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Research Article

EFFECT OF *AZADIRACHTA INDICA* AND *ANNONA RETICULATA* LEAF AS NATURAL ANTHELMINTICS AND THEIR EFFECTS ON PERFORMANCES OF ZEBU COW UNDER SUBSISTENCE FARMING CONDITION IN BANGLADESH

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ABSTRACT

This work was done to appraise the anthelmintic properties of *Azadirachta indica* (locally known as Neem) and *Annona reticulata* (locally known as Ata) leaf and their effects on milk production and body weight of zebu cattle (*Bos indicus)*. Twenty cows were selected based on the age (4 to 5 years) and the severity of gastrointestinal parasitic infection (>300 eggs per gram of faeces/cow). The animals were grouped into four, namely –Neem, Ata, Albendazole and control group. The basal diet was composed of rice straw, road side grass and rice polish. Powder of Neem and Ata leaf was supplemented @ 200 mg/kg live weight of the animal where the Albendazole group received Albendazole Tablet (600 mg/Tab, 7.5 mg/ Kg live weight). Data were collected weekly on egg per gram (EPG) of faeces, body weight (Kg) of cows and their daily milk yield (L). It was observed that with the progress of the experimental period, Neem leaf, Ata leaf and Albendazole had significant ($p<0.01$) effect in reducing EPG. The commercial Albendazole ended 100% reduction in the faecal egg count which was 6 and 15% more than that of the Neem leaf and Ata leaf, respectively. Similarly, within days, the effectiveness of the anthelmintics was Albendazole>Neem leaf >Aata leaf. The differences in average milk yields turned out to be significant ($p<0.01$) after 28 days. The body weight was found similar in all the groups ($p>0.05$).

Keywords: Neem leaf, Ata leaf, Milk yield, Body weight, parasitic egg count

INTRODUCTION

The climatic condition of Bangladesh is favorable for the optimal ecological survival of most of the parasites and the intermediate hosts (Akter*et al.,* 2011). Diseases caused by helminth infections in livestock continue to be a major productivity constraint, especially in the tropical and subtropical countries (Rohini*et al.,* 2011). According to Sujon*et al*., (2008) gastro-intestinal parasitism is a major problem affecting productive performance of animals in Bangladesh. Harmful effects of gastro-intestinal parasites of ruminants on feed intake, digestibility and utilization of energy and protein have been documented in several comprehensive reviews of parasitism (Fekete*et al*., 2007). To reduce the spread of helminth infections in animals, pharmaceutical industries have released a number of anthelminthic drugs and the indiscriminate use of these drugs has lead to the development of helminths resistance (Peter *et al.,* 2008). A larger number of plants are naturally available in the Indo-Pak-Bangladesh subcontinent, which possess specific or broad spectrum anthelmintic activities (Sujon*et al.,* 2008). In Bangladesh, limited works have found with Neemas anthelmintic agent and Khalid *et al*. (2005), Amin *et al.* (2010) and Rob *et al*. (2004) indicated positive result against gastro-intestinal parasites. On the other hand, no work has yet been found with Ata leaf as

anthelmintic agent in Bangladesh and Kumar *et al*. (2014), Sonale *et al.* (2011) and Jamkhande *et al.* (2015) worked with *Annona reticulate* and found the anthelmintic activity against earth worms (*Pheretima posthuma*).The aim of the present study was to evaluate the efficacy of the Neem and Ata leaf as herbal agents on zebu cattle compared to commercial anthelmintic (Albendazole) and control group

MATERIALS AND METHODS

Study area and period

The research work was conducted at Uzankashiar Char, Police Station: Gouripur, District: Mymensingh, Bangladesh during March - April, 2015.

Animals

A total of 20 indigenous dairy cows were selected based on the severity of gastro-intestinal nematode infection (>300 eggs per gram of faeces/cow) and randomly divided into four groups each having 5 animals. The fourth – controlgroup received none of the anthelmintics. The average live weight of the animals was 193.2±23.22, 199.2±10.70, 188.2±39.78and 188.0±24.16 Kg in Neem, Ata, Albendazole and control group, respectively.

Management of the animals

The animals were fed on straw based diet and allowed to graze in the fallow land for 4 to 5 hours of the day. Rice straw was fed adlibitum. Concentrate feeds (mixture of rice polish and common salt @ 0.5 Kg /cow) were supplied to the cows once a day. The management practices of all the cowswere similar.

