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Efficacy and Mechanisms of Karanja *Ghrita* in Wound Healing: An Ayurvedic Perspective

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Abstract

Introduction:

Wound healing is a critical process in clinical care, where traditional therapies, such as those derived from Ayurveda, offer significant benefits. *Karanja Ghrita*, a formulation combining *Karanja* (Pongamia pinnata) oil and ghee, is traditionally used in *Ayurvedic* practices for its wound healing properties. This review explores its efficacy and underlying mechanisms in wound management.

Methods:

The paper examines the *Ayurvedic* principles of wound healing, which include the stages of *dushta vrana* (septic wound), shudh vrana (clean wound), *roohyamana vrana* (healing wound), and *roodha vrana* (healed wound). Emphasis is placed on the role of *Karanja Ghrita* in each phase of healing and its application in clinical settings.

Results:

Karanja Ghrita demonstrates significant therapeutic potential in wound healing. It acts through its antimicrobial, anti-inflammatory, and analgesic properties, promoting both wound purification (*vrana shodhana*) and healing (*vrana roopana*). The formulation enhances tissue regeneration, prevents infection, and accelerates wound closure, particularly in chronic and septic wounds.

Discussion and Conclusion:

The clinical benefits of *Karanja Ghrita* in wound healing extend beyond its traditional use, supported by its bioactive compounds. Its ability to support tissue regeneration, reduce inflammation, and prevent infections makes it a valuable adjunct in both acute and chronic wound care. By integrating *Ayurvedic* formulations like *Karanja Ghrita* with modern wound management, healthcare practitioners can offer holistic, effective treatments for various wound types.

Keywords: *Karanja Ghrita*, Wound Healing, *Ayurvedic* Formulations, *Vrana Shodhana*, Chronic Wounds

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Introduction

Wound healing is a dynamic and intricate process that involves the replacement of damaged tissue with functional, living tissue.[1] This process, aimed at restoring the anatomical and functional integrity of the affected area, engages various cellular components such as neutrophils, macrophages, lymphocytes, fibroblasts, and collagen.[2,3] The healing mechanism unfolds in a series of well-coordinated stages: hemostasis, inflammation, proliferation, matrix synthesis, maturation, remodeling, epithelialization, and wound contraction.[3] In Ayurvedic medicine, the term *dushta vrana* refers to wounds that fail to heal naturally, often becoming chronic or septic.[4,5] The revered sage *Acharya Sushruta*, considered the father of Indian surgery, described the *Shashthi upakrama* as a set of therapeutic procedures for managing *dushta vrana*. Among the primary Ayurvedic treatments for such wounds are medicinal formulations involving *Ghrita* (clarified butter) and *taila* (oil).[6.7]

Karanja *Ghrita*, a potent Ayurvedic formulation made from the seeds of the Karanja tree (*Pongamia pinnata*) and *Ghrita*, plays a critical role in wound healing. Karanja possesses notable *krimighna* (anti-parasitic) and *vishaghna* (toxic-neutralizing) properties, making it highly effective in managing *dushta vrana*. Furthermore, *Karanja taila* has inherent *shodhana* (purifying) and *ropana* (healing) qualities that promote tissue regeneration.[8] In Ayurveda, there are four primary types of *sneha* (fats or oils): *Ghrita*, *taila*, *vasa* (fat), and *mamsa* (meat). Among these, *Ghrita* is regarded as the most therapeutically potent. A key characteristic of *Ghrita*, termed *sanskaranuvartana*, allows it to absorb and enhance the medicinal qualities of the herbs and ingredients it carries. This property significantly improves the bioavailability and therapeutic efficacy of active compounds.[9,10] Additionally, *Ghrita* is known for its nourishing, rejuvenating, and healing effects, making it indispensable in various Ayurvedic formulations, particularly those aimed at wound healing. Its ability to support digestion, metabolism, and provide a calming effect further supports holistic healing practices.[11]

