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ANTHELMINTIC EFFICACY OF SOME MEDICINAL PLANTS TO CONTROL MANGE IN GOAT IN BANGLADESH

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ABSTRACT

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Parasitism is an important limiting factor that responsible for deteriorating the health and productivity of livestock. Goat rearing is hindered by various problems, among them parasitism is an important limiting factor in Bangladesh as the climatic condition of the country favors the development and survival of various parasites. Of the parasitic problems, ectoparasitic infestations are commonly seen in goats. Common ectoparasites of animals are ticks, lice and mites which cause considerable amount of blood loss, irritation and annoyance. Mange infested goats bite and rub the affected area so that the affected skin becomes abraded. Ectoparasitic infestations reduce the quality and market value of valuable skin. Besides, ectoparasites transmit various types of deadly pathogens of animals. The objectives of this study to find out the alternative measures of mange control especially with herbal products. In the experimental study of mange control, fifteen affected goats of both sexes, aged between 10 and 30 months which were divided into four groups randomly and 3 goats were considered in each group. The treatments were considered with control (A), Neem ointment (B), Ata ointment (C), Mehedi ointment (D). The control experiment was conducted during November'2012 to December'2012 in Rajshahi district of Bangladesh. A descriptive statistical analysis and ANOVA were used for the results of clinical parameters (hair coat, skin lesion bodyweight and adverse effects). The recovery of skin lesion was statistically significant ($P < 0.10$) in all treatment groups except control group ($P > 0.10$). The bodyweight was increased in all treatment groups and it was decreased in control group which was 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*). Further studies are required to clarify the efficacy of the ethno veterinary widely used in agro ecologies, animal species and livestock management system in Bangladesh.

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INTRODUCTION

Goats play an important role in the socio-economic activities of people, especially in developing countries, by providing food and income (Peacock, 2005). However, A number of arthropods, including flies, ticks and mites have economic importance mainly because of their role in the transmission of various disease producing agents, and they may affect the general health of livestock resources. Pests and parasites of livestock include arthropods, protozoans, which exploit animals for their nutrition and multiplication. The tropical climate of Bangladesh and poor husbandry methods provide suitable ecological conditions for rapid multiplication and dissemination of a wide variety of pests and parasites. The ectoparasitic mites of mammals and birds inhabit the skin, where they feed on blood, skin debris or sebaceous secretions, which they ingest by puncturing the skin, scavenging from the skin surface or imbibe from epidermal lesions. Infestation by mites is called acariasis and can result in severe dermatitis, known as mange. Mange is a widespread and most important ectoparasitic disease of animals, which may cause significant welfare problems and economic losses (Wall and Shearer, 1997). Most ectoparasitic mites spend their entire lives in intimate contact with the host. The major species that cause mange in small ruminants belongs to the four genera of mite, namely *Sarcoptes*, *Psoroptes*, *Chorioptes* and *Demodex*.

Commercial drugs are mostly used to control parasites; however, these are expensive and are out of reach for many resource-poor farmers. Some of the parasites have also developed resistance against these drugs (Clark, Stephen and Cawley, 1996), and the drugs can pollute the environment (Wall, 2007). This has led farmers to resort to alternative measures that include the use of medicinal plants to treat and control livestock parasites. There is also a belief that natural products are safe to use and harmonious with the biological system (Erasto, 2003). Knowledge on the use of ethno-veterinary medicine is passed on orally, and there is a danger that this information might disappear because of technical and socio-economic changes. Therefore, this study was conducted to document the medicinal plants used to control external parasites in goats. This will help in the pharmacological study of these plants and in the development of therapeutic drugs that have fewer side effects than synthetic chemicals. It also revealed that information on ethno-veterinary medicine in Rajshahi is mostly confined to older people and there is danger that this knowledge can be lost before being passed on to other generations. Therefore, there is an urgent need to document information on these plant species so that the future generation can benefit. Further investigation should be carried out to validate the efficacy and safety of the above-mentioned plants so as to provide cheap alternative ways of controlling parasites.

