Original Research Article

Comparative Efficacy of Selamectin, Sarolaner and Ivermectin in Canine Sarcoptic Mange

ABSTRACT

Sarcoptic mange, caused by *Sarcoptes scabiei* var.*canis*, is a highly contagious and zoonotic ectoparasitic infestation affecting dogs worldwide. This study evaluated the occurrence of sarcoptic mange and compared the therapeutic efficacy of selamectin, sarolaner and ivermectin in affected dogs in and around Jabalpur, Madhya Pradesh, India. From May to October 2024, 269 dogs with dermatological affections suspected of sarcoptic mange were examined, with 13 dogs (4.83%) tested positive based on skin scrapings. Age-wise analysis revealed that young dogs (<1 year) exhibited a higher susceptibility to the condition (53.85%). Additionally, male dogs demonstrated a higher occurrence rate (61.54%) compared to females; however, this difference was not statistically significant. A therapeutic trial was conducted on 12 dogs diagnosed with *S. scabiei* infestations, divided into three treatment groups: Group 1 received ivermectin (0.4 mg/kg PO daily for 28 days), Group 2 received sarolaner (2 mg/kg PO on Day 0), and Group 3 received selamectin (6–12 mg/kg topical spot-on on Day 0). Dermatological signs and mite counts were monitored before and after treatment, including crusting, scaling, erythematous papules and pruritus. Mite counts significantly decreased in sarolaner (100%) and selamectin (100%) treated groups, compared to the ivermectin treated group (26.32%). Sarolaner and selamectin demonstrated superior efficacy in eliminating mites and resolving clinical signs. Sarolaner monthly oral administration and selamectin topical application provide practical, effective options for managing sarcoptic mange, especially for the

Keywords: Sarcoptic mange; Sarolaner; Selamectin; Ivermectin; *Sarcoptes scabiei*

1. INTRODUCTION

Ectoparasites are a significant cause of dermatological disorders in dogs, with *Sarcoptes scabiei* being one of the most prevalent mite infestations globally. *Sarcoptes scabiei* var. *canis* causes canine scabies (sarcoptic mange), a non-seasonal, intensely pruritic and highly contagious skin infestation. The disease is globally prevalent, affecting dogs of all breeds, ages and sexes. Sarcoptic mange is highly contagious to other dogs and can also lead to mild, self-limiting skin reactions in humans upon contact [1]. The clinical signs include intense pruritus, scratching, alopecia, inflammation, excoriation and hyperkeratosis, sometimes accompanied by secondary bacterial infections and pyoderma [2]. The areas most affected initially include the periocular region, ear pinnae, elbows and hocks, with potential spread over time [3]. This burrowing mite not

only affects dogs but can also infest various other hosts, including cats, pigs, raccoon dogs, rabbits, sheep and humans [4]. Highly contagious and zoonotic, *S. scabiei* can cause skin lesions in approximately half of the infested dogs and up to 50% of their human companions after direct contact [5]. However, the mites cannot reproduce on human skin, as humans serve as dead-end hosts for the canine variety. In humans, the infestation typically results in a transient erythematous and papular skin reaction, localized to certain areas of the body.

The definitive diagnosis of *Sarcoptes scabiei* relies on the microscopic detection of mites and their eggs in skin scrapings [6]. However, under practical veterinary conditions, detecting *Sarcoptes* mites can be challenging, often requiring multiple skin scrapings to identify even a small number of mites [7].

The health and welfare of dogs affected by *Sarcoptes scabiei* can be severely compromised and the zoonotic risk to humans in contact with infested dogs signifies the need for prompt and effective treatment. Recently, isoxazoline-based products have been introduced for the treatment and control of flea and tick infestations in dogs.

Milbemycin oxime is the only oral product approved in some countries for the treatment of sarcoptic mange. However, its every-other-day dosing schedule may be inconvenient and cost-prohibitive for many dog owners. This implies the need for a proven, safe and convenient oral treatment option to improve the management of sarcoptic mange. Sarolaner a recent addition to the isoxazoline class of oral ectoparasiticides, is a highly potent insecticide and acaricide [8]. With its monthly dosing regimen, sarolaner offers a practical and effective solution for treating dogs with mite infestations, enhancing both caring compliance and recovery outcomes. Extra label use of macrocyclic lactones such as moxidectin and ivermectin has been reported to be effective via oral and injectable routes, but these must be given at high dose rates (0.2-0.5 mg/kg) and 1-2 week intervals, risking potentially severe side effects[9].

