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REVIEW ARTICLE

WOUND HEALING POTENTIAL OF MEDICINAL PLANTS WITH THEIR SCREENING MODELS: A COMPREHENSIVE REVIEW

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ABSTRACT:

A wound is a breakage in tissue continuity that can be produced by physical, chemical and thermal damage. It is a generally called as physical injury that cause opening and breaking of skin. Healing of chronic cutaneous wound is a big problem and it involves the restoration of continuity after wounding. Wounds are treated with various medicinal herbs or their extracts. Plants provide various remedies to mankind and herbal plants are nature's gift used to treat wound with much lesser side effects. Some of those plants are *Acalypha langiana, Tinospora cardifolia, Tragia involucrata, Napoleona Imperialis, Prosopis cineria, Lawsonia alba,Ginkgo biloba, Aloe vera, Catharanthus roseus.* This review discusses about the wound healing potential of herbal plants and provides overview on wound healing problems and solution.

Key words: wound healing, herbal remedies, open wound, close wound, models.

INTRODUCTION

A wound is a breakage in the tissue continuity, from violence and trauma[1]. It can be produced by physical, thermal, chemical or immunological damage to the tissue[2]. They do not only affect the physical and mental health of patients but also impose the significant cost on them[3]. Wound generally termed as physical injury that cause opening and breaking of skin[4]. A wound consist of physical damage (pressure ulcers), thermal damage (burns), mechanical damager (cut, abrasion, lacerations) etc.

Wound Types:

Normally wounds are classified into three classes i.e. based on nature of wound, intensity of the wound and physiology of the wound.

Based upon nature wound

Open wound: An open wound is break in skin's surface that may cause external bleeding and allow bacteria to enter in the body, causing an infection such as: contusions, abrasions, hematoma [5],incision, laceration, abrasion etc. [6] .

***Closed wounds*:** When blunt object strikes the body, a closed wound happens such as: incised, lacerated, penetrating & crushed.

Based upon intensity of wound[7]

Simple wound: In this type, the damage is only to the skin.

Complex wound: In this type, the wound involves underlying tissues, tendons etc.

Based upon physiology of wounding

***Acute wounds*:** Those wounds that get healed in short period of time and proceeds through series of steps that are necessary for wound healing for the restoration of anatomical integrity of injured site, such as: wound due to cut & surgical injury[8] .

Chronic wounds: These types of wounds takes a long period of time for their healing .For example: local infection, loss of oxygen supply, trauma, diseases such as diabetes, nutritional insufficiency and medication may contribute to development of chronic wounds[9].

Wound repair involves two steps

1. Regenerating injured tissues by parenchymal cells. It involves cell migration & cell multiplication.
2. Replacement & wound contraction of connective tissue.

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Wound Healing: Wound healing involves the restoration of continuity after wounding & act as a survival mechanism to maintain normal status of living tissue[10] .Wound healing is a process of cell contraction, movement, re-adhesion after injury. Wound healing is the first stage of series of cellular events which are necessary to initiate a regenerative response[11].

Wound healing is possible by two ways[6]:

Primary healing	**Secondary healing**
Closure of wound within hours after its creation	Closure of wound by contraction and epithelialization
Duration of healing is short	Duration of healing is long
During primary healing, wounds get infected	During secondary healing, wound may be or may not be infected.

NORMAL WOUND-HEALING PROCESS [12,13]

Hemostasis:

Hemostasis starts immediately after injury and cause arrest of bleeding by formation of platelets. It involves vascular constriction, Platelet aggregation & fibrin formation (Table no.1).

Inflammation:

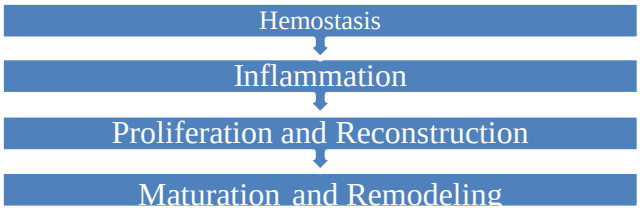
It lasts for 4-6 days. It involves hemostatic mechanism to prevent blood loss from the site of wound [14].

Proliferation:

It starts after inflammation which lasts for 5-21 days. It involves the formation of granulation tissue, angiogenesis, re -epithelialization.

