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A Survey of Seasonal Infestation with *Przhevalskiana* Larvae in Slaughtered Goats and Sheep in South-western Iran

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Abstract: In this research slaughtered sheep and goats were investigated during August 2003-July 2004 at a slaughterhouse in Masjed-Soleyman, South-Western Iran. The number of infested animals with *Przhevalskiana* larvae and their age and sex was recorded. Collected larvae from infested animals were stored in Alcohol-Glycerin solution and were studied to determine their morphological properties and species. The data was analyzed by the chi-square test. Rate of infestation was 0.2 and 5.3% in sheep and goats, respectively. Infestation rate in male and female goats and sheep was significantly different ($p < 0.05$). Prevalence of hypodermosis in sheep was significantly different in spring and winter, while infestation prevalence in goats was significantly different in four seasons of the year. Myiasis was seen more frequent in 2-3 and 1-2-year-old age groups of sheep and goats, respectively. The causative agents of goat and sheep hypodermosis were *Przhevalskiana aegagri* and *Przhevalskiana crossii*. The onset of fly activity was from late June to mid July.

Key words: Hypodermosis, *Przhevalskiana*, goat, sheep, South-Western Iran

INTRODUCTION

Myiasis is infestation of live humans and vertebrate animals with dipterous larvae which at least for a certain period, feed on the host's dead or living tissue, living body substances or ingested food (Zumpt, 1965).

Sheep and goat hypodermosis is a kind of subcutaneous myiasis, caused by larvae of *Przhevalskiana*, an insect belonging to Order *Diptera*, Suborder *Brachycera*, Family *Oestridae* and Subfamily *Hypoderminae*. Because of its major economic losses, myiasis is a worldwide problem in husbandry industry. Clinical characteristics of hypodermosis are tumors and nodules under the skin of the back and flanks of the animals. In this kind of myiasis, larvae cause considerable economic losses in hide, leather and meat products industry and adult fly causes a drop in milk, meat and wool production by induction of emotional disturbances in the hosts while swarming around them for oviposition (Zumpt, 1965).

Goats and sheep are infested with *Przhevalskiana* genus and on the basis of the morphological differences the existence of three different species was suggested by Zumpt: *P. silenus*, *P. crossii* and *P. aegagri* (Zumpt, 1965).

The molecular analysis of the same mitochondrial and ribosomal regions showed that *P. silenus*, *P. aegagri* and *P. crossii* are morphotypes of the same species (Otranto *et al.*, 2004).

Initial reports of sheep and goat hypodermosis was submitted by Brauer in Cisily, Italy, 1985 and it was also reported by Grunin (1962) in sheep and goats of different regions of central Asia in 1963. Sheep and goat hypodermosis is reported from Isreal, Pakistan, Afghanistan, Cypress, Iraq, Iran, Syria, Turkey, India, Albania, Greece and Yugoslavia (Zumpt, 1965).

Morsey *et al.* (1998) during monthly visits to North Sinai, Egypt found that 2.11% of goats were infested with *P. silenus*, mainly in winter. Also nodules caused by *P. silenus* were recovered from 32.65% of slaughtered goats in summer.

During the period of December 1998-May 2000 Abo-Shehada *et al.* (2000) examined 900 slaughtered goats for the larval instars of *P. silenus* in Northern Jordan. Of 900 goats 10% were infested with *P. silenus* larvae. Only the second and third larval instars had been seen. The percentage of infested goats and the mean monthly total number of larvae per goat peaked in samples taken in autumn and winter.

During the period of May 1997 to June 1998 Otranto and Puccini investigated 154 goats from 10 months to 6 years of age. Two hundred and six *P. silenus* larvae were collected from the subcutaneous tissue of the slaughtered animals during the trial period. The larval stage average size ranged from 4.7 mm, for first instar larvae (May), to 16.6 mm, for third instar larvae (February), in the first cycle of infestation. Small first instar larvae were found at the beginning of the second cycle of infestation (May-June).

Some studies conducted on the external life-cycle of *P. silenus* showed that total sum of temperature and length of time seem to play an important role in determining the duration of the pupal stage. Epidemiological data derived from a two-year survey carried out in six infected groups of goats are also reported that age parameter and variance of infection intensity are closely related (Tassi *et al.*, 1989).

The first reports on sheep and goat hypodermosis in Iran belong to William Prime. That study was conducted in 1936 at a slaughterhouse in Isfahan, central Iran and it showed severe infestation with *Hypoderma* in goats (Jafari Shourigeh and Reza zadeh, 1996). Since then many investigations have been conducted into frequency rate of hypodermosis infection in different areas of Iran.

