

Original Research Article

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## Hemato-Biochemical and Therapeutic Trials on Sarcoptic Mange in Camels

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### ABSTRACT

Ten camels showing typical clinical lesions of itching, pruritus, biting and rubbing against objects, alopecia, erythema, keratinization, thickening, corrugations and wrinkling of the skin, exudation and bleeding, fissured skin and scab formation were identified. The skin scrapings were collected from the edges of skin lesions in clean small size plastic jars separately, each duly marked for identification of the individual animal. *Sarcoptes scabiei* var *cameli* mites were identified on the basis of their characteristic morphological features. Blood from these camels was collected for Hemato-biochemical analysis at the start of each treatment to find out the effect of mange infestation on the blood physiology of animals. The results reveal that Hb, PCV, TEC showed a decreasing trend than the normal range indicative of anemia in the diseased animals. Among the biochemical parameters, Total Protein, Albumin, Globulin was decreased. TLC, Neutrophils, Eosinophils, Lymphocytes, Basophils, Monocytes and AST, ALT, ALKP, LDH, Bilirubin, BUN was increased. Treatment trial was started by dividing the ten camels into three groups. On Group 1, 40 % concentration of *Azadirachta indica* was applied, on Group 2, Cypermethrin was applied, on Group 3, 40 % concentration of *Azadirachta indica* was applied and additionally Injection Ivermectin and Injection Vetade were also given. After some days again blood samples were taken for Hemato-biochemical analysis which showed a satisfactory response in all the groups. The treatment given to the Group 3 was best among the three therapeutic trial groups.

#### Keywords

*Azadirachta indica*,  
Camel,  
Cypermethrin,  
Hemato-  
biochemical  
analysis,  
Ivermectin,  
*Sarcoptes scabiei*  
var *cameli*, Vetade

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### Introduction

Sarcoptic mange is the second most important problematic disease of camels after Trypanosomiasis (Nayel and Abu-Samra, 1986). Scabies caused by *Sarcoptes scabiei* var *cameli* is a serious, highly contagious and economically important skin disease of the camel (Pegram and Higgins, 1992). Camels,

which are reared with deficient nutrition, poor management and under unhygienic conditions, are mostly affected by this disease (Kumar *et al.*, 1992). This disease is caused by a mite known as *Sarcoptes scabiei* var *cameli* which belongs to genus *Camelus* of Sarcopitidae family in Veterinary Entomology. It is an extremely pruritic, contagious and debilitating skin disease which is very

frequently and sudden in onset. It is also ranked as one of the most serious and important disease of the camels. Sarcoptic mange infestation is very common in the areas of thin skin, the head, neck, flanks, medial aspect of thighs or inguinal region, mammary glands and prepuce. The head is usually affected very rapidly as the animal uses its teeth for scratching the affected areas. Besides linking the occurrence of the disease with poor camel management, malnutrition and contact with infected objects, the stray and infected camels also often become a focus of infecting the healthy animals when mingling with them particularly at watering places for drinking purpose (Abdel-Rehman *et al.*, 2001).

Sarcoptes is a burrowing mite as it penetrates deeply through the skin surface of the infected camel. This burrowing of mites in the skin helps these parasites lead to intense pruritus and exudative dermatitis. In pruritus, mites penetrate deep into muscular areas, damaging the flesh and lowering the quality of meat. The early inflammatory reaction of the host body towards the mites becomes evident in the shape of small popular elevations, invasion and injuries leading to formation of hairless areas, scaly crust formation or scabs on the affected parts and the skin become dark and thickened. Skin of mangy camel show hemorrhages, and subcutaneous odema after the development of fissures in the underlying epidermis (Kumar *et al.*, 1992; Amer *et al.*, 2006).

The fertilized female mites create winding burrows or tunnels in the upper layers of the epidermis of the skin of the host animal and feeding on the serous exudate, a liquid oozes from the damaged tissues. The female mites lays about 40-50 fertilized eggs in these tunnels which hatch in 3-5 days into a six legged larvae. These larvae immediately crawl to the surface and burrow themselves in

the superficial layers of the skin and create small molting pockets. In these molting pockets, the larvae molt to next stages of nymph and adult. The adult male then emerges and seeks a female either in the molting pocket or on the surface of skin. After fertilization the female produces new tunnels, either de novo or, by extension, of the molting pockets, lays eggs in these tunnels and a new life cycle starts. The entire life cycle of Sarcoptic mange is completed in 17-21 days.