Considering the aforementioned factors, the study was undertaken to evaluate the occurrence of sarcoptic mange and to assess the therapeutic efficacy of Selamectin, Sarolaner and Ivermectin in the treatment of canine sarcoptic mange in and around Jabalpur, Madhya Pradesh.

2. MATERIALS AND METHODS

2.1 Location and Place of Work

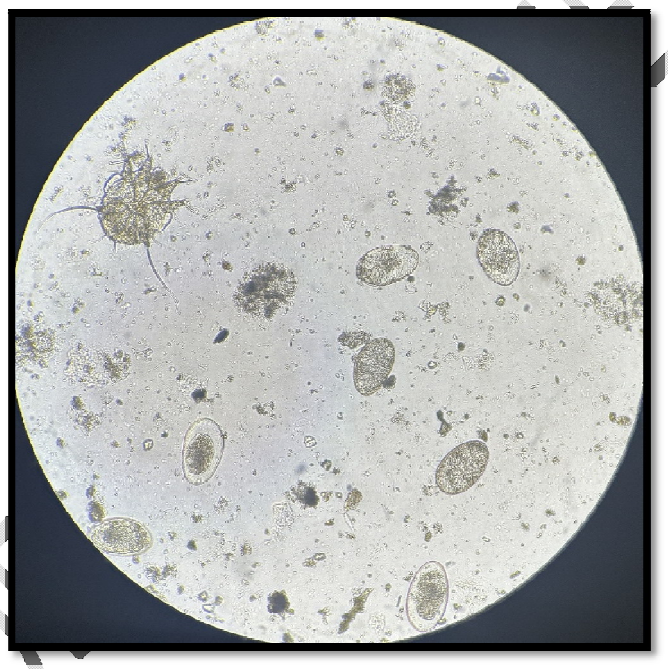
This study was conducted over six months at Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University (N.D.V.S.U), Jabalpur, Madhya Pradesh (M.P.). Located at 23.17° latitude and 79.57° East longitude, Jabalpur is 410.87 mean sea level in southern part of the second agro-climatic zone, which includes Satpura Plateau and Kaymore Hills. A tropical climate prevails here with an average annual rainfall of 1241 millimeters.

2.2 Screening

From May to October 2024, a total of 269 dogs exhibiting clinical signs indicative of scabies were presented to the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, India were screened. Comprehensive clinical and dermatological examinations were conducted and relevant patient data, including age, sex and clinical signs, were systematically recorded.

2.3 Deep Skin Scraping

For diagnostic confirmation, skin scrapings were obtained using a scalpel blade coated with mineral oil, ensuring sufficient pressure to elicit dermal capillary bleeding. The collected material was suspended in mineral oil, mounted on glass slides and examined microscopically



under 10× objective lense, following the protocol described by Soulsby [10](Fig. 1).

Fig. 1. Microscopic examination of skin scrapping showing *Sarcoptes scabiei* and their eggs; (x100)

2.4 Assessment of Characteristic Clinical Signs of Sarcoptic Mange

The clinical signs and severity of sarcoptic lesions in each dog were evaluated both before treatment and 28th day, post-treatment. The assessment included the following parameters: body regions exhibiting erythematous papules, scaling and crust formation. Additionally, the presence or absence of pruritus was determined by observing the dog's behavior for a duration of 5 minutes.

2.5 Therapeutic Regimen

Out of the total cases, twelve dogs with confirmed sarcoptic mange, based on the detection of mites in deep skin scrapings, were selected for a therapeutic trial. These dogs were randomly allocated into three treatment groups for further evaluation with each group comprising four dogs. In Group 1 (G1), ivermectin was administered orally at a daily dosage of 0.4 mg/kg body weight for 28 consecutive days. Group 2 (G2) received sarolaner as a single oral dose of 2 mg/kg body weight on day 0. Group 3 (G3) was treated with selamectin applied topically as a spot-on formulation at a dosage of 6–12 mg/kg body weight, administered as a single dose on day 0. The dogs enrolled in the present studies all had *S. scabiei* infestations confirmed by the presence of live mites in skin scrapings.

2.6 Therapeutic Response Study

The therapeutic response study was evaluated, based on the percentage reduction in mean live mite counts relative to pre-treatment counts, calculated on Day 0 and Day 28 using the following formula:

$$\%\text{Efficacy} = \frac{(\text{Mean (Pretreatment)} - \text{Mean Treated})}{\text{Mean (Pretreatment)} \times 100}$$

2.7 Statistical Analysis

Qualitative data on the occurrence of sarcoptic mange was analyzed using the Chi-square test. Quantitative data on mite counts across different treatment groups (between groups) was evaluated using one-way ANOVA, while changes within groups were assessed using an independent sample t-test.

