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Study on the Prevalence, Intensity, Seasonal Dynamics of Abomasal Helminths in Sheep from Different Climatic Zones of Iran

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Abstract: Gastrointestinal nematodes of small ruminants are one of the major causes of productivity loss.This study was carried out to determine the correlation between the prevalence, seasonal incidence and geographical distribution January 12, 2011of abomasal worm infection of native sheep in 3 different climatic zones of Iran, suitable for animal husbandry. From March 2008 to February 2009 the contents of abomasums of 341 sheep from Mazanderan province (Zone I), 318 from Isfahan province (zone II) and 390 from Khuzestan province (Zone III) were washed separately in a 100 mesh sieve. The worms present in each abomasum were collected separately, counted and preserved in 70% alcohol containing 5% glycerin for identification to the species. The overall percentage of infection was 30.98% and *Haemonchus contortus*, *Teladorsagia circumcincta*, *Marshallagia marshalli*, *Ostertagia occidentalis*, *Ostertagia trifurcata* and *Parabronema skrjabini* were 6 species identified in all 3 studied areas. The overall prevalence rate and intensity of worm's burden as representative of Iran, as well as in each of 3 different climatic zones were low, although *Teladorsagia circumcincta* was the most prevalent and frequent worm species found. Using Chi-Square and ANOVA, no significant relationship was found between prevalence, season, age and sex in 3 regions, although the intensity of worm burden in zone I was significantly higher than the other two zones (P= 0.011).

Key words: Prevalence · Seasonal · Sheep · Abomasum · Nematodes · Iran

INTRODUCTION

Abomasum is one of the most important sites for living bursate nematodes belonging to Trichostrongylidae family in small ruminants, because it is the site location for 3 pathogen species of GI nematodes e.g., *Haemonchus spp., Teladorsagia spp., Ostertagia spp. and Trichostrongylus spp*., Meanwhile it was shown that gastrointestinal nematodes could be harmful to the health of infected animals and causes economic losses due to mortalities, reduce weight gain and other production losses [1-4]. On the other hand the development of parasites including gastrointestinal nematodes of ruminants is entirely weather dependant [4, 5]. Although the effects of helminth infections on production of particular livestock species depend mostly upon the age of the animal, breed, parasite species involved and the intensity of the worm population [6].

Seasonal incidence of GI nematodiasis is done to find the time at which infections with infective larvae begin, rise to a peak and decline so that the treatment can be timed to prevent development of serious infection and to reduce contamination of pastures with eggs and larvae. If major differences occur in climatic condition of different zones, epidemiological studies must be carried out according to each zone.

In several studies big differences have been shown in the prevalence and intensity of small ruminant's GI nematodes according to different climatic condition [1, 2, 5, 7]. Fifty two millions sheep are scattered in different regions of Iran, [8], where climatologically it is divided into 4 regions [1]. The majorities of sheep population in Iran are grazing in the pasture and are in permanent contact with pasture harboring 3rd stage larvae of GI nematode.

In a comprehensive study in 2 zones (Zone 1 and 2), which carried out by Skerman *et al* 1967, epidemiology, seasonal incidence and economic importance of gastrointestinal nematode of small ruminants of Iran was studied. Since then, in several studies, no attention has been paid to the effects of climatic conditions of different zones on the epidemiology of GI nematodes. This study was carried out to have new understanding of abomasal helminthiasis in 3 climatic zones of Iran.

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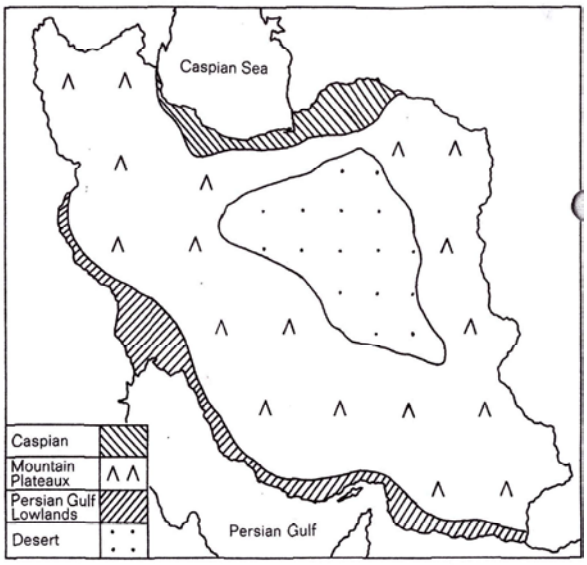

Fig. 1: The major climatic zones of Iran, Zone I (Caspian), Zone II (Mountain plateaux), Zone III (Persian Gulf lowland) and Zone IV (Desert), (Skerman *et al* 1967).

