



Review on ticks and mites of cattle and their management in uttar Pradesh, India

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Abstract

Cattle ticks and mites are among the most significant ectoparasites affecting livestock health and productivity in Uttar Pradesh (UP), India. The state's diverse agro-climatic zones and dense cattle population create an ideal environment for the proliferation of various tick and mite species. This review presents a comprehensive overview of the occurrence, taxonomy, biology, ecology, and economic impact of key ectoparasitic species, particularly *Rhipicephalus* (Boophilus) *microplus*, *Hyalomma anatolicum*, and mange-causing mites such as *Sarcoptes scabiei* and *Psoroptes ovis*. The study highlights seasonal infestation trends, resistance patterns to commonly used acaricides, and emerging challenges in control strategies. Furthermore, the zoonotic and vector-borne disease implications of these ectoparasites, such as babesiosis and anaplasmosis, are discussed in the context of public health and veterinary concern. Emphasis is laid on integrated tick and mite management (ITMM), combining chemical, biological, and ecological approaches suited to the socio-economic realities of rural UP. This work aims to serve as a scientific resource for veterinarians, livestock farmers, and policymakers working towards sustainable livestock health management in the region.

Key words – Ectoparasite , cattle , health management ,arachnida and arthropods

Introduction

Ticks and mites are tiny arthropods belonging to the subclass Acari within the class Arachnida. In the state of Uttar Pradesh (UP), India, where agriculture and animal husbandry are the backbone of the rural economy, these ectoparasites represent a significant threat to both livestock health and farm productivity. Their high prevalence is supported by the region's tropical and subtropical climate, which offers favorable conditions for year-round breeding and survival (Ghosh et al., 2007).

Ticks, such as *Rhipicephalus (Boophilus) microplus*, *Hyalomma anatolicum*, and *Haemaphysalis spp.*, are commonly found infesting cattle, buffaloes, goats, and even dogs across various districts of UP (Kumar et al., 2021). These blood-feeding parasites are of particular concern due to their role as vectors of hemoprotozoan diseases like babesiosis, theileriosis, and anaplasmosis, which significantly reduce milk yield, cause mortality, and lead to economic losses for farmers (Singh & Rath, 2019).

Mites, on the other hand, such as *Sarcoptes scabiei*, *Psoroptes ovis*, and *Demodex spp.*, typically affect the skin of domestic animals, causing mange. Mange is characterized by intense itching, hair loss, skin thickening, and secondary bacterial infections. If left untreated, it can result in severe animal distress, reduced productivity, and sometimes even death (Yadav et al., 2020).

The frequent movement of livestock between rural markets, combined with limited awareness and veterinary support, facilitates the spread of these parasites across UP. Despite their economic and public health importance, there remains a gap in detailed regional surveillance and integrated pest management programs. Here's a detailed review article on ticks in Uttar Pradesh (UP) without an introductory section, focusing directly on the core aspects such as diversity, distribution, host range, impact, control measures, and research gaps.

Ticks

Ticks are obligate hematophagous ectoparasites that infest a wide range of vertebrate hosts. In India, and particularly in Uttar Pradesh (UP), ticks pose a significant threat to livestock health and productivity due to their role as vectors of various pathogenic microorganisms. Their presence



adversely impacts rural economies dependent on animal husbandry.

In cattle, ticks are primarily from the Order Ixodida, and mostly belong to two families:

Order: Ixodida (Ticks)

Common groups parasitizing cattle:

1. Family: Ixodidae (Hard ticks)



These are the most important ticks affecting cattle due to their role in transmitting diseases like babesiosis and anaplasmosis.

