Research Article

Prevalence of tick fauna and KAP study on commonly used acaricides in the tribal belt of Khandesh region

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Abstract: The present study aimed to evaluate the prevalence of tick infestation in cattle and assess tribal farmers' awareness of and practices regarding acaricide usage in the tribal sub-plan (TSP) areas of the Khandesh region, Maharashtra. A total of 737 cattle were screened, with 74 found infested, resulting in an overall tick prevalence of 10.04 percent. A structured Knowledge, Attitude, and Practice (KAP) survey among twelve tribal respondents revealed no significant resistance to deltamethrin, suggesting less exposure to chemical acaricide to the animals. However, limited awareness of resistance risks among farmers indicates a need for continuous awareness programs to prevent future resistance development. This study provides critical insights into tick prevalence and acaricide resistance patterns in the Nandurbar district, emphasizing the need for continuous resistance monitoring and integrated tick management strategies and awareness programs for tribal farmers. Future research should explore molecular and biochemical resistance mechanisms to enhance sustainable tick control in cattle.

Keywords: Rhipiciphalus microplus, prevalence, acaricidal resistance, tribal farmers, Khandesh region, Nandurbar district. KAP survey, deltamethrin.

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Introduction

Ticks are significant external parasites affecting nearly 80% of the global cattle population and causing major health and economic losses in livestock [1]. In India, tick prevalence rates reach 53% in cattle and 38% in buffaloes [2]. Ticks not only reduce productivity through stress, blood loss, and skin damage but also act as vectors for serious tick-borne diseases (TBDs) [3]. The most common tick species in India include Rhipicephalus microplus and Hyalomma anatolicum [4,5]. Chemical acaricides are widely used for tick control, but their effectiveness is declining due to increasing resistance caused by improper use and over reliance [6].

A Knowledge, Attitude, and Practice (KAP) survey is a valuable tool to assess community awareness and guide targeted interventions. In Maharashtra's Nandurbar district, where tribal farmers face challenges due to limited awareness and growing acaricide resistance, a KAP survey was conducted. This study aimed to assess tick prevalence, resistance patterns, and control measures used by livestock owners. The findings will help design effective, community-based strategies to improve cattle health and support the livelihoods of tribal farmers

Materials and Methods

Ticks Collection and study area

Partially fed and unfed male and female ticks were collected from both Indigenous and crossbreed cattle, reared for draught and milking purposes from six tehsils of tribal villages of Nandurbar district viz. Akkalkuwa (Deomogra-nagar), Akrani (Roshmal), Taloda (Dhanore), Shahada (Sarangkheda), Nandurbar (Kolde) and Navapur (Pangaran). Ticks were stored in insect-breeding plastic jars with a nylon mesh window, ensuring proper air and moisture exchange. Ticks were carefully removed from cattle using forceps or by hand (thumb and forefinger), taking precautions to avoid damage to their mouthparts and appendages. Additionally, engorged female ticks were collected from the ground, cracks, crevices, and beneath stones in cattle sheds.

KAP survey

A systematic survey was designed to collect data on several aspects related to acaricide used. Questionnaire parameters were designed in a multiple-choice format as per the guidelines [7], with some modifications with vernacular language for the formal testing process. This set of parameters covers several practices like socio-demographic information, feeding methods, housing types, condition of sheds, managemental practices, risk factors, methods of acaricide application, etc. This information was obtained from two tribal farmers from each selected village having more than four animals. The survey work was conducted through face–to–face interaction with the head of family members. If there were other family members involved in livestock rearing, they were also involved in the survey [7]. They underwent pilot knowledge testing to ensure their effectiveness in collecting correct information. The data were carefully recorded, collected, analyzed, and screened for its accuracy. These tribal farmers selected for the study were obtained their willingness. The replies obtained with 1 to 4 scores in Table 1 indicate no scientific, fair, good, and scientific approach [8].

