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## CLINICAL AND EPIDEMIOLOGICAL INVESTIGATION OF MANGE INFESTATION IN SHEEP IN KHALIS CITY -DIYALA PROVINCE IN IRAQ

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### ABSTRACT

This study was conducted to investigate the prevalence of mange infestation in sheep beside the effects of age, gender and time in different regions of Khalis city\Diayala Province in Iraq. Complete clinical investigation for all animals was applied. Direct microscopic examination of the skin scraping was applied. Microscopically examination of the skin scraping revealed that 133 out of 2600 sheep were infested with mites with an overall percentage of infestation 7.942%. The prevalence of the infestation was highest in winter time, February reach (7.46%) and lowest in December (2.71%). In this study, three genera of mites that parasitized sheep were recorded: *Psoroptes ovis*, *Chorioptes ovis* and *Sarcoptes scabiei*. The prevalence of the infestation was highest in sheep more than 6 months old (12.59%) and, lowest in sheep with age (2-3) years old (1.096%). The prevalence of mange mites in female was (5.311%) versus (2.63%) in males. There were no significant differences ( $P>0.05$ ) in the rate of the infection according to sex of animals and the time of disease prevalence while significant differences ( $p<0.05$ ) in the rate of the infection according to age of animals was observed. Infestation with *Psoroptes ovis*, *Chorioptes ovis* and *Sarcoptes scabiei* was not affected by gender and season. Small aged 6-12 months were more susceptible to infestation.

**Key words:** mange mites, sheep, age, gender, Iraq.

## INTRODUCTION

The most important parasitic mite species of sheep are *Psoroptes ovis* that causes psoroptic mange, also called sheep scab, *Sarcoptes scabiei var. ovis* that causes Sarcoptic mange, also called scabies, *Chorioptes ovis* that causes chorioptic mange, also called leg mite, foot scab, and the last is *Psorergates ovis*, responsible for psorergatic mange, also called itch mite, especially in Australia, New Zealand, South Africa, North and south America (Tolossa, 2014). In most cases mange causes no clinical symptoms and has little or no economic impact on sheep flocks. Some sheep mite species have been eradicated in certain regions, e.g. *Psoroptes ovis* in Australia, Canada New Zealand and the USA, *Psorergates ovis* and *Chorioptes ovis* in the USA.

Sheep mites are not vectors of other pathogens, i.e. they do not transmit microbial diseases as many other livestock parasites do. Infestations with mites are technically called acariosis or acariasis, both on animals and humans (Plant and Lewis, 2011). Adult *Psoroptes* mites are ~0.75 mm long, i.e. they are usually only recognizable under the microscope (Bornstein and de-Verdier, 2010). As for all mites, development goes through various larval and nymphal stages. A female mite lays 1 to 3 eggs a day, a total of about 50 to 100 eggs in her lifetime. Adult life lasts for about 50 days. The shortest life-cycle duration from eggs to eggs of the next generation is about 10 to 14 days (Bates, 2012). *Psoroptes* mites do not dig tunnels in the skin. In the past it was thought that they pierce the skin of their hosts. Today it is believed that they do not pierce the skin, but that the mite feces cause an allergic

reaction of the host's skin, which reacts producing exudations and skin thickening and hardening (lichenification) with formation of papules scale and crusts (excoriations), mostly with wool loss (Purwanta *et al.*, 2014). The mites feed on the exudates and secretions produced by the affected skin. Large scabs may develop that spread to cover the entire body in 2 to 3 months if left untreated. Mites concentrate at the edge of the growing scabs (Bates, 2012). As all mite species, *Psoroptes* mites spend their whole life on the same host (AL-Kardi and Khudhair, 2013). Transmission within a herd is mostly by physical contact.

Mites do not actively jump or crawl from one host to another one, but are passively transmitted when animals come in close contact (AL-Kardi and Khudhair, 2013). Nevertheless, psoroptic mites and eggs can survive 2 to 3 weeks off the host (e.g. in tags of fallen wool, on fence posts, etc.) by suitable conditions (maximum of 12 weeks by cold weather). This means that sheep can pick mites or eggs from their environment, especially from those objects that affected sheep use for rubbing, e.g. fence posts. But there are no external vectors that transmit the mites, e.g. insects, worms, rats, mites, birds, etc., as it happens with many other parasites. Sheep scab is a serious and very harmful sheep disease (Bates, 2012). Lesions often affect the back, the flanks and the shoulders. Infestations remain often unnoticed until wool loss becomes evident, which mostly means that the whole flock is probably already infested. Affected animals suffer from intense itching (pruritus) and react vigorously scratching, biting and rubbing against objects, which causes injuries

that can be infected with secondary bacteria (Burgess, 2012). All this leads to weight loss and wool loss, reduced milk production, and general weakness that makes the affected animals more susceptible to other diseases. Left untreated it is often fatal, especially for lambs. The short life cycle allows quite sudden outbreaks that can be devastating if left untreated.