Table1: Common Genera and Species:

Genus	Species	Scientific name	Common name
<i>Rhipicephalus</i>	<i>microplus</i>	<i>Rhipicephalus</i> (<i>Boophilus</i>) <i>microplus</i>	Southern cattle tick
<i>Rhipicephalus</i>	<i>annulatus</i>	<i>Rhipicephalus</i> (<i>Boophilus</i>) <i>annulatus</i>	American cattle tick
<i>Hyalomma</i>	<i>anatolicum</i>	<i>Hyalomma</i> <i>anatolicum</i>	Tick of arid
<i>Haemaphysalis</i>	<i>bispinosa</i>	<i>Haemaphysalis</i> <i>bispinosa</i>	Found in tropical Asia
<i>Amblyomma</i>	<i>variegatum</i>	<i>Amblyomma</i> <i>variegatum</i>	Tropical bont tick

<i>Dermacentor</i>	<i>andersoni</i>	<i>Dermacentor</i>	Rocky mountain
		<i>Andersoni</i>	wood tick

2. Family: Argasidae (Soft ticks)

Less commonly found on cattle; more associated with poultry and arid habitats. Example:

Ornithodoros savignyi – causes tick toxicosis in some cattle, especially in desert regions.

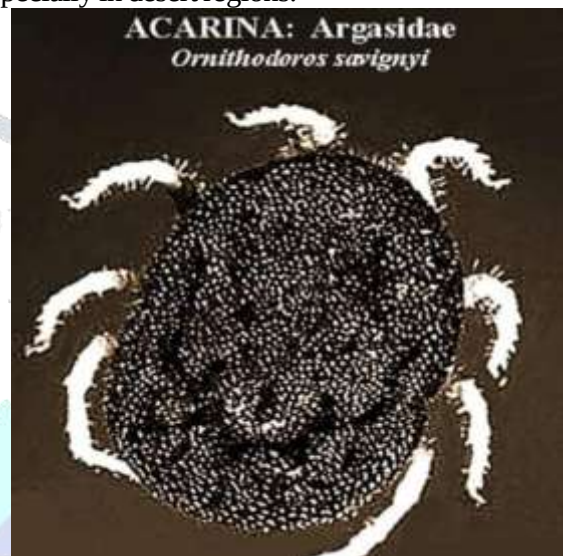
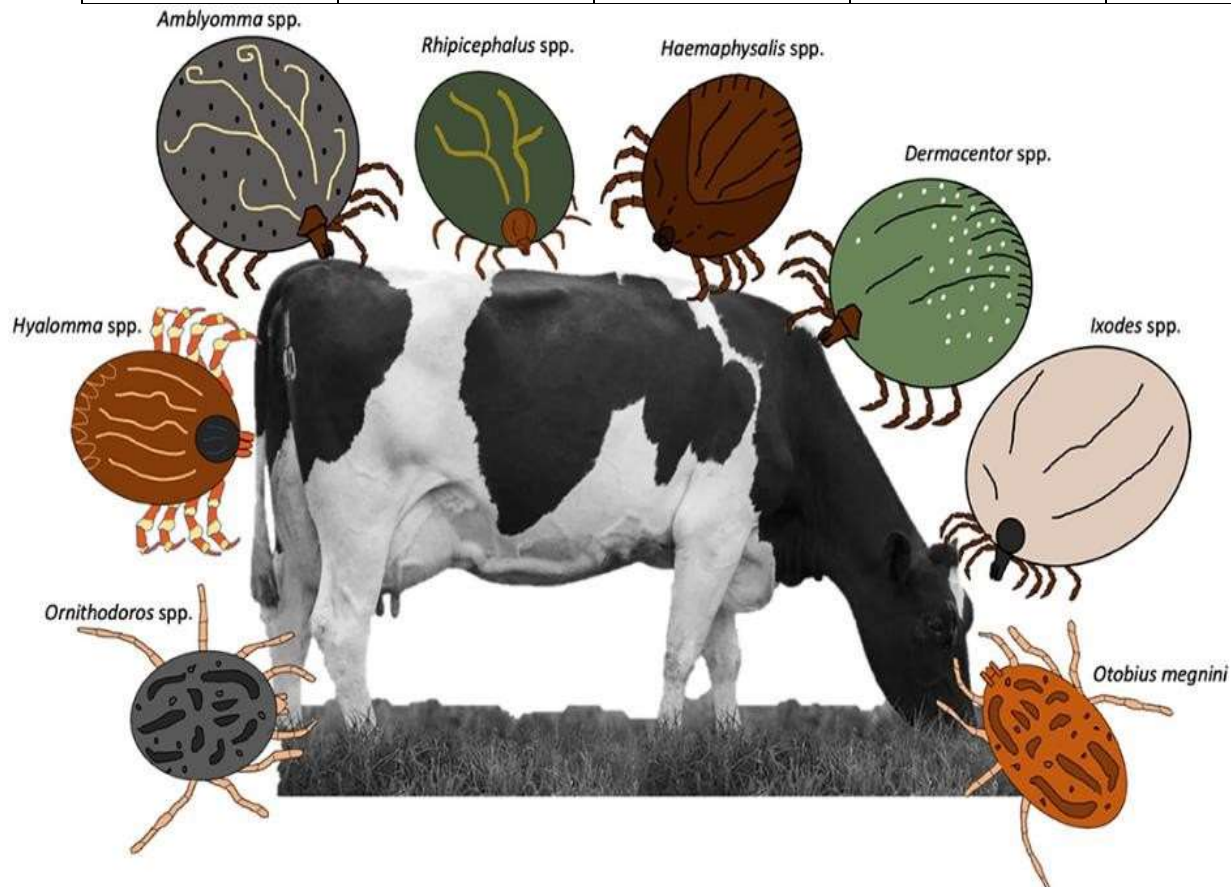