Meat, hide and leather exports is one of the main sources of Iran's national income and since carcasses and hides of infested sheep and goats show marked evidence of infestation and reduced in value it is important to get knowledge about seasonal and sexual prevalence of hypodermosis and detecting the species of collected larvae from slaughtered goats and sheep to eliminate this disease and prevent economic losses.

MATERIALS AND METHODS

In a 1-year-old period, from August 2002 to July 2003, 8848 slaughtered goats and 16705 slaughtered sheep were investigated for presence of *Przhevalskiana* larvae at Masjed-Soleyman slaughterhouse (south-western Iran). The number of infested animals, their age and sex and other useful information were recorded. Since *Przhevalskiana* fly doesn't have internal migration and infestation with its larvae is local, larvae were collected from subcutaneous tissues of the slaughtered animals and stored in Alcohol-Glycerin solution and then samples were sent to parasitology laboratory.

These samples had been taken from 510 infested animals (476 goats and 34 sheep). After that, the first, fifth and last segments of the third-stage larvae were separated and observed under loop. Different species of *Przhevalskiana* are classified on the basis of posterior

peritremes in the third larval stage, having denticles above the mouth dots and arrangement of ventral spirulation of fifth segment.

At last seasonal prevalence of disease and incidence variations between sexes and among different age groups were investigated.

RESULTS

In this research two species of *P. crossii* and *P. aegagri* were supposed to be the major causes of subcutaneous myiasis in sheep and goats of Masjed-Soleyman region.

The posterior peritremes of third-stage larvae are very similar in these species. In both of these two species peritremes have many pores (Fig. 1) and this key point is used to distinguish these species and other properties were used to differentiate between *P. aegagri* and *P. crossii*.

P. crossii larvae have a few rudimentary and irregularly arranged denticles above the mouth-dots, but there are no denticles in *P. aegagri* (Fig. 2) (Zumpt, 1965)

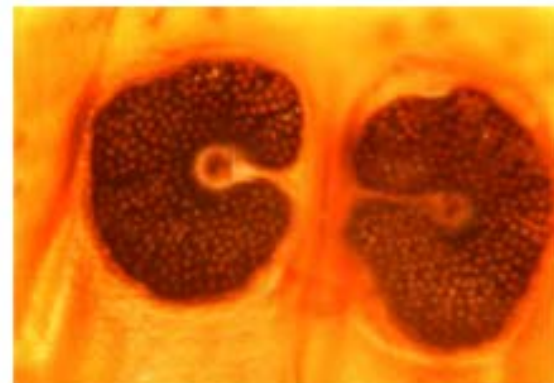


Fig. 1: Posterior peritreme in *P. aegagri*

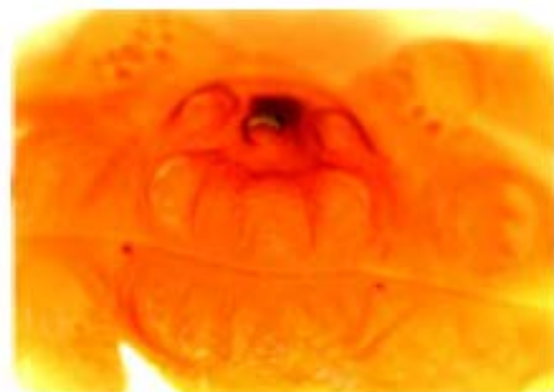


Fig. 2: Mouth dot in *P. aegagri*

The number of third-stage larvae which were collected in this research was 35 and these larvae were only obtained from goats (26 female and 9 male). Twenty one out of these 35 third-stage larvae belong to *P. aegagri* (17 larvae from female goats and 4 larvae from male goats) and 14 larvae belong to *P. crossii* (9 larvae from female and 5 larvae from male goats).

After investigation of collected larvae in different months of the year these results were obtained:

The primary larvae were collected around August, the developmental stage of these larvae was between the first and second larval stage and had a club-shaped pseudocephalon and they were 6 mm long, furthermore these larvae had peritremes with 12 pores but peritremes were not totally matured.

In June and July 2004 no larvae were obtained and it seemed that because of the small size of newly hatched first-stage larvae they hadn't been seen and didn't count in sampling. Larvae which were collected in August were white in color and had dorsal and ventral rows of denticles in anterior margins.

The size of the larvae was gradually proven from mid August to September and reached to 8-9 mm. In these fusiform larvae pseudocephalon resolved totally, peritremes matured and each had 19-21 pores. Denticles covered the dorsal surface totally and they arranged in rows in anterior margins of the ventral surface.

The size of the larvae remained unchanged from September to January and then they reached the size of 9-10 mm till February.