3. RESULTS AND DISCUSSION

3.1 Occurrence of Sarcoptic Mange

A total of 269 dogs exhibiting dermatological symptoms were suspected for sarcoptic mange and skin scrapings were collected for the detection of *Sarcoptes* mites. Out of these, 13 dogs tested positive, yielding an overall occurrence rate of 4.83% (Table 01).These results closely align with the findings of Katariya et al. [11], who reported a 4.44% occurrence of sarcoptic mange. Similarly, this study partially agrees with Mosallanejad et al. [12], who documented an occurrence rate of 5.56%. In contrast, Akter et al. [13] reported a higher occurrence of scabies, with a rate of 20.45% in dogs. The observed variations in the current findings may be attributed to differences in geographical regions, climatic factors such as temperature and humidity, the availability of diagnostic procedures and variations in sample collection methods.

The age-wise analysis of sarcoptic mange occurrence in dogs showed the highest occurrence in young dogs (<1 year), accounting for 53.85% (07/13), while adult dogs (>1 year) exhibited a lower occurrence of 46.15% (06/13). The difference in occurrence between age groups was statistically non-significant in the Jabalpur region (Table 01 and Fig. 02). These findings are consistent with the observations of Chen et al. [14] and Kumar and Shekhar [15], who reported higher occurrence rates of scabies in young dogs (<1 year). This increased susceptibility is likely due to frequent and close contact with carrier mothers or owners, as scabies is primarily transmitted through direct person-to-animal or animal-to-animal contact.

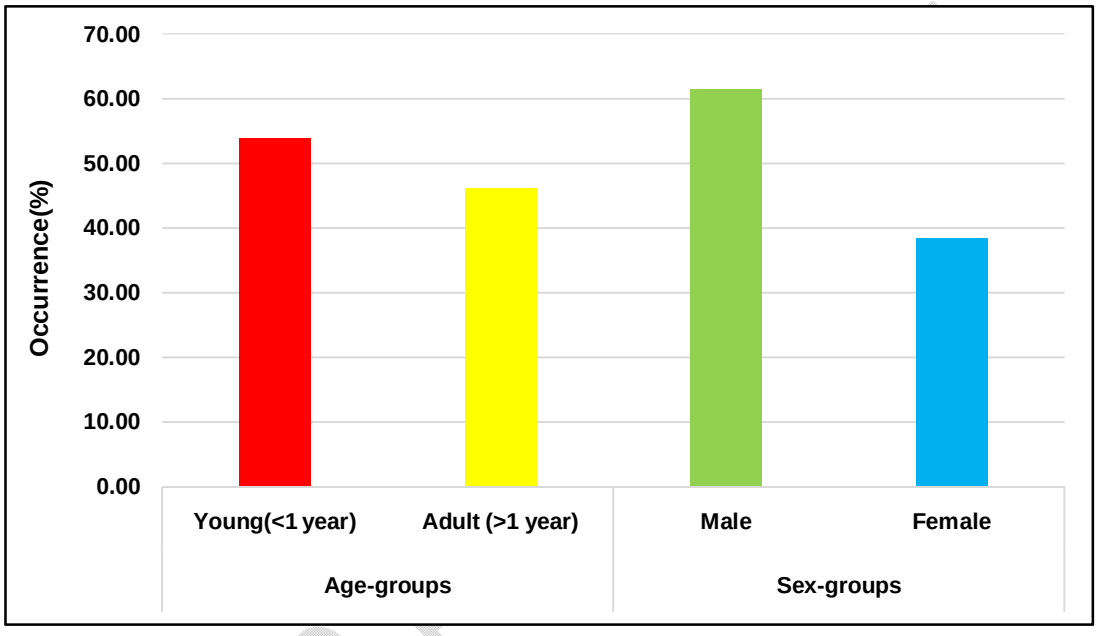


Fig. 2. Age-wise and Sex-wise occurrence of sarcoptic mange in dogs

The occurrence of sarcoptic mange was higher in male dogs, accounting for 61.54% (8/13), compared to 38.46% (05/13) in female dogs. However, this difference was not statistically significant (Table 01 and Fig. 02). The present findings are consistent with those of Katariya et al. [11] and Bhowmik et al. [16], who reported a higher occurrence of sarcoptic mange in male dogs compared to females. Conversely, Chen et al. [14] documented a slightly higher occurrence of scabies in female dogs than in males. Roger et al. [17] proposed that higher testosterone levels in male dogs may play a role in their increased susceptibility to parasitic infestation.

