



Comparative efficacy of traditional and modern practices for control of mange in goats in Bangladesh

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ABSTRACT

To assess the efficacy of selective anthelmintics against ectoparasites of goats and their treatment effects on hematobiochemical indices an experiment was conducted at Dalal Para of Katakhal in Rajshahi district in the year 2012. Fifteen affected goats of both sexes aged between 10 and 30 months which were divided into five groups randomly and 3 goats were considered in each group. The treatments were considered as control (A), Neem ointment (B), Ata ointment (C), Mehedi ointment (D) and Ivermectin (E). After treatment, TEC, Hemoglobin gm%, Packed Cell Volume (PCV %) and TLC of blood was increased in all treatment groups except control group which were significant ($P < 0.10$) and the SGOT and SGPT of blood were decreased in all treatment groups except control group which were significant ($P < 0.10$). In the herbal ointments, Neem (*Azadirachta indica*) was more effective for control of mange in goats than Mehedi (*Lawsonia inermis*) and Ata (*Annona reticulata*). The patent drug Ivermectin was very much successful in mange mite infestation than the herbal ointments. However, in order to design a proper anthelmintic schedule against parasitic infections in goats, a long-term trial, covering seasons of a calendar year, needs to be conducted. Additional detailed studies are required to clarify the current status of the efficacy of the anthelmintics widely used in different agro ecologies, animal species and livestock management systems in Bangladesh.

INTRODUCTION

Small ruminants are widely distributed in arid, semidesert, and humid rainforest regions in the world. Goat constitutes an important species of livestock in Asia and contributes greatly to food, rural employment, and the gross domestic product (GDP). The total livestock population in Bangladesh contributes to the GDP and to the foreign currency earning. The skin of the Black Bengal goat is unique and very popular around the world because of its outstanding quality (Banerjee, 1980). Infectious diseases and parasitism are the main problems in backyard goat rearing in Bangladesh. Parasitism is thought to be one of the major factors hindering rural goat production in the country (Chowdhury et al, 2003, Nooruddin et.al, 1982). Mites are the common and pivotal

cause of skin diseases in the domestic animal. They can transmit various diseases and can cause hypersensitivity disorders in animals. They may also cause life threatening anemia in young and/or debilitated animals. Available anthelmintic efficacy trials have been conducted on goats affected with parasitic infections under the control system in Bangladesh. However, limited attempts were made to explore the efficacy of anthelmintics against ecto- and endoparasitic infection in goat. 13 plant species and other non-plant remedies were commonly used in the treatment of diseases and the control of intestinal parasites in goats and used to treat diarrhea, cough and mange (Setlalekgomo and Setlalekgomo, 2013) in Botswana as ethnoveterinary medicine practice. The methanolic extract of *Tecomella undulata* G. Don. with concentrations of 10% and 20% was

applied topically on the skin of mange affected camels, buffalos, goats, dogs and people and Ivermectin (reference compound) and 100% methyl alcohol (control) on scabies affected goats (Rahman et al., 2009). The Neem and its products can prove to be efficacious and economical in controlling parasitic infestations (Tiwary and Pandey, 2010). The high efficacy was recorded in ivermec® pour on upon ectoparasites activity in calves (Razu et al., 2010) and in Murrah buffaloes (Sreedevi et al., 2010). Another investigation showed the efficacy of Ivermectin and Neem plants against ectoparasites in calves (Rahman et al., 2009). Black Bengal goats were treated with CEVAMEC®-1% (Ivermectin, ENDEX®-1500 (Triclabendazole along with Levamisole), and a placebo. The level of Serum Glutamate Pyruvate Transaminase (SGPT) and Serum Glutamate Oxaloacetate Transaminase (SGOT) declined significantly ($P < 0.05$) in both of the treated groups and packed Cell Volume and Hemoglobin levels were increased significantly ($P < 0.05$) in both of the treated groups, which was indicative of effective treatments of those trial drugs (Hassan et al., 2012). The hemato-biochemical changes observed in the mange infested Surti buffaloes and buffalo calves. Hematological analyses of blood samples were done to evaluate changes in Hb, PCV, TEC, TLC and DLC counts. Infestation caused anaemia, increased TLC with eosinophilia. There was decrease in total protein as well as zinc concentration in serum in infested buffaloes (Vishe et al., 2012). A significantly high efficacy was recorded in 3% aqueous extract of Ata leaves and Ivermec® pour on hematological parameters (TEC, Hb, PCV and ESR) and post mortem findings. The results showed that the increased values of TEC and PVC were observed, but Hb increased and slightly decreased in calves after treatment. Whereas ESR and TLC values were slightly decreased and increased respectively in all treated groups. But ESR and TLC were slightly increased and decreased respectively in control group (Razu et al., 2010). The present study was undertaken to evaluate the comparative efficacy of Neem, Ata, Mehedi as herbal products and Ivermectin as reference drug. The impacts of those herbal and anthelmintic treatments on hematobiochemical indices of goats were also recorded.

