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ORIGINAL ARTICLE

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Oestrus ovis larval infestation among sheep and goats of Green Mountain areas in Libya

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A B S T R A C T

Heads of sheep (n=180) and goats (n=120) slaughtered at four regions (Labraq, Shahat, Elbeida, and Masa) of Green Mountain areas in Libya were investigated for the presence of larvae of *Oestrus ovis*. The animals were divided into sex and age groups. The heads were cut along longitudinal and sagittal axes, and the larvae (L1, L2, and L3) were collected. The infestation rate was significantly higher in sheep (51.66%; n=93/180) as compared to goats (28.33%; n=34/120). In sheep, the rate was higher during May (100%), while in goat, it was higher during August (70%). The incidence of L1 peaked in April (90%) for sheep and October (100%) for goats, while L2 reached to maximum in May for sheep (26.95%) and goats (75%). L3 reached to peak in February (50%) for sheep, and June (25%) for goats. Mean intensity of larval burden was higher in sheep than goat, reaching to peak in June (9.1 larvae/head) for sheep and March (3.5 larvae/head) for goats. The infestation rate was significantly higher in males than females. The older animals were mostly affected as compared to younger animals. Highest infestation rate was recorded in Masa (45.83%), and the lowest rate was found in Labraq (40.27%). In conclusion, these findings may be used in designing the control strategies of myiasis in Libya.

Keywords

Larval burden, *O. ovis* , prevalence, Seasonal dynamics

ARTICLE HISTORY

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INTRODUCTION

It is well known that *Oestrus ovis* is a widespread parasite, and its larvae usually inhabit in the nasal cavities and sinuses of sheep and goats, and subsequently causes myiasis (Zumpt, 1965). This myiasis severely impairs health condition, causes difficult breathing when the nasal discharge becomes caked with dust, mouth breathing, lung abcess and/or emaciation, followed by death (Dorchies et al., 2000). From the nasal cavities and sinuses, the larvae may migrate into brain causing false gid (Mozaffari et al., 2013).

O. ovis may cause ophthalmyiasis in man; thus, it is also considered as a zoonotic parasite, as reported in many parts of the world including Libya (Fathy et al., 2006) and other Middle Eastern countries (Abo-Shehada et al., 2000; Masoodi and Hosseini, 2004; Gregory et al., 2004; Al-Amry et al., 2014; Negm- Eldin, 2015)

Several studies on *O. ovis* have been reported from Mediterranean or Middle Eastern countries such as Italy (Caracappa et al., 2000), Saudi Arabia (Alahmed, 2000; Dorchies et al., 2000), Greece (Papadopoulos et al., 2001; Scala et al., 2001), Jordan (Abo-Shehada et al., 2000), Turkey (Uslu and Dik, 2008; Karatepe et al., 2014), and Libya (Gabaj et al., 1993). However, the current status of *O. ovis* in Libya is unknown. Moreover, month-wise myiasis burden in Libya is yet to be known. The aim of this research work was to investigate for the first time the monthly prevalence and larval burden of *O. ovis* among slaughtered sheep and goats in the Green Mountain area, Libya.

MATERIALS AND METHODS

Animals and study area: Three hundred heads of sheep (n=180) and goats (n=120) were slaughtered and examined weekly for *O. ovis* infection from April 2010 to March 2011 at the abattoirs of four regions (Labraq, Shahat, Elbeida and Masa) located in the Green Mountain area, Libya. The area rises to an altitude of 840 meters and lies northeast of Benghazi and south of Derna and the Mediterranean Sea.

Examination procedure. Individual heads of the slaughtered animals were seperated from the carcasses, and the sex and age of animals were registered. The heads were cut along their longitudinal and sagittal axes by electrical saw. After collection of the larvae, 1% hydrogen peroxide (H_2O_2) was injected through the breathing hole of the larvae, and were preserved in alcohol-glycerin or 10% formalin, as described by Khan et al. (2006). In each positive head, the larvae were counted, identified using keys, following the procedure of Zumpt (1965). The severity of the infestation was calculated based on number of larvae/number of infected animals. Moreover, the gross pathogenicity associated with larval infestation was demonstrated.

Statistical analysis. The collected data were analyzed statistically using chi-square and *t*-tests using SPSS version 17.1, as decribed by Steel and Torie (1981).

RESULTS AND DISCUSSION

The gross pathological changes associated with the *O. ovis* larvae were observed in most of the infested animals revealed the presence of sinusitis, rhinitis, catarrhal discharges and purulent exudates (**Figure 1**). The recorded pathogenic effects on infested animals might be referred to a hypersensitivity response than to the mechanical trauma caused by larval oral hooks (Dorchies and Alzieu, 1997), or to the immune deficiency caused by the larval development which is accompanied by secondary bacterial infestations such as pasteurolosis (Abo-Shehada et al., 2000).