Remodeling:

This phase lasts for 3 weeks -2 years. It involves the synthesis of collagen and scar formation [15] (Flow chart1).



Flow chart 1: Phases of Wound Healing

Table 1: Phases of Wound Healing

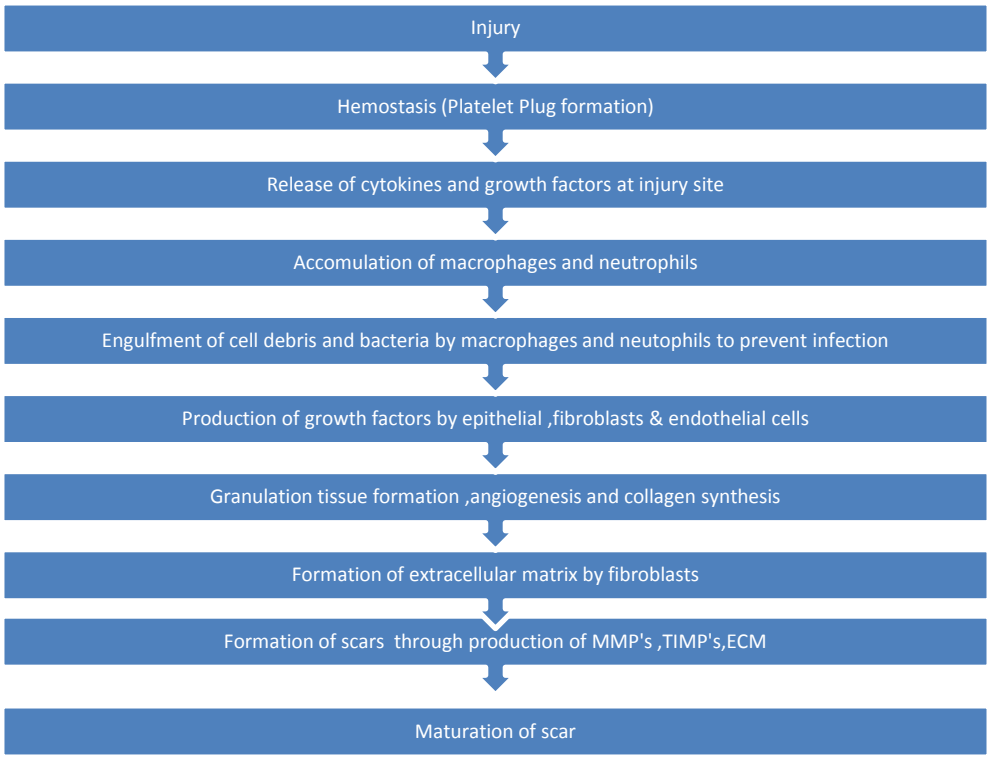
Sr. no.	Phase of healing	Time post injury	Cells involved in phases	Function or purpose
1.	Hemostasis	Immediate	Platelets	Arrest of bleeding
2.	Inflammation	2-5 days	Neutrophils Macrophases	Removal of cell debris and infection causing agents
3.	Proliferation (granulation and contraction)	5-3 weeks	Lymphocytes Fibroblasts Keratinocytes	Granulation tissue formation, angiogenesis
4.	Remodeling (maturation)	21 days –2years	Fibroblasts	Formation of collagen & maturation of scars

PHYSIOLOGY OF WOUND HEALING:

Wound healing process consist of mainly four phases **i.e.** hemostasis ,inflammation, proliferation and remodelling. After the injury ,hemostasis starts immediately that is followed by inflammation. It involves the bloodvessels constriction, movements of platelets towards the injured site, coagulation of blood through the release of various factors such as platelet -derived growth factor (PDGF's) and transforming other growth factor beta (TGF- β) and other chemoattractant factors that are released by injured parenchymal cells. Inflammation is then followed by proliferative phase. It promotes the replication of cells such as mesenchymal cells ,fibrocytes ,endothelial cells and platelets that are required for regeneration of tissues and regrowth of capillaries by angiogenesis (formation of new blood vessels by construction of endothelial cells)[16] to enhance the blood supply to the injured cells. During this phase, the repair processes are angiogenesis, fibroplasia & epithelisation.The final stage of wound healing is maturation & remodelling phase leading to maturation & formation of scar through production of MMM's(matrix metallo peoteinases),TIMP's and ECM (extracellular matrix)(**Table No. 2)**. The wound contraction is promoted by myofibroblasts and combination of all these steps results in the healing of wound with formation of scar [17] (**Flow chart 2)**.