Collection and processing of Neem and Ata leaves

Neem and Ata leaves were collected fresh and washed with clean water followed by sun drying. The dried leaves were then grounded by using grinding machine (Christy and Nornis Limited, England, Serial No.: 47466). The amount of powder for each dose was 200 mg/kg live weight of the animals (Akbar *et al*., 2003 and Juvellanos, 1997).

Feeding medicinal plants to the animals

Three treatments namely - Neem leaf, Ata leaf and Albendazole were supplied to cows in such a manner that each group received any one treatment. Natural anthelmintics were fed to the animals in equally divided three aliquots in three consecutive days. The dose for Albendazole was recommended by the manufacturing company (600 mg/Tab, 7.5 mg/ Kg live weight, Techno Drugs, Dhaka, Bangladesh).

Collection of data

Data on egg per gram (EPG) of faeces, milk production (L) and body weight (Kg) were collected throughout the experimental period. The first month was mainly to harmonize the animals on a uniform system. Milk was measured by using measuring cylinder from day 1 to 28 and body weight was also recorded by the measuring tape weekly.

Collection and examination of faeces samples for helminth eggs

Faecal samples were collected in the morning on day 0, 7, 14, 21 and 28 of the subsequent month. About 10 to 12 g faecal samples were collected from the rectum of cows and examined for parasitic egg count using the McMaster counting technique (Soulsby, 1986). In brief, 10% (w/v) solution of the faecal samples was made in saturated common salt solution and strained. Counting was done by using 10 x 10 magnifications.

Statistical analysis

The one way analysis of variance (ANOVA) along with Tukey's test was done by Statistical Package for the Social Sciences (SPSS-16).

RESULTS AND DISCUSSION

Parasitic eggs load in the faeces of the cows (no./g):

Treatments differed significantly ($p<0.01$) in reducing EPG at day 7, 14, 21 and 28. Significant ($p<0.01$) variation in days (day 0 to day 28) was also observed in reducing EPG in Table 1 in case of three treatments. The report of this study agrees with the finding of Amin *et al*. (2010) where they reportedasignificant ($p<0.05$) effect of Neem leaf in EPG reduction at day 7, 14, 21 and 28, respectively. Sonale *et al*. (2011) found a anthelmintic activity of *Annona reticulata* leaf in earth worms. Similarly, Kumar *et al*. (2014) stated anthelmintic activity of *Annona reticulata* seeds. In Table 2, FECR% in case of control group was nearly similar from day 7 to day 28. Albendazole showed the highest result (98.96%) at day 7. On the other hand, Neem leaf was at second position (48.94%) and Ata leaf at third position (27.55%). The increasing rate of FECR% after whole period of time was highest in case of Albendazole (100%). This was followed by Neem leaf (around 96%) and Ata leaf (85%). Sujan *et al.* (2008) stated that the efficacy of Neem leaf to be 81% at day 21 in goats. Amin *et al.* (2008) reported EPG count 62.23%, 65.77%, 56.70% and 48.05% on 3rd,

10th, 17th and 28th day, respectively in cattle using Neem leaf. In pair wise comparison, Neem leaf and Ata leaf were statistically similar ($p>0.05$). Neem leaf and Albendazole differed significantly ($p<0.01$) at day 7 whereas, Ata leaf and Albendzole showed significant difference at day 7($p<0.01$) and at day 14 ($p<0.05$).

Effects on milk yield (L) of cows

Initial milk yield of the four groups was not different ($p>0.05$) but after 28 days it became so ($p<0.01$). Neem (1.42±0.15 L) and Albendazole (1.48±0.19 L) group werethe highest milk yielder followed by Ata (1.32±0.16 L) and control group (0.92±0.06) in Table 4. The average daily milk yield (L/h/d) of 20 cows from day 1 to day 28 has shown in Figure 1. In control group, the average initial milk yield was 0.85 L/h/d which were 1.05 L/h/d on day 28. Neem leaf and Albendazole group ended at the same point (1.70 L/h/d) while Ata leaf ended at 1.55 L/h/d on day 28 and Albendazole showed the same percentage (78.95%) at day 28 followed by Ata leaf (63.16%) in Table 5.Vanderstichela*et al*. (2013) stated that anthelmintic treatment has positive effect on milk yield. Raghavendra *et al*. (2002) reported that feeding with tree foliage from *Azadirachta indica* and *Prosopis cineraria* increased the milk yield by 58%.

