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Research Article

Studies on Economic Losses of Coccidial Infection

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ABSTRACT

The aim of present study was to see the effect of infection and its medication on weight gain of calves under indigenous environment. Twelve cattle calves under 3 months of age were procured and reared under standard manage mental conditions. After one week of deworming and acclimatization, calves were randomly divided into two groups and were infected with 20000 oocysts of *E. bovis*. Group A: Animals of this group were infected but medicated and their feed conversion ratio and body weight were recorded weekly for a period of two months. Group B: Animals of this group were kept as infected and non-medicated and their feed conversion ratio and body weight were recorded weekly for a period of two months.

The economical losses due to coccidiosis in experimental calves was calculated on the basis of loss in weight gain and feed conversion ratio as compared with the control groups. It was concluded that there was significant difference ($p<0.05$) between weight gain and feed conversion ratio of treated animals and infected non-treated group. Weight gain and FCR of treated group A was high as compared to non-treated group B.

Keywords: Coccidiosis; Weight gain; FCR

INTRODUCTION

Livestock has a major role in promoting socio-economic development in rural areas. Nearly 8 million families are involved in livestock raising and deriving more than 35 percent income from livestock production activities. It is a source of cash income and playing an important role in poverty alleviation.

Presently it contributes 60.5 percent to the overall agricultural and 11.2 percent to the GDP during 2018-19. Gross value addition of livestock has increased from Rs. 1,384 billion (2017-18) to Rs.1,440 billion (2018-19), showing an increase of 4.0 percent over the same period last year There are at present about 47.8 millions cattle and 40.0 millions buffaloes.

The annual production of milk by cattle and buffalo is 21,691 million tonnes and 36,180 million tonnes respectively. Beef production is 2,227 million tonnes per year. Livestock products (Hides) by cattle and buffalo are 9,063 and 8,373 million respectively [1]. As livestock industry is continuously expanding and its significance for global food production, control of coccidiosis, perhaps the most widespread and intractable disease of poultry and other livestock [2]. Coccidiosis is a parasitic disease associated with diarrhoea, weight loss and anemia. In severe cases, there may be blood and mucus in the manure [3,4].

The disease is Worldwide in distribution. Coccidiosis is caused by many species of *Eimeria* which invade certain cells of intestinal epithelium, caeca and other organs like liver and kidney [5]. At least nine species of coccidia have been reported in cattle which include *E. subspherica*, *E. zuernii*, *E. alabamensis*, *E. elipsoidalis*, *E. cylindrica*, E. bovis, *E. condenses*, *E. bukidonensis* and *E. auburnensis*. Two species i.e., *Eimeria zuernii* and *Eimeria bovis* are more pathogenic and common [6]. Coccidiosis produces bloody diarrhoea, loss of weight.

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Most cases of coccidiosis occur during winter but outbreaks may occur sporadically throughout the year. Bovine coccidiosis occurs most frequently in calves between six-to-twelve months of age [7]. Coccidiosis occurs in calves from the age of 21 days.

It arises in young calves that have an underdeveloped immune system and are being housed in dirty, unhygienic accommodation. Infected calves excrete large amounts of oocytes (eggs) which, in turn, contaminate the environment and lead to the rapid spread of the disease [8]. Once calves reach 6 months of age, they have a 100% infection rate even though 5% or less show clinical signs [9]. The most serious losses are seen in dairy herds where large numbers of calves are kept along with older cattle carriers [10]. Calves become infected by ingesting sporulated oocysts along with their food and water.

The severity of disease in calves depends upon the number of sporulated oocysts they ingest. No symptoms are evident if few oocysts are ingested. Disease is severe if large numbers of oocysts are ingested. The acute disease is characterized by haemorrhagic diarrhoea, and the condition may become so intense that the feces become bloody. Tenesmus is marked accompanied by anaemia, weakness and emaciation.

The epithelium may slough away leaving large denuded areas which are infiltrated with lymphocytes and leucocytes. In less acute cases the mucous membrane is roughened and spotted with petechial haemorrhages [11]. The intestinal parasite cause problems mainly in calves, and is known to have long term effects on the growth rate, and in severe cases can result in mortalities [12]. Overcrowding, poor sanitation and poor nutrition are contributing factors for coccidiosis [13]. Subclinical infection may lead to retarded growth. Stress produced by adverse conditions such as sudden dietary changes, prolong travel, extreme weather conditions can reduce the resistance of animals which may lead to infection with *coccidia* [14].

In severe infection death may occur as early as seven days after the onset of clinical signs. The extent of death ranged from 7-20% depends on the age of animal; the younger they are the more severe is the course of the disease [15,16].