Out of the examined 300 sheep and goat heads, 42.33% (n=127/300) were found to be infested with *O. ovis* larvae; this result was very close to the reports of Dorchies et al. (2000), Arslan et al. (2008) and Shoorijeh et al. (2009). Conversely, a higher infestation rate was reported by Alcaide et al. (2003), Alem et al. (2010), Papadopoulos et al. (2010) and Gebremedhin (2011), and a lower infestation rate was described by Karatepe et al. (2014). This variation might be due to differences in geographical location, animal breed and environmental condition.

The higher infestation rate ($P<0.05$) recorded in sheep (51.66%; n=93/180) than goats (28.33%; n=34/120) (**Table 1**) was previously observed by other researchers (Gabaj et al., 1993; Dorchies et al., 2000; Yilma and Genet, 2000; Papadopoulos et al., 2001; Gepremedhin 2011). In contrast, Papadopoulos et al. (2010) recorded a higher infestation rate in goats than sheep. This variation may be accredited to the fact that sheep are either immunologically compatible or the avoidance behavior of goats gives them a protective advantage and prevent female *O. ovis* from laying its larvae (Gabaj et al., 1993). The morphological characteristics of the larval stages were displayed in **Figure 2** and **Figure 3**.

The highest prevalence rates in sheep and goats were recorded during May (100%) and August (70%) respectively, while the lowest prevalence was observed in January in sheep (13.33%) and January and Febrauray in goats (0%). L1 predominated at 60.61% of the total larval burden in sheep and goats. The L1 was peaked during April (90%) in sheep and October (100%) in goat. The highest percent of L1 recorded during spring and summer might be due to increased activity of the adult *O. ovis* fly and favorable climatic conditions (Othman, 2009), or to winter diapause periods, and decrease in the larval growth rate (Dorchies and Alzieu, 1997; Scala et al., 2001). These findings coincided with previous reports of Alahmed (2000), Arslan et al. (2008) and Uslu and Dik (2008), who reported the peak of larval infestation in August. In contrast, winter peak larval infestations was observed by Alcaide. et al. (2003) and Shoorijeh et al. (2009), suggesting that the deceleration in larval development during these months along with the deposition of new larvae by gravid female flies causinge pooling effect. The significantly higher proportion of L1 over L2 and L3 larvae recorded in the present research suggested the lack of the evolution of most of the first stage larvae (Zumpt, 1965) and/or retarded growth in situations of unfavorable season (Rogers, 1973). These findings were in support of Abo-Shehada et al. (2000), Uslu and Dik (2008) and Gebremedhin (2011).

The mean intensity of larval burden per infested animal was significantly ($P<0.05$) higher in sheep (5.96 larvae/head) than in goat (2.02 larvae/head). The highest mean intensity per infested animal peaked in June (9.1 larvae/head) in sheep and in March (3.5 larvae/head) in goat, while the least one was in

Table 1: The overall prevalence of *O. ovis* larvae among examined sheep and goat.

Animal	No. examined	Infested No	%
Sheep	180	93	51.66
Goat	120	34	28.33
Total	**300**	**127**	**42.33**

Table 2: Monthly prevalence and mean intensity of larval burden of *O. ovis* in infested sheep and goat.

Months	Species	No examined	No. Infested	Infestation %	Mean larval burden	L1%	L2%	L3%
January	Sheep	15	2	13.33	2.5	60	20	20
	Goat	10	0	0	0	0	0	0
Febrauary	Sheep	15	3	20	2	33.33	16.5	50
	Goat	10	0	0	0	0	0	0
March	Sheep	15	4	26.66	4	90	6	4
	Goat	10	2	20	3.5	75	25	0
April	Sheep	15	8	53.33	6.25	90	6	4
	Goat	10	2	20	2	75	25	0
May	Sheep	15	15	100	7.66	68.69	26.95	4.34
	Goat	10	6	60	1.33	25	75	0
June	Sheep	15	10	66.66	9.1	82.4	15.3	2.19
	Goat	10	6	60	3.33	65	10	25
July	Sheep	15	10	66.66	7.2	86.11	9.72	4.16
	Goat	10	6	60	1.83	81.8	18.18	0
August	Sheep	15	11	73.33	6	81.81	12.12	1.8
	Goat	10	7	70	1.57	72.7	27.2	0
September	Sheep	15	10	66.66	5.5	85.45	12.72	6.06
	Goat	10	4	40	1.75	85.78	0	14.28
October	Sheep	15	9	60	5.11	73.9	19.5	6.5
	Goat	10	1	10	1	100	0	0
November	Sheep	15	7	46.66	3.14	72.7	22.7	4.5
	Goat	10	0	0	0	0	0	0
December	Sheep	15	4	26.66	2.5	50	20	30
	Goat	10	0	0	0	0	0	0
Total		**300**	**127**	**42.33**	**3.22**	**60.61**	**15.33**	**7.46**