Table 2: Blood components involved in wound healing:

Sr.no.	Components	Time of appearance	Effect
1.	Fibronectin	Immediately after injury	Structural support for cell migration organisation of collagen.
2.	Neutrsophils	6 hours after injury	Wound debridement
3.	Platelet	Immediately after injury	Hemostasis; release growth factors; releases proteolytic enzymes.
4.	Macrophages	3-5 hours after injury	Wound debridement; release growth factors.
5.	Fibroblasts	48-72 hours after injury	Synthesis of collagen,proteoglycans ;wound maturation & contraction.
6.	Keratinocytes	After injury, first 24 hours	Epidermal secondry healing to migration & mitosis; formation of fibronectin.
7.	Collagen	Several days & weeks, later after injury.	Structural support and strength regulate cellular interactions.
8.	Proteoglycans	2 weeks after injury	Regulation of collagen synthesis and cellular interactions.
9.	Hyaluronic acid	4 days after injury	Increase cell motility.



Flow chart 2: Physiology of wound healing [18]

FACTORS AFFECTING WOUND HEALING[19]:

Local Factors: Movement, topical agents, foreign bodies, vascular surgery, type size & location, infection.

Systemic Factors: Circulatory conditions, Hormones, Malnutrition, Immunosuppressions, Systemic Infections, Metabolic changes.

Table 3: Signs and symptoms of wound healing:[20]

Systemic Infection	Deep wound infection	Superficial increased bacterial burden
Fever	Bigger size	Non healing
Chills	Decreased temperature	Exudate wound
Increased blood pressure	New breakdown areas	Red and bleeding wound
Multiple organ failure	Exudate , Erythema & Oedema	Debris in the wound
	Smell from wound	Smell from wound

TREATMENT AVAILABLE FOR WOUND HEALING:

Honey: Honey is used as an effective remedy for wounds, burns, ulcers (leg ulcers, pressure ulcers, diabetic foot ulcers). It is a saturated and supersaturated solution of sugars that have strong interaction with water molecules. In this case, when honey is diluted by wound exudates, hydrogen peroxide produced by an enzyme i.e. glucose oxidase which released slowly & provide protection from bacteria.

Home Treatment for Minor Wounds: Minor wounds have been treated at home.

Wash and disinfect the wound to remove all the dirt and debris.

Then use direct pressure and elevation to control the bleeding and swelling.

During wound wrapping, always use sterile dressing or bandage.

During pain, Acetaminophen can be taken.

Apply ice during burns and avoid picking at scabs.

Treatment of wound infection:

- ***Wound cleaning:*** It may be done with soap and water to wash the germs and also decrease the risk for infection. The wound may be washed with sterile water and germ killing solution is used. Dirt from the wound will be removed by debridement (surgical cleaning). After that wet bandages may be placed inside the wound and left to dry. Then drain the wound to clean out pus.
- **An *antibiotic* helps** to prevent an infection caused by bacteria eg. cephalexin

Complications of wound healing [21]

a. *Deficient scar formation*: Due to inadequate granulation tissue formation or unsuitable extracellular matrix leads to deficient scar formation.
b. *Ulceration:* Due to inadequate blood supply or vascularization.
c. *Excessive scar formation:* Due to excessive deposition of extracellular matrix at the site of wound.

