

Comparative Efficacy of Ivermectin, Amitraz Combination with Herbal Combination Against Sarcoptic Mange Infestation in Calves

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Abstract

In present investigation 197 calves having dermatological problem were examined. Out of them, 20 calves were found positive for Sarcoptic scabei var. bovis were screened and randomly divided in two treatment groups, A and B. Calves of Group-A treated with Ivermectin and Amitraz combination while Group- B treated with herbal combination and Group-C, kept as healthy control. Pre-treatment (0 day) evaluation of haemato biochemical parameters of both groups revealed significant (P<0.05) decrease in Hb, PCV and TEC, neutrophils, serum glucose, total protein, albumin, globulin, A:G ratio, Cu and Zn level and significant (P<0.05) increase in ESR, TLC, eosinophils, lymphocytes, ALT and AST value as compared to healthy control group. On 35th day of post treatment, skin scrapings were found negative, disappearance of clinical manifestations and restoration haemato-biochemical parameters towards normalcy in both treatment groups. Calves treated with Ivermectin and Amitraz combination showed faster recovery as compared to herbal combination.

Keywords: Amitraz and Herbal Combination, Calves, Ivermectin, Skin Scraping

Introduction

Mange is widespread, highly contagious disease of animals and transferred by closed physical contact between animals. It tends to spread all over the body within a short period of times result in repulsive look and stunted growth in young animals and causes considerable economic loss to the dairy farmers. Four types of mites i.e. sarcoptic, chorioptic, psoroptic and demodectic are responsible for causing mange infestation in animals (Radostits *et al.*, 2007). Among these sarcoptic and psoroptic mites mainly affects the young growing cattle, while chorioptes mite predominately affects dairy cattle. *Sarcoptes scabiei* var. *bovis* are burrowing mites and live in the epidermis of the young cattle. Calves infected with *Sarcoptes* mange usually suffer from intense pruritus causes scratching and rubbing against hard objects, which can lead to injuries and secondary bacterial infections. The *Sarcoptes* mange produced much more severe skin lesions than other mange (Radostits *et al.*, 2007). The disease spreads rapidly in dairy herds with the morbidity rate varying from 1.5 to 82 %, and may reached up to 100 % in severely affected herds, causing heavy losses of young animals (Gill *et al.*, 1989). The incidence of disease is higher in cold and wet weather rather than hot weather. The agro-climatic condition of Jharkhand favours the survival, multiplication, spread and stability of mange infestation in cattle. Moreover, poor management practices play an important role in high degree of occurrence of mange infestation in cattle. In Jharkhand, animals are mainly maintained in mixed farming system, close confinement and malnutrition conditions have limitation to control of mange infestation. Common method for control of mange infestation in cattle was usually regular applications of synthetic chemical drugs like Deltamethrin, Amitraz and Ivermectin reported by earlier workers (Singh *et al.*, 1993; Yathiraj *et al.*, 1990 and Peer, 2008). However, as these drugs are very expensive and are not available everywhere in rural areas, the farmers can't afford to control mange infestations in calves. Furthermore, some serious disadvantages of using these chemical drugs, notably the development of resistance and their harmful effects have been reported (Lekimme *et al.*, 2010). The indigenous system of medicine is of specific value in developing countries where precious allopathic veterinary medicines are often beyond the reach of poor cattle owners. At the same time, increased use of herbal medicine draws attention of scientific community towards exploitation of plant resources. Therefore, an On Farm trial (OFT) was conducted to determine the comparative efficacy of Ivermectin, Amitraz combination with Herbal combination against natural infestation of *S. scabiei* in calves at Koderma, Jharkhand, India.

Materials and Methods

An On Farm Trial (OFT) was carried out at unorganized private dairy farms located in peri-urban region of Koderma district of Jharkhand in the time period from July 2018 to June 2019. A total 197 calves irrespective of age, sex and breed shown dermatological problem like poor hair coat, itching, inflammation, alopecia, wrinkling and red papules were examined.

Collection of Samples

The skin scrapings for the detection of mites and their eggs were collected in liquid paraffin with the help of a sterilized scalpel blade. Deep skin scrapings were taken from the peripheral areas of active lesions and were collected in test tube containing 10% KOH on 0, 7, 14, 21, 28, 35 and 42 days of post-treatment (DPT) to evaluate efficacy of treatment. Skin scrapings were examined under microscope as per method describe by Soulsby (1986). The severity of infection was graded on the basis of number of mites observed per microscopic field at 10 X and graded as given 1-2 mites - mild (+), 3-4 mites-moderate (++), 5- 6 mites-severe (+++) and > 6 mites- very severe (++++).

