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Investigating Winter-Linked Variables and Goat Ectoparasite Rates

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Abstract

Goat ectoparasitic infections have a significant negative impact on animal health and production, so it is essential to understand how winter-related factors relate to ectoparasite rates to develop appropriate control techniques. A total of 644 migratory sheep were selected in Kangra, Himachal Pradesh. During a particular winter season from September to January, a detailed field study was conducted in which different types of ectoparasitic were found in other winter conditions and flocks of scattered ectoparasitic infections. Microsoft 365 Excel sheets and SPSS 28.0 were used for statistical analysis to estimate the data and calculate the percentage of ectoparasites. Using the χ^2 test, the study assessed the relationship between the distribution of ectoparasites and winter-linked risk variables. Significant differences were identified as $p > 0.05$ at a 95% confidence interval. According to the study, goat ectoparasitism was the most prevalent in the Kangra region and its frequency was calculated to be 99.98%. The most frequent ectoparasites are Melophagus ovinus (Keds), Sarcoptes scabiei (Mites), Damelinia spp (lice) and Boophilus (ticks). Pediculosis is the most prevalent ectoparasitic infection in Kangra throughout the research period in the monsoon and post-monsoon seasons. The research highlights the dynamic interactions between winter and parasites by revealing the fluctuations in ectoparasite rates during winter. The study emphasizes the need to develop appropriate intervention plans to improve ectoparasite management and increase the knowledge of farmers.

Keywords: Goat Ectoparasite, Winter-Linked Variables, lice, monsoon season, Kangra

INTRODUCTION

Ectoparasites that live outside of their host's body are a big concern when it comes to managing cattle. Common kinds include lice, ticks, fleas and mites. Goats that itch are unpleasant to be around that have goat lice in their hair, wool, or feathers. Mites are the cause of skin disorders, hair loss and mange. Ticks are known to spread two diseases: hemoglobin and Lyme disease (1). Fleas bring on itching and large infestations can induce anemia, particularly in frail or immature goats. It is essential to keep parasitic insects under control to preserve the health and production of goats (2). Constant training, cleanliness and the use of parasiticides are examples of managerial techniques. Owners should consult veterinarian doctors with regard to treatment and preventative strategies, as well as for indicators of infestation in their animals. These parasites can have a minimal negative effect on goat health and herd profitability when appropriately managed (3). The winter months have a significant impact on goats' health, behaviors and overall well-being for a variety of reasons, such as temperature stress, food challenges, water scarcity, ectoparasite issues, behavioral shifts, challenges with reproduction, hoof health and housing as well as shelter needs (4). Stressful temperatures can cause hypothermia; nutritional problems arise from a shortage of fodder along with grazing opportunities and low temperatures limit the amount of water available. Ectoparasite issues can cause pain and medical issues. Changing social dynamics, retreating and reducing activities are a few instances of behavioral changes. Reproductive problems include things like less weight at birth, decreased fertilization and

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interruptions in estrus cycles (5). The study examines the relationship between temperature, snow cover and food availability in the wintertime, including the incidence of ectoparasites in goats.

