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Comparative evaluation of the efficacy of some topical herbal formulations in the management of mange and dermatophytosis in cattle

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Abstract

Mange and dermatophytosis are common veterinary problems of cattle in most parts of the world. Topical formulations based on essential-oils of plant origin form an important component of traditional and contemporary therapies for these diseases. These agents relax the requirements for protracted differential diagnosis and also tackle mixed infections successfully. A clinical trial was undertaken to compare the efficacy of some topical essential-oil based formulations in clinical cases of mange and fungal dermatitis in cattle. 24 cattle suffering from these diseases were assigned to either of three (03) equal groups. Group T1 received treatment with AV/CPS/23 spray (M/s Ayurved Ltd., India); Group T2 with competitor Brand A; and Group T3 with competitor Brand B. The response of the animals to the treatment was evaluated using an efficacy index based on the proportion of animals cured within each group and the severity of the cases successfully cured. Amongst treatments, AV/CPS/23 spray was found to be most effective for the management of mange and fungal dermatitis in cattle.

Keywords: mange, dermatophytosis, dermatitis, topical, veterinary, essential-oil

Introduction

Dermatophytosis, the fungal invasion of the superficial keratinized layers of the skin and its appendages *viz.* hair, nails, horns, is a frustrating and common problem in veterinary practice that occurs worldwide and affects all species of animals (Hamid, 2016) [5]. The disease is zoonotic in nature and affected animals are highly infectious to other animals and humans (Esch *et al.*, 2014) [2]. Cattle are commonly affected but unlike humans, topical therapy is preferred over systemic antifungal therapy. The differential diagnosis includes mange, most commonly caused by the mite *Sarcoptes scabiei*. Like dermatophytosis, mange is also a very common veterinary problem of zoonotic significance and occurs worldwide in all species, including cattle. Though both of these conditions can present as patchy dermatitis in the face, head or neck region with crusts and scabs, the conventional treatments for the two conditions take very different courses. Microscopy of skin scrapings for differential diagnosis between the two conditions (Hamid, 2016) [5] is relatively easy but is often impracticable for field veterinarians. Mixed infections with both of these agents are also not uncommon. Essential oils are known to bear promising activity against a range of skin pathogens. Many essential oils have been used traditionally, forming important *materia medica* in the treatment of dermatophytosis and scabies. Several of these oils of plant origin, such as those of garlic, cinnamon, eucalyptus, *neem*, and clove, have been validated for their efficacy using contemporary methods (Baptista *et al.*, 2015; Fang *et al.*, 2016; Orchard *et al.*, 2019) [1, 3, 8]. Many commercial preparations based on this class of plant-derived agents have also been shown to be very effective *in vitro* and *in vivo* against *S. scabiei* and different fungi that commonly cause affections of the skin in various species of animals (Sharma *et al.*, 1995; Silver and McGill, 1998) [10, 11]. Here, we report the findings of a clinical trial undertaken to compare the efficacy of some essential oil-based topical formulations in clinical cases of mange and dermatophytosis in cattle.

Materials and Methods

The trial was held from July, 2018 to June, 2019 in the Indian state of Uttarakhand at State Veterinary Hospital, Dwarahat, District Almora; State Veterinary Hospital, Rameshwarpur, District Udham Singh Nagar; and State Veterinary Hospital, Sadar Bageshwar, District Bageshwar. 24 cattle of either sex, aging 5 months to 8 years, presenting to the clinics with

complaint of pruritus, alopecia, flaky skin, patchy dermatitis, etc., were recruited in the study and randomly assigned to either of three equal groups. Group T1 received treatment with AV/CPS/23 spray (M/s Ayurved Ltd., India); Group T2 with popular competitor Brand A; and Group T3 with popular competitor Brand B. In each case, the overlying hair were clipped, the affected area was cleaned and the spray was applied generously. The spray was applied twice daily till recovery or till discontinuation of therapy due to non-recovery. Non-recovering cases were treated with ivermectin (Gill *et al.*, 1989; Kirmizigul *et al.*, 2012) [4, 6] systemically as per standard clinical procedures.