Table 2: Summary Classification of Cattle Ticks:

Order	Family	Genus	Species	Scientific name
Ixodida	Ixodidae	<i>Rhipicephalus</i>	<i>microplus</i>	<i>Rhipicephalus microplus</i>
Ixodida	Ixodidae	<i>Hyalomma</i>	<i>anatolicum</i>	<i>Hyalomma anatolicum</i>
Ixodida	Ixodidae	<i>Haemaphysalis</i>	<i>bispinosa</i>	<i>Haemaphysalis bispinosa</i>
Ixodida	Ixodidae	<i>Amblyomma</i>	<i>variegatum</i>	<i>Amblyomma variegatum</i>

Ixodida	Argasidae	Ornithodoros	savignyi	Ornithodoros savignyi
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1. Taxonomic Diversity and Distribution of ticks

Uttar Pradesh, with its diverse agro-climatic zones, supports a variety of tick species, particularly those parasitizing domestic animals. The predominant tick families in the region include Ixodidae (hard ticks) and Argasidae (soft ticks). Key genera reported are:

- *Rhipicephalus* :Notably *Rhipicephalus* (*Boophilus*) *microplus*, a major cattle tick
- *Hyalomma* : Including *Hyalomma anatolicum*, a vector of Crimean-Congo hemorrhagic fever (CCHF).
- *Haemaphysalis* : Common in rural and forest-edge habitats.
- *Argas* and *Ornithodoros* (soft ticks): Less frequently reported but significant in poultry and rodent habitats.

Among these, *Rhipicephalus microplus* is the most economically significant tick infesting cattle and buffalo across UP.

2. Host Range

Ticks in Uttar Pradesh infest a wide range of domestic and wild hosts:

- Cattle and Buffaloes: Most common hosts for *Rhipicephalus* and *Hyalomma* spp.
- Goats and Sheep: Infested by *Haemaphysalis bispinosa* and *R. haemaphysaloides*.
- Dogs: Frequently host *R. sanguineus*.
- Poultry and Birds: Infested by *Argas persicus*.
- Rodents and Reptiles: Occasionally host immature stages.

Ticks show host preference influenced by environmental conditions, host density, and management practices.

3. Seasonal Dynamics

Tick abundance in UP shows strong seasonal variation, with peaks typically observed during the monsoon and post-monsoon months (June–September). Humidity and moderate temperatures promote tick breeding and survival. Drier seasons reduce activity, though soft ticks may remain active in microhabitats.

4. Specific disease and their transmission

Uttar Pradesh, ticks are known to transmit several diseases to cattle, including theileriosis, babesiosis, and anaplasmosis. These diseases are caused by parasites transmitted by ticks like *Theileria annulata* (theileriosis), *Babesia bovis* and *Babesia bigemina* (babesiosis), and *Anaplasma marginale* (anaplasmosis).

a. **Theileriosis:** *Theileria annulata* is a protozoan parasite that causes theileriosis, a significant and sometimes fatal disease in cattle. The warm temperatures in Uttar Pradesh are conducive for tick survival and transmission of theileriosis.