The study (6) conducted between May and December 2020 to identify the main ectoparasite species infesting 150 goats in 10 small ruminant flocks in northern Iraq. The most common parasites were fleas, ticks and lice, with an overall prevalence rate of 57.33% found in the study. The higher infection rate was caused by *Rhipicephalus spp.,* the most common type of tick. Two types of chewing lice and one type of flea were discovered during the study. Ectoparasites are known to affect the health and productivity of goats. The study (7) discovers *Rickettsia hoogstraalii,* a tick-borne illness, in hard ticks infesting animals in Pakistan. With an incidence rate of 4.3% overall, *Rhipicephalus* microplus is the most prevalent species of tick. Given that this is the first genetic characterization of R. hoogstraalii in Pakistan and globally, further research is required to ascertain its role in the transmission of tick-borne illnesses. The study (8) conducted in Bangladesh, 170 Black Bengal goats had 70% of them infested with ticks, lice, and fleas, with Boophilus microplus having the greatest incidence. The most susceptible groups were women and young lambs, who were more common in the summer, winter, and monsoon seasons. It is advised to take immediate action to lower the danger of transmission. The study (9) included both stationary and route inspections to look at the territorial epizootology of goat toxicologists. In many goat herds, ten to fifteen goats of varying ages were gathered and checked for bovicola and other parasitic insects. By looking for them near the skin, ear and lower regions, one can locate bovid Colas. Bovi colas were counted by arranging them on filter paper in a Petri dish, and their type was identified under a magnifying glass and with the use of specialized recognition dictionaries. The paper (10) addresses skin diseases in livestock animals, such as sheep with parapox infection, goats with immune-mediated illness, pigs with ectoparasites, alpacas with ectoparasites and reindeer with antler velvet. A thorough history, a clinical examination, a differential diagnosis and the relevant tests are necessary for treatment. The roles of microbial infections, ectoparasites coupled with less prevalent autoimmune and allergy disorders should be made clear in management regimens. The research (11) advises informing the public about the detrimental effects that mites have on goat output. According to an Ethiopian study, mange those of the Sarcoptes and Demodex species, has a significant effect on cow output. Body condition scores were correlated with prevalence but not with other risk factors. 76.56% of respondents believed ivermectin therapy was effective, but 85.94% of respondents preferred contemporary treatment methods. The study (12) measured the number of mites by analyzing 430 skin samples after they had been digested. Seasonally, regionally and in the presence of other parasites, the number of mites increased and varied accordingly. Positive co-occurrence correlations, between ticks, were seen in pairs of different ectoparasites. On lice and H. sulcata populations, Sarcoptes scabiei showed an adverse effect. Sarcoptic mange affects over a third of the host's area has expanded to ibex populations in and around the Mediterranean Basin. The paper (13) covers the allover biological variety of hard ticks, tick-borne illnesses, risk factors and tick infestation in Africa. There are 27 species of Rhipicephalus ticks, which are the most frequent and infested small ruminant animals. Tick paralysis and lameness are non-infectious diseases that can result from tick infestations. To lessen the burden of vector-borne illnesses in small ruminant production, the authors recommend integrated control approaches against tick-borne infections and associated arthropod vectors. The study (14) examines how alterations in the natural world have contributed to a rise in illnesses carried by ticks that impact domestic and wild animals. In addition to decreasing the production of meat as well as dairy products, these illnesses can result in harm to the skin, anaemia, decreased weight, dying and sickness. Ten tick species were found in District Muzaffargarh, with Hyalomin anatomical ticks that are the most common. Goats, sheep, cows and buffaloes were found to have tick infestations, with buffaloes having the highest infection rate. Accurate identification and epidemiology are crucial for effective tick management. The study (15) utilized in India, ruminants are grown for milk, meat, soil manures and organic fertilizer. Buffaloes, cows, sheep and goats are some of these creatures. These animals are vulnerable to infectious diseases in sub-tropical countries. Traditional medicine practitioners use around 36 medicinal plants to treat a wide range of illnesses, including rinderpest, piglet diarrhea, blue tongue, mastitis, foot

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as well as mouth disease, lesions, Johne's disease and viral infections. An initiative to vaccinate these animals is underway.

The goal is to complex relationships that exist between these variables to improve knowledge of ecosystems and create efficient management strategies. The study will include cold areas and how the hard factor will infect the goat. Ectoparasites or creatures that live outside of their host's body are a big concern when it comes to managing cattle. Common kinds include lice, ticks, fleas and mites.

MATERIALS AND PROCEDURES

This study examines the relationship between wintertime parameters such as temperature, snow cover, food availability and the prevalence of ectoparasites in goats. By the complex relationships among these elements, we will improve our knowledge of ecosystems and create more efficient management techniques, as shown in Figure (1).