Table 01: Occurrence of sarcoptic mange

Number screened	Number affected	Occurrence (%)

269	13	04.83
Age-wise occurrence		
Age-groups	**Number affected**	**Occurrence(%)**
Young(<1 year)	07	53.85
Adult (>1 year)	06	46.15
x^2=0.1538*P*=.69		
Sex-wise occurrence		
Male	08	61.54
Female	05	38.46
	x^2=1.3846*P*=.24	

3.2 Assessment of Characteristic Clinical Signs Associate with Sarcoptic Mange

The clinical signs observed in all dogs across all groups varied (Table 02). In Group 1, consisting of dogs treated with oral ivermectin (n = 4), there was a reduction in crust from 4 to 3, erythematous papules from 1 to 0 and pruritus from 3 to 2 at 28 days post-treatment. However, the number of dogs presenting with scales increased from 2 before treatment to 3 after treatment. Following treatment with oral sarolaner (Group 2, n = 4), clinical signs resolved in 1 dog with crusts, 1 dog with erythematous papules and all 4 dogs with pruritus. However, the number of dogs presenting with scales increased from 1 before treatment to 2 after treatment. In dogs treated with topical spot-on selamectin (Group 3, n = 4), clinical signs resolved in 2 dogs with crusts, 2 with erythematous papules and 3 with pruritus. The number of dogs with scales remained unchanged at 3 before and after treatment.

The present findings are consistent with those of Beugnet et al. [7], Becskei et al. [9], Taenzler et al. [4] and Chiummo et al. [18], who identified pruritus, erythema, scaling or crusting, papules and alopecia as the most commonly observed clinical signs of sarcoptic mange in dogs. These clinical signs were resolved following appropriate treatment in their respective studies.Sarcoptic mange infestations are intensely pruritic, causing considerable discomfort in affected dogs due to constant scratching. Even after successful elimination of mites, pruritus often persists temporarily as the healing process continues. Similarly, associated skin lesions, particularly crusted lesions, may require additional time to resolve completely. The increased shedding of scales observed in some cases is likely associated with the natural process of skin healing and regeneration. Crust formation is attributed to chronic inflammation, secondary bacterial infections and the accumulation of exudates on the skin surface, while erythematous papules are likely the result of hypersensitivity reactions triggered by mite antigens.

Table 02: Dermatological signs in dogs affected with sarcoptic mange before treatment and 28 days after

Clinical sign	Group 1 (n=4)		Group 2 (n=4)		Group 3 (n=4)	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Crust	4/4 (100%)	3/4 (75%)	2/4 (50%)	1/4 (25%)	3/4 (75%)	1/4 (25%)
Scale	2/4 (50%)	3/4 (75%)	1 (25%)	2/4 (50%)	3/4 (75%)	3/4 (75%)
Erythmatous papule	1/4 (25%)	0/4 (0%)	1/4 (25%)	0/4 (0%)	2/4 (50%)	0/4 (0%)
Pruritis	3/4 (75%)	2/4 (50%)	4/4 (100%)	0/4 (0%)	3/4 (75%)	0/4 (0%)

3.3 Evaluation of Different Treatment Protocol

Mite counts were recorded in all 12 dogs included in the therapeutic trial on day 0 (pre-treatment) and day 28 (post-treatment). The results indicated that the mean mite count on day 0 was 14.25, 19.00 and 18.25 in Groups G1, G2 and G3, respectively. Following treatment, the mean mite counts on day 28 decreased to 10.50 in Group G1 and to 0.00 in both Groups G2 and G3. Statistical analysis revealed no significant difference in mean mite counts between the groups on day 0 pre-treatment. However, a significant reduction in mite counts was observed in Groups G2 and G3 post-treatment. Additionally, the mean mite count in Group G1 remained significantly higher compared to Groups G2 and G3 after treatment.

Table 03: The efficacy of the treatment was evaluated by comparing the mite counts recorded before treatment and post-treatment

Groups	Mite count		
	Pre-treatment (Day 0)	Post-treatment (Day 28)	Efficacy (%)
Group 1	14.25	10.5^{a}	26.32
Group 2	19.00^{A}	00^{Bb}	100
Group 3	18.25^{A}	00^{Bb}	100

Mean values with different superscripts between groups (lowercase) and between days (uppercase) differ significantly ($p \leq 0.05$).

In the current field efficacy study, oral sarolaner chewable tablets and selamectin spot-on formulations exhibited high effectiveness against canine sarcoptic mange. These findings are consistent with previous studies by Becskei et al. [9] and Six et al. [19], which also demonstrated the efficacy of these products in managing sarcoptic infestations respectively. Additionally, no adverse effects of any drug were reported by the authors in any of the dogs included in the therapeutic trial.

