

# Effective Treatment of Bovine Mastitis with Herbal Medicines: An Alternative to Antibiotics

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## Abstract

Mastitis in indigenous and exotic cattle reared for dairy purposes is a highly prevalent infectious disease, leading to considerable financial loss to farmers. Mastitis causes huge economic losses to dairy industries by reduced milk quality and production, mortality, and culling of cows and also due to the cost required for treatment. Common treatment available against disease is the intra-mammary, intramuscular, and intravenous infusion of antibiotics. However, antibiotic use is associated with the problem of antibacterial resistance, residues in milk, and residual effect in

the food chain. This led to a search for alternative treatment methods necessary. Medicinal herbs or plants are an excellent resource that can be used as an alternative treatment method. The plants form an essential component of ethno-veterinary medicine used in the treatment of diseases like bovine mastitis. This article helps to provide brief information on the medicinal plants used in the treatment of bovine mastitis. Antimicrobial studies of these plant species, some of their extracts and indications for how to use have been included in detail so that the farmers on their level can check mastitis.

**Keywords:** Antibacterial, Bovine mastitis, Ethno-veterinary, Medicinal plants, Residual effect.

## INTRODUCTION

Mastitis in indigenous and exotic cattle reared for dairy purposes is a highly prevalent infectious disease, leading to considerable financial loss to farmers. Cows suffering from mastitis cannot be milked regularly after the mammary gland cells are affected along with the formation of a clot in milk. Collectively, these factors cause huge economic losses to dairy industries by reduced milk quality and production, mortality, and culling of cows and also due to the cost required for treatment. The main mastitis-causing pathogens include contagious bacteria and fungi that survive and replicate on the skin surface and teat wounds, e.g., *Staphylococcus aureus*, *Streptococcus agalactiae*, and *Streptococcus dysgalactiae*, as well as environmental contaminants that are not retained on the teat, e.g., *Streptococcus uberis*, *Escherichia coli*, and other coliforms. These bacteria gain entry into mammary glands of cows through their teat canal,

where they colonize, replicate, synthesize toxins and release toxins, affecting the mammary gland cells.

### Reasons for alternative to antibiotics:

Continuous and inappropriate use of antibiotics is developing resistance in microbial population leading to its ineffective treatment. Antibiotic use is associated with the problem of residues in milk and residual effect in the food chain. The indiscriminate use of these products may contribute to the establishment of persistent infections in the udder. Demand for organic products has become a priority in livestock health research. Side effects like digestive disturbances, fungal infection, drug interaction, etc can be avoided by the use of herbals. Expensive treatment expenses can be avoided. Medicinal plants like *Azadirahcta indica* (Neem), *Garcinia indica* (Kokam), *Aloe vera*, *Allium sativum* (Garlic) and *Tinospora cordifolia* (Giloy) are studied against mastitis.

## Medicinal Plants

Medicinal plants beneficial against mastitis are well studied and evaluated one by one.

### Azadirahcta indica (Neem)

Neem tree is native to the Indian subcontinent and is typically grown in tropical and sub-tropical regions. Indian Ancient Ayurveda was the first to bring the antifungal, antihelmintic, antibacterial, antiviral, antioxidant, immunomodulatory, and antitumorigenic constituents of the neem tree to the attention of Indian people. Neem is traditionally used as medicine and neem leaves are consumed as prevention from various diseases. Similarly, neem leaves and seed kernels are traditionally used in animal populations from ancient times as herbal antiseptic, herbal antibacterial, and herbal antifungal.

Triterpenes and carbohydrates are active principles. Cause reduction of somatic cell count, milk neutrophils, nitric oxide content, and total bacterial count which reflects the anti-inflammatory and antimicrobial activities of the herb. Nimbidin is the main active antibacterial ingredient and the highest yielding bitter component in the neem oil which is extracted from neem leaves and seed kernels. Nimbidin has antimicrobial property against *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus uberis*, *Streptococcus dysgalactiae* and some candida spp.

To extract neem oil, the tree seeds weighing 100mg are crushed, then filtered or warm 100ml water is added into crushed seeds and mixed uniformly, the further mixture is kept for overnight and the next morning mixture is sieved properly. Such freshly extracted 15ml neem oil is injected intramammary in the affected quarter of the mammary gland once in a day for a couple of weeks.

### Garcinia indica (Kokum)

Kokum is a fruit-bearing tree and is native to the Western Ghats region of India located along the western coast of the country. Kokum is found in forest lands, riversides, and wastelands. These trees prefer evergreen forests but can be seen in areas with relatively low rainfall. Guttiferone-A and 7-epiclusianon from the fruits and seed kernels of a tree are the active principles. It has antimicrobial property against *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus uberis*, and *Bacillus cereus* along with the trypanocidal, antispasmodic, antioxidant, antitumorigenic activity.



Kokum Kernels

### Allium sativum (Garlic)

A common herb, annual in life form. Its bulb is known for its medicinal properties. Allicin (diallylthiosulfinate) is a defense molecule from garlic with a broad range of biological activities. A study conducted by has shown the efficacy of 150 g of garlic bulbs ground and mixed with butter in 7-day recovery or an alternative dose of 1–2 glasses of garlic, resulting in a 10-day recovery. The sensitivity of antibiotic-resistant strains to certain antibiotics may increase by a fresh garlic extract. A significant decrease in the number of somatic cells was observed in all sample from the demonstrated level of over 100 thousands/ml to the value of several tens of thousands in 2-3 weeks post-treatment. It acts by inhibiting the proliferation of bacterial cells and has immune potentiating activity.

More than 50% recovery was observed in animals affected with mastitis when treated with Garlic, Vitamin E & Se, and Lemon separately.