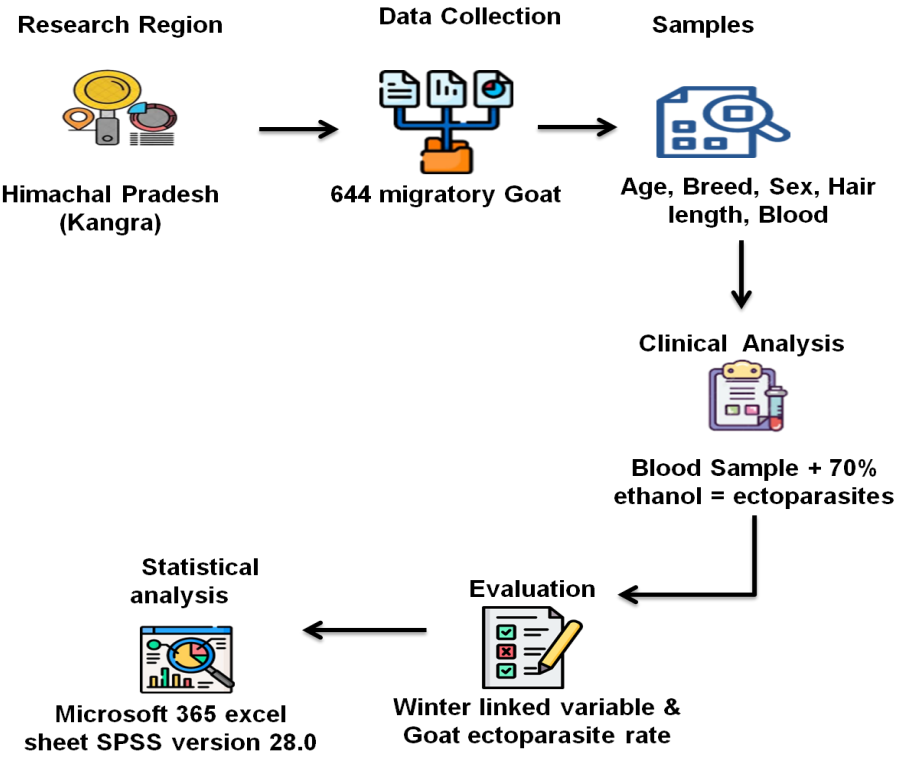

Figure (1). Analysis Flow (Source: Author)

- **Research Region:** In the monsoon and post-monsoon seasons of 2019, 644 migratory goats from various flocks in the "Kangra area (*latitude: 31° 21′ to 32° 59′ N and longitude: 75° 47′ to 77° 45′ E*) Himachal Pradesh," took part in the study.
- **Data Collection:** Goats' age, breed, sex, hair length, herd strength, raising technique, flooring, nutrition, treatment history and climate from September to January are among the variables that affect ectoparasitic infection. This provides important insights for the management and control of ectoparasitic infestations in goats by assisting in the identification of risk factors and understanding the dynamics of chewing lice

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infection. Genetics influences resistance, but age increases vulnerability. Grooming techniques and hair length can affect infestation. Congested environments and overcrowded herds facilitate the transmission of parasites. Floor systems affect cleanliness and intensive rearing methods enhance exposure. Both immunity and general health are influenced by nutrition. Infestation levels are impacted by treatment history, which includes deforming and ectoparasite therapy. Comprehending these variables facilitates the creation of focused approaches for managing and preventing parasites.

- **Clinical Experiment:** Using a systematic methodology, the analysis evaluates the degree of chewing lice infection in goats into three categories: mild, moderate and severe. Ticks were gathered and the animals were inspected to look for signs of ectoparasitic infection. Methanol was used to preserve peripheral blood smears, 70% ethanol was used to separate Ectoparasite from whole blood (16) and the entire bloodstream was placed into anti-coagulation coated vials. Following Blood film staining, ticks were mounted on Canada balsam for morphological identification, lice were inspected under a microscope and creatures belonging to the hemo-protozoan/Ricketts ales family were detected in peripheral blood smears. The goats are majorly affected with *Boophilus (Ticks), Damalinia Spp (Lice), Sarcoptes scabiei (Mites), Ctenocephalides Spp (Fleas) and Melophagus Ovinus (keds)* ectoparasites. These ectoparasites are given in Figure (2).

