



Review Article

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THERAPEUTIC APPLICATIONS OF EXTERNAL AYURVEDIC FORMULATIONS IN VRANA CHIKITSA: A COMPREHENSIVE REVIEW

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ABSTRACT

Dushta Vrana (~chronic wounds or ulcers) present significant challenges in medical management due to their persistent nature and potential complications. Ayurvedic medicine offers a comprehensive approach to wound healing through various herbal formulations known for their anti-inflammatory, antimicrobial, granulation-promoting, and moisture-retaining properties. This review aims to explore the efficacy of different Ayurvedic formulations, including Malahar (~ointments), Taila (~medicated oils), Ghrita (~medicated ghee), and Lepa (~herbal pastes), in the treatment of Dushta Vrana and their role in enhancing the wound healing process. An extensive review of classical Ayurvedic texts and contemporary research was conducted to identify key formulations used in Vrana Chikitsa. The pharmacological properties of these formulations were analyzed, focusing on their anti-inflammatory, antimicrobial, granulation-promoting, and moisture-retaining effects. Ayurvedic formulations demonstrate significant efficacy in wound management. Anti-inflammatory herbs like Turmeric and Triphala modulate immune responses, reducing chronic inflammation. Antimicrobial agents such as Neem and Honey effectively inhibit the growth of pathogens, including antibiotic-resistant strains. Formulations like Jatyadi Malahar and Shatadhauta Ghrita promote granulation by stimulating fibroblast activity and collagen synthesis, while lipid-based Taila and Malahar ensure moisture retention, providing an optimal healing environment. Ayurvedic formulations offer a holistic and effective approach to the management of Dushta Vrana. Their multi-targeted actions not only address immediate wound care needs but also support long-term healing and tissue regeneration. Further research could solidify their role in modern clinical practice, enhancing the integration of Ayurvedic wound care into contemporary medical treatments.

Keywords: Wound Healing, Ayurveda, Herbal Medicine, Chronic Wounds, Non-Steroidal Anti-Inflammatory Agents, Anti-Bacterial Agents

INTRODUCTION

Wounds, referred to as Vrana in Ayurveda, are a common health concern that requires careful management to prevent complications such as infections or chronic ulceration. In Ayurveda, Dushta Vrana refers to a wound that has become chronic or infected, often characterized by delayed healing, foul odor, excessive discharge, and signs of inflammation such as redness, swelling, and pain. These wounds are typically stubborn and resistant to regular treatment, often worsening over time if not properly managed. According to Ayurvedic texts, Dushta Vrana is a result of imbalances in the body's doshas, Vata, Pitta, and Kapha, leading to poor circulation, accumulation of toxins, and compromised tissue integrity. Treatment involves cleansing the wound (Shodhana), using specific herbs and Malahars to reduce infection and supporting the natural healing process (~Ropana), with an emphasis on restoring balance to the affected doshas and overall body health.¹

Ayurveda offers a variety of formulations to treat Dushta Vrana (~chronic or infected wounds), each designed to address the specific symptoms and underlying causes of the condition. The most common formulations include Kashaya (~decoctions), Lepa (~pastes), Malahar (~ointments), Ghrita (~medicated ghee), and Taila (~medicated oils). These formulations, when used appropriately, work synergistically to cleanse, heal, and restore the integrity of the tissue in Dushta Vrana. Kashaya are herbal decoctions prepared by boiling medicinal plants in water. Kashayas are used for both internal and external applications to

cleanse the wound, reduce inflammation, and remove toxins. For Dushta Vrana, herbs like Triphala, Neem, and Guduchi are commonly used. Lepa refers to herbal pastes applied directly to the wound. They are typically made from finely powdered herbs mixed with liquids like water, milk, or honey. Lepas help in absorbing excess moisture, reducing infection, and promoting the drying of the wound. Ingredients like Turmeric (~Haridra), Sandalwood (~Chandana), and Manjistha are often included for their antimicrobial and anti-inflammatory properties.²

Ayurvedic ointments such as Jatyadi Malahar and Panchavalkala Malahar are applied topically to soothe the wound, prevent infection, and promote healing. These Malahars are made by simmering herbs in oils or ghee, which acts as a carrier to deliver the medicinal properties deep into the tissue. Medicated ghee, such as Triphala Ghrita, is used for both oral consumption and topical application. It nourishes the tissues, promotes healing, and reduces scarring. Medicated oils like Neem Taila and Yashtimadhu Taila are used to soften the wound, reduce pain, and enhance healing by penetrating the deeper layers of the skin.³