This disease is caused by *Babesia bovis* and *Babesia bigemina*. Ticks transmit these parasites, leading to severe illness in cattle.



c. Anaplasmosis:

Anaplasma marginale causes anaplasmosis, which can damage red blood cells and lead to anemia in cattle.



Other tick-borne diseases:

While the above three are the most prevalent, other tick-borne diseases like Lyme disease, KFD (Kyasanur Forest Disease), and Indian tick typhus can also affect cattle in Uttar Pradesh.

5. Economic and Veterinary Impact

Ticks impose both direct and indirect impacts:

- Direct Effects: Blood loss, dermatitis, hypersensitivity, skin damage.
- Indirect Effects: Transmission of tick-borne diseases (TBDs) including:
 - Babesiosis (caused by *Babesia bigemina*, *B. bovis*)
 - Anaplasmosis (*Anaplasma marginale*)
 - Theileriosis (*Theileria annulata*)
 - Ehrlichiosis in dogs
- Reduction in milk yield, hide value, and reproductive performance is common.

Annual economic losses due to tick infestation and tick-borne diseases in UP livestock are estimated to be substantial, although exact values are underreported.

6. Control and Management Strategies

a. Chemical Control

- Use of acaricides (e.g., deltamethrin, cypermethrin, ivermectin) remains the dominant strategy.
- Problems include acaricide resistance, environmental contamination, and residues in animal products.
- Administered through dipping vats, spray races, pour-ons, spot-on treatments, and injectables.
- Requires careful rotation of classes to prevent the development of acaricide-resistant tick populations.

b. Biological Control

- Entomopathogenic fungi (e.g., *Beauveria bassiana*, *Metarhizium anisopliae*) show promise under laboratory conditions.
- Applied as sprays or in bait formulations, they offer environment-friendly control options.
- Predators and parasitoids are under-explored in Indian settings.
- Some entomopathogenic nematodes (e.g., *Steinernema spp.*) can infect ticks, though field efficacy is variable.

c. Integrated Tick Management (ITM)

Integrated Tick Management (ITM) is a comprehensive, ecologically sound approach that combines multiple control strategies to suppress tick populations while minimizing environmental impact and resistance development. It involves understanding the tick's life cycle, seasonal dynamics, host preferences, and environmental niches

- Combines chemical, biological, and cultural control.

- Includes pasture rotation, proper housing sanitation, and strategic acaricide application.

d. Vaccination

a. Anti-Tick Vaccines

- Target antigens from tick midgut (e.g., Bm86) have been used to create commercial vaccines such as Gavac™ and TickGARD™.
- Vaccination reduces tick reproduction and feeding success, thus suppressing population growth.
- Not a standalone solution but effective as part of ITM.

b. Future Prospects

- Ongoing research focuses on multi-antigen and multistage vaccines to broaden protection.
- Challenges include variable efficacy across tick species and the need for booster doses.
- Research is ongoing for anti-tick vaccines, especially targeting *R. microplus*, but no commercial vaccine is yet available in India.