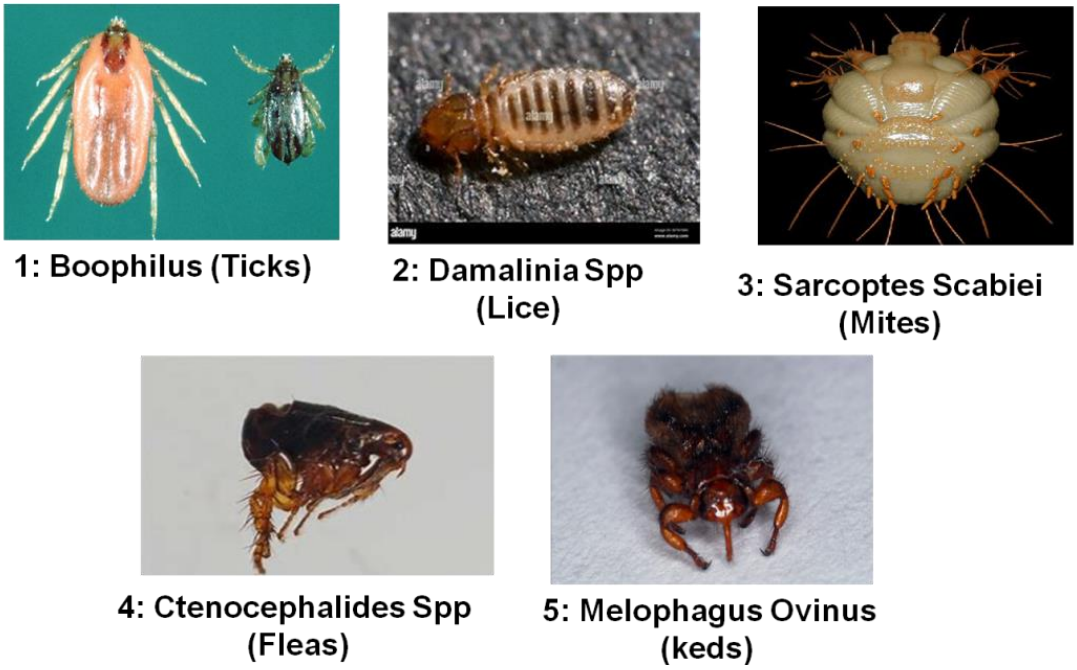

Figure (2). Types of Ectoparasites (Source: Author)

- **Statistical Analysis:** The most recent version of Excel sheets, Microsoft 365 and SPSS 28.0 were used in the study to evaluate the data and provide a percentage summary of the prevalence of ectoparasitic. The association between winter-linked risk factors and ectoparasite distribution and prevalence was investigated using the χ^2 test. When $P>0.05$ at the 95% confidence interval was present, the differences were deemed significant.

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RESULT

Major infestations and ectoparasites were reported to be significant problems for the goat producers in the research region. Table (1) as well as Figures (3) and (4) provide a thorough examination of the prevalence along with infection rates of several ectoparasites in goats. It includes a list of many ectoparasite species, including *Melophagus Ovinus (Keds), Sarcoptes scabiei (Mites), Damalinia spp. (Lice) and Boophilus (Ticks).* The infection rates for each group of ectoparasites, from moderate to severe, are included in the table. Each ectoparasite type's total number of occurrences is given, along with a percentage that shows how common each kind is in relation to the events. The bottom row contains a summary of the total number of incidents and infection rates. The table provides an evaluation of the frequency and severity of several ectoparasites in goats, with the most significant number of occurrences (153) that is *Damalinia spp. (Lice).* There are notable instances *of Boophilus (Ticks)* and *Sarcoptes scabiei (Mites).* The percentages make it easier to comprehend how much of each sort of Ectoparasite contributes proportionately to the total incidence.

