



Evaluation of oil of *Cedrus deodara* and benzyl benzoate in sarcoptic mange in sheep

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Abstract

Two commonly used acaricidal drugs in India containing oil *Cedrus deodara* (OCD) and benzyl benzoate (BB), respectively, were used in 24 lambs (3–6 months) naturally infected with *Sarcoptes* mites. The lambs were divided in three equal groups. Two groups were kept as treated groups and a third as control. Drugs were applied locally on affected parts on alternate days and recovery changes in skin lesions were observed regularly at the time of application. Blood samples from each group were collected and analysed for total erythrocytes, leukocytes, and haemoglobin concentration every 10 d Post treatment (PT). The two treated groups responded to the treatment but recovery in the *C. deodara* group (CDG) was faster and lesions were free from mites after 5 applications (tenth day) as compared to the seventh application (fourteenth day) in the benzyl benzoate group (BBG). Erythrocyte and leukocyte counts were significantly different in treated groups as compared to control. Animals treated with OCD had significantly more erythrocyte and leukocyte counts compared to control; however, haemoglobin did not show significant difference. Oil of *C. deodara* was found more efficacious in controlling sarcoptic mange in sheep. © 1997 Elsevier Science B.V. © 1997 Elsevier Science B.V.

Keywords: *Cedrus deodara*; Benzyl benzoate; Sarcoptic mange; Sheep

1. Introduction

Sarcoptic mange is a serious skin problem in livestock. In sheep particularly, the problem is widespread and ranks among the most chronic, debilitating and economically important diseases. It is characterized by chronic dermatitis with intense itching and formation of thick scabs on the affected body parts. The disease is stubborn and hardly manageable with chemical application. However, treatment with various acaricides like Diazinon, Fen-

valerate (Chhabra and Singh, 1991) and Deltamethrin (Pathak et al., 1991) have been attempted with different grades of success. A systemic broad spectrum acaricide, Ivermectin, has also been projected as a suitable alternative to locally applied ones.

In view of toxic effects, developing resistance, high cost and the health hazards to humans using these chemical acaricides, use of herbal preparations against skin problems like mange is visualized. Various herbal drugs in human cosmetology have come on the market claiming to improve skin conditions. Moreover, they are cheaper, easily available and safe for users.

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Barring a few reports, the herbal drugs have hardly been tried as acaricides in animals, though the acaricidal effect of *Azadirachta indica* is well established. Kale and Panchegaonkar (1969) successfully treated 67 goats suffering from sarcoptic mange with oil of Karanj (*Pongamia pinnata*). Srivastava and Chhabra (1971) used oil of *Erucastiva* (Tara) with sulfur in sarcoptic mange on buffaloes and found it 100% effective in killing the mites. Chhabra et al. (1994) used Dermoccept (herbal) cream against mange in camels and buffaloes with complete cure within 20 d of the start of treatment.

The present study was undertaken to evaluate two acaricidal drugs commonly used against sarcoptic mange. Of these two, one is herbal and the other a chemical, having oil *Cedrus deodara* (OCD) and benzyl benzoate (BB), respectively, as active principles. The drugs are used extensively for acaricidal purposes in India. Both are used locally but differ physically, the herbal being an ointment and the other a suspension.

2. Materials and methods

Lambs (3–6 months) at the Sheep Unit, CIRG, Makhdoom, Farah, Mathura (U.P.), India were used in the study. Twenty-four lambs with severe mange infection were maintained separately in a semi-intensive system of sheep rearing. They were provided with stall feeding along with 6 h grazing daily. These animals had lesions on the head, face and ears ascribed to *Sarcoptes scabiei* var. *ovis*. The lesions were characterized by the presence of thick dry skin of a wrinkled appearance and thick scab formation resulting in alopecia. The identification was based on recovery of the mites from the skin scraping with Potassium hydroxide (KOH) (10%) treatment. All animals were of approximately the same age and body weight. They were randomly divided in three groups, A, B and C, with eight animals in each. The animals in each group were marked and kept separate, not being allowed to mingle. Though lesions were measured and skin scrapings were examined before and after treatment to assess recovery, the exercise was visual due to the irregular shape of the lesions and excessively large number of parasites. Quality of lesions was described using grade codes

from 1–4 depending on severity of skin reaction (Appendix A), and mean lesion quality (MLQ) was calculated using these grade codes.