MATERIALS AND METHODS

Collection of Medicine and Herbal Products

The leaves of Neem (*Azadirachta indica* A.Juss., 1830), Ata (*Annona reticulata* Linnaeus, 1758) and Mehedi (*Lawsonia inermis* Linnaeus, 1758) were collected from local villages of Motihar Upazila in Rajshahi district. The required chemicals to prepare ointments were Vaseline and Butylated hydroxyl anisole (Loba Chemie Pvt. Ltd., Mumbai, India) and these were purchased from the local market. Vaseline was used as vehicle in the herbal ointment and Butylated hydroxyl anisole was used as preservative in the ointment. The different solutions for blood examination like salt solution, normal saline (0.9%), anticoagulant (sodium citrate 3.8%), Hayem's solution, 0.14% hydrochloric acid solution were prepared in the laboratory of the Department of Animal Husbandry and Veterinary Science of Rajshahi University. The Ivermectin injection was purchased from the local market of Rajshahi.

Selection of goat and experimental schedule

Fifteen affected goats of both sexes aged between 10 and 30 months were selected for treatments. The control experiment was conducted at Dalal Para of Katakali in Rajshahi district during the period from November 2012 to December 2012. All of the experimental goats were divided into 5 groups randomly and 3 goats were considered in each group. Specific treatment groups were selected by tossing a coin. The experimental groups were named as A, B, C, D and E. All groups were considered under different treatments as control (A), Neem ointment (B), Ata ointment (C), Mehedi ointment (D) and Ivermectin (E).

Blood samples were collected from jugular vein of the goats of treated and control group in vials containing anticoagulant (Sodium Citrate 3.8%) at day 0, 7, 14, 21, 28 of treatment period to determine the effects of Ivermectin and herbal preparation on the hematological parameter like Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), Determination of Hemoglobin (gm %), Packed Cell Volume (PVC) and determination of Biochemical Parameters (SGOT and SGPT).

Approximately 5 ml of blood per goat was drawn from the jugular vein each time. A portion of the blood from each sample was used to evaluate routine hematological indices and biochemical

parameters. The detailed herbal and anthelmintic treatment schedules are presented in Table 1.

Table 1

The anthelmintic schedule for the experimental goats affected with mites.

Treatment groups	Drug details				
	Scientific/generic name	Trade name	Company name	Doses	Route of administration
A(Control)	N/A	N/A	N/A	No drugs given	N/A
B (Neem ointment)	Neem ointment	N/A	Self-made	5gm paste once daily for 28 days	Applied topically in affected area
C (Ata ointment)	Ata ointment	N/A	Self-made	5gm paste once daily for 28 days	Applied topically in affected area
D (Mehedi ointment)	Mehedi ointment	N/A	Self-made	5gm paste once daily for 28 days	Applied topically in affected area
E (Ivermectin)	Ivermectin	CEVAMEC ®-1%	ACI Animal Health Ltd.	0.2 mg/kg bodyweight for day 0 and 14	Inject subcutaneously