Results

Overall prevalence

During the present study, a total of 737 cattle were screened from six talukas of Nandurbar district for the presence of ticks. Out of these, 74 animals were found infested, indicating an overall tick prevalence rate of 10.04 percent. The highest prevalence was reported in Akrani (Roshmal) at 12.90%, whereas the lowest was observed in Shahada (Sarangkheda) at 9.23%. The variation among talukas was not statistically significant (P=0.6), as revealed by the chi-square test (Table 2).

Acaricide resistance by KAP survey

The survey data from 12 respondents were entered into the Microsoft Excel 2010 sheet for probe analysis. The nine parameters recorded in the

survey were analyzed by correlation matrix and student t-test. The study location was a tribal sub-plan area (TSP) where 100 percent population was dominated by tribal livestock farmers. The tribal farmer kept their animals in small to big sheds having concrete/ mud floors and thatched roofs. In the survey, it was surprisingly noticed that tribal farmers rarely use shed treatment (Table 3).

Table 1. Standard questionnaire and scoring given according to weightage

Question	Options	Response Score
1. Which acaricide is used?	a) Deltamethrin	2
	b) Ivermectin	3
	c) Herbal	4
	d) None	1
2. How do you use the acaricide?	a) Self	3
	b) Children	1
	c) Expert	4
	d) Not used	2
3. Frequency of acaricide use?	a) 30 days	4
	b) 2 months	3
	c) 2½ months	2
	d) Not used	1
4. Method used for acaricide application?	a) Spray	4
	b) Washing	2
	c) Dusting	1
	d) Mobbing	3
5. How do you handle on-host ticks?	a) Manually removed	2
	b) Removed and thrown in the shed	1
	c) Burning of tick	4
	d) Buried	3
6. Application of acaricide on the animal body?	a) Whole body	2
	b) Flank region	3
	c) Inguinal region	4
	d) Head region	1
7. Where do you purchase acaricide from?	a) Directly from medical	2
	b) From government scheme	4
	c) From NGO	3
	d) None	1

8. Where do you spray acaricide?	a) On animal body	2
	b) On cracks and crevices	3
	c) On walls	1
	d) Both a and b	4
9. Who applies the acaricide?	a) Self	2
	b) From child	1
	c) From woman	3
	d) Veterinary doctor	4

Table 2: Overall prevalence of tick on cattle from unorganized farms in Nandurbar district of Maharashtra State

Sl. No.	Taluka / Village	No. of Cattle		Prevalence (%)
		Examined	Infested	
1	Akkalkuwa/Deomogra-nagar	94	9	9.57
2	Akrani/Roshmal	93	12	**12.90**
3	Taloda/Dhanore	102	10	9.80
4	Shahada/Sarangkheda	130	12	9.23
5	Nandurbar/Kolde	155	15	9.67
6	Navapur/Pangaran	163	16	9.81
	Total	737	74	**10.04**
	Table			NS
	P value (X^2)			0.6

Table value of the chi-square test is statistically not significant (NS).

Table 3: Details of data collected from farmers through a simple questionnaire from Nandurbar district to study acaricide use for control Awareness of ticks from unorganized farms.

Taluka / Village and Farmer Sr. No.	Awareness	Application of acaricide			Shed Treatment
		Since last 5 years	Method	Frequency	
Akkalkuwa / Deomogra- nagar, Farmer 1 and 2	Not aware	Deltamethrin, Amitraz, Ivermectin	Spray, Parenteral	Occasional	Never
	Not aware	Deltamethrin, Cypermethrin ,Amitraz	Spray	Occasional	Never
Akrani / Roshmal, Farmer 3 and 4	Not aware	Deltamethrin, Amitraz	Spray		Never
	Not aware	Deltamethrin, Cypermethrin Amitraz	Spray	Occasional	Never
Taloda / Dhanore, Farmer 5 and 6	less aware	Deltamethrin, Flumethrin, Ivermectin	Spray, Parenteral	Occasional	Rarely
	less aware	Deltamethrin, Cypermethri, Amitraz	Pour on	Occasional	Never
Shahada / Sarangkheda, Farmer 7 and 8	Aware	Deltamethrin, Amitraz, Ivermectin	Spray, Parenteral	Frequent	Rarely
	Aware	Deltamethrin, Amitraz, Ivermectin	Spray, Parenteral	Occasional	Rarely

