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# Prevalence of Mange Mite Infestation on Cattle in South Achefer District, Northwest Ethiopia

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**Abstract:** A cross sectional study was conducted in South Achefer district from November 2014 to April 2015, to determine the prevalence of mange mite and associated risk factors on cattle. Out of 384 cattle examined, 41 (10.7%) were found positive. There was statistically significant variations between sex, body condition categories and sites of lesions in mange infestation; There was no statistically significant variation between age and origin of the animals. Mange infestation was found higher in poor body conditioned local breed (10.1%), adults (6.4%), females (8%) and in extensive management system (10.1%). The most preferable site of lesions was shoulder (7.9%) while head and body was the lowest (0.3%). Three genera of mange mites *Demodex* 25 (6.5%), *Psoroptes* 10 (2.6%)and*Sarcoptes*6 (1.6%) were identified in the study area. In conclusion, the prevalence recorded in this study was found high in the study area. Therefore, measures must be taken on management system, veterinary service and awareness creation to the cattle owners about the disease to prevent further infestation.

**Key words:** Cattle · Demodex · Prevalence · Achefer

## INTRODUCTION

The world human population is growing at a rate much faster than food production and this increase is mainly in developing countries, which are unable to assure adequate food for their people. Developing countries have nearly two third of the world's livestock population, but produce less than a third of the world's meat and a fifth of its milk [1]. Ethiopia is known for its high livestock population, being the first in Africa and tenth in the world, the recent livestock population estimated that the country has 50 million heads of cattle, 48 million sheep and goat and 7 million equines. Ethiopia is the most populous country in cattle than any African country [2].

In Ethiopia ruminant livestock are important source of income for rural communities and are one of the nation's major sources of foreign currency from export. However, this great potential is not properly exploited mainly due to prevailing traditional management, limited genetic potential and rampant animal disease [3].

Ethiopia has huge livestock population which provide draught power, milk, meat, fibber, fuel and fertilizer and they also provide hide and skin which partially processed for export or tanned and finished in the country's tanning for shoe making and leather goods. The development of leather industry requires great quantity of raw materials of various origins, the principal source of which is livestock industry [4].

During past decades leather and semi-processed hides and skins have constituted the second major export product of country with 10 to 20% of total of foreign earnings. Although the number of tanneries involved in production of finished and semi-finished leather products are increasing from time to time, the sector and the country are losing revenue due to a decline in leather quality. A considerable portion of these pre-slaughter defects are directly related to skin diseases or secondary damage that occurs when the animal scratches itself to relieve the itching associated with some of these diseases ([5]. Of the disease that cause serious problem, parasitism represents a major impact on livestock production in the

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tropics. Among the parasitic diseases, mange mite infestation in domestic ruminants inflicts enormous economic damage due to the condemnation of affected organs and lowering of the meat, milk and wool production. The most commonly affected organ due to mange is skin [6]

Mange mites belong to phylum arthropoda, class arachnida and order acarina.With few exceptions, they are in prolonged contact with the skin of the host, causing the condition, generally known as mange. Mites are obligate parasites that most species spend their life cycles, from egg to adult, on the host so that transmission is mainly by contact. Mites are classified according to their location on the host as burrowing and non-burrowing mite [7]

Common sites of these mites are skin, scales, feathers or fur [8]. They feed on lymph, skin debris or sebaceous secretion. They ingest by puncturing the skin, scavenge from the skin surface [9]. Mange mites are the major causes of skin diseases and that affect ruminant reproduction in many areas of Ethiopia. The infestations by these mites are called acariasis and can result sever dermatitis, Known as mange [10].

Though, mange mites in cattle were prevalent in South Achefer, the distribution and identification of the disease was not well studied. Hence, the objectives of the present study are:

- To determine the prevalence of mange mites in South Achefer and
- To identify the main genera of mange mites in cattle in the study area.

## MATERIALS AND METHODS

**Study Area:** The study was conducted in South Achefer district, Northwestern Ethiopia. South Achefer district is one of the thirteen woredas found in West Gojjam Administrative Zone. It is located 60 km south-west of Bahir Dar town, the capital of Amhara Regional state. Durbete town is the home of the district. The district borders North Achefer to the north, Awi Zone to the south (Dangilaworeda) and west (Jawiworeda) and Mechaworeda to the east. It is subdivided into 18 rural and 2 urban kebele administrations.

South Achefer district is located at latitude of 11° 21' 32''N and longitude of 36°57'42" E. The altitude of the district ranges from 1,500 to 2,500m above mean sea level. The district is known for its flat topography (72%), but there are also mountains (10%), valleys (6%) and undulating areas (12%). 87% of the district has 'woinadega' climate and the remaining 13% has 'kola' climatic conditions. The mean annual rain fall ranges from 1,450 to 1,594 mm with average annual temperature of 26.8°C.

