



RESEARCH ARTICLE

SURVEY OF ETHNO MEDICINAL PLANT SHOWING WOUND HEALING ACTIVITY

Ansumita Borsaikia, Saikat Sen, Pal Gogoi and Biplab Kumar Dev

Faculty of Pharmaceutical Science, Assam down town University, Panikhaiti, Guwahati, Assam.

Manuscript Info

Manuscript History

Received: 30 June 2021

Final Accepted: 31 July 2021

Published: August 2021

Key words:-

Injury, Traditional Medicine And Wound Healing

Abstract

In most recent couple of a few years, there has been a unprecedented advancement in understanding the biochemical and cell occasions of typical injury recuperating or wound healing. Healing is survival mechanism and represents a trial to take care of normal complex body part and performance. Wound healing could be a process by which tissue regeneration occurs. Healing of wounds, either accidental or surgical interventions, involves complex activities of blood cells, tissues, soluble mediators, cytokines and several other growth factors. This increased cellular activity of damaged tissue enhances metabolic demands and active drug therapy. The main objective of treating a wound is to either shorten the time required for healing process or to reduce the undue effects. Plants because of presence of assorted valuable active phytoconstituents have immense potential for management and treatment of wounds over the years. All the Traditional systems of medicine, Ayurveda, Siddha and Unani describe applications of medication of plant, mineral and animal origin to treat and heal wounds. Herbal drugs induce healing and regeneration of lost tissue by number of mechanisms. Due to their traditional applicability, affordability and safety plants gained a reputed position within the world of wound management and repair. The present review is a trial to focus on various Indian ethno-medicinal plants which are to be scientifically proved for the treatment of wounds. Beside this review also emphasis on normal wound healing process, pharmacological activities and role of plants in wound management and parameters accustomed assess wound healing.

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Introduction:-

The external surface of the body is covered by skin. Skin regulates body temperature, acts as a water repellent, synthesises a number of useful compounds such as vitamin D, and most importantly, acts as a protective shield between the external environment and internal tissue¹. Wound is described as a breach of skin or underlying tissue caused by an accident, act of violence, or surgery, according to the medical dictionary². After an accident, the skin has an extraordinary capacity to heal. When skin is injured, the healing process entails removing the damaged tissue and replacing it with a new extracellular matrix (ECM), which restores epidermal consistency³. Wound repair must take place in a physiological setting to allow tissue healing and regeneration. Hypoxia, inflammation, tumours, metabolic disorders including diabetes mellitus, the presence of debris and necrotic tissue, certain medications, and a diet lacking in protein, vitamin, and minerals, to name a few, have all been shown to inhibit wound healing.

Corresponding Author:- Ansumita Borsaikia

Address:- Faculty of Pharmaceutical Science, Assam down town University, Panikhaiti, Guwahati, Assam.

According to current figures, nearly 6 million people worldwide suffer from chronic wounds⁵. There are few reports on the epidemiology of wounds in India. In the population surveyed, 15.03 per 1000 people had wounds. Chronic wounds were found to be prevalent in the group at 4.5 per 1000 people, while acute wounds were nearly doubled at 10.5 per 1000 people⁶. The concepts of topical wound therapy today include the removal of necrotic tissue, bacterial load control, wound exudate management, the preservation of open proliferative wound edges, and the provision of a moist and covered wound surface⁷. The administration of drugs either locally (topical) or systemically (oral or parenteral) or both in an effort to aid wound healing is referred to as medical wound care. Topically applied antimicrobial dressings, such as disinfectants, antiseptics, and antibiotics, provide a wide range of non-selective antibacterial action.⁹ Hemostasis, also known as haemostasis, is a method of preventing and stopping bleeding by keeping blood inside a damaged blood vessel (the opposite of hemostasis is hemorrhage). It is the first stage of wound healing and a blood clotting process. Coagulation is the process by which blood transforms from a liquid to a gel. Blood vessels that are not damaged play a critical role in preventing blood from clotting. Endothelial cells in healthy vessels use a heparin-like molecule and thrombomodulin to prevent blood clotting and nitric oxide and prostacyclin to prevent platelet aggregation. When endothelial cells are injured, they avoid secreting coagulation and aggregation inhibitors and instead secrete von Willebrand factor, which starts the process of restoring hemostasis. Hemostasis has three major steps : 1) vasoconstriction, 2) temporary blockage of a break by a platelet plug, and 3) blood coagulation, or formation of a fibrin clot. These processes seal the hole until tissues are repaired.

