

Parasite nematode infections in Awassi adult sheep: distribution through Syrian farm flocks

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Summary — A survey was conducted on 1 474 adult sheep from 73 flocks distributed in the 13 provinces of Syria. Faecal egg and larval nematode outputs were studied. *Marshallagia* and *Nematodirus* infections were higher in the driest areas; infections by other nematodes, *Dictyocaulus* and small lungworms (*Cystocaulus* and *Muellerius*) were higher in the more rainy areas. A long transhumance limited small lungworm infections, which were higher in flocks using wet night shelters.

nematode / parasite / sheep / Syria / epidemiology

Résumé — Infestations des Ovins Awassi adultes par les nématodes parasites : distribution parmi les troupeaux syriens. Une enquête sur 1 474 Ovins appartenant à 73 troupeaux répartis dans les 13 provinces syriennes a permis de préciser la distribution des principaux genres de nématodes parasites des poumons et du tractus digestif, par province, région climatique et type d'élevage. En dehors de *Marshallagia* et de *Nematodirus*, plus abondants dans les zones sèches, la majorité des nématodes parasites sont favorisés par le régime pluviométrique. Les infestations par les protostrongles sont plus importantes parmi les troupeaux utilisant de mauvais abris nocturnes et limitées chez ceux pratiquant la transhumance sur de longues distances.

nématode / parasite / Ovin / Syrie / distribution

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INTRODUCTION

Helminth infections in Awassi sheep from north-west Syria are dominated by lungworms and gastrointestinal strongyles and undergo large seasonal and annual variations (Thomson and Orita, 1988; Giangaspero *et al*, 1995). Levels of infection are higher during the rainy season in winter and spring and a summer hypobiosis permitted the predominant parasites species from the abomasum to survive the hot and dry season (Giangaspero *et al*, 1992).

The studies above concerned farm flocks in the north-west part of Syria, but there was no data for the rest of the country, except some abattoir observations (Hörchner, 1964; El-Moukdad, 1977). The aim of this work was to study the distribution of the different nematode parasites in 73 flocks from the 13 provinces in Syria, and to determine the effect of some management and environmental conditions on the levels of infection.

MATERIALS AND METHODS

Seventy-three Awassi sheep flocks representative of the live stock production systems in the country (fig 1), were sampled from mid-November 1991 to mid-February 1992 (the period when faecal egg and larval outputs are highest). The numbers of sampled flocks in each province were chosen according to the animal population of the province.

From each flock, 20 adult sheep were selected for sampling, 1 male and 19 females distributed as yearlings, pregnant, lactating or dry ewes in proportions corresponding to their distribution in the flock. Faecal samples were collected from 1 474 individual sheep, details of each individual's sex, physiological state and age were recorded. Three grams of faeces was put in a Baermann apparatus at room temperature (20°C) for 16 h to recover lungworm larvae which were identified and counted. Eggs from *Marshallagia*, *Nematodirus* and other gastrointestinal nematodes were counted using the McMaster method with saturated NaCl, and the presence of eggs from *Moniezia* was noted. A pooled sample of faeces

from each flock was used in a simple sedimentation technique (Watannabe, 1953) to determine the presence of trematode eggs.

For each flock, information was recorded on the number of sheep, the distance of the transhumance to find food during the dry season, and on the management of the animals overnight.

Flock structure, management and climatic zone

Scorings were given for sex or physiological state (0 = male, 1 = yearling, 2 = pregnant, 3 = lactating and 4 = dry ewe), the type of night shelter (0 = absent, 1 = only for lambs, 2 = poor, usually overcrowded and poorly ventilated, and 3 = good) and the climatic zone (1 = > 600 mm/year, 2 = 350–600 mm/y, 3 = 250–350 mm/y, 4 = 175–250 mm/y, 5 = 100–175 mm/y, 6 = < 100 mm/y and 7 = Euphrate valley where irrigation was used). Flocks were also scored on size (1 = < 50, 2 = 50–150, 3 = 150–300 and 4 = > 300 sheep) and the distance of transhumance (1 = < 50, 2 = 50–150 and 3 = > 150 km).