Table (1). Rate of Ectoparasite Occurrences (Source: Author)

Several Types Of Ectoparasites	Goat Infection Rate				Occurrences (%)
	Mild	Moderate	Severe	Total	
Boophilus (Ticks)	43	36	48	127	19.12
Damalinia Spp (Lice)	86	43	24	153	23.04
Sarcoptes Scabiei (Mites)	60	72	22	154	23.19
Ctenocephalides Spp (Fleas)	31	53	16	100	15.06
Melophagus Ovinus (keds)	72	23	15	110	16.56
Healthy-no Ectoparasite				20	3.01
Total	292	227	125	664	100.00

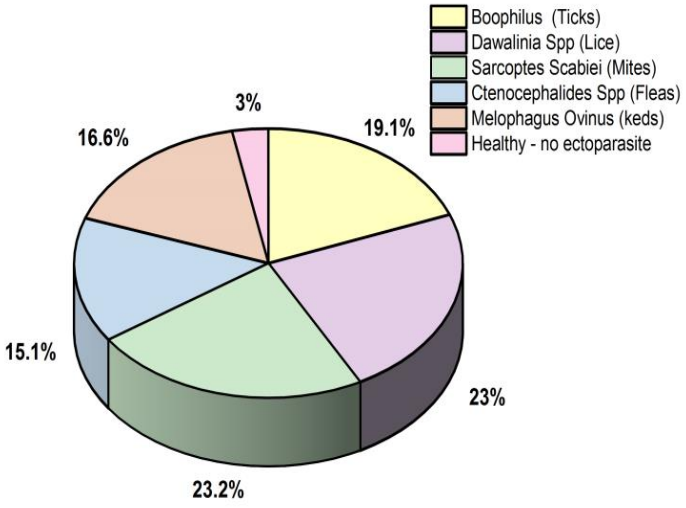

Figure (3). Goat Ectoparasite Occurrences (Source: Author)

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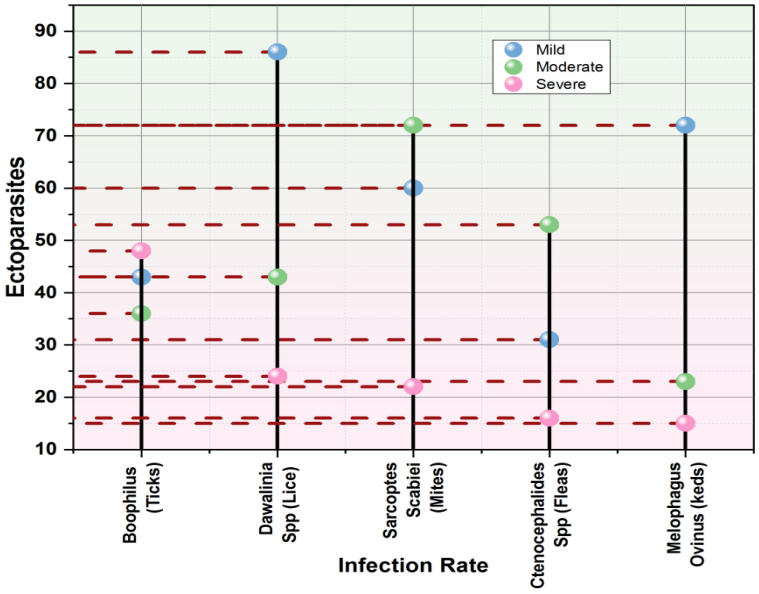

Figure (4). Infection Rates (Source: Author)

Table (2) shows the total number of goats investigated, the proportion of ectoparasite infestations in each group coupled with the categorization of goats based on age and sex (Figure (5)). The most significant overall percentage of ectoparasite infection (19.60%) was seen in male goats older than one year, with more excellent rates found in these older goats. The most significant overall percentage of ectoparasite infection (19.32%) was seen in female goats older than one year, with more excellent rates found in these older goats. Based on age and sex, the table offers a thorough study of ectoparasite infestation, assisting in the identification of trends, patterns and potential risk factors for various demographic groups. This knowledge is essential for creating focused management and prevention plans for goat ectoparasite infestations.