Mechanism

Vaso Constriction

Vascular spasm, which contributes to vasoconstriction, occurs within 30 minutes of damage/trauma to the blood vessels. The extracellular matrix (ECM)/collagen becomes exposed to the blood components at the site of the disrupted endothelial lining¹⁰.

Platelet Adhesion

This ECM releases cytokines and inflammatory markers, which cause platelets to adhere to the site and aggregate, resulting in the formation of a platelet plug and the sealing of the defect. Platelet adhesion is a complicated process involving interactions between a variety of receptors and proteins, including tyrosine kinase receptors, glycoprotein receptors, and other G-protein receptors as well as the von Willebrand Factor (vWF). The von Willebrand Factor functions via binding to the Gp 1b-9 within the platelets¹⁰.

Platelet Activation

Platelets that have adhered go through a series of shifts. ADP, thromboxane A₂, serotonin, and a variety of other activation factors are released from their cytoplasmic granules. They also change shape into a pseudopodal shape, which causes different chemokine release reactions. Platelets' conformational changes are aided by P2Y₁ receptors¹.

Platelet Aggregation

Various platelets are activated, adhered to each other, and the damaged endothelial surface using the mechanisms described above, resulting in the formation of a primary platelet plug..

Extrinsic Pathway

Factor VII is activated after the tissue factor binds to it. Via proteolysis, activated factor VII (factor VIIa) activates factor X and factor IX. Factor X is activated when activated factor IX (factor IXa) binds to its cofactor, activated factor VIII (factor VIIIa) (factor Xa). Factor Xa forms a prothrombinase complex with activated factor V (factor Va) and calcium, which cleaves prothrombin into thrombin¹¹.

Intrinsic Pathway

Factor XI is converted to active factor XI during thrombin formation (factor XIa). Factor XIa transforms factor IX to activated factor IX when combined with activated factor VII and tissue factor (factor IXa). Factor X is activated when activated factor IX combines with activated factor VIII (factor VIIIa). Prothrombin is converted to thrombin when activated factor X (factor Xa) binds to activated factor V (factor Va). Thrombin serves as a cofactor and catalyses many of the aforementioned proteolytic pathways, increasing their bioactivity.¹¹.

Fibrin Clot Formation

The conversion of fibrinogen to fibrin monomers, which polymerize and form fibrin polymer mesh, results in a cross-linked fibrin clot, is the final step in the coagulation cascade. Activated factor XIII (factor XIIIa) catalyses this

reaction by stimulating the lysine and glutamic acid side chains of fibrin molecules, resulting in cross-linking and the formation of a stabilised clot.

Clot Resolution (Tertiary Hemostasis)

Activated platelets contract their cytoskeleton's internal actin and myosin fibrils, causing the clot volume to shrink. Plasminogen then converts to plasmin, which facilitates fibrin clot lysis and restores blood flow in weakened or obstructed blood vessels.¹¹.

Pharmacological activities of plants supporting wound healing

Anti- inflammatory activity

The inflammation step of the normal wound healing process is critical because it releases neutrophils, which are responsible for microbial clearance in the injury area (phagocytosis) and also play a role in antigen introduction. Inflammatory cytokines and growth factors are also produced during this point. Because of net destruction of solvent development components and lattice components, any obsessive cycle that interferes with this self-restricted physiological cycle can result in a non-healing wound¹². Plant extricate has a calming effect, as evidenced by various traditional writings and animal studies, and thus can be used as a wound healer drug..

Antioxidant activity

Plants contain a variety of antioxidative compounds to combat reactive oxygen species (ROS). Free superoxides, such as superoxide anion radicals and hydroxyl radicals, as well as non-free species, such as hydrogen peroxide, are aggravating variables in cell injury and maturation¹³. Different plant-based cell reinforcement cures, such as polysaccharides from *Angelica sinensis*, *Aloe vera* gel, and *Eucommia ulmoides* Oliver leaf extract promotes collagen synthesis and wound healing by scavenging free radicals.