MATERIALS AND METHODS

Experimental Sites and Climates: Iran, although is a semi dry country but climatologically can be divided into 4 different zones among which zone 4 (Central and Salt Deserts) is neither suitable for animal husbandry nor fit for human to live in. Three other zones include: the Caspian zone (Zone I) The mountain plateau zone (Zone II) the Persian Gulf Lowland (Zone III), (Fig. 1), where their rainfall per year, relative humidity and mean monthly temperature are 40-150 cm, relatively high and (+8)-(+26) °C and 20-50 cm, low and(-5)-(+29) °C and 20-30 cm, relatively high and (+13)-(+36) °C respectively. The sampling was carried out in the main abattoir of each zone including: Babol (Zone I), Chadegan and Daran (Zone II) and Shoushtar (Zone III), where local and native sheep were slaughtered.

Experimental Animals and Parasitological Techniques: From March 2008 to February 2009, the age and sex of 341 native sheep from Zone I, 318 from Zone II and 390 from Zone III were determined and their abomasums were collected. The contents of each abomasums were washed under running water using a 100 mesh sieve and the present nematodes were counted and preserved in 70% alcohol containing 5% glycerin. Because the intensities of nematode infections were low, hundred percent of nematodes were subjected to microscopical examination and they were identified according to morphological characteristics described by Skerjabin (1954), [9].

Data Analysis: Prevalence of parasite species was calculated as number of individuals of a host species infected with a particular parasite species/number of host examined. Chi-square test was employed to examine the effect of region, season, age and sex of the host on the level of parasitism.

ANOVA test was used to show the correlation between mean worm burden and region, season, age and sex of the host. In all the analyses, $P = 0.05$ was for significance.

RESULTS

The prevalence and intensity of nematode infections in 3 zones which could be taken as representative of infection for whole country are summarized in Table 1.

Six species of nematodes with low prevalence and intensity were found in examined abomasums. The overall prevalence and intensity was 30.98% and 112.5 respectively. Among the species found *Teladorsagia circumcincta* was the most prevalent and frequent species. No significant correlation was observed between the prevalence of infection with seasons, ages, sexes and regions. Although the mean worm burden in Zone I was significantly higher than the two other regions (P = 0.011). The results of our findings for 3 different zones are summarized in Table 2, 3 and 4.

Table 1: The total prevalence and intensity of abomasal nematode infection in Iran

Parasite	% Prevalence	Mean number of worm per infected abomasum	Maximum burden
Haemonchus contortus	3.62	13.7	43
Parabronema skrjabini	5.43	11.7	22
Marshallagia marshalli	12.20	92.6	450
Teladorsagia circumcincta	19.35	113.8	597
Ostertagia trifurcata	0.09	8.4	31
Ostertagia occidentalis	3.90	8.9	24

Table 2: The prevalence and intensity of worms in 341 abomasum of native sheep examined in zone I. N, is number of total abomasums were examined

	Spring N, 90		Summer N, 90		Autumn N, 86		Winter N, 75	
Nematode species	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden
Haemonchus contortus	1.1	19	1.1	9	3.5	22.4	2.7	27
Parabronema skrjabini	7.8	19.5	6.7	16	7	24.5	6.6	15.6
Marshallagia marshalli	17.8	93.75	13.4	117	8.1	142.8	12	111
Teladorsagia circumcincta	27.8	120	17.8	125	23.3	150	17.4	154
Ostertagia trifurcata	1.1	10	1.1	5	2.3	8	0	0
Ostertagia occidentalis	5.6	10	4.5	7.5	5.8	10	5.4	10

Table 3: The prevalence and intensity of worms in 318 abomasum of native sheep examined in zone II. N, is number of total abomasums were examined

	Spring N, 73		Summer N, 87		Autumn N, 71		Winter N, 87	
Nematode species	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden
Haemonchus contortus	4.1	8.3	2.3	7	4.2	21	4.6	12.3
Parabronema skrjabini	9.6	4.42	3.5	4.4	12.7	6.7	7	6.8
Marshallagia marshalli	12.3	105	7	83.4	14	160	10.4	100
Teladorsagia circumcincta	23.3	118	12.7	182	19.8	128.5	15	123
Ostertagia trifurcata	0	0	1.2	10	1.4	6	0	0
Ostertagia occidentalis	2.8	10	2.3	12.5	5.6	7	3.5	5

Table 4: The prevalence and intensity of worms in 390 abomasum of native sheep examined in zone III. N, is number of total abomasums were examined