Statistical analysis

The egg and larval counts per g of faeces (epg, lpg) were log-transformed. Variance analysis and correlations were performed by using the SAS computer package (Statistical Analysis System Institute, 1989).

RESULTS

Parasite distribution in Syria

Table I contains details of the animal numbers, numbers of gastrointestinal nematode eggs, lungworm larvae and prevalence of *Moniezia* for flocks in the 13 provinces. Flocks from the NW + E provinces had higher GI faecal egg counts (mean of 650 epg, 509 lpg) compared with the S provinces (mean 237 epg). The numbers of

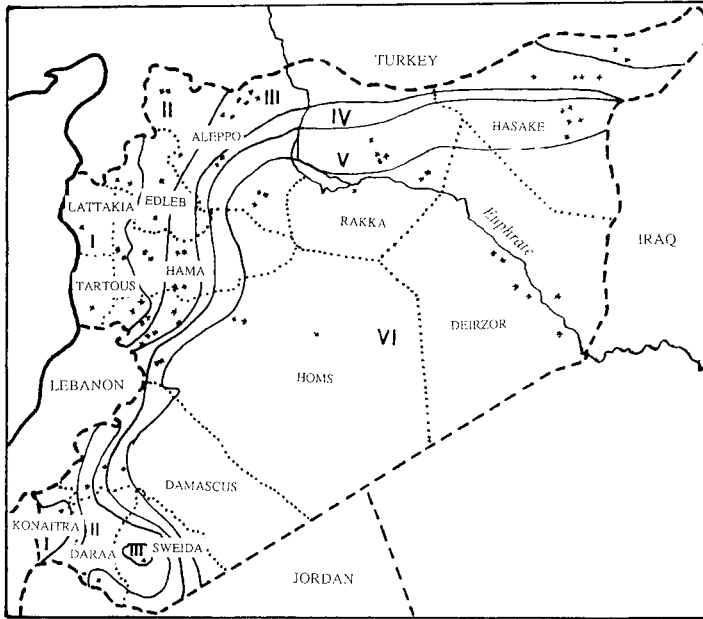


Fig 1. Syrian agro-climatic zones defined by rainfall (I = > 600 mm/year, II = 350–600 mm/y, III = 250–350 mm/y, IV = 175–250 mm/y, V = 100–175 mm/y and VI = < 100 mm/y). (—) Boundaries of agro-climatic zones. (---) Province boundaries. * Locations of sampling.

eggs of *Marshallagia marshalli* and *Nematodirus* spp were low in the provinces of Lattakia and Tartous close to the Mediterranean sea and highest in the semi-desert province of Rakka. The other species of gastrointestinal nematodes were predominant in the egg counts, especially in the northwest provinces. Relatively few lungworm larvae were recovered from flocks in the E provinces, although *Dictyocaulus filaria* larvae were present in all 3 provinces. In the NW + S provinces, *Cystocaulus ocreatus* appeared to be the predominant lungworm species and faeces from the flock in Sweida contained more than 1 200 lpg. *Muellerius capillaris* was commonly found in the NW + S provinces, but only flocks in Homs, Dara and Konaitra had larval recoveries of less than 30 lpg instead of an abundance of *C ocreatus*. *Neostrongylus linearis* and *Protostrongylus* spp were secondary species tending to be more abundant in northern flocks. *Moniezia* eggs were most frequently found in faeces from animals in the north-western provinces but were never recorded

in the southern provinces. *Fasciola* sp was recorded in 12 flocks out of 73, mainly those using irrigated pastures in or near the Euphrate valley. *Dicrocoelium lanceolatum* was observed on only 1 occasion.