Ayurvedic texts like Sushruta Samhita and Charaka Samhita describe a variety of treatments for Vrana, with a special emphasis on the use of Malahars. These topical preparations are known for their ability to cleanse, heal, and protect wounds through natural ingredients and precise formulations. Malahar in Ayurveda refers to a therapeutic ointment or salve used topically to treat various skin conditions and wounds. These formulations are typically composed of a blend of medicinal herbs, oils, and

other natural substances, designed to promote healing, reduce inflammation, and prevent infection. Malahars are specifically tailored to address different types of wounds, such as fresh cuts, chronic ulcers, and burns, by providing a protective barrier that aids in moisture retention and facilitates the regeneration of healthy tissue. Their application is an integral part of Ayurvedic wound care, known as Vrana Chikitsa, where they play a crucial role in soothing the affected area, accelerating healing, and ensuring the wound heals without complications.⁴

A systematic and comprehensive literature search was conducted across various electronic databases, including PubMed, Scopus, AYUSH Research Portal, and Google Scholar. The review focused on classical Ayurvedic texts such as Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, as well as contemporary research articles published in peer-reviewed journals. Keywords such as "Vrana Chikitsa," "Ayurvedic formulations," "wound healing," and "external applications" were used to identify relevant studies. Inclusion criteria involved studies discussing the efficacy, pharmacological actions, and clinical applications of Ayurvedic external formulations in wound management. Articles not meeting these criteria were excluded from the review. Data were synthesized and analyzed to identify the therapeutic potential and clinical relevance of these formulations in modern wound care practices.

TYPES OF AYURVEDIC MALAHARS

Malahars are categorized based on their ingredients and therapeutic actions. The following are some of the most notable Malahars used in Vrana Chikitsa:

Sikta Malahar: Composed primarily of beeswax (Sikta) and oils, Sikta Malahar is traditionally used to provide a protective layer over wounds, promoting healing by maintaining moisture and preventing infection. Its soothing properties make it ideal for treating dry and painful wounds.⁵

Gandhaka Malahar: This sulfur-based ointment is renowned for its antimicrobial properties. Gandhaka (~sulphur) is mixed with oils or ghee to create a preparation that is particularly effective against infected wounds, ulcers, and skin disorders. Its use in treating chronic non-healing ulcers is well-documented.⁶

Jatyadi Malahar: A popular choice in Ayurvedic wound care, Jatyadi Malahar is a blend of various herbs, including Jati (~Jasmine), Nimba (~Neem), and Haridra (~Turmeric). It is used to cleanse wounds, promote granulation, and accelerate healing. The combination of antimicrobial and anti-inflammatory herbs makes it suitable for both fresh and chronic wounds.⁷

Panchavalkala Malahar: This Malahar is prepared from the decoction of five tree barks, Vata, Udumbara, Ashwattha, Parisha, and Plaksha. Known for its astringent and anti-inflammatory properties, Panchavalkala Malahar is used to reduce swelling, cleanse the wound, and support tissue regeneration.⁸

MECHANISM OF ACTION

The efficacy of Ayurvedic formulations in wound healing can be attributed to their multifaceted mechanisms of action:

Antimicrobial Activity: Ayurvedic formulations for treating Vrana (wounds or ulcers) are highly regarded for their antimicrobial activities, which play a crucial role in preventing

infection and promoting healing. These formulations include a variety of herbal decoctions, pastes, oils, and ointments, each possessing unique properties that combat pathogens and support the body's natural healing processes. Herbal decoctions, or Kashayas, are water-based extracts made by boiling medicinal herbs. Ingredients like Triphala, Neem (*Azadirachta indica*), and Guduchi (*Tinospora cordifolia*) are commonly used for their potent antimicrobial effects. Triphala, a combination of three fruits, Haritaki, Bibhitaki, and Amalaki has been shown to have strong antibacterial and antifungal properties, making it effective in cleansing infected wounds and ulcers. Neem is renowned in Ayurveda for its broad-spectrum antimicrobial activity, particularly against bacteria and fungi, which are common culprits in wound infections. These decoctions can be applied directly to the wound or used as a wash to cleanse and disinfect the area.^{9,10}