Diagnosis is based on the presence of symptoms, but has to be confirmed examining skin scrapping of affected parts under the microscope for visualization of the mites. Psoroptic mites are not infectious for humans, dogs and cats (Burgess, 2012). Sarcoptic mites of sheep are a species-specific strain of *Sarcoptes scabiei*, a mite species that infests also cattle, pigs, other livestock and also humans causing elevation of serum IgE (Ibrahim, AL-Ezzy *et al.*, 2012). This means that it can be transmitted to humans (Wells, 2012). They are less abundant on sheep than psoroptic mites. Sarcoptic mites are very small (0.3 to 0.5 mm) and can be seen only under the microscope. As all mite species, sarcoptic mange mites spend their whole life on the same host. Mites do not actively jump or crawl from one host to another one, but are passively transmitted when animals come in close physical contact (Alasaad, 2011). However, sheep can pick mites from the immediate environment or fomites. There are no external vectors that transmit the mites, e.g. insects, worms, birds, etc., as it happens with many other parasites (Currier, 2011). The mites dig tunnels beneath the skin. Their saliva has potent digestive enzymes that dissolve the skin tissues. They feed on the resulting liquids. They do not suck blood. Adult females de-

posit their eggs in tunnels, which hatch in 3 to 5 days. The whole development through several larval and nymphal stages can be completed in less than 2 weeks (Tsioli, *et al.*, 2013). Adults live for 2 to 3 weeks. Off the host the mites survive only a few days. Sarcoptic mange is also a winter pest in regions with a cold season, for the same reasons and with similar dynamics as previously mentioned for sheep scab. As soon as the animals go back to pasture in spring exposure to sun reduces the humidity in the hair coat, which slows down mite development, and without crowding mite transmission is significantly reduced (Amer, 2014).

If a herd is free of mites, contamination can only come from cattle brought in. Consequently, to avoid contamination all incoming animals must be treated against mites, also those that went to the fair or to the market and came back unsold: they may have picked mites from other sheep (Amer, 2014). Two injections with a macrocyclic lactone e.g. doramectin, ivermectin, moxidectin) with 7 to 10 days interval should do the job, but keep the animals isolated until 10 days after the second injection (Giadinis, 2014). Sheep may be infected with mites without showing clinical signs. Topical sprays and pour-ons are not reliable for controlling psoroptic mites (Foreyt, 2013). For the time being there are no vaccines that will protect sheep by making them immune to the mites. There are no repellents, natural or synthetic that will keep mites away from sheep. There are no biological control means for controlling sheep mites (or any other mites of livestock and pets). Injectable macrocyclic lactones are highly effective against psoroptic mites. A single doramec-

tin injection (300 mcg/ kg B.W), or ivermectin or moxidectin injections (at 200 mcg/kg B.W) 7 days interval are enough to ensure complete control (Rehbein, 2013). The major disadvantage is that they are substantially more expensive than topical products. There are reports on field resistance of *Psoroptes ovis* (sheep scab) against some organochlorines and organophosphates organochlorines and organophosphates in Argentina, and against a few organophosphates and synthetic pyrethroids in the UK. However, it does not seem to be a widespread problem and such products are still effective in many properties in these countries (Bates, 2012).

This study was designed to determine the prevalence of mange mite infestation in sheep beside the effects of age, gender and time in different regions of Khalis city-Diyala Province in Iraq.

## **MATERIALS AND METHOD**

### **1. Area of study**

This study was organized and carried out after obtaining approval from ethical committee in College of Veterinary medicine, Diyala University, Iraq. The strategy depends on random examination of 2600 sheep in Khalis city from November 2013 to April 2014 (Fig. 1) recording after general examination of health status, with special attention to cutaneous manifestations of animals any mange mites infestations.

### **2. Clinical examination**

Evaluation of the general state of the animals, temperature, pulse rate, respiratory rate, appetite and morbidity rates were recorded. The shape, size, position, distribution and time of the appearance of skin lesions as well as the age of the animals were also recorded.

