl valley
Dec.	22.3/ 5.8	24.4/13.1	60	58	0.0	0.2
Jan.	22.4/ 7.8	20.6/10.1	57	68	5.2	8.8
Feb.	21.5/ 7.3	22.8/10.8	46	51	4.6	0.0
Mar.	25.6/11.8	24.0/13.5	44	53	0.6	18.4
Apr.	28.3/13.6	28.6/17.8	51	43	78.8	30.6
May	30.9/16.5	33.7/22.6	43	30	24.2	4.2
June	35.3/19.5	37.0/25.0	18	19	0.2	16.2
July	34.0/20.2	38.1/25.8	14	15	0.0	0.0
Aug.	33.8/22.0	36.1/25.0	16	23	1.2	0.0
Sept.	33.8/17.3	36.5/24.0	24	16	0.0	0.0
Oct.	28.1/14.1	32.3/18.1	55	25	89.4	0.0
Nov.	23.3/ 8.6	28.1/17.0	56	41	0.2	0.0

Liyah valley and ranged from 20.6 and 10.1°C in winter to 28.1 and 25.8°C in summer in Al-Sayl valley. The mean relative humidity ranged from 14 to 60% in Liyah valley to 15 to 68% in Al-Sayl valley. Most of the precipitation was in winter and spring seasons in Liyah valley and in spring time in Al-Sayl valley.

The seasonal variations in the number of adult *R. turanicus* on sheep and goats in Liyah valley and Al-Sayl valley are shown in Fig. 1. The tick was found on sheep throughout the year in both valleys with two infestation peaks, one in January and the other in September. The percentage of infestation was 75% in Liyah valley and 60% in Al-Sayl valley during January and 60% in September in both valleys. Males exceeded females most of the year, except in Febraury, March, April, June and November in Liyah valley. In Al-Sayl valley the males predominated throughout the year, except in January and November (Table 2).

The lowest number of ticks was found on goats in Liyah valley during August to October, where the percentage of infestation was lowest (0-10%). The number of ticks increased slightly during November to January, and reached the highest in February, where the percentage of infestation was 45% (Table 2). In Al-Sayl valley the lowest number of ticks was found on goats during May to to October, when the precentage of infestations were 0 to 20%. The number of thicks increased slightly during November and December, and the highest number was found in January where the precentage of infestion was 35%. Females predominated throughout the year in Liyah valley. In Al-Sayl valley, the males and females were equally present (Table 2).

In general the number of adult *R. turanicus* on both sheep and goats were almost the same throughout the year in Liyah valley and in Al-Sayl valley.

No immature *R. turanicus* were collected from 23 Lizards *Agama* spp., captured. A total of 65 nymph and 24 larvae were collected from 7 king jird *Meriones rex* Yerbury and Thomas, 46

