



# HERBAL MEDICINE FOR WOUNDHEALING

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## Abstract -

Herbs have been integral to both traditional and non-traditional forms of medicine at least 5000 years. More recently scientists increasingly rely on the modern scientific method and focus on better understanding of mechanism of their action preparation from traditional medicine plants are often used for wound healing purpose covering broad area different skin related diseases Herbal medicine in wound management involve disinfectant, debridement and provision of suitable environment for adding the natural course of healing.wounds are related injuries such as cuts, burns caused by external injury . Wound is a common injury due to the internal and external factors which are subsequently associated with many immunological events.The aim of this review is therefore to review herbal medicine which are pose high potential for effective treatment of minor wounds.

**Keywords - Herbal Medicine, wounds , Traditional medicine.**

## Introduction -

Ancient civilizations had a strong connection between humans and plants for a long time. In the past, people used plants to make medicine, either by using different parts of the plant or by making extracts or mixtures[1] plant extracts have many healing benefits for wounds because they contain helpful substances like flavonoids, fatty acids, alkaloids, and carbohydrates. These substances have properties that fight bacteria, fungi, and

inflammation, as well as protect against damage from free radicals.[2]. Plants that help heal wounds are commonly used to treat a variety of skin problems. Using herbal remedies to heal wounds includes cleaning, removing dead tissue, and creating a good environment to help the body heal on its own Using herbal medicines for treating wounds includes cleaning, removing dead tissue, and creating a good environment to help the wound heal naturally.[3] A wound is defined when the skin gets damaged by things like physical, chemical, or mechanical forces When this happens, it's important to heal the skin and make sure it goes back to working normally. Start the healing process quickly to keep the body balanced, ensuring that the skin starts to heal right after getting injured.[4] Wound healing is something that happens in your body . It's not just a simple process, though Many different cells, chemicals, and the blood vessels all work together to help the wound heal. At first, your blood vessels shrink and your blood cells stick together to stop the bleeding. This is then followed by a rush of different inflammatory cells, starting with the neutrophil. These cells release different substances to help with the growth of new blood vessels, blood clotting, and the healing of the skin. The fibroblasts then create a framework by laying down materials the cells] Injuries can often lead to wounds, whether they are caused by something inside or outside the body. These wounds can trigger a series of immune responses, such as tissue death and inflammation[5]. A wound is when the skin gets damaged or broken in some way. This can happen from accidents like burns, cuts, or tears, as well as from surgeries, diseases, or skin conditions like eczema or psoriasis. A wound happens when there is damage to the body's normal structure and function.

Wounds happen because of medical issues. Starting either inside or outside the organs Wounds are the physical injuries that result in an opening or breaking of the skin or break in the epithelial integrity of the skin and may be accompanied by disruption of the structure and function of underlying normal tissue[6].Compounds found in plants can help wounds heal better by decreasing the formation of scars. These compounds have properties that fight bacteria, protect against damage, and promote healing. Bioactive compounds from plants help to clot blood, combat infections, and accelerate the healing of wounds.[7]. Wound healing involves four important phases that need to happen in a specific order.

If there are any problems or delays

in these phases, the wound may take longer to heal or not heal at all.[8]The process of skin wound healing is really interesting and gives mammals an evolutionary edge. This is because the skin acts as a barrier against physical, chemical, and bacterial threats. Skin wound healing is a crucial process that ends with the wound closing to help the body survive. Even though there is a lot of information about how wounds heal, there are still many unanswered questions. Skin wound healing is a complicated process that relies on different cells and mediators working together in a specific order. While certain interactions are important for healing, there is often a lot of repetition and other cells or mediators can take on roles or signals without any issues. This update on skin wound healing aims to highlight the various stages, providing readers with current information and fresh perspectives. In conclusion, the update will summarize the key points. Concentrate on three popular

topics: scarring, using tissue engineering for fixing skin wounds, and applying plasma to heal skin wounds.[9] |

