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Therapeutic Efficacy of Mayir Manikam (*Sida spinosa* Linn.) in Calf Diarrhea

Selvam R.*
Department of Animal Genetics and Breeding,
Veterinary College and Research Institute, Theni (Tamil Nadu), India.

(Corresponding author: Selvam R.)*
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ABSTRACT: Preserving traditional knowledge of medicinal plants and ethnoveterinary practices is crucial for future generations. The objective of this present study is to analyze the efficacy of *Sida spinosa* Linn. in treating calf diarrhea. *Sida spinosa* Linn. belongs to the family Malvaceae and is commonly known as 'Prickly Fan-Petals', 'Prickly Sida', 'Kantakinibala' and in Tamil it is called 'Mayir manikam'. It is widely used in Ayurveda and Siddha medicine. It is an annual weed found throughout the hotter parts of India and flowering occurs in October- December. The leaves are demulcent and refrigerant and the root is demulcent, gentle tonic and diaphoretic. The roots and leaves are used in the treatment of diarrhea and dysentery. The leaves are used for skin diseases and orally for snake bite treatment. The roots are used in gonorrhoea, debility, and fever. The whole plant is used in arthritis, asthma, bronchitis, burning sensation, haemorrhoids, intermittent fever, general debility, dysentery, diarrhea, malaria, renal inflammation, and cardiac diseases. Reports state that the extracts and isolated compounds from these plants (alkaloids, flavonoids and ecdysteroids) showed antimicrobial, anti-inflammatory, analgesic, hepatoprotective, antiulcer, cytotoxic, cardioprotective, neuroprotective, antitubercular, antioxidant, nephroprotective, antidiabetic, abortifacient and antipyretic activities. The powdered leaves of this 'Mayir manikam' plant was mixed with the curd and given orally, twice a day for controlling diarrhea in young calves. The efficacy was evaluated by the average number of doses required for complete recovery. Complete recovery was seen in two to three days in all the treated animals with no recurrence. This 'Mayir manikam' leaves and curd mix can be used for treating non-specific diarrhea in calves. This is the first record of a clinical research on the use of the plant *Sida spinosa* Linn. to treat calf diarrhea.

Keywords: *Sida spinosa* Linn., Mayir manikam, Calf diarrhea, Scours, Treatment.

INTRODUCTION

Calf diarrhea commonly referred to as enteritis or calf scours, is a gastrointestinal illness that primarily affects pre-weaned calves. It has a significant impact on animal welfare and productivity in the livestock farming industry. The most frequent cause of sickness and death in pre-weaned calves is calf diarrhea, which can result in significant financial losses because of the high death rate, high expense of treatment, and potential for stunting (Lorenz *et al*., 2011). The calf diarrhea is multifactorial in nature, with contributing variables including feeding and management practices, environmental factors, and both infectious and non-infectious factors. For newborn calves, diarrhea can be lethal because of acidity and dehydration, which can cause ataxia and anorexia. The symptoms of diarrhea might worsen quickly. Despite the development and implementation of numerous new intervention measures, such as vaccinations, treatments, and herd management, the ailment still has a large economic burden. A variety of enteric infections, including bacteria, viruses, and protozoa, contribute to the development of this illness. Several factors contribute to the varying rates of pathogens and disease occurrence on farms, including Geographic location, Farm management practices and Herd size. These factors influence the prevalence of specific pathogens and ultimately impact the overall disease incidence, emphasizing the importance of tailored approaches to disease prevention and control (Cho and Yoon 2013).

Calf diarrhea is caused by Salmonella, Clostridium, Yersinia, and Campylobacter genera of bacteria, with Escherichia coli being the main causes. In viruses, primarily rotavirus, coronavirus, and BVD and parasites that are most found are *Strongyloides* sp, *Giardia sp, Eimeria* sp, and *Cryptosporidium parvum*. In calves that are fed artificially, diarrhea is frequently the result of digestive issues. Risk factors for calf diarrhea include milk replacers, inconsistent feeding, variations in the milk replacer's temperature, and modifications to the dam's diet or pasture. In general diarrhea is extremely uncomfortable and painful for calves. The dehydration is the primary cause of death, replacing electrolytes is a crucial part of any therapeutic strategy. The main objective of rehydration therapy for animals is to restore their fluid balance and the electrolyte

feedings ought to be added to milk feedings (Tilling, 2013).