According to the woreda agricultural office sources, the total geographical area of South Acheferworeda is about 118,228 hectare. The arable and grazing lands are known to be 39,195 and 18,018 hectare respectively. The rest 4,850 hectare or 4% of the total area is covered by forest, water bodies and used for constructions [11].

The total human population of the district is about 148,974; of which 134,447 or 90.2% live in rural areas and 14,528 or 9.8% of the population is urban resident [12]. The estimated livestock population of the district is 153,612 cattle, 80,868 sheep and goats, 22,375 equines, 16,721 bee colonies, 74,689 poultry and 16,684 other domestic animals [13].

**Study Animals:** The study was conducted on cattle which are managed extensively, semi intensively and intensively. In this study two breeds of cattle were involved, namely local and cross breeds.

**Study Design:** The cross sectional type of survey was performed on the study animals so as to determine the prevalence of cattle mange mite infestation in the study area.

**Sample Size and Sampling Method:** Simple random sampling method was applied for sampling representative animals. The minimum number of animals used for this study was determined by the formula given by Thrusfield [14] at 95% CI and 5% precision as follows;

$$n = \frac{1.96^2 Pexp\ (1-Pexp)}{d^2}$$

where,

n = required sample size
Pexp = expected prevalence
d = absolute precision

Since there is no previous study done on the area concerning this title, the 50% expected prevalence was used. So, by using the given formula the sample size was calculated to be 384.

**Investigating Procedure:** After the animal was restrained and handled properly, skin scraping was collected from each suspected animals and brought to the parasitology laboratory with tightly closed plastic vials or peteri dishes containing 10% formalin. The specimen was processedby adding 10% KOH to release the mites from the crusts and scabs and examined mite morphology using microscope.

**Data Entry and Analysis:** The data was first entered and managed in to Microsoft Excel worksheet and analyzed using Statistical Package for Social Sciences (SPSS) software version 16.0. The prevalence of mage was expressed as percentage with 95% confidence interval by dividing the total number of cattle positive to mange to the total number of animal examined in the study period. The prevalence rate of mange was calculated for different risk factors as the number of mange positive animals examined dividing by the total number of animals investigated at the particular time. The significant difference of mange prevalence was determined using descriptive statistics; Chi-Square test ($\chi^2$) where P - value found less than 0.05.

## RESULTS

Out of the total 384 cattle examined in South Achefer district, 41 (10.7%) were found positive for mange mites. Of these, 39 (95.9 %) were local breed and 2 (4.1 %) were cross breed; 16 (40.0%) were less than two years old, 25 (60.0%) were two years and above; 10 (24.4%) were male and 31 (75.6 %) were female; 39 (95.1%) were from extensive, 2 (4.9%) from semi-intensive and 0 (0.0%) from intensive management systems. Higher prevalence was observed on cattle from extensive 39 (10.1%) and lowest from intensive management system (0.0%) (Table 1). There was statistically significant difference observed between the two categories of breeds ($\chi^2 = 8.398$, $p<0.05$) and the prevalence was 2 (0.6 %) in cross breeds and 39 (10.1%) in local breeds. Higher prevalence of mange was observed in two and above years of age (6.4%) while the lowest prevalence was observed in those less than two years of old (4.3%) but there was no statistically significant difference in prevalence between the two age categories ($\chi^2 = 11.791$, $p>0.05$) (Table 1). Statistically significant variation was detected between the two sex groups ($\chi^2 = 8.576$, $p<0.05$) and the prevalence of cattle mage mite was found high in females (31; 8%) and low in male animals (10; 2.7 %) (Table 1).

Out of the 41 positive cases, 25 (61.0%) were found positive for *Demodex*, 6 (14.6%) for *Sarcoptes* and 10 (24.4%) were found positive for *Psoroptes*. *Demodecosis* was highly prevalent, 25 (61%) than mange caused by other genera in the study area (Table 2).

Table 1: Prevalence of mange genera with respect to breed, sex, age and management system

| | | | Prevalence in number (%) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Factor | Category | No. positive | *Demodex* | *Sarcoptes* | *Psoroptes* | Total % | $\chi^2$ | P–value |
| Breed | Local | 39 | 24(6.2) | 5(1.3) | 10(2.6) | 10.1 | 8.398 | .038 |
| | Cross | 2 | 1(0.3) | 1(0.3) | 0(0.0) | 0.6 | | |
| | Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |
| Sex | Male | 10 | 6(1.6) | 1(0.3) | 3(0.8) | 2.7 | 8.576 | .035 |
| | Female | 31 | 19(4.9) | 5(1.3) | 7(1.8) | 8 | | |
| | Total | 41 | 25(6.5) | (1.6) | 10(2.6) | 10.7 | | |
| Age | <2 years | 16 | 11(2.9) | 2(0.6) | 3(0.8) | 4.3 | 11.791 | .067 |
| | ≥2 years | 25 | 14(3.6) | 4(1.0) | 7(1.8) | 6.4 | | |
| | Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |
| Management system | Extensive | 39 | 24(6.2) | 5(1.3) | 10(2.6) | 10.1 | 12.833 | 0.046 |
| | Semi intensive | 2 | 1(0.3) | 1(0.3) | 0(0.0) | 0.6 | | |
| | Intensive | 0 | 0(0.0) | 0(0.0) | 0(0.0) | 0.0 | | |
| | Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |