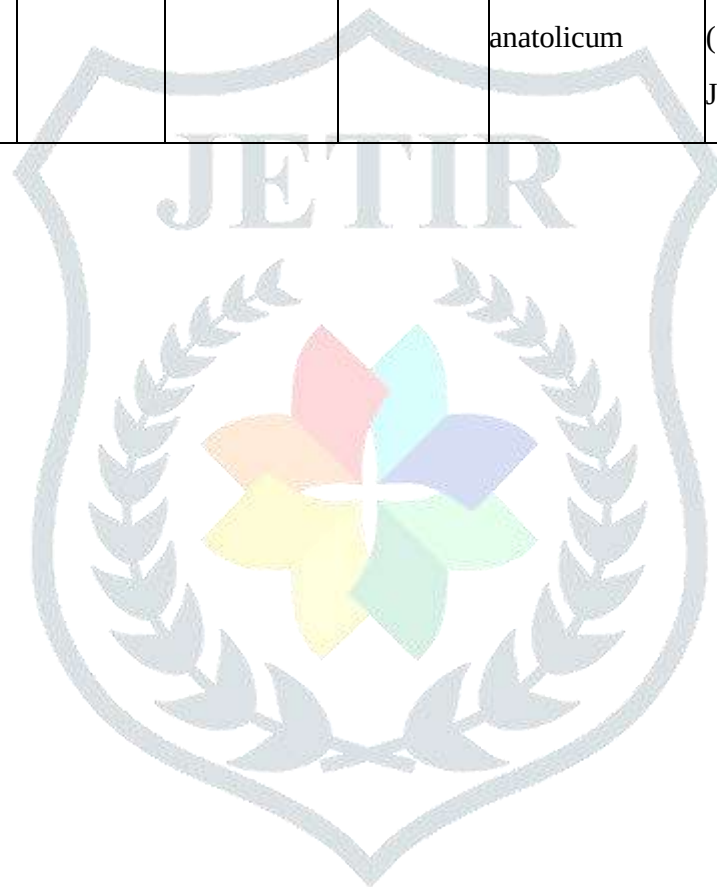
e. Research Gaps and Recommendations

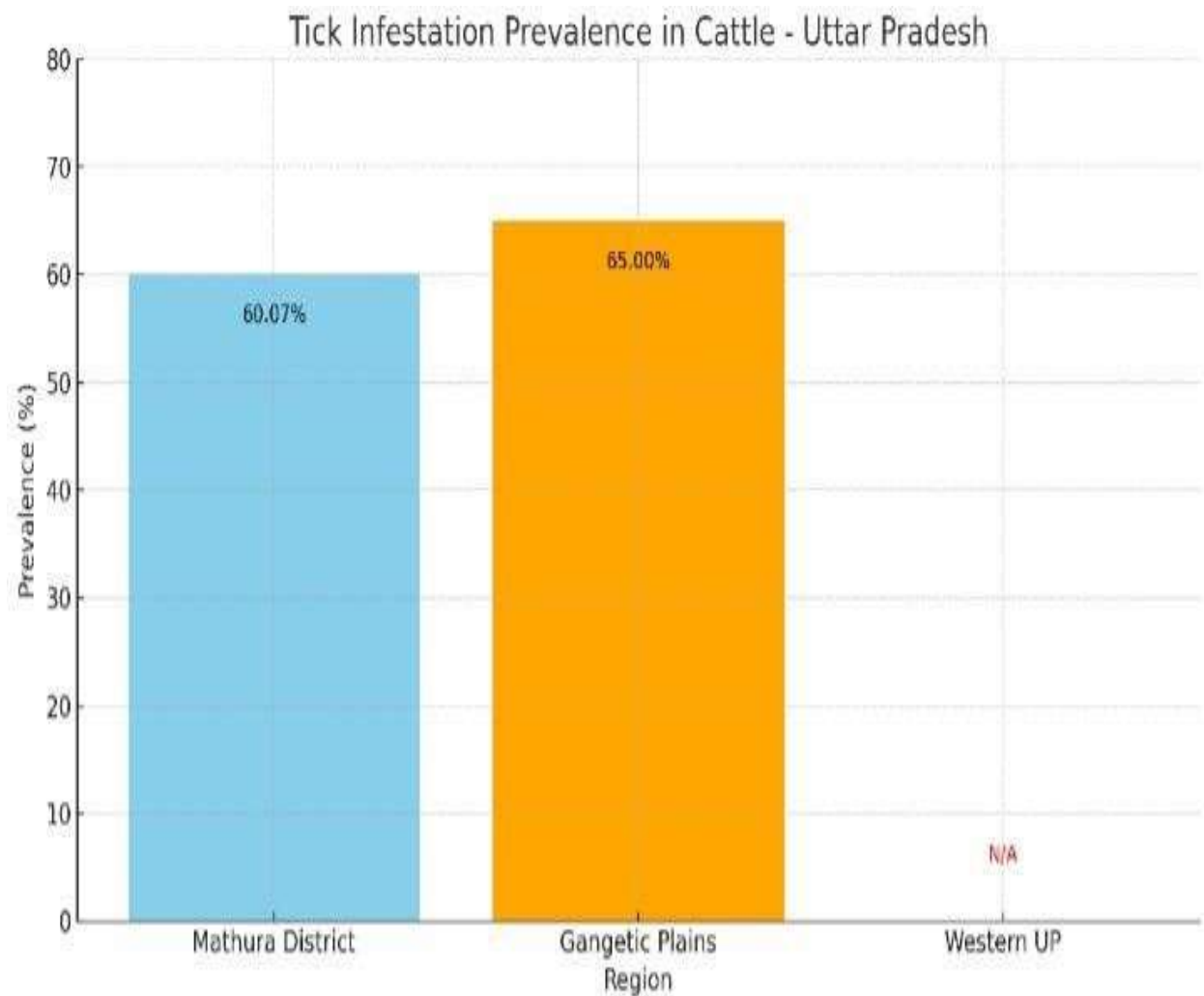
- Taxonomic surveys in rural and forest-adjacent areas remain incomplete.
- Tick resistance patterns to acaricides in UP are poorly documented.
- Need for molecular characterization of tick-borne pathogens.
- Enhanced surveillance systems for TBD outbreaks.
- Greater focus on eco-friendly control alternatives and farmer education

