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Impact of Helminth Infections Control on Milk Production in Dairy Cattle of Assam

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ABSTRACT

Gastrointestinal (G.I.) parasitic infections are common in dairy cattle and impact of G.I. helminth control on milk production was studied in naturally infected dairy cattle of Guwahati, Assam. Selected animals were divided into three groups (I, II and III) having 10 animals in each group. Animals of group I (Amphistome sp. + Strongyle sp. + *Trichuris* sp.) and group II (Strongyle sp.) are infected treated groups whereas group III (Amphistome sp. + Strongyle sp.) was untreated control group. The animals of group I and group II are treated with Neozide plus bolus @10mg/kg b.wt. and Minthal bolus @7.5mg/kg b.wt., respectively. The egg per gram of feces (EPG) and milk production (litres) were recorded pre-treatment and post-treatment (1, 2, 3 and 4 weeks). In animals of group I and group II, post-treatment EPG (Mean±SE) was reduced to zero which was maintained up to 4th weeks. The post-treatment milk yield recorded in animals of group I during 1st, 2nd, 3rd and 4th weeks were 8.64 ±0.12, 9.22±0.10, 9.75±0.09 and 9.87±0.11 litres, respectively. In animals of group II, the post-treatment milk yield recorded during 1st, 2nd, 3rd and 4th weeks were 8.30±0.15, 8.58±0.16, 8.91±0.16 and 9.14±0.15, respectively. Milk production was increased in dairy cattle over a period of 4 weeks in animals treated with Neozide plus and Minthal up to 17.50% and 12.83%, respectively. A net profit of Rs 261.00 per cattle was observed following anthelmintic treatments.

1. Introduction

Livestock plays an important role in Indian economy and is an important subsector of Indian Agriculture. Among the livestock population, cattle (199.10 million) plays a major role in India's economy, accounting 16.24 % of world bovine population (Livestock census 2007, GOI). However, as per estimation record of State Animal Husbandry and Veterinary Department, Assam has 8,938,760 cattle population (Economic Survey, Assam 2012-13) and the per capita/per day milk availability in the state was only 74 g/day as against per capita national availability of 290 gm/day. Gastrointestinal (G.I.) parasitic infections are common in dairy cattle causing considerable economic losses as a consequence of mortality in infected animals and reduced weight gain. It is a worldwide problem for both small and large scale farmers and is a great threat to livestock industry (Saddiqi et al. 2010). It is recognized as a major constraint to production by causing clinical and subclinical parasitism. Subclinical G.I. parasitic infections are most common and economically important in cattle in India (Chowdhury and Tada 1994). Most of the economic losses are due to subclinical effects which go unnoticed to the owner's inspite of frequent contact. The economic losses caused by gastrointestinal parasites are multifarious: lowered fertility, reduced work capacity, reduction in food efficiency and lower weight gain, lower milk production, increased treatment cost and mortality in heavily parasitized animals (Fikru et al. 2006). The hot and humid climatic conditions of Assam are very congenial for propagation and perpetuation

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of parasites (Enderjat 1964). Radostits et al. (1994) observed that the prevailing epizootiological determinants offer the most favourable and optimum environment, for faster propagation of the parasites in the surroundings and *in situ* development, causing serious diseases. Sanyal et al. (1992) observed that cows could produce 142 litres of more milk in 100 days after removal of parasites by anthelmintic medication. Therefore, taking into account the significance of the G.I. parasites as one of the most important causes of economic losses, the present study was designed to assess the impact of G.I. helminths control on milk production in dairy cattle of Guwahati, Assam.

2. Materials and Methods

2.1 Study area

The present study was conducted in Guwahati, the capital city of the state of Assam that lies within the latitude of 26°11′0″N and longitude 91°44′0″E. The city is situated on an undulating plain with varying altitudes of 49.5-55.5 m above mean sea level. The southern and eastern sides of the city are surrounded by hillocks.

2.2 Study design

The economic impact of G.I. helminth control on milk production was studied in naturally infected crossbred cattle as per method described by Kumar et al. (2006) and Rahman and Samad (2010). The selection criteria of animals included similar nutrition, no history of deworming, 3rd-5th lactation (mid lactation 3-6 months) and aged between 5-7 years. Selected animals was divided into three groups (I, II and III) on the basis of egg per gram of feces (EPG) having 10 animals in each group. Animals of trected group I (Amphistome sp. + Strongyle sp. + *Trichuris* sp.) and group II (Strongyle sp.) were infected, whereas group III (Amphistome sp. + Strongyle sp.) was the untreated control. The animals of group I and group II was treated with Neozide plus bolus (oxyclozanide and levamisole, @10 mg/kg b.wt.; Intas Pharmaceuticals Ltd.) and Minthal bolus (albendazole, @7.5 mg/kg b.wt.; Alembic Pharmaceuticals Ltd.), respectively. The egg per gram (EPG) of feces was counted pre-treatment and 1, 2, 3 and 4 weeks post-treatment (Souls by 1982). Pre-treatment (0 day) and post-treatment (1, 2, 3 and 4 weeks) milk production (litres) records were recorded in order to calculate per animal per day increase in the quantity of milk yield. Increase or decrease in milk yield was calculated as per the formula described by Kumar et al. (2006).

$$C = A - B$$

Where, C = Increase/decrease in milk yield (in litres)

A = Milk yield 4 weeks post-treatment (in litres)

B = Pre-treatment milk yield (in litres)

2.3 Statistical analysis

Data were statistically analyzed by Analysis of Variance (ANOVA) for significance using SPSS 15 version.