Table 2: Prevalence with respect to mite genera

| Species of mites identified | No. of positives | Prevalence (%) | Chi-square | P- value |
|---|---|---|---|---|
| *Demodex* | 25 | 61.0 | | |
| *Sarcoptes* | 6 | 14.6 | 3.840 | 0.000 |
| *Psoroptes* | 10 | 24 | | |
| Total | 41 | 100 | | |

Table 3: Prevalence of mange with respect to body condition

| | | Prevalence in number (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Body condition | No. positive | *Demodex* | *Sarcoptes* | *Psoroptes* | Total % | $\chi^2$ | P-value |
| Poor | 38 | 23(6.0) | 5(1.3) | 10(2.6) | 9.9 | 18.951 | 0.004 |
| Medium | 3 | 2(0.5) | 1(0.3) | 0(0.0) | 0.8 | | |
| Good | 0 | 0(0.0) | 0(0.0) | 0(0.0) | 0.0 | | |
| Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |

Table 4: Spatial distribution of cattle mange on the body

| | | Prevalence in number (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Siteof infestation | No. positive | *Demodex* | *Sarcoptes* | *Psoroptes* | Total % | $\chi^2$ | P –value |
| Neck | 10 | 6(1.6) | 0(0.0) | 4(1.0) | 2.6 | 28.238 | .001 |
| Shoulder | 30 | 18(4.7) | 6(1.6) | 6(1.6) | 7.9 | | |
| Body | 1 | 1(0.3) | 0(0.0) | 0(0.0) | 0.3 | | |
| Head | 0 | 0(0.0) | 0(0.0) | 0(0.0) | 0.0 | | |
| Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |

Table 5: Prevalence of cattle mange based on origin

| | | Prevalence in no. (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Origin | No. positive | *Demodex* | *Sarcoptes* | *psoroptes* | Total % | $\chi^2$ | P – value |
| Abchikli | 12 | 4(1.0) | 4(1.0) | 4(1.0) | 3 | | |
| Durbete | 8 | 6(1.6) | 1(0.3) | 1(0.3) | 2.2 | 14.636 | 0.262 |
| Gedema | 7 | 5(1.3) | 1(0.3) | 1(0.3) | 1.9 | | |
| Kare | 5 | 3(0.8) | 0(0.0) | 2(0.5) | 1.3 | | |
| Nunu | 9 | 7(1.8) | 0(0.0) | 2(0.5) | 2.3 | | |
| Total | 41 | 25(6.5) | 6(1.6) | 10(2.6) | 10.7 | | |

Statistically significant variation was detected among the three groups of body conditions ($\chi$2=, P<0.05) in the study area and poor body conditioned animals were highly affected by mange (9.9%) than other categories (Table 3).

There was also a statistically significant variation detected among the sites of infestation ($\chi^2$ = 28.238, p<0.05) (Table 4).

The highest prevalence was observed on shoulder 30 (7.9%) and the lowest was on body and head 1(0.3%) (Table 4).

There was no statistically significant variation of mange prevalence among kebeles (origin) ($\chi^2$=14.636, P>0.05). However higher prevalence was detected on cattle from Abchikli and the lowest prevalence was recorded on cattle from Kare (Table 5).

## DISSCUSSION

The present study revealed that the overall prevalence of mange in cattle was 10.7%. This result is higher than the previous studies conducted by Chalachew[15], 1.63% in WolayitaSodo, [16], 1.88% in Adama, [17], 0.42% in Nekemte, [18], 4.19% in Debre-Zeit, [19], 1.8% in Iceland, [20], 1% in Poland and [21], 5.9%, in and around Mekelle. This indicates that bovine mange mite is one of the prevalent ectoparasites of cattle in the study area. This might suggest that the study area was conducive for the survival, multiplication and development of mange. But it was lower than the previous study of [22]13.79% in Gondar town, [23] who reported 94% in Mongolia. This might be due to agro - ecological difference between the study areas.