Table3: Tick prevalence in cattle – uttar pradesh

Region	Study period	Sample size	Overall prevalence	Peak season	Predominant Species	Note
Western up	2019-2020	Not specified	Not specified	Not specified	Rhipicephalus microplus, Hyalomma anatolicum	Study conducted in district like Amroha, Moradabad, Rampur, Bareilly etc.

Gangati c plains	2016- 2018	1,500	65%	Monsoo n	R.microplus various Hyalomma spp.	Higher prevalence in unorganised farms (45%)vs.organize d farm(4%)
Mathura district	2010- 2011	2,515	60.07%	Rainy	Boophilus microplus, hyalomma anatolicum	Highest prevalence in September (75%)lowest in January (46.07%)





Mites

Mites are minute arthropods of the subclass Acari under the class Arachnida. With over 55,000 described species worldwide, they occupy a vast range of ecological niches. In India, and

particularly in UP, mites are of great concern due to their impact on agriculture, livestock health, and human allergies.

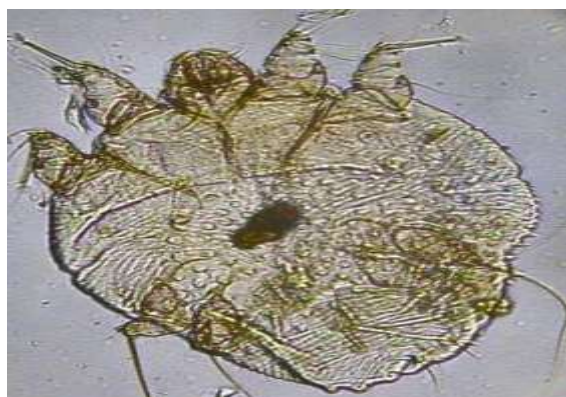


Table 4:order , family , scientific name of mites

Order	Family	Scientific name	Common name
Astigmata	Sarcoptidae	<i>Sarcoptes scabiei</i> <i>var. bovis</i>	Sarcoptic mange mite
Prostigmata	Psoroptidae	<i>Psoroptes ovis</i>	Psoroptic mange mite
Prostigmata	Psoroptidae	<i>Chorioptes bovis</i>	Chorioptic mange mite
Prostigmata	Demodicidae	<i>Demodex bovis</i>	Demodectic mange mite
Mesostigmata	Macronyssidae	<i>Ornithonyssus bacoti</i>	Tropical rat mite(can infest cattle rarely)

1. Taxonomic Diversity of Mites in UP

UP hosts a variety of mite species, often categorized based on their ecological role:

1.1. Agricultural Mites

- *Tetranychus urticae* (two-spotted spider mite) affects crops such as okra, tomato, and cotton.
- *Polyphagotarsonemus latus* is a polyphagous pest on chilli and brinjal.

1.2. Veterinary Mites

- *Sarcoptes scabiei* causes mange in cattle, buffaloes, and goats.
- *Psoroptes ovis* and *Demodex spp.* Are also prevalent in livestock in rural UP.

1.3. Stored Grain and House Dust Mites

- *Tyrophagus putrescentiae* and *Dermatophagoides pteronyssinus* contribute to stored grain degradation and human allergies.