Therapeutic Study

The 20 calves having natural infection of *Sarcoptic scabiei* var. *bovis* were randomly divided in two treatment groups namely A and B, each group having 10 calves. Group A treated with Ivermectin (Neomac®- Intas pharmaceutical Ltd., Ahmadabad), 200 mcg/kg b. wt., s.c., at weekly interval for 3 weeks along with topical application of Amitraz (Virtraz® - Virbac Animal Health Ltd., Mumbai) @ 3 ml in 500 ml of water, wait for half an hour and were washed out with clean water, weekly for 3 weeks. Group B - treated with herbal combination- Neem oil (*Azadirachta indica*)-50 ml, Karanj oil (*Pongamia pinnata*)-50 ml, Sulphur- 10 gm and Camphor-10 gm applied topically on alternate day up to 15 application. The therapeutic groups were also given supportive treatment Inj. Chlorpheniramine maleate (Anistamin ® - Intas pharmaceutical Ltd. Ahmadabad) , 1 mg/kg b. wt., i.m., was given for 5 days, Inj. AD₃ E (Vitacept ® - Concept pharmaceutical Ltd., Mumbai), 3 ml/calf i.m. at weekly interval for

4 weeks and liver tonic (Livotas ® - Intas pharmaceutical Ltd., Ahmadabad) 10-15ml / calf orally for 4 weeks. Group C - kept as healthy control and also having 10 calves. The haematological parameters such as Hb, PCV, ESR, TEC, TLC and DLC were estimated as per the standard procedure. Biochemical estimation viz. serum glucose, total protein, Albumin, Globulin and A:G ratio, ALT, AST, Cu, and Zn were done with the help of standard diagnostic kits. All the haemato-biochemical parameters were estimated before treatment at 0 day and 35th day of post treatment (DPT). The therapeutic efficacy of Ivermectin, Amitraz combination and herbal combination were evaluated on the basis of reduction in number of mites, disappearance of clinical manifestations and significant variation in each haemato-biochemical profile and its comparison with healthy control to observe improvement in value of each profile towards normalcy.

Statistical Analysis

Statistical analysis of the data was done using statistic software SPSS 16.0. Data pertaining to haematological and biochemical profiles was analyzed by t-test and ANOVA technique to test the significance of means as per the method described by Snedecor and Cochran (1994).

Results and Discussions

During the present investigation 197 cases of dermatitis were examined, of them 20 calves were found positive for sarcoptic mange infestation. The prevalence rate of sarcoptic mange infestation in calves was recorded 10.15 %. In contrast to present findings low prevalence rate was reported by Nazir *et al.* (2014). The high prevalence of sarcoptic mange in unorganised dairy farm was might be due to overcrowding, malnutrition and poor managerial conditions. The skin lesions were present on different area of the body surface, mostly on the neck, followed by wither, under tail, thigh, head, ear and scrotum. The calves showed symptoms like intense pruritus, alopecia, rough body coat, erythema, papules, crusts, scales, wrinkle, thickening and keratinisation of skin. These clinical symptoms were similar to the findings of Pentyala *et al.* (2009). Intense itching may be due to burrowing and feeding activities of mite, which generally occur three weeks after the initial infestation (Rahbari *et al.*, 2009). Hyperkeratosis and alopecia might have occurred due to cutaneous mechanical irritation and inflammation of hair follicle caused by mites. On day 0 (pretreatment) the haematological and biochemical analysis of calves of group A and B revealed significant ($P<0.05$) decrease in Hb, PCV and TEC, neutrophils, serum glucose, total protein, albumin, globulin, A: G ratio, Cu and Zn level and increase in ESR, TLC, eosinophils, lymphocytes, ALT and AST (Table 1 and 2), which was the close agreements to the findings of earlier workers (Dimri *et al.*, 2007 and Vishe *et al.*, 2012).