Phytoconstituents	Role
Tannins	Promote wound healing due to their astringent and antimicrobial property, act as free radical scavengers
Flavanoids	Possess antioxidants and free radical scavenging effects, astringent and antimicrobial activity, improve vascularity
Saponins	Antioxidant and antimicrobial activity.
Sterols and Polyphenols	Free radical scavenging and antioxidant activity
Tri-terpenoids	Astringent and antimicrobial activity

Antimicrobial activity

Microorganisms are thought to play a significant role in the disabled recovery of long-term injuries and the progression of disease-related complications. Bacterial disease can lead to sepsis, which obstructs the wound-healing cycle. Various polyherbal arrangements with antimicrobial activity have been experimentally demonstrated to have wound healing properties, such as polyherbal gel derived from *Terminalia arjuna*, *Centella asiatica*, and *Curcuma longa*, which have antimicrobial and wound healing properties.¹⁴.

Analgesic activity

Patients with wounds frequently experience pain. Wound pain is caused by tissue damage (nociceptive pain) or sensory system dysfunction (neuropathic pain) on a physiological level. Pain can cause a delay in injury recovery by disrupting neuroendocrine and immune functions, which play a crucial role in wound healing¹⁵. As a result, herbal preparations with pain-relieving and anti-inflammatory properties can be used to treat wound pain.

Role of phytoconstituents in wound healing activity

As shown in Table 2, phytoconstituents present in plant extracts may interfere in a positive manner with one or more phases of the wound healing process in the proper sequence and at the right time frame to show improved efficacy.. Plants have yielded a number of substances with wound-healing properties.e.g. tannins from *Terminalia arjuna*, polysaccharides from *Opuntia ficus-indica*, asiaticoside, asiatic acid and madecassic acid from *Centella asiatica* and curcumin from *Curcuma longa* etc .

Traditionally used medicinal plants with haemostatic activity :**Table 2:-** Phytoconstituents and Their Role In Wound Healing.

S l N o	Name of Plant	Family	Common Name	Parts Used	Uses	Traditional mode of use	Area	Refer ence
1	Euphorbia hirta L	Euphorbiaceae	Paal chedi	Whole plant	Used for respiratory ailments, worm infection in children, dysentery, jaundice, digestive problems and tumors.	Plant is first grind into paste and then the paste is slightly heated and applied on the wounds.	Kampur district (assam)	16
2	Amaranthus tricolor L.	Amaranthaceae	Bishalya karani	leaves	Used for ulcers, diuretic, high cholesterol, diarrhea.	Leaf paste is mixed with spit and applied to cuts and wounds for quick heal.	Dhekorgorah, Jorhat.	16
3	Eupatorium odoratum L	Astraceae	Jarmanibon	Leaves, young shoots	Used to treat peptic ulcer, burns, skin infections and wounds.	Leaf paste is mixed with spit and applied to wounds for quick heal.	Silchar (Assam)	16
4	Hydrocotyle sibthorpioides Lamk.	Apiaceae	Khoru manimuni	leaves	Used to treat boils, sore throat, hepatoma, influenza, itch, jaundice, sinusitis.	Leaves are grind into paste and mixed with coconut oil and applied to wounds before going to bed at night.	Sikkim, Tripura,	16
5	Centella asiatica L.	Apiaceae	Bor manimuni	Leaves	Used for diabetes, wound healing, memory enhancing, skin nourishment.	Leaf paste is applied to wounds.	Guwahati	16
6	Drymaria cordata L.	Caryophyllaceae	Lai Jabor	Leaves	Used for cold, headache, poultice on sore, bronchitis, coryza, leprosy, tumors.	Leaves are crushed with spit and applied on the wounds.	Nagaon (Assam)	16