Nandurbar / Kolde, Farmer 9 and 10	Aware	Deltamethrin, Ivermectin	Spray, Parenteral	Frequent	Rarely
	Aware	Deltamethrin, Flumethrin, Amitraz, Ivermectin	Spray, Parenteral	Occasional	Rarely
Navapur / Pangaran, Farmer 11 and 12	Less Aware	Deltamethrin, Ivermectin	Spray, Parenteral	Occasional	Rarely
	Less Aware	Deltamethrin, Amitraz	Spray, Pour on	Occasional	Rarely

The factors which were selected for assessment of the status of acaricide resistance (AR) in a particular/ locality where cattle owners were less aware or unaware about the use of deltamethrin in a specific scheduled manner. To assess KAP study questions were prepared which includes nine questions which are interrelated with one common goal i.e. deltamethrin resistance. The correlation analysis and conclusions which are as follows. i) Amongst all nine questions there was found to be a positive significant correlations. It indirectly suggests that all these questions were very important at right on the target. ii) Significant positive correlations also impliedly suggest that the use of deltamethrin showed no resistance. It may be due to the treatment undertaken by the farmer community being judicious or less susceptible population (refugia). iii) Development of resistance to a particular acaricide depends on either low or high concentration, or misuse or abuse of the acaricides. In the present case such scenario has not happened as a result there was no incidence of resistance development. However in future there is a likely chance that the unawareness or less awareness of the farmers may lead to detrimental results.iv) Thus the present study based on correlation analysis amongst these nine questions suggests that these questions are far off standard nature and shall be included in such types of the study.v) While planning the resistance studies elsewhere the data from the present study can be considered a susceptible population.

The questionnaire survey result provides useful insights to support the development of outreach and awareness programs for tribal farmers. The proper knowledge about tick infestation amongst the tribal farmers is essential for effective management of animal health and productivity.

Discussion

The overall tick prevalence of 10.04% observed in this study aligns with the findings of , who reported a 14.68% prevalence in cattle from Bihar. This relatively low infestation rate may be attributed to the sporadic but effective use of acaricides by tribal farmers, possibly leading to a controlled tick population across the region [9].

Interestingly, the highest infestation was recorded in Roshmal (12.90%), where farmers were largely unaware of proper acaricide application, indicating that lack of knowledge directly impacts tick control efficacy. This supports the hypothesis that tick prevalence is influenced more by management practices than geographic variation.

The KAP survey further highlighted critical gaps in awareness and practices. Many farmers did not know the correct methods or frequencies for acaricide application, and shed treatment was rarely practiced. Despite this, no resistance to deltamethrin was observed. This could be due to the low selection pressure, possibly from infrequent or improper acaricide use, maintaining a susceptible tick population (refugia) [10].

These findings underscore the need for regular awareness campaigns, farmer education on integrated tick management, and proper acaricide use. The positive correlation among survey questions validates the questionnaire design, suggesting it could serve as a model for future resistance monitoring studies in similar regions.

Conclusion

The overall tick prevalence was found to be as low as 10.04%. In the Roshmal area comparatively, the prevalence is higher at 12.90 percent since the tribal farmers are unaware of the acaricide spraying. A KAP survey in tribal villages revealed that most of the farmers don't know about the concentration, methods of application, how to use, frequency of application, where to apply, where to spray and shed treatment, etc. due to whatever the tick fauna present in the remote tribal area these animals are less exposed to chemical acaricides. Therefore, the study highlights the need for continued monitoring and farmer awareness programs to prevent future resistance issues. These findings provide critical insights into tick prevalence and less acaricide resistance patterns in the Nandurbar district of the Khandesh region. Future research should focus on integrated tick management strategies, including molecular and biochemical approaches, to improve resistance monitoring and control measures.

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