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Satish Kumar K
Professor and University Head, Department of Veterinary Medicine, CVSc., Rajendranagar, Hyderabad, Telangana, India

Ambica G
Assistant Professor, Department of Veterinary Medicine, CVSc., Rajendranagar, Hyderabad, Telangana, India

Isai Gautam
Graduate Student, PVNR Telangana Veterinary University, Hyderabad, Telangana, India

Corresponding Author:
Satish Kumar K
Professor and University Head, Department of Veterinary Medicine, CVSc., Rajendranagar, Hyderabad, Telangana, India

Efficacy of ethno veterinary medicine (Herbolact) in bovine mastitis

Satish Kumar K, Ambica G and Isai Gautam

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Abstract
Bovine mastitis is one of the globally known disorders where antimicrobial therapy is a common practice. Misuse of antibiotics both in humans and animals leading to antimicrobial resistance, thus tackling AMR is a global priority. 10 crossbred cattle with 23 affected quarters were selected for the present study. All these cattle showed similar manifestations like hard, hot, and painful swollen udder, with clots/blood in milk along with reduced quantity. Affected milk had a pH of <5 and SCC of >3,00,000. *Staphylococcus* and *E. coli* were the common bacteria that were isolated from the affected Milk samples. Ethnoveterinary medicine Herbolact @ 20 g was applied thrice daily for 3-7 days (depending on the severity). Herbolact was thoroughly mixed with lukewarm water (100 ml) and applied all over the udder (affected quarters + all healthy quarters) with gentle massage. Following treatment for 4 days, improvement in clinical signs were recorded in 15/23 quarters with complete clinical recovery among the remaining 8 quarters that were severely affected also showed improvement by day 7. Culture negative was recorded in 14/23 samples on day 4 and whereas, completely negative among all the remaining samples were also recorded on day 7 of treatment.

Keywords: Bovine mastitis, ethnoveterinary drugs, Herbolact

Introduction
Irrational use of antimicrobials in therapy and prophylaxis is the most common cause of developing antimicrobial resistance, which has emerged as a global threat affecting not only animals but also humans (Tang *et al.*, 2019) [17]. This has become one of the major resons for increased morbidity and mortality, thus predicting its contribution to 10 million deaths per year with an estimated economic loss of 100 million dollars and 11% loss of production of livestock (Firth *et al.*, 2021 and Pulingam *et al.*, 2021) [7, 16]. This is also an emerging concern of environmental pollution as the manure mixed with antibiotic residues spreads out in agricultural soils (Cagnardi *et al.*, 2018) [4]. In order to curtail antimicrobial misuse and thereby reduce antimicrobial resistance, the WHO has linked up animal, human and environmental health under one health concept. Mastitis is one of the common disorders affecting animal health and farmers' wealth. Various antibiotics form the mainstay in the treatment of mastitis. In cattle, of all the conditions, the majority of antimicrobials used are for the treatment of mastitis (Ajose *et al.*, 2022) [1]. Irrational or misuse of antibiotics contributes a major role in the subsequent development of antimicrobial resistance and thus alternative medicine, like ethnoveterinary or herbal medicine is being practiced as the most sustainable approach (Khan *et al.*, 2019 and Ajose *et al.*, 2022) [10, 1]. Hence, the present study is proposed to study the efficacy of one of the ethnoveterinary medicine (Herbolact) in clinical mastitis cattle.

Materials and Methods
The present study was carried out in a group of farmer-owned crossbred cattle at certain parts of Ranga Reddy district of Telangana State. A total of 10 crossbred cattle that were showing the signs of clinical mastitis *viz.*, swollen udder with change in the quality and quantity of milk were selected for the study. Milk samples from the affected quarter were collected in sterile vials to examine somatic cell count and pH and later subjected to CMT to confirm mastitis. Ethnoveterinary medicine Herbolact @ 20 g was applied thrice daily for 3 – 7 days (depending

on the severity). Herbolact was thoroughly mixed with lukewarm water (100 ml) and applied all over the udder (affected quarters + all healthy quarters) with gentle massage (fig. 1a and 1b). Before each application, milk was completely stripped out and the udder was cleaned and dried. Milk samples were collected on day 0 (before therapy), 4 (during therapy), and 7 (after therapy) to evaluate SCC and pH and thus to evaluate the efficacy of ethnoveterinary medicine.

Fig 1: Mastitis affected cattle being treated with Herbolact

Results and Discussion

A total of 10 crossbred cattle between 3-5 lactation that were showing signs and lesions of varied intensity related to clinical mastitis were considered for the study. Out of these 23 quarters were affected with mastitis. Mastitis is one of he most predominant disease that affects the dairy cattle globally not only occurs during lactation but also during dry period. A wide variety of infectious pathogens may cause mastitis that occurs in either clinical or subclinical forms. Mastitis not only affects the udder but also the quality and quantity of the milk in the affected animal thus rendering huge economic loss to the farmer (Mushtaq *et al.,* 2018) [12]. Almost all these cattle were showing similar signs *viz*., swollen painful udder, hot and painful on palpation, engorged and swollen teats, milk with clots or blood and odor (table). Few farmers also reported a drop in the yield during the past couple of days. Mastitis, particularly, the clinical form is characterised by hard and swollen udder and teats with the presence of clots which alters the quality and quantity of the milk (Kholif *et al.,* 2017) [11]. Mastitis in severe cases and forms not only cause huge economic loss to the farmer, but may also cause death of the affected cattle (Kholif *et al.,* 2017 and Bianchi *et al.,* 2019) [11, 3].