3. Results and Discussion

The effects of anthelmintics on pre-treatment and post-treatment EPG are presented in Table 1. Pre-treatment EPG (Mean±SE) in animals of group I and group II are 840±27.69 and 810±43.97, respectively. In animals of group I and group II, post-treatment EPG (Mean±SE) was reduced to zero which was maintained up to 4th weeks. The pre-treatment and post-treatment (1- 4 weeks) EPG (Mean±SE) in animals of group III (control) were 860±34.80, 865±35.78, 850±19.72, 870±23.80 and 875±27.13, respectively. ANOVA of anthelmintic treatments on EPG of cattle (Table 2) revealed significant effect ($P<0.01$) of anthelmintic treatment on EPG of animals over a defined period of time. The present study is in conformity with Rahman and Samad (2010) from Bangladesh, they reported 100% reduction of fecal egg count (EPG) at day 7 post-treatment with combined treatment of two commercial preparations Levanid and Tetranid (Tetramisole hydrochloride 2 g + Oxyclozanide 1.4 g) against paramphistomiasis in Red Chittagong cattle.

Table 1. Effect of Anthelmintic treatment on Mean EPG of Dairy cattle

Group	No. of animals	Anthelmintic treatment	Pre-treatment EPG ± SE	Post-treatment EPG (Mean±SE)			
				1st week	2nd week	3rd week	4th week
I	10	Neozide plus	840 ^{a} ± 27.69	0.00 ^{b}	0.00 ^{b}	0.00 ^{b}	0.00 ^{b}
II	10	Minthal	810 ^{a} ± 43.97	0.00 ^{b}	0.00 ^{b}	0.00 ^{b}	0.00 ^{b}
III	10	Control	860 ^{a} ± 34.80	865 ^{a} ± 35.78	850 ^{a} ± 19.72	870 ^{a} ± 23.80	875 ^{a} ± 27.13

Means with different superscripts differ significantly at $P<0.05$

Table 2. ANOVA of Anthelmintic treatment on EPG

Source	d.f.	Sum of Squares	Mean Square	F Ratio	Prob > F
Anthelmintic treatment	2	16287600	8143800	2120.88	<.0001**
Animal No.	9	102400	11377	2.96	0.2350
Animal No. × Anthelmintic treatment	18	102400	5688	1.48	0.1107
Time	4	7217233	1804308	469.89	<.0001**
Anthelmintic treatment × Time	8	3680067	460008	119.80	<.0001**
Error	108	414700	3839		
C. Total	149	27804400			

**P<0.01

The effects of anthelmintic treatment on milk productions are presented in Table 3. The average milk yield/animal/day (litres) observed in animals of pre-treatment groups I, II and III were 8.40 ±0.12, 8.10±0.16 and 8.25, respectively. However, the post-treatment average milk yield/animal/day (litres) was found to increase every week up to 4th week in both the treated groups (I, II). The post-treatment milk yield recorded in animals of group I during 1st, 2nd, 3rd and 4th weeks were 8.64, 9.22, 9.75 and 9.87 litres, respectively. In animals of group II, the post-treatment milk yield recorded during 1st, 2nd, 3rd and 4th weeks were 8.30, 8.58, 8.91 and 9.14, respectively. However, in untreated group III (control), milk yield during 1st, 2nd, 3rd and 4th weeks were 8.09±0.14, 7.93±0.13, 7.33±0.14 and 7.03±0.16, respectively. Therefore, an increase of 17.50% and 12.83% milk production was recorded over a period of 4 weeks in animals of group I (Amphistome sp. + Strongyle sp. + *Trichuris* sp.) and group II (Strongyle sp.), respectively. However, in group III (control), milk production was reduced by 14.78% over a period of 4 weeks. The difference in total milk production of group I, II and III was found to be significant (P<0.05) statistically. ANOVA revealed significant effect (P<0.01) of anthelmintic treatment on milk production in cattle (Table 4).