## Type of wound healing

**Acute wound** - An acute wound is when the skin gets hurt suddenly, not gradually. It gets better at a normal speed like other wounds. These wounds can happen anywhere on the body and can range from small scratches to deep cuts that hurt blood vessels, nerves, and muscles.[10] Acute wounds are injuries to the skin that usually heal fast and go through the normal healing stages at the right speed, leading to the wound fully closing. These wounds

can be small cuts from sharp objects like knives or paper, skin tears with uneven edges, bites or scratches from animals, and wounds from surgery. Acute wounds happen suddenly instead of developing over time. An acute wound can occur all over the body and can vary from minor cuts to severe injuries that harm blood vessels, nerves, and muscle tissue.[11] Sudden injuries that cause a lot of pain are known as acute injuries. They can include things like a broken bone, muscle tear, or bruising. Chronic injuries, on the other hand, happen from using one part of the body too much for a long time. Some common chronic injuries include stress fractures and inflammation in the heel. Suddenly experiencing intense pain, swelling, and being unable to put weight on a leg. Severe pain in an arm or hand, not being able to move a joint properly, and feeling very weak in a limb. A visible bone is out of place or broken.[12] Different types of injuries can cause acute wounds due to damage to tissues and bones. For instance, in cases of crushing or high-impact injuries, there may be a clear line that shows up later, even a week or two after the injury. It is crucial to understand how the injury occurred and remember that the wound you see initially may not show the full extent of the damage that will be visible in a week. In these situations, it is important to teach the patient and their family about how the disease will develop so that they don't get

frustrated or confused. [13] An acute wound is a sudden skin injury that can occur anywhere on the body. These wounds vary in severity, from minor scratches to deep cuts. Acute wounds can either get better on their own or not get better. Wounds that get better are usually caused by a one-time injury or accident. They heal in a normal way that is steady and can be expected.[14]

**Chronic wound** - A chronic wound is one that doesn't heal properly in a set amount of time like most cuts and scrapes do. For instance, a wound that hasn't gotten better in three months is usually considered chronic. Chronic wounds are linked to getting older and having health issues like diabetes.[15] Long-lasting wounds, like simple cuts from small surgeries, need to be taken care of properly to prevent scarring. Patients may worry about scars forming after the wound heals.[16] A chronic wound that doesn't get better with the right treatment could be classified as an atypical wound. These kinds of wounds are found in strange places, look different, and don't get better even after three to six months of regular wound care. Atypical wounds

can be caused by inflammation, infection, blood vessel issues, metabolic problems, genetic factors, cancer, or external factors like calciphylaxis, pyoderma gangrenosum, vasculitis, or autoimmune diseases. Doctors need to do a biopsy to check out unusual wounds on patients. They might also need to send the patient to a specialist [17]

When a wound gets stuck in the healing process for a long time, it is called a chronic wound. This happens when the wound does not progress for about three months. Chronic wounds

usually get stuck in the first stage of healing. Many things like diseases can make it hard for wounds to heal properly, leading to chronic wounds that don't get better. In chronic wounds, the key idea is a continuous state of inflammation that makes it hard for the wound to heal. This ongoing inflammation is a common feature of chronic wounds, and problems with certain immune cells called macrophages play a big role in this abnormal process. The main focus in treating chronic wounds is to figure out why they are not healing and to remove any barriers that are stopping the healing process. Chronic wounds can be divided into different categories, and it's important to answer the related questions for each category [18] A long-lasting wound could turn into cancer [19]

### Stage of wound Healing -Homeostasis phase -

The first step, called hemostasis, starts right away when there is an injury (within a few Minutes), causing changes in the tissue; at this point, platelets become active and send Signals to create blood clots (made up of fibronectin, fibrin, vitronectin, and thrombospondin) And help platelets form a plug. Additionally, growth factors (such as epidermal growth, Platelet-derived growth factor, transforming growth factor- $\beta$ , and chemokines) are released to Begin the healing process. During this step, prostaglandin H<sub>2</sub> changes into thromboxane A<sub>2</sub> (TXA<sub>2</sub>) with the help of the enzyme thromboxane synthase. TXA<sub>2</sub> is a strong substance that Helps platelets become active and tightens blood vessels. It also plays a role in releasing Important cells like macrophages, neutrophils, and endothelial cells that are needed for Healing wounds. [20]

### Inflammatory Phase -

The process starts as soon as the injury happens, with the damaged blood vessels leaking a fluid called transudate (which is made of water, salt, and protein) and causing swelling in the area. Inflammation helps stop the bleeding and keeps infections away. The extra fluid helps healing cells reach the wound and repair it. In the first stage of healing, the body gets damaged cells, germs, and bacteria from the wound. White blood cells, growth factors, nutrients, and enzymes work together to cause swelling, heat, pain, and redness. This is normal and helps the wound heal. But if inflammation lasts too long or is too severe, it can be a problem [21]