N/A: Not applicable

Data analysis

The obtained data were analyzed by using Microsoft Excel program. A descriptive statistical analysis was carried out for the results of certain hematological parameters (Hb, TEC, PCV and TLC) and biochemical parameters (SGOT and SGPT). The results were expressed as the mean \pm standard error and percentage mean reduction and increment of the mentioned parameters during different time points of the herbal preparation and anthelmintic treatments. One way ANOVA was used to compare the effects of different treatments on some selected clinical, hematological and biochemical of experimental goats. The efficacy of the drugs in terms of reduction and increment status of parasitic orientation in goats between the treatment groups at different time points was tested for significance. Significant difference was set as $P < 0.10$ in experimental study in analyses.

RESULT AND DISCUSSION

Hematological Parameters

Total Erythrocyte Count (TEC Million/Cu. Mm)

In the control group A it was found that the TEC of blood was decreased at 4.31 percent on 28th day from the 0 day which was significant ($P=0.049$). Table 2 displayed that the TEC of blood were increased with the treatment of Neem, Ata, Mehedi and Ivermectin at 8.80 per cent, 5.83 per cent, 7.89 per cent and 60.30 per cent, respectively to the post-treatment (28th day) from the pre-treatment (0 day). The highest increase of TEC of blood was depicted in the treatment group E (Ivermectin) which was 60.30 per cent and the lowest increase of TEC of blood was found to be 7.64 per cent in the treatment group C. The effects of Neem ($P=0.001$), Ata ($P=0.008$), Mehedi ($P=0.001$) and Ivermectin ($P=0.000$) were highly significant.

Table 2

Comparative effects of different treatments on Total Erythrocyte Count (TEC million/cu.mm) in experimental goats by using ANOVA.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	2.858	2	1.429	57.541	0.049
	Within Groups	0.298	12	0.025		
	Total	3.156	14			
Group B (Neem)	Between Groups	2.693	2	1.346	15.032	0.001
	Within Groups	1.075	12	0.089		
	Total	3.768	14			
Group C (Ata)	Between Groups	1.523	2	0.761	27.437	0.008
	Within Groups	0.333	12	0.028		
	Total	1.856	14			
Group D (Mehidi)	Between Groups	1.682	2	0.841	12.650	0.001
	Within Groups	0.798	12	0.067		
	Total	2.480	14			
Group E (Ivermectin)	Between Groups	2.116	2	1.058	0.433	0.000
	Within Groups	29.354	12	2.446		
	Total	31.470	14			

Hemoglobin Content (Hb) %

Table 3 demonstrated that the Hemoglobin gm% of blood were increased with the treatment of Neem, Ata, Mehidi and Ivermectin at 11.60 per cent, 7.64 per cent, 9.19 per cent and 64.70 per cent, respectively to the post-treatment (28th day) from the pre-treatment (0 day). The highest increase of Hemoglobin gm% of blood (64.70 per cent) was depicted in the treatment group E (Ivermectin) and the lowest increase of Hemoglobin gm% of blood (7.64 per cent) was found in the treatment group C. The effect of Ata (P=0.044) was significant and Neem (P=0.000), Mehidi (P=0.009) and Ivermectin (P=0.000) showed the highly significant effects (Table 4.27).

Packed Cell Volume (PCV %)

In the control group A it was found that the PVC percent of blood was decreased at 4.65 per cent on

28th day from the 0 day which was insignificant (P=0.246) (Table 4).

Table 4 displays that the PVC percent of blood were increased with the treatment of Neem, Ata, Mehidi and Ivermectin at 8.74 per cent, 6.42 per cent, 7.95 per cent and 4.25 per cent, respectively to the post-treatment on 28th day from the pre-treatment on 0 day. The maximum increase of PVC percent of blood was presented in the treatment group B (Neem) which was 8.74 per cent and the minimum increase of PVC percent of blood was found to be 4.25 per cent in the treatment group E (Ivermectin). The effects of Neem (P=0.062) and Mehidi (P=0.071) were significant and Ata (P=0.367) and Ivermectin (P=0.138) showed the insignificant effects (Table 4.30).