Table 1: Haematological parameters (Mean \pm SE) of Ivermectin, Amitraz combination and herbal combination treated group on 0 day and 35th day of post treatment

Parameters	Group A		Group B		Healthy control	
	0 th day	35 th day	0 th day	35 th day	Healthy	
Hb (g/dl)	8.5 \pm 0.52 ^b	11.83 \pm 0.22 ^a	9.1 \pm 0.51 ^b	11.46 \pm 0.52 ^a	12.25 \pm 0.19 ^a	
PCV (%)	32 \pm 1.25 ^b	38.43 \pm 1.80 ^a	33.5 \pm 0.95 ^b	39.13 \pm 1.25 ^a	40.51 \pm 1.4 ^a	
ESR (mm/h)	9.5 \pm 0.65 ^b	6.15 \pm 0.37 ^a	8.17 \pm 0.45 ^b	6.46 \pm 0.45 ^a	5.15 \pm 0.55 ^a	
TEC (106 / cu mm)	5.42 \pm 0.27 ^b	7.79 \pm 0.35 ^a	5.35 \pm 0.28 ^b	7.45 \pm 0.51 ^a	8.72 \pm 0.36 ^a	
TLC (103 / cu mm)	16.95 \pm 0.79 ^a	10.82 \pm 0.32 ^b	15.43 \pm 0.20 ^a	11.23 \pm 0.21 ^b	10.18 \pm 0.43 ^a	
DLC (%)	N (%)	18.54 \pm 3.10 ^b	23.16 \pm 0.85 ^a	19.83 \pm 0.70 ^b	24.33 \pm 1.25 ^a	23.10 \pm 1.34 ^a
	E (%)	9.87 \pm 0.43 ^a	4.16 \pm 0.35 ^b	9.21 \pm 0.63 ^a	4.12 \pm 0.21 ^b	3.80 \pm 1.70 ^b
	B (%)	0.34 \pm 0.21 ^a	0.19 \pm 0.16 ^a	0.32 \pm 0.21 ^a	0.51 \pm 0.22 ^a	0.90 \pm 0.20 ^a
	L (%)	69.12 \pm 0.83 ^a	69.4 \pm 2.17 ^a	68.61 \pm 0.81 ^a	67.21 \pm 0.99 ^b	68.8 \pm 0.86 ^b
	M (%)	2.13 \pm 0.25 ^b	3.16 \pm 0.40 ^a	2.03 \pm 0.33 ^b	3.83 \pm 0.30 ^a	3.4 \pm 0.40 ^a

Means bearing different superscripts in a row differ significantly ($P<0.05$)

Table 2: Biochemical parameters (Mean±SE) of Ivermectin, Amitraz combination and herbal combination treated group on 0 day and 35th day of post treatment

Parameters	Group A		Group B		Healthy control
	0 th day	35 th day	0 th day	35 th day	Healthy
Glucose(mg/dl)	55.5±4.11 ^b	71.83±3.5 ^a	55.17±3.77 ^b	72.23±4.5 ^a	74.11±3.42 ^a
Total Protein (g/dl)	5.72 ± 0.12 ^b	7.21±0.15 ^a	5.45±0.82 ^b	7.15±0.25 ^a	7.85±0.05 ^a
Albumin(g/dl)	2.11±0.15 ^b	3.51±0.32 ^a	2.19±0.22 ^a	3.54±0.21 ^b	3.94±0.05 ^a
Globulin(g/dl)	3.62±0.25 ^{ab}	3.69±0.15 ^{ab}	3.27±0.07 ^b	3.65±0.12 ^{ab}	3.87±0.15 ^a
A:G ratio	0.58±0.18 ^b	0.95±0.35 ^a	0.67±0.17 ^b	0.96±0.31 ^a	1.01 ± 0.21 ^a
ALT (U/l)	65.22±2.12 ^a	42.58 ± 1.12 ^b	62.12±2.72 ^a	41.58 ± 1.27 ^b	39.58 ± 1.12 ^b
AST (U/l)	47.31±0.9 ^a	21.35±2.1 ^b	45.12±1.3 ^a	22.42±2.3 ^b	19.57±1.15 ^b
Cu (µ mol/l)	9.82± 0.62 ^b	11.05 ± 0.85 ^a	8.75± 0.73 ^b	11.75 ± 0.75 ^a	11.22 ± 0.25 ^a
Zn (µ mol/l)	8.15 ± 0.35 ^b	16.45 ± 0.75 ^a	7.42 ± 0.35 ^b	17.26 ± 0.51 ^a	17.58 ± 0.55 ^a

Means bearing different superscripts in a row differ significantly ($P<0.05$)