**Proliferative phase -**

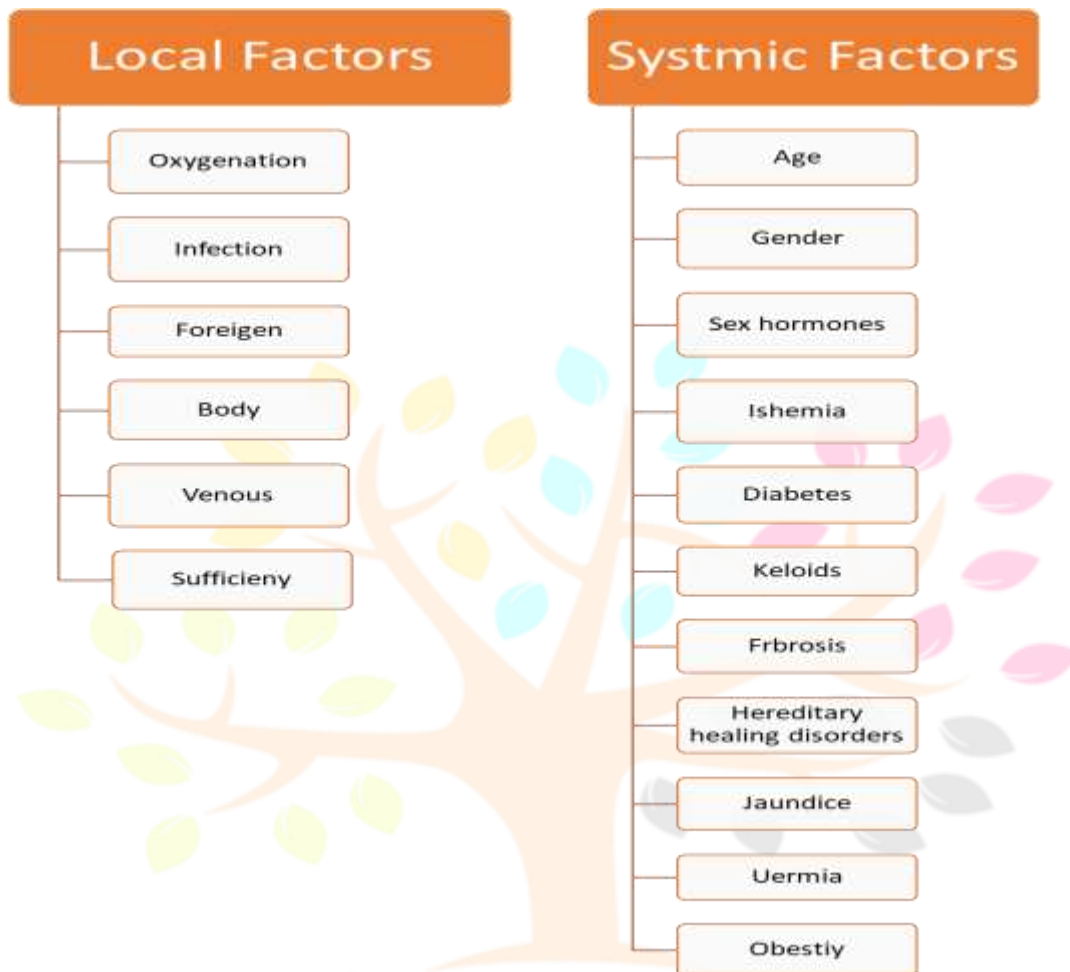
During the proliferative phase, which lasts for a few days to weeks, the goal is to decrease the damaged tissue area. This phase involves the regeneration of the skin and the formation of new blood vessels. When a wound occurs, activated fibroblasts move to the site and produce proteins like hyaluronan, fibronectin, and collagen, leading to the formation of granulation tissue. Special substances like fibronectin and proteoglycan are used to replace fibrin clots. After that, collagen is made to make the tissue strong. This tissue is called connective tissue or granulation tissue, where type 3 collagens are mostly found. help in the creation of new tissue. Additionally, the cytokines also play a role in the growth of blood vessels by endothelial cells. This process helps in the healing of wounds and the regeneration of skin cells. Cells move to the wound to create a new skin barrier. Also, during this stage, fibroblasts change into myofibroblasts, which reduces growth and enhances healing. Collagen production helps the wound to shrink and become smaller by pulling the edges of the wound together.[22]

