

A Survey of Arthropod Ectoparasites Infesting Goat in North-Western Uttar Pradesh

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ABSTRACT

Goat farming plays an important role in the rural economy of North-Western Uttar Pradesh by providing meat, milk, manure, and income to small and marginal farmers. However, arthropod ectoparasites significantly affect goat health and productivity. The present study was conducted during 2026 to investigate the prevalence and control of ectoparasites in goats maintained under organized farms and village management systems. A total of 2,076 goats belonging to Jamunapari, Barbary, Black Bengal, and non-descript breeds were examined. Jamunapari goats were found to be the predominant breed in the study area. Tick infestation was the major ectoparasitic problem with an overall prevalence of 19.27%, which was higher in farmers' goats (22.88%) than in organized farms (17.59%). Female goats showed greater susceptibility to infestation than males. Ticks belonging to the genera *Haemaphysalis*, *Rhipicephalus*, *Hyalomma*, and *Boophilus* were commonly recorded, while lice infestation was mainly observed in the belly and neck regions. Evaluation of acaricidal dusts revealed that higher concentrations of DDT, Malathion, and Aldrin provided better tick control, although toxic effects were observed with Malathion and Aldrin. The study emphasizes the need for proper management, regular surveillance, and safe ectoparasite control measures for sustainable goat production in North-Western Uttar Pradesh.

Keywords- Goat, Arthropod ectoparasites, Tick infestation, Lice infestation, Acaricides, North-Western Uttar Pradesh.

I. INTRODUCTION

Goat farming is an important component of rural livelihoods and socioeconomic development in many developing countries, particularly in tropical and subtropical regions where goats provide meat, milk, fibre, manure, and income to smallholder farmers. In India, goats are often regarded as the "poor man's cow" because of their adaptability, low maintenance requirements, and economic importance among marginal and landless communities (Iqbal et al., 2006; Taylor et al., 2016). However, goat productivity is greatly affected by parasitic diseases, especially ectoparasitic infestations, which adversely influence animal health, welfare, and production performance (Wall & Shearer, 2001).

Ectoparasites are organisms that inhabit the external surface of the host and obtain nourishment

through blood feeding, tissue invasion, or skin irritation. Common ectoparasites affecting goats include ticks, lice, mites, fleas, flies, and keds, many of which are of considerable veterinary and zoonotic importance (Soulsby, 1982; Wall & Shearer, 2001). These parasites infest the skin, hair follicles, ears, and other body regions, causing irritation, dermatitis, alopecia, anaemia, reduced weight gain, poor feed efficiency, and decreased milk production (Radostits et al., 2007). Severe infestations may predispose animals to secondary bacterial infections and physiological stress, particularly in young and immunocompromised animals.

Among the ectoparasites, ticks are considered the most economically important because of their blood-feeding habit and their ability to transmit several pathogenic organisms such as *Babesia*, *Theileria*, and *Anaplasma* species (Jongejan & Uilenberg, 2004). Tick infestations can result in skin damage, toxicosis,

hypersensitivity reactions, anaemia, and substantial production losses. Similarly, lice infestations are associated with intense pruritus, hair loss, skin lesions, and reduced productivity, whereas mites such as *Sarcoptes scabiei* and *Psoroptes cuniculi* cause mange characterized by severe itching and dermatitis (Taylor et al., 2016). Fleas and flies also contribute significantly to irritation, stress, blood loss, and disease transmission in goats.

The prevalence and distribution of ectoparasites are influenced by environmental conditions, season, husbandry practices, nutrition, hygiene, and host immunity. Extensive and free-range management systems commonly practiced in rural areas facilitate the transmission and persistence of ectoparasites because of increased exposure to contaminated environments and infested animals (Horst, 1996). Furthermore, the emergence of resistance against commonly used acaricides and insecticides has complicated the effective control of ectoparasitic infestations worldwide (Perez-Cogollo et al., 2010; Garcia et al., 2011).

Ectoparasitic diseases have therefore emerged as major constraints to sustainable goat production and animal welfare. Accurate knowledge regarding the prevalence, diversity, and epidemiology of ectoparasites is essential for developing effective prevention and control strategies. Therefore, the present study was undertaken to survey arthropod ectoparasites infesting goats in North-Western Uttar Pradesh and to evaluate their impact on animal health and productivity.