Lepa refers to thick pastes made from powdered herbs mixed with water, honey, or other liquids. These pastes are applied directly to wounds and ulcers, where they serve both therapeutic and protective functions. Turmeric (~Haridra), a common ingredient in Lepa, is well-known for its antibacterial, antiviral, and antifungal properties, largely due to its active compound curcumin. Sandalwood (~Chandana) and Manjistha (*Rubia cordifolia*) are also used in Lepas for their antimicrobial and anti-inflammatory properties. These pastes help in preventing microbial colonization and reduce the chances of infection spreading.¹¹ Taila or medicated oils are infused with various herbs that possess antimicrobial activities. Neem Taila is particularly effective due to its rich content of azadirachtin, which exhibits significant antibacterial and antifungal effects. Yashtimadhu Taila (~Licorice oil) contains glycyrrhizin, known for its antiviral and antibacterial properties, making it useful in treating wounds that are prone to infections. The oil-based medium allows deep penetration of the active compounds into the tissues, providing long-lasting protection against pathogens. Malahar are ointments that combine herbal ingredients with bases like oils, ghee, or beeswax, which act as carriers. Jatyadi Malahar, a popular Ayurvedic ointment, includes herbs such as Neem, Haridra, Daruharidra (*Berberis aristata*), and Patol (*Trichosanthes dioica*), all known for their strong antimicrobial effects. This formulation is particularly effective in treating chronic, non-healing ulcers where there is a high risk of bacterial infection. Gandhaka Malahar, another sulphur-based ointment, exhibits broad-spectrum antimicrobial activity, especially against bacteria that cause skin infections and ulcers.¹²

Ghrita or medicated ghee is used both topically and orally in Ayurveda. Triphala Ghrita, for instance, combines the wound-healing properties of Triphala with the nourishing and antimicrobial effects of ghee. Ghee itself has been shown to have mild antimicrobial properties and acts as an excellent medium for delivering herbal actives into deep tissues, making it effective in treating deep-seated infections and promoting tissue regeneration.¹³

The antimicrobial activity of these Ayurvedic formulations primarily stems from the presence of bioactive compounds such as alkaloids, flavonoids, tannins, terpenoids, and saponins. These compounds disrupt the cell walls of bacteria and fungi, inhibit their growth and replication, and neutralize the toxins produced by pathogens. Furthermore, many of these herbs possess antioxidant properties, which help in reducing oxidative stress at the wound site, thereby preventing further tissue damage and supporting the healing process.¹⁴

Ayurvedic formulations, through their diverse range of antimicrobial activities, provide a natural and effective means of treating wounds, ulcers, and chronic infections. The use of herbal decoctions, pastes, oils, ointments, and ghee not only helps in combating infection but also promotes overall wound healing, making them invaluable tools in Ayurvedic medicine for Vrana Chikitsa. With increasing interest in natural and integrative therapies, these ancient remedies continue to hold promise for modern wound care practices.¹⁵

Anti-inflammatory Effects: Ayurvedic formulations are highly effective in treating Vrana (wounds or ulcers) due to their significant anti-inflammatory effects, which are crucial in managing the inflammation that often accompanies these conditions. Inflammation is a natural response to injury or infection, but when it becomes excessive or chronic, it can hinder the healing process and lead to complications. Ayurvedic medicine offers a range of herbal formulations that reduce inflammation, promote tissue repair, and accelerate wound healing.¹⁶

Triphala Kashaya is well-known for its ability to reduce swelling and redness due to its high content of tannins and polyphenols. These compounds inhibit the production of pro-inflammatory cytokines, thus reducing inflammation at the wound site. Neem (*Azadirachta indica*) is another powerful anti-inflammatory herb used in decoctions, known for its ability to downregulate inflammatory mediators and soothe irritated tissues.¹⁷ Turmeric (~Haridra) is a primary ingredient in many Lepas, celebrated for its potent anti-inflammatory effects, primarily due to curcumin, its active compound. Curcumin has been shown to inhibit the activity of nuclear factor-kappa B (NF- κ B), a key player in the inflammatory response, thereby reducing the production of inflammatory enzymes and cytokines.¹⁸

