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Commercial cattle feed induced dermatosis in cattle and buffaloes of Karnataka: Role of defatted rice bran as cause

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Abstract

Typical dermatosis was developed in cattle and buffaloes of Karnataka State after feeding few brands of pelleted commercial cattle feeds and withdrawing the cattle feed and replacing it with different feed along with sulphur supplementation therapy cured dermatitis. The cause of the dermatitis was attributed to defatted rice bran as the feed component.

Keywords: Commercial cattle feed, dermatitis, cattle, buffaloes, defatted rice bran, hexane, mycotoxin, toxicity

1. Introduction

Many reasons are attributed to the dermatitis of the cattle and buffaloes. Few among them are infection, nutritional deficiency, toxic materials etc. Skin eruption from consumption of potato and its products are known for long time (Chopra *et al.*, 1965) [4]. In Karnataka State, since 2003 till date, there were repeated episodes of commercial cattle feed induced dermatoses in cattle and buffaloes (Shridhar and Narayana, 2005, Shridhar *et al.*, 2013) [16, 19]. The exact cause of the commercial cattle feed induced dermatitis is not clearly known yet. It was suspected that the defatted rice bran was the cause of the same due to the allergens in its contents or may be due to hexane toxicity.

2. Material and methods

2.1 Study area

Commercial cattle feed induced dermatitis was seen in the cattle and buffaloes of Karnataka State in Kolar, Shivamogga, Dakshina Kannada, Udupi and Uttara Kannada districts. A total of 136 (115 cross bred cattle and 21 buffaloes) cases of commercial cattle feed induced dermatitis were recorded in these districts.

2.1 Incidence

In the present study, cattle and buffaloes had dermatoses clinically characterized from the hind limb by isolated areas of alopecia, parakeratosis to hyperkeratosis, and seborrhea. There was erythema and edema of the coronary band, pastern and fetlock, which progressed toward exudation and marked crusting. In many species, the lesions ascended through the thigh's inner and outer surface to the inguinal region. Face eczema has also been seen in some cattle. The lesions were common in the legs, ventral abdomen and back, including the muzzle (Figure 1 to 2).

2.2 Collection of samples for analysis

The skin scraping from the affected animals was collected for screening for the presence of any parasites, bacteria and mycelium in the hairs or skin surface. The blood sample was collected for collected for hematology and biochemistry. The fodder samples simultaneously fed to the cattle with the suspected feed were sent for mycological identification.

2.3 Change of feed suggested in affected animals

The owners were advised to withdraw the commercial feed that has induced dermatitis and advised to use feed formulation computed using individual ingredients like crushed maize powder (45%), wheat bran (17%), rice bran with oil (20%), ground nut cake (15%), salt (2%) and mineral mixture (1%).

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The said concentrate mixture was advised to be fed to the affected cattle @ 0.5/l of milk per day and @ 2 kg per animal as maintenance ratio.

2.4 Treatment

The therapy did included a course of enrofloxacin 10 mg/kg, IM (Flobac[®], 100 mg/ml, 100 ml vial, Intas Animal Health, Ahmedabad) and chlorpheniramine maleate, 0.5-1.0 mg/kg IM (Anistamin[®], 10 mg/ml, 100 ml vial, Intas Animal Health, Ahmedabad) for three days after withdrawing the culprit feed. The lesions were applied with a paste of sulphur sublimate and zinc oxide (150 g each) in a litre of neem oil for 15 days with concurrent oral administration of the mineral mixture containing sulphur and zinc or to administer sodium sulphate 30 g and zinc sulphate 2 g orally.

2.5 Exploring the cause

The feed samples were collected and subjected to the analysis of proximate principles, urea, mycotoxins, pesticides etc. A questionnaire was circulated among the feed manufacturers for obtaining the ingredients and raw materials used for the manufacture of the culprit feed. A specific question was included about inclusion of the rice bran as ingredient and the source. The method of preparation of de-oiled or defatted rice bran was also obtained from the concerned manufacturer.

3. Results and Discussion

3.1 Incidence of the feed induced dermatitis

Not all the animals had the similar incidence of the dermatitis lesions which were fed with few suspected brands of commercial cattle feed. The incidence was usually 1:5 ratio. Difference in susceptibility difference in individual animals might be attributed to difference in the nutritional status of individual animals. In cattle, the rumen environment, plays a protective role in different animals as per the finding of Van Dijk *et al.* (1988) [24]. Further, food induced dermatitis in cattle was also suspected whenever similar lesions were developed (Halliwell and Gorman, 1989) [8].

Similarly Dutra and Cesar (2000) [5] also described a skin disease of cattle associated with the ingestion of Uruguayan and Brazilian defatted rice bran and attributed it to the allergy.

