

Traditional Remedies for Myiasis by Plant-based Preparation

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Abstract

Myiasis is a parasitic infestation caused by the fly larvae which poses a significant threat to livestock's health, production and also affects human health as well. Although there are many conventional treatments for myiasis but it becomes difficult to manage this challenging condition as due to the development of resistance against synthetic insecticides. This book chapter focuses on developing the use of traditional plant based remedies as an alternative strategy for dealing with myiasis by discussing the efficacy of various traditionally used plants like neem, aloe, hermal, tulsi etc. It also focuses on their medicinal properties, mechanism of actions for successfully eliminating the maggots, preventing the development of secondary infections and promoting the wound healing. Since there are many advantages of using traditional herbal remedies but there is a need for standardization, regulation, and integration with modern medicine. Additionally, it also highlights the emerging role of nanoparticles technology in promoting the efficacy and delivery of plant based remedies. This book chapter aims to provide a comprehensive overview of some of the traditionally used plants for myiasis treatment, highlighting their properties as a sustainable and effective treatment strategy.

Keywords: Myiasis, herbal, fly, larva, medicine

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Introduction

Myiasis also called 'Flystrike' is defined as a parasitic infestation which flies cause larvae of order Diptera infestation that grows inside the host body and feeds on the dead tissues (Mahiuddin, 2015; Zahan, 2018). It can be an intestinal or cutaneous infection. Intestinal myiasis can occur by ingestion of contaminated food with eggs or larvae of flies whereas cutaneous myiasis can occur by laying of fly's eggs on open wounds (Udgaonkar et al., 2012; Zahan, 2018; Sykes et al., 2021). Myiasis most likely to occur in animals having long hairs where the chance of infestation is high. Animals like cats, sheep, dogs, and horses (; Burns, 2010; Francesconi & Lupi, 2012). Living organisms having open wounds have more risks of getting myiasis (Millikan, 1999; Singh & Singh, 2015; Bautista-Garfias et al., 2023). This infestation occurs as the flies are attracted to open wounds, urine and feces. Non-myiasis flies like houseflies are responsible for accidental infestation of skin and primarily feed on decaying matters while myiasis flies like botflies, screwflies, and blowflies look for an open wound, actively infest living tissues and feed on host body tissues causing myiasis. Species of myiasis flies can even infest on unbroken skin (James, 1947; Robbins & Khachemoune, 2010). This parasitic infestation occurs more often in tropical areas where the flies are particularly abundant in numbers (Bernhardt et al., 2019; Bambaradeniya et al., 2019; Bautista-Garfias et al., 2023;). Such conditions occur in areas having poor sanitation, limited accessibility of healthcare, warm and humid climates which support the proliferation of flies (Singh & Singh, 2015; Singh & Kaur, 2019).

Three main families of flies cause myiasis in livestock and occasionally in humans by either laying their eggs in the open wounds or in the food (Hall & Smith, 1993; Hall, 1995). Once the eggs are hatched, the larvae penetrate the skin of the host and live inside the body tissues causing many clinical symptoms.

Following are the families

- *Calliphoridae* (blowflies) (Rognes, 1997; Whitworth, 2019)
- *Oestridae* (botflies) (Otranto et al., 2004; Scholl et al., 2019)
- *Sarcophagidae* (fleshflies) (Hall & Smith, 1993; Ramana, 2012)

Myiasis has great impact on the livestock economy and production (Chhabra & Pathak, 2009). As mentioned above the main etiological agent of myiasis is the larvae of flies. As soon as the flies find a wound or edible items, they lay their eggs, which are transformed into larvae

and ultimately produces the myiasis infestation. The cutaneous myiasis infestation is responsible for producing severe and for reaching tissue damage, pain, and discomfort, as well as weight loss, reduced growth rates, secondary infections, and reduced fertility chances (Mukandiwa, 2012). The intestinal myiasis infection resulted from contamination of food with eggs or larvae produces gastrointestinal disturbances like abdominal cramps, nausea, vomiting and diarrhea (Aguilera et al., 1999; Udgaonkar et al., 2012). The overall prominent symptoms include pain and itching, swelling and inflammation, ulceration and tissue necrosis and secondary bacterial infections.

The routine treatment for myiasis includes the use of insecticides like ivermectin topically, surgical removal of myiasis larvae with forceps by applying liquid paraffin, heavy oils or petroleum jelly to the opening of the lesions as they occlude the airways of larvae and lidocaine hydrochloride injection into the lesion to facilitate the extraction (Calderon-Lozano et al., 2025). The routine control methods include insect growth regulators for prevention of larvae to develop, fly traps like UV traps and sticky traps and biological control like predators.

