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Research Article

Efficacy of Selamectin, Sarolaner, and a Combination of Selamectin-Sarolaner for the Treatment of Lynxacariasis in Cats in West Sumatra, Indonesia

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Abstract | Lynxacariasis is a dermatological condition in cats caused by the non-burrowing fur mite *Lynxacarus radovskyi*, commonly found in cats in West Sumatra, Indonesia. Selamectin and sarolaner are new-generation ectoparasiticides that are presumed to remain effective in the treatment of lynxacariasis. This study aimed to evaluate the efficacy of selamectin, sarolaner, and a combination of selamectin–sarolaner in cats infested with *L. radovskyi* in West Sumatra, Indonesia. A total of 36 cats with suspected lynxacariasis based on clinical signs were divided into three groups. All cats underwent clinical and laboratory examinations including hair sample collection for mite counting and infestation severity scoring. Group I was treated with selamectin, Group II with sarolaner, and Group III with a combination of selamectin and sarolaner. Evaluations were conducted on days 0, 14, and 28 post treatment. Efficacy was calculated on days 14 and 28 as the percentage reduction in live mite counts compared with day 0. Mite counts were analyzed using repeated-measures ANOVA to assess the differences in mean values across the observation days. Infestation scores of grades 3 and 4 were observed in 18 of 36 cats (50%), while scores of 0, 1, and 2 were absent. No live mites were detected on days 14 and 28 in any of the treatment groups, indicating a therapeutic efficacy of 100% in all groups. Statistical analysis using the Friedman test (α = 0.05) showed a significant difference between days 0 and 14, but no significant difference between days 14 and 28. These results indicate that selamectin, sarolaner, and a combination of selamectin and sarolaner are equally effective in treating *L. radovskyi* infestations in cats.

Keywords | Cat, *Lynxacarus radovskyi,* Efficacy, Selamectin, Sarolaner

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INTRODUCTION

Lynxacariasis is a dermatological condition in cats caused by the non-burrowing fur mite *Lynxacarus radovskyi*. Infestations frequently occur alongside other ectoparasites, such as fleas and ticks, which can induce dermatological disorders and serve as vectors for infectious and zoonotic agents (Moriello, 2003; Eisen and Gage, 2012). Recent evidence indicates that *L. radovskyi*, previously considered a non-vector parasite, has zoonotic potential and can cause papular dermatitis in humans (Colella *et al.*, 2020).

Lynxacarus radovskyi infestation compromises skin integrity by consuming corneocyte layers on the hair cuticle, increasing susceptibility to secondary infections, and is transmitted via direct contact or contaminated objects (Restrepo, 2010). Clinically, affected cats may exhibit multifocal alopecia, intense pruritus, scaling, miliary dermatitis, and a characteristic "salt and pepper" hair coat; severe infestations may result in chronic weight loss, hairball vomiting, anorexia, and behavioral stress (Lopes *et al*., 2021; Siagiaan, 2022; Rocha *et al*., 2019).

Lynxacariasis remains underdiagnosed and underreported, particularly in Indonesia, due to its frequently subclinical presentation and resemblance to other dermatological disorders. The lack of epidemiological data and the absence of comparative studies on treatment protocols highlight the need for further investigation into effective therapeutic approaches (Lopes *et al*., 2021). Prevalence reports in other Indonesian cities, such as 15.8% in Yogyakarta and 21.3% in Surabaya, suggest a potential endemic pattern (Gunawan *et al*., 2024; Saputro, 2024). Padang City, as an urban area, exhibits high interactions between pet and stray cats and a semi-caged management system, in which cats are allowed outdoors but receive regular feeding and care. The high incidence of ectoparasite infestations recorded at the West Sumatra Veterinary Hospital suggests that lynxacariasis may be present at a significant level in this region (Patisya et al., 2021). As a tropical country, Indonesia experiences ectoparasite problems throughout the year, necessitating appropriate control measures to mitigate their impact (Hadi and Susi, 2010).

Treatment of lynxacariasis in West Sumatra primarily relies on ivermectin, which, despite its efficacy, may cause adverse effects if improperly dosed (Hermawan *et al*., 2024). Selamectin, a newer-generation parasiticide, has been proven effective and safe for the treatment of ectoparasites in cats and dogs (Shank *et al*., 2000). Sarolaner, an isoxazoline-class parasiticide, has also been introduced in veterinary medicine and is effective against various ectoparasites, including mites (Six *et al*., 2016; Becskei *et al*., 2020). Sarolaner offers advantages over ivermectin and selamectin, including a longer duration of action and a broader spectrum of activity.

