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Biochemical Effect of *Rhipicephalus microplus (*Canestrini 1888*)* on milk of milch cattle from Chhatrapati Sambhajinagar district. MS India

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Abstract
The present study investigates the biochemical effects of *Rhipicephalus microplus (Canestrini 1888)* infestation on the milk quality of milch cattle (*Bos indicus*) from Chhatrapati Sambhajinagar district. A total of 55 animals were surveyed during 2023–2024, and those infected with ectoparasites were categorized into treated (dewormed) and untreated groups. Milk samples were collected under strict hygienic conditions and analysed using an SL30 Lactoscan Milk Analyzer for parameters including fat, solids-not-fat (SNF), density, protein, and lactose. Quantitative and qualitative assessments were performed on Day 1 (before treatment) and Day 15 (post-treatment) to compare biochemical changes.
Results revealed a significant improvement in milk composition in treated cows, with marked increases in fat (0.422%), protein (0.292%), SNF (0.186%), and lactose (0.053%) after deworming. This indicates a positive recovery in nutritional quality following ectoparasite control. Conversely, untreated cattle showed deterioration in milk parameters, with notable decreases in fat (–0.945%), SNF (–0.394%), density (–0.535), and lactose (–0.314%), reflecting the negative impact of prolonged infestation. The findings suggest that tick infestation, particularly by *Rhipicephalus microplus*, significantly reduces milk yield quality and composition, leading to economic losses for farmers. Effective ectoparasite management, including timely deworming, improves milk quality and may enhance overall productivity in smallholder dairy systems. This study highlights the importance of integrated parasite management programs to sustain dairy health and improve rural economic outcomes in the Aurangabad district.

Keywords: Ticks, *Rhipicephalus microplus* Biochemical effect, Milch cattle

Introduction

In India, the cattle farming industry is expanding as an agrobusiness. Because of India's growing population Small-scale dairy farms have proven to be an effective tool for boosting rural development, and there is a great opportunity to raise milk yield and boost dairy productivity in order to meet the growing demand for milk, particularly in India. India is becoming the world's largest producer of milk because to its massive cow population. However, the potential of the Indian milch herd is still unrealized. Since the bulk of milk producers—more than 70 million rural families—are small and marginal farmers, small holding dairy farms are crucial to rural development. Numerous variables, such as the secondary nature of dairying, low milk yields, growing input costs, and a shift to non-farm activities, have a significant impact on the sustainability of such dairy farms. (Hemme Torsten *et al.*,2015) [3]

Milk can be consumed in a variety of forms, such as cheese, butter, curd, and ghee. Dairy and fisheries operations, as well as agriculture, have been an essential part of human life since the dawn of civilization. Some very important cow breeds in India and other places are used in the production of biogas and fuel the animal dung used as manure. By preserving ecological equilibrium, these operations have also helped the food basket and draught animal power. because of the conductive topography and environment. animal husbandry. In India, the dairy and fishing industries have had a significant socioeconomic impact. Traditional, cultural and religious beliefs have also contributed in the continuance of these activities. In addition to giving millions of people access to affordable, wholesome food, they also significantly contribute to the creation of meaningful employment in the rural sector, especially for women, small-scale and marginal farmers, and those without land. (Annual Report 2016–17, Government of India, Ministry of Agriculture and Farmers Welfare). According to Richard and David (2001), the host offers the ectoparasites several crucial resources. First and foremost, the host provides a food source, which could be blood, lymph, tears, perspiration, or the remains of skin hairs or feathers. A certain amount of defence against the outside world is also provided by the host body through the skin or hair. Domestic animals have been brought to new parts of the world due to the growing global human population, where they are attacked by endemic ectoparasites to which they have little to no defence. This has been especially true since domestic cattle, or Bos taurus, were brought into regions where they are susceptible to a wide range of ectoparasites and diseases that are caused by ectoparasites. Byford *et al.*, (1992) [1] reported the medical and economic importance of ticks has been recognised due to their ability to transmit diseases to human and animals. Ticks cause great economic losses to livestock and adversely affect livestock hosts in several ways.