3.2 Clinical signs

In most of the cases, the animals had ascending dermatoses up to udder in hind limb. The lesions developed faster in hind limbs than forelimb. There was a slight alopecia to total hair loss in few cases. There was seborrhea, hyperkeratosis and parakeratosis. Characteristic erythematous lesion of the coronary in most of the animals was seen. Further it was progressed to fetlock joint and up words till udder. Some lesions were also seen on the face also. The disease appeared after 15 to 60 days of feeding on suspected commercial cattle feed. Similar lesions in commercial cattle feed induced dermatitis by Shridhar and Narayana (2005) [16] who also narrated the same. Shridhar *et al.* (2013) [19] further indicated the same. Dutra and Cesar (2000) [5] also reported similar type of lesions in the cattle fed with defatted rice bran. The lesions in the present study observed were similar to that of the cattle fed with defatted rice bran as reported by Dutra and Cesar (2000) [5]. The lesions like hyperplasia of basal dermal layer hyperkeratinisation of stratum corneum, cytolysis in some of the sebaceous glands with occasional complete loss of secretory cells, loss of dermal papillae, subcutaneous adipose tissue disappearance, reduction in number and size of hair

follicles etc were also observed by Dutra and Cesar (2000) [5] in cattle fed with defatted rice bran.

3.3 Serum hematology and biochemistry

There was no change in the serum hematological and biochemical parameters. This might indicate the non involvement of the system in the disease process. Shridhar and Narayana (2005) [16] also observed similar findings in cattle and buffaloes affected with feed induced dermatitis.

3.4 Results of sample analysis

The skin scraping from the affected animals revealed negativity to the presence of pathogenic parasite, bacteria and mycelium revealing the non infectious nature of the dermatitis. However few animals had the mange infestation which might be secondary infection. Similar reports of non infectious nature of dermatitis was reported by Somvanshi *et al.* (1992) [21] who noticed the dermatitis caused by cattle by feeding the potato or its products. Non infectious nature of dermatitis induced by *Latana camara* toxicity in cattle is well documented by many workers (Sharma *et al.*, 1988) [14].

Earlier, urea used as non portentous nitrogen (NPN) source as feed component feed (1-2%) was suspected as cause of the dermatitis. This was ruled out by finding of Charan *et al.* (1998) [3] who reported that feeding the buffaloes with feed containing urea (3%), molasses (84%), by pass protein (10%) with mineral mixture was not going to induce any dermatitis. This was further supported by feeding of the urea free pelleted commercial cattle feed to the susceptible cattle which also induced the disease (Shridhar and Narayana, 2005, Shridhar *et al.*, 2013) [16, 19].

3.5 Treatment

After therapy with antibiotic, antihistamine and sulphur and zinc supplement, most of the animals recovered. The enrofloxacin which was used in the treatment did the job of eradicating the secondary bacterial infection in dermatitis. Enrofloxacin belongs to fluoroquinolone family which is a subfamily of quinolone and used commonly for the treatment of dermatitis of cattle (Tessa and Sebastien, 2016) [22].

The suggested therapy included a course of antibiotic, antihistamine after withdrawing the culprit feed. The lesions were applied with a paste of sulphur and zinc (150 g each) in a litre of neem oil for 15 days with concurrent administration of the mineral mixture containing sulphur and zinc or to administer sodium sulphate 30 g and zinc sulphate 2 g orally. Chlorpheniramine maleate is an antihistamine with known anti allergic property and is a H1 receptor antagonist antihistamine used to treat many allergic conditions in cattle and buffaloes. In the present study also, it is used as anti allergic drug to reduce the allergic reactions as reported to be efficacious in earlier studies (Shridhar *et al.*, 2014; Vardanyan and Hruby, 2006) [20, 25]. Supplementation of sulphur will hasten the recovery rate of affected animals with dermatitis in cattle. Shibabrata Pattanayak (2009) [15] also applied sulphur in the form of formulated ointment to treat the humpsore in cattle and had the opinion that sublimated sulphur may act as antibacterial agent in the ointment. Shridhar and Narayana (2005) [16] also treated the commercial cattle feed induced dermatitis of cattle with a solid paste of zinc oxide and sulphur sublimate with good recovery rate. Shridhar (2009a) [17] reported the efficacy of a tablet containing zinc, sulphur and cobalt claimed to cure various types of dermatitis including the commercial cattle feed induced dermatitis.

Apart from this many herbal preparations were also claimed to cure the cattle feed induced dermatitis with a polyherbal ointment containing *Pongamia pinnata* oil, Gandhakam and *Psoralea corylifolia* claimed to cure various types of dermatitis and which may also be used in feed induced dermatitis (Shridhar, 2009b) [18].

In zinc deficiency, dermatoses is common disease of skin of pigs which also occurs in cattle with similar lesions (Tokarnia *et al.*, 2000; Hensel, 2010) [23, 9]. Hence, supplement of zinc in the form of zinc sulphate might have helped for faster recovery rate. Shridhar and Narayana (2005) [16] also reported that the supplementation of zinc will speed up the recovery rate of the disease which is further supported by the finding of Shridhar *et al.* (2013) [19].

The secondary bacterial infection was treated with enrofloxacin effectively. Use of enrofloxacin in dermatitis is documented in cattle dermatitis complicated with *Dermatophilus congolensis* with effectiveness (Saravanan and Palanivel, 2019) [11].