New hosts can be infected through direct transmission by contact between the animals, presumably from larvae, nymph or adult mites, which are commonly present on the skin surface of the infected animal. Indirect transmission of infestation can also take place through the objects or fomites having mange infection, which come into contact with the affected camel, such as harnesses, blankets, baggage tack, tents and tree trunks (Richard, 1987). The pruritus increases as the mites penetrate deeper in the skin (Driot *et al.*, 2011, Bekele *et al.*, 2012). Based on the rate of infection camels can be seriously disturbed by the Sarcoptic infestation as they may stop grazing which can lead to a rapid fall in milk production, and deterioration of health condition. With the increase in the irritation due to scabies, the camel rubs, bites and scratches the affected areas in an attempt to reduce the itchiness.

Due to rubbing, biting or scratching, the mites move to the periphery affecting the healthy tissues and resultant affected area spreads. As the disease prolongs, the skin becomes excoriated, leading to hair loss and the development of scabs. These scabs in turn may be rubbed away and a red surface developed. The animal becomes restless due to severe Sarcoptic mange infestation and involvement of most of the body surface. If the diseased animal is not treated in time, the animal loses its health condition, become

emaciated and within two, three weeks the acute stage of disease may give way to more chronic state (Driot *et al.*, 2011).

Sarcoptic mites rarely survive long off the host under natural conditions. A continuous direct contact of animal keepers with their camels can also lead to transmission of diseased condition in human beings which is termed as pseudo-scabies. Transmission of infection from camel to man usually takes place during milking, handling or riding. The main symptoms of pseudo-scabies can therefore be seen in the inter-digital spaces of the hands, on the wrists, forearms, the elbows, the axillary folds and inner side of the thighs. Once a herd is infected with Sarcoptic mange, continuous reinfection of the disease occurs (Premalatha *et al.*, 2010). Sarcoptic mange is usually considered to be a seasonal disease and is often reported severe during the winter months as in cold weather the disease had an acute course. However, there is some evidence that in some countries hot weather predisposes to acute outbreaks of camel mange and in the cooler, winter season the rate of mange infestations are at the lowest. In the summer the activity of the mite seems to decline or disease becomes chronic. Dietary intake is an important factor in mange infestation. Nomadic camels on a low nutrition plane, probably carrying heavy worm burdens in hot desert conditions are likely, therefore, to be highly prone to Sarcoptes at this time (Dinka *et al.*, 2010). During such periods of great activity, the mites are readily transmissible from one animal to other animals (Richard, 1987).

Mange can easily be diagnosed clinically from the occurrence of pruritus, depilation, alopecia, thickened skin, folds around the joints and encrusted plaques being the main characteristics of this parasitosis. In order to control this zoonotic disease, it is essential to treat both camel and man along with effective

checks over other predisposing factors of the disease such as hygiene and nutritional requirements of the animals. The skin diseases like the scabies both in human beings and animals are being treated with a variety of allopathic drugs now-a-days, but the role of herbal plants in use since centuries in different shapes cannot be ignored at all, especially in the rural lifestyle. Further with the continuous use of different acaricidal drugs, the issue of resistance development has come across as a challenge for the researchers to find some alternatives for the purpose. Accordingly the research work on the use of traditional herbal medicines is gaining attention day by day.

### **Materials and Methods**

Ten camels showing typical clinical lesions of itching, pruritus, biting and rubbing against objects, alopecia, erythema, keratinization, thickening, corrugation and wrinkling of the skin, exudation and bleeding, fissured skin and scab formation were identified. (Fig.2). Each camel was restrained properly and the hairs were clipped from the margins of the lesions with the help of scissors and then the area was cleaned with a 10% solution of KOH. After cleaning and letting the area dry, the lesions were scraped from the margins with the help of a fresh razor blade in such a manner till the blood oozes out of the site. The reason of scraping deeply is that some mange / mite may burrow deeply in skin while some remain on the shallow surface of the skin. The skin scrapings were collected from the edges of skin lesions in clean small size plastic jars separately, each duly marked for identification of the individual animal. *Sarcoptes scabiei* var *cameli* mites were identified on the basis of their characteristic morphological features (Georg, 1985). (Fig.1) *Sarcoptes scabiei* var *cameli* mites were identified on the basis of their morphological characteristic features such as circular outline

having four pairs of short and stumpy legs. The third and fourth pair of legs do not project beyond the body margins (Nayel and Abu-Samra, 1986, Arora, 2003).