In the current study high mange prevalencewas found in local breeds (10.1%) and lower prevalence was observed in cross breeds (0.6%). This finding was in agreement with the report ofYacob, Nesanet and Dinka [21] who indicated higher prevalence of mangein local breed (8.8%) and lower in cross breeds (2.2%) in and around Mekelle [22] who reported higher prevalence in local breeds (9.425%) and lower prevalence in cross breeds (4.367%) in Gondar town. This might be, because of cross breeds usually kept in and around urban areas with good management while local breeds of cattle are reared mostly in rural areas where farmers do not afford them with good management and most of them were kept

under free range communal grazing system which lets them to contact with those cattle having mange and this facilitates transmission of mange from infested to healthier cattle. In addition [16] reported a lower prevalence of mange (0.00%) on cross breeds in Adama. The current slightly higher prevalence (0.6%) on cross breed of cattle might be due to difference in agro - ecology of study areas and time of study.

This study revealed higher prevalence in cattle managed under extensive (10.1%) than semi intensive and intensive management systems (0.6%). This was found lower than the results reported byYacob, Nesanet and Dinka [21] which accounts 23.7 and 76.2% for semi-intensive and extensive systems respectively. This difference might be due to a variation in climatic conditions, management and feed accessibility between the two study areas. Additionally, the lower prevalence on those managed under semi-intensive and intensive production systems might be due to the smaller number of sample size (84) than in those kept under extensive production system (300).

Mange infestationwas also found varied according to sex of animals. Prevalence of mange was high in females 31(8%) than males 10 (2.7%) in the study area. This result agrees with the study of Matthes and Bukva [23] who reported 32% in females and 1.22% in male animals. But this report disagrees with the previous work of Yacob *et al*. [16] who reported 2.22% in male and 1.67% in female animals, respectively in Adama and the report of Bogale (1991) who indicated 4.57 and 3.17% in male and female animals in DebreZeit, respectively. This might be associated with physiological stress conditions during pregnancy and lactation, the lesser emphasis given on feeding of female animal with regard to better feeding habit to male animals by owners since they used for ploughing, fattening and higher financial gain at the market level.

Age of animals was also another point which appears as a risk factor for the occurrence and different prevalent rates recorded on animals. Based on the present finding, the prevalence of magewas 4.3 and 6.4% for less than two years and two and above years of age respectively. This was higher than but in agreement with the previous work done byYacob, Nesanet and Dinka [21] who stated 1.06 and 2.04% prevalence in young and adult cattle, respectively. But it was not in line with the work of Bogale [18] who reported 7.95% in young 2.40% adult in DebreZeit. This indicated that mange was occurred in all age groups with various intensity. The higher prevalence in adults might be due to the fact that they graze on pasture in groups with different herds that contributes a lot for such diseases [24] while the lower prevalence in young stock is due to the fact that they do not go to the field for grazing rather they are stall feeders by the owners and are not that much exposed to ectoparasites like mange as compared to adults.

The spatial distribution of cattle mange on the body parts revealed that mangewas highly prevalent on the shoulder region (7.9 %) followed by neck (2.6%), body (0.3 %) and head (0.0 %). Similar body location and infestation were reported by [25-28]. Furthermore, [27] andBukva, Vitovec and Schandl [28] in Czechoslovakia stated that the distribution of nodules of mangeon the host's body has typical pattern where the predilection sites were the shoulder, neck and the adjoining body part. Therefore, the most frequently affected sites were shoulder and neck while the less frequently affected were the forelimb, head and back. The higher exposure of shoulder and neck regions may be due to their purpose for yoke pad and easiness for the animal to rub the affected part with permanent objects to avoid itching which might lead to self infliction and might facilitate the infestation, progress and spread to other parts.

## CONCLUSION

In this cross-sectional study of cattle mange infestation, high overall prevalence (10.7%) of mangemiteinfestation was recorded. This can imply that it can be responsible for the great economic losses of hides even at a national level. The female cattle, which were two and above years of old, local breed of cattle and cattle found under extensive production system were found as the most susceptible to the mange. The shoulder and neck areas were the most exposed sites for disease. Among the genera of mange mites identified, *Demodex* was the genus which is highly devastating cattle mange mite in the study area. Prevalence of mange mite increases together with poor body condition and management, especially in extensive management system. It has been associated with poor husbandry system that can facilitate the spread of the disease.

Based on the above conclusion the following recommendations were forwarded:

- Better cattle management practices should be implemented to minimize transmission of the disease and to increase the productivity of cattle.
- Further researches on mange mite of cattle should be initiated and encouraged especially to identify the risk factors, epidemiology and regarding with zoonotic importance of the disease.

- The government, private sectors and veterinarians should create awareness of the cattle owners regarding the effects of mange mite on hide and skin quality, animal health and production and they should work together to decrease the effect of mange mite on livestock production.
- The farmers should be advised in order to avoid the risk factors like stress condition and poor nutrition which can aggravate the disease.

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