Sandalwood (~Chandana) and Manjistha (*Rubia cordifolia*) are also common in Lepas for their cooling and anti-inflammatory properties, helping to reduce swelling and promote healing. Murivenna Taila, made from coconut oil infused with a variety of herbs, is traditionally used in Ayurveda to treat wounds and inflammation. It contains herbs like Karanja (*Pongamia pinnata*) and Moringa (*Moringa oleifera*), which have significant anti-inflammatory effects, helping to reduce pain, swelling, and redness. Neem Taila is another example, where the anti-inflammatory properties of Neem help in calming the inflamed tissues and aiding in the resolution of chronic wounds.¹⁹

Jatyadi Malahar is a well-known Ayurvedic ointment that contains anti-inflammatory herbs like Neem, Haridra, and Daruharidra (*Berberis aristata*). Gandhaka Malahar, which contains sulphur, also has notable anti-inflammatory effects, particularly useful in managing the inflammation associated with infected or non-healing ulcers. Triphala Ghrita, combining the anti-inflammatory effects of Triphala with the nourishing qualities of ghee, is particularly effective in treating inflammatory conditions of the skin and wounds. Ghee itself has soothing and cooling properties, which help reduce inflammation and pain, while the herbal components provide additional anti-inflammatory action. This combination makes Ghrita an excellent choice for managing wounds that are inflamed, painful, and slow to heal.²⁰

The anti-inflammatory effects of Ayurvedic formulations are largely due to their ability to modulate the immune response and inhibit the activity of inflammatory mediators such as prostaglandins, leukotrienes, and cytokines. Many herbs used in

these formulations contain bioactive compounds like alkaloids, flavonoids, tannins, and glycosides, which target various pathways involved in inflammation. For example, curcumin in Turmeric blocks the NF- κ B pathway, which is a major regulator of inflammation, while the tannins in Triphala inhibit the production of inflammatory enzymes. These actions collectively help in reducing swelling, pain, and redness, thereby promoting a conducive environment for wound healing. The anti-inflammatory properties of Ayurvedic formulations play a critical role in the treatment of Vrana or ulcers, as they help to control and reduce the inflammatory response, which is essential for preventing complications and ensuring proper wound healing. Whether through the use of herbal decoctions, pastes, oils, ointments, or medicated ghee.²¹

Promotion of Granulation: In Ayurveda, the promotion of granulation tissue formation is a key aspect of wound healing, particularly in the treatment of Vrana (wounds or ulcers). Granulation tissue is the new connective tissue and microscopic blood vessels that form on the surfaces of a wound during the healing process. Ayurvedic formulations, composed of various herbs and natural ingredients, are designed to enhance this phase of wound healing, ensuring that wounds heal efficiently and with minimal scarring. Triphala Kashaya is one of the most effective formulations for promoting granulation. The combination of Haritaki, Bibhitaki, and Amalaki in Triphala not only cleanses the wound but also stimulates the formation of new tissue.²²

Guduchi (*Tinospora cordifolia*) and Neem (*Azadirachta indica*) Kashayas are also commonly used for their regenerative properties, helping to initiate and accelerate the development of healthy granulation tissue by promoting cell proliferation and improving blood supply to the wound. Aloe Vera (~Kumari) is frequently used in Lepas for its soothing and regenerative effects. The polysaccharides in Aloe Vera promote fibroblast activity, which is crucial for collagen synthesis and granulation tissue formation. Jatyadi Lepa, made from a blend of herbs including Neem, Turmeric (~Haridra), and Manjistha (*Rubia cordifolia*), is another powerful formulation that aids in the development of granulation tissue.²³

Karanja Taila (*Pongamia pinnata*) and Neem Taila are particularly effective due to their ability to stimulate the formation of new tissue. These oils are rich in fatty acids and bioactive compounds that nourish the wound bed, provide moisture, and create an optimal environment for granulation.²⁴ The application of these oils helps in the proliferation of fibroblasts and the formation of extracellular matrix components. Jatyadi Malahar not only prevent infection but also enhance the granulation process. The herbs in these formulations stimulate the production of collagen, promote angiogenesis (formation of new blood vessels), and accelerate the maturation of granulation tissue, ensuring that the wound heals from the inside out.