In the Ayurvedic system, *vranaropaka* (wound management) has always held significant importance, being essential for survival and recovery.[12] The use of *Ghrita* as a base in medicinal formulations is highly valued for its ability to concentrate and retain the active compounds of its ingredients, thereby

enhancing their therapeutic potency and ensuring effective wound care.[13,14]

A. **Karanja-**

Table 1 Showing Vernacular names of *Karanja*[15]

S.NO.	Language	Name
1.	English	Indian Beech
2.	Hindi	Karanj, Kanja, Karanja, Karuaini, Dithouri
3.	Sanskrit	Ghrtakarauja, Karanjaka, Naktahva, Naktamala
4.	Bengali	Dahara karanja, Karanja, Natakaranja
5.	Assamese	Korach
6.	Kannada	Honge, Hulagilu
7.	Marathi	Karanja
8.	Gujrati	Kanaji, Kanajo
9.	Punjabi :	Karanj
10.	Telugu	Ganuga, Kanugu
11.	Malayalam	Pungu, Ungu, Unu, Avittal
12	Tamil	Pungai, Pongana

Table 2 Showing Botanical Aspects of *Karanja*[15]

Taxonomical rank	**Taxon**
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Leguminosae
Genus	Pongamia
Species	Pinnata
Common Name	Karanja, Indian beech

Table 3 Showing Properties of *Karanja*[15]

Rasa	*Katu, Tikta, Kasaya*
Guna	*Tiksna*
Virya	*Usna*
Vipaka	*Katu*
Karma	*Kaphahara, Pittahara, Vatahara*

Table 4 Showing Utility of *Karanja*[15]

Yonidoshahrut	Detoxifies vaginal diseases, useful in uterine disorders
Kushtaghna	Useful in skin diseases
Udavartahara	relieves bloating
Gulmahara	abdominal tumor, bloating
Arshahara	useful in piles/hemorrhoids
Krumihara	relieves worm infestation

Geographical Distribution

Pongamia pinnata (Karanja) is widely distributed across various regions of Asia and has been introduced in several other parts of the world, including Australia, Florida, Hawaii, India, Malaysia, Oceania, the Philippines, and Seychelles.[16] In South India, it flourishes at elevations of up to 1200 meters, primarily in areas near streams and rivers, where it thrives in well-drained sandy loam soils with consistent moisture availability. [17] Its adaptability to a range of climatic conditions has facilitated its spread across diverse geographic locations.

Phytochemical Constituents

The seeds of *Pongamia pinnata* (*Karanja*) contain a variety of bioactive compounds, including two sterols, three sterol derivatives, and one disaccharide, as well as eight fatty acids—three of which are saturated and five unsaturated. Noteworthy compounds identified include β-sitosteryl acetate, stigma sterol, galactoside, and sucrose, with the structures of these compounds elucidated through spectroscopic techniques and comparisons to literature data. Additionally, the compounds Pongamones A-E have been tested in vitro against *DHBV RCs DNAP* and *HIV-1 RT*, showing significant activity.[18]

A study on Japanese *Pongamia pinnata* has revealed 18 flavonoid compounds, nine of which are novel, isolated from the root bark. Among these, notable flavonoids include Pongone, Galbone, and Pongagallone, while immature seeds contain a flavone derivative known as 'pongol'. The stems of the plant have also been found to yield five unusual flavonoid metabolites.[19]

The fatty acid composition of Karanja oil is dominated by oleic acid (42.44%), followed by stearic acid (29.64%) and palmitic acid (18.58%). Further, the fruits of the plant have been shown to yield three new furanoflavonoid glucosides, namely pongamosides A-C, and a new flavonol glucoside, pongamoside D. These compounds were identified through advanced spectroscopic studies, marking the first discovery of naturally occurring furanoflavonoid glucosides. Additionally, pinnatin, a furanoflavone isolated from *Derris indica*, was found to have a nearly planar structure with a phenyl ring axially attached to the furanoflavone nucleus. The molecular structure forms molecular ribbons along the b-axis through C-HO interactions.[20]