In general, coccidiosis affects the intestinal tract. In mild cases, calves only have watery diarrhea, but in most cases, blood is present in the feces. Straining, along with rapid dehydration, weight loss and anorexia (off feed), may be evident [17]. At present coccidiosis in cattle has neither been given importance in most of the developing countries. Keeping in view the importance of this disease in calves, the project was designed to study the effect of infection and its medication on weight gain of calves under indigenous environment.

MATERIALS AND METHODS

The economical losses due to coccidiosis in experimental calves was calculated on the basis of loss in weight gain and feed conversion ratio as compared with the control groups.

Grouping of Animals

Twelve cattle calves under 3 months of age were procured and reared under standard manage mental conditions. Experimental calf was examined for endoparasitic infections at the start of the experiment.

The positive animals were treated accordingly. After one week of deworming and acclimatization, calves were randomly divided into two groups and were infected with 20000 oocysts of *E. bovis*. The Protocol of the experiment is as under:-

Group A: Animals of this group were infected but medicated and their feed conversion ratio and body weight were recorded weekly for a period of two months.

Group B: Animals of this group were kept as infected and non-medicated and their feed conversion ratio and body weight were recorded weekly for a period of two months.

STATISTICAL ANALYSIS

1. Student t test was applied to find significant difference between weight gain of healthy and diseased animals.

2. Student t test was applied to find significant difference between feed conversion ratio of healthy and diseased animals.

RESULTS AND DISCUSSION

In the first two weeks there was no difference in body weight in experimental animals of A (infected and medicated) and B (infected but none medicated) groups. During the 3rd week, mean body weight gain of calves in group B was due to infection and at the end of 3rd week; average body weight gain of group A and group B was 50.2 and 41.5 kg respectively.

At the end of 4th week average body weight gain of group A and B was 53.5 kg and 40.00 kg, respectively. At the end of 5th week average body weight gain of calves in group A and B was 58.5 and 42.5 kg, respectively.

At the end of 6th week, average body weight gain in calves of group A and B was 62.5 kg and 43.5 kg respectively. At the end of 7th week, average body weight gain of calves in groups A and B was 66.50 and 45.5 kg.

At the end of 8th week, average weight gain in calves of group A and B was 70.5 kg and 48.5 kg respectively (Table 1) (Figure 1). It was concluded that medicine was effective as weight gain of group A was more than group B (infected and non-medicated).

Table 1: Mean Weight gain in experimental calves during and after treatment.

Weeks	Body weight gains (Kg)	
	Group A	Group B
0	38.5	37.5
1st	40.2	39.5
2nd	45.6	44.5
3rd	50.2	41.5
4th	53.5	40
5th	58.5	42.5
6th	62.5	43.5
7th	66.5	45.5
8th	70.5	48.5

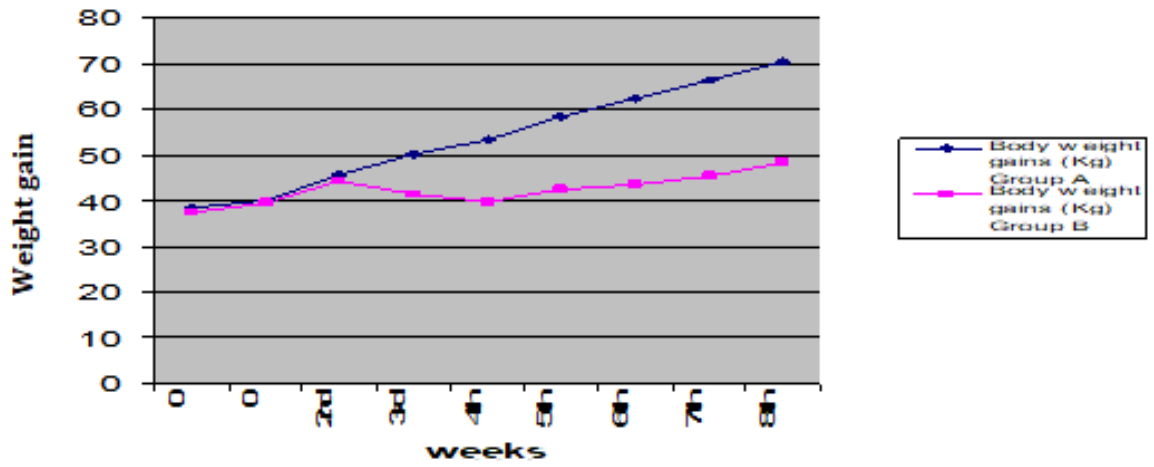

Figure 1: Average weight gain of calves during and after treatment in experimental group.