Marked decrease Hb, PCV and TEC values were might be due to impairment in erythropoiesis caused by sarcoptes mites Hogg (1979) and Vishe *et al.* (2012). The raise in ESR could be due to change in globulins level and directly proportional to the ESR (Benjamin, 2010). Leucocytosis and eosinophilia noticed in present case might be linked to inflammatory reaction, antigen antibody interactions or stress of parasitism (Ramprabhu *et al.*, 2001). Hypoglycaemia and hypoproteinaemia may be due to malnutrition and regressive hepatic functional status. The respective increase globulin level might be due breakdown of tissues and overlying infections, which are commonly occurred in the skin infections (Sharma, 2002). Change in A: G ratio might be due to low albumin and high in globulins level. The significant ($P<0.05$) increased liver specific enzymes (ALT and AST) were attributed, may be due anorexia and hepato-cellular injury caused by the toxic products of tissue breakdown. Copper plays important role in haemoglobin formation, hypocupraemia may be correlated with anemic condition of the calves as observed in present study. Zinc plays the most important role in the immune system, the protective shield of the skin to gene regulation within lymphocytes, as well as normal development and functioning of cells mediating nonspecific immunity and stabilization of cell membranes of macrophages (Shankar and Prasad, 1998). Zinc deficiency cause immune suppression and vulnerability to opportunistic infections as in dermatitis, enteritis and alopecia Zalewski (1996). On 7th day of post treatment, gradual decrease in skin lesions and mites counts was recorded in both the treated groups. The calves of both the treated groups stopped itching and comfortable with the environment. On day 21st and 28th of post treatment skin scrapings were found negative from the mite and marked progressive improvement in skin lesions evidenced in Ivermectin, Amitraz combination and herbal combination treated group respectively (Table 3).

Table 3: Detection of mites in calves of Ivermectin, Amitraz combination and herbal combination treated group on different days of post treatment

Treatment group	Days of post treatment (DPT)						
	0 th day	7 th day	14 th day	21 st day	28 th day	35 th day	42 nd day
Group A	++++	++	+	-	-	-	-
Group B	++++	+++	++	+	-	-	-
Group C	-	-	-	-	-	-	-

Resolve of keratinised lesions, cutaneous wrinkles and regrowth of hair was observed on day 28th and 35th day of post treatment in Ivermectin, Amitraz combination and herbal combination treated groups respectively. Calves of healthy control group were found negative for mites throughout the trial periods. On 35th day of post treatment (DPT) haemato-biochemical parameters of group treated with Ivermectin, Amitraz combination and herbal combination (Neem, Karanz, Sulphur and camphor) treated groups varied none significantly ($P<0.05$) from healthy control group. Amitraz is classified as a monoamine oxidase inhibitor, although the exact mechanism is unknown, it is widely used for eradication of mange infestation in Canine. Ivermectin a well-known acaricidal drug used

effectively for treatment of mange infestation in animal (Rehbein *et al.*, 2002; Peer *et al.*, 2008 and Kumar *et al.*, 2018). Amitraz act as adjunct for Ivermectin to be the best protocol for eradication and prevention of re-infestation with mange mites in calves (Pentyala *et al.*, 2009). Neem (*Azadirachta indica*) oil widely use in various skin disorders and very effective against mange infestation in animals (Dakshinkar *et al.*, 1992; Hirudkar *et al.*, 1997); Rahman *et al.*, 2009 and Barman *et al.*, 2019). Karanj (*Pongamia glabra*) oil also has acaricidal value Kale and Panchegaonkar (1969). Sulphur has keratolytic activity and inhibitory effect on the growth of sarcoptes mites. Camphor produced numbness and local anaesthetic effect on the body of animals that potentiated the action of other two oils. Kumar *et al.* (2007) also find that combination was effective against mange infestation in pig. Similarly, herbal combination was found to be efficacious and may be recommended for the management of sarcoptic mange infection in calves. No any untoward reactions were observed in the calves during or after the trial period, indicating that the tested drugs were safe and well tolerated.

Conclusion

On comparison Ivermectin, Amitraz combination with herbal combination (Neem, Karanz, Sulphur and Camphor), the faster recovery was observed in Ivermectin and Amitraz combination treated groups as compared to herbal combination treated group, both the drugs combination were found to be very effective against sarcoptic mange infestation in calves. Herbal combination was more preferred by farmers because it is easy to prepared from local available materials, apply topically and cost effective.

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Conflict of Interests

There is no conflict of interest.

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