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COMPARATIVE THERAPEUTIC EVALUATION OF NEEM (AZADIRACHTA INDICA) LEAF PASTE AND IVERMECTIN FOR THE MANAGEMENT OF CAPRINE SKIN LESIONS IN MUKTAGACHA UPAZILA, MYMENSINGH

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COMPARATIVE THERAPEUTIC EVALUATION OF NEEM (AZADIRACHTA INDICA) LEAF PASTE AND IVERMECTIN FOR THE MANAGEMENT OF CAPRINE SKIN LESIONS IN MUKTAGACHA UPAZILA, MYMENSINGH

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ABSTRACT

Caprine skin lesions related to ectoparasitic disease are a common practical problem in smallholder goat production. They may cause irritation, hair loss, crusting and poor skin condition and may reduce the economic value of the affected animals. Ivermectin is a well-known anti-parasite drug whereas neem (*Azadirachta indica*) is a locally available traditional drug for skin problems. This field study was carried out to compare the clinical healing response of neem leaf paste and ivermectin in naturally occurred skin lesions of goats of Muktagacha Upazila, Mymensingh. Seven local-breed goats aged 1–2 years were included and treated with freshly prepared neem leaf paste once daily for 14 days (3 goats), 1% ivermectin subcutaneously at 200 µg/kg body weight on Days 0 and 7 (3 goats), and one goat was used as a reference (untreated). Lesions were evaluated on Days 0, 7, 14, 21 and 28. Ivermectin led to a quicker improvement in the first three weeks. The lesion reduction was 50%, 75% and 95% on days 7, 14 and 21 respectively as compared to 30%, 55% and 80% in neem group. By day 28 the respective reductions were 100% and 98% and the difference was no longer statistically significant ($p=0.06$). The untreated goat showed spontaneous improvement of about 30 per cent. No adverse effects were seen. In this small field study, ivermectin produced faster clinical improvement, while neem leaf paste showed significant healing over time. Neem may thus have practical value as a low-cost topical choice for mild or localized skin lesions but larger controlled studies are needed before recommending it as a substitute for established antiparasitic therapy.

1.0 INTRODUCTION

Goat rearing is a vital component of rural livestock production in Bangladesh. Goats are suitable for smallholder systems because they can be raised with relatively limited resources and provide meat, milk, skin and manure. The Black Bengal goat is of special importance in Bangladesh due to its adaptability, reproductive performance and valuable skin characteristics (Nooruddin & Dey, 1990;

Samad, 2003). The sector contributes to the nutrition of households and rural income (BBS, 2023). Goats are adaptable, but they can contract several infectious and parasitic diseases. Skin diseases caused by mites, ticks and lice are of particular importance because they cause pruritus, hair loss, scaling, crust formation and dermatitis. In severe or prolonged disease, poor body condition and secondary infection may be present. These problems can result in reduced productivity and lower quality of goat skin and hence additional costs to the farmers (Rahman et al., 2009; Samad, 2003). This is especially true for ectoparasitic disease in warm and humid conditions. Close contact between animals, poor hygiene of housing and favorable environmental conditions may favor parasite transmission and persistence. Mange from mites like *Sarcoptes*, *Psoroptes* and *Demodex* can cause severe itching, crusting and progressive hair loss. Extended irritation can affect feeding, growth and general performance (Hannan et al., 2001; Hanif et al., 2005). Thus, effective treatment is important for both animal welfare and farm productivity. Ivermectin is a commonly utilized veterinary anti-parasitic drug. It is a macrocyclic lactone that affects nerve and muscle function of the parasite causing paralysis and death of susceptible parasites. Previous studies have shown good efficacy of ivermectin against ectoparasites of goats including lice and ticks (Pandey et al., 1989; Hannan et al., 2001). Other field studies have also shown rapid clinical improvement following ivermectin treatment (Hanif et al., 2005; Lal et al., 2012). Ivermectin is effective, but proper diagnosis, dose and treatment interval is important. Repeated or inappropriate use may lead to reduced drug susceptibility. Failure to follow withdrawal requirements could create residue issues. The accessibility and price of veterinary medicines in smallholder farming areas may also affect treatment options. These practical problems have led to an interest in locally available plant-based remedies. Neem (*Azadirachta indica*) is readily available in Bangladesh and has a long history of traditional use. Its leaves contain biologically active compounds such as azadirachtin, nimbin and salannin. Preparations of neem have been reported to have antimicrobial, antifungal, antiparasitic and anti-inflammatory properties (Biswas et al., 2002). Experimental work has also shown that neem preparations can assist in wound healing and tissue repair (Gnanamani et al., 2009). Neem based preparations have been explored for the use against ectoparasitic conditions in livestock. Earlier, beneficial effects of neem oil and other neem preparations against ectoparasites in goats and other animals have been reported (Rahman et al., 2009; Kanon Das et al., 2015; Sharma & Katoch, 2017). The practical advantages of neem are that it is locally available, inexpensive and easy to prepare. Nevertheless, the concentration of active constituents may vary with the plant material and method of preparation and the clinical response may be slower than that of conventional anti-parasitic drugs. Hence, a direct comparison of neem leaf paste and ivermectin under field conditions is justified. Such information may assist veterinarians and farmers to consider treatment options based on disease severity, speed of recovery, cost and availability. The present study was conducted to compare the clinical healing response of neem leaf paste and ivermectin in goats with naturally occurring skin lesions of Muktagacha Upazila, Mymensingh. In particular, the study looked at change in lesion size over 28 days, visible healing and apparent adverse effects.