Table 3
Comparative effects of different treatments on Hemoglobin content (Hb)% of experimental goats by using ANOVA.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	2.009	2	1.005	17.288	0.002
	Within Groups	0.697	12	0.058		
	Total	2.706	14			
Group B (Neem)	Between Groups	1.273	2	0.637	3.717	0.000
	Within Groups	2.055	12	0.171		
	Total	3.328	14			
Group C (Ata)	Between Groups	1.415	2	0.708	9.372	0.044
	Within Groups	0.906	12	0.075		
	Total	2.321	14			
Group D (Mehidi)	Between Groups	4.013	2	2.006	18.367	0.009
	Within Groups	1.311	12	0.109		
	Total	5.324	14			
Group E (Ivermectin)	Between Groups	4.510	2	2.255	0.667	0.000
	Within Groups	40.579	12	3.382		
	Total	45.089	14			

The TLC of blood were increased on 28th day (post-treatment) from 0 day (pre-treatment) at 7.26 per cent, 4.16 per cent, 6.95 per cent and 23.40 per cent with the treatment of Neem, Ata, Mehidi and Ivermectin, respectively. The highest increase of TLC of blood was observed in the treatment group E (Ivermectin) which was 23.40 per cent and the lowest increase of TLC of blood was found to be 4.16 per cent in the treatment group C (Ata). The effects of Neem (P=0.032) and Ata (P=0.046) were significant and Mehidi (P=0.003) and Ivermectin (P=0.005) showed the highly significant effects (Table 5).

Total TEC of blood in the experimental goats groups A, B, C, D and E were accounted on pre-treatment (0 day) and on post-treatment (28th day). In the control group A, the TEC of blood was decreased at 4.31 per cent on 28th day from the 0 day which was significant (P=0.049) and it was increased with the treatment of Neem, Ata, Mehidi

and Ivermectin at 8.80 per cent, 5.83 per cent, 7.89 per cent and 60.30 per cent, respectively in post-treatment (28th day) which were highly significant {Neem (P=0.001), Ata (P=0.008), Mehidi (P=0.001) and Ivermectin (P=0.000)}. These results of the treatment with Neem are in agreement with the earlier researchers Rahman, et al. (2009) and Roy (2007). In case of treatment with Ata, the results are in consistency with Razu et al. (2010) and the results of treatment with Mehidi are in compliance with the findings of Roy (2007). The similar findings have been stated due to Ivermectin treatment by some researchers like Hassan et al. (2012), Aktaruzzaman et al. (2012), Islam et al. (2003), Islam (1999) and Khalid, et al. (2004). The Hemoglobin gram percentages of blood in the experimental goats of the groups A, B, C, D and E were estimated on pre-treatment (0 day) and on post-treatment (28th day). In the control group A, the Hemoglobin gm% of blood was decreased at 8.31 per cent on 28th day which