Statistically at the end of 8th week, mean body weight of groups A was 54.0 ± S.E. 3.79 and mean body weight of group B was 42.56 ± S.E.1.12. Statistically, using t test data was analyzed the p value is 0.01 which is less than 0.05 so it concluded that results are significant between two groups (Table 2).

Table 2: T Test used to evaluate significant difference in the feed conversion ratio during and after treatment in experimental groups.

Factors		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Weight	Equal variances assumed	11.495	0.004	2.891	16	0.011	11.44444	3.9584	3.05301	19.83587

Feed consumption

The mean values of feed consumed of groups A and B at the end of 1st week of experiment was 53.46 kg and 56.50 kg respectively. The mean values of feed consumed in groups A and B at the end of 8th week of experiment was 81.1 kg and 62.1 kg respectively (Table 3) (Figure 2).

Table 3: Mean feed consumption in experimental calves.

Weeks	Feed Consumption in Kg per week	
	Group A	Group B
1st	53.5	56.5
2nd	57.5	61.4
3rd	59.7	50.2
4th	62.1	50.4
5th	64.9	53.1
6th	70	56.6
7th	75.8	60.1
8th	81.1	62.1

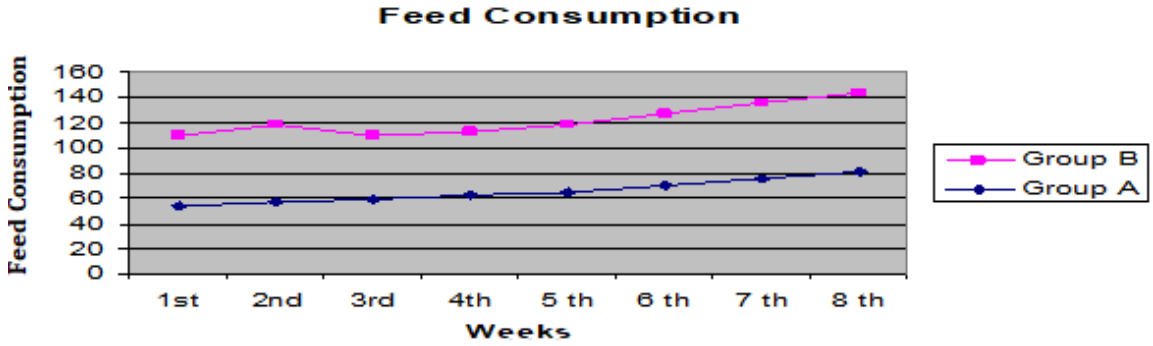

Figure 2: Mean Feed consumption in experimental calves.

Feed conversion ratio

The mean value of feed conversion ratio in experimental groups A and B on weekly basis is presented and curve is present (Table 4) (Figure 3). The mean value of FCR in experimental groups A and B at the end of 8th week was 1.15 and 1.28, respectively.

Table 4: Mean Feed conversion ratio of calves during and after treatment in experimental groups.

Weeks	Feed Conversion Ratio	
	Group A	Group B
1st	1.33	1.43
2nd	1.26	1.38
3rd	1.19	1.21
4th	1.16	1.26