Table (2). Age and Sex Variation in Goat Parasites Disease (Source: Author)

Sex	**Age**	**Examined creatures**	**Boophilus (Ticks) %**	**Damalinia Spp (Lice) %**	**Sarcoptes Scabiei (Mites) %**	Ctenocephalides **Spp (Fleas) %**	**Melophagus Ovinus (keds) %**	**Healthy-no Ectoparasite %**
Male	>1 Years	58	14 (24.13)	9 (15.5)	8 (13.79)	14 (24.13)	9 (15.51)	4 (6.89)
	1Years	71	10 (14.08)	14 (19.71)	8 (11.26)	18 (25.35)	11 (15.49)	10 (14.08)
	2Years	59	13 (22.03)	5 (8.47)	12 (20.33)	16 (27.11)	12 (20.33)	1 (1.69)
	Total	188	37 (19.60)	28 (14.89)	28 (14.89)	48 (25.53)	32 (17.02)	15 (7.97)
Female	>1 Years	138	32 (23.18)	5 (3.62)	9(6.52)	43 (31.15)	48 (34.78)	1 (0.72)
	1Years	189	43 (22.7)	6 (3.17)	18 (9.52)	84 (44.44)	37 (19.57)	1 (0.52)
	2Years	149	17 (11.4)	5 (3.35)	22 (14.76)	37 (24.83)	65 (43.62)	3 (2.01)
	Total	476	92 (19.32)	16 (3.36)	49 (10.29)	164 (34.45)	150 (31.51)	5 (1.05)

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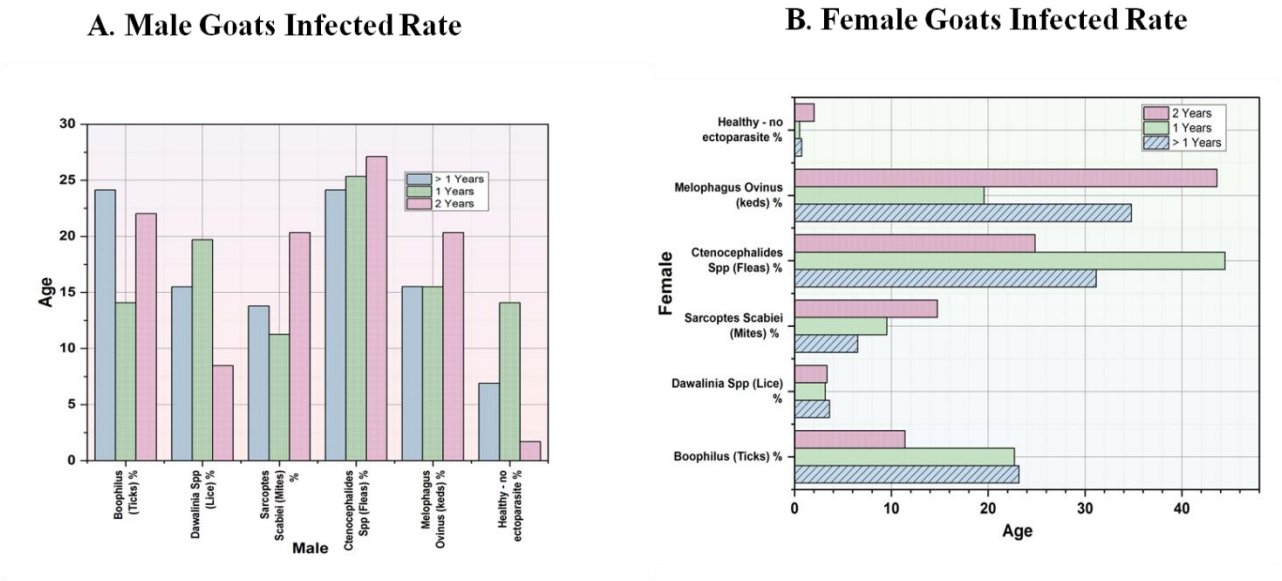

Figure (5). Differences between (A-B) Age and Sex in Goat Parasite Disease (Source: Author)