was highly significant ($P=0.002$) and it was increased with the treatment of Neem, Ata, Mehidi and Ivermectin at 11.60 per cent, 7.64 per cent, 9.19 per cent and 64.70 per cent, respectively on the post-treatment (28th day) in which the effect of Ata was significant ($P=0.044$) and Neem ($P=0.000$), Mehidi ($P=0.009$) and Ivermectin ($P=0.000$) were highly significant. These findings of the treatment with Neem are in conformity with the earlier researchers Rahman, et al. (2009) and Roy (2007). In case of treatment with Ata, the results are in agreement with Razu et al. (2010) and the results of treatment with Mehidi are similar to the works of Roy (2007). The similar findings have been stated due to Ivermectin treatment by some researchers Hassan et al. (2012), Islam et al. (2003), Islam (1999), Khalid, et al. (2004) and Kumar and Joshi (1992). The Packed Cell Volume (PCV %) of blood in the experimental goats groups A, B, C, D and E were computed on pre-treatment (0 day) and post-treatment (28th day). In the control group A, the PVC per cent of blood was decreased at 4.65 per cent on 28th day from the 0 day which was insignificant ($P=0.246$) and it was increased with the treatment of Neem, Ata, Mehidi and Ivermectin at 8.74 per cent, 6.42 per cent, 7.95 per cent and 4.25 per cent, respectively in post-treatment on 28th day in which the effects of Neem ($P=0.062$) and Mehidi ($P=0.071$) were significant and it was insignificant effects for Ata ($P=0.367$) and Ivermectin ($P=0.138$). The present findings of treatment with Ivermectin were in agreement of the works with Hassan et al. (2012), Aktaruzzaman et al. (2012), Islam et al. (2003), Islam (1999) and Khalid, et al. (2004). These results of the treatment with Neem are in agreement with the earlier researchers Rahman, et al. (2009) and Roy (2007). In case of treatment with Ata, the results are in consistency with Razu et al. (2010) and the results of treatment with Mehidi are in compliance with the findings of Roy (2007). Total Leukocyte Count (TLC thousand/cu.mm) of blood in the experimental goats groups A, B, C, D and E on pre-treatment (0 day) and post-treatment (28th day). In the control group A, the TLC of blood was decreased at 3.86 per cent on 28th day which was insignificant ($P=0.357$) and it was increased on 28th day (post-treatment) at 7.26 per cent, 4.16 per cent, 6.95 per cent and 23.40 per cent with the treatment of

Neem, Ata, Mehidi and Ivermectin, respectively in which the effects of Neem ($P=0.032$) and Ata ($P=0.046$) were significant and Mehidi ($P=0.003$) and Ivermectin ($P=0.005$) showed the highly significant. This findings of the treatment with Neem are in agreement with the earlier researchers Rahman, et al. (2009) and Roy (2007). In case of treatment with Ata, the results are in consistency with Razu et al. (2010) and the results of treatment with Mehidi are in compliance with the findings of Roy (2007). The similar findings due to Ivermectin treatment are in conformity with Aktaruzzaman et al. (2012), Hassan et al. (2012), Khalid, et al. (2004), Islam et al. (2003) and Islam (1999). Blood parameters such as TEC, Hb, PCV, and TLC were improved significantly with the herbal products (Neem, Ata and Mehidi) and Ivermectin treatment, which could be due to the lack of blood-sucking mites. The rise in mean PCV after treatment might be associated with the increase of Hb%, as these parameters are closely interrelated with each other. The improvement of blood TEC, Hb, PCV, and TLC levels in the treated goats might be due to the elimination of mange mite, which was expected.

Biochemical Parameters

Serum Glutamic-Oxaloacetic Transaminase (SGOT)

The highest decrease of SGOT of blood was observed in the treatment group E (Ivermectin) which was 47.95 per cent and the lowest increase of SGOT of blood was found to be 14.43 per cent in the treatment group C (Ata). The effects of Neem ($P=0.085$), Ata (0.099), Mehidi ($P=0.087$) and Ivermectin ($P=0.066$) were significant (Table 6).

Serum Glutamic-Pyruvic Transaminase (SGPT)

The SGPT of blood were decreased on 28th day (post-treatment) from 0 day (pre-treatment) at 53.32 per cent, 33.23 per cent, 44.55 per cent and 70.54 per cent with the treatment of Neem, Ata, Mehidi and Ivermectin, respectively. The highest decrease of SGPT of blood was observed in the treatment group E (Ivermectin) which was 70.54 per cent and the lowest increase of SGPT of blood

was found to be 33.23 per cent in the treatment group C (Ata). The effects of Neem (P=0.095),

Ata (P=0.082), Mehidi (P=0.093) and Ivermectin (P=0.097) were found to be significant (Table 7).