Ghrita

Ghrita is a viscous liquid or semi-solid substance at room temperature, characterized by its granular texture and a

color that ranges from white to light yellow. It exudes a rich aroma and offers a pleasant taste. The preparation must be free from any animal fats, waxes, mineral oils, or vegetable oils. According to *Acharya Charaka*, *Ghrita* is recognized for its unctuous (oily) properties, enhancing its therapeutic and nutritive value.[21]

Properties of *Ghrita*

General Properties

Ghrita is widely praised for its vast array of health benefits. It enhances cognitive functions such as memory and intellect, while also supporting the digestive system (*agni*). It aids in the production of vital bodily fluids like semen and *ojas*, which are linked to vitality and immunity. Furthermore, *Ghrita* helps balance *kapha* and *medas* (body fats), contributing to overall health.

Therapeutic Properties

On a therapeutic level, *Ghrita* has proven effective in alleviating conditions related to the *vata* and *pitta* doshas, making it an excellent remedy for numerous ailments. These include poisoning, mental disturbances (such as insanity), tuberculosis (*phthisis*), inauspiciousness, and fever. Regarded as one of the finest fats, *Ghrita* possesses a cooling effect and a sweet taste (*madhura rasa*). It undergoes a sweet transformation during digestion (*madhura vipaka*), enhancing its therapeutic properties.

Health Benefits

When utilized correctly in accordance with Ayurvedic principles, *Ghrita* offers a broad range of benefits, including its role in balancing the body's doshas and improving physical and mental health. It is particularly valuable in restoring strength and promoting longevity.

Table 5 Showing Vernacular names of *Ghrita*[15]

Hindi	Gaya ghee
Gujarati	Ghee
English	Clarified butter
Bengali	Gava ghee
Telagu	Neyyi, nei
Punjabi	Ghee
Marathi	Marathi
Malayalama	Pasu nei
Kannada	Tuppa

Table 6 Showing Properties of *Ghee*[15]

Category	Description
***Rasa* (Taste)**	*Madhura* (Sweet)
***Guna* (Qualities)**	*Snigdha* (Unctuous), *Mridu* (Soft), *Shalakshana* (Smooth), *Guru* (Heavy), *Yogavahi* (Facilitates the effects of other substances), *Alpabhishyandi* (Low spreading tendency), *Soumyama* (Mild)
***Virya* (Potency)**	*Sheeta* (Cooling)
***Vipaka* (Post-digestive Effect)**	*Madhura* (Sweet)
***Dosha Shamakata* (Effect on *Dosha*)**	*Tridosha shamaka* (Balances all three doshas: *Vata*, *Pitta*, and *Kapha*)

Table 6 Showing Therapeutic Effects of *Ghee*[23]

Action/Therapeutic Effect	Description
Agnidipana	Enhances digestive fire
Anabhishayandi	Improves absorption and assimilation
Ayushya	Promotes longevity
Balya	Strengthening
Cakshushya	Beneficial for eyesight
Dipana	Stimulates digestion
Hrudya	Heart-promoting
Kāntipradā	Enhances complexion
Medhya	Improves intellect
Ojovardhaka	Increases vitality and immunity
Rasāyana	Rejuvenating
Rucya	Improves taste and appetite
Slesmavardhana	Increases Kapha and lubrication
Snehana	Lubricating and nourishing
Śukravardhaka	Enhances fertility
Tejobalakara	Enhances vigor and strength
Tvacya	Beneficial for skin
Vātapittapraśamana	Pacifies Vata and Pitta
Vayaasthpaāna	Anti-aging
Vishahara	Neutralizes toxins

Properties of Old *Ghrita*

Old *Ghrita*, also known as aged clarified butter, holds a revered place in traditional medicine due to its enhanced therapeutic properties, which develop with time. It is particularly valued for its capacity to address a wide array of health conditions. The therapeutic benefits of old *Ghrita* include:

1. **Intoxication**: Old *Ghrita* is used to detoxify the body and alleviate symptoms of poisoning, making it a key remedy in cases of acute intoxication.