Rajput *et al.*, (2006) reported that the effects of ticks lead to economic losses, such as lower performance of cattle,

increased mortality in cattle herds, and reduced meat and milk production. Richard and David (2001) state that blood-feeding flies, particularly stable flies, horn flies and tabanids, can cause severe disturbance and annoyance to cattle, leading to reduced weight gain, reduced milk production and hide damage. Fly bites may cause pruritic papules and wheals. Blood-feeding flies may also be important vector of viral, bacterial and protozoal diseases and filaroid nematodes, a heavy louse infestation may cause pruritus, alopecia, excoriation and self-wounding, the disturbance caused may result in lethargy and loss of weight gain or reduced egg production. fevered infestation with sucking lice may cause anaemia Heavy infestations are usually associated with young animals or older animals in poor health, or those kept in unhygienic conditions.

These effects lend to economic loves, such as lower performance of carte increased mortality in cattle herds, and reduced meat and milk production. Blood sucking by large number of ticks causes reduction in live weight and anaemia among domestic animals, while their bites absorb reiluce the quality of the stock which are of great economic importance worldwide. (Rajput *et al.,*2006). Ectoparasites have a detrimental impact on the production and performance of livestock. The various ectoparasites transmit a broad spectrum of pathogens to all these animals (Muhammad *et al.,* 2021). Heavy infestations are usually associated with young animals or older animals in poor health, or those kept in unhygienic conditions, (Richard and David 2001).

Parasites lead to decreased milk production, weight gain, and reproductive efficiency. For instance, tick-borne diseases and trypanosomiasis are associated with reduced milk yield, while coccidiosis affects weight gain and causes mortality

Materials and Methodology

Ectoparasites were collected during afternoon and evening time, DKMM Cattle farm was chosen for collection of parasites of Milch-cattle from Aurangabad district, Maharashtra, India. Ticks collected by Hand picking Methods, Adults stages were removed by hand using a forcep or a brush and preserved. The milch cattle selected at randomly. The ectoparasites usually collected from their hosts at the time of feeding. To removing the ticks and lice it is necessary to use strong steel forcep, these should be medium size and blunt ends and pointed forcep also. Ticks were preserved in 70% of alcohol in a clean thick glass walls with proper labels. Flies was collected with the help of aerial net and collected in a small jar with contain a small cotton boll which was dipped in chloroform.

In the present study the collected ticks, brought to the lab for further Identification of the parasites. Identification was done by using slandered identification keys with the help of stereoscope microscope Identification for ticks we used the keys given by Stephen C Barker, Alan R. Walker (2014), Walker ef al., (2003),

Milk were collected in sterilised bottles. from infected animals separately. During milking strict hygienic measures were employed and the samples were transferred to Department of Studies in Zoology, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar for the estimation of parameters such as

Total solids, proteins, Fats, lactose, through automatic milk analyser kit**.** Thapa Shrestha, *et al* 2020 [5]. The present study was undertaken to assess the impact of tick infestation on the quality, quantity and composition of milk from the study area. A total of 55 animals belonging to different species of cattle were considered for the current study from 2024-25. The selection of infected cattle mostly infected by ectoparasites and categorized into treated and non-treated cattle. Both of cattle infected by treated cattle choose for ectoparasticides by using permethrin and untreated cattle used for compares with treated cattle. After removal of ectoparasites from treated cattle that time milk was collected and quantitative and qualitatively analysed with lactoscan milk analyzer at that time milk also collected from untreated cattle for analysis and compared with quantitative and qualitatively with treated cattle milk. The different between those cattle milk were considered for effect of tick on milk.

SL30 Milk Analyzer

Results and discussion

In the present study A Survey was conducted for period of 12 month from 2024-2025 to assess the impact of infestation on the production and composition of milk only milking animal selected for this study after the surveyed of selected cattle farm from Aurangabad district the collection of parasites mostly ectoparasites like *Rhipicephalus microplus (Canestrini 1888)*collected the species of parasites from cattle we observed highly infected cattle and chosen for the checking effect of parasite on their milk.