Previous research concluded that antibiotic treatment of calf diarrhea is inappropriate. The medications used to treat calf diarrhea could significantly reduce the intestinal flora and the beneficial natural bacteria that help with digestion and detoxification are hindered in ruminants when broad-spectrum antibiotics are administered. Antibiotic resistance develops as a result, and animal products contain antibiotic residues (Peter, 2004). Non-steroidal anti-inflammatory drugs have shown positive effects because they reduce pain and inflammation. Vaccines presently target the most prevalent infectious causes of diarrhea in calves; however, a prophylactic measure will only be successful if calves receive adequate high-quality colostrum within a few hours of birth (Gabriele *et al.*, 2022).

In India, the majority livestock farmers still rely on their own traditional treatment methods particularly ethnoveterinary medicines. Plant-derived components, being integral to the natural physiological processes of living organisms, are believed to exhibit enhanced biocompatibility, reduce treatment expenses, and minimize adverse side effects commonly associated with conventional medications. This is attributed to their inherent harmony with the human body, making them a promising alternative for safer and more cost-effective therapeutic options. The benefits of using ethnoveterinary treatment for calf diarrhea include its easy accessibility, lack of tissue residue, capacity to address drug resistance, affordability, and efficacy (Jayakumar *et al*., 2018).

Sida spinosa Linn. is a member of the Malvaceae family of plants used for traditional medicine to cure a variety of conditions, including snakebite, skin conditions, respiratory conditions, diarrhea, and dysentery. It is known as Kantakinibala, or prickly fanpetals, prickly sida, spiny sida, teaweed, In Bengali: bon methi, in Gujarati: kantalo bal, in Hindi: baryar, gulsakari, in Malayalam: kurunthotti, in Marathi: bala, jungali methi, in Sanskrit: gangeruki, kantakinibala, mahabala, nagabala, sahadeva, visvadeva, in Telugu: nagabala, in Urdu: baryar and in Tamil it is called Mayir manikam (eflora of India, 2011). This plant is mostly found at a height of 4400 feet in the warmer regions of India (Khilari, *et al*., 2018). This perennial herb spreads freely across open clearings, roadside ditches, waste areas, and farmed fields. It has several branches and is erect (Singh and Navneet 2018). Thirty filiform, stellate leaves make up the plant. The plant is 1-2 m tall with 3-5 mm long stipules and 1-2 mm long petioles. Furthermore, fruits are attached toward the tip or center, pedicel 2-4 mm long, solitary or in clusters, and blooms in axillary and terminal branches 1-2 in fascicles. The fruits are globular, compact, and have a pubescent layer above the calyx, which is 4-5 mm long (Aminah *et al*., 2021). Leaves are refrigerant and demulcent and said to be beneficial for gonorrhoea, gleet, and burning urine. Root is used as a diaphoretic and tonic in mild cases of fever and debility. According to Kirtikar and Basu (1987), a decoction of it is used as a demulcent for bladder discomfort and gonorrhoea. Ayurveda refers to the genus Sida as "Bala." A drug known by the Sanskrit word "Bala" is highly valued for its anti-pyretic and anti-rheumatic qualities. In addition, it is utilized to treat uterine problems, fever, leukorrhea, TB, diabetes, and neurological disorders. Research has demonstrated that *Sida spinosa* Linn. possesses a broad spectrum of biological activities, including anti-cancer, anti-HIV properties, liver protection, abortion induction, microbial inhibition, and immune system enhancement (Sivarajan and Pradeep 1996). Further studies have confirmed its diverse pharmacological properties, such as antibacterial, antifungal, and anti-parasitic effects, anti-fertility, antidiabetic, and anti-inflammatory actions, antioxidant, anti-arthritic, and cytoprotective capabilities and hepatoprotective, anti-diarrheal, and analgesic effects (Deepak *et al*., 2023). This study specifically investigated the efficacy of *Sida spinosa* Linn. in treating calf diarrhea and enhancing overall health.