2.0 MATERIALS AND METHODS

2.1 Study area and period

The study was carried out in a selected rural area of Muktagacha Upazila, Mymensingh, Bangladesh. The animals were observed for 28 days, with clinical assessments made at seven-day intervals.

2.2 Experimental animals

Seven local-breed goats (1-2 years of age) with natural skin lesions were selected. Animals of both sexes were used. They were clinically examined before treatment and were fed with locally available feed and clean drinking water under semi-intensive management. They were dewormed before the treatment period.

2.3 Treatment groups

Group	No. of goats	Treatment	Dose/route	Observation
A	3	Neem leaf paste	Topical, once daily for 14 days	28 days
B	3	Ivermectin 1%	200 µg/kg SC on Days 0 and 7	28 days
C	1	Untreated reference	No treatment	28 days

2.4 Preparation and use of neem

Take fresh neem leaves and wash them with clean water. Grind to a fine paste. A little mustard oil was mixed with the paste to help in application. New paste was made every day. The affected skin was washed with lukewarm water before application and the paste was applied once daily for 14 consecutive days.

2.5 Ivermectin therapy

Commercial ivermectin 1% was given subcutaneously at 200 µg/kg body weight in the neck region. The second dose was administered on Day 7.

2.6 Clinical assessment

Clinical observations were performed on days 0, 7, 14, 21 and 28. Lesion size, crusting and dryness, regrowth of hair, apparent itching, skin condition and general health were observed. Healing was mainly expressed as the percentage reduction in lesion area from the baseline measurement.

2.7 Statistical analysis

Mean lesion area and standard deviation were calculated for each observation point. Healing was expressed in terms of percentage reduction of lesion area. The thesis reports Student's t-test to compare between treatment groups, with $p < 0.05$ considered statistically significant. The statistical findings were interpreted with caution due to the very small sample size.

3.0 RESULTS

3.1 General observations

All seven goats completed the 28-day observation period with no apparent adverse reaction in either treatment group.

Day	Untreated (n=1)	Neem (n=3)	Ivermectin (n=3)	p-value*
0	165.0 ± 5.0 (0%)	55.4 ± 6.3 (0%)	56.8 ± 7.1 (0%)	0.91 NS
7	148.0 ± 4.8 (10%)	38.7 ± 5.0 (30%)	28.4 ± 4.3 (50%)	0.04
14	132.0 ± 4.1 (20%)	24.9 ± 4.3 (55%)	14.2 ± 3.5 (75%)	0.03

21	124.0 ± 3.8 (25%)	11.1 ± 2.8 (80%)	2.8 ± 1.4 (95%)	0.02
28	115.0 ± 3.5 (30%)	1.1 ± 0.6 (98%)	0.0 ± 0.0 (100%)	0.06 NS

* p-values are the reported comparisons between neem and ivermectin groups. NS = not significant.

3.2 Baseline lesion size

Baseline mean lesion areas were similar in the neem and ivermectin groups (55.4 ± 6.3 and 56.8 ± 7.1 cm², respectively). The untreated reference goat had a larger lesion (165.0 ± 5.0 cm²). At Day 0, there was no significant difference between the two groups ($p=0.91$).