Male *Rhipicelalus microplus* (Canestrini 1888) (dorsal side)

Diagnostic characters of species *Rhipicephalus (Boophilus) microplus* (Canestrini 1888) (Plate no.1)

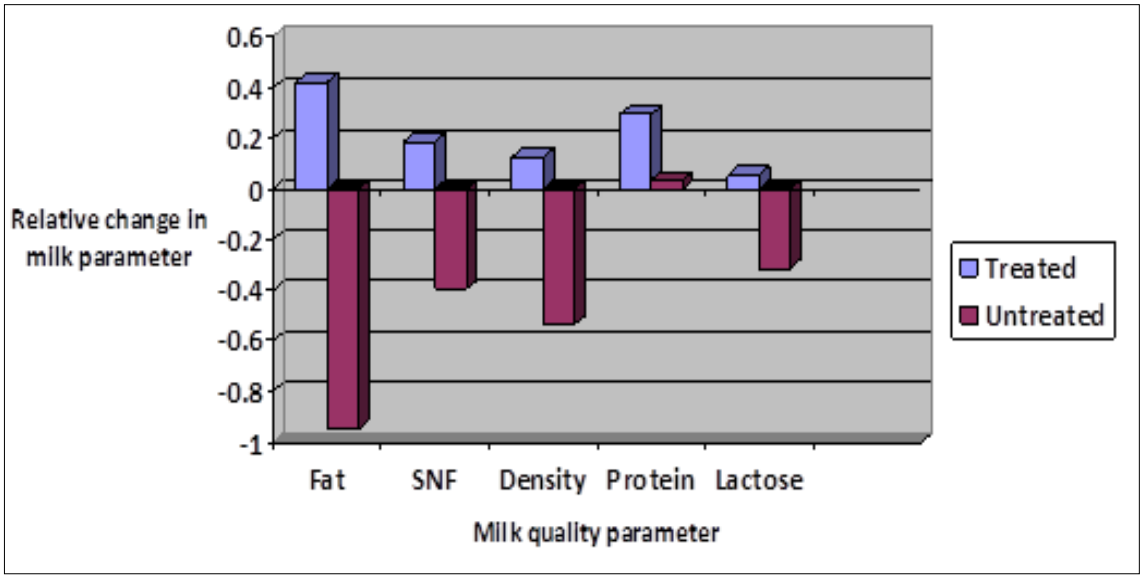
Rhipicephalus (Boophilus) microplus is commonly referred to as "the cattle tick" in various regions of the world (Walker *et al*., 2003). Their bodies are yellowish to reddish-brown, and they are little. The 4+4 column contains the hypostomal teeth. They are different from cornua. The length of the coxae I spur is long and noticeable. Spurs of Coxae 2 and 3 are evident. The adanal shield and supplementary adanal shield are the two separate ventral shield spurs. Dorsally, the ventral shield spurs are invisible. The caudal appendages of males are thin. The posterior lips of the genital opening form a wide U shape

Effect of *Rhipicelalus microplus* (Canestrini 1888) on cattle

Milk qualities analysis in treated and untreated cattle: In the present study, after surveying infected milch cattle divided into treated and untreated animals for analysis of milk in dairy cows, various milk quality parameters such as SNF percentage, fat percentage, density, lactose percentage, and protein percentage in milk were analysed during the survey. While the collection of parasites at that time also collected the milk of both treated (dewormed) and untreated cows on day 1. After the completion of 15 day then collect the milk from similar treated and untreated. The compares milk contents like fat, protein, lactose, densities, etc., analysed and differentiated the effect of parasites in treated and untreated cows. Following milk parameter considers for the biochemical analysis.

Table 1: Effect of Ectoparasites on Milch Cow *(Bos Indicus*) from DKMM Cattle farm.