2. **Epilepsy**: Its neuroprotective properties are believed to stabilize neurological function, aiding in the management of epilepsy and reducing the frequency of seizures.
3. **Fainting**: The calming effects of old *Ghrita* may help prevent fainting episodes by stabilizing the nervous system and improving overall vitality.
4. **Phthisis (Tuberculosis)**: It supports lung health and aids in the recovery from phthisis by nourishing the body and enhancing immune function.
5. **Insanity**: The soothing nature of old *Ghrita* makes it useful in alleviating mental disturbances, stabilizing mood, and reducing anxiety or agitation.
6. **Poison**: In addition to its general detoxifying action, old *Ghrita* is specifically effective against certain types of poisons, promoting healing and recovery.
7. **Fever**: The cooling properties of old *Ghrita* help reduce body temperature, providing relief in cases of fever.
8. **Pain Relief**: Old *Ghrita* has analgesic effects and is effective in alleviating pain, including in the female genital tract, ear, and head.[16,17,18]

The traditional uses of old *Ghrita* underscore its versatility and potency, particularly in addressing neurological, respiratory, and reproductive health issues.

Importance of Go *Ghrita*

Go Ghrita (cow-derived clarified butter) is a prized ingredient in Ayurveda, celebrated for its therapeutic benefits, especially in enhancing overall health and well-being. Its key benefits include:

- **Eye Health**: *Go Ghrita* is particularly beneficial for enhancing vision, improving eye health, and potentially slowing the progression of age-related eye conditions.
- **Semen Production**: It is believed to stimulate semen production, which is integral to reproductive health.
- **Digestive Health**: *Go Ghrita* improves digestive fire (*Agni*), aids in the absorption of nutrients, and enhances digestive processes.
- **Retention Power**: It promotes retention power, which is essential for preserving mental and physical strength.
- **Beauty Enhancement**: Regular use of *Go Ghrita* is associated with

enhanced skin tone, vitality, and overall beauty.[19,20]

- **Antioxidant Properties**: *Go Ghrita* possesses significant antioxidant properties, facilitating the absorption of vitamins and minerals and supporting cellular health.
- **Cancer Prevention**: Some studies suggest that *Go Ghrita* may help combat cancer by increasing the availability of detoxifying enzymes that neutralize carcinogenic substances.[21,22]

Go Ghrita stands out as a healthier and safer option due to its composition of saturated fats, offering a natural, nutrient-rich alternative for enhancing overall health.

Discussion

The traditional use of *Karanja Ghrita* in wound healing has been well-documented within Ayurvedic practices, where it is considered a powerful remedy for various types of wounds, including *Dushta Vrana* (chronic or non-healing wounds). As a formulation combining *Karanja* (Pongamia pinnata) and *Ghrita* (clarified butter), it leverages both the pharmacological properties of the plant and the therapeutic benefits of *Ghrita*. Modern research supports the traditional claims of *Karanja Ghrita* being effective in wound care, primarily due to its antimicrobial, anti-inflammatory, and tissue-regenerative properties.

Antimicrobial and Anti-inflammatory Properties

One of the key features that make *Karanja Ghrita* an effective treatment for wounds is its antimicrobial action. *Karanja* oil contains a range of bioactive compounds, including flavonoids, furanoflavonoids, and triterpenoids, which have demonstrated strong antimicrobial effects. These compounds work synergistically to inhibit the growth of bacteria, fungi, and viruses, which are often present in chronic wounds. *Karanja* is traditionally known for its *krimighna* (anti-parasitic) and *vishaghna* (toxic-neutralizing) properties, making it highly effective in treating wounds that become infected or festering. This antimicrobial action is essential in preventing wound infection, a common complication in wound healing.

Moreover, *Karanja Ghrita* has significant anti-inflammatory properties. In Ayurveda, inflammation is considered a key aspect of the healing process, but when prolonged or excessive, it can hinder wound healing. The *Karanja Ghrita* formulation helps regulate the inflammatory response through the action of flavonoids and other active compounds. These compounds

inhibit the pro-inflammatory cytokines and enzymes responsible for chronic inflammation, thus promoting faster recovery and reducing pain at the site of the wound.