Effect on body weight of cows

In case of body weight of cows no significant ($p>0.05$) difference was found among the treatments as because the indigenous cows were mature enough and the research work was for short duration (28 days). So, the body weight was not increased in a greater extent mentioned in Table 6. But Amin *et al*. (2010), Amin *et al.* (2008) and Hossain *et al.* (1996) reported positive effect of anthelmintic treatment on body weight.

CONCLUSION

The addition of *Azadirachta indica* leaf and *Annona reticulata* leaf in straw based basal diet has positive effect on the performance of the indigenous cows under village condition. However, further study is needed to identify specific compound(s) that affects the parasitic load and enhance the productivity of the dairy cow.

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Table 1: Average parasitic egg per gram (EPG) of faeces of cows under different anthelmintic treatments

Anthelmintic treatment group	Post treatment EPG (mean value ±SD)					'p' value
	Day 0	Day 7	Day 14	Day 21	Day 28	
Neemleaf	639.8^{a1} ±59.84	326.67^{b2} ±95.45	153.33^{ab3} ±55.78	46.66^{a4} ±44.72	26.80^{a4} ±27.93	0.00
Ata leaf	653.26^{a1} ±164.37	473.26^{bc2} ±151.62	280.00^{b3} ±138.64	160.00^{b34} ±111.55	99.99^{a4} ±40.82	0.00
Albendazole	640.00^{a1} ±92.49	6.66^{a2} ±14.90	20.0^{a2} ±29.81	6.66^{a2} ±14.90	0^{a2}	0.00
Control	633.33^{a1} ±187.08	619.99^{c1} ±144.53	600.00^{c1} ±158.11	633.33^{c1} ±117.85	660.0^{b1} ±151.65	0.98
'p' Value	0.996	0.00	0.00	0.00	0.00	

$^{a, b, c}$ Means with different superscript (s) in the same column differ significantly;
$^{1, 2, 3, 4}$ Means with different superscript (s) in the same row differ significantly;
**Significant at 1% level (P<0.01); *Significant at 5% level (P<0.05); NS=non-significant (P>0.05)

Table 2: Parasiticfaecal egg count reduction percentage (FECR %) of cows under different anthelmintic treatments

Anthelmintic treatment group	Pre-treatment	Post treatment FECR (%)			
	Day 0	Day 7	Day 14	Day 21	Day 28
Neem leaf	639 .80±59.84	48.94	76.03	92.71	95.81
Ata leaf	653.26±164.37	27.55	57.13	75.50	84.69
Albendazole	640.00±92.49	98.96	96.88	98.96	100
Control	633.33±187.08	2.11	5.26	0.00	5.26

FECR%, Faecal egg count reduction percentage

Table 3: Pair wise comparison of parasitic faecal egg count of the different treatments at day 7, day 14, day 21 and day 28

Interaction among treatment	'p' value at 7 day	'p' value at 14 day	'p' value at 21 day	'p' value at 28 day
Neem leaf*vs* Ata leaf	0.062	0.087	0.050	0.166
Neem leaf*vs* Albendazole	0.000	0.073	0.465	0.603
Neem leaf*vs* Control	0.001	0.000	0.000	0.000
Ata leaf*vs* Albendazole	0.000	0.002	0.011	0.065
Ata leaf*vs* Control	0.061	0.000	0.000	0.000
Albendazole*vs* Control	0.000	0.000	0.000	0.000

**Significant at 1% level (P<0.01); *Significant at 5% level (P<0.05); NS=non-significant (P>0.05)

Table 4: Average milk yield of control and anthelmintic treated groups

Anthelmintic treatment group	Initial milk yield (L/h/d) (Mean ± SD)	Average milk yield (L/h/d) (Mean ± SD)
Neem leaf	0.95^{a}±0.11	1.42^{a}±0.15
Ata leaf	0.95^{a}±0.20	1.32^{b}±0.16
Albendazole	0.95^{a}±0.11	1.48^{a}±0.19
Control	0.85^{a}±0.13	0.92^{c}±0.06
'p' value	0.642	0.000

$^{a, b, c}$ Means with different superscript(s) in the same column differ significantly;
**Significant at 1% level (P<0.01)

Table 5: Weekly increases (%) in milk yield as cows treated with different anthelmintic treatments

