EPIDEMIOLOGY OF SHEEP INFECTION BY *OESTRUS OVIS* IN ALGERIA

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Summary:

313 sheep were examined in 1996 to assess the importance and seasonal evolution of *Oestrus ovis* infection in the Algerian region of El-Tarf. Prevalence was found to be 67.4 %. The larval burden was 18 larvae by infected sheep. The prevalence was higher in older sheep than in lambs; intensity was similar. The different larval stages were found all along the year in sheep with prevalence ranging from 33.1 to 80.5 % for L1, 9.7 to 43.9 % for L2 and 8.4 to 23.0 % for L3. The sheep were the least infected in winter (prevalence from 35.7 to 44 % and intensity seven to ten larvae per sheep). The highest infection was found during the warm season (spring to autumn, prevalence from 62 to 90 % and intensity ranging from 15 to 25). This larval evolution profile suggested the existence of one long cycle (November-April) and possibly two short cycles (May-October). This epidemiological pattern is similar to that in Morocco but was slightly different from the situation in Tunisia where the winter cycle was apparently of lesser importance.

KEY WORDS : *Oestrus ovis*, sheep, epidemiology, Algeria.

MOTS CLÉS : *Oestrus ovis*, mouton, épidémiologie, Algérie.

Résumé : ÉPIDÉMIOLOGIE DE L'INFESTATION DES OVINS PAR *OESTRUS OVIS* EN ALGÉRIE

313 têtes d'ovins de la région d'El-Tarf en Algérie ont été examinées en 1996 en vue d'étudier l'infestation des ovins par *Oestrus ovis*. La prévalence est de 67,4 %. L'intensité d'infestation atteint une moyenne de 18 larves par ovin. La prévalence était plus forte chez les animaux de plus d'un an que chez les agneaux, mais l'intensité était similaire. Les différents stades larvaires ont été retrouvés tout au long de l'année avec des prévalences de 33,1 à 80,5 % pour les L1, 9,7 à 43,9 % pour les L2 et 8,4 à 23,0 % pour les L3. Une période d'infestation minimale des ovins est mise en évidence en hiver avec des prévalences de 35,7 à 44 % et des intensités de sept à dix larves par ovin infesté. Une période d'infestation maximale est enregistrée pendant la saison chaude (printemps, été, automne) avec une prévalence de 62 à 90 % et des intensités de 15 à 25 larves par ovin infesté. Le profil d'évolution de l'infestation des ovins par *Oestrus ovis* suggère l'existence d'un cycle long (novembre-avril) en période froide et vraisemblablement de deux cycles courts en période chaude (mai-octobre). La situation épidémiologique est similaire à celle du Maroc, mais diffère un peu de celle décrite en Tunisie, qui présente un cycle d'hiver long de moindre importance.

Oestrus ovis is a Diptera belonging to the Oestridae family that infects sheep. Larvae are found in frontal sinuses and nasal cavities. The disease may decrease production in infected animals (Lucker & Foster, 1958; Marsh, 1965), or cause pathology (Dorchies & Alzieu, 1997). It is widely distributed in small ruminant breeding areas (Babcock, 1953; Breiev *et al.*, 1980). There is a clear seasonal evolution of infection in South of France or in the Sahelian countries of Africa (Tabouret *et al.*, 2001). The seasonal evolution is much less clear in Mediterranean countries (Morocco: Pandey & Ouhelli, 1984; Tunisia: Kilani *et al.*, 1986; or Sicily: Caracappa *et al.*, 2000). The situation in Algeria has not been studied and we intended to assess the seasonal prevalence and intensity of

infection by *O. ovis* in the region of El Tarf in Algeria in a Mediterranean comparative approach.

MATERIAL AND METHODS

REGION OF STUDY AND SHEEP FARMING

El-Tarf is located at the north-east of Algeria. The yearly rainfall is 700 mm, and maximum and minimum temperatures are respectively 41°C (July-August) and 4°C (January-February). The rainfall season extends from October to April. Sheep are grazed on pastures all the year. They graze on fallow fields in winter and stubble fields in summer. A part of sheep are bred in peri-urban conditions and kept near house. The lambing periods are November-December and April-May.

SAMPLE COLLECTIONS

The sheep heads were collected at the Ai-Assel slaughterhouse from January to December 1996. The animals

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Fig. 1. – Monthly *Oestrus ovis* prevalence in sheep.

less than one year were male and female lambs; the sheep older than one year were mostly old ewes. Most of the sheep originated from the El Tarf area but some could have been bred in distant regions. *O. ovis* were collected weekly on 6-9 sheep heads using a technique described in Testé (1979) and Yilma (1992). The sheep characteristics (region of origin, age based on tooth growth, and sex) and localisation of *O. ovis* were recorded. The identification of larvae was done using the keys of Zumpt (1965).

STATISTICAL ANALYSES

One-way analysis of variance (ANOVA) and Newman-Keuls comparison tests, GLM (General linear model), and chi-square analyses were performed using a Simstat software (Peladeau & Lacouture, 1993). A test was considered as significant when the probability of the result was equal or less than 0.05.

RESULTS

OVERALL PREVALENCE AND INTENSITY OF *O. OVIS* INFECTION

211 heads out of 313 were positive for *O. ovis* (prevalence 67.4). 129 sheep (61.1 %) harboured the three larval stages of *O. ovis*, 61 (28.9 %) had two larval stages and only 21 (9 %) were infected with only one larval stage. Mean intensity of infection was 18.6 larvae (range: 1-113). The proportion of L1, L2 and L3 stages were respectively 59.5 %, 24.6 % and 15.9 %.