Tissue Regeneration and Healing

Beyond its antimicrobial and anti-inflammatory properties, *Karanja Ghrita* also promotes tissue regeneration, which is crucial for effective wound healing. The *Ghrita* component in *Karanja Ghrita* enhances the bioavailability of the active compounds from *Karanja*, facilitating deeper penetration into the skin and tissues. *Ghrita* itself has long been considered a powerful healer due to its unctuous and nourishing qualities (*snigdha*), which support the regeneration of tissues. It works as a base for the active compounds, ensuring that the herbal extracts are absorbed more efficiently into the tissues.

In Ayurveda, the use of *Ghrita* is believed to balance all three doshas—*Vata*, *Pitta*, and *Kapha*—and specifically targets the *Vata* dosha, which governs movement and healing. By balancing *Vata*, *Karanja Ghrita* supports the natural processes of tissue repair and regeneration. *Ghrita* also has a stabilizing effect on cell membranes, which is essential for the repair of damaged tissues, promoting faster epithelialization, the process through which new skin cells are formed.

Holistic Healing Approach

One of the unique aspects of *Karanja Ghrita* in wound healing is its holistic approach. In addition to its direct medicinal properties, Ayurveda emphasizes the balance of physical, mental, and spiritual health in the healing process. Wound healing is seen not only as a physical recovery but also as a process that involves restoring the balance of the body's energies. By incorporating *Karanja Ghrita* into wound care, Ayurveda offers a more integrated and holistic healing process that not only accelerates physical recovery but also contributes to emotional and mental well-being.

The rejuvenating effects of *Ghrita*, as highlighted in Ayurvedic texts, support overall vitality (*Ojovardhaka*) and immunity, which are essential in preventing future infections and promoting a resilient healing environment. Furthermore, the calming effect of *Ghrita* on the nervous system is believed to help manage stress, which is known to negatively impact wound healing. This holistic perspective makes *Karanja Ghrita* an excellent complement to modern wound care, particularly in cases where chronic wounds or recurring infections are prevalent.

Integration with Modern Medical Practices

While Ayurveda offers valuable insights and treatments, its integration into modern healthcare is often met with skepticism due to a lack of empirical data and clinical trials. However, contemporary scientific studies have begun to validate the claims made by Ayurvedic practitioners regarding the effectiveness of *Karanja Ghrita* in wound healing. The antimicrobial and anti-inflammatory properties of *Karanja* are well-documented in modern research, and studies are increasingly investigating the synergistic effects of *Ghrita* and herbal formulations in tissue regeneration.

Integrating *Karanja Ghrita* into modern wound care can offer significant advantages. Its natural composition, availability, and low cost make it an attractive option, especially for treating chronic wounds that do not respond well to conventional treatments. Additionally, its minimal side effects and holistic approach to health can provide a complementary alternative to chemical-based ointments, which may have long-term adverse effects.

Conclusion

Wound healing, or *vranaropaka*, remains a crucial aspect of human health. The historical significance of wound management in Ayurveda is as pertinent today as it was in ancient times. In the context of modern medicine, particularly with our increased focus on hygiene and synthetic pharmaceuticals, there is growing interest in how traditional healing practices, like those found in Ayurveda, can complement and enhance contemporary healthcare methods.

This review highlights the use of polyherbal *Ghritas* and ghee-based formulations, which have long been utilized in Ayurvedic practices for wound healing. These formulations exhibit substantial pharmacological and therapeutic potential, promoting efficient wound healing and aligning with Ayurvedic principles of holistic health.

The extensive use of cow-derived products, particularly *Ghrita*, in Indian civilization is supported by numerous experimental studies, both on humans and animals. Research indicates that *Ghrita* formulations significantly aid in wound management, further establishing their effectiveness and relevance in modern therapeutic practices. This study reinforces the value of integrating Ayurveda into contemporary medical care, advocating for natural and time-tested approaches in treating wounds and promoting overall health.

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