### **3. The Samples Collection**

The skin scales were collected by scraping of the lesion deeply using a sterile scalpel. These scraping samples were taken from the peripheral or edge of the lesion, then collected into sterile Petri dish and transmitted to the laboratory under aseptic conditions (Sargison and Busin, 2014).

### **4. Direct microscopic examination**

The skin cells sample was placed on a microscopic slide, mixed with few drops of 10-30% KOH to dissolve tissue material, then gently wormed and left for few minutes then a cover is placed, pressed and the slide was examined by low and high power under the reduced light (AL-Kardi and Khudhair, 2013).

### **5. Statistical analysis**

Data analysis performed using SPSS for windows TM version 17.0, and Microsoft EXCEL for windows 2010. Frequency of variables express as percentage Chi-Square used for categorical data analysis. The level of significance was 0.05 (two-tail)



**Figure (1): Khalis city area under investigation for Mange in sheep (Google, 2014).**

## RESULTS

The main clinical signs recorded in sheep infested by mange mite was itching, the animal attempts to rub the infested region with the legs or walls, fences and some of sheep biting the infested area with teeth in addition to wool loss, crusts, pityriasis, and pustules. The wool becomes curly and like matted with the presence of calcified serous exudation leading to pigmentation with yellow color. On the other hand, in severe infestation some sheep passing from increase in the respiratory and heart rate, anemia, paleness of mucus membrane and normal temperature.

Macroscopic and microscopic examination of the skin scraping revealed that out of 2600 of sheep investigated, 133 were infested with mites. Three genera of mange mites were recorded that parasitized sheep: *Psoroptes ovis* (fig. 3), *Sarcoptes scabiei* (fig. 4) and *Chorioptes ovis* (fig. 5) which invade superficial and burrowing

keratinized structures such as skin , hair and claws as shown in fig. 2. Sporadic or mixed infestation was detected, as shown in fig. 6 mixed infestation of *Sarcoptes scabiei* and *Psoroptes ovis* mite.

As shown in table 1, an overall percentage of infestation was 7.942%. The prevalence of the infestation was highest in sheep more than 6 months old (12.59%) and, the lowest in sheep with age (2-3) years old (1.096%) as shown in table 2. The prevalence of mange mites in female was 5.311% versus 2.63% in males as shown in table 2. There were significant differences in the rate of the infection according to age of animals. No significant differences regarding sex of animals and the time of disease prevalence were recorded. The prevalence of the infestation was highest in wintertime, February reach 7.46 % and lowest in December (2.71%) as shown in table 3.



Figure (2): Tail of sheep infected with mange mites. Losing of wool, crusts and pityriasis noticed.

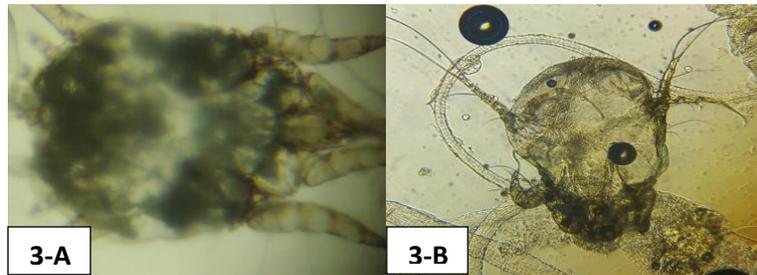


Figure (3: A, B): Microscopic features of mite: Ventral view of female of *Psoroptes ovis* mite.



Figure (4): Microscopic features of mite: Ventral view of female (A) and male (B) of *Sarcoptes scabiei* mite.

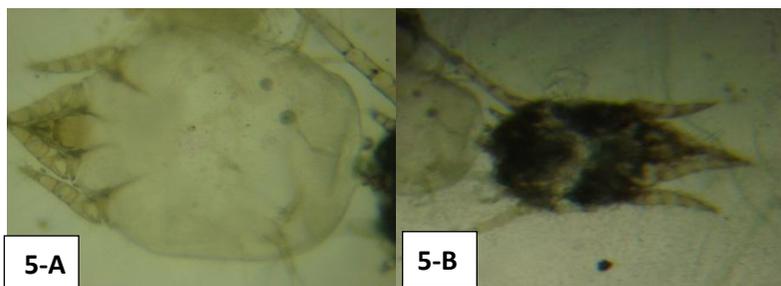


Figure (5): Microscopic features of mite: Ventral view of mite: Ventral view of female (A) and male (B) of *Chorioptes* spp. x10.