Table 4: Ethanonobotanical claims for the herbs having wound healing activity

S. N.	Name of Plant	Family	Scientific name	Vernacular Name	Part used	Chemical Constituents	Uses	Ref
1.	*Acalypha langiana*	Euphorbiaceae	Ricinocarpus langianus	Indian acalypha	Fresh leaves	acalyphine and triacetoneamine and include cyanogenic, glucosides and alkaloids	Wound healing	22
2.	*Aloe vera*	Aloaceae	Aloe Barbadensis miller	Gheekumari	Leaves, latex	aloe-emodin, barbaloin.	Wound healing	23 24
3.	*Alternanthera sessilis*	Amaranthaceae	Alternanthera sessilis L.	chanchi, haicha	Leaves	stigmasterol, campesterol, B-sitosterol, a-stigmasteanol and also contain 5-a-stigmasta-7-enol.	Antibacterial, wound healing	25
4.	*Artemisia pallens*	Asteraceae	Artemisia pallens	Davana, Davanum, Artemisia pallens herb oil	Whole plant	Davanone, davan ether, davana, furanand linalool.	Cuts and wounds	26
5.	*Azardiracta indica*	Meliaceae	Azadirachta indica	Margosa , Neem	Whole plant	nimbin, azadiradione, deacetylnimbin.	Diabetes, Antibacterial	27, 28
6.	*Catharanthus roseus*	Apocynaceae	Catharanthus roseus(L.)	cayenne jasmine,old maid,sada bahar, sada bahar	Flowers	Rosinidin, Vincristine.	Antidiabetic, Antitumor	29
7.	*Clerodendron serratum*	Verbenaceae	clerodendrum serratum (linn.)	Blue glory, Beetle killer	Roots, Leaves	carbohydrates, flavanoids, phenolics, terpenoids and steroids.	Asthma, wounds	30
8.	*Cynodon dactylon*	Poaceae	Cynodon dactylon (L.)	Bermuda grass	Grass	Proteins, carbohydrates, calcium, sodium and others includes cartone palmitic acid, triterpenoids, ergonovine, ergonovinine.	Anticonvulsant	31 32
9.	*Elephantopus scaber*	Asteraceae	Elephantopus scaber L.	Gojialata, Shamdalan	Whole plant	sesquiterpene lactones ,triterpenoids, steroids, flavanoids.	Eczema, wounds, ulcers	33, 34
10.	*Euphorbia*	Euphorbiaceae	Snake weed	dudhani,	Aerial	heptacosane,	Cuts,	35,

	hirta			dudhi.	parts	leucocyanidin, camphol, shikmic acid, tinyatoxin, choline, camphol, quercitol derivatives containing rhamnose and chtolphenolic acid.	wounds, boils, burns	36
11.	*Ginkgo biloba*	Ginkgoaceae	Ginkgo biloba	Balkuwari	Leaf	terpene, trilactones i.e.ginkgolides, alkylphenols,6-hydroxykynurenic acid, polyprenol.	brain disorders, bronchitis	37
12.	*Jatropha curcas*	Euphorbiaceae	jatropha curcas	parvata-randa, jangalirandi, ratanjot	Leaf	flavanoids, alkaloids, saponins, tannins, triterpenoids.	Paralysis, skin diseases	38, 39
13.	*Kaempferia galanga*	Zingiberaceae	Kaempferia galangal linn.	chandramul, chandramuli ka	Rhizomes	ethyl cinnamate (25%), ethyl-p-methoxy cinnamate (30%), p-methoxy cinnamate,3-carene-5-one.	Wounds Lycopodium	40
14.	*Lycopodium serratum*	Lycopodiaceae	lycopodium clavatum Linn.	licopodio clavato (Italian)	Leaf	fixed oil (47%), serratene triterpenoids ,lycopodine, clavatine, clavatoxine, flavanoids including apigenin and triterpenes.	Wounds	41
15.	*Lawsonia alba*	Lythraceae	lawsonia alba lam.	Henna, henne	Leaf	lawsonecoumarins, xanthones, flavanoids, naphthoquinines, steroids, fatty acid.	Wounds	42
16.	*Morinda citrifolia*	Rubiaceae	Morinda citrifolia L.	Indian mulberry	Leaves	scopoletin, catechin, betasitosterol, damnacanthal, alkaloids, lignans.	Wounds	43
17.	*Morinda citrifolia*	Rubiaceae	Morinda citrifolia L.	Indian mulberry	Leaves	Carbohydrates, dietary fibres, iron, potassium, calcium, vit.C, sodium, niacin	Wounds	43 ,44
18.	*Murraya koenigii*	Rutaceae	KoengiiMur	barsanga, gandhelu.	Leaf	mahanimbine, girinimbine, koenimbine, isomahanine, mahanine, undecalactone, 2-methoxy-3-methyl-carbazole.	Antioxidant, antibacterial	45 46
19.	*Myristica andamanica*	Myristicaceae	Myristica andamanica	Jayaphal,jati-phal	Aerial parts	sabinene, myristicin, elemicin, safrole, mace oil.	Wounds	47
20.	*Napoleona Imperialis*	Lecythidaceae	Napoleona Imperialis	Umuahia	Leaf	Saponin (0.75%), tannin (333.4mg/kg/5g, phenol, alkaloids0.8%.	Antihypertensive,wounds	48, 49
21.	*Prosopis cineraria*	Leguminosae	Prosopis cineraria L.	Janti, banni, jand, sangri, chaunkra, khejiri.	Aerial parts	Methyl nonacosanoate, tricosan-1-ol,methyl octadec-9-enoate	Analgesic, Antihelmenthic	50
22.	*Pterocarpus marsupium*	Papilionaceae	Pterocarpus marsupium	Gummy kino, gammalu, kino, Malabar kino tree	Stem bark	marsupin, pterosupin, liquiritigenin, isoliquiritigenin, carpusin, kinoin, kino-red, epicatechin, marsupinol	Boils, sores, skin diseases	51
23.	*Pterocarpus santalinus*	Fabaceae	Pterocarpus santalinus L.	lal chandan, rakta chandan	Leaf, stem	phenols, anthocyanin, saponin, triterpenoids, flavanoids, tannins, glycerides, glycosides,	Cuts, wounds, boils, inflammation	52