Ivermectin have been used "off-label" to manage mite infestations. However, their unlicensed use has been associated with serious adverse reactions in certain breeds, such as Collies [20]. Additionally, reports by Terada et al. [21] highlight clinical failures with the off-label use of oral ivermectin. These findings underscore the importance of evaluating the faster mite-killing

action and quicker resolution of clinical signs achieved with newer drug classes through randomized and controlled clinical trials.

The most recently developed ectoparasiticides from the isoxazoline class offer highly effective and convenient solutions for managing ectoparasitic infestations. These compounds work through systemic exposure of parasites following administration in either chewable tablets or topical formulations. Isoxazolines represent a relatively novel class of antiparasitic agents that act by inhibiting gamma-aminobutyric acid (GABA) chloride channels (GABA Cls) and L-glutamate chloride channels (GluCl) [22].

The two systemic acaricides-ivermectin and selamectin share a similar mode of action as they belong to the macrocyclic lactone class [23]. These agents function as acaricides primarily by disrupting neuronal signal transmission in mites, leading to paralysis, starvation and eventual death. This mechanism involves two key effects: (i) acting as agonists of the gamma-aminobutyric acid (GABA) neurotransmitter in nerve cells and (ii) binding to glutamate-gated chloride channels in the nerve and muscle cells of mites. Additionally, these acaricides impair mite reproduction by reducing oviposition or inducing abnormal oogenesis.Salib[24] reported no significant difference in the efficacy of selamectin and ivermectin in treating dogs affected by sarcoptic mange. In this study, selamectin was administered topically at a dose of 6 mg/kg as a spot-on application, while ivermectin was given orally at 0.2 mg/kg. Both treatment groups showed complete recovery by the fourth week post-treament. Similarly, Pin et al. [25] observed no significant difference in efficacy between the two drugs. In their study, ivermectin was administered orally at doses of 0.4 mg/kg and 0.3 mg/kg in two separate groups, with treatments repeated two weeks apart. Selamectin was applied topically at 6–12 mg/kg as a spot-on treatment, repeated three times at two-week intervals. All dogs recovered within two weeks, except for one dog in the selamectin group, which recovered after one month.

Randomized, controlled multi-center field studies have been conducted for selamectin[19], demonstrating parasitological cure following two monthly applications. Study also reported significant improvement in pruritus and skin lesions associated with sarcoptic mange. In a field study evaluating the efficacy of sarolaner, parasitological efficacy rates were 88.7% and 100% in the sarolaner-treated group on Days 30 and 60, respectively.[9].

The routine uses of isoxazoline-based products for controlling flea and tick infestations, or isoxazoline-anthelmintic combination products for managing flea and tick infestations alongside gastrointestinal nematode infections, heartworm prevention and lungworm treatment, has proven effective in treating canine sarcoptic mange. Furthermore, these products are expected to provide protection against *Sarcoptes* mite infestations.

Fig. 3.Sarcoptic mange in Non-descript dog treated with Ivermectin (G1), in Non-descript dog treated with Sarolaner (G2) and in Golden Retriever dog treated with Selamectin (G3)

(a) Pre-treatment on Day 0 and (b) Post-treatment on day 28

4. CONCLUSION

The present study demonstrated that sarolaner and selamectin are highly effective in treating canine sarcoptic mange, providing complete mite elimination and significant resolution of clinical signs. Both treatments outperformed ivermectin, which showed a lower efficacy in reducing mite counts and alleviating dermatological symptoms. The convenience of sarolaner's monthly oral administration and selamectin's topical application makes these options practical and favorable for managing sarcoptic mange in dogs. These findings support the use of isoxazoline-based products and selamectin as a superior alternative to traditional treatments, highlighting their potential for improving animal welfare and mitigating zoonotic risks.

5. FUTURE SCOPE

This study provides valuable insights into the therapeutic management of canine sarcoptic mange in and around Jabalpur, Madhya Pradesh. Future research should focus on larger sample sizes to improve the robustness of findings and evaluate the efficacy of sarolaner and selamectin under diverse geographical and climatic conditions. Comparative analyses of newer isoxazoline derivatives could yield critical data for optimizing treatment protocols. Furthermore, investigations into the development of resistance in *Sarcoptes scabiei* and the long-term safety profiles of these therapies are warranted. Assessments of the cost-effectiveness and adherence to treatment protocols by dog owners could further enhance the practical applicability of these interventions in the management of sarcoptic mange.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-imagegenerators have been used during the writing or editing of this manuscript.

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