Shatadhauta Ghrita, a type of medicated ghee, is particularly effective in treating burns and chronic ulcers. The ghee acts as a carrier for the herbs, facilitating deep penetration into the tissue and promoting regeneration. The combination of herbs and ghee in formulations like Triphala Ghrita not only nourishes the tissues but also provides the necessary environment for granulation. The ghee's cooling and soothing properties also reduce inflammation, further supporting the granulation process.²⁵

The promotion of granulation by Ayurvedic formulations is largely due to their ability to enhance fibroblast activity,

collagen synthesis, and angiogenesis. These compounds include tannins, flavonoids, and polyphenols, which modulate growth factors, enhance cellular proliferation, and improve blood circulation to the wound site. Additionally, the emollient properties of oils and ghee used in Ayurvedic formulations provide moisture, which is essential for the migration and function of cells involved in granulation.

Moisture Retention: Moisture retention is a crucial aspect of wound healing, particularly in the treatment of Vrana (~wounds or ulcers). Maintaining adequate moisture levels in the wound environment helps prevent desiccation, promotes cellular activities essential for healing, and reduces the risk of scarring. Ayurvedic formulations are well-suited to this purpose, as they contain natural ingredients that not only retain moisture but also provide a protective barrier against environmental factors that could hinder the healing process. Oils such as Karanja Taila (*Pongamia pinnata*) and Neem Taila are commonly used in Ayurveda for their emollient properties. These oils form a protective layer over the wound, preventing the loss of moisture and keeping the wound bed hydrated. The fatty acids in these oils help in the regeneration of skin cells, while their antimicrobial properties protect the wound from infections. The use of these oils is particularly beneficial in treating dry and chronic wounds, where maintaining moisture is critical for healing.²⁶

Jatyadi Malahar helps in locking in moisture and providing a sustained release of the active compounds. The application of Malahar to wounds creates a moist environment, which is essential for the proliferation of new tissue and the prevention of scab formation, thereby promoting faster healing. Lepa or Pastes made from herbs like Aloe Vera (~Kumari) and Manjistha (*Rubia cordifolia*) are commonly used in Ayurvedic wound care. Aloe Vera, in particular, is known for its hydrating properties. The gel-like consistency of Aloe Vera paste provides a cooling effect and helps to keep the wound moist, which is vital for cellular repair and regeneration. The mucilaginous nature of these herbal pastes ensures that moisture is retained on the wound surface, facilitating a conducive environment for healing.²⁷

Shatadhauta Ghrita, a type of ghee that has been washed 100 times with water, is particularly effective in this regard. It has a creamy, hydrating texture that creates a protective barrier over the wound, preventing moisture loss. When combined with herbs like Triphala or Neem, medicated ghee not only retains moisture but also delivers the healing properties of these herbs directly to the wound. Herbs like Guduchi (*Tinospora cordifolia*) and Neem (*Azadirachta indica*), when used in decoctions, cleanse the wound and help to maintain a moist environment. These decoctions also have mild astringent properties that help in managing wound exudate while keeping the wound sufficiently moist to promote healing.²⁸

The moisture-retaining properties of Ayurvedic formulations are primarily due to their lipid content, which forms a protective barrier over the wound. This barrier prevents trans-epidermal water loss (TEWL) and ensures that the wound environment remains hydrated, which is essential for the migration of cells like fibroblasts and keratinocytes. These cells are responsible for tissue repair and regeneration. Additionally, the bioactive compounds in Ayurvedic herbs, such as flavonoids, tannins, and mucilages, contribute to moisture retention by enhancing the natural hydration processes of the skin and supporting the formation of a healthy extracellular matrix.²⁹

CLINICAL EVIDENCES

Several studies have explored the clinical effectiveness of Ayurvedic Malahars in Vrana Chikitsa. Jatyadi Malahar has been clinically tested for its efficacy in treating diabetic foot ulcers, showing significant improvements in wound size and healing time. Gandhaka Malahar is noted for its success in managing chronic, non-healing ulcers, particularly in cases where conventional treatments have failed.³⁰ Panchavalkala Malahar has been studied for its role in reducing wound exudate and promoting faster healing, with positive outcomes reported in various clinical settings. These studies underscore the potential of Ayurvedic Malahars as complementary or alternative treatments in modern wound care.³¹