Table 4

Comparative effects of different treatments on Packed Cell Volume (PCV %) in experimental goats.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	0.872	2	0.436	1.581	0.246
	Within Groups	3.309	12	0.276		
	Total	4.181	14			
Group B (Neem)	Between Groups	1.043	2	0.522	0.411	0.062
	Within Groups	15.220	12	1.268		
	Total	16.263	14			
Group C (Ata)	Between Groups	1.507	2	0.753	1.090	0.367
	Within Groups	8.292	12	0.691		
	Total	9.799	14			
Group D (Mehidi)	Between Groups	2.906	2	1.453	1.458	0.071
	Within Groups	11.959	12	0.997		
	Total	14.865	14			
Group E (Ivermectin)	Between Groups	1.404	2	0.702	2.347	0.138
	Within Groups	3.589	12	0.299		
	Total	4.992	14			

Table 5

Comparative effects of different treatments on Total Leukocyte Count (TLC thousand/cu.mm) in experimental goats by using ANOVA.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	0.046	2	0.023	1.123	0.357
	Within Groups	0.245	12	0.02		
	Total	0.290	14			
Group B (Neem)	Between Groups	0.102	2	0.051	1.043	0.032
	Within Groups	0.587	12	0.049		
	Total	0.689	14			
Group C (Ata)	Between Groups	0.163	2	0.082	5.611	0.046
	Within Groups	0.175	12	0.015		
	Total					

	Total	0.338	14			
Group D (Mehidi)	Between Groups	1.018	2	.509	7.234	0.003
	Within Groups	0.845	12	0.07		
	Total	1.863	14			
Group E (Ivermectin)	Between Groups	0.053	2	0.026	0.051	0.005
	Within Groups	6.142	12	0.512		
	Total	6.194	14			

Table 6

Comparative effects of different treatments on Serum Glutamic-Oxaloacetic Transaminase (SGOT) in experimental goats by using ANOVA.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	8.943	2	4.472	1.682	0.194
	Within Groups	7.977	3	2.659		
	Total	16.920	5			
Group B (Neem)	Between Groups	2.405	2	1.203	0.047	0.085
	Within Groups	77.103	3	25.701		
	Total	79.508	5			
Group C (Ata)	Between Groups	10.220	2	5.110	1.192	0.099
	Within Groups	12.861	3	4.287		
	Total	23.081	5			
Group D (Mehidi)	Between Groups	2.097	2	1.048	0.066	0.087
	Within Groups	47.888	3	15.963		
	Total	49.985	5			
Group E (Ivermectin)	Between Groups	8.171	2	4.086	0.100	0.066
	Within Groups	122.057	3	40.686		
	Total	130.229	5			

Table 7

Comparative effects of different treatments on Serum Glutamic-Pyruvic Transaminase (SGPT) in experimental goats by using ANOVA.

Treatment Groups		Sum of Squares	df	Mean Square	F	P value
Group A (Control)	Between Groups	31.915	2	15.957	1.479	0.207
	Within Groups	32.370	3	10.790		
	Total					

	Total	64.285	5		
Group B (Neem)	Between Groups	18.176	2	9.088	
	Within Groups	555.829	3	185.276	0.049
	Total	574.005	5		0.095
Group C (Ata)	Between Groups	30.751	2	15.375	
	Within Groups	226.540	3	75.513	0.204
	Total	257.291	5		0.082
Group D (Mehidi)	Between Groups	15.650	2	7.825	
	Within Groups	334.631	3	111.544	0.070
	Total	350.281	5		0.093
Group E (Ivermectin)	Between Groups	13.312	2	6.656	
	Within Groups	761.414	3	253.805	0.026
	Total	774.726	5		0.097