The selection of herbal medicine for the treatment of myiasis like plant-based extracts over other synthetic medicines is that herbal products have more efficacy and advantages than others (Attia & Omar, 2025). The justification for selecting herbal products and their benefits are that herbal remedies have natural and non-toxic properties which reduces the chances of adverse reactions. Herbal remedies are more cost-effective than conventional medications. They provide a comprehensive approach against myiasis by promoting the overall health and well-being of livestock as well as these remedies contain antimicrobial properties which can help in preventing secondary infections.

The objectives for selecting herbal remedies is that these remedies help in reducing the risks of antibiotic resistance, help in promoting faster wound healing and tissue repair as compare to other conventional medications, enhancing the immune system and help in preventing future infections. These remedies reduce the environmental impact of conventional medications as they are prepared from natural products while conventional medicines are manufactured synthetically in industries. These remedies reduce the economic losses in the livestock industry as they are cost effective and easily available (Aldayarov et al., 2025; Bambaradeniya et al., 2025).

Pathogenesis of Myiasis

As the eggs are deposited by the adult fly onto the wound, the larvae emerge and crawl down from the wound on to the skin. These larvae then lacerate the skin with their oral suckers and secrete proteolytic enzymes and starts digesting and liquefying the tissues. Since the infestations has been done, secondary blowflies are attracted by the odor of the decomposing tissues and their larvae extend and deepens the lesion. The situation becomes even more complicated by secondary bacterial infection.

The irritation and distress caused by the lesion is extremely debilitating and sheep can rapidly lose condition. The latter is often the first obvious sign of strike as the lesion occurs at the skin surface and is sometimes observed only on close examination. Where death occurs, it is often due to septicemia.

Strike may be classified according to the area of the body affected, i.e. breech, tail, body, poll or penile sheath ('pizzle rot'). In Europe body strike, emanating from wool-rot created by heavy rainfall, is the most common.

Such irritation and distress not only reduce the growth and production of livestock animals but also reduces their feed intake. This condition severely effects the economics of farmer and if left un-treated will cause the death of animal.

Plant-based Remedies for Myiasis

From the past centuries, traditional plant-based remedies are widely used for the treatment of maggot wound infestations in tropical and sub-tropical regions because these remedies of plants have certain antimicrobial, anti-inflammatory and wound healing properties (Lillian Mukandiwa et al., 2012; Muhammad et al., 2025). This review provides a descriptive look into these traditional plant-based remedies, their mechanism of action, application methods and their results. Following gives the traditional plant-based remedies for myiasis treatment

1. Original plant-based Preparations

Original plant-based preparations are defined as the raw, unprocessed or minimal processed plant materials which are used in herbal medications. They are characterized by natural composition, minimal processing and traditional use. These preparations include crude plants, material like roots, leaves, shrubs and stems (Mukandiwa et al., 2012).

i. *Azadirachta indica*

Neem also botanically called as *Azadirachta indica* is a fast-growing plant which is valued for its medicinal properties. Neem plant is likely to be found in Indian subcontinent and in the dry areas of South Africa. It is one of the traditional plant-based medicine which is widely used in rural areas for treating myiasis (Singh & Kaur, 2016). Neem oil, neem leaf extracts and neem seed powder are widely used for treatment of myiasis (Carnevali et al., 2019; Joshi, 2022). Neem contains active compounds like azadirachtin, nimbin and nimbidin which are responsible for providing antimicrobial, anti-inflammatory and larvicidal properties (Gutierrez, 2011). The mechanism of action of neem is due to the active insecticidal compounds like azadirachtin which is a feed inhibitor and disrupt the hormones involved in the insects molting. Since the insects can't molt which prevents the larvae from developing into adults.

- traditional practices include the applying of neem leaf paste onto the maggot wound which results in the elimination of maggots within 24 hours followed by rapid wound healing (Singh, 2000).

ii. *Aloe marlothii*

Mountain aloe or the flat-flowered plant which is botanically named as *Aloe marlothii* is a large, perennial, succulent and single stem plant belonging to the family of *Asphodelaceae* native to South Africa, Zimbabwe etc. (Klopper et al., 2020). This plant is found in mountainous, rocky and slope areas where the temperature are higher and can grow up to 6 meters tall. Traditionally this plant is used in many rural areas of South Africa, Zimbabwe for the treatment of myiasis (Mukandiwa, 2012). The treatment involves the use of leaves which are crushed to produce

a juice and that juice is applied topically onto the wound for eliminating the larvae and preventing the secondary infections. Some studies suggests that the mechanism of action of this plant includes the bioactive compounds such as anthraquinones which are responsible for antimicrobial activity, anti-inflammatory and anti-larvicidal effects ultimately contributes to the elimination of larvae and promoting the tissue repair and regeneration for wound healing (Fatima et al., 2023).