Treated Cow (*Bos indicus*)				Untreated Cow (*Bos indicus*)			Standard value
DKMM Cattle farm				DKMM Cattle farm			
Parameters	Day 1 (10-09-2024	Day 15 (25-09-2024	Day 15-Day1 (Difference)	Day 1 (10-09-2024)	Day 15 (25-09-2024)	Day 15-Day1 (Difference)	
Fat	7.587	8.009	0.422	7.415	6.47	-0.945	1.851
SNF	7.406	7.592	0.186	7.114	6.72	-0.394	0.526
Density	26.808	26.933	0.125	27.482	26.947	-0.535	6.056
Protein	3.368	3.66	0.292	3.572	3.606	0.034	0.784
Lactose	3.308	3.361	0.053	3.229	2.915	-0.314	0.495

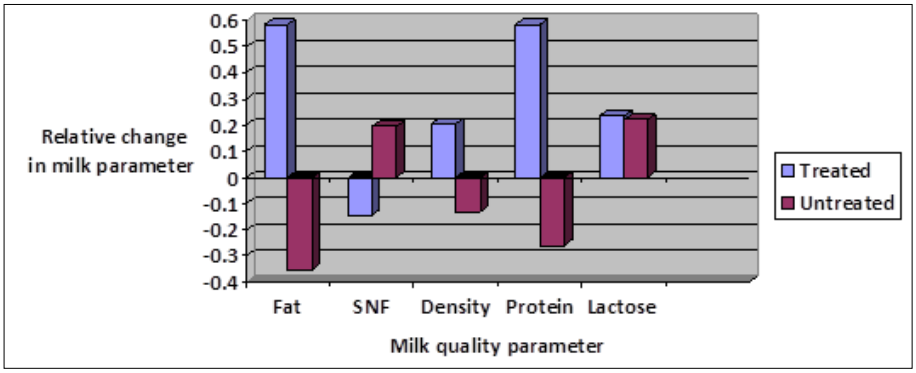


Graph 1: Showing effect of parasites on cattle milk from Cow (*Bos indicus*) in DKMM cattle farm**.**

X-axis: Milk Quality Parameters (Fat, SNF, Density, Protein, Lactose),
Y-axis: Relative Change in Milk Parameters,
Legend: Blue = Treated, Maroon = Untreated.
All parameters improved in treated cows, but fat and protein levels were particularly high, indicating that the treatment improved the composition of their milk. Improved milk richness was indicated by an increase in fat. slight rise in solids rather than fat. slight rise that is in line with a higher SNF. A moderate increase in protein indicates higher-quality nutrition. slight rise in the amount of lactose.
Over the course of 15 days, untreated cows displayed a decline in the majority of milk quality parameters, particularly fat and SNF, indicating a deterioration in milk composition. substantial decrease in fat and lower-quality milk. decreased density, which suggests a loss of nutrients. minimally increased protein content. A decrease in lactose could be a sign of metabolic problems.

Table 2: Effect of Ectoparasites on Milch Buffalo *(Bubalus bubalis*) from DKMM Cattle farm.

Treated Buffalo *(Bubalus bubalis*)				**Untreated Buffalo *(Bubalus bubalis)***			**Standard value**
DKMM Cattle farm				**DKMM Cattle farm**			
Parameters %	**Day 1 (10-02-2025)**	**Day 15 (25-02-2025)**	**Day 15-Day1 (Difference)**	**Day 1 (10-02-2025)**	**Day 15 (25-02-2025)**	**Day 15-Day1 (Difference)**	
Fat	7.479	8.062	0.583	7.455	7.102	-0.353	1.851
SNF	7.47	7.325	-0.145	7.187	7.38	0.193	0.526
Density	26.822	27.026	0.204	27.462	27.33	-0.132	6.056
Protein	3.349	3.933	0.584	3.526	3.267	-0.259	0.784
Lactose	3.397	3.632	0.235	3.209	3.428	0.219	0.495



Graph 2: Effect of Ectoparasites on Milch Buffalo *(Bubalus bubalis*) from DKMM Cattle farm.

X-axis: Milk Quality Parameters (Fat, SNF, Density, Protein, Lactose), Y-axis: Relative Change in Milk Parameters, Legend: Blue = Treated, Maroon = Untreated.
The fat content of treated buffalo milk rises, suggesting that the treatment may have improved the situation. The decline in untreated buffalo milk may indicate a gradual decline in quality in the absence of treatment. SNF While the untreated group exhibits a slight increase, the treated group shows a slight decline; this could be due to feed-related changes or natural variability. The improved protein and solid content of treated milk may have contributed to the slight increase in density. The density of untreated milk dropped, confirming indications of milk deterioration. When it comes to proteins Significant growth was observed in the treated group, which is a clear sign of increased nutritional value. Again, indicating a potential adverse effect of no treatment, the untreated group experienced a decline. There was a slight, but marginal, increase in both groups. Lactose synthesis may have been marginally increased by treatment.
The current study examines how the milk composition of milch cows (Bos indicus) and milch buffaloes (Bubalus bubalis) kept at DKMM Cattle Farm is affected by ectoparasite infestation and the therapeutic intervention that follows. The findings showed that ectoparasite treatment had a significant impact on important milk quality metrics, which enhanced milk composition and productivity.