SEASONAL EVOLUTION OF PREVALENCE AND INFECTION

Prevalence (Fig. 1) is lower in January to March (36 % to 44 %) and remained over 60 % for the most of the rest of the year, and a maximum was recorded in July (90 %). No month effect was demonstrated using one-way ANOVA ($p = 0.12$), but comparing winter with spring, summer and autumn yielded significant difference (Chi-square, $p = 0.0001$).

Fig. 2. – Seasonal evolution of intensity of *Oestrus ovis* infection.

Fig. 3. – Monthly proportions of the three *Oestrus ovis* instars.

Intensity seasonal pattern (Fig. 2) followed that of prevalence. The lowest intensities were found in January (9.5 larvae by sheep) and February-March (six to seven larvae by sheep) and the highest intensities (> 20 larvae by sheep) were recorded from April to October. There is a significant difference between winter and the other seasons (GLM; $p = 0.0002$) but no difference could be found during the period from April to October ($p = 0.18$).

L1 instars were the most frequent along the year (Fig. 3) except in April, when L2 were more frequent (43.9 L2 vs 33.1 L1). The seasonal evolution of proportions was as follows (Fig. 3): L1 decreased during winter (80.5 %

Sheep	Intensity of the three instars (no of instar/infected sheep)			Prevalence % (no positive/no sheep sampled)
	L1	L2	L3	
Age (number)				
< 1 year (123)	11.6	5.4	3.2	58.9 (209)
> 1 year (88)	10.4	3.4	2.7	84.6 (104)

Table I. – *Oestrus ovis* in Algerian sheep: intensity of the three instars and prevalence.

in January to 33.1 % in April, when it then increases steadily from May to December (47.4 to 77.1 %). Seasonal differences were recorded for the three instars (L1: $p = 0.006$; L2: $p = 0.009$; L3: $p = 0.046$)

INFLUENCE OF AGE ON PREVALENCE AND PROPORTIONS OF THE THREE-INSTAR INTENSITY OF INFECTION (Table I)

Prevalence was significantly higher in sheep older than one year (Anova: $p = 0.048$).

Intensity of infection was 20.1 in younger sheep and 16.5 in older sheep.

A general analysis (GLM using the following model: proportions of each instar = age + month + interaction age $\times$ month) did not show any influence of age, on L1 ($p = 0.24$), L2 ($p = 0.14$) or L3 ($p = 0.66$).

DISCUSSION

O. ovis prevalence in El Tarf is comparable to that found in Morocco (prevalence: 69.2 %, Pandey & Ouhelli, 1984) and lower to that in Tunisia (93 %, Kilani *et al.*, 1986). The intensity of infection (18.6 by sheep) is higher than in Morocco (6.7 by sheep) and lower than in Tunisia (34 by sheep). These discrepancies between the North African countries might be related to conditions of survey (age of sheep, microclimate, etc.). The influence of age of sheep is comparable to the findings of Yilma (1992). Prevalence was higher in older sheep whereas intensity was not very different according to age.

Infection of sheep in Algeria might be classified into two periods: *i*) winter, with low intensity and prevalence, possibly due to low temperature ($< 16^{\circ}\text{C}$) that does not permit the activity of flies and development of pupae (Rogers & Knapp, 1973; Yilma, 1992) and *ii*) spring to autumn, with high prevalence and intensity. The rise occurring in the beginning of spring has also been noticed in France (Yilma, 1992) and Morocco (Pandey & Ouhelli, 1984). The prevalence in winter (January to March: approximately 40 %) was compa-

rable to that recorded in Morocco (40 %) but was different from that recorded in Tunisia (nearly 95 %). This could be due to sampling as Tunisian sheep were all older than one year, and thus winter prevalence was higher due to age and probably not to location. The Morocco and Algeria winter prevalences were higher than those recorded by Yilma (1992) in the Limousin region of France in lambs (22 %), but were similar to those recorded in ewes (40 %). First instars are found over all the year but they represent more than 75 % of all instars from November to February (see Fig. 3). The seasonality of L1 is weak in Mediterranean countries (monthly percentages: 35 to 65 %) compared to that recorded in South West of France (30 to 100 %) (Tabouret *et al.*, 2001). The period of predominance of the L1 in South of France is clear: September to February in French Pyreneans (Yilma & Dorchies, 1991) and October to March in French Limousin (Yilma, 1992). The seasonality of L3 is also lower: monthly percentages 10 to 30 % in Mediterranean countries against 0 to nearly 40 % in South West of France. These colder periods may correspond to inhibition of development. In the El-Tarf region we may consider an end of autumn-winter long cycle in relation to inhibition of development and several shorter cycles during spring to beginning of autumn, considering the duration of one life cycle). The data obtained in Morocco (Pandey & Ouhelli, 1984) on tracer lambs indicate that infection occurs from April to November and that probably two generations in warm period do occur, one with a peak in June and another in September; this does not clearly appear on slaughterhouse results, resulting from overlap in these warm season generations. These two peaks are not seen during the warm season neither in Tunisia (Kilani *et al.*, 1986) nor in Algeria slaughterhouse data. The knowledge on epidemiology of *Oestrus ovis* is important to control the disease. The risk of infection in Mediterranean countries is high during most of the year and control relies on frequent treatments. In Algerian and Moroccan conditions, a short winter period is not at risk and treatment given at the end of the fly season will interrupt the life-cycle, and although it could not be as efficient as it has been in South West of France (Jacquet & Dorchies, 2002), it may reduce risk during the warm season.

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