	Spring N, 96		Summer N, 94		Autumn N, 101		Winter N, 99	
Nematode species	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden	Prevalence (%)	Mean worm Burden
Haemonchus contortus	4.17	8.5	3.2	4.7	7	8.8	5.05	22.4
Parabronema skrjabini	1.05	8	0	0	2.98	9.7	4.05	7.8
Marshallagia marshalli	10.45	50	9.58	33.4	16.84	58.8	14.14	85.7
Teladorsagia circumcincta	13.55	77	17.03	43.75	21.8	91	23.3	87
Ostertagia trifurcata	2.09	4	0	0	1.98	12.5	0	0
Ostertagia occidentalis	3.13	6.8	1.07	10	3.97	10	4.05	10

Data in Table 2 would indicate the presence of six species of nematodes in examined abomasums with low prevalence and intensity, although, *T.circumcincta* was the most and *O.trfurcata* and *H.contortus* were the least prevalent and frequent species. No seasonality was observed in this climatic zone (P= 0.4552).

Similar nematode species reported in zone I was found in zone II and the trend in seasonality was also in line with the findings in zone I (P=0.3693). In zone III with different climatic condition, as far as nematode species, prevalence and intensity of infection and seasonality (P=0.3933) are concerned, no differences were noticed with those of zone I and II.

DISCUSSION

The interpretation of our results, enlighten a new concept on the epidemiology of abomasal helminths of sheep from Iran and show a reduction in the number of species recorded, prevalence rate and intensity of infection and the absence of seasonality. As far as the prevalence and intensity of abomasal worm infections are concerned, our findings are in consonant with studies carried out in this field in recent years [10-12] but not with old reports. In the survey, carried out two decades ago, [13], dramatic differences and decrease occurs with our results in the prevalence and mean intensity of

3 common nematode species; e.g. *H.contortus* (3.62% and 13.7 ≠ 49% and 113), *T.circumcincta* (19.35% and 113.8 ≠ 84% and 599) *and M. marshalli* (12.2% and 92.6 ≠ 86% and 921). Although as it is notices by Santin-Duran *et al*. [14], worm burden may have been underestimated in our study, as we did not also search or recover fourth stage larvae that may have been presented as the arrested population in sheep, a phenomenon recorded for *M.marshalli, H.contortus, N.filicollis* and *T.colubriformis* in sheep from Fars province, southern part of Iran [15]. A striking founding is the absence of 3 species of *Trichostrongylus* spp in the present research, which were recorded from sheep with high prevalence and mean intensity range (17-58% and 8-740 respectively), [13]. This shows the more responsiveness of these species to strategic anthelmintic treatment starting two decades ago. On the other hand, our findings uniformity of seasonality and prevalence in 3 studied zones, are in contrast with Skerman *et al*. [1], who showed seasonality and fluctuation in prevalence in zone I and II. Although similar to latter study worm burden observed in zone I was higher than the other two zones. This is a natural phenomenon related to more annual rainfall in zone I. These remarkable changes are firstly related to the governmental strategic treatment of Iranian sheep and goats' population since 1968 twice a year for a period of 10 years, with albendazole and its continuation later on by sheep owner themselves. Secondly to periodical draught encountered in Iran in last two decades. Meanwhile the economic benefits of strategic treatment and rise the price of meat bring the sheep owner to the assumption that more treatment will lead to more meat, the result of which, among other things, was production of resistance of some trichostrongylids to albendazole and tetramisole. Moreover limitation in grazing pastures due to rise in price of land decreased the available pastures and its compensation by hand feeding and hence less worm infections.

According to several studies carried out in Iran, [1] and other parts of the world, [4, 16, 17] gastrointestinal nematodes could be harmful to the health of infected animals and causes economic losses due to mortalities, reduce weight gain and other production losses. As far as the site location of GI nematodes are concern, abomasums has a strategic situation, because 3 important pathogenic nematodes of GI e.g. *H. contortus,* Ostertagia spp. and Trichostrongylus spp., live in this organ. It seems likely even to take into consideration the mean number of multispecies nematodes infections reported in this study (112.5) no pathogenecity can be attributed to them. As far as abomasal helminths fauna of sheep is concern, it seems likely that the similar species are prevalent in countries neighboring Iran such as Turkey [18], Iraq [19, 20], to a lesser extent in Pakistan [6], where *H. contortus* was the most prevalent species and Ethiopia a country with completely different climatic conditions, where *T. circumcinct, H. contortus and Trichostrongylus axei* were the prevalent species [21].

The results of this paper show a harmony between fauna, prevalence and even intensity of abomasal helminths of sheep from different parts of Iran despite the differences in climatic conditions. For actual abomasal worm infections and its extent to GI nematodiasis, no chemotherapy is recommended, but it is necessary to prevent emerging sever and new resistance of GI helmiths to anthelmintic compounds and reemerging a new population of helminths harmful to the health and economy of sheep breeding by monitor the trend of infection in the future.

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