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Comparative evaluation of the efficacy of some topical herbal formulations in the management of traumatic myiasis in cattle

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Abstract

Traumatic myiasis, variably known as wound myiasis or maggot wounds, can be a serious problem in veterinary practice, especially in the warmer latitudes of the globe. Several agents of plant origin, such as turpentine oil and camphor, form the backbone of the therapeutic practices used for the first-line treatment and management of this problem. A clinical trial was undertaken to compare the efficacy of some topical polyherbal formulations in clinical cases of traumatic myiasis in bovines. 24 cattle suffering from myiasis were assigned to either of three (03) equal groups. Group T1 received treatment with AV/CPS/23 spray (M/s Ayurvet 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 recovered within each group and the severity of the cases successfully treated. Amongst treatments, AV/CPS/23 spray was found to be most effective for the management of myiasis in cattle based on the findings of the study.

Keywords: Herbals, maggots, myiasis, topical, veterinary, wounds

Introduction

Some dipteran flies are attracted to lay eggs on open wounds and on moist skin near natural orifices of the body. The larvae hatching out of these eggs can invade the pre-existing wounds and enlarge them, or create new wounds after having actively gained access to the tissue (Hall *et al.*, 2016) [9]. This condition, known as traumatic myiasis, is a common clinical problem in veterinary practice in India, and wounds even as small as tick bites may get maggot (Singh and Singh, 2016) [19]. Flies belonging to the families Calliphoridae and Sarcophagidae commonly cause myiasis among livestock (Zumpt, 1965) [21], *Chrysomya bezziana* being the commonest agent in India (Chhabra and Pathak, 2009) [5]. The larvae invade the broken skin and feed on the underlying tissue, causing serious tissue damage and resulting in loss of body condition, injury to the hide and secondary invasion (Humphrey *et al.*, 1980) [10]. Parasitized animals do not feed properly and may turn weak and anemic. Severe production losses may be registered and death may also occur in some cases due to toxemia and septicemia (Chhabra and Pathak, 2009; Schnur *et al.*, 2009; Singh and Singh, 2016) [5, 16, 19]. The first line of treatment of traumatic myiasis commonly involves the use of oviposition deterrents, larvicides and larva-repellents of plant origin; different plant-derived volatiles and oils such as camphor, turpentine oil, eucalyptus oil, neem oil, etc. have been shown to be very effective (Husain *et al.*, 1991; Shalaby *et al.*, 2016) [11, 17]. Many commercial preparations based on such herbal constituents have also been shown to be very effective against traumatic myiasis (Anand, 2001; Debasis and Mousumi, 2005; Naraladker *et al.*, 2011; Debnath *et al.*, 2013) [1, 7, 12, 8]. Here, we report the findings of a clinical trial undertaken to compare the efficacy of some topical herbal formulations in cases of traumatic myiasis in bovines.

Materials and methods

The trial was conducted from July, 2018 to June, 2019 in the Indian state of Uttarakhand at State Veterinary Hospital, Majkhali, District Almora; State Veterinary Hospital, Rameshwarpur, District Udham Singh Nagar; and State Veterinary Hospital, Sadar Bageshwar, District Bageshwar.

Bovines presenting to the clinics with complaint of traumatic myiasis were diagnosed confirmatively on the basis of history of trauma and wound, close examination of the wound, characteristic 'maggoty' odor, and the presence of maggots. 24 myiasis-affected bovines of either sex, aging 5 months to 8 years, 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 a combination of maggotocidal dressing liniment (Sapre and Dakshinkar, 2007)^[15] topically and ivermectin (Anziani *et al.*, 2000)^[2] systemically as per standard clinical procedures. Before initiation of treatment, the wounds 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 and volume of tissue involved, swelling and pain, presence of discharge and granulation tissue, *etc.*), with 10 being the most severe. For comparing the efficacies of the treatments, an efficacy index, based on the total number and the severity of the cases treated successfully, was calculated for each

treatment using the formula:

$$I = 0.5 \{ [\Sigma(S_i * n)] / (S * T) + (N/T) \};$$

where I = efficacy index, S_i = severity of case, n = total number of cases of severity S_i treated successfully, S = highest possible severity of a case, T = total number of cases assigned to a treatment, and N = total number of cases treated successfully with a treatment.

Results and discussion

The estimates of economic losses due to traumatic myiasis in livestock from geographical areas like India, where it is a bigger and widespread problem, are lacking. However, estimates of similar losses from other areas, such as Australia, for example, amounting to \$200 million in the year 1979 (Singh and Singh, 2016)^[19], do reflect the likely magnitude of the problem. Effective and easy-to-administer point-of-care remedies for traumatic myiasis are much needed in veterinary practice. In the present study, three topical herbal preparations were compared for their efficacy in the management of traumatic myiasis 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	1	3	1	1	0	8	0.600
	Cases cured	0	0	0	1	1	1	3	0	0	0	6	
T2	Cases observed	0	0	0	0	4	0	2	1	1	0	8	0.587
	Cases cured	0	0	0	0	4	0	2	0	0	0	6	
T3	Cases observed	0	0	0	1	1	2	2	1	1	0	8	0.493
	Cases cured	0	0	0	1	1	1	2	0	0	0	5	

In a clinical setting, it is nearly impossible to find all cases of same severity, and drawing comparisons between groups with differing number of cases of dissimilar severity can be problematic. Therefore, an efficacy index was used for comparing the efficacies of the different treatments. In the calculation of the efficacy index, half of the weightage was given to the proportion of total cases treated successfully and the other half to the weighted mean of the severity of the successfully-treated cases. Based on the efficacy index, AV/CPS/23 was found to be most effective for the management of traumatic myiasis in cattle amongst the treatments compared. Competitor Brand A had comparable albeit slightly lower efficacy than AV/CPS/23 whereas Brand B appeared least efficacious.

AV/CPS/23 contains several active ingredients including turpentine oil, *neem* oil, citronella oil and camphor, which may account for its superior efficacy over competitor brands. These oils make the surfaces slippery and interfere with the anchoring of the maggots. Oils also form a film, preventing the larvae from breathing and compelling them to come out of the wounds to the surface, from where they may fall off or can be removed easily (Husain *et al.*, 1991)^[11]. Even the crude extracts of these plants, *e.g.* neem, are potent maggotocidal agents (Singh and Kaur, 2016)^[18]. Besides these mechanisms, turpentine oil, *neem* oil, citronella oil and camphor also act as irritants for the larvae and as deterrents of oviposition by adult flies, allowing their successful use in traditional and contemporary human (Chan *et al.*, 2005; Chowdhury and Prasad, 2014; Barolia *et al.*, 2020)^[4, 6, 3],

veterinary (Patel *et al.*, 2015; Visvesvaran and Thirumalaiswamy, 2015)^[14] and agricultural practices (Ntiamoah and Borden, 1996)^[13] for the prevention and treatment of traumatic myiasis.

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 traumatic myiasis 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 fly repellent and maggotocidal activity through manifold mechanisms.

Competing Interests

M/s Ayurved Limited, India, intends to manufacture AV/CPS/23 commercially. Su, 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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