7	Eclipta prostrata L	Asteraceae	Keheraj	Roots	Used to treat diabetes, fever, GI Disorder, RT disorder, hair loss and greying of hair.	Roots are grind into paste and mixed with coconut oil and applied in wounds.	Cachar, Dibrugarh	16
8	Oroxylum indicum L	Bignoniaceae	Bhatghila	Root and bark	Used as Astringent, aphrodisiac, expectorant, antihemetic and tonic.	Dry the seeds in the shade powder it and powder is applied in wounds.	Karbi – Anglong	16
9	Ageratum conyzoides L	Asteraceae	Ghondva Bon	Leaf, young shoot	Used to treat pneumonia, dysentery, diarrhea, cure wounds and burns	Paste and juice is applied in injured portion of cut and wounds.	Jorhat	16
10	Curcuma longa L	Zingiberaceae	Haladhi	Rhizome	Used to treat joint pains, diarrheal condition, fever, skin inflammation.	Rhizome is grind into paste and mixed with mustard oil and applied on the wounds.	Dibrugarh	16
11	Aegle marmelos	Rutaceae	Bel	Leaves and Fruit palm	Used for cancer, ulcer, diuretic, diarrhea, malaria, skin infections.	Leaves are grind into paste along with black pepper, slightly heated and applied on the wounds.	Kokrajhar	16
12	Delonix regia	Fabaceae	Krishnochura	Leaves	Used to treat diarrhea, diabetes, hepatoprotective, wound healing and gastroprotective.	Leaves are crushed and applied on the wounds.	Darikal Gaon (Tezpur)	16
13	Dillenia indica L.	Dilleniaceae	Otenga	Barks	Used for malarial, cancer, dysentery, jaundice, rheumatic pain, asthma, influenza.	Barks are dipped in water for overnight and then grind into paste and applied on the wounds.	Dibrugarh	16
14	Azadirachta indica	Meliaceae	Neempat	Leaves	Used for skin disorders, intestinal worms, eye disorder, bloody nose, heart disease, stomach upset, leprosy, diabetes, gum disease, liver problems.	Boiled leaves water are used for washing the wounds and leaves paste mixed with mustard oil is also used for wound healing.	Assam	16

15.	Clitonia ternata	Papilionaceae	Aparajita	Roots.	It supports digestive, circulatory and central nervous system also used as aphrodisiac, pain reliever, diuretic, reduces wrinkles, greying of hair, blurred vision.	Roots paste is applied on the wounds	Dibrugarh	16
16.	Mimosa pudica	Mimosaceae	Nilaj bon	Leaves	Used to treat microbial infection, diarrhea, ulcer, mood disorder, heal wound, gastric disorder.	Leaves are crushed along Eupatorium odoratum and applied on the wounds.	Dibrugarh	16
17.	Argemone maxicana	Papaveraceae	Siyal kata	Roots	Used in tumors, warts, skin diseases, inflammations, microbial infection.	Roots paste is applied on the wounds.	Jorhat	16
18.	Alocasia indica	Araceae	Kochu	Stems	Useful in treating pneumonia, asthma, rheumatism and several other skin ailments.	Stems are cut and its juice is applied on the wounds.	Karbi angling	16
19.	Blechnum orientale L.	Blechnaceae	Bonoria dhekia	Fronds	Used in diabetes, Skin problems.	Fronds are crushed and is applied on the wounds.	Meghalaya	16
20.	Bryophyllum pinnatum (Lam.)	Crassulaceae	Dupor Tenga	Leaves	It is used in skin infection, inflammation, insect-bite, burns and wounds.	Shade dried leaves are very good for application to wound and leaves reduced to paste when applied to wounds encourage papillations.	Bongaigaon, Assam	17,18
21.	Aloe vera	Asphodelaceae	Ghrit kumara	leaves	Used in Ulcer, diabetes, cancer, diarrhoea.	Leaf paste is topically applied on the wound.	Guwahati	19,20, 21
22.	Arctium lappa	Asteraceae	Jangli kuth	Roots, seed, leaf	Used Skin problems, diabetes, Ulcer cancer, digestive problems	Root paste is topically applied on the wound.	Barpeta	22
22.	Targetes erecta L.	Compositae	Narji-phul	leaf	Used in ulcer, digestive problems.	Leaf paste is topically applied to wound.	Magaldai (Assam)	23
23.	Tridax procumbens	Compositae	Tridax daisy or belamaku	Leaf	Used in inflammatory disorders, diabetes, skin disease.	Leaf paste is applied on the wound.	Jorhat	24