### **Hemato-biochemical studies**

Blood from these camels was collected for Hemato-biochemical analysis on day zero, i.e. at the start of each treatment to find out the effect of mange infestation on the blood physiology of animals. Two blood samples with the help of disposable syringe were collected from the jugular vein, one in a tube containing the Na<sub>2</sub>-salt of EDTA for the hemogram / study of Hemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), and Differential Leukocyte count (Neutrophils, Eosinophils, Lymphocytes, Monocytes and Basophils). The second sample of blood was collected in a tube without anticoagulant for the subsequent serum collection for the study of Total Proteins, Albumin, Globulin, Bilirubin, BUN, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Alkaline phosphatase (ALKP) and Lactate Dehydrogenase (LDH). The blood samples of camels treated with different medicines were again taken in a similar manner at the end of treatment (Day-30) to make its comparison with findings of day zero or before treatment.

### **Therapeutic trials**

A total of ten camels which were found positive for Sarcopticosis were divided into three groups, Group 1 and Group 2 have three camels each and Group 3 has four camels. 40 % concentration of *Azadirachta indica* (Neem) was applied once a week, for a total of four applications to the camels of Group 1. On the 22<sup>nd</sup> day of treatment, two camels showed complete recovery and one camel showed partial recovery as was observed from

the clinical signs. The camel which showed partial recovery was again given an application of Neem. On the 30<sup>th</sup> day the camel recovered completely.

*Cypermethrin* was used topically once a week, for a total of four applications at the rate of 1ml / liter of water to the camels of Group 2. On the 25<sup>th</sup> day of treatment, one camel showed complete recovery and two camels showed partial recovery as was observed from the clinical signs. The camel which showed partial recovery was again given an application of Cypermethrin. On the 30<sup>th</sup> day the camel also recovered completely. 40 % concentration of Neem was applied once a week, for a total of four applications, Injection Ivermectin @0.2 mg/kg BW, once a week, for a total of four injections and Injection Vetade 10 ml per camel, once a week, for a total of four injections was given to the camels of Group 3. Complete recovery in all the camels was observed on 15<sup>th</sup> day of treatment. It was also noted that camels in this group improved clinically earlier and gained more weight than Group 1 and 2. There was no apparent adverse reaction to treatment in any of the study groups.

### **Results and Discussion**

The results of different Hematological parameters before and after the treatment were studied to ascertain the changes in their values and to find out the effect of mange infestation on the blood physiology of camels. The mean averages of these parameters are presented in Table-1. All these Hematological parameters were found approaching towards normality after treatment and recovery from the mange infestation.

The results of different biochemical parameters before and after treatment were studied to ascertain the changes in their values. The mean averages of these

parameters are presented in Table-2. All these biochemical parameters were found approaching towards normality after treatment and recovery from the mange infestation.

The results reveal that Hb, PCV, TEC showed a decreasing trend than the normal range indicative of anemia in the diseased animals, as also reported by Parmar *et al.*, 2005, Gorak Mal *et al.*, 2006, Rathod *et al.*, 2008, Premalatha *et al.*, 2010, Momenah, 2014, Arul, 2016, Prajapati *et al.*, 2018. Mange mites abrade the skin surface and feed on exudates and blood from small surface haemorrhages leading to decrease in haemoglobin concentration and RBC value.

The decrease in Hb concentration might have been due to decrease in total erythrocyte counts.

TLC was increased as also reported by Parmar *et al.*, 2005 and Premalatha *et al.*, 2010. Neutrophils, Basophils and Monocytes were increased as also reported by Arul, 2016. Eosinophils and Lymphocytes were increased as also reported by Parmar *et al.*, 2005, Premalatha *et al.*, 2010, Arul, 2016. The results revealed that Total protein showed a decreased value as also reported by Parmar *et al.*, 2005, Arul, 2016 and Prajapati *et al.*, 2018. Albumin showed a decreased value as also reported by Parmar *et al.*, 2005, Arul, 2016.