24.	*Radix paeoniae*	Paeoniaceae	Radix paeoniae alba.	white peony,peony ,peony root,mudan	Roots	paeoniflorin (0,05-6.01%), n-hexadecanoic acid,	Hepatoprotective	53
25.	*Salvia splendens*	Lamiaceae	Salvia splendens	scarlet sage, red salvia	Leaves	spathulenol (38.73%), caryophyllene (10.32%). ledol(45.85), phytol (41.46%), beta-cubebene (22.9%).	Emetic, dysentry	54
26.	*Saussurea lappa*	Asteraceae	Saussurea lappa C.B Clarke	Kuth	Roots	costunolide, dehydrocostus lactone, cynaropicrinla, dilactone, germacrenes.	Asthma, bronchitis	55
27.	*Sesamum indicum*	Pedaliaceae	sesamum indicum L.	Til, kali til, Saphed til	Roots	sesame seeds (up to 60% oil), 30% protein, vitamin E, B-complex vitamins (niacin), folic acid, magnesium, phosphorous, calcium,	wounds	56
28.	*Solanum violaceum*	Solanaceae	Solanum violaceum L.	Phutki, baikur, tit begun	Leaf	steroidal alkaloids (1.8%), solanine, solanidine, solasodine	Rheumatic pains, wounds	58
29.	Terminalia bellirica	Combretaceae	belleric myrobalan	baheda, bahera	Fruits	glucoside, gallo-tannic acid, resins, ellargic acid, lignans, ethyl gallate, galloyl glucose andchebulaginic acid , phenyllemblin, mannitol, fructose, rhamnose**.**	Wound, antiseptic	59
30.	*Tinospora cardifolia*	Menispermaceae	Tinospora cardifolia	Guduchi	Stem, leaves	terpenoids, alkaloids ,steroids, lignans	Ulcers, leprosy	60
31.	*Tragia involucrata*	Euphorbiaceae	Tragia involucrata	bichchuti, lata bichchuti, beshani	Roots	Tannins, flavanoids, alkaloids, saponins.	Pain, wounds, swellings, Eczema	61
32.	*Trigonella foenumgraecum*	Fabaceae	Trigonella foenum – graecum	Asumodhagam, greek hay, methi.	Seeds, Aerial parts	alkaloids, amino acids, saponins, steroidal sapinogens, fibres	Reduces appetite	62
33.	*Vernonia arborea*	Asteraceae	Vernonia arborea	Karana, Sadagai, Shutthai.	Leaf, Bark	alpha-amyrin acetate, beta-amyrin, lupeol, stigmasterol, beta-sitosterol	Wounds	63 64
34.	Vitex pinnata	Verbenaceae	vitex pinnata L.	leban tandok, tinnok, kyetyoh	Leaves	flavone glycoside, lignans, Ecdysteroids, Pinnatoside iridoid glucoside	Analgesic, anti-inflammatory, antipyretic.	65
35.	*Abrus precatorius* .	Fabaceae	Abrus precatorius Linn.	Gunchi, Gunja, Mulati	Leaves	Glycyrrhizin, Triterpene glycosides, pinitol and alkaloids suchas asabrine, hepaphotine, choline and precatorine.	Used in Folk medicine to treat Cuts and Wounds.	66, 67
36.	*Acalypha langiana*	Euphorbiaceae	Acalypha langiana L.	khokali, khokli, khokla, kholi, kuppi, kuppu, kuppikhokli.	Leaves	acalyphine and triacetone amine , cyanogenic glucosides and alkaloids.	On External Human Wounds.	68