3.6 Exploring the cause of the dermatitis

Most of the feed companies divulged the ingredients except few who denied the same saying that it is their trade secret. However, they revealed that de-oiled rice bran (DORB) was one of the major ingredient of the compound feed. This is in accordance with the finding of Brum *et al.* (2012) [2] who reported that feeding defatted rice bran to the extent of 1% of body weight of cattle caused the similar disorders in cattle in Uruguay and Rio Grande do Sul.

Earlier the cause of the disease was attributed to the higher content of urea in it. Later after a thorough investigation, it was ruled out. The respective feed manufacturing units were requested for the content of the feed to explore the possibility of the content as cause of the dermatitis. The feed with zero urea content also caused the disease where as the feed with 4% urea did not cause it. Hence the role of urea as cause of the disease was ruled out. This finding is in accordance with the finding of Shridhar and Narayana (2005) [16] who also ruled out role of urea as cause of commercial cattle feed induced dermatitis.

Wu *et al.* (1997) [26] reported dermatitis in bovines caused by oat straw infected with *Fusarium sporotrichioides* and it was attributed to trichothecenes in the straw. Many mycotoxins kin animal feed do play important role in causing several forms of dermatitis. The mycotoxins involved in causing the dermatitis include trichothecenes in the straw, citrinin, sporidesmin etc (Pankaj Kumar Patel *et al.*, 2019) [10]. Hence, the role of the mycotoxins in the commercial cattle feed induced dermatoses of cattle can't be ruled out.

Deoiled rice bran (DORB) or defatted rice bran (DFRB) is one of the common ingredient of the commercial cattle feed to the extent varying from 15-25%. This was suspected to be the culprit of the said peculiar dermatitis. Such disease also occurred in Rio Grande do Sul after consumption of DFRB as reported by Schild *et al.* (1997) [12]. After 10 years, the same author further confirmed that the disease is due to the consumption of DFRB (Schild, 2007) [13]. Dutra and Cesar (2000) [5] also reported that the skin disease noticed in cattle of Uruguay and Southern Brazil was attributed to the feeding of defatted rice bran (DFRB). About 6% of the dairy farmers were using DFRB as cattle feed. Such disease was rarely noticed in the cattle fed with full-fat rice bran. Brum *et al.* (2012) [2] observed that cattle supplemented with DFRB to the extent of 1% body weight developed the typical signs of

dermatitis.

Initially it is believed that the disease is produced due to a food hypersensitivity as a consequence of the high protein level in DFRB (Belyea *et al.* 1989; Dutra, 1998) [1, 6]. Dutra and Cesar (2000) [5] induced the skin disease experimentally by force feeding the calves with DFRB experimentally to the extent of 1-1.8% and concluded that condition is mediated by a skin-sensitizing, heat-labile serum component probably a IgE antibody and this remained uncertain. They ruled out the role potentially toxic contaminants of the feed like n-hexane, cadmium, polychlorinated biphenyls and mycotoxins as their level was far below to cause the toxicity.

The role of n-hexane as causative agent is yet to be ruled out after proper experiments. The DORB or DFRB is obtained after a batch-type extracting technique with n-hexane as a solvent at 110°- 120°C (Young *et al.*, 1991) [27]. Hexane solvent extraction is the most popularly used method for commercial extraction of Rice bran oil (RBO) and relatively cheap compared to other methods which yields 92% oil. Hexane is a volatile, flammable, toxic and pollutes the environment (Garba *et al.*, 2017) [7].

There is chance that the n-hexane do remain in to defatted rice bran as residue. The role of hexane as cause of the dermatitis need further exploration. A systematic approach of each feed ingredient in the genesis of this dermatoses has to be investigated.



Fig 1: Commercial cattle feed induced dermatitis: hoof lesions

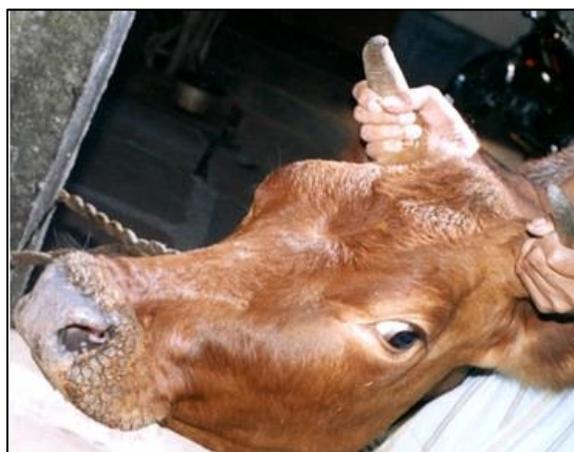


Fig 2: Commercial cattle feed induced dermatitis: Face lesions

4. Summary

The dermatosis problem of the cattle fed commercial cattle feed was discussed with success of therapy. Typical

dermatosis was developed in cattle and buffaloes fed few brands of commercial cattle feeds and withdrawing the cattle feed and replacing it different cattle feed along with sulphur supplementation therapy cured it.

5. Conflict of interest

No conflict of interest.

6. Acknowledgement

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