3.3 Day 7 healing response

Neem group had about 30% reduction in the lesion area by Day 7 and ivermectin group about 50% reduction. The mean residual lesion areas were 38.7 ± 5.0 and 28.4 ± 4.3 cm² respectively. The p-value reported was .04.

3.4 Healing reaction on Day 14.

The reduction in lesion at Day 14 was approximately 55% with neem and 75% with ivermectin. The mean residual lesion area was 24.9 ± 4.3 and 14.2 ± 3.5 cm², respectively ($p=0.03$).

3.5 Day 21 Healing Response

By Day 21, the neem group had about an 80% reduction in lesions, and the ivermectin group had about a 95% reduction in lesions. Mean residual lesion areas were 11.1 ± 2.8 and 2.8 ± 1.4 cm², respectively. The p-value was 0.02.

3.6 Final healing response after 28 days

By Day 28, the mean residual lesion area was 1.1 ± 0.6 cm² with about 98% reduction in the lesion area of the neem-treated goats. Goats treated with Ivermectin had 100 % reduction with an average residual area of 0.0 ± 0.0 cm². The reported p-value was 0.06, indicating no significant difference between treatment groups at the last observation.

3.7 Natural development of untreated goat

The untreated reference goat showed gradual improvements with approximately 10%, 20%, 25% and 30% decrease on Days 7, 14, 21 and 28 respectively. So there was spontaneous improvement, but it was much slower than the response in either of the treated groups.

3.8 General healing pattern

Ivermectin showed a rapid early response and neem a slower but consistent pattern of improvement. Difference between treatments was statistically significant at Days 7-21 but not at Day 28. This general pattern is consistent with previous reports describing rapid activity of ivermectin and gradual improvement after neem-based treatment (Pandey et al., 1989; Hannan et al., 2001; Rahman et al., 2009; Sharma & Katoch, 2017).

4.0 DISCUSSION

The present field trial demonstrated significant clinical improvement in both treatment groups. The main difference was in the rate of recovery. Ivermectin had a sharper response in the first 3 weeks, while neem kept improving, almost matching the ivermectin result by Day 28. The speed of the ivermectin response was consistent with its known activity against susceptible ectoparasites. Ivermectin has proven to be effective against ectoparasites of goats like lice and ticks (Pandey et al., 1989; Hannan et al., 2001). Therefore, the pattern of 50% lesion reduction by Day 7 and 95% by Day

21 is broadly consistent with the literature. Neem-treated goats improved more slowly. Neem has several bioactive constituents and is reported to possess antiparasitic, antimicrobial and anti-inflammatory properties (Biswas et al., 2002). Experimental research also has shown a role in wound healing and tissue repair (Gnanamani et al., 2009). These combined effects may account for the sustained clinical improvement observed in the neem group. Previous studies have also shown positive effects of neem-based preparations against ectoparasitic skin conditions in livestock (Rahman et al., 2009; Kanon Das et al., 2015; Sharma & Katoch, 2017). However, the present study does not show that neem is equivalent to ivermectin for parasite clearance as parasite identification and quantitative parasite counts were not reported. The outcome measured here was predominantly clinical lesion healing. From a practical standpoint, ivermectin may be preferred if a rapid improvement is needed. Neem leaf paste may be useful where a low-cost, locally available topical preparation is desired, particularly for mild or localized lesions. It is not proposed as a universal alternative to veterinary antiparasitic treatment in severe or generalized disease. The untreated reference animal showed only about 30% improvement over 28 days compared to 98 and 100% in the neem and ivermectin groups respectively. Given the inclusion of only a single untreated animal, this finding should be considered descriptive rather than strong experimental evidence.

“The main limitation of this study is the small sample size. Furthermore, the specific ectoparasite was not confirmed by laboratory means, parasite burden was not directly measured and recurrence was not assessed after 28 days. Further larger controlled studies with standardized neem preparation, confirmed parasitological diagnosis, parasite counts and longer follow-up are needed.

5.0 CONCLUSION

Both neem leaf paste and ivermectin were associated with significant clinical healing of caprine skin lesions in this small field trial. Ivermectin resulted in faster improvement; ~95% lesion reduction on Day 21 and 100% on Day 28. Neem improved more slowly but steadily and achieved ~98% reduction by Day 28. No adverse effects were observed: The neem leaf paste may have some practical value as a low-cost topical agent for mild or localized lesions. Ivermectin is still useful when rapid antiparasitic action is required. Larger controlled studies are needed before more generalizations can be made.

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7.0 FUNDING

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8.0 CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

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