37.	*Cassia fistula*	Fabaceae	Cassia fistula L.	amaltās , bendra lathi , bandarlauri, dhanbaher , dhanbohar, g irimaloah, golden shower tree	Levaes	anthraquinones, fistulic acid, rhein, rheinglucoside, sennosoides A and B, phlobaphenes, lupeol, emodin, chrysophanic acid, beta-sitosterol and hexacosanol, fistuacacidin,	Human wounds	69

Table 5: Plants having wound healing activity with their models (Indian origin)

Plant Name	**Family**	**Chemical Constituents**	**Part and Extract Used**	**Model Studied**	Ref
Ageratum conyzoides	Asteraceae	Monoterpenes(6.4%),oxygenated ,onoterpenoides(0.08-1.4%), sesquiterpenes(5.1%),phenylpropanoides and benzanoides(2,33%),o-cadinene(4.3%),caryophyllene epoxide(0.5%)etc.	Root, alcohol	Excision wound healing model	71
Andrographis paniculata	Acanthaceae	2-trimetoxy flavone,4-pentamethoxyflavone,dihydroneobaicalein, andrographidine A, andrographidine B, beta-sitosterol etc.	Leaf, alcohol, pet ether& aqueous	Excision, incision, dead space	72 73
Butea monosperma	Fabaceae	Butrin(1.5%), butein (0.3%),butin(0.04%),flavanoides ,steroids.	Bark, alcohol	Excision	74 75
Bryophyllum pinnatum	Crassulaceae	phenols,triterpenoides,steroids,fatty acids,clionasterol,codisterol,clerosterol.	Leaf, alcohol	Excision	76 77
Calotropis gigantean	Apocynaceae	Usharin,gigantin,calcium oxalate,alpha &beta- calotropeol,beta-amyrin.	Latex	Excision and incision	78 79
Colutea Cilicia	Fabaceae	Flavanoids,sterols,quinine,sterol,tannins,gallic acid,caffeic acid,myricetin	Fruit & leaf, aqueous	Excision and incision	80
Colebrookea oppositifola	Lamiaceae	chrysin,negletein,quercetin,triacontanol,palmitic,oleic,stearic acid,beta-sitisterol	Leaf, alcohol	Excision, incision	81 82
Crotalaria verrucosain	Fabaceae	crotalaburnine,crotaverrine,iso-senkirkine, crotaverrine acetate,isovitexin,apigenin o-glycoside	Aqueous	Excision and incision, dead space	83
Cordia dichotoma	Boraginaceae	alpha-amyrin,betulin,octacosanol,lupeol 3-rhaminoside,beta-sitosterol,bohenic,oleic acid	Fruit, alcohol	Excision, incision ,dead space	84
Datura alba	Solanaceae	saponin,tannin,glycosides,flavanoid,steroid ,terpenoides	Leaf, alcohol	Burn wound	85 86
Dissotis theifolia	Melastomataceae	saponin, glycoside,steroids,tannin,saponin,alkaloids ,carbohydrates.	Stem, methanol	Excision model	87 88
Elaeis guineensis	Arecaceae	Palmitic,stearic,oleic,oleodapalmitins,palmitodioleins,linoleodioleinsdiapalmitistearin	Leaf, methanol	Excision model	89, 90
Euphorbia neriifolia	Euphobiaceae	Sugar ,tannin, flavanoids, triterpenoids, saponin	Latex, aqueous	Excision	91 92
Echinops echinatus	Asteraceae	7-hydroxyisoflavone,kaempferol-4-methylether,kaempferol-7-methylether,myricetin-3-o-a-L-rhamnoside,kaempferol-3-o-L-rhamnoside.	Root, petroleum ether, chloroform, ethanol and distilled water	Excision, incision, dead space	93 94