DISCUSSION

The management of Dushta Vrana (~chronic wounds or ulcers) is a significant challenge in clinical practice due to their complex pathophysiology and the potential for severe complications if left untreated. Ayurvedic medicine, with its rich repository of herbal formulations, offers a comprehensive and holistic approach to wound healing that addresses multiple aspects of the healing process.³²

One of the core strengths of Ayurvedic formulations lies in their multifaceted action. These formulations are not only effective in reducing inflammation and microbial load, which are critical in the early stages of wound management, but also in promoting granulation and maintaining optimal moisture levels, which are essential for proper tissue repair and regeneration. The use of Malahar (~ointments), Taila (~medicated oils), Ghrita (~medicated ghee), and Lepa (~herbal pastes) reflects the depth of Ayurvedic knowledge in wound care, each formulation serving a specific purpose while also complementing the others.

The anti-inflammatory effects of these formulations, driven by the presence of bioactive compounds such as curcumin in Turmeric and tannins in Triphala, play a crucial role in mitigating the inflammatory response that can otherwise impede healing. By modulating the activity of inflammatory mediators and promoting a balanced immune response, these formulations help to prevent the chronicity of wounds and reduce the risk of complications such as tissue necrosis and secondary infections.³³

The antimicrobial properties of Ayurvedic formulations, particularly those containing Neem, Turmeric, and Honey, are well-documented and have been shown to be effective against a broad spectrum of pathogens. This is particularly relevant in the context of chronic wounds, which are often complicated by biofilm-forming bacteria that are resistant to conventional antibiotics. Ayurvedic formulations, with their ability to disrupt biofilms and enhance local immunity, offer a valuable alternative or adjunct to modern antimicrobial treatments.³⁴

Promotion of granulation is another critical aspect where Ayurvedic medicine excels. The ability of formulations like Jatyadi Malahar and Shatadhauta Ghrita to stimulate fibroblast activity, enhance collagen synthesis, and support angiogenesis is instrumental in the formation of new, healthy tissue. This not only accelerates wound closure but also reduces the likelihood of excessive scarring, which is a common concern in wound management.³⁵

Moisture retention, facilitated by the lipid-rich bases of Ayurvedic formulations, ensures that the wound environment remains conducive to healing. The prevention of desiccation and the maintenance of a moist wound bed are essential for optimal cellular activity, including the migration and proliferation of

keratinocytes and fibroblasts. This aspect of wound care is particularly well-addressed by Ayurvedic Taila, Malahar, and Ghrita, which create a protective barrier while allowing for the sustained release of therapeutic compounds.³⁶

In conclusion, the Ayurvedic approach to Vrana Chikitsa offers a holistic and effective strategy for managing wounds and ulcers. The integration of anti-inflammatory, antimicrobial, granulation-promoting, and moisture-retaining effects within these formulations underscores the comprehensive nature of Ayurvedic wound care. This approach not only addresses the immediate needs of wound management but also supports long-term healing and tissue regeneration. Further research and clinical trials could provide additional evidence to validate these traditional practices, potentially leading to broader acceptance and integration of Ayurvedic wound care in modern clinical settings.

CONCLUSION

Ayurvedic Malahars hold significant promise in the field of wound care, offering natural, effective, and time-tested treatments for various types of wounds. As interest in integrative medicine grows, these ancient remedies could play a vital role in enhancing patient outcomes in Vrana Chikitsa. Future research should focus on standardizing formulations and conducting large-scale clinical trials to establish these Malahars as mainstream therapeutic options.