DISCUSSION

Ectoparasites are common in goat farming, especially in the Kangra area of Himachal Pradesh, which emphasizes how important it is to take care of this problem to protect the welfare of the animals and continue to use lucrative agricultural methods. The study examines how ectoparasite rates vary with the seasons, with a particular emphasis on the winter months of September through January. It talks about how cold affects ectoparasite life cycles and offers goat producers practical control techniques. To enhance knowledge and management strategies about winter-linked factors, it identifies research gaps and makes future direction suggestions. Ectoparasites, such as fleas, ticks as well as sucking lice, are linked to a number of illnesses that cause decreased development and output in goats (17). Developing successful therapeutic options requires a comprehension of the variables underlying ectoparasite infections. The significance of taking regional considerations into account is shown by the geographic variation levels of ectoparasite infestations observed in various regions of the world. Given the incidence shown in Himachal Pradesh, the local climate and environment have a significant impact on how ectoparasitic illnesses emerge. Variables impacting the prevalence Ectoparasite prevalence are influenced by a number of variables, including host immunological condition, age, sex, environment, cleanliness and parasitic biology. The dynamics of ectoparasite transmission in goat populations are influenced by the intricate web that is created when these elements interact (18). The function of raising the cultivation structures and extensive grazing systems is identified as a critical component in the spread and upkeep of ectoparasitic infections. The transmission of ectoparasites, such as lice, among goats is facilitated by direct contact while grazing. The use of appropriate habitation and administration techniques can impact ectoparasitic illnesses (19). Intervention Strategies' Value is that effective intervention measures are desperately needed, as evidenced by the high frequency of Ectoparasite in the research region. Enhancing herd management techniques, putting in place suitable housing facilities and increasing knowledge among goat farmers should be the main goals of these tactics. For such measures to be implemented successfully, cooperation between veterinary specialists, local government officials and farmers is necessary.

CONCLUSION

Goat rearing in the Himachal Pradesh Kangra region is seriously threatened by Ectoparasite. The complexity of the mechanisms affecting the incidence of Ectoparasite emphasizes the necessity for an all-encompassing strategy for management and avoidance. To lessen the impact of ectoparasitic illnesses on goat health and to ensure sustainable along with lucrative livestock production in the area, measures of intervention addressing rearing procedures, housing conditions as well as farmer knowledge must be developed and put into action. Furthermore, given the dynamic setting of goat farming, continuous investigation and surveillance are necessary to adjust solutions to changing environments and new obstacles.

REFERENCE:

[1] Smith, A. T., Krasnov, B. R., Horak, I. G., Ueckermann, E. A., & Matthee, S. (2023). Ectoparasites associated with the Bushveld gerbil (Gerbilliscus leucogaster) and the role of the host and habitat in shaping ectoparasite diversity and infestations. Parasitology, 150(9), 792-804. https://doi.org/10.1017/S0031182023000562

[2] Tiwari, A., Udainiya, S., & Rana, T. (2023). Prevention and Control Strategy in Combating Diseases of Goats. Principles of Goat Disease and Prevention, 285-298. https://doi.org/10.1002/9781119896142.ch21

[3] Kabir, A., Islam, M. K., Yasmin, M. S., Alam, M. E., & Rahman, M. M. (2022). Assessment of Acaricidal Efficacy of Ivermectin Against Ectoparasitic Skin Lesions in Goats. European Journal of Veterinary Medicine, 2(2), 1-5. https://doi.org/10.24018/ejvetmed.2022.2.2.22

[4] Nizamov, N. S. (2023). Identification of ectoparasitic insects among domestic goats in Bulgaria. Veterinary World, 16(4), 728. https://doi.org/10.14202%2Fvetworld.2023.728-734

[5] Doley, M. K., Maibangsa, S., Neog, M., Baruah, N., Neog, B. K., Barkalita, L. M., ... & Pathak, P. K. (2023). Rearing Practices and Performance Attributes of Assam Hill Goat in Assam, India. Journal of Krishi Vigyan, 11(2), 312-321. http://dx.doi.org/10.5958/2349-4433.2023.00057.0

[6] Hassan Abdullah, S. H. A. D. A. N. (2023). Ectoparasite Infestation Of Goats (Capra Hircus) In Northern Iraq: Prevalence And Species Identification. Assiut Veterinary Medical Journal, 69(177), 16-26.https://doi.org/10.21608/avmj.2023.171961.1102