II. MATERIALS AND METHODS

2.1 Study Area and Experimental Design

The present study was conducted in different districts of North-Western Uttar Pradesh, India, including Saharanpur, Muzaffarnagar, Meerut, and Shamli, to investigate the prevalence, biology, and control of arthropod ectoparasites infesting goats under organized farm and village management systems during 2026. Approximately 2,076 goats of different breeds maintained under intensive, semi-intensive, and extensive management systems were examined. Village goats were mainly managed under free-range grazing systems, whereas organized farm animals were stall-fed and provided routine veterinary care including prophylactic antiparasitic treatment and sanitation measures (Soulsby, 1982; Wall & Shearer, 2001).

2.2 Collection and Identification of Ectoparasites

Goats were randomly examined for ectoparasitic infestations including ticks, lice, mites, and flies. Ticks and lice were collected manually using forceps, while skin scrapings were obtained from suspected mange lesions for mite examination. Flies were collected using standard insect nets during morning and evening hours. Infestation intensity was estimated using wire square frames applied to different body regions of goats. Collected specimens were preserved in

70% ethanol and identified morphologically after clearing in xylol and mounting in Canada balsam. Potassium hydroxide (KOH) treatment was used for softening heavily sclerotized specimens before microscopic examination (Soulsby, 1982; Taylor et al., 2016).

2.3 Biological Studies

The longevity and survival of ticks were studied under laboratory conditions by maintaining adult ticks and larvae in glass tubes without feeding. Observations regarding survival were recorded daily under varying temperature and humidity conditions. Engorged female ticks were utilized for studying oviposition, egg hatching, and larval development. The biology of lice including egg laying, moulting, and adult longevity was studied on naturally infested goats and kids under field and laboratory conditions (Wall & Shearer, 2001).

2.4 Evaluation of Control Measures

Treatment trials were conducted using different insecticides and acaricides against naturally infested goats. Dusts, wettable powders, and wash formulations of DDT, Malathion, and Aldrin were used at varying concentrations for tick and lice control. Sulphur ointment, Himax, and Ascabiol were applied topically against mite infestations. The efficacy of treatments was evaluated on the basis of reduction in parasite load and recovery of animals on the 1st, 10th, 20th, and 30th days post-treatment (Radostits et al., 2007; Taylor et al., 2016).

III. RESULTS

3.1 Particulars of Goats

Goat farming represents an important component of the rural livestock economy in North-Western Uttar Pradesh, where goats are reared under organized farms as well as traditional village production systems. During the present investigation, different breeds including Jamunapari, Barbari, Black Bengal, and non-descript goats were recorded from organized farms and farmers' flocks located in Saharanpur, Muzaffarnagar, Meerut, and Shamli districts.

Table 3.1: Breed Distribution of Goats in North-Western Uttar Pradesh

Breed	Percentage Distribution (%)
Jamunapari	68-75
Barbari	8-12
Black Bengal	2-5
Non-descript	14-15

The observations revealed that Jamunapari goats constituted the predominant breed in both organized farms and village production systems, accounting for approximately 68-75% of the total goat population examined. Barbari goats represented nearly 8-12%, while Black Bengal goats accounted for 2-5% of the total population. Non-descript goats comprised

approximately 14-15% of the examined animals. Similar breed distribution patterns were observed among both adult goats and kids maintained under different management systems.

Table 3.2: Sex-wise Distribution of Goats

Management System	Male (%)	Female (%)
Organized Farms	30-32	68-70
Farmers' Goats	25-29	71-75

A comparatively higher proportion of female goats was observed in all study areas. In organized farms, females constituted nearly 68-70% of the goat population, whereas males represented approximately 30-32%. Similarly, among farmers' goats, females accounted for nearly 71-75% of the population. The predominance of female goats was mainly attributed to their importance in milk production and breeding purposes.

3.2 Particulars of Parasites: Ticks

Table 3.3: Tick Species Identified from Goats

Phylum	Class	Order	Family	Genera Identified
Arthropoda	Arachnida	Acari	Ixodidae	<i>Haemaphysalis</i> , <i>Rhipicephalus</i> , <i>Hyalomma</i> , <i>Boophilus</i>
Arthropoda	Arachnida	Acari	Argasidae	Soft ticks observed

Ticks collected during the study belonged to the phylum Arthropoda, class Arachnida, order Acari, and included both hard ticks (Family: Ixodidae) and soft ticks (Family: Argasidae). The hard ticks observed were mainly represented by genera of veterinary importance including *Haemaphysalis*, *Rhipicephalus*, *Hyalomma*, and *Boophilus*. These ticks were commonly recovered from the ears, neck, groin, axillary regions, and base of the tail of goats.