To date, no studies in Indonesia have evaluated the treatment of lynxacariasis in cats using selamectin, sarolaner, or their combination. This lack of evidence highlights the need to investigate effective therapeutic options for this condition. Therefore, the present study aimed to assess the efficacy of selamectin, sarolaner, and a combination of both for the treatment of lynxacariasis in cats in West Sumatra.

MATERIALS AND METHODS

Materials

The materials and instruments used in this study included a binocular light microscope, digital camera with television monitor, digital weighing scale, tourniquet, artery clamp, 24G intravenous catheter, 1 mL syringes, surgical masks, tissue paper, cotton swabs, glass slides, disposable gloves, EDTA vacutainer tubes (0.5 mL), and serum separator tubes. Laboratory analysis was conducted using a hematology analyzer (Exigo H400, Boule, Sweden) and a blood chemistry analyzer (Fuji Dri-Chem NX500, Tokyo, Japan). Biological samples consisted of blood and hair samples collected from 36 domestic cats (*Felis catus*) suspected of lynxacariasis based on the presence of characteristic clinical signs, particularly the "salt and pepper" appearance of the coat. Ectoparasiticides used for treatment included Revolution Plus® (selamectin and sarolaner), Revolution Cat Blue® (selamectin), and Simparica® (sarolaner), all manufactured by Zoetis, USA. Additional reagents and materials included 70% alcohol, 10% potassium hydroxide (KOH), Vigantol® (vitamins A, D, E), and Dimedryl® (antihistamine).

Methods

This study involved 36 cats in Padang City, West Sumatra that were infested with *L. radovskyi*, regardless of age, breed, sex, vaccination status, housing system, or population size, and had no history of antiparasitic treatment within the previous three months. The cats were divided into three treatment groups. Group I was treated with selamectin (Revolution®, Zoetis, USA) applied as a spot on the nape of the neck at a dose of 6 mg/kg body weight. Group II was administered sarolaner (Simparica ®, Zoetis, USA) orally at a dose of 1 mg/kg body weight. Group III was treated with a combination of selamectin and sarolaner (Revolution Cat Plus®, Zoetis, USA) applied as a spot on the nape of the neck at doses of 6 mg/kg (selamectin) and 1 mg/kg (sarolaner). All cats received a single dose on day 0.

The methodology used to determine efficacy was the same as that described by Guimaraes et al. (2023). For a total of three samples per cat per day of evaluation, three trichograms were conducted, each involving the removal of about 50 hairs from three predetermined areas: the dorsal region of the neck, lateral lumbar region, and perineal region and/or tail. Samples were collected on day 0 (treatment day) and days D+7, and D+14 . The collected hair samples were placed between slides and coverslips and examined under an optical microscope. The animals were given scores based on the number of eggs/mites recovered: 0, when no mites or eggs were found in any sample; 1, only non-adhering eggs were found; 2, only adhering eggs were found; 3, ≤50 mites were seen; 4, >50 mites were seen. The final score was determined by adding up the scores found in the three trichograms.

Statistical analysis

Mite counts were analyzed using repeated-measures measures ANOVA to evaluate the differences in mean values across the observation days. Therapeutic efficacy was evaluated on days 14 and 28 post-treatment using the method described by Geurden *et al.* (2017), with the following formula: Efficacy (%) = 100 × (number of mites on day (0), number of mites post treatment/ Number of mites on day (0).

RESULTS AND DISCUSSION

This study included 36 cats that were naturally infested with *Lynxacarus radovskyi* based on clinical signs and physical examination of the cats, such as having signs of itching and a "salt and pepper" appearance on the hair coat (Figure 1). Trichography of hair samples was performed for confirmation of *L. radovskyi* infestation (Krantz and Walter, 2009). In Vietnam, 60.25% of 2,430 cats were reported to be infested (Trang *et al.*, 2024). In Brazil, 35.27% of 224 domestic cat hair samples were positive for *L. radovskyi* (Santos *et al.*, 2011). In Singapore, 30.7% of 75 cats were infested (Hock *et al.*, 2018). The differences in prevalence between studies may be influenced by factors such as the number of cats examined, the length of the study, and the particular region of distribution of the mite (Trang *et al.*, 2024).