5th	1.11	1.25
6th	1.12	1.3
7th	1.14	1.32
8th	1.15	1.28

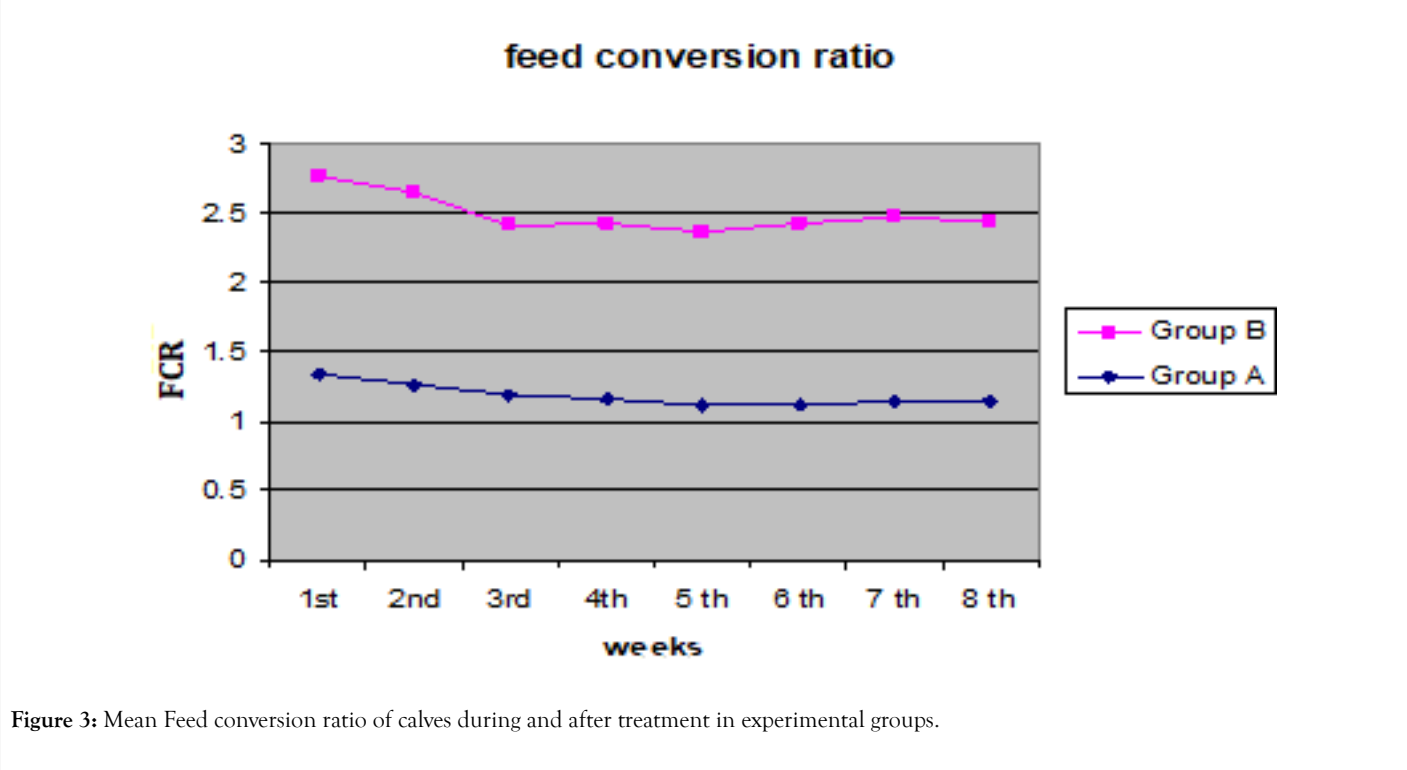

Figure 3: Mean Feed conversion ratio of calves during and after treatment in experimental groups.

Statistically, the mean value of FCR in group A and group B at the end of 8th week was 1.182 ± S.E. 0.026 and 1.303 ± S.E. 0.025 respectively. The statistical analysis showed a significant difference among the groups. FCR of groups A was better than B (Table 5).

Table 5: T Test used to evaluate significant difference in the feed conversion ratio during and after treatment in experimental groups.

Factors		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
FCR	Equal variances assumed	0.026	0.875	-3.280	14	0.005	-0.12125	0.03697	-0.20054	-0.04196, -0.04194

During present study there was significant difference ($p<0.05$) between weight gain and feed conversion ratio of treated animals and infected non-treated group. Weight gain and FCR of treated group A was high as compared to non-treated group B. Similar findings were reported by Fitzgerald and Mansfield, Aiello [18,19]. He reported that watery faeces, with little or no blood. Severely affected cattle develop bloody diarrhoea that may continue for more than 1 week, or faeces with streaks or clots of blood, shreds of epithelium and mucus. They develop fever, depressed and dehydrated and loss weight.

However, Wight et al., and Barb Glen reported that coccidiosis in calves is characterized by bloody diarrhoea and tenesmus is a

distinctive clinical entity [20]. Nadis and Craig Askim (2017) reported the most common sign of coccidiosis in cattle was watery diarrhoea, accompanied by straining, mucous and blood; other signs included depression loss of weight [21]. *Eimeria zuemii*, *E. bovis* and *E. aubarnensis* are the species most often associated with clinical disease in cattle. The most typical syndrome is chronic or subclinical disease in groups of growing animals. Calves may appear unthrifty and have fecal stained perinea areas. In light infection, cattle appear healthy and oocysts are present in normally formed faeces, but feed efficiency is reduced and loss weight. Cattle that survived after severe illness reduced significant weight that is not quickly regained or can remain permanently stunted. The control of coccidiosis is possible only with high level of management as indicated by Cox and Niall Claffey [22].

CONCLUSION

The weight gain of treated animals was higher as compare to non-treated animals. The FCR value in treated animals was better than non-treated animals. The control of coccidiosis is possible only with high level of management.

It is recommended that knowledge of *Eimeria* strains occurring under field conditions is necessary and there should be demonstrated protection against Coccidiosis by the immunizing stocks. Hence long term availability of both the immunizing stock and chosen anti-coccidial drug is required.

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