3.3 Incidence of Tick Infestation

Table 3.4: Incidence of Tick Infestation in Goats

Category	Goats Examined	Goats Infested	Percentage Infestation (%)
Organized Farms	1416	249	17.59
Farmers' Goats	660	151	22.88
Grand Total	2076	400	19.27

A total of 2,076 goats were examined during the study period, out of which 400 goats were found infested with ticks, resulting in an overall infestation rate of 19.27%.

Goats maintained under farmers' management systems exhibited a comparatively higher infestation rate (22.88%) than goats maintained in organized farms

(17.59%). The increased prevalence in village goats was mainly associated with inadequate sanitation, poor housing conditions, unrestricted grazing, and lack of regular prophylactic treatment.

Table 3.5: Sex-wise Incidence of Tick Infestation

Management System	Sex	Goats Examined	Parasites Collected	Infestation (%)
Organized Farms	Male	440	60	13.63
Organized Farms	Female	976	189	19.36
Farmers' Goats	Male	190	37	19.47
Farmers' Goats	Female	470	114	24.26

Sex-wise observations indicated that female goats showed higher susceptibility to tick infestation than males. In organized farms, infestation rates were 13.63% in males and 19.36% in females, whereas in farmers' goats the infestation rates were 19.47% and 24.26%, respectively. Higher infestation among female goats may adversely affect milk production, growth, and reproductive efficiency.

3.4 Distribution of Lice on Different Body Parts

Table 3.6: Distribution of Lice on Different Body Parts of Goats

Body Part	Percentage Infestation (%)
Ears	4-6
Neck	17-20
Back	13-15
Belly	56-58
Groin	6-9

Lice infestation was observed in both adult goats and kids of different breeds. The distribution pattern indicated that the belly region was the most preferred site of infestation, accounting for approximately 56–58% of the total lice collected. Other commonly affected body regions included the neck, back, ears, and groin regions.

Among adult goats, Jamunapari goats exhibited the highest number of lice infestations followed by non-descript and Barbari breeds. Similar infestation patterns were also observed among kids. The higher infestation in the belly region may be associated with favourable temperature, humidity, and dense hair cover supporting lice multiplication and survival.

3.5 Efficacy of Acaricidal Dusts Against Ticks

Table 3.7: Efficacy of Acaricidal Dusts Against Tick Infestation

Concentration (%)	Acaricide	Effectiveness (%)	Observed Effects
5	DDT	20	Low effectiveness
5	Malathion	60	Moderate

			effect
5	Aldrin	80	Better control
7	DDT	66.6	Moderate control
7	Malathion	100	Effective
7	Aldrin	100	Effective
10	DDT	80	Good control
10	Malathion	80	Pneumonia-like symptoms
10	Aldrin	100	Toxic symptoms
15	DDT	30	Less effective
15	Malathion	100	Respiratory irritation
15	Aldrin	100	Toxic effects
20	DDT	100	Complete control
20	Malathion	100	Severe respiratory irritation
20	Aldrin	100	Severe pneumonia-like symptoms

The efficacy of different acaricidal dust formulations including DDT, Malathion, and Aldrin at varying concentrations was evaluated against tick infestations in goats. Lower concentrations (5%) showed limited effectiveness, with control rates of 20%, 60%, and 80% for DDT, Malathion, and Aldrin, respectively, within 24 hours of treatment. Reinfestation occurred rapidly within 10-30 days.

At 7% concentration, Malathion and Aldrin achieved complete tick control (100%), whereas DDT showed 66.6% effectiveness. Treatments at 10-20% concentrations produced substantially higher efficacy with prolonged residual effects. Complete eradication of ticks within 24 hours was observed at 20% concentration for all acaricides tested.

However, higher concentrations of Malathion and Aldrin produced adverse effects including pneumonia-like symptoms, nasal discharge, respiratory irritation, and weakness in treated goats. Although higher concentrations provided prolonged protection against reinfestation, their toxic side effects limited their practical applicability under field conditions.