Serum Glutamic-Oxaloacetic Transaminase (SGOT) of blood in experimental goats groups A, B, C, D and E in pre-treatment (0 day) and post-treatment (28th day). In the control group A, the SGOT of blood was increased at 12.90 per cent on 28th day which was insignificant (P=0.194) and it was decreased on 28th day at 34.65 per cent, 14.43 per cent, 28.79 per cent and 47.95 per cent with the treatment of Neem, Ata, Mehidi and Ivermectin, respectively in which the effects of Neem (P=0.085), Ata (0.099), Mehidi (P=0.087) and Ivermectin (P=0.066) were significant (Table 4.36 in the chapter 4). The finding is consistent with the study of Hassan et al. (2012), Roy (2007), Chaudhury et al. (1988), Alam et al. (1994) and Ragab et al. (1981). Serum Glutamic-Pyruvic Transaminase (SGPT) of blood in the experimental goats groups A, B, C, D and E were counted in pre-treatment (0 day) and post-treatment (28th day). In the control group A, the SGPT of blood was increased at 13.80 per cent on 28th day which was insignificant and it was decreased on 28th day at 53.32 per cent, 33.23 per cent, 44.55 per cent and 70.54 per cent with the treatment of Neem, Ata, Mehidi and Ivermectin, respectively in which the effects of Neem (P=0.095), Ata (P=0.082), Mehidi (P=0.093) and Ivermectin (P=0.097) were significant. These results are in conformity with earlier reports Hassan *et al.* (2012), Roy (2007), Chaudhury et al.

(1988), Alam et al. (1994) and Ragab et al. (1981). The levels of SGPT and SGOT in the herbal and Ivermectin treated groups are decreased, which suggest the removal of mange from the affected goats. The present findings suggest that the herbal products (Neem, Ata and Mehidi) and Ivermectin drugs have shown very satisfactory performances in terms of the removal of mange mite and the changing of healthy hematological and biochemical parameters. The herbal products (Neem, Mehidi and Ata) contain some chemical contents like phenolics, terpenoids, polyphenols and alkaloids and polypeptide which have some medicinal values and these are frequently used for the treatment of mange, ticks, lice and flies (Iqbal et al., 2012, Cowan 1999, and Satyanarayana et al. 2013). Ivermectin stimulates the release of GABA (Gamma-Aminobutyric Acid) from nerve ending and enhance binding of GABA to special receptors at nerve junctions and decreasing nerve transmission. The hyperpolarization of neuronal membranes mediates a flaccid paralysis in parasites. Neem, Ata and Mehidi and Ivermectin were more or less effective against mange mite in the experimental goats. In the present study Mehidi showed the better performance to gain bodyweight and Ata was less effective than others. In the maximum increase of blood parameters TEC and HB%, Ivermectin showed the better performance followed by Neem, Mehidi and Ata.

Neem showed the more effective performance to increase PCV of blood than Mehidi, Ata and Ivermectin. To increase TLC of blood, Ivermectin was more effective followed by Neem, mehidi and Ata. In biochemical parameters Ivermectin was more effective to reduce SGOT and SGPT followed by Neem, Mehidi and Ata.