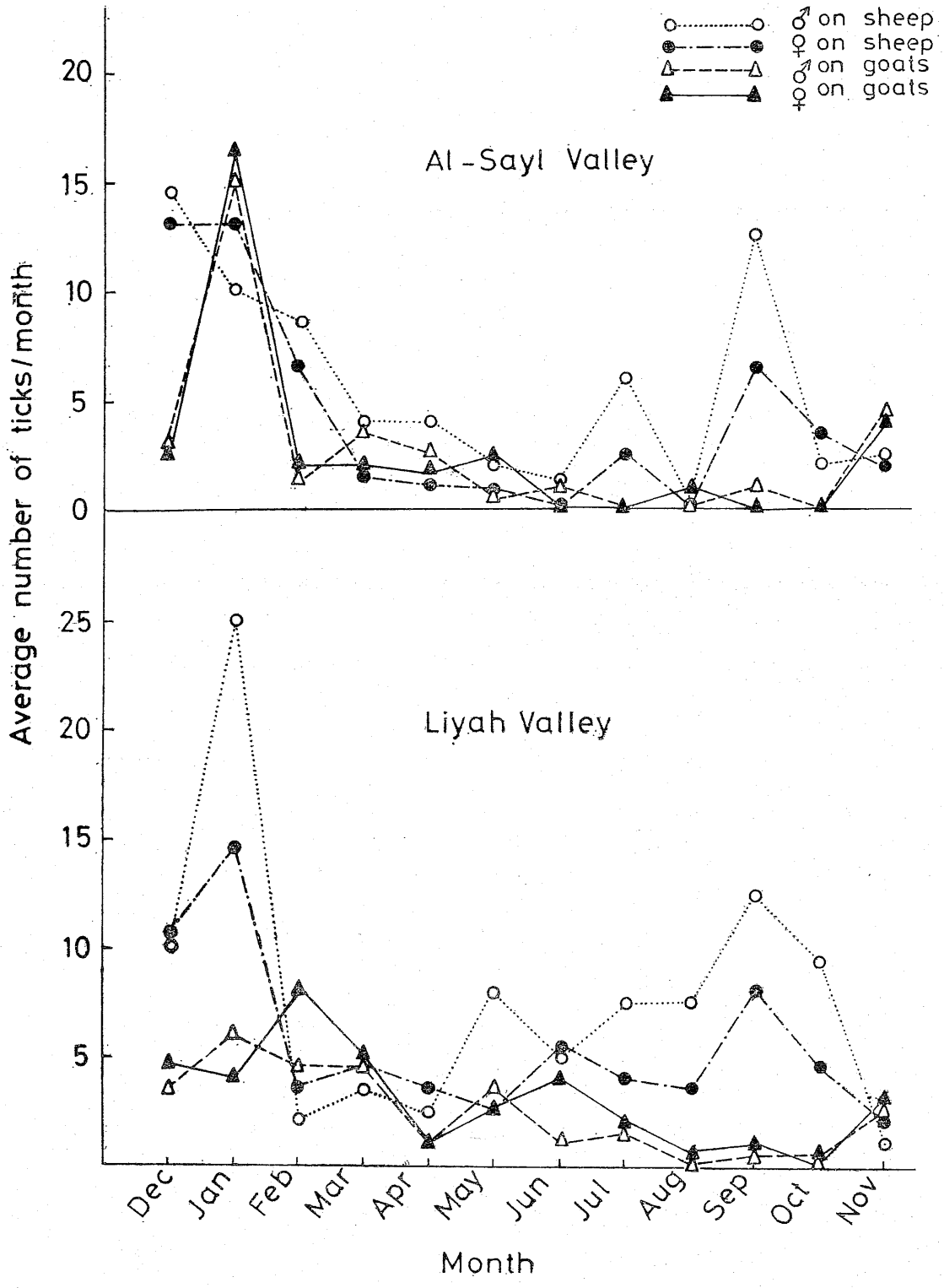

Fig. 1. Seasonal variations in the average number of adult *Rhipicephalus turanicus* on sheep and goats over two years period (December 1985-November 1987) in the Al-Sarawat Mountains, Makkah province, Saudi Arabia.

Table 2
The percentage of infestion and sex ratio of *Rhipicephalus turanicus* on sheep and goats over two years period (December 1985–November 1987) in the Al-Sarawat Mountains, Makkah province, Saudi Arabia

	Sheep				Goat			
	Liyah valley		Al-Sayl valley		Liyah valley		Al-Sayl valley	
Month	% of infestation	: ♀	% of infestation	: ♀	% of infestation	: ♀	% of infestation	: ♀
Dec.	60	1.05:1	70	1.12:1	45	0.87:1	30	1.20:1
Jan.	75	1.72:1	60	0.77:1	15	1.63:1	35	0.61:1
Feb.	40	0.57:1	55	1.31:1	40	0.56:1	20	0.50:1
Mar.	40	0.78:1	40	2.67:1	45	0.90:1	25	1.75:1
Apr.	35	0.70:1	30	4.00:1	20	1.00:1	30	1.67:1
May	50	3.20:1	25	2.00:1	20	1.40:1	20	0.20:1
June	40	0.90:1	05	0	20	0.25:1	10	—
July	45	1.88:1	35	2.00:1	10	0.75:1	00	0
Aug.	45	2.14:1	0	0	0	0	05	0
Sept.	70	1.56:1	60	1.92:1	10	0.50:1	10	—
Oct.	50	2.11:1	30	0.57:1	05	—	0	0
Nov.	10	0.50:1	20	1.25:1	30	0.83:1	15	1.13:1

spiny mouse *Acomys d. dimidiatus* (Cretzchmer) and 2 Wagner's gerbil *Gerbillus dasyurus*. The immature stages were found during the fall, winter and spring (September-May) in the both valleys, but nothing was found during the summer (June-August).