**Remodeling phase -**

During remodelling, the new tissue that formed during healing turns into a scar and becomes stronger. This happens because the small blood vessels combine to form bigger ones, and there is less water and certain substances in the tissue. The number of cells and how active they are also decrease as the tissue matures. Changes in collagen type, amount, and arrangement improve the strength of the skin. At first, a lot of type III collagen is made, but it is later replaced by type I collagen, which is the main type in skin. A wound that has healed with new skin is only about 25% as strong as normal skin. When tissue heals or gets fixed, it's not as strong as tissue that was never hurt. [23]

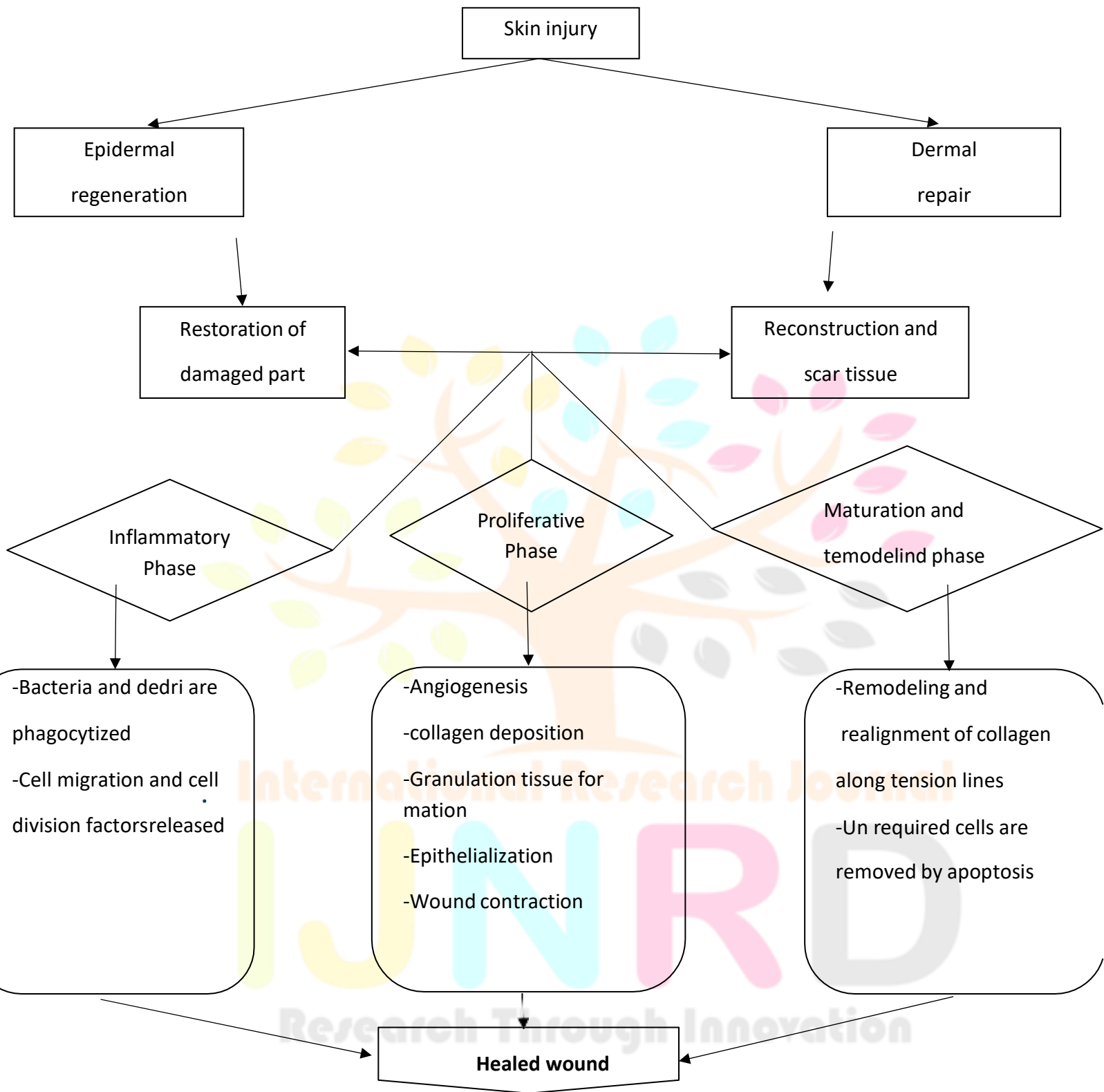


## Factors of wound healing -



**Fi1:Common Wound Healing**

## Mechanism Of Action-



## Herbs mechanism of action -



### Aloe vera-

Aloe vera is also called Kumari, is a popular herbal remedy used in India. Aloe vera has a short stem, shallow roots, and big succulent leaves. Aloe vera is a plant that naturally grows in the deserts of India. It has over 100 parts that are good for healing wounds and have other helpful qualities like stopping bleeding, treating diabetes, preventing ulcers, killing germs, reducing inflammation, fighting cancer, and acting as an antioxidant. In a study conducted by Saini and colleagues, it was found that the pulp of Aloe vera leaves is more effective and works quicker as an antidiarrheal remedy. Aloe vera ointment has a better ability to heal wounds compared to Povidone Iodine ointment (5% w/w) on a cut wound. It has been found that Aloe vera not only helps wounds heal faster but also keeps the area safe from germs. Aloe vera is said to improve how quickly collagen is made and increase the amount of lysyl oxidase that links new collagen together. Aloe vera can also help heal ulcers when consumed and protect the skin. When you apply aloe vera gel on your skin, it helps wounds to heal faster by reducing their size and closing them up. This is because aloe vera gel helps to increase the amount of collagen in your skin, which is important for healing wounds. According to research, Aloe vera gel helps wounds heal faster by speeding up the growth of new skin cells, blood vessels, and reducing wound size. This healing ability is due to a substance called glucomannan. This substance is made up of complex carbohydrates. It impacts how fibroblast growth factor works and changes the behavior and growth of these cells. As a result, it boosts the production and release of collagen. Aloe vera's mucilage helps collagen bands connect better, speeding up wound healing without altering the collagen's structure.[26] Aloe vera helps wounds heal faster and reduces swelling. Researchers looked into whether mannose-6-phosphate, the main sugar in Aloe gel, plays a role in these benefits. Mice that were given 300 mg/kg of mannose-6-phosphate showed better healing of wounds compared to mice that were given saline. This dosage also showed anti-inflammatory effects.[27]