All animals were examined for internal parasites and then treated with albendazole (7.5 mg kg^{-1} body weight) to rule out internal parasite infestation. The cleaned animals were rested for 3 weeks before acaricidal treatment. Group A was kept as control and groups B and C were treated with drugs having oil *C. deodara* (OCD) and benzyl benzoate (BB), respectively.

Before application of the drugs the hair around the affected parts was clipped, the lesions were cleansed with lukewarm water and allowed to dry for some time and then the drugs were applied locally to the respective groups on alternate days in sufficient quantity to make a thin film over the lesions. The treatment continued till the animals recovered completely.

Response to treatment was monitored on alternate days at the time of drug application. Recovery was described through grade codes from 0–4 in both treated groups (Appendix A). The mean recovery response (MRR) for each group after every application was calculated and tested using a *t*-test in both treated groups (Snedecor and Cochran, 1967). The animals from each group were bled every 10 d post-treatment to study haematological parameters i.e. erythrocytes, leukocytes and haemoglobin concentration. Data were analysed statistically using analysis of variance (Harvey, 1975) for comparison among groups. Treatments and days of replication and their interaction were included in the model.

3. Results

The mean lesion quality (MLQ) before treatment was found to be 2.75 ± 0.29 , 3.00 ± 0.35 and 3.00 ± 0.30 in groups A, B and C, respectively, which was not significantly different. Treatment response in the form of mean recovery response after every medication is presented in Table 1. Statistical analysis of MRR (based on grade codes) revealed significantly higher recovery rates in the *Cedrus deodara* group (CDG) from the second to fifth applications. All animals in the CDG completely recovered after the fifth application, giving an MRR of 4.00 as

Table 1
Comparison of mean recovery response in different applications in the CDG and BBG

	Applications				
	I	II	III	IV	V
CDG	0.875 + 0.12 ^a	2.25 + 0.25 ^a	2.8 + 0.16 ^a	3.8 + 0.15 ^a	4.0 + 0 ^a
BBG	0.875 + 0.12 ^a	1.0 + 0 ^b	2.0 + 0 ^b	2.0 + 0 ^b	2.62 + 0.15 ^b

^{a, b} Means with different superscripts in a column differ ($P < 0.05$).

against 2.62 in the benzyl benzoate group (BBG) in the corresponding application (Table 1). Treated groups showed improvement over controls as the condition deteriorated and lesions increased in size and severity. In treated groups, the size of lesions on affected parts was reduced considerably after the third application.

Examination of skin scrapings after the first application revealed a remarkable decrease in all stages of mites. Also, the animals' condition improved and itching and rubbing almost disappeared after the third application. In the CDG, the mites were almost nil in skin scrapings after the fifth application, against the seventh in the BBG. Recovery in the CDG was

quick as compared to the BBG as shown by shrinkage of affected parts and distinct hair growth after the fifth application of OCD. Analysis of variance revealed significant effects of drugs on erythrocyte and leukocyte counts ($P < 0.05$). Least squares means were higher for erythrocytes and leukocytes in the CDG group as compared to the control; however, haemoglobin concentration did not show significant differences (Table 2). Overall means for erythrocytes and leukocytes in the CDG were $(11.69 \pm 0.14) \times 10^6 \text{ cm}^{-3}$ and $268.5 \pm 3.65 (\times 50) \text{ cm}^{-3}$ as against $(11.21 \pm 0.14) \times 10^6 \text{ cm}^{-3}$ and $263.25 \pm 3.65 (\times 50) \text{ cm}^{-3}$ in the BBG. Results showed superiority of oil of *C. deodara* in haematological

Table 2
Factor-wise least squares means for various haematological parameters in sarcoptic mange in sheep