MATERIALS AND METHODS

Control of mange using herbal products

The research was conducted to study the efficacy of herbal products for mange control in goats in veterinary practice. The locally available medicinal plant (Neem, Ata and Mehedi) were selected with the aim for comparative investigation of the efficacy of anthelmintic activity on mange and on some clinical parameters in goats.

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 were prepared in the laboratory of the Department of Veterinary and Animal Sciences, Rajshahi University.

Preparation of herbal ointment

The required materials for preparation of ointment were leaves of Neem, Ata and Mehedi and Vaseline, Butylated hydroxyl anisole (BHA), hot air oven, grinder, slab, spatula, plastic tube, sieve, measuring balance, cotton, paper and spoon. The procedure of ointment preparation was followed systematically. At first the leaves of Neem, Ata and Mehedi were wiped with cotton and these were kept in separate steel tray in hot air oven. The temperature in the oven was maintained at 37°C and then it was gradually increased at 40°C, 50°C and 60°C. The relative humidity was maintained as 60 per cent. In this way the leaves were dried within 5 days. Then the dried leaves were grinded separately by grinder. The grinding of leaves was done three times for making fine particles. Then the fine particles of leaves were sieved separately by a sieve. These were weighted by using measuring balance separately. In the preparation of 100 gm ointment of Neem, Ata and Mehedi, 20 gm of each leave, 79.5 gm of Vaseline and 0.5 gm of Butylated hydroxyl anisole (BHA) were mixed smoothly on a slab with a spatula. Then the prepared ointments were kept in plastic containers separately. Then the ointments were taken in small plastic tubes for applying convenience.

Selection of goat and experimental schedule

Fifteen affected goats of both sexes aged between 10 and 30 months were selected for treatments from different areas of Rajshahi district. The experiment of control was conducted at Dalal Para of Katakhal 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. The sample size for each group was statistically sufficient. Specific treatment groups were selected by tossing a coin. The experimental groups were named as A, B, C and D. All groups were considered under different treatments as control (A), Neem ointment (B), Ata ointment (C) and Mehedi ointment (D). The goats affected by ectoparasites were considered for the selective herbal preparations for experiment. The collected samples for ectoparasites (mites) from different body regions of the goats were examined as per the protocol referred to earlier in order to assess some clinical parameters like hair coat, skin lesion, bodyweight and adverse effects on day 0 (before the start of the treatment) and days 7, 14, 21, and 28 (during the treatments). The digital balance was used to measure bodyweight. The detailed herbal 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 |

N/A: Not applicable

Significant difference was set as $P < 0.10$ in experimental study in analyses

Clinical parameters

Hair coat

Hair coat of each affected goat of different treatment groups as well as non-treatment groups (control groups) was physically examined by visual examination on day 0 (pre-treatment) and days 7th, 14th, 21st and 28th (post-treatment) following the earlier mentioned schedule.

Skin lesions

The severity of infestation of mite was observed by the skin lesion of individual goat. The skin lesions were studied on the basis of gross pathological changes which were observed at pretreatment (0 day) and (7th, 14th, 21th, 28th) treatment period by visual examination of the goats.

Body weight

The effects of herbal preparations on bodyweight were observed following a standard schedule. The parameter body weight of each goats of different treatment groups and non-treatment groups was taken on day 0 (before starting the treatment that was considered as control group) and days 7, 14, 21, and 28 (during the post-treatment period). It was measured by using the digital balance.