Table 1: Showing various clinical parameters of mastitis affected udder (+ mild, ++ moderate, +++ severe, ++++ extreme severe, - absent / improved)

Sl. No	Parameter	No affected	Day-wise improvement in affected quarters		
			Day 0	Day 4	Day 7
1	Swollen udder	23	+++ to ++++	- to ++	-
2	Hot and Painful udder	19	+++ to ++++	- to ++	-
3	Clots in milk	14	+++ to ++++	- to ++	-
4	Blood in milk	6	++ to +++	- to ++	-
5	Altered pH of milk (mean)	23	5.4	6.9	7.8
6	Altered SCC (mean)	23	3,50,000	2,00,000	1,00,000
7	Bacterial culture	23	++++	+ to ++	-
8	Reduced yield	23	+++ to ++++	+ to ++	-

The mean somatic cell count was 3,50,000 and whereas the pH of the affected milk samples was 5.4. *Staphylococcus sps* and *E.coli* were the common bacteria that were isolated from the affected milk. Mastitis is diagnosed by various methods such as using Californian mastitis reagent to recently developed an Immuno Chromatographic Strip coated with anti-ribosomal protein L7/L12 for detecting staphylococcus aureus associated bovine mastitis (Nagasawa *et al.,* 2020) [13]. However, other parameters like somatic cell count (> 2,00,000) and milk pH (<6) is also considered for diagnosing mastitis and also for assess the therapeutic progress (Williamson *et al.,* 2022) [18]. Due to migrating neutrophils in mastitis affected udder, there is an increase in both epithelial cells and leukocytes, thus increasing the somatic cell count which can be detected by Californian mastitis test reagent. Some of the common bacteria like *Streptococcus* sp., and *Staphylococcus aureus* that was normally seen on the skin are common pathogens apart from other environmental microorganisms like *E.coli* and other coliforms. Some of these bacteria cause toxemia that actually damages or alters the mammary tissue (Yang *et al.,* 2019) [19].

Following application of Herbolact twice daily for 3 days, 15/23 quarters revealed alleviation of signs like reduction in udder size, pain and other inflammatory signs. Milk abnormalities returned to normal with the absence of clots/milk. Further, there was also an improvement in the milk quantity. However, the remaining 8 quarters that were severely affected also showed similar improvement signs following treatment for 7 days. Antimicrobial treatment using antibiotics is the mainstay of mastitis treatment in bovines. These drugs raised a concern for human consumers due to the presence of antibiotic residues in the milk. Further oral antibiotic use also being restricted in certain parts of the world as these are some of the probable causes of developing antibiotic resistance both in human and animals. Thus the role of alternative medicine is emerging and most of the diseases including the mastitis is now being treated with various herbal drugs (Harjanti *et al.,* 2019) [9]. Ethnoveterinary practice that includes the utilisation of whole plant or its components as medicine being used by rural people traditionally is passed through many generations. These components has various properties like, antibacterial, antifungal and antioxidant properties that help in preventing or curing the disease there by increasing the production (Bakare *et al.,* 2020) [2].

The present ethnoveterinary medicine, Herbolact contains aloe vera, curcuma longa and calcium hydroxide acts

synergistically and provides an effective cure in clinical mastitis owing to its wide spectrum of antimicrobial, antioxidant, anti-inflammatory and immunomodulator affects (Nair *et al.,* 2017) [14]. The herbal ingredients, aloe vera, curcuma longa and calcium hydroxide improve the status of metabolism, reduces the inflammation and microbial load, cleanse the toxins of various parts of the body including udder and lactiferous tissue and pacify the aggravated pitta dosha and raktha doosha (Charaka Samhitha, 1992) [6]. Following treatment for 3 days, 14/23 milk samples revealed culture negative, whereas, the culture test was completely negative among all the remaining samples on day 7 of treatment. Further, there was no recurrence of mastitis among these recovered animals till 6 months. The ethno-veterinary herbal medicine is one of the most sustainable alternative medical practices that incorporate traditional beliefs to scientific knowledge on medicinal plants is an simple, easy and cost effective alternate approach with much less to no side effects (Khan *et al.,* 2019 and Chakale *et al.,* 2022) [10, 5] promising therapeutic efficacy with minimal side effects, lack of AMR to these phytochemicals, and reduced drug residues in animal products (Hallier *et al.,* 2013 and Pas *et al.,* 2020) [8, 15].

Conclusion

Ten crossbred cattle with 23 clinical mastitis-affected quarters were evaluated and treated with ethnoveterinary medicine, Herbolact topical application @20g, thrice daily for 3-7 days. Successful clinical recovery of all the affected quarters were recorded along with culture-negative among 61 percent and 100 percent on day 4 and 7, respectively. Hence, it may be concluded that the ethnoveterinary medicine, Herbolact is effective against clinical mastitis in bovine. However, further studies involving a larger sample are warranted.

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