Figure (6): Mixed infestation of *Sarcoptes scabiei* and *Psoroptes ovis* mite (X 10)

**Table (1). The rate of mange infection according to the gender of the sheep, in Khalis city.**

Gender of animal	The total number	Positive number
Male	190	5 (2.631%)
Female	2410	128(5.311%)
The sum	2600	133(7.942%)
$X^2 = 2.605$ $P. v. = 0.1056$ $P > 0.05$ N.S.D $X^2 = \text{Chi-Square}$ , $P. v = \text{Probability value}$ ; N.S.D = No significant difference		

**Table (2). The rate of the infection according to the age of the sheep.**

The age of sheep ( months)	The male		The female	
	Total number	Positive cases No. (%)	Total number	Positive cases No. (%)
6-12	84	3 (3.571%)	278	35 (12.589%)
13-24	49	1 (2.040%)	135	13 (9.629%)
25-36	15	0 (0%)	741	08 (1.096%)
37-48	28	0 (0%)	827	23 (2.781%)
49-60	13	1 7.692%)	310	37 (11.935%)
61- 72	1	0 (0%)	119	12 (10.084%)
Total	190	5 (13.54%)	2410	128 (5.311%)
$X^2 = 110.661$ , $P. v. = 0.0006$ $P < 0.05$ S.D $X^2 = \text{Chi-Square}$ ; $P. v = \text{Probability value}$ ; S.D = Significant difference				

**Table (3). The rate of infection according to the time of examination.**

Month of Examination	No.of animals	positive cases No.(%)
November 2013	241	12 (4.98%)
December 2013	369	10 (2.71%)
January 2014	1048	56 (5.34%)
February 2014	295	22 (7.46%)
March 2014	190	12 (6.32%)
April 2014	457	21 (%)4.595
$X^2 = 8.673$ $P. v. = 0.1228$ $P > 0.05$ N.S.D $X^2 = \text{Chi-Square}$ , $P. v = \text{Probability value}$ N.S.D = No significant difference		

## DISCUSSION

The result of main clinical signs of sheep infested by mange mite agreement with other authors (Al-Shebani, *et al.*, 2012), reported that the itching and loss of wool can explained by the mites dig tunnels beneath the skin, their saliva has potent digestive enzymes that dissolve the

skin tissues as well as the *Sarcoptes* mite burrows in the deeper parts of the stratum corneum, or the superficial layers of the stratum malpighii of the skin. On the other hand, signs of tachycardia and tachypnea may be related to anemia and dehydration.

The result in table 1 has revealed the rate of the mange infection in male and female sheep reached to 2.631% and 5.311% respectively. This study agrees with (AL-Kardi and Khudhair, 2013) who found the rate of mange mites Infestation reach to 7.17% in Al-Najaf province. This study didn't agree with (Al-Shebani, Dawood *et al.*, 2012) study, who found the rate of Mange Mites Infestation reach to 3.65% in Al-Diwaniyah province. Also this study disagree with (Husain and Yaqoob, 2010) and (Husain and Ali, 2014) study who found that the rate of mange mites infestation reached to 3.65% in Baghdad and Diyala province. Also this study disagreed with Asghar (2011) who refers the total rate of infection by different species of mites in the examined sheep and goats reached to 2.8 %.

The results shown in table 2 revealed the rate of mange infection according to the age of the infected animals so the highest rate reach to 12.589% in age stage 6 to 12 months while, the lowest was 1.096% in age stage 25 to 36 months. This study disagree with Al-Shebani, *et al.* (2012) study who found the highest rate in sheep more than two years old (3.74%) and

the lowest in sheep with age less than two years old (3.40%). Also this study disagree with (Husain and Yaqoob, 2010) study who found the highest rate was 22.96% in age stage 2 to 4 years, while the lowest was 15.91% in age stage 1 to 2 years. Other study done by AL-Kardi and Khudhair (2013), refers to the prevalence of the infestation was highest in sheep older than two years (9.02%) and the lowest in sheep with age younger than two years (1.9%).

The results in table 3 revealed the rate of the mange infection according to the time of the infection so the highest infection was 7.457% in February, while the lowest rate was 2.71% in December. This study agrees with Husain and Ali (2014) findings who found the highest infection rate in February, while it was lowest in June.

In conclusion, the present study has shown that mange is still constitutes a notable problem, even with a limited percentage for Khalis city-Diyala province. Infestation with *Psoroptes ovis*, *Chorioptes ovis* and *Sarcoptes scabiei* does not affected by gender and season. Small age (6-12 months) is more susceptible to infestation.

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