RESULTS

Experimental study for mange control in goats

An experiment with different treatments was conducted to control mange in selected goats. The herbal products like Neem (*Azadirachta indica*), Ata (*Annona reticulata*) and Mehedi (*Lawsonia inermis*) were used as drug for treatment to control mange in goats. The results of clinical parameters (hair coat, skin lesion, bodyweight and adverse effects) are discussed subsequently below:

Clinical Parameters

Hair coat

Hair coat of each affected goat of different treatment groups (B, C and D) as well as non-treatment groups (control groups A) was rough with discoloured wool on day 0 (pre-treatment). It was observed that the hair coat of goats started to become smooth and shiny gradually after giving the treatment with Neem, Ata, Mehedi in the group of B, C and D, respectively. The hair coat of the infected control group A became more and discolored.

Skin lesion

The skin lesion caused by mange was examined in individual goat. The condition of skin lesions was observed at pretreatment (0 day) and treatment period (7th, 14th, 21th, 28th). The efficacy of three herbal drug against mange infestation in goats is presented in the Table 2. In the control group A, it was found that the wound per skin lesion area was gradually increased at 1.23 per cent, 2.63 per cent, 3.16 per cent and 5.44 per cent on the treatment days of 7th, 14th, 21st and 28th, respectively. On the other hand, the group of B, C, and D were treated with Neem, Ata, and Mehedi, respectively. In the group B, it was found that the wound per lesion area was decreased at 10.33 per cent, 26.68 per cent, 39.40 per cent and 64.57 per cent on the treatment days of 7th, 14th, 21st and 28th, respectively.

Table 2. Comparative efficacy of herbal preparations on skin lesions in goats

| Experimental days | Area (cm ²) of skin lesion in group A (control) (mean \pm SD) | % of wound/lesion area increased | Area (cm ²) of skin lesion in group B (Neem) (mean \pm SD) | % of wound/lesion area decreased | Area (cm ²) of skin lesion in group C (Ata) (mean \pm SD) | % of wound/lesion area decreased | Area (cm ²) of skin lesion in group D (Mehedi) (mean \pm SD) | % of wound/lesion area decreased | % of wound/lesion area decreased |
|-------------------|---|----------------------------------|--|----------------------------------|---|----------------------------------|--|----------------------------------|----------------------------------|
| 0 | 9.50 \pm 0.50 | | 10.58 \pm 0.38 | | 9.08 \pm 0.63 | | 8.95 \pm 0.85 | | |
| 7 | 9.62 \pm 0.60 | 1.23 | 9.49 \pm 0.65 | 10.33 | 8.36 \pm 0.29 | 7.93 | 8.07 \pm 0.77 | 9.76 | 25.07 |
| 14 | 9.75 \pm 0.51 | 2.63 | 7.76 \pm 0.28 | 26.68 | 7.61 \pm 0.24 | 16.26 | 7.16 \pm 0.73 | 19.97 | 49.72 |
| 21 | 9.80 \pm 0.43 | 3.16 | 6.41 \pm 0.33 | 39.40 | 6.73 \pm 0.21 | 25.87 | 6.15 \pm 0.29 | 31.22 | 71.26 |
| 28 | 10.02 \pm 0.38 | 5.44 | 3.75 \pm 0.25 | 64.57 | 5.65 \pm 0.27 | 37.76 | 4.96 \pm 0.55 | 44.60 | 97.37 |

In the group C, the wound per lesion area was decreased at 7.93 per cent, 16.26 per cent, 25.87 per cent and 37.76 per cent on the treatment days of 7th, 14th, 21st and 28th, respectively. It was found in the group D that the wound per lesion area was decreased at 9.76 per cent, 19.97 per cent, 31.22 per cent and 44.60 per cent on the treatment days of 7th, 14th, 21st and 28th, respectively.