IV. DISCUSSIONS

The observations recorded in **Table 3.1** revealed that Jamunapari goats constituted the predominant breed in North-Western Uttar Pradesh, followed by Barbari, non-descript, and Black Bengal goats. The predominance of Jamunapari goats in organized farms as well as village production systems may be attributed to their superior adaptability, higher

milk yield, rapid growth rate, and better economic value under the agro-climatic conditions of Uttar Pradesh. Similar findings regarding the dominance of Jamunapari goats in northern India have also been reported by Devendra and Burns (1983) and Iqbal et al. (2006).

The sex-wise distribution presented in **Table 3.2** indicated a comparatively higher proportion of female goats in both organized farms and farmers' flocks. Female goats are generally retained for breeding and milk production purposes, whereas male goats are commonly sold earlier for meat production. Similar observations have been reported by Devendra and McLeroy (1982), who emphasized the importance of females in rural goat production systems.

The tick species identified during the present study (**Table 3.3**) mainly belonged to the genera *Haemaphysalis*, *Rhipicephalus*, *Hyalomma*, and *Boophilus*. These genera are commonly recognized as important ectoparasites of goats and other domestic animals in tropical and subtropical regions. Similar observations have been documented by Soulsby (1982), Wall and Shearer (2001), and Taylor et al. (2016). These ticks are of considerable veterinary significance because they serve as vectors of several haemoprotozoan diseases including babesiosis, theileriosis, and anaplasmosis.

The incidence of tick infestation presented in **Table 3.4** demonstrated an overall infestation rate of 19.27%, with higher infestation among farmers' goats (22.88%) compared to organized farms (17.59%). The higher prevalence in village goats may be associated with poor sanitation, overcrowded housing, unrestricted grazing, and irregular use of prophylactic treatments. Similar findings were also reported by Horst (1996) and Radostits et al. (2007), who stated that environmental and management conditions greatly influence ectoparasite prevalence in livestock populations.

The sex-wise infestation data shown in **Table 3.5** indicated that female goats exhibited higher susceptibility to tick infestation than males under both organized and village management systems. This higher susceptibility may be associated with physiological stress during pregnancy and lactation, hormonal influences, and prolonged retention of females for breeding purposes. Similar observations have also been reported by Taylor et al. (2016).

The distribution pattern of lice infestation shown in **Table 3.6** revealed that the belly region was the most preferred site for lice infestation, followed by the neck, back, ears, and groin regions. The preference of lice for the belly region may be due to favourable temperature, humidity, and dense hair cover which support parasite survival and multiplication. Comparable findings were reported by Wall and Shearer (2001), who observed that lice generally infest protected body regions possessing suitable microclimatic conditions.

The efficacy trials presented in **Table 3.7** demonstrated that higher concentrations of Malathion and Aldrin were more effective against tick infestation

than lower concentrations and DDT formulations. Complete tick eradication was achieved at higher concentrations; however, toxic side effects including pneumonia-like symptoms, respiratory irritation, nasal discharge, and weakness were observed particularly with Malathion and Aldrin treatments. Similar toxic manifestations associated with excessive use of organophosphate and chlorinated hydrocarbon compounds have been reported by Garcia et al. (2011) and Perez-Cogollo et al. (2010). Therefore, careful dosage regulation and safer acaricidal application strategies are essential for effective ectoparasite management.

V. CONCLUSIONS

The present study demonstrated that arthropod ectoparasites, particularly ticks and lice, are important health problems affecting goats in North-Western Uttar Pradesh. Jamunapari goats were the predominant breed, and tick infestation was higher in farmers' goats compared to organized farms due to poor management and sanitation practices. Female goats showed greater susceptibility to infestation than males. Higher concentrations of acaricides provided effective tick control; however, toxic side effects were observed with Malathion and Aldrin. Therefore, regular surveillance, improved hygiene, scientific management practices, and safe use of acaricides are essential for effective ectoparasite control and sustainable goat production in the region.

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PK and SK conceptualized and supervised the study and contributed to study design, data analysis, interpretation of results, and manuscript preparation. HS conducted the field survey, collection and identification of ectoparasites, laboratory work, and drafting of the manuscript. MC assisted in statistical analysis, literature review, manuscript editing, and interpretation of findings. All authors read and approved the final version of the manuscript.

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