**Table.1** Hematological findings

Parameters	Range	Pre-treatment	Group 1	Group 2	Group 3
Hb (g/dl)	7.2-13.2	5.7-6.9	6.1-6.3	5.9-6.6	6.8-7.5
PCV (%)	24-51	18-23	21-25	20-24	26-28
TEC (10 <sup>6</sup> /μL)	3.15-7.55	2.75-4.53	4.04-5.43	3.95-5.19	5.58-6.29
TLC (10 <sup>3</sup> / μL)	4.45-16.05	12.67-26.86	6.76-10.72	5.53-7.98	8.95-11.50
N (%)	24-45	38-62	34-46	36-57	32-40
E (%)	3-9	4-12	4-8	5-10	3-7
L (%)	40-59	56-73	52-64	55-68	48-56
M (%)	2-7	3-9	2-6	2-8	2-7
B (%)	0-1	0-2	0-1	0-2	0-1

**Table.2** Biochemical findings

Parameters	Range	Pre-treatment	Group 1	Group 2	Group 3
TP (g/dL)	5.97-10.67	3.24-4.68	5.47-5.76	4.48-5.77	6.45-7.87
Alb. (g/dl)	1.22-7.75	1.03-2.24	1.45-1.72	1.23-1.68	1.79-2.12
Glo. (g/dL)	3.10-4.85	2.68-3.02	3.67-3.90	2.73-3.27	3.82-4.44
Bili. (mg/dl)	1.15-1.65	2.74-3.05	2.45-2.55	2.24-2.41	1.86-2.34
BUN (mmol/l)	2.6-8.05	7.97-9.08	7.40-8.09	7.92-9.00	6.23-7.65
AST (μ/L)	84.1-161.8	234.65-240.65	216.67-231.23	222.78-226.89	210.52-219.78
ALT (μ/L)	7.1-21.5	25.65-27.15	21.90-23.03	24.03-26.34	17.64-19.31
ALKP (μ/L)	52-71	74-80	63-67	71-73	58-60
LDH (IU/L)	350-380	426-543	389-394	412-417	403-406



**Fig.1** *Sarcoptes scabiei* var *cameli* in 40 X magnification



**Fig.2** Camel with Sarcoptic mange

The hypoproteinaemia observed in the present study could be associated with the seepage of protein through exudation. Decrease in serum albumin could be a useful indicator of parasitism. Low level of albumin in affected camels of the present study could be due to loss of albumin as a result of dermatitis. Severity of hypoalbuminaemia could be related to loss of albumin or decreased synthesis due to inappetance. Hypoalbuminaemia occurs in starved animals (Kelly, 1983).

Globulin showed a decreasing trend in the diseased animals, as also reported by Parmar *et al.*, 2005. Whereas AST, ALT and BUN were observed with increased concentrations

as also supported by findings of Gorak Mal *et al.*, 2006, Premalatha *et al.*, 2010 and Arul, 2016 in camels infested with mange. AST and ALT activities varied according to the liver function which in turn varied according to the physiological and the health conditions of the animal, Sarwar *et al.*, 2004. Bilirubin was observed with increased concentrations as also supported by findings of Momenah, 2014.

The Group 3 showed complete recovery in all the camels on 15<sup>th</sup> day of treatment. It was also noted that camels in this group improved clinically earlier and gained more weight than Group 1 and 2, which shows the efficacy of the drugs when used combinedly. Based on

the report given by Fassi-Fehri (1987) who stated that malnutrition and nutritional deficiency (particularly vitamin A deficiency) favoured development of Sarcoptic mange, that is why we added Vitamin A in the Group 3.

Hb, PCV, TEC showed a decreasing trend than the normal range indicative of anemia in the diseased animals. Among the biochemical parameters, Total Protein, Albumin, Globulin was also decreased. TLC, Neutrophils, Eosinophils, Lymphocytes, Basophils, Monocytes and AST, ALT, ALKP, LDH, Bilirubin, BUN was increased. The treatment given to the Group 3 was best among the three therapeutic trial groups. This proves that 40 % concentration of Neem applied once a week, for a total of four applications, Injection Ivermectin @0.2 mg/kg BW, once a week, for a total of four injections and Injection Vetade 10 ml per camel, once a week, for a total of four injections was more efficient to cure sarcoptic mange in camels as compared to other trial groups.

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