REFERENCES

- Dudhamal TS. Review of grey literature on Ayurveda wound healing formulations and procedures - A systematic review. *J Ayurveda Integr Med.* 2023;14(4):100779. DOI: 10.1016/j.jaim.2023.100779.
- Kumar V, Nesari TM, Ghildiyal S, Sherkhane R. Pharmacodynamic appraisal of wound-healing herbs of Sushruta Samhita. *Ayu.* 2021;42(1):1-18. DOI: 10.4103/ayu.AYU_34_20.
- Datta HS, Mitra SK, Patwardhan B. Wound healing activity of topical application forms based on Ayurveda. *Evid Based Complement Alternat Med.* 2011;2011:134378. DOI: 10.1093/ecam/nep015.
- Albahri G, Badran A, Hijazi A, Daou A, Baydoun E, Nasser M, Merah O. The therapeutic wound healing bioactivities of various medicinal plants. *Life (Basel).* 2023;13(2):317. DOI: 10.3390/life13020317.
- Britto EJ, Nezwek TA, Popowicz P, et al. Wound dressings. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470199/>
- Stan D, Tanase C, Avram M, Apetrei R, Mincu NB, Mateescu AL, et al. Wound healing applications of creams and "smart" hydrogels. *Exp Dermatol.* 2021;30(9):1218-1232. DOI: 10.1111/exd.14396.
- Prasanna D, Shinde PS, Jadar PG, Killedar RS, Priyanka K. Efficacy of Jatyadi, Madhughrita and honey tulle in wound management: a three-arm randomized controlled clinical trial. *J Ayurveda Integr Med.* 2023;14(3):100719. DOI: 10.1016/j.jaim.2023.100719.
- Bhat KS, Vishwesh BN, Sahu M, Shukla VK. A clinical study on the efficacy of Panchavalkala cream in Vrana Shodhana w.s.r to its action on microbial load and wound infection. *Ayu.* 2014;35(2):135-40. DOI: 10.4103/0974-8520.146216.
- Samy RP, Pushparaj PN, Gopalakrishnakone P. A compilation of bioactive compounds from Ayurveda. *Bioinformation.* 2008;3(3):100-10. DOI: 10.6026/97320630003100.
- Saha S, Ghosh S. *Tinospora cordifolia*: One plant, many roles. *Anc Sci Life.* 2012;31(4):151-9. DOI: 10.4103/0257-7941.107344.
- Moghadamtousi SZ, Kadir HA, Hassandarvish P, Tajik H, Abubakar S, Zandi K. A review on antibacterial, antiviral, and antifungal activity of curcumin. *Biomed Res Int.* 2014;2014:186864. DOI: 10.1155/2014/186864.
- Srivastava S, Rawat AK. Quality evaluation of ayurvedic crude drug daruharidra, its allied species, and commercial samples from herbal drug markets of India. *Evid Based Complement Alternat Med.* 2013;2013:472973. DOI: 10.1155/2013/472973.
- Peterson CT, Denniston K, Chopra D. Therapeutic uses of Triphala in Ayurvedic medicine. *J Altern Complement Med.* 2017;23(8):607-614. DOI: 10.1089/acm.2017.0083.
- Mujeeb F, Bajpai P, Pathak N. Phytochemical evaluation, antimicrobial activity, and determination of bioactive components from leaves of *Aegle marmelos*. *Biomed Res Int.* 2014;2014:497606. DOI: 10.1155/2014/497606.
- Othman L, Sleiman A, Abdel-Massih RM. Antimicrobial activity of polyphenols and alkaloids in Middle Eastern plants. *Front Microbiol.* 2019;10:911. DOI: 10.3389/fmicb.2019.00911.
- Shanti K, RS. Ayurvedic management of venous ulcer - A case report. *J Ayurveda Integr Med.* 2023;14(3):100723. DOI: 10.1016/j.jaim.2023.100723.
- Alzohairy MA. Therapeutics role of *Azadirachta indica* (Neem) and their active constituents in diseases prevention and treatment. *Evid Based Complement Alternat Med.* 2016;2016:7382506. DOI: 10.1155/2016/7382506.
- Kim JH, Gupta SC, Park B, Yadav VR, Aggarwal BB. Turmeric (*Curcuma longa*) inhibits inflammatory nuclear factor (NF)- κ B and NF- κ B-regulated gene products and induces death receptors leading to suppressed proliferation, induced chemosensitization, and suppressed osteoclastogenesis. *Mol Nutr Food Res.* 2012;56(3):454-465. DOI: 10.1002/mnfr.201100270.
- Martínez-González CL, Martínez L, Martínez-Ortiz EJ, González-Trujano ME, Déciga-Campos M, Ventura-Martínez R, Díaz-Reval I. Moringa oleifera, a species with potential analgesic and anti-inflammatory activities. *Biomed Pharmacother.* 2017;87:482-488. DOI: 10.1016/j.biopha.2016.12.107.
- Srivastava S, Rawat AK. Quality evaluation of ayurvedic crude drug daruharidra, its allied species, and commercial samples from herbal drug markets of India. *Evid Based Complement Alternat Med.* 2013;2013:472973. DOI: 10.1155/2013/472973.
- Hooda P, Malik R, Bhatia S, Al-Harrasi A, Najmi A, Zoghebi K, Halawi MA, Makeen HA, Mohan S. Phytoimmunomodulators: A review of natural modulators for complex immune system. *Heliyon.* 2023;10(1). DOI: 10.1016/j.heliyon.2023.e23790.
- Kumar MS, Kirubanandan S, Sripriya R, Sehgal PK. Triphala promotes healing of infected full-thickness dermal wound. *J Surg Res.* 2008;144(1):94-101. DOI: 10.1016/j.jss.2007.02.049.
- Rahman S, Carter P, Bhattarai N. Aloe vera for tissue engineering applications. *J Funct Biomater.* 2017;8(1):6. DOI: 10.3390/jfb8010006.
- Kovářiková K, Pavela R. United forces of botanical oils: Efficacy of neem and karanja oil against Colorado potato beetle under laboratory conditions. *Plants (Basel).* 2019;8(12):608. DOI: 10.3390/plants8120608.
- Wayal SR, Gurav SS. Bhallatakadi Ghrita: Development and evaluation with reference to Murchhana and Shata-