[7] Aneela, A., Almutairi, M. M., Alouffi, A., Ahmed, H., Tanaka, T., da Silva Vaz, I., ... & Ali, A. (2023). Molecular detection of Rickettsia hoogstraalii in Hyalomma anatolicum and Haemaphysalis sulcata: updated knowledge on the epidemiology of tick-borne Rickettsia hoogstraalii. Veterinary Sciences, 10(10), 605.https://www.mdpi.com/2306-7381/10/10/605#

[8] Rony, S. A., Mondal, M. M. H., Islam, M. A., & Begum, N. (2010). Prevalence of ectoparasites in goat at Gazipur in Bangladesh. International Journal of Biological Research, 2(9), 19-24.

[9] Boltaev, D. M., & Pulotov, F. S. (2023). Epizootology Of Bovicolliosis Of Goats. Texas Journal of Multidisciplinary Studies, 20, 8-11.

[10] Foster, A. P. (2023). Challenges in the diagnosis and management of skin diseases in alpacas, goats, pigs, and sheep. Journal of the American Veterinary Medical Association, 261(S1), S86-S94. https://doi.org/10.2460/javma.22.12.0572

[11] Lebene, C., & Tora, E. (2023). Mange: Epidemiology and ivermectin efficacy in goats and application of zero-inflated negative binomial regression in Uba Debre Tsehay, southern Ethiopia. Veterinary Parasitology: Regional Studies and Reports, 37, 100814. https://doi.org/10.1016/j.vprsr.2022.100814

[12] Fernández-Muñoz, M. J., Castillo-Contreras, R., Pérez, J. M., Granados, J. E., Márquez, F. J., & López-Montoya, A. J. (2023). Co-infection patterns in the ectoparasitic community are affecting the Iberian ibex Capra pyrenaica. Parasites & Vectors, 16(1), 172. https://doi.org/10.1186/s13071-023-05797-y

[13] Onyiche, T. E., & MacLeod, E. T. (2023). Hard ticks (Acari: Ixodidae) and tick-borne diseases of sheep and goats in Africa: A review. Ticks and Tick-borne Diseases, 14(6), 102232. https://doi.org/10.1016/j.ttbdis.2023.102232

[14] Jamil, M., Ali, S., Gul, J., Kashif, M., Ullah, N., Ali, M.,... & Qazi, I. (2023). 45. Taxonomical and epidemiological study of tick species on domesticated animals. Pure and Applied Biology (PAB), 12(1), 523-530. http://dx.doi.org/10.19045/bspab.2023.120054

[15] Verma, N., Agarwal, N., & Misra, L. (2023). Review of some diseases of dairy animals and treatment by ethno-veterinary medicines. Adv Med Plants Res, 11, 9-32. https://doi.org/10.30918/AMPR.111.23.002

[16] Contreras, M., Karlsen, M., Villar, M., Olsen, R. H., Leknes, L. M., Furevik, A., ... & de la Fuente, J. (2020). Vaccination with ectoparasite proteins involved in midgut function and blood digestion reduces salmon louse infestations. Vaccines, 8(1), 32. https://www.mdpi.com/2076-393X/8/1/32#

[17] KESKİN, A., & Bilal, D. İ. K. (2022). First data on the ectoparasites (fleas, ticks, and lice) of the stone marten, Martes foina (Erxleben) in Turkey. https://doi.org/10.21203/rs.3.rs-1680340/v1

[18] Tepox-Vivar, N., Stephenson, J. F., & Guevara-Fiore, P. (2022). Transmission dynamics of ectoparasitic gyrodactylids (Platyhelminthes, Monogenea): An integrative review. Parasitology, 149(7), 865-877. https://doi.org/10.1017/S0031182022000361

[19] Jamil, M. U. H. A. M. M. A. D., Idrees, A. T. I. F., Qadir, Z. A., Elahi, M. E., Imran, F. A. R. E. E. H. A., Qasim, M. U. H. A. M. M. A. D., ... & Sadia, B. I. (2022). Medical and Veterinary Ectoparasites' Importance: An Insight on Alternative Control. Pakistan Journal of Medical and health sciences, 16(01), 667. https://doi.org/10.53350/pjmhs22161667