### Tulsi -

*Ocimum sanctum*, also known as Tulasi in Sanskrit and belonging to the Labiaceae family, grows in warm areas of India. People have been using different parts of this plant in Ayurveda and Siddha medicine to help with

things like infections, skin issues, liver problems, and even to counteract snake bites and scorpion stings. Sanctum leaves have substances called tannins such as gallic acid and chlorogenic acid. They also have alkaloids, glycosides, and saponins, as well as a volatile oil. The main ingredient in basil leaves is urosolic acid. It contains 70% eugenol, carvenol, and eugenol-methyl-ether. Ocimum sanctum products help protect cells from damage by getting rid of free radicals. It also helps in healing wounds by helping with the immune system, like making antibodies and releasing substances that cause hypersensitivity reactions. Studies have shown that Ocimum sanctum has different effects like protecting against stomach ulcers, reducing stomach acid, and strengthening the lining of the stomach. The leaves of Ocimum sanctum have essential oils with limonene, borneol, copaene, and caryophyllene. Experts have found that certain substances like elemol, phenolic compounds such as rosmarinic acid and flavonoids like orientin are good for healing wounds. These compounds can be found in products made from Ocimum sanctum, which can also help increase the level of TNF-alpha during the healing process.[28] This process is known as phytochemical. Researchers have found that essential oils derived from plants can help reduce inflammation, fight against harmful oxidants, and prevent the growth of harmful microbes. One of the most popular natural products is essential oils, which are commonly used in dermatology. Experts have found 90 essential oils that are useful for skin care, and there are over 1500 combinations available. For many years, people have been using essential oils safely in making perfumes, food, and cleaning products. Yet, wound healing rarely involves the use of essential oils or their primary components. Ocimum sanctum Linn, a commonly available plant, belongs to the class Magnoliopsida, is found to have anti-inflammatory, analgesic, immunostimulatory, free radical scavenging and found to have anti-inflammatory, analgesic, immunostimulatory, free radical scavenging and anti-microbial activity . It is widely distributed throughout India and in different parts [29]