- Dhauta process. J Ayurveda Integr Med. 2020;11(3):261-269. DOI: 10.1016/j.jaim.2020.05.005.
25. Vismaya, Belagihally SM, Rajashekhar S, Jayaram VB, Dharmesh SM, Thirumakudalu SK. Gastroprotective properties of karanja from Karanja (*Pongamia pinnata*) seeds; role as antioxidant and H, K-ATPase inhibitor. Evid Based Complement Alternat Med. 2011;2011:747246. DOI: 10.1093/ecam/nej027.
 26. Hekmatpou D, Mehrabi F, Rahzani K, Aminiyan A. The effect of Aloe vera clinical trials on prevention and healing of skin wound: A systematic review. Iran J Med Sci. 2019;44(1):1-9.
 27. Datta HS, Mitra SK, Patwardhan B. Wound healing activity of topical application forms based on Ayurveda. Evid Based Complement Alternat Med. 2011;2011:134378. DOI: 10.1093/ecam/nep015.
 28. Kono T, Miyachi Y, Kawashima M. Clinical significance of the water retention and barrier function-improving capabilities of ceramide-containing formulations: A qualitative review. J Dermatol. 2021;48(12):1807-1816. DOI: 10.1111/1346-8138.16175.
 29. Roy A, Khan A, Ahmad I, Alghamdi S, Rajab BS, Babalghith AO, Alshahrani MY, Islam S, Islam MR. Flavonoids a Bioactive Compound from Medicinal Plants and Its Therapeutic Applications. Biomed Res Int. 2022 Jun 6;2022:5445291. DOI: 10.1155/2022/5445291
 30. Sathish HS, Baghel MS, Bhuyan C, Gupta SK, Dudhamal TS. Review of clinical observational studies conducted on tissue healing at IPGT and RA Jamnagar. Int J Res Ayurveda Pharm. 2011;2(1):13-17.
 31. Pandey MM, Rastogi S, Rawat AK. Indian traditional Ayurvedic system of medicine and nutritional supplementation. Evid Based Complement Alternat Med. 2013;2013:376327. DOI: 10.1155/2013/376327.
 32. Mirghani R, Saba T, Khaliq H, Mitchell J, Do L, Chambi L, Diaz K, Kennedy T, Alkassab K, Huynh T, Elmi M, Martinez J, Sawan S, Rijal G. Biofilms: Formation, drug resistance and alternatives to conventional approaches. AIMS Microbiol. 2022;8(3):239-277. DOI: 10.3934/microbiol.2022019.
 33. Javed D, Das AK. Preparation, standardization, and *in vitro* antimicrobial efficacy of Gairikadya Malahara – An Ayurvedic ointment. Int J Ayurveda Res. 2022;3(2):136-141.
 34. Javed D. A time-motion study of OPD services at a state level Ayurvedic hospital to reduce the OPD congestion. IAMJ. 2015;3(10):1-9.
 35. Javed D, Anwar S, Pathan S. Comparative antimicrobial efficacy of Ayurvedic formulations; Satva and Ghana of *Tinospora cordifolia* (Willd.) Miers (Giloy) against commensals and opportunistic pathogens. J Drug Deliv Ther. 2022;12(1-S):23-28.

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