The largest larvae had been seen in March. Third-stage larvae were obtained in February and March, They had pointed denticles and ventral spinulation of fifth segment. Their color was getting dark because of chitin accumulation. In April, May, June and July no larvae had been obtained.

The data of 1-year-period study of slaughtered goats and sheep in South-Western Iran were analyzed by the chi-square test and these results were obtained:

Of 16705 sheep and 8848 goats, 34 (0.2%) and 476 (5.3%) were respectively infested with *Przhevalskiana*. The yearly prevalence in goats and sheep had a significant difference ($p < 0.05$).

Of 34 infested sheep, 9 were male and 25 were female. 185 out of 476 infested goats were male and 291 were female. There had been a significant difference between prevalence in male and female goats as well as male and female sheep ($p < 0.05$).

The numbers of infested sheep were 0 in spring, 18 in summer, 16 in fall and 0 in winter. The prevalence of hypodermosis in sheep was significantly different in winter and spring ($p < 0.05$) (Table 1).

Table 1: Seasonal frequency of hypodermosis among sheep and goats

Animal group	Season				Total
	Spring	Summer	Fall	Winter	
Goats	0	53	226	197	476
Sheep	0	18	16	0	34

Table 2: Frequency of hypodermosis in different age groups of infested male and female sheep

Sex	Age group			Total
	1-2-year-old	2-3-year-old	3-4-year-old	
Male goats	7	2	0	9
Female goats	2	20	3	25

Table 3: Frequency of hypodermosis in different age groups of infested male and female goats

Sex	Age group				Total
	1-2-year-old	2-3-year-old	3-4-year-old	>4-year-old	
Male goats	150	021	014	0	185
Female goats	51	133	104	3	291

The numbers of infested goats were 0 in spring, 53 in summer, 226 in fall and 197 in winter. The prevalence in goats was significantly different in four seasons of the year ($p < 0.05$) (Table 1).

Infestation rate of hypodermosis was studied among different age groups in sheep and goats. The most percentage of infested sheep was in age group of 2-3-year-old, while the most prevalence in goats was among goats in the age group of 1-2-year-old.

Prevalence in different age groups of sheep and goats are respectively shown in Table 2 and 3. As it can be seen infestation rate was more among older females and younger males.

DISCUSSION

Statistical data show a significant difference between prevalence of hypodermosis in goats (5.03%) and sheep (0.2%) ($p < 0.05$). One of the probable reasons of this difference can be the kind of these animals' coat. The body of goat covered with smooth hair, which is appropriate for laying eggs, hatching of larvae and their sloping towards skin, while the coat of sheep is wool, which consists of thin, curly and luxuriant hair and it is not a suitable place for oviposition of adult fly, hatching of larvae and their sloping down towards skin. So this significant difference between prevalence in sheep and goats is logical (Jafari Shourigeh and Rezazadeh, 1996).

Infestation with hypodermosis was significantly more frequent in female sheep and goats compared to male sheep and goats ($p < 0.05$). One of the most important reasons for this difference is that male animals are kept at least for 1 year and then they will be slaughtered but female animals are kept for several years because of

economic purposes. Age increasing results in more chance of disease occurrence in female animals.

The seasonal prevalence in sheep was 0% in spring and winter while in goats it is 0% in spring. It seems to be logical because the season for adult fly activity and pupa stage is spring.

After investigating the larvae, results pointed that collected larvae from infested animals were *P. aegagri* and *P. crossii*. The primary larvae which were between the first and second larval stage were obtained in early August, soon after that second-stage larvae were collected, in this regard the onset season of adult flies is in early summer so appropriate steps should be taken from late spring to early summer to control the adult flies and early hatched larvae.

Meat and milk consumption is prohibited during administration of anti-parasitological drugs (Aiello, 1998), so it is better to start the control program in the research area in September or early October, because in this period the second-stage larvae don't damage the skin severely and this time also coincides with the beginning of the sheep dryness period.

Effective insecticides, in various formulations, are available for treatment. Ivermectin, Organophosphates, Doramectin, Cydectin and Fenthion are among these drugs (Aiello, 1998).

Hypodermosis cause major economic losses. Carcasses and hides of infested sheep and goats show marked evidence of infestation and reduced in value. At Masjed-Soleyman slaughterhouse when *Przhevalskiana* larvae had been seen in subdermal tissues of the back and flanks of the animals, about 12 kg of carcass meat was locally depreciated and this local depreciation results in poor appearance of carcass and lowered its quality. Hypodermosis leads to body weight loss, growth retardation and decrease in milk and meat production.

Also adult flies cause emotional disturbances in the hosts while swarming around them for oviposition and the animal will be damaged because of escape and fear (Zumpt, 1965).

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