The highest significant correlations between individual egg and/or larval outputs for the different genera were positive; their values were 0.418 for *Cystocaulus* and *Muellerius*, 0.263 for *Cystocaulus* and *Dictyocaulus*. This last genus was also correlated with total strongyles (0.216), *Nematodirus* (0.158) and *Marshallagia* (0.149).

Factors influencing predominance

The effect of fixed factors was studied by variance analysis of the transformed parasitological data (table II). In the wetter climatic zones, the gastrointestinal nematodes of *Teladorsagia circumcincta* and *Trichostrongylus* spp predominated, whereas *Marshallagia* and *Nematodirus* appeared to

Table 1. Parasitic infection of Awassi sheep from the provinces of Syria (arithmetic means of the sampled flocks per province for the gastrointestinal strongyles and the lungworms, and prevalence for *Moniezia* spp).

Province	No of flocks	No of animals	GI strongyles (epg)				Lungworms (lpg)				Moniezia (%)
			Total	Marshallagia	Nematodirus	Dictyocaulus	Muellerius	Cystocaulus	Neostrongylus	Protostrongylus	
<i>North western provinces</i>											
Aleppo	14	239	808	138	82	9.4	30.4	57	1.5	0.3	13.8
Edleb	4	86	738	55	7	18.7	99.8	247	4.2	6.4	9.3
Hama	8	119	386	102	68	4.2	63.9	108	15.8	1.8	4.2
Homs	14	280	662	127	89	13.5	4.2	294	1.3	9.4	11.4
Lattaq/Tartous	2	41	656	7	0	0.5	36.7	21	56.2	0	9.8
<i>Eastern provinces</i>											
Rakka	7 ^a	100	669	187	150	1.3	0.3	10	0	0	3
Deirzor	6 ^a	121	578	64	40	1.9	0	0	0	0	1.7
Hasake	11	219	281	98	56	3.7	1.0	8	0	0	0.5
<i>Southern provinces</i>											
Damascus	3	40	137	52	27	4.7	213	146	0.1	7.1	0
Dara	2	40	169	62	12	3.7	5.3	254	0.2	0.3	0
Konaitra	1	20	255	75	25	19.2	0	0	0	0	0
Sweida	1	20	385	115	80	50.1	110	1 237	0	64.9	0

^a Three and 6 flocks from Rakka and Deirzor, respectively, were in the Euphrate's valley.

predominate in the drier zones. Lungworms tended to occur more frequently in the wetter regions. Gastrointestinal nematode faecal egg and lungworm larval counts were highest in flocks containing between 50 and 150 animals. The effect of the distance of transhumance was more significant for small lungworm infections; short distances favoured the possibility of animal infection. The availability of good night shelter appeared to influence the prevalence of small lungworms. Small lungworm larval counts averaged 1.6 lpg in animals with good shelter compared to 7 and 6.8 lpg in animals lacking any shelter or having poor shelter.

DISCUSSION

Haemonchus contortus was not recorded in this survey but has been shown to be present in small numbers in a previous survey

conducted in an adjacent region of northern Iraq (Altaif and Issa, 1983). However, our data are not complete at this specific level and necropsies of some animals must be done mainly from flocks from the Euphrate valley to verify the eventual presence of this species in Syria. The results from our survey, conducted largely during the winter months, suggest that the predominant gastrointestinal species in Syria are other species, followed by *Marshallagia marshalli* and *Nematodirus* spp. By reference to surveys of flocks from Aleppo (Giangaspero *et al*, 1992) and from northwest Syria (Giangaspero *et al*, 1995), including necropsies of ewes performed during winter time, other species comprised a mixture of *T circumcincta* and *Trichostrongylus* spp.

The distribution of the various genera/species of parasite recorded in this survey appeared to be most influenced by the availability of moisture. The highest *T*

Table II. Effect of climatic zone, flock size, distance of transhumance and type of night shelter on the parasitic infection of the flocks during winter (geometric means and significance *P*).