### Neem (Azadirachta indica)-

Neem is a tall evergreen tree with small green leaves that can grow up to 100 feet. It is commonly found all over India and is also known as the Herbal Indian Doctor. The neem tree, also known as *Azadirachta indica* (AI) A. Juss, belongs to the Meliaceae family and is a well-liked tree found widely in India. The advantages of different parts of the neem tree are described in the oldest Sanskrit medical texts. As a result, neem tree has been an important part of human culture and civilization since ancient Vedic times. The neem tree has been used for a long time to treat different health problems. The bark helps with pain and fevers, the twigs are used for coughs, asthma, and other issues, the leaves can help with skin problems, and the flowers are good for getting rid of worms and other digestion problems. Experts recommend using neem for various health issues such as piles, intestinal worms, urinary disorder, diabetes, wounds, eye problems, leprosy, and cancer. Neem seeds are also beneficial for treating leprosy and intestinal worms, while neem oil can help with leprosy, intestinal worms, scabies, wounds, ulcers, and skin diseases. Different natural chemicals found in the neem tree, like alkaloids, triterpenoids, limonoids, flavonoids, fatty acids, and steroids, have been shown to have a lot of good effects. These include reducing inflammation, fighting cancer, preventing ulcers, protecting against damage from free radicals, boosting the immune system, fighting fungal and bacterial infections,

stopping viruses, preventing malaria, reducing the chances of mutations in DNA, and lowering blood sugar levels. Nimbidin, nimbin, and nimbidol are active compounds found in neem. These compounds have anti-inflammatory and antimicrobial properties that can speed up the healing of wounds. Neem has plenty of amino acids, vitamins, and minerals that are important for helping wounds heal. The extract from neem is used to treat skin conditions like eczema, ringworm, and scabies. Neem leaves and oil from seeds have been found to have antimicrobial properties. This helps to stop additional infections caused by tiny organisms. Research shows that neem can reduce inflammation just as well as cortisone acetate, which helps wounds heal faster. Neem oil, derived from the neem tree, has been proven to be very effective in treating long-lasting wounds and helping to heal wounds that won't go away when applied directly to the skin. Using Neem and decubitus ulcers can also be treated with this method. Haridra (*C. longa*) together can help in creating new blood vessels and increasing the amount of DNA. This combination is very effective in tree[30]



## Turmeric -

Turmeric is a spice that comes from the root of a plant called *Curcuma longa*. It belongs to the same family as zingiberaceae Ayurveda, turmeric has been used for its healing properties in different treatments and ways. Different ways of administering turmeric, such as applying it on the skin, taking it by mouth, or inhaling it, have been mentioned. Turmeric, which has been used as a natural remedy for many years, is used to treat different illnesses. Studies have shown that curcumin, which is a chemical compound found in turmeric, has important abilities to help heal wounds. It also has effects that can fight infections, reduce inflammation, prevent mutations, lower the risk of cancer, and help with blood clotting. It speeds up the wound healing process by working on various stages. Curcumin can also help improve granulation tissue. Curcumin speeds up the healing process by helping the body produce growth factors that help with wound contraction, collagen deposition, tissue remodeling, and formation. In the lab, curcumin helps wounds heal better when used in different amounts. It can speed up healing at lower doses but slow it down at higher doses. Studies have shown that curcumin helps in wound healing by changing the way urokinase . Turmeric has properties that can assist in the healing of wounds. Curcumin helped the body make more growth factors that help wounds heal faster. This made the wound heal quicker.[31] For a long time, curcumin has been used to heal wounds. Recently, studies have shown that it can help with both new and long-lasting wounds. Curcumin is not only antibacterial, antioxidant, and anti-inflammatory, but it also helps with tissue growth and repair, making it a very effective healing substance. Recent studies have confirmed that curcumin plays a vital role in all stages of wound healing. It helps to prevent... By producing two important cytokines, interleukin-1 (IL-1) and tumor necrosis factor alpha (TNF-), the body manages inflammation. These cytokines play a key role in controlling inflammatory responses. Additionally, it significantly reduces the production of antioxidant enzymes, which are a main factor in causing inflammation and the oxidation process. It also boosts the movement of fibroblasts. Increasing growth factors like granulation tissue formation, collagen buildup, and skin re-growth to enhance healing. Additionally, stimulating the production of TGF- helps in promoting fibroblast growth. It

helps with tissue remodeling and wound healing by promoting cell growth.[32]