DISCUSSION

The present results indicate that *R. turanicus* are found on sheep throughout the year in Liyah and Al-Sayl valleys of Makkah province with two infestation peaks, one in January and the other in September. The infestation on goats showed marked seasonal variations, and infestation occurred in both valleys mostly during, the winter (December-March), and none or very little infestation was found during the period from July through October. Two infestation peaks on goats were observed, one in February in Liyah valley and one in Al-Sayl valley. In general, the tick was found in abundance on sheep and goats in both valleys during the winter. The winter months are the most humid months of the year in that area (Table 1). In other words, the tick number increases at winter, and decreases in the summer. In contrast, Ouhelli *et al.* (1982) found peak infestation of adult *R. turanicus* on sheep in April and May in Morocco. Le Riche *et al.* (1974) reported that the adults *R. turanicus* are active from March to July the spring and summer (March-July) in Cyprus. In these habitats *R. turanicus* appears to complete, one generation per year. Mitchell and Spillett (1968) recorded adults *R. turanicus* throughout the year on dogs in West Bengal, their data indicate that there are 3 overlapping generation annually. Pegram *et al.* (1987a) reported that the majority of known records of *R. turanicus* indicate that the adults are active mainly in the late rainy to early dry season periods. Collection from Ethiopia, northern Somalia and Tanzania were made in the dry season. The data obtained in the present investigation suggest that *R. turanicus* complete one generation a year on goats and three overlapping generations on sheep annually.

The results also indicate that *R. turanicus* apparently prefer sheep as a host, since the number of the tick found on sheep was much greater than that found on goats. However, during surveys made in the present nationwide tick programme, all the adult *R. turanicus* collected were from sheep and goats (Al-Khalifa and Diab, 1986; Al-Khalifa *et al.*, 1987; Diab *et al.*, 1987, 1990 and Hussein *et al.*, 1988). Moreover, a single collections of *R. turanicus* were also made from a donkey and a camel at Gizan as well as a cattle at Riyadh, but these might have been just accidental infestation. Although, host-parasite records for *R. turanicus* indicate that this species has the most diverse range of hosts in the *R. sanguineus* group. (Pegram *et al.*, 1987a). Other host data are those of Norval *et al.* (1983), these include adwolf *Proteles cristatus* and brown hyaena *Hyaena brunnea.*

Immatures of *H. turanicus* were collected during fall, winter and spring from both valleys. The data on the numbers of *R. turanicus* are not sufficient to discuss any seasonal variations.

Plans are made to further investigation to the immatures and adults *R. tuanicus* to determine their potential to harbor and transmit infection agents to wildlife, livestock and man. Since the tick is a reservior and vector of *Babesia* and *Theileria* (Achuthan, 1980; Chow *et al.*, 1983), as well as several viruses were isolated from the tick (Hoogstraal, 1979). Moreover, it might be the vector of *Babesia* spp. dectected in the blood of goats in the Eastern province of the Kingdom (Hussein, Al-Khalifa, Diab and Al-Asgah, unpublished data).

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沙烏地阿拉伯 Makkah 省 Al-Sarawat 山區山羊身上之壁蝨 *Rhipicephalus turanicus* (Acari: Ixodidae) 的季節性變化

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自 1985 年 12 月至 1987 年 11 月，在沙烏地阿拉伯 Makkah 省 Al-Sarawat 山區中的二處山谷調查壁蝨 *Rhipicephalus turanicus* 在綿羊及山羊身上之成蟲及幼蟲嚙齒動物身上之季節性變化。在綿羊身上的 *R. turanicus* 成蟲，終年都有發生，而在 1 月及 9 月則出現二高峯期。在山羊身上則出現明顯的季節性變化，冬天、春天及初夏（12 月～6 月）可見此種壁蝨，成蟲於晚夏及秋天（7 月～11 月）則很少發現。*R. turanicus* 成蟲分佈在綿羊身上多於在山羊身上者，而其幼體則在寄主動物 *Meriones rex*, *Acomys dimitiatus* 及 *Gerbillus dasyurus* 身上爲害。