Factor	Obs.	Erythrocytes (10^6 cm^{-3})	Leucocytes ($\times 50 \text{ cm}^{-1}$)	Haemoglobin (g/dL)
		Mean \pm standard error	Mean \pm standard error	Mean \pm standard error
Overall	72	11.39 \pm 0.8	262.08 \pm 2.10	10.69 \pm 0.80
<i>Post treatment</i>				
Day 0	24	11.26 \pm 0.14	256.25 \pm 3.65	10.40 \pm 0.14
Day 10	24	11.61 \pm 0.14	263.20 \pm 3.65	10.85 \pm 0.14
Day 20	24	11.30 \pm 0.14	266.79 \pm 3.65	10.80 \pm 0.14
<i>Treatments</i>				
OCD	24	11.69 \pm 0.14 ^a	268.50 \pm 3.65 ^a	10.84 \pm 0.14
BB	24	11.21 \pm 0.14 ^b	263.25 \pm 3.65 ^{a, b}	10.53 \pm 0.14
Control	24	11.27 \pm 0.14 ^b	254.50 \pm 3.65 ^b	10.70 \pm 0.14
<i>Days \times treatment</i>				
Day 0 \times OCD	8	11.49 \pm 0.24	262.50 \pm 6.32	10.72 \pm 0.24
Day 0 \times BB	8	11.15 \pm 0.24	260.25 \pm 6.32	10.17 \pm 0.24
Day 0 \times Control	8	11.13 \pm 0.24	246.00 \pm 6.32	10.32 \pm 0.24
Day 10 \times OCD	8	12.14 \pm 0.24	268.12 \pm 6.32	11.10 \pm 0.24
Day 10 \times BB	8	11.42 \pm 0.24	267.00 \pm 6.32	10.65 \pm 0.24
Day 10 \times Control	8	11.27 \pm 0.24	254.50 \pm 6.32	10.80 \pm 0.24
Day 20 \times OCD	8	11.43 \pm 0.24	274.87 \pm 6.32	10.70 \pm 0.24
Day 20 \times BB	8	11.06 \pm 0.24	262.50 \pm 6.32	10.77 \pm 0.24
Day 20 \times Control	8	11.42 \pm 0.24	263.00 \pm 6.32	10.95 \pm 0.24

^{a, b} Means having same superscript in a column do not differ significantly ($P > 0.05$).

response over benzyl benzoate. The effect of interaction (days \times treatment) was non-significant on all haematological parameters. Also, the means for erythrocytes, leukocytes and haemoglobin concentration for the CDG were more than the overall means. Erythrocyte count in the CDG was significantly higher than in the BBG and control group, whereas the difference was non-significant for leukocyte count between treated groups.

4. Discussion

With an emerging concept of non-chemical, non-toxic and environmentally congenial acaricides, the use of herbal products for controlling various ectoparasites is needed in modern research. Besides, herbal acaricides are supposed to be more safe for users and resistant free in animals. Moreover, herbal drugs can hardly be a cause of environmental pollution as most of the ingredients of these drugs are natural and very conventionally used as an acaricide by the animal owners at their homes. In addition, they are easily available and of low cost. Ruprah et al. (1980) reported a complete cure of psoroptic mange in buffalo calves with *C. deodara* in 17 d. Singh and Satija (1989) effectively used it in psoroptic mange in buffalo calves. In the present study, before onset of treatment, the initial MLQ in all the groups had no significant difference showing that lesions were almost alike in quality. However, significantly higher MRR in each application (second to fifth) in the CDG showed superiority of OCD over BB in treatment of sarcoptic mange in sheep. In the CDG complete recovery was observed after the fifth application (10 d) (MRR-4.00–0), whereas the BBG took 7 applications (14 days) for complete recovery. Therefore OCD proved more effective than BB as recovery was fast being reached in the CDG. On aesthetic grounds the BB being white milky in colour and agreeable in odour was superior to the OCD preparation, which has quite a strong odour, blackish colour and gives an apparently slightly awkward look to white animals.

Hogg (1979) demonstrated that pigs heavily infested with *Sarcoptes scabiei* became anaemic implying that mites may consume erythrocytes which escape from capillaries. The present study revealed

significantly more erythrocytes in the CDG over the other two groups. The mean of erythrocyte count in the CDG was more than the overall mean, which showed a faster recovery in erythrocytes if they are being consumed by *Sarcoptes scabiei*. Though all haematological parameters are well within the normal clinical range, the significantly higher erythrocytes in the CDG emphasize that herbal drugs have more pronounced redressal effects. The results consolidate the belief that the use of herbal acaricides may provide a better way of combating a menace such as mange in domestic animals and that they can be used more safely and effectively.

Appendix A. Grade codes for lesions and response to treatment

	Grade codes
<i>Description of lesions</i>	
Reddening of skin with severe itching	1
Bare, exposed, moist lesions with serious exudation	2
Dry lesions with scab formation and loss of hairs	3
Thick, wrinkled skin with hyperkeratinization	4
<i>Description of recovery</i>	
No response	0
Dryness of lesions and loss of itching	1
Start of shrinkage of lesions and hair growth	2
Marked hair growth with smooth skin surface	3
Complete recovery	4

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