Table 3. Comparative effects of different treatments on skin lesions in experimental groups of goats by using ANOVA

| Treatment Groups | | Sum of Squares | df | Mean Square | F | P value |
|----------------------|----------------|----------------|----|-------------|--------|---------|
| Group A (Control) | Between groups | 2.320 | 2 | 1.160 | 26.417 | 0.384 |
| | Within groups | 0.527 | 12 | 0.043 | | |
| | Total | 2.847 | 14 | | | |
| Group B (Neem) | Between Groups | 0.677 | 2 | 0.338 | 0.047 | 0.059 |
| | Within Groups | 87.146 | 12 | 7.262 | | |
| | Total | 87.822 | 14 | | | |
| Group C (Ata) | Between Groups | 0.466 | 2 | 0.233 | 0.123 | 0.085 |
| | Within Groups | 22.636 | 12 | 1.886 | | |
| | Total | 23.102 | 14 | | | |
| Group D (Mehedi) | Between Groups | 3.609 | 2 | 1.804 | 0.712 | 0.079 |
| | Within Groups | 30.403 | 12 | 2.534 | | |
| | Total | 34.012 | 14 | | | |

The recovery of skin lesion was found to be significant in group B, C and D with the treatment of Neem (P=0.059), Ata (P=0.085) and Mehedi (P=0.079), respectively. On the other hand, the skin lesion was expanded in the control group A with the treatment of no drugs that was insignificant (P=0.384) (Table 20).

Bodyweight

The average bodyweights of the experimental goats on 0 day (pre-treatment) were 14.02 kg, 17.58 kg, 15.27 kg, 12.76 kg and 12.50 kg for the group of A, B, C, and D, respectively and after treatment it was estimated on 28th day (post-treatment) at 13.06 Kg, 18.77 Kg, 15.99 Kg, 14.09 Kg and 13.22 Kg in the treatment group A, B, C, and D, respectively. In the control group A, it was observed that the bodyweight was decreased at 6.85 percent on 28th day from the 0 day which was significant (P=0.077). **Table 4** showed that

the bodyweights of goats were increased with the treatment of Neem, Ata, and Mehedi at 6.73 per cent, 4.74 per cent and 10.40 per cent respectively to the post-treatment (28th day) from the pre-treatment (0 day).

Table 4. Effect of different herbal drugs on bodyweight of goats

| Name of the groups and drugs | Pre-treatment | Post-treatment | | | |
|------------------------------|---------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| | 0 day | 7 th day | 14 th day | 21 st day | 28 th day |
| Group A (Control) | 14.02±0.35 | 13.82±0.33 (1.45 ^b) | 14.04±0.34 (0.12 ^a) | 13.55±0.27 (3.38 ^b) | 13.06±0.35 (6.85 ^b) |
| Group B (Neem) | 17.58±0.38 | 17.81±0.33 (1.29 ^a) | 18.09±0.37 (2.90 ^a) | 18.42±0.37 (4.78 ^a) | 18.77±0.48 (6.73 ^a) |
| Group C (Ata) | 15.27±0.48 | 15.52±0.31 (1.64 ^a) | 15.47±0.26 (1.31 ^a) | 15.72±0.49 (2.95 ^a) | 15.99±0.28 (4.74 ^a) |
| Group D (Mehedi) | 12.76±0.65 | 12.98±0.59 (1.72 ^a) | 13.32±0.63 (4.39 ^a) | 13.62±0.76 (6.74 ^a) | 14.09±0.72 (10.40 ^a) |

'a' and 'b' indicate the increase and decrease percentages, respectively.

The maximum increase of bodyweight (10.40 per cent) was depicted in the treatment group D (Mehedi) and the minimum increase (4.74 per cent) was observed in the treatment group C. The effect of Ata (P=0.078) was significant and Neem (P=0.007), Mehedi (P=0.006) showed the highly significant effects (Table 4).