24	Angelica sinensis	Apiaceae	Women's ginseng	Roots	Used in inflammatory problems, analgesic problems, Haemorrhage	Root paste is applied on the wound	Tripura	25,26
25	Blumea balsamifera	Asteraceae	Langthrei (Manipur)	Leaves, roots	Used against skin injury, tumour, dermatitis.	Oil extract is applied on the wound.	Manipur	27
26	Caesalpinia sappan	Fabaceae	Baghasora	Leaves, bark, roots	Used in inflammatory problems, allergic, odema and pain	Leaf paste is topically applied on the surface of wound.	Tinsukia, Assam	28
27	Calendula officinalis	Asteraceae	Pot marigold, Narji	Whole plant	Used in cuts, rashes, swelling.	Plant extract is applied on the wound.	Moirabari, Assam	29
28	Camellia sinensis	Theaceae	Cha	Leaf	It is used in skin infection, inflammation and diabetes.	Leaf paste is applied on the wound.	Chabua, Assam	30
29	Panax ginseng	Araliaceae	Asian ginseng	Rhizome	It is used in skin infection, inflammation.	Applied as paste on the wound.	Arunachal	31
30	Ocimum gratissimum L.	Asteraceae	Ram tulsi	Leaf	It is used in skin infection, inflammation.	Leaf paste is applied on the wound.	Silchar	32,33
31	Acalypha Indica	Euphorbiaceae	Muktojhuri	leaves	It is used in treating pneumonia, asthma, rheumatism, several other skin ailments	Leaf paste is applied on the wound.	Kamrup	34,35, 36
32	Aerides multiflora	Orchidaceae	Rongakopouful	Leaves	Used in treating cuts and wound, fractures and dislocated bones	Leaf paste are prepared to apply on the wound.	Tinsukia, Sibsagar, Lakhimpur, Karbi-Anglong	37
33	Zantedeschia aethiopica	Araceae	Arum lily or calla lily	Root, stem, leaves	Used boils, wounds, minor burns, insect bites, gout or rheumatism.	Root or leaf paste is applied on the wound.	Shillong	38
34	Verbascum fruticosum	Scrophulariaceae	Mullein	Aerial part	It is used in skin infection, inflammation, cancer and ulcer	Plant extract is applied on the wound.		39
35	Vitis vinifera	Vitaceae	Common grape or wine grape	seed	Used against inflammation, allergic reaction, pain to promote wound healing	Seed oil is applied on the wound.	Goraimari (Assam)	40

36	Typha capensis	Typhaceae	Bulrush	Root, stem, leave	It is used in skin infection, inflammation	Applied on the wound topically as paste.	Sonitpur (Assam)	41
37	Solanum panduriforme	Solanaceae	Poison apple	Fruit	Used against Edema, inflammation, other, skin infections.	Fruit paste is applied on the wound.	Kamrup	42
38	Panax bipinnatifidus	Araliaceae	Feather-leaf bamboo ginseng	Root	Used in haemostatic bruising, bleeding and muscle pain	Root paste is applied on the wound.	Arunachal Pradesh	43
39	Calamintha officinalis	Lamiaceae	Mill mountain	Aerial part	Used in Cuts, rashes, swelling and burns.	Plant extract is applied on the wound.	Jorhat, Sivasagar	44,45
40	Allium sativum	Liliaceae	Garlic	Bulb	Used in inflammatory problems, skin infection.	Topically applied as creams on the wound.	Sonitpur	46
41	Taraxacum officinale	Asteraceae	Dandelion	Root, Leaves, Petals	Used in inflammatory problems, skin infection.	Leaf paste is topically applied on the wound.	Digboi	47
42	Lumnitzera racemosa	Combretaceae	Black mangrove	Leaves	Used in inflammatory problems, Skin disease, diabetes, ulcer.	Leave paste is applied as cream, ointment and lotion	Barpeta	48
43	Arnica montana	Asteraceae	Mountain arnica	Flowers	Used in inflammatory problems, heal, pain, injuries, such as sprain and bruises.	Flower paste is applied as cream, ointment and lotion	Assam	49
44	Thymus spicata	Lamiaceae	Mediterranean thyme	Aerial part	Used in hyperlipidemia, hyperglycemia, hepatic steatosis, wound healing.	Applied on the wound topically	Golaghat	50
45	Syzygium aromaticum	Myrtaceae	Clove	Flower bud	Used in tumor, skin infection, scabies, cholera, malaria, and tuberculosis	The clove flower buds are crushed using mortar and pestle and applied on wounds.	Raha (Assam)	51,52