Impact on Bos indicus Milch Cows
Over the course of the 15-day period, analysis of the milk from treated cows showed a steady and favorable trend in all assessed parameters. A significant increase in fat content (+0.422%) indicated better milk richness and increased energy yield. Likewise, density and solids-not-fat (SNF) showed modest but significant increases (+0.186% and +0.125%, respectively), suggesting a higher percentage of total solids and better milk quality.
Given that protein is a crucial nutritional component and a sign of immunological and metabolic health in dairy animals, a moderate increase in protein content (+0.292%) is especially noteworthy. The slight increase in lactose content (+0.053%) could be attributed to improved udder health and increased carbohydrate synthesis after treatment.
Conversely, untreated cows showed a sharp drop in fat (-0.945%) and SNF (-0.394%) along with a decrease in density (-0.535%), pointing to a decline in milk composition and raising the possibility that ectoparasite stress could impair milk synthesis and nutrient assimilation. Protein levels only slightly increased (+0.034%), most likely as a result of normal physiological variability rather than any improvement in health. These results indicate that ectoparasite treatment substantially improves the overall milk composition and quality in cows by reducing parasitic stress and enabling better nutrient utilization.

Impact on Buffaloes *Bubalus bubalis*,

Buffaloes showed a similar pattern. The fat (+0.583%) and protein (+0.584%) contents of treated buffaloes significantly improved, suggesting improved milk richness and a better nutritional profile. The protein content increase is especially significant because buffalo milk already has a higher protein content than cow milk, and further development could result in higher dairy processing profits (e.g., paneer, cheese production).

A moderate increase in lactose levels (+0.235%) indicated better udder function and increased conversion of glucose to lactose. The hypothesis of improved milk solids concentration was supported by a slight increase in density (+0.204%). Remarkably, SNF decreased slightly (-0.145%) in treated buffaloes, which might be related to variations in water intake throughout the season, individual physiological variations, or seasonal feed variability.

In contrast, the untreated buffaloes showed decreases in density (-0.132%), protein (-0.259%), and fat (-0.353%), suggesting that ectoparasite infestation has a detrimental impact on milk quality. There was only a slight increase in SNF (+0.193%), which might be due to natural variability rather than better health.

Comparative Analysis of Buffaloes and Cows

Although ectoparasite treatment was beneficial to both cows and buffaloes, the amount of protein improvement in buffaloes was higher (+0.584%) than in cows (+0.292%), indicating that the composition of buffalo milk is more susceptible to ectoparasite stress and treatment. The decrease seen in both species' untreated groups emphasizes how ectoparasites negatively affect milk composition and productivity. These findings corroborate earlier studies reporting that ectoparasitic infestations lead to reduced feed conversion efficiency, nutrient loss, and immune suppression, all of which adversely affect milk yield and composition. The post-treatment improvement demonstrates the effectiveness of ectoparasite control in mitigating these negative impacts.

Conclusion

The study unequivocally shows that ectoparasite infestation negatively impacts milk quality parameters in both cows and buffaloes, with untreated animals gradually losing density, fat, and protein values. When compared to their untreated counterparts, treated animals displayed higher fat, protein, and density values, indicating a significant improvement in milk composition.

These results provide compelling evidence that regular ectoparasite control programs are an essential part of managing the health of dairy herds. These actions increase milk quality and farm profitability in addition to improving animal welfare.

In order to maintain optimal milk production, guarantee higher nutritional quality of milk, and maintain long-term financial benefits for dairy farmers, ectoparasite management should be prioritized in dairy farms.

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