iii. *Erythrina lysistemon*

Common coral-tree or lucky bean tree which is botanically called as the *Erythrina lysistemon* is a tree belonging to the *fabaceae* (pea) family (Obakiro et al., 2021). This long plant is native to countries like South Africa, Zimbabwe, Angola etc and is characterized by scarlet red flowers in spring seasons, smooth grayish barked surface, leaves with 3 leaflets and can grow up to 12 meters tall. Because of its abundance in South Africa and its natives, this plant is also used traditionally for the treatment of myiasis. This practice includes the use of leaves which are being crushed and placed onto the myiasis wound (Mukandiwa, 2012). The active compounds like alkaloids and flavonoids are responsible for wound healing.

iv. *Aloe zebrina baker*

Aloe zebrina is a spiny, green and succulent plant which forms a rosette of spreading leaves (Dortort, 2019). This plant is native to countries like Zimbabwe, south Africa etc. having capabilities of growing up to 2 meters tall. The traditional used remedy for treatment includes the use of succulent fresh leaves which are crushed and applied onto the wound for antibacterial and wound healing properties (Mukandiwa, 2012).

2. Plant Extracts

Plant based extracts are defined as the concentrated substances which are being derived from the parts of plants like roots, leaves, flowers, seeds, fruits etc. These extracts are usually oils, powders, ointment, and mixtures. Following gives the traditional used plant based extracts for the treatment of myiasis.

- The extract of *Azadirachta indica* is used for the treatment of myiasis by extracting the dried leaves of *A. indica* using four different solvents viz. petroleum ether, chloroform, ethyl alcohol and methanol (Singh & Kaur, 2016). These extract of dried leaves show toxic effects on the larvae as they contain bioactive compounds like nimbin, azadirachtin and nimbidin which interfere with the growth, development and survival of fly larvae (Saleem et al., 2018). Another practice includes the use of a derived formulation composed of neem oil and the oily extracts of perforate St. John's wort plant (*Hypericum perforatum*) for animals suffering from myiasis (Özdemir et al., 2023).
- The essential oils of various plant extracts being extracted by distillation or cold pressing are used against myiasis infestations which have various active compounds like thymol, β -pinene, eugenol, α -pinene, camphor, citral, carvacrol etc. (Bedini et al., 2019; Chaaban et al., 2017). These active compounds have certain biological properties like anti-microbial, insecticidal, insect repellent, anti-inflammatory, anti-oxidant etc. effects on the maggots affected wounds. Examples include the clove oil, Eucalyptus oil, lemongrass oil having eugenol, citronellal and citral as their active compounds respectively.
- The extract of *Clausena anisata* is also used for myiasis infestations traditionally by treating the larvae of fly with aqueous extract of *C. anisata* made with dried leaves which interferes with the neuroendocrine control mechanism and performs anti-larvicidal actions (Mukandiwa et al., 2015). This inhibits the growth of larvae and causes its death as *C. anisata* contains high amount of terpenoids (Mukandiwa et al., 2016).
- The extract of some plants' seeds like *peganum hermala* (hermal) and *ocimum tenuiflorum* (tulsi) are traditionally used for treating myiasis. This treatment utilizes the fumigation process in which the seeds of both tulsi and hermal are ignited and fumigate near the maggot wound affected organism (Aziz et al., 2018; Chil-Núñez et al., 2020). This technique was effective and is traditionally being used for its disinfecting, anti-insecticidal, and antimicrobial properties. The active compound of *peganum hermala* which is responsible for such properties is harmaline and for *ocimum tenuiflorum* is eugenol (Roozitalab et al., 2017; Khater, 2021).

Mechanism of Action

Traditional plant-based remedies for maggot wounds typically involve the use of plant extracts, pastes, or poultices that possess several bioactive compounds. These compounds can act through multiple mechanisms to treat the wound and eliminate maggots:

1. **Antimicrobial Activity:** Many plants contain compounds such as alkaloids, flavonoids, tannins, and essential oils that exhibit antimicrobial properties (Ferdes, 2018). These compounds can inhibit the growth of bacteria and fungi that may infect the wound, preventing secondary infections that can complicate the healing process.
2. **Anti-inflammatory Effects:** Inflammation is a common response to maggot infestation. Plants with anti-inflammatory properties can reduce swelling, pain, and redness, promoting a more conducive environment for wound healing.
3. **Wound Healing Properties:** Certain plants stimulate tissue regeneration and collagen synthesis, accelerating the healing process. They may also promote the formation of granulation tissue and epithelialization, which are crucial for wound closure.
4. **Larvicidal Activity:** Some plants have larvicidal properties, meaning they can kill or repel maggots. This is particularly important in the treatment of myiasis, as it directly addresses the cause of the wound.
5. **Analgesic Effects:** Pain relief is another critical aspect of wound management. Plants with analgesic properties can help alleviate the discomfort associated with maggot wounds, improving the patient's quality of life during recovery.