Anthelmintic treatment group	Increased milk yield (%)								
	Day 1 Mean±SD	Day 7 Mean±SD	Increase as compared today 1	Day 14 Mean±SD	Increase as compared to day 1	Day 21 Mean ±SD	Increase as compared to day 1	Day 28 Mean±SD	Increase as compared to day 1
Neem leaf	0.95± 0.11	1.35± .28	42.11	1.45±0.27	52.63	1.45±0.27	52.63	1.7± 0.20	78.95
Ata leaf	0.95± 0.11	1.2± 0.23	26.32	1.35±0.13	42.11	1.4±0.13	47.37	1.55±0.11	63.16
Albendazole	0.95± 0.20	1.3± 0.27	36.84	1.58±0.17	66.32	1.55±0.11	63.16	1.7± 0.11	78.95
Control	0.85± 0.27	0.95±0.37	11.76	0.95±0.27	11.76	1.00±0.20	17.65	1.05±0.2	23.53

Table 6: Average body weight (kg)of control and anthelmintic treated groups

Anthelmintic treatment group	Body Weight(kg)				
	Day 0 Mean±SD	Day 7 Mean±SD	Day 14 Mean±SD	Day 21 Mean±SD	Day 28 Mean±SD
Neem leaf	193.2±23.22	193.6±23.54	193.8±23.38	194.6±23.62	194.4±23.44
Ata leaf	184.8±10.70	185.4±10.13	185.8±9.78	185.4±9.86	186.2±10.13
Albendazole	188.2±39.78	188.6±39.56	188.8±39.75	189.4±39.82	189.5±39.28
Control	188.0±24.16	188.2 ±23.98	188.2±23.98	188.6±24.00	188.6±24.48
'p' value	0.967	0.968	0.970	0.967	0.967

NS=non-significant (P>0.05)

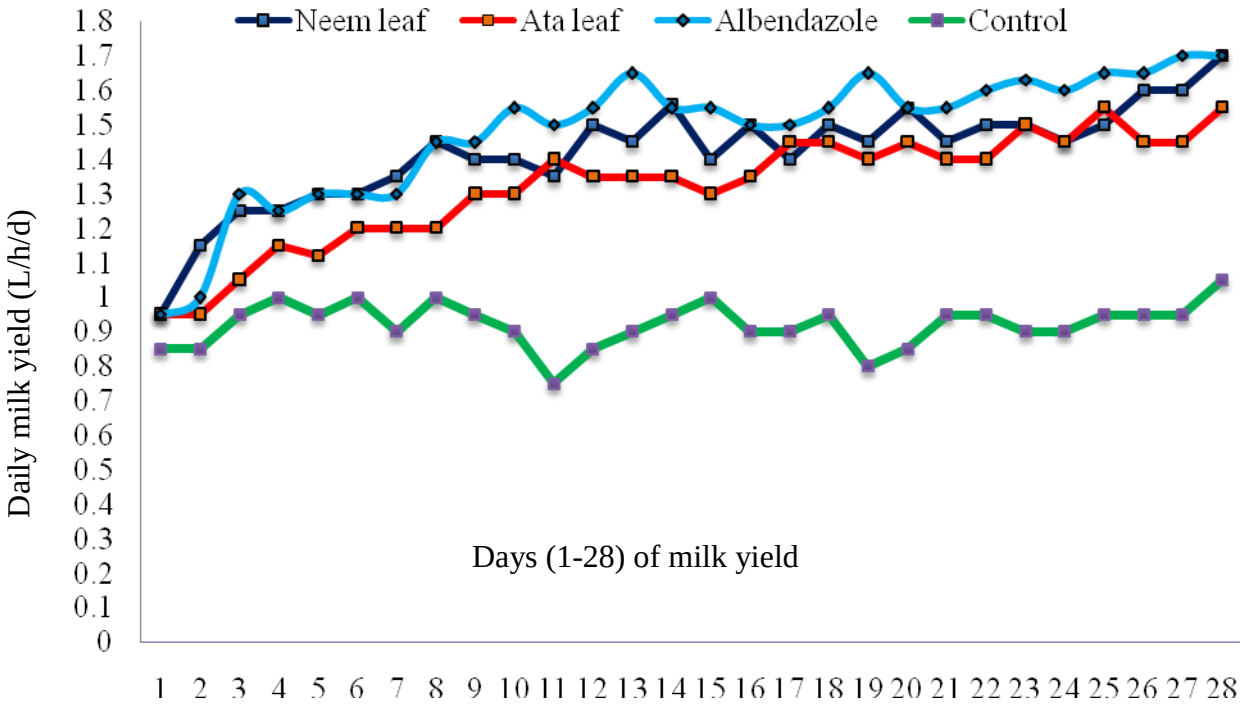

Fig. 1: Average daily milk yield of cowsunder four groups

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