Elephantopus scaber	Asteraceae	Sesquiterpene lactones,triterpenoids,steroids ,flavanoids.elephantopin	Whole plant, ethanol& aqueous	Excision, incision, dead space	95 96
Glycyrrhiza glabra	Fabaceae	Glycyrrhizin,glycyrrhetinic,liquirtic acid	Root, ethanol	Excision	97 98
Gentiana lutea	Gentaniaceae	Secoiridoid glycoside amarogentin,gentiopicrin	Rhizomes, alcohol and petroleum ether	Excision, incision, dead space	99 100
Glycosmis pentaphylla	Rutaceae	Glucosmin, phlobaphene, glycoquinone,glycocitrine.	Leaf, methanol	Excision	101 102
Hippophae rhamnoides	Elaeagnaceae,	Oleanolic acid,ursolic acid,dulcioic acid,cirsiumaldehyde,octacosanoic acid,19-alpha- hydroxyursolic acid	Leaf, aqueous	Excision	103 104
Heliotropium indicum	Boraginaceae	Alkaloids,saponin, phlobotamins,steroids,flavanoids,tannis,glycosides,coumarins.	Whole plant , ethanol	Excision and incision	105 106
Indigofera enneaphylla	Leguminosae	Ethylacetate,alcohol,alkaloids,amino acids,antraquinone glycosides,flavanoids, saponins,steroids,sugars.	Aerial parts, alcoholic	Excision and incision	107 108
Ixora coccinea	Rubiaceae	Triterpenes(62.60%),sesquiterpenes(3.35%),ursolic acid(27.34%),lupeol(15.10%),geranyl acetate(8.74%).	Flower, alcohol	Dead space	109
Jatropha curcas	Euphorbiaceae	Oleic acid(41.5-48.8%),linoleic(34.6-44.4%),stearic(2.3-2.8%),resins,tannins.	Bark,	Excision, incision, dead space	110
Kalanchoe pinnata	Crassulaceae	Bryophillin A,bersaldegenin-3-acetate,bryphillin C,alkaloid,tannin,magnesium,calcium,ascorbic acid.	Leaf, ethanol	Excision wound model	111
Napoleona imperialis	Lecythidaceae	Carbohydrate(9.95),fat(1.0%),fibre(2.5%), protein(0.4%),moisture(80,5%),fat,protein.	Leaf, methanol	Excision model	112
Ocimum sanctum	Lamiaceae	Oleanolic acid,ursolic acid,eugenol,carnacrol,linalool,rosmarinic acid,germacrene D(2%).	Leaves, alcoholic and aqueous	Leaves, alcoholic and aqueous	113
Quercus infectoria	Fagaceae	Tannin(50-70%),syringic acid,beta-sitosterol,amentoflavone,hexamethyl ether,isocryptomerin,methyl betulate,methyl oleanate.	Leaf, ethanol	Excision, incision, dead space	114
Rubia cardifolia	Rubiaceae	Alizarin, alkaloids, anthraquinones, carbohydrates, coumarins, glycosides, proteins, saponons, steroids.	Roots, alcoholic extract	Excision wound model	115 116
Rubus sanctus	Rosaceae	Quercetin,kaempferol,trifolin,hyperin,chlorogenic acid,caffeic acid,glucose-caffeoyl ester	n-hexane, chloroform, ethyl acetate and methanol	Excision and incision	117
Solanu xanthocarpum	Solanaceae	Alkaloid,sterols,saponins,glycosides,flavanoids,amino acid ,fatty acids	Fruit, methanol	Excision and incision	115
Vinca rosea	Apocynaceae	Vincristine,vinblastine,rosinidine.	Leaf, ethanol	Excision model	118 119

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CONCLUSION:

Wound healing is a process that starts with trauma and ends with scar formation. The goal of wound care is to enhance the healing process and reduce the risk factors. This review covers various types of reported medicinal plants that are used for wound healing and models used for wound healing.

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