A net profit of Rs 261.00 per animal was observed over a period of 4 weeks following anthelmintic treatment (Table 5). However, a loss of Rs 298.00 per animal was observed in infected untreated animals over a period of 4 weeks. Thus, it may be inferred that for a lactation period of 300 days or 10 months, the untreated animals would cause a loss of Rs 2980.00 per animal/lactation. In the present study, an increase of 12.83-17.50% milk production in anthelmintic treated groups was observed as compared to control group. The present findings are in agreement with Kumar et al. (2006) who also reported 4-18% increase in milk production in anthelmintic treated cows as compared to control animals. Similarly, Orellana et al. (1990) observed a decrease in milk production as a result of *Fasciola hepatica* infection in cows, which increased up to 17 % following treatment while Spence et al. (1996) found an increase in milk yield (0.4 litres/day) in dairy cows when treated with oxyclozanide and oxfenbendazole against *F. hepatica* and paramphistome infections. Gross et al. (1999) while studying the impact of G.I. parasites on milk production in cattle also recorded an increase of 0.63 kg per day following anthelmintic treatment. Rahman and Samad (2010) also observed an average increase in milk yield (0.32 litre /day/ animal) of Red Chittagong cattle infected with subclinical gastro-intestinal parasitosis following anthelmintic treatment. Gains in milk yield may be attributed to improvement in feed intake and feed conversion ratio after anthelmintic treatment (Oakley et al. 1979). Absorption of proteins, lipids, carbohydrates, vitamins and minerals has been reported to be altered by endoparasites resulting in the deficiency of these elements (Lee et al. 1999; Saleh et al. 2007). Moreover, Odoi et al. (2008) observed that under congenial environmental condition, the parasitic load increases and thereby causes significant economic loss in terms of reduction of daily milk yield. Bandyopadhyay et al. (2010) also observed that productivity of cattle in terms of milk yield was estimated to be considerably higher due to strategic anthelmintic treatment.

Thus, it can be concluded that G.I. parasitic infections have direct impact on milk production and regular anthelmintic medication of dairy cattle is required for profitable dairy farming. But it is important to keep in mind that parasites become resistant due to repeated exposure of same/similar group of anthelmintics over a considerable period of time (Miller and Horohov 2006), and thus it is mandatory to switch over to alternative anthelmintic to control parasites effectively.

Table 3. Effect of Anthelmintic treatment on milk production of Dairy cattle Means with different superscripts differ significantly at P<0.05

Group	No. of animals	Anthelmintic treatment	Pre-treatment milk production (Litres) (Mean±SE)	Post-treatment milk production (Litres) (Mean±SE)				Total (Mean±SE)	Percent Increase/Decrease in milk production over a period of 4 weeks
				1st week	2nd week	3rd week	4th week		
I	10	Neozide plus	$8.40^{ef} \pm 0.12$	$8.64^{de} \pm 0.12$	$9.22^{b} \pm 0.10$	$9.75^{a} \pm 0.09$	$9.87^{a} \pm 0.11$	$9.17^{a} \pm 0.10$	(+) 17.50
II	10	Minthal	$8.10^{gh} \pm 0.16$	$8.30^{fg} \pm 0.15$	$8.58^{e} \pm 0.16$	$8.91^{cd} \pm 0.16$	$9.14^{bc} \pm 0.15$	$8.61^{b} \pm 0.09$	(+) 12.83
III	10	Control	$8.25^{fg} \pm 0.13$	$8.09^{gh} \pm 0.14$	$7.93^{h} \pm 0.13$	$7.33^{i} \pm 0.14$	$7.03^{j} \pm 0.16$	$7.72^{c} \pm 0.09$	(-) 14.78
Total (Mean±SE)			$8.25^{b} \pm 0.08$	$8.34^{b} \pm 0.09$	$8.57^{a} \pm 0.12$	$8.66^{a} \pm 0.20$	$8.68^{a} \pm 0.24$	8.50±0.07	

Table 4. ANOVA of anthelmintic treatment on milk production in dairy cattle **P<0.01

Source	d.f.	Sum of Squares	Mean Square	F Ratio	Prob > F
Anthelmintic treatment	2	53.316900	26.6584	832.16	<.0001**
Animal No.	9	6.589017	0.7321	22.85	<.211
Animal No. × Anthelmintic treatment	18	15.609433	0.8671	27.07	<.110
Time	4	4.494600	1.1236	35.07	<.0001**
Anthelmintic treatment × Time	8	30.597600	3.8247	119.39	<.0001**
Error	108	3.45980	0.03204		
C. Total	149	114.06735			

Table 5. Economic impact of anthelmintic treatment on milk yield of dairy cattle

Group	No. of animals	Total milk yield (Litres)					Total Increase /Decrease in milk production (Ltrs) over a period of 4 weeks
		One week pre-treatment	1st week	2nd week	3rd week	4th week	
A. Infected Treated (I, II)	20	1155.00	1185.80	1245.65	1305.85	1330.35	(+) 175.35
B. Infected Untreated(III)	10	577.50	566.30	554.75	512.75	492.10	(-) 85.40
Income from increased/decreased milk production (Rs 35.0/ litre)					Group A		Group B
					(+) 6137.25		(-) 2989.00
Expenditure on anthelmintics (Rs)					(-) 917.00		---
Net Profit/Loss* (Rs) (*Excluding labour charges)					(+) 5220.25		(-) 2989.00
Net Profit/Loss/Animal (Rs)					(+) 261.00		(-) 298.00

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