Factor	No of flocks	GI strongyles (epg)			Lungworms (pg)				
		Total	Marshallagia	Nematodirus	Dictyocaulus	Muellerius	Cystocaulus	Neostongylus	Protostrongylus
<i>Climatic zone</i>		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>P</i> <									
> 600 mm/y	9	98	2.2	0.8	1.6	1.8	2.4	2.0	0
350–600 mm/y	12	78	8.9	2.3	1.9	12.1	3.7	0.5	0.8
250–350 mm/y	21	30	18.2	5.4	2.8	7.5	1.1	0.5	0.2
175–250 mm/y	5	10.5	13.8	3.3	1.1	1.4	0.4	0	0
100–175 mm/y	11	30	20.8	14.2	0.7	0.1	0.1	0	0
< 100 mm/y	6	31	36.9	4.0	1.2	0.2	0	0	0
Euphrate	9	43	8.5	4.2	0.7	0.5	0.1	0	0
<i>Size of the flock (no of animals)</i>									
<i>P</i> <		0.000	ns	0.001	0.012	0.000	0.000	0.000	0.070
< 50	7	34	13	2.5	1.6	1.3	0.3	0.1	0.2
50–150	40	61	10	3.4	1.9	4.5	1.8	0.7	0.2
150–300	21	18	14	5.4	1.4	3.1	0.3	0.1	0.1
> 300	5	22	15	10.3	0.7	0.4	0.2	0.2	0
<i>Distance of transhumance (km)</i>									
<i>P</i> <		ns	0.03	ns	ns	0.000	0.000	0.000	0.000
< 50	45	43	9.8	3.8	1.6	3.9	1.3	0.6	0.2
50–150	11	26	15.4	4.7	1.5	1.0	0.4	0.1	0
> 150	5	46	18.1	4.1	2.3	3.2	0.3	0	0.5
<i>Type of night shelter</i>									
<i>P</i> <		ns	ns	0.000	ns	0.000	0.000	0.000	0.000
Absent	24	41	14.1	6.1	1.7	5.0	1.0	0.7	0.3
For lambs	2	30	8.5	5.3	1.3	0.6	0	0	0
Bad	29	39	9.7	2.2	1.7	4.6	1.7	0.4	0.1
Good	17	44	11	6.0	1.5	1.2	0.3	0.1	0

ns = non-significant.

circumcincta and *Trichostrongylus* spp egg counts occur in zones with more than 350 mm of rain *per annum* and in the Euphrate's Valley. The distribution of *Marshallagia* appeared to be influenced by climate and is the most common in the driest zones. Suarez and Cabaret (1981) have suggested that this species favours steppe and sub-desert areas which have a hot, dry summer and cold winter. The distribution of *Nematodirus* spp also appeared to be influenced by rainfall, and regions with more than 350 mm rainfall *per annum* had the lowest *Nematodirus* egg counts.

The distribution and prevalence of the different genera of lungworms was variable. Although *D filaria* was ubiquitous, the small lungworms, especially *Cystocaulus* and *Muellerius*, tended to predominate. These findings are similar to those reported from a survey of Awassi sheep in northwest Syria (Thomson and Orita, 1988). *Cystocaulus* and *Muellerius* tended to be commonest in wetter regions as were *Neostongylus* and *Protostrongylus*. The latter genera were less frequently recorded and never in samples from animals from the drier regions where rainfall was less than 100 mm *per annum*. The distance of transhumance also influenced *Cystocaulus* and *Protostrongylus* distribution with fewer larvae being recovered from animals which moved more than 150 km. As reported previously for sheep in the northwest Syria (Giangaspero *et al*, 1995), the absence or provision of poor night shelter also influenced small lungworm distribution.

In conclusion, out of *Marshallagia* and *Nematodirus* located in the driest areas, rainfall favoured lungworm and gastrointestinal infections.

tions were higher in flocks with a wet and poorly aerated night shelter and lower in those practicing a long-distance transhumance.

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