Figure 1: Salt and pepper appearance on the hair coat in cats with infestation *L. radovskyi.*

The distribution of cat characteristics is summarized in Table 1. The age distribution of cats was more frequently observed in adult cats aged 1–5 years. This finding is consistent with previous studies, which reported that adult cats are more susceptible to *L. radovskyi* infestations than younger or geriatric cats (Santos *et al.*, 2011; Trang *et al.*, 2024). Trang *et al.* (2024), in Vietnam found a prevalence of *L. radovskyi* of 60.25% in the domestic cat population, primarily in adult age groups. Sex distribution was equal, with 50% male and 50% female cats, and no significant differences in infestation prevalence were observed between sexes, supporting the observation by Ketzis *et al.* (2016) that sex does not influence infestation risk . Regarding the housing system, the majority of cats were kept outdoors (80.55%), while 19.44% were indoor cats, which is consistent with reports from Hidayah (2021), Lopes *et al.* (2021), and Saputro (2024) indicating that cats with outdoor access are more frequently exposed to environments conducive to mite transmission.

Table 1: Characteristics of cats infested with *Lynxacarus radovskyi* (n = 36).

Characteristic	Category	Number of cats	Percentage (%)
Age	<1	4	11.11
	1-5	27	75
	>5	5	13.88
Sex	Male	18	50
	Female	18	50
Housing system	Indoor	7	19.44
	Outdoor	29	80.55

Examination of all 36 cats revealed universal infestation with *Lynxacarus radovskyi*, with 50% of cats scoring 3 and 50% scoring 4; scores 0, 1, and 2 were absent (Figure 2). This indicates that all infestations occurred at high intensity, consistent with findings of Guimarães *et al.* (2023), who reported predominance of high infestation scores prior to treatment, and Santos *et al.* (2011), who observed that infestations generally occur at significant intensity in cats. The high prevalence of scores 3 and 4 in the present study may be attributed to the rapid reproductive capacity of mites (Craig et al., 2016) and delays in clinical recognition by cat owners before seeking veterinary care (Miller *et al.*, 2016).

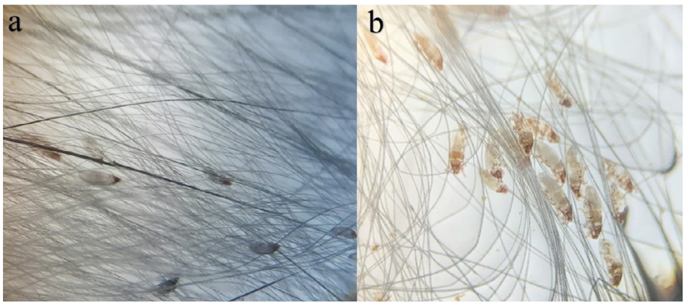

Figure 2: Degree of mite infestation in this study: (a) score 3; (b) score 4. Images captured under light microscopy at 10×40 magnification.

The mean number of *L. radovskyi* mites at different developmental stages before and after treatment is presented in Table 2. On day 0 (H-0), all groups exhibited mite infestations with varying intensities. Adult mites predominated in Group I (58.2) and Group II (83.41), whereas Group III showed higher counts of eggs (5.16) and larvae–nymphs (19.17) compared with the other groups. Following treatment, mite numbers at all developmental stages markedly declined and reached zero by day 14 (H-14), remaining at zero through day 28 (H-28). Statistical analysis revealed significant differences ($p < 0.05$) between pre-treatment counts (H-0) and post-treatment counts (H-14 and H-28), while no significant differences were observed between H-14 and H-28.

Table 2: Mean number of mites before and after treatment.

Group	Phase	H-0	H-14	H-28
Group I	Egg	1,08 ^{a}	0 ^{b}	0 ^{b}
	Larvae-Nymph	3,58 ^{a}	0 ^{b}	0 ^{b}
	Adult	58,2^{a}	0^{b}	0^{b}
Group II	Egg	2,41 ^{a}	0 ^{b}	0 ^{b}
	Larvae-Nymph	2,41 ^{a}	0 ^{b}	0 ^{b}
	Dewasa	83,41^{a}	0^{b}	0^{b}
Group III	Egg	5,16 ^{a}	0 ^{b}	0 ^{b}
	Larvae-Nymph	19,17 ^{a}	0 ^{b}	0 ^{b}
	Adult	24,66^{a}	0^{b}	0^{b}

Different superscripts $^{a, b}$ in the same row indicated significant differences ($p < 0.05$).

Table 3: Efficacy of three drug formulations in the treatment of lynxacariasis.