Application Methods

The application depends upon the plant and the type of remedy. Below are given the common traditional methods for application of remedies

1. **Pastes and poultices:** This method includes the crushing or grinding of dried or fresh parts of plants into the paste or poultice and applied directly onto the wound (Khan, 2009). In this method, the active compounds are allowed to come in a direct contact with the affected area. For

example, neem leaves are crushed into the paste and applied to maggot-infected wound.

2. **Decoctions and infusions:** This method involves the extracting of active compounds of plants by boiling them to create a decoction or infusion (Soyelu & Masika, 2009). The resulting liquid is used to wash the wound. Example, Guava plant decoction is traditional used for cleaning wounds because of its antimicrobial characteristics.

3. **Ointments and oils:** This method includes the mixing of plants extracts with a base such as beeswax and coconut oil for creating an ointment or oil to be applied onto the wound. This traditional method provides a prolong treatment as the base allows the active compound to be in contact with the wound for an extended time period (de Barros et al., 2024). The examples of such preparations includes turpentine oil, neem oil etc. (Tewari et al., 2020).

4. **Fumigation** This traditional method involves the burning of plant parts or their extracts to create a smoke which helps in fumigating the wound (Sabu et al., 2021). In ancient times it was believed that the smoke kills the maggots and disinfect the wound. For example, the smoke created from the seeds of hermal plant and the leaves of tulsi plant is used in some backyard areas for myiasis.

5. **Oral administration:** This method involves the oral consumption of plant extracts to enhance the body healing process. Like in some traditional practices, drinking tea of turmeric is believed to boost the immune and helps in wound healing.

Results of using Traditional Plant-based Remedies

The overall results of plant based remedies are more than other synthetic medicines as they have certain broad characteristics which becomes the basis for their selection while synthetic medicines have specific characteristic results. These characteristics are responsible for the overall results of all the plant based remedies. Following gives the results of using them

1. Effective Elimination of Maggots

Many traditional plant-based remedies have anti-larvicidal properties which are effective against killing or eliminating the maggots such as the anti-larvicidal characteristics of neem plant enable the easy removal of maggots by detaching them (Bambaradeniya et al., 2025)

2. Decrease Infection Rate

Many plants having antimicrobial property enables them to reduce the severity of the infestation and prevents the body from developing secondary bacterial and fungal infections. This contributes in low incidence of sepsis.

3. Speedy Wound Healing

Several plant based extracts facilitate the tissue regeneration, formation of capillaries and production of collagen which ultimately contributes to the speedy recovery of the wound.

4. Effective Pain Reliever

Most of the plant-based extracts because of their anti-inflammatory effects provide pain relief in organism suffering from maggot wound infestation.

5. Economical Acceptance

Since the plant based remedies are easily available in local areas because of which their prices are very low. This leads to the economical acceptance of the plant-based remedies.

6. Cultural Dependence

In rural areas of countries like south Africa, people are dependent on the local available products because of which this they heavily rely on plant-based medications for infections like myiasis. Hence this becomes their cultural dependence.

Modern Technique

Nano-formulations or nano-particulations is a modern technology which involves the use of tiny particles for the delivery of drugs or other therapeutic agents to the specific targets in the body. Nanoparticles is the new emerging technology for getting rid of maggot wound infections (Seugling et al., 2019). The need for this technology emerges as the insects are potential of developing resistance against insecticides through the metabolic process to protect themselves. There are various kinds of nanoparticles develop over the past years, some of them are lipid-based nanoparticles like nanoemulsions, solid lipid nanoparticles, nanostructure lipid carriers, exosomes and liposomes. The class of nano-emulsions are extensively used nanoparticles because of their 20-500 nm size which enhance the penetration by the cells (Salatin et al., 2015). The main categories of nanoemulsions involves water-in-oil, transparent, translucent or colloidal dispersions. Water-in-oil emulsions contains the bioactive segment (essential oils) and the hydrophilic segment containing aqueous medium in the presence of an emulsifier. Many kinds of essential oils which were effective and used traditionally to treat myiasis are now used in the presence of an aqueous medium containing an emulsifier.

Conclusion

To conclude, myiasis is a devastating parasitic infestation having severe impacts on livestock production and development and effecting the human health. Neem, aloe and certain other plants are plant-based remedies which are traditionally being use for treating myiasis from the past centuries and recent studies have shown their efficacy. All these remedies have antimicrobial, anti-inflammatory and anti-larvicidal characteristic properties which helps in elimination of maggots, prevention of secondary infections and enhances the wound healing. Although plant based remedies offer an effective approach but there is a need of standardization, regulation and involvement of modern medicine

technologies to enhance their safety, affects and efficacy as larvae can develop resistant against them. Emerging technology of nanoparticles is used for such approach which combines traditional facts with modern science and technology for effective control and management of myiasis.

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