Clean kokum kernels are boiled using a steam boiler and these kernels are then sent to the oil press to obtain kokum oil. Kokum oil can be extracted traditionally from kokum kernels by roasting the seeds on a wooden fire and such roasted seeds are finely grounded on a grinding stone; such powdered seeds generate moisture which gives it pasty appearance; water is added to paste and such paste is boiled on low flame. Boiling causes the release of oil and helps it to float on water. Such oil is collected and filtered. Kokum oil is applied to an affected quarter of mammary gland thrice in a day for at least two weeks.

### Aloe Vera

A Succulent plant species are widely being used as a medicinal plant for various conditions like an antioxidant, antibacterial, antifungal, antiviral, wound healer, diabetes, etc. Because of its antibacterial activity against *Staphylococcus aureus* (*S. aureus*), *Escherichia coli*, MRSA (Methicillin Resistant *S. aureus*), *Streptococcus* spp., it can be used in mastitis treatment. Bacterial Cell Membrane Disruption was observed in the above-stated species after incubation for 24 hours with methanolic extract of Aloe vera.

Aloes helps to drain the infection, has anti-inflammatory properties, and is a coagulant. It has a diuretic property also, which serves to soften the hardened udder. Coats and Holland recommend injecting 20 to 60 cc of aloes (in gel or juice form) into the infected quarter at least once a day or can be applied over udder in paste form.

Aloesin, Aloin, Aloe-emodin, Aloe-mannan are the active compounds. The ingredients required for the preparation of herbal paste were Aloe vera (3 leaves gel), turmeric powder (handful quantity), and lime. Dilute it with water and apply over infected and normal udder after the complete draining of quarters. In the study pH, conductivity, and somatic cell count of mastitis found lesser than the positive control in the herbal treatment after 5 days of post-treatment.



### *Tinospora cordifolia* (Giloy)

Genetically diverse, large, deciduous climbing shrub with greenish-yellow typical flowers, found at higher altitude. It is famous for its medicinal properties like antimicrobial, anti-diabetic, anti-spasmodic, anti-inflammatory, anti-oxidant, anti-stress, anti-malarial, immunomodulatory and anti-neoplastic activities. Gloitin, Tinosporic acid (active compounds) aids in increasing the phagocytic activity of PMNL cells in milk in Subclinical mastitis and also play a role in a specific and nonspecific immune response. Upadhy and coworkers demonstrated the antibacterial activity of *Tinospora cordifolia* extract against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus vulgaris*, and *Salmonella typhi*. Intramammary infusion of a polysaccharide fraction of *T. cordifolia* (PFTC) treatment significantly reduced the somatic cell count (SCC) and neutrophil count. The stems were cut into small pieces washed, shade dried and pulverized by a mechanical grinder, passed through a mesh sieve. Further, dilute the obtained paste in PBS and infuse intramammary for 1-2 weeks.

It is concluded that Dairy farming is one of the largest sources of economy in India. Mastitis and its consequences led to serious losses to the farmers and entrepreneurs engaged in the Dairy farming sector. The commonest treatment available against mastitis is the intra-mammary, intramuscular, and intravenous infusion of antibiotics. However, antibiotic use is associated with the problem of antibacterial resistance, residues in milk and residual effect in food chain therefore use of herbal medicines against mastitis is the best alternative. Proper management, preventive measures, and alternatives to allopathic medicines need to gear up in the animal sector to reduce the financial viability of farmers and save them from an economic crisis.



# DIGITIZING INDIAN AGRICULTURE

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By 2050, the world's population will be nearly 10 billion. Much of the addition will be in developing countries like India, where increasing quality of life often causes an increase in food intake per capita. As a result, to feed the planet we will need to produce 50% more food than we do today, despite restricted and insufficient arable land and water supplies. At the same time, existing agricultural activities, absorbing 70 % of global water withdrawal (and 91% in India), are largely ineffective. An example is the still commonly used flood irrigation system, which wastes water and yields unoptimized. The planet will need to embrace smart technology and learn how to best use its capital to produce more with less. India is one of the world's most water-challenged countries, with 16 % of the world's population and just 4% of world's water supplies. With more than 90% of freshwater withdrawals going to agriculture and following the unpredictable monsoon and conventional farmers' use of inadequate flood irrigation - including for rising water-hungry crops such as paddy, cotton and sugarcane - groundwater levels have dropped over the years. Water shortage, declining cultivable land and lower productivity add to the farming community's woes in India and highlight the need for sector reform. Drip irrigation is a technology that gives each plant the amount of water and fertilizers it needs, when and where it needs them. This helps farmers to double their yields by using just 50 percent of the water provided by conventional irrigation methods, by increasing the productivity of other farm inputs such as fertilizers, pesticides, labor, etc. India has over 140 million hectares of net cultivated land and about 45% of the land is irrigated. Roughly 9 million ha are currently under micro irrigation, around four million ha of which is irrigated by drip. It means a long way to go in agriculture for a smarter India

Farmers in India once had no landline phones and went straight to cell phones. This technology is the same. There's great technology transforming agriculture and helping farmers dramatically increase yields. For example, an ongoing project at Ramthali in Karnataka is spread over 11,000 ha and involves over 6,000 farmers. The community-based drip irrigation system is regulated from where we can determine how much water will go to each field and, when, everything is digital, wireless the hardware, data and other digital resources are continually dropping and their functionality improves, you don't need to own a large farm to reap the advantages and high returns of these systems.

I assume we will see a much wider adoption of advanced drip irrigation technology in India in five to 10 years from now, and every farmer will have an integrated, intelligent system that he can run from his mobile device. These mass adoptions would boost farm sector profitability, and India's overall economy would increase farmers' income. It is the vision of "smarter India," a vision already happening