METHODOLOGY

The calves that were showing signs of semi-solid to watery dung with or without other signs including reduced appetite, dry skin and coat, and dehydration were considered for the evaluation protocol. Treatment was initiated with the oral administration of traditional ethnoveterinary medicine formulation consisting of powdered leaves of this *Sida spinosa* Linn – "Mayir manikam" plant, that was mixed with the curd and given orally, twice a day for controlling diarrhea in young calves at the Dairy section, Livestock Farm Complex, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India. The treatment was continued consecutively for three days by making fresh formulation every time before application. The efficacy was evaluated by the average number of doses required for complete recovery. However, the required supportive medication and other supplements were also included.

RESULTS AND DISCUSSION

In Ayurvedic and Siddha medicine, the *Sida spinosa* Linn, also known as the "Mayir manikam," is frequently utilized. It is an annual weed that grows from October to December in the hotter regions of India. The animals in this study were given an ethnoveterinary formulation consisting of powdered leaves of the *Sida spinosa* Linn. plant, mixed with curd, recovered in three days, and their feed intake returned to normal, with an overall improvement in the animals' general body condition. All treated animals showed full recovery with no recurrence in two to three days. The leaves and curd mixture can be used to cure calves' non-specific diarrhea. It was revealed that the traditional ethnoveterinary medication was successful in treating diarrhea.

Within the Malvaceae family, the genus Sida L. is one of the most varied, containing over 200 species spread across the globe and 142 chemical components recorded for Sida across several classes. Approximately 16%, 13%, and 11% of all classes were discovered to be alkaloids, flavonoids, and phytosteroids,

respectively. Previous investigations on the phytochemical examination of *Sida spinosa* Linn. found that the plant's extracts contained tannins, terpenoids, alkaloids, carbohydrates, proteins, and amino acids in addition to flavonoids, glycosides, and saponins (Narendra *et al*., 2011). Selvadurai *et al*. (2011) identified an array of phytochemicals in *Sida spinosa*, encompassing alkaloids, carbohydrates, glycosides, flavonoids, and phytosterols. The roots, employed as a nervine and diaphoretic tonic, contain alkaloids like betaphenethylamine and ephedrine (Prakash*et al*., 1981). Further analysis by Khare (2007) revealed additional compounds, including vasicinol, vasicinone, and ecdysterone. Notably, the compounds with the greatest number of biological and pharmacological actions reported for the genus were flavonoids and alkaloids.

Extensive research has confirmed the multifaceted benefits of plant extracts and compounds, including antimicrobial, antioxidant, and anti-inflammatory properties. *Sida spinosa* has been specifically shown to inhibit the growth of various bacteria, fungi, and pathogens, highlighting its potential as a therapeutic agent (Rodrigues and Oliveira 2020; Navaneethakrishnan *et al*., 2011; Karteek *et al*., 2011). When *Sida spinosa* root is extracted aqueously, it exhibits potent antipyretic properties against fever caused by yeast. According to Sangreskopp *et al*. (2013), the body temperature was considerably decreased by the higher dosage of the aqueous extract.

Several Sida species have been used in traditional medicine for a variety of purposes. *Sida spinosa* Linn. is used to treat atonic asthma and other chest disorders (Prakash *et al.,* 1981). The roots and leaves of *Sida spinosa* are used to treat diarrhea and dysentery (Noumi and Yomi 2001). The root of *Sida spinosa* Linn. exhibits strong antipyretic properties in a test for yeast-induced pyrexia and has antibacterial properties against Staphylococcus aureus, Bacillus subtilis, Escherichia coli and S. aeruginosa (Mannasaheb 2013). The high antipyretic effect of the *Sida spinosa* root aqueous extract may be attributed to the presence of flavonoids and phenolic tannins, which are largely responsible for inhibiting prostaglandin synthesis in the hypothalamus (Noumi and Yomi 2001). According to Elumalai *et al*. (2011), flavonoids, tannins, and other phytochemical components are responsible for *Sida spinosa*'s antioxidant action. According to Darwish and Reinecke (2003), in addition to their anabolic qualities, the phyto ecdysteroids derived from *Sida spinosa* Linn. also exhibit diuretic and tonic effects and biological activity as insulin regulators.