46	Teucrium creticum	Labiaceae	Cretan Germander	Aerial part	Used in digestive diseases, diabetes, rheumatism, scars, blood pressure lowering, antispastic, anorexia.	Plant extract is applied on the wound.	Golaghat(Assam)	53,54
47	Ruta chalepensis	Rutaceae	Fringed rue	Aerial part	It is used in arthritis,eczema, ulcers, arthritis, fibromyalgia, antidote for venoms.	Plant extract is applied on the wound.	Kashi hills(Assam)	55
48	Parinari curatellifolia	Chrysobalanaceae	Mobola plum	Bark	Used to treat toothache, pneumonia, fever.	Bark extract is applied as paste on the wound.		56,57
49	Jatropha curcas Linn	Euphorbiaceae	Bongali-botora	Bark	Used in the treatment of allergies, burns, cuts, wound inflammation, leprosy, leucoderma, smallpox, respiratory infection, cancer, indigestion, infectious disease.	Bark excude was applied on the wound.	Hengrabari, Guwahati	58,59, 60
50	Jatropha gossypifolia	Euphorbiaceae	Bellyache bush	Bark	Used in hemorrhage, cancer, constipation stomachache, coagulant.	Resin of the plant is used as Paste on the wound.	Rani, Guwahati	61,62
51	Chromolaena odorata	Asteraceae	Communist patche	Leaves	Used in the treatment of leech bites, swelling, rashes, burns, diabetes, periodontitis and as an insect repellent.	Leaf paste is applied on the wound.	Bhutan	63,64
52	Solanum aculeastrum	Solanaceae	Soda apple or bitter apple	Fruit	Used for jigger infestations, cuts, burns, swollen joints in fingers, gangrene, toothaches, gonorrhea, bronchitis, rheumatism and in ringworm.	Flower paste is applied on the wound	Arunachal Pradesh	65
53	Ficus religiosa	Moraceae	Bodhi tree, peepal tree	Leaves, bark	Used in the treatment of ulcer, diabetes, gonorrhea and skin diseases.	Oil extract of bark is applied on the wound.	Tinsukia	66,67, 68

54	Nigella sativa	Ranunculaceae	Black seed or kola jira	Seed (oil)	Used for diuretic, hypertensive, diabetes, cancer asthma, various skin conditions, lowering blood sugar and cholesterol levels, aiding in weight loss and protecting brain health.	Oil extract of seed is applied on the wounds	Malegaon, Assam	69
55	Anethum graveolens.L	Apiaceae	Dill	Seeds, leaves	Used for ulcers, abdominal pains, eye diseases and uterine pains.	Leave paste is topically applied on the wound.	Meghalaya	70
56	Eucalyptus	Myrtaceae	Ghost gum	Aerial part	Used in asthma, bronchitis, plaque and gingivitis, head lice, toe nail fungus.	Plant extract is applied as paste on the wound.	Golaghat	71
57	Trigonella foenum	Fabaceae	Fenugreek	Seeds	Uses for gastric stimulant, diabetes, and a galactagogue, as well being used to combat anorexia.	Seed oil is applied on the wound.	Assam	72
58	Nelumbo nucifera	Nymphaeaceae	Komol	Flower, rhizome	Used in hematemesis, epistaxis, hematuria, lowering blood sugar levels, diarrhea, cholera, fever, and hyperdipsia.	Flower paste is applied on wounds.	India	73
59	Morinda cotrifolia Linn	Rubiaceae	Bartundi(hindi)	Leaves	Used in headache, fever, arthritis, gingivitis, respiratory disorders, infections, tuberculosis, and diabetes	Leave paste is applied on the wound.	Assam	74
60	Astragalus membranaceus	Leguminosae	Mongolian milkvetch	Roots	Used to treat the common cold, upper respiratory infections, fibromyalgia, and diabetes.	Paste is applied on the wound	Rajbar(Assam)	75
61	Pistacia atlantica	Anacardiaceae	Ethiopia or Mt. Atlas mastic tree	Aerial parts	Used for stomach diseases, renal disorders, wounds and coughs, gastrointestinal disease.	Plant paste is applied on the wound.	Guwahati	76
62	Rosemary officinalis	Lamiaceae/labiateae	Rosemary	Leaves	Used for improving memory, indigestion (dyspepsia), arthritis-related joint pain, hair loss.	Leaf paste is applied on the wound.	Bagmora, Assam	77