Before initiation of treatment, the lesions were graded by the attending clinician on an ordinal scale of 1-10 as per the severity of the clinical presentation of the case (area of the lesions, alopecia, redness, exudation, presence and characteristics of crusts and scabs, etc.), with 10 being the most severe. An efficacy index proposed by us previously

(Tiwari *et al.*, 2020) [13] was used for comparing the efficacies of the treatments.

Results and Discussion

Although quantitative estimates are not available, it is well accepted that both scabies and dermatophytosis cause substantial economic harm to cattle on account of poor feeding, loss of body and coat condition, loss of milk yield, depreciation of hide quality, and treatment costs (Mousa and Eman-abdeen, 2018) [7]. Effective and easy-to-administer point-of-care topical formulations that preclude withholding of the animals' produce are much needed for these conditions in veterinary practice. In the present study, three topical herbal preparations were compared for their efficacy in the management of mange and dermatophytosis in cattle. The group-wise severity of cases at their first presentation, the respective responses to the treatments and the calculated efficacy indices are summarized in Table 1.

Table 1: Summary of severity of cases, responses, and efficacy indices of the treatments

Group	Severity	1	2	3	4	5	6	7	8	9	10	Total	Efficacy Index
T1	Cases observed	0	0	0	1	1	3	1	1	1	0	8	0.819
	Cases cured	0	0	0	1	1	3	1	1	1	0	8	
T2	Cases observed	0	0	0	1	1	2	2	1	1	0	8	0.494
	Cases cured	0	0	0	1	1	1	2	0	0	0	5	
T3	Cases observed	0	0	0	0	0	3	3	2	0	0	8	0.544
	Cases cured	0	0	0	0	0	0	3	2	0	0	5	

Comparing the efficacy of treatments across groups that have differing number of cases of dissimilar severity can be challenging. Therefore, an efficacy index, which assigned half of the weightage to the proportion of total cases cured successfully and the other half to the weighted mean of the severity of the successfully-cured cases (Tiwari *et al.*, 2020) [13], was used for comparing the efficacies of the different treatments. Based on the efficacy index, AV/CPS/23 was found to be most effective amongst the treatments compared for the management of mange and fungal dermatitis in cattle. Both topical sprays of competitor brands A and B had considerably lower efficacy than AV/CPS/23.

AV/CPS/23 contains several active ingredients including turpentine oil, neem oil, lemongrass oil and camphor, which may account for its superior efficacy over competitor brands. In particular, the oil of neem seeds shows very good activity against dermatophytosis. Sepahvand *et al.* (2018) [9] found that neem oil was the most effective agent of plant origin against dermatophytosis. Previously, it was demonstrated that 15 µg.mL⁻¹ of the oleous extract of neem seeds significantly eliminated and prevented the growth of different dermatophytes. Most of this antifungal activity of neem oil could be attributed to the phytochemicals like the tetranortriterpenoid, azadirachtin, and 6-deacetylnimbin, azadiradione, nimbin, salannin and epoxyazadiradione (Sepahvand *et al.*, 2018) [9]. Similarly, octadecanoic acid-3,4-tetrahydrofuran diester has been shown to be the phytochemical chiefly responsible for miticidal property of neem oil against *S. scabiei* (Song *et al.*, 2017) [12]. Camphor and lemongrass oil have also been shown to be effective acaricides (Tran *et al.*, 2020) [14]. Essential oil-based formulations empower the practicing veterinarian to initiate therapy as soon as the case is presented without having to wait for differential diagnosis or having to bother about complex, mixed etiologies.

In conclusion, a comparison of the efficacies of the three

formulations included in the present study found AV/CPS/23 as the most effective treatment for the management of cases of mange and fungal dermatitis in cattle. The better efficacy of AV/CPS/23 could be attributed to the presence of a variety of constituents like oils of turpentine, neem and citronella, and camphor that exert antifungal and miticidal activity through manifold mechanisms.

Competing Interests

M/s Ayurved Limited, India, intends to manufacture AV/CPS/23 commercially. KR and BG are employees of M/s Ayurved Limited, India. However, the nature of this affiliation did not influence the outcomes of the study in any manner.

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