This is the first record of a clinical research on the use of the plant *Sida spinosa* Linn. to treat calf diarrhea. However, various ethnoveterinary formulations and plants from the Sida species have been shown to be quite successful in treating diarrhea in previous research. In their review, Dinda *et al*. (2015) examined the various applications of *Sida spinosa* Linn. in traditional medicine for the prevention and treatment of various illnesses, including dysentery, diarrhea, gastrointestinal and urinary tract infections, malarial fevers, problems related to childbirth and miscarriage, skin conditions, cardiac and neurological issues, respiratory disorders like asthma and bronchitis, aids in weight loss, rheumatic and other inflammations, and tuberculosis and they concluded that alkaloids, flavonoids, other phenolics, and ecdysteroids might be accountable for the actions of plant extracts in this genus, though no clinical studies were reported. Mary *et al*. (2012) reported that the similar plant in the same Sida family, Sida rhombifolia has anti-inflammatory, antimicrobial, anthelminthic, antifungal, and anti-rheumatic properties, it can be used topically for chicken pox and female infertility, as well as for the treatment of diarrhea, cough, and ulcers. Mah *et al*. (2017) also stated that the *Sida rhombifolia* Linn. found to have anti-inflammatory, cytotoxic, and anti-cholinergic properties and they also noted that they have been used traditionally to treat fevers, gastrointestinal dysentery, diarrhea, malaria, asthma, and inflammation. Sarangi *et al*. (2011) examined the antidiarrheal properties of a methanolic extract of Sida rhombifolia root in children with castor oil-induced diarrhea and they found that an oral dose of Sida rhombifolia extract significantly reduced the severity of diarrhea. Bhardwaj *et al.* (2019) reported that the *Sida acuta* and *Sida chordate* used in diarrhoea and dysentery. Sustainable livestock production greatly benefits from the practice of ethnoveterinary medicine. Conventional herbal medicine is a valid approach that is essential in tackling the livestock health problems. The results of this study offer a substantial addition to the investigation of possible innovative plant-based livestock treatments and are relevant to the documentation of ethnoveterinary knowledge.

CONCLUSIONS

Preserving traditional knowledge of medicinal plants and ethnoveterinary practices is crucial for future generations. This study pioneers clinical research on *Sida spinosa* Linn. as a treatment for calf diarrhea, revealing its powdered leaves effectively alleviate non-specific diarrhea in young calves. Ancient Tamil literature also recognized this plant's antidiarrheal properties, as follows.

The results of this investigation are useful for recording ethnoveterinary knowledge and make a substantial addition to the investigation of possible new plant-based treatments for livestock. Further investigation is essential to unravel the bioactive phytochemicals responsible for its efficacy. To pinpoint the compound driving this effect, additional research should focus on extracting, purifying, and characterizing the active constituents.

FUTURE SCOPE

This is the first documented clinical study on the application of Sida spinosa Linn. to the treatment of diarrhoea in calves. The benefits of using traditional ethnoveterinary medicines include their affordability, effectiveness, ease of administration, absence of tissue residue, ability to treat drug resistance, and ease of accessing.

Veterinarians are need to be trained in the field of ethnoveterinary medicine. To ascertain the therapeutic dosages, modes of action, and potential interactions with other substances, more research is encouraged. To extract, purify, and characterize the active ingredients of herbal plants and identify the bioactive phytochemicals that underlie their efficacy, more research in ethnoveterinary medicine is imperative.

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Conflict of Interest. None.

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