Day of examination	Group	Number of eggs	Number of Larvae Nymphs	Number of adults	Total live mites	Efficacy (%)
Day-0	K1	13	43	689	745	-
	K2	29	29	1001	1059	-
	K3	62	230	296	588	-
Day-14	K1	0	0	0	0	100%
	K2	0	0	0	0	100%
	K3	0	0	0	0	100%
Day-28	K1	0	0	0	0	100%
	K2	0	0	0	0	100%
	K3	0	0	0	0	100%

K1 = Group I, K2= Group II, K3= Group III

Selamectin acts by potentiating glutamate-mediated inhibition of electrical impulses in the neuromuscular system of invertebrates, leading to neuronal hyperpolarization and subsequent paralysis of the nervous system (Hermawan *et al.*, 2024). Sarolaner exerts its effect by inhibiting chloride channels associated with γ-aminobutyric acid (GABA) and glutamate receptors, preventing the influx of chloride ions into neuronal cells, enhancing neural excitation, and ultimately causing parasite death (Núñez *et al.*, 2021). The combination of selamectin and sarolaner provides a complementary effect, enhancing the speed and spectrum of mite elimination. The significant reduction observed on day 14 reflects the acute effect of these compounds, whereas the non-significant difference between days 14 and 28 may be due to the complete elimination of mites after day 14 and the absence of reinfestation during the study period . Selamectin and sarolaner are already widely used in clinical practice for the control of *Ctenocephalides felis* and *Otodectes cynotis*, which further enhances the practical value and applicability of the present findings in veterinary medicine (Taenzler *et al.*, 2017; Curtis *et al.*, 2019).

The efficacy of the three drug formulations against *L. radovskyi* infestation is shown in Table 3. The total number of live mites counted was 745 in Group I, 1.059 in Group II, and 588 in Group III on day 0 (H-0), and following treatment no mites were detected on day 14 (H-14) or day 28 (H-28). The present study demonstrated that selamectin, sarolaner, and their combination effectively eliminated *L. radovskyi* in cats, achieving 100% efficacy by day 14 post-treatment and maintaining this effect through day 28.

These findings differ from previous reports involving other molecules. Han *et al.* (2016) showed that oral fluralaner reached 100% efficacy only on day 28, while Guimarães *et al.* (2023) reported that transdermal fluralaner required until day 42 to achieve complete mite clearance, although its protective effect lasted until day 98. Similarly, Campos *et al.* (2020) observed that oral sarolaner combined with another isoxazoline achieved >95% efficacy by day 30, but did not reach 100% throughout the study. Such variations may be explained by differences in active compound content, route of administration, formulation, and initial parasite burden.

Although other drugs such as ivermectin (Foley *et al.*, 1991), fipronil (Clare *et al.*, 2004), and d-phenothrin combined with pyriproxyfen (de Souza *et al.*, 2012) have been described as effective against lynxacariasis, their use requires caution due to potential adverse reactions (Boland and Angles, 2010). Ivermectin can induce elevated liver enzyme levels, such as AST and ALT, indicating hepatocellular stress or liver damage, and may also affect renal function, although specific data on creatinine and urea levels remain limited (El-Saber *et al.*, 2020). The difference in application of ivermectin, which is typically administered subcutaneously or orally, not topically like Selamectin and Sarolaner, which are applied topically as spot-on treatment to the skin at the back of the neck (Dryden *et al.*, 2018). Therefore, selamectin, sarolaner, and their combination can be considered safer, more effective, and clinically practical options for the treatment of lynxacariasis in cats. Notably, the similar outcomes obtained with selamectin, sarolaner, and their combination suggest that monotherapy may be sufficient for the treatment of lynxacariasis, while also offering practical benefits in terms of cost efficiency and ease of application.

CONCLUSION AND RECOMMENDATIONS

The results of this study indicate that selamectin, sarolaner, and a combination of selamectin and sarolaner are equally effective in treating *L. radovskyi* infestations in cats in Padang, Indonesia, and potentially be used for cats in other regions under the similar conditions. These findings indicate that monotherapy with either selamectin or sarolaner is sufficient and effective for the treatment of lynxacariasis.

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NOVELTY STATEMENT

The novelty of this study found that there was a 100% therapeutic efficacy of selamectin, sarolaner, and their combination in eliminating *Lynxacarus radovskyi* infestations in cats by day 14 post-treatment. This is the first study to compare these three treatment protocols in naturally infested cats in West Sumatra, Indonesia, and highlights their equal effectiveness and potential for application in clinical practice.

AUTHOR'S CONTRIBUTION

TR: Writing original draft, conceptualization, data curation, formal analysis, visualization.
HR: Conceptualization, funding acquisition, supervision, project administration.
DP: Investigation, methodology, supervision, validation.
SI: Data curation, investigation, supervision, validation.
VIN: Preparation of the initial draft of the manuscript.

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Ethical committee

This study was approved by the Ethics Committee of the Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia (Approval No. 38/EC-FKH/int./2025).

Generative AI and AI-assisted technology statement

The authors declare that no Generative AI was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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