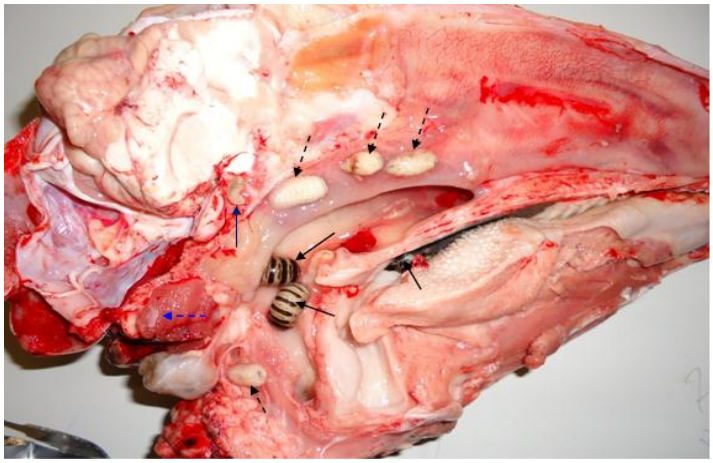

Figure 1: A sagittal section sheep head showing various larval stages of nasal pot (the dotted blue arrow: L1, the blue arrow: L2, the dotted black arrows: the initial stages of larvae L3, the black arrow: more advanced L3).

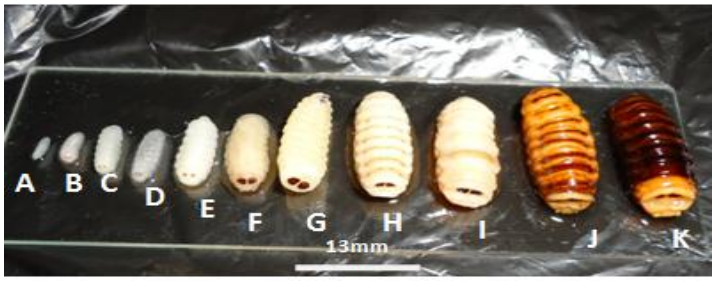

Figure 2: The three larval instars of *O.ovis* in the nose of sheep. A: first larval instar (L1), B-D: Second larval instar (L2), E-I: initial stages of third larval instar (L3), J and K: more advanced stage of L3.

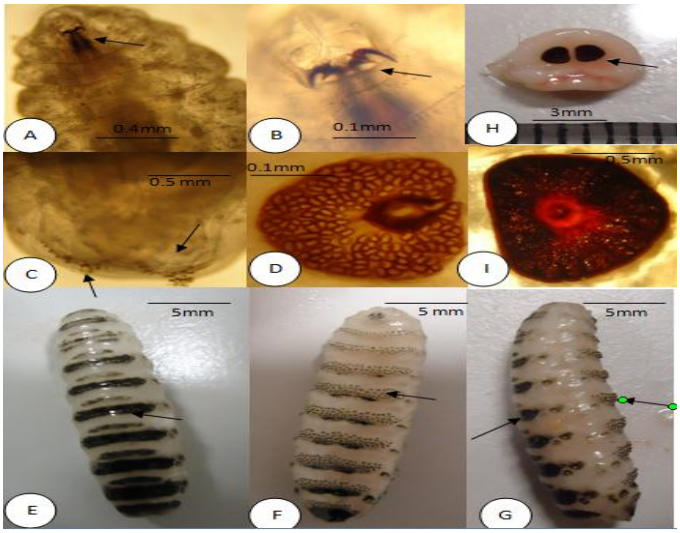

Figure 3: Some characteristic features of the larval stages *O. ovis*, A: the front end containing the cephaloskeleton, B: the vertical structure, C: the back end scallops and their terminal hooks, D: Stigmal plates which characterize L2 and channel appears with clear distinct suture, E- G: L3 (E: a dorsal view, F: a ventral view shows rows of spines on every segments, G: a side view illustrates parts of dark dorsal stripes and ventral spines), H and I: Posterior spiracles is D shape with a central button without distinct suture.