63	Ribwort plantain	Plantaginaceae	Bartang	Leaf	Used for toothaches, prevent infections, poison ivy, cuts, insect bites and, rashes.	Both externally as paste and internally as juice can be applied	Assam	78
64	Aegle marmelos	Rutaceae	Bael	Leave, fruit.	Used in the treatment of chronic diarrhea, dysentery, and peptic ulcers, as a laxative and to recuperate from respiratory affections in various folk medicines.	Leave paste is externally applied on wound	Bongaigaon	79
65	Linum usitatis simuzzm	Linaceae	Flaxseed	Seeds	Used for constipation, for controlling levels of <u>cholesterol</u> and blood <u>sugar</u> in the body.	Externally used as ointment on the wound.	Assam	80
66	Curcuma longa	Zingiberaceae	Haladhi	Rhizome, Tuber	Used in inflammatory disease, hemorrhage, high cholesterol, Skin infections.	The tuber is mashed and is applied on wounds.	Mangaldoi	81,82, 83
69	Acorus calamus	Acoraceae	Bach	Green leaves	Used for gastrointestinal (GI) problems, ulcers, <u>rheumatoid arthritis</u> , <u>stroke</u> and skin diseases.	Green leaf paste is topically applied on the wound.	Jorhat	84
70	Adhatoda vasica	Liliaceae	Adulasa, Vasaka	Leaves	Used in bronchitis, leprosy, blood disorders, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leucoderma, jaundice, tumors, mouth troubles, sore-eye, fever, and gonorrhoea.	Green leaf paste is topically applied on the wound.	Cachar, Assam	85
71	Alternanthera brasilliana	Amaranthaceae	Matikaduri	Leaves	Used in elimination of kidney stone, tumor, infections of the liver and bladder.	Leaf paste is topically applied on the wound.	Langting, Assam	86
72	Cissampelos pareira L.	Menispermaceae	Tubukilota	Leaf	Used in ulcer, chronic Skin disease, poisonous bites, has Anti-inflammatory activity,	Juice of leaf is applied to wounds.	Sivsagar.	87
73	Cleome viscosa L.	Cleomeaceae	Hurduriya	Leaf	Used in hypertension, malaria, rheumatic arthritis and wound healing.	Paste of leaf is applied topically to heal wounds.	Arunachal Pradesh	87

74	Combr etum flagroc arpum	Combre taceae	Madhavi lata	Leaf	Used in anaplastic thyroid cancer, wound healing	The leaf juice is applied to wounds and cuts.	Guwahati	88
75	Commiphora mukul Engl.	Bursera cae	Guggul	Bark	Used in rheumatoid Arthritis, osteoarthritis, high cholesterol.	Bark exudates was applied on the wound.	Jorhat	89
76	Comm elina bengha lensis	Comme linaceae	Kona-simalu	stem	Uses to reduce high blood pressure, treat burns, sore throat, dysentery, leprosy, rashes, cuts and burns.	Juice of the stem is applied to heal wounds.	Golaghat	87
77	Sida acute	Malvac eae	Boriala, jan ghali methi	Leaf	Used in diuretic, sedative, blood disorder, astringent.	Leaf paste with albumin applied on wounds.	Kanchanjuri , kajiranga Assam	91
78	Calotropis procera Br	Asclepi adaceae	Akan	Stem latex	Used in skin disease, arthritis, cramp and joint pain.	Drops of the stem latex are used to treat wounds	Guwahati	89
79	Calortopis gigante an L.	Asclepi adaceae	Akon	Latex and leaves	Used in toothache, cramps, joint pain, parasitic infection.	Latex and leaves was applied on the wounds.	Guwahati.	87
80	Cassia alata L.	Caesalp inae	Khor goss	leaves	Used in malaria, asthma, diabetes, typhoid, tinea infections, scabies, eczema.	Leaves of the plant applied on the wounds.	Jorhat	89
81	Cassia auricul ata L.	Carsalpi nae	Soru-medelua	Leaves, bark	Used in muscle pain, constipation, jaundice, liver disease, UIT.	Leaves and bark usually applied on the wounds.	Assam	89
82	Chenopodium album Linn.	Chenop odiaceae	Jilmil sak	Leaves	Used in rheumatoid, skin problem, UIT.	Crushed leaves are applied locally.	Bongaigaon, Assam.	90
83	Cirsium verutum Spreng.	Asterac eae	Thakal	Roots	Used in stomach disorder, relieve fever, sore throat,	The root is crushed and tied on the wound.	Assam	90