## Herbal Formulation-

Drug Name	Use	Company	Year
1 jatyadi oil	-Healing wound -Treating skin conditions	Jiva Ayurveda pharmacy Pvt Ltd	2022
2 Echinacea Ointment	-Antiseptic -Help deal with sores insect bites	Bakson Drugs and pharmaceutical pvtLtd	2001
3 Ropani Ointment	-Treat all kinds of cuts wound ringworm	Vaidyaratnam aushadhashala pvtLtd	2017
4 Charmrogari Ointment	-To treat variety of skin conditions like itching cuts and wound	Baidyanath pharmaceutical pvtLtd	1917
5 Jatyadi Cream	-To treat skin ulcer - Skin bleeding ulcer	Siddha and Ayurved Company Ltd	2018
6 Tea tree oil	-Treating acne - Antioxidant	A G Organics	1920
7 Quick Heal Cream	-Cuts -burns	Srived Sattva pvt Ltd	1995
8 Belladonna ointment	-Antinflammatory -wound care -minor cuts	Bakson Drugs and Pharmaceutical pvtLtd	19 th century 18005

9 Cutis Cream	-Fungal infection -Ringworm	Vasy Healthcare pvtLtd	1980
10 Calendula & Aloe vera Cream	-Antiseptic action cuts and wounds	Willmar Schwabe India	1984
11 Calendula Salve	-Rashes -Stings wounds	Aromatics pvt Ltd	30 years
12 Jatyadi Ghritham	-Quick heal -weeping Ulcer	Nagarjuna Herbal Concentrate Ltd	Oct 2012
13 Vedic dermacream	-Skin conditions	Pristine Bioceticals Pvt Ltd	2022
14 Staphysagria	-Clean surgical cuts -wound -Reduce pain	SBL pvt Ltd 4:4	1815
15 Arnica Montana	-Reduce inflammation and heal wounds	Ransom Naturals Ltd	1809
16 Lepum pal	-For puncture wounds	IG Homeo Remedies Pvt Ltd	1775
17 Murivena Oil	-Acute soft tissue injury	Kerala Ayurveda	2003

## Synthetic Formulation -

Drug	Use	Company	Year
1 2 -octyl Cyano acrylate	-protect from microbes -wound Closer -barrier protection -wound Sealant	Dermabond Ethicon .INc	1998
2 Alevicyn	-manage and drelieve burning -itching Pain - promote healing	Alevicin .INC	2018
3 Cadexomeriodine	-skin treat wet ulcerand wounds	Fanco Indian pharmaceutical pvt Ltd	1980
4 Collagens	-Healing burns andskin ulcer	Nord mark pharma Gmbh	1962
5 Eleton cream	-Minor Skin irritation -prvent dry skin	Fermdale Laboratories Inc	2009
6 Evicel	-Improvement of homeostasis	Omrix Biopharmaceutical Ltd	2008
7 Fibrin sealant	-To help stop bleeding seal tissue and promote wound healing	Baxter healthcare Corporation	1998
8 Hypochhlorous acid topical	-Disinfectant -wound care -skincare	Acuro organics limited Sells Hypochhlorous acidin Mumbai	1834
9 Iodsorb	-Treat wet ulcer And wounds -kill bacteria	Smith + Nephew	1980

10 Prontosan	-To treat and prevent infection in acute and chronic wound	Baraun Medical AG	2016
11 Filsuvez	-Treatment of wound associated with dystrophic and functional epidermolysis	Chiesi global acquired Amryt pharma	2023
12 Nexon Brid	-Remove dead skin tissue from burn wounds	Medi wound Ltd	2022
13 Silvadene	-Used for burn wounds infection	Smith & Nephew	1973
14 Cefixime	-Used to treat infection	Alkem Laboratories Ltd	1979
15 Clavam	-Wound healing	Alkem Laboratories Ltd	1973

## Conclusion -

Herbal products are increasingly being used in wound treatment due to their ability to enhance the skin's natural healing processes. These natural remedies show promise in promoting the body's own repair capabilities and are increasingly popular in therapeutic applications for wound treatment. We have seen an increase in the use of scientific methods to study plants and their extracts for their healing properties. This has led to an increasing number of herbal products being developed for wound treatment. The study of the seven therapeutic effects of herbal products has led researchers to discover many other plants for their healing and preventive properties. Future research should focus on separating and identifying individual active compounds present in plant extracts. This may lead to the discovery of compounds with greater therapeutic effects. Combining old and new knowledge could help create new drugs to treat wounds, with fewer harmful effects.

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