February (2 larvae /head) in sheep and October (one larva/ head) in goat. Though, no significant variation was observed between the various larval stages in were in accordance to other studies (Alem et al., 2010; Karatepe et al., 2014). However, lower results were reported by Dorchies et al. (2000), Yilma and Genet (2000) and Arslan et al. (2008). Higher results were obtained by Gabaj et al. (1993), Caracappa et al. (2000) Alcaide et al. (2003), Uslu and Dik (2008) and Papadopoulos et al. (2010). In goat, the result approached that of Biu and Nwosu (1999) and Dorchies et al. (2000), but it was much less that of Gabaj et al. (1993). The prevalence of infestation, the mean larval burden per month and the percentage of each larval stage (L1-L3) were displayed in **Table 2**.

Likewise, A significantly higher overall prevalence was observed in males than females sheep and goat (44.01% and 36.36% respectively), where 54.88% and 29% of males; 42.55% and 21.05% of females were infested respectively (**Figure 4**). This may be due to the increased density of males to females or to the physiological differences between sexes, and/or the habit of securing of male animals which facilitate their attack by *O. ovis* flies. A different result was encountered by Uslu and Dik (2008), Biu and Nwosu (1999), while Gebremedhin (2011) detected no significant differences between male and female.

A significant variation (P<0.05) in the overall prevalence was also observed between young and adult animals, where the prevalence was significantly higher (P<0.05) in sheep and goat of 25-36 months old followed by 13-24 months, 9-12 months and 5-8 months old (**Figure 5**). This finding was consistent with that was recorded by Abo-Shehada et al. (2000), Arslan et al. (2008), Uslu and Dik (2008) and Shoorijeh et al. (2009). In goat, Many authors reported a significantly higher infestation rate in young than adult (Yilma and Genet, 2000; Scala et al., 2001; Alem et al., 2010; Karatepe et al., 2014) and attributed such to the existence of immunity linked to the age and the lack of immune response of young ages to the parasite.

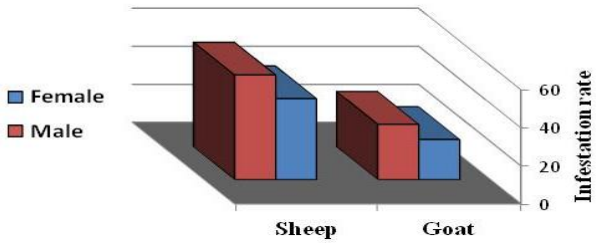

Figure 4: Prevalence of infestation according to sex.

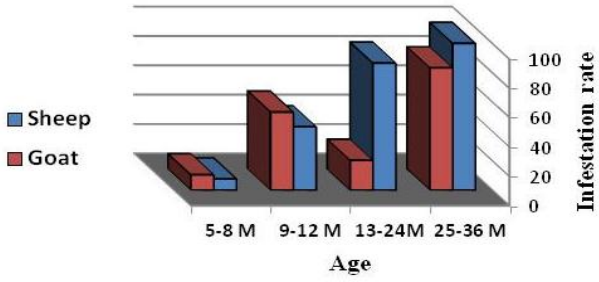

Figure 5: Infestation rate according to age.

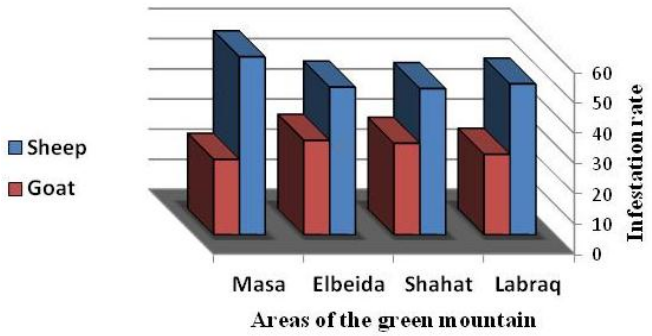

Figure 6: Infestation rate according to areas of study.

Additionally, the result showed no statistically significant variations (P>0.05) in the prevalences of *O. ovis* in sheep and goat of different areas of the Green Mountain. The highest and lowest prevalences were recorded in sheep from Masa and Shahat cities (59% and 48.48%, respectively). Goat from Elbeida city had the highest rate (31.3%), while those from Masa had the lowest one (25%) (**Figure 6**). Generally, the highest overall infestation rate was observed in Masa city (45.83%) followed by Elbeida (42.3%) and Shahat (41%) and the lowest was in Labraq (40.27%). These differences may be ascribed to the difference of animal density between different areas of study.

CONCLUSION

Sheep were more susceptible to *O. ovis* larvae infestation as compared to goats, and L1 dominanted over L2 and L3 in both the animal species. The infestation rate was significantly higher in males than female sheep and goats. The older animals were more susceptible to *O. ovis* than young animals. Among four regions in the Great Mountain area, the infestation rate was found to be the highest in Masa, followed by Elbeida and Shahat, and the rate was lowest in Labraq.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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