84	Datura stramonium L.	Solanaceae	Kola-Datura	leave	Used in intestinal infection, inflammatory disorders, intestinal pain, toothache, fever.	Latex of the leaves was applied on the wound.	Chamoria, Kamrup	89
85	Daucus carota L.	Apiaceae	Wild carrot		Used in inflammatory disorder, diuretics, intestinal and skin infection.	Juice of the root applied on the wound	Bongaigaon, Assam	89
86	Dendrophthoe falcata L.f.	Loranthaceae	Raghumala	Leaves and stem	Used in ulcer, menstrual disorder, swelling, wounds, renal, asthma.	Paste of leaf and stem is applied to heal wounds.	Sapekhati, Assam.	87
87	Dodonaea viscosa Linn.	Sapindaceae	Sand olive	Leaf	Used in malaria, fever, ulcer, diarrhoea, rheumatism.	Leaf paste with albumin applied as plaster.	Bhangagarh, Guwahati.	91
88	Dumasia villosa DC.	Fabaceae	Black bean	Whole plant	Used in healing wounds, sore throat, skin rashes, burns and cuts.	Whole plant parts are used to wash wounds.	Bhangagarh, Guwahati.	87
89	Euphorbia antiquorum L.	Euphorbiaceae	Bajbarran	Stem	Used in inflammation, arthritis, wounds, stomach ache, Diabetes	Latex from the stem is applied topically to heal wounds.	Mangaldoi, Assam.	87
90	Euphorbia pilosa	Euphorbiaceae	Siju	Latex	Used in respiratory disorders, skin infection, inflammation, gonorrhoea, migraine.	Latex of plant applied locally.	Dibrugarh.	90
91	Ficus bengalensis L.	Moraceae	Bor goss	Leaf	Used in ulcer, fever, inflammation, leprosy, syphilis, dysentery.	Leaf powder is applied topically to treat wounds.	Tinsukia	87
92	Gelsemium elegans	Loganiaceae	N	Leaf	Used in migraine, cancer, sores,	The leaf juice is applied to wounds and cuts.	Mizoram	88
93	Ixora coccinea L.	Rubiaceae	Rogiyal-phul	Flower	Used in dysentery, tuberculosis, antiseptic, astringent, analgesic, sedative, stomachic.	Flower's decoction is applied to heal wounds.	Assam	87
94	Melastoma malabathricum	Malastomataceae	Phutuka, phutukala (assam)	Bark	Used in diarrhoea, dysentery, haemorrhoids, cuts and stomachache.	Paste of bark and juice is applied to the wounds.	Kokrajhar.	88

95	Mentha viridis L.	Lamiaceae	Peppermint	Leaves	Used in indigestion, diarrhea, nausea, upper gastro intestinal tract spasms,	Leaves paste was applied on the wounds.	Assam	89
96	Mikania micrantha HRK	Asteraceae	Japani lota	Leave	Used in skin itches, rashes, wound healing, stomach aches, headaches, cold.	The leaf juice is applied to wounds and cuts.	Tezpur.	88
97	Morinda pubescens	Rubiaceae	Bartundi	Leaf	Eczema, fever, ulcer, digestive disorder, glandular swellings, dysentery, rheumatic disease.	Leaf paste was applied topically to heal wounds.	Karbi Anglong	87
98	Murraya paniculata Mill	Rutaceae	Kamini-kanchan	Leaf	Used in dysentery, diarrhea, analgesic, antinociceptive activity, anticancer.	Leaf paste with albumin applied on the wound.