2. Ecology and Habitat Preferences

Mites in UP thrive in diverse microhabitats:

- Soil and leaf litter (Oribatid mites)
- Animal skin and hair follicles (Sarcoptidae, Demodicidae)
- Plant surfaces and crops (Tetranychidae)
- Stored food products (Acaridae)

Temperature, humidity, and host availability play critical roles in their distribution.

3. Economic Importance

3.1. Agricultural Losses

Spider mites can cause up to 40% yield loss in untreated infestations on certain crops (Singh & Gupta, 2020).

3.2. Veterinary Losses

Mange leads to poor hide quality, weight loss, and reduced milk yield in livestock (Sharma et al., 2018).

3.3. Public Health

House dust mites are major indoor allergens, causing asthma and dermatitis, especially in urban households (Kumar & Verma, 2017).

4. Diseases caused by mites

In cattle in Uttar Pradesh, mites cause several diseases collectively known as mange, including sarcoptic mange, demodectic mange, and chorioptic mange. These diseases are characterized by skin lesions, itching, and potentially hair loss. Mites can also cause psoroptic mange, which is highly contagious and spreads rapidly through direct contact.

Detailed Explanation:

Sarcoptic Mange:

This is caused by *Sarcoptes scabiei* and is highly infectious, spreading through direct contact or contaminated surfaces. It leads to lesions starting on the head, neck, and shoulders, which can then spread.



Demodectic Mange:

This is caused by *Demodex bovis* and is common in tropical areas. The mites live in hair follicles and associated skin glands, causing papules and nodules.



Chorioptic Mange:

This is caused by *Chorioptes bovis* and *Chorioptes ovis* and is also known as chorioptosis. Lesions are usually mild and spread slowly, affecting areas like the tail head, legs, and udder, with dry, scaly skin and localized hair loss.

**Psoroptic Mange:**

Caused by *Psoroptes ovis* (sheep scab mite), this is a highly contagious form of mange that spreads rapidly through direct contact. It is characterized by lesions on the shoulders and rump.

**Other Mite-Borne Issues:****Lumpy Skin Disease (LSD):**

While not caused by mites directly, LSD is a viral disease that can be spread by insects, including flies and mosquitoes, which can also transmit mites.

Scrub Typhus:

While not a primary disease of cattle, scrub typhus is a bacterial disease transmitted by chigger mites, which can be a concern for humans in areas where cattle are raised.

5. Control and Management Strategies**1. Identification and Monitoring**

- Regular inspection of animals, plants, or environments to detect mite infestations early.
- Use of magnification tools to properly identify mite species.

2. Cultural Control

- Maintain hygiene and sanitation in animal sheds and agricultural fields.
- Remove infested plant material or bedding.
- Rotate crops to break the life cycle of plant-infesting mites.

3. Biological Control

- Introduce natural predators (e.g., predatory mites like *Phytoseiulus persimilis*).
- Encourage beneficial insects by avoiding broad-spectrum pesticides.

4. Chemical Control

- Use of miticides (acaricides) such as amitraz, permethrin, or abamectin.
- Apply chemicals as per recommended doses and rotate them to prevent resistance.
- Target treatment to affected areas to minimize environmental impact.

5. Environmental Control

- Control humidity and temperature, as mites thrive in warm, moist environments.
- Improve ventilation in storage and animal housing areas.

6. Integrated Pest Management (IPM)

- Combine biological, cultural, and chemical methods for sustainable control.
- Regularly assess the effectiveness of control measures and adjust as needed.

7. Quarantine and Isolation

- Isolate newly acquired animals or plants before introducing them to the main stock.
- Avoid transferring infested materials between locations.