Table 5. Comparative effects of different treatments on bodyweight of experimental goats by using ANOVA

| Treatment Groups | | Sum of Squares | df | Mean Square | F | P value |
|-------------------|----------------|----------------|----|-------------|-------|---------|
| Group A (Control) | Between Groups | 1.067 | 2 | 0.534 | 3.204 | 0.077 |
| | Within Groups | 1.998 | 12 | 0.167 | | |
| | Total | 3.065 | 14 | | | |
| Group B (Neem) | Between Groups | 1.067 | 2 | 0.534 | 3.204 | 0.007 |
| | Within Groups | 1.998 | 12 | 0.167 | | |
| | Total | 3.065 | 14 | | | |
| Group C (Ata) | Between Groups | 1.453 | 2 | 0.727 | 3.183 | 0.078 |
| | Within Groups | 2.739 | 12 | 0.228 | | |
| | Total | 4.193 | 14 | | | |
| Group D (Mehedi) | Between Groups | 1.294 | 2 | 0.647 | 7.692 | 0.006 |
| | Within Groups | 1.010 | 12 | 0.084 | | |
| | Total | 2.304 | 14 | | | |

Adverse effects

There was an attempt to see the adverse effects of herbal drugs during the treatment period of the experimental goats. But, no visible effects of the different drugs were observed in the four experimental groups of goats.

DISCUSSION

This study was conducted to compare the effects of herbal products like Neem (*Azadirachta indica*), Ata (*Annonareticulata*) and Mehedi (*Lawsoniainermis*) in different experimental treatment groups as well as to compare the effects of different drugs on clinical parameters (hair coat, skin lesion, bodyweight and adverse effects). Here is an attempt to discuss the findings for the treatment of mange in goats with herbal products like Neem (*Azadirachta indica*), Ata (*Annonareticulata*) and Mehedi (*Lawsoniainermis*).

Hair coat of affected goats in different treatment groups (B, C, and D) and control groups A was seen as rough with discolored wool on day 0 (pre-treatment). After treatment with Neem, Ata (custard apple) and Mehedi in the group of B, C and D respectively, the hair coat of goats started to become smooth and shiny gradually. The hair coat of the infected control group A became more and discolored. This result was in agreement with the findings of Razu *et al.* (2010) and Hanif *et al.* (2005). The efficacy of three herbal and one patent drug against mange infestation in goat. The wound per skin lesion area in goats of the control group A was increased on the treatment days 28th that was insignificant ($P=0.384$). It was found that the wound per lesion area was decreased in the treatment group B, C, and D with Neem, Ata, and Mehedi, respectively. The recovery of skin lesion was found to be significant in group B, C, and D with the treatment of Neem ($P=0.059$), Ata ($P=0.085$), and Mehedi ($P=0.079$), respectively (Table 4). The present findings of the treatment with herbal products were in well agreement with Rahman *et al.* (2009), Razu *et al.* (2009), Ghani (2003), Habluetze *et al.* (2007), Ajose (2007) and Roy (2007) as they observed that the Neem, Ata and Mehedi leaves act effectively against skin lesions, tick and mite infestations. The bodyweights of the experimental goats were taken in pre-treatment (0 day) post-treatment (28th day). From Table 3, it was observed that in control group A the bodyweight was decreased at 6.85 per cent on 28th day from the 0 day which was significant ($P=0.077$) and it was increased with the treatment of Neem, Ata, and Mehedi at 6.73 per cent, 4.74 per cent, and 10.40 per cent, respectively on 28th day from 0 day. The effect of Ata was significant ($P=0.078$) and Neem ($P=0.007$), and Mehedi ($P=0.006$) showed the highly significant effects (Table 4). The present findings support the earlier observation of Roy (2007), Aktaruzzaman *et al.* (2012), Hanif *et al.* (2005), Khalid *et al.* (2004) and Razu *et al.* (2010). The results are in disagreement with the report of Hassan *et al.* (2012). The bodyweight was increased may be due to removal of parasitic load might have had facilitate the weight regain through proper digestion, absorption and metabolism of feed nutrients. The adverse effects of herbal drugs in experimental goats were not found during the treatment period. This observation was similar with the findings of Roy (2007) and Rahman *et al.* (2009).

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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