REFERENCES

- Aktaruzzaman M, Islam MSD, Uddin MN, Belal SA, Sarkar S (2012). Comparative efficacy of Ivermectin (Inj. Vermic), Fenbendazole (Peraclear) and Albendazole (Almex Vet) against gastrointestinal nematodiasis in goats, *Journal of Research in Pharmacy*, 1(1), 001-008.
- Alam MM, Samad MA, Chowdhury NS, Ahmed MU (1994). Haemato-biochemical changes and therapeutic management of clinical fascioliasis in a mixed flock of sheep and goats. *Bangladesh Veterinary Journal*, 28: 7-14.
- Banerjee, G. C. 1980. A Text book of Animal Husbandry, 4th edition, Published by Mohan Primalami, Oxford and IBM Publishing Company. 66 Janpath, New Delhi 10001. p. 591.
- Chaudhri, S. S., Mandokhot, V. M., Gupta, R. P., Yadav, C. I. 1988. Haematological and biochemical observations in buffaloes naturally infected with *Fasciola gigantica*. *Indian Veterinary Journal*, 65: 23-27
- Chowdhury SA, Shill BK, Hossain SMJ (2003). *Chagol palon manul*. 2nd edn., Bangladesh Livestock Research Institute, Savar, Dhaka. (in Bengali).
- Cowan MM (1999). Plant products as antimicrobial agents. *Clinical Microbiology Review*, 12: 564-582
- Hassan MM, Hoque MA, Islam SKMA, Khan SA, Hossain MB and Banu Q (2012). Efficacy of anthelmintics against parasitic infections and their treatment effect on the production and blood indices in Black Bengal goats in Bangladesh, *Turkish Journal of Veterinary and Animal Science*, 36(4): 400-408.
- Iqbal Z, Babar W, Sindhu ZuD, Abbas RZ and Sajid M. S (2012). Evaluation of anthelmintic activity of different fractions of *Azadirachta indica* A. Juss seed extract. *Pakistan Veterinary Journal*, 32: 579-583
- Islam MS, Begum F and Alam MS (2003). Comparative efficacy of Aldazole®, Fenvit® and Ivomec® injection against natural infection of gastrointestinal nematodes in goats. *Journal of Animal and Veterinary Advances*, 2: 382-384.
- Islam MS (1999). Comparative efficacy of albendazole, Fenbendazole and Ivermectin against gastrointestinal nematodiasis and ectoparasites in goats and adverse effect of Ivermectin in pregnant goats., M.S. Thesis, Bangladesh Agricultural University Mymensingh, Bangladesh.
- Khalid SMA, Amin MR, Mostofa M, Hossain MA and Azad MJ (2004). Effects of Vermic® against Gastro-intestinal Nematodiasis in sheep, *Journal of Biological Science*, 4 (6): 720.
- Kumar A and Joshi BP (1992). Anthelmintic efficacy of ivermectin against naturally occurring gastrointestinal nematodes of sheep. *Indian Veterinary Journal*, 69: 935-937.
- Nooruddin M, Samad MA and Rahman A (1982). A note of certain haematological and biochemical changes of Black Bengal goats infected with *Fasciola gigantica*. *Haryana Veterinary* 21: 133-136.
- Rahman SA, Islam MJ, Begum N, Ali MA and Bari A SM (2009). Prevalence and pathology of potential arthropods of the domestic and stray cats in Bangladesh. *Bangladesh Journal of Veterinary Medicine*, 9 (2): 287-292.
- Razu MMT, Mostofa M, Dutta PK, Bhowmik DR, Saha SS and Awal MA (2010). Comparative efficacy of Ivermectin (pour on) and a medicinal plant *Ata* (*Annona reticulata*) against ectoparasites in calves, *International Journal of Biological Research*, 2 (7): 07-11.
- Ragab MR, Yousef AA, El-Belbasi HI (1981). Transaminase activities in serum of cattle infected with fascioliasis. *Bangladesh Veterinary Journal*, 15: 13-17.
- Roy S (2007). Comparative efficacy of three patent drugs (Ivermectin, Benzyl Benzoate, Monosulfiram) and three herbal drugs (Neem oil, Kalozira oil, Mehedi leaves) against ectoparasites of goats. M.S. thesis, Department of Pharmacology, BAU, Mymensingh.
- Satyanarayana T, Gangarao B, Surendra G, Rajesh K and Raghupathi M (2013). Anthelmintic activity of *annona squamosa* linn leaf extracts, *International Journal of Pharmaceutical, Chemical and Biological Sciences*, 3(2): 458-460.
- Setlalekgomo MR and Setlalekgomo T (2013). The Use of Ethnoveterinary Medicine in Goats in Lentsweletau Village in Kweneng District of Botswana, *Journal of Veterinary Advances*, 3(7): 197-202.
- Sreedevi C, Murthy GSN and Rani NL (2010). Therapeutic management of *Psoroptes natalensis* in buffaloes (*Bubalus bubalis*), *Buffalo Bulletin*, 29(4): 304-307.
- Tiwary, MK and Pandey A (2010). Feeding neem (*Azadirachta indica*) products to small ruminants

as anthelmintics, *Food Science and Technology*,
1(1): 10.
Vishe HP, Pawar K, Gupta HK and Rao GS (2012).
Prevalence and hemato-biochemical studies in

parasitic and nonparasitic dermatological
disorders in Surti buffalo and buffalo calves,
Veterinary World, 5(4): 230-235.