8. Education and Awareness

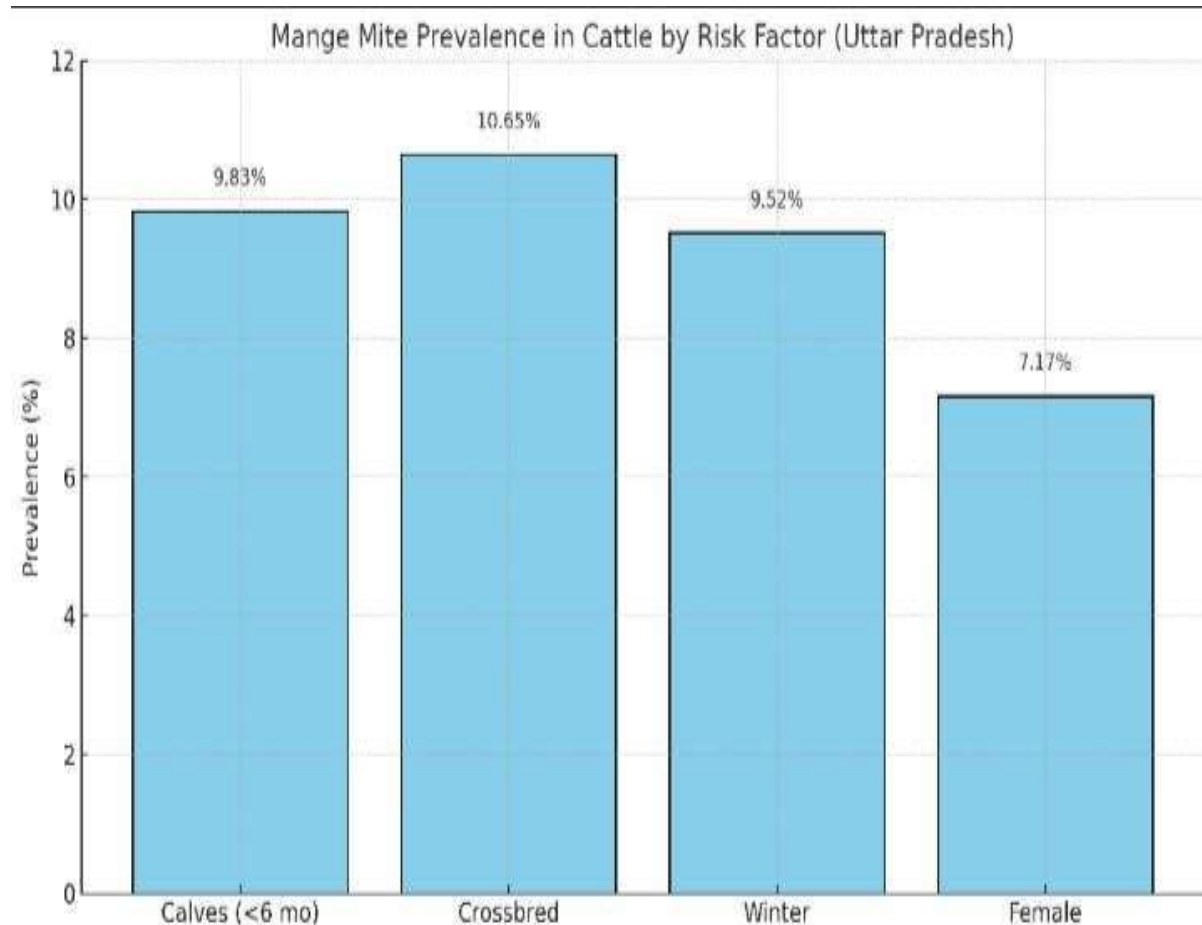
- Train workers and farmers to recognize and manage mite infestations effectively.
- Promote community participation in control programs.

4. Challenges and Research Gaps

- Lack of updated regional taxonomic keys.
- Limited data on acaricide resistance patterns in UP.
- Inadequate surveillance of mite-borne zoonotic pathogens.

Risk factor	Category	Prevalence (%)
Age	Calves(<6months)	9.83%
	6months -3 years	Intermediate
	Adult (>3 years)	Lowest
Breed	Crossbred	10.65%
	Indigenous	4.83%
Season	Winter	9.52%
	Rainy	6.48%
	Summer	4.05%
Sex	Female	7.17%
	Male	7.07%

Conclusion



Ticks pose a serious constraint to animal productivity in Uttar Pradesh. An integrated and sustainable tick management approach, supported by regional epidemiological research, is critical for safeguarding animal health and rural livelihoods in the state.

Mites in UP pose significant challenges across agriculture, veterinary health, and public welfare. Comprehensive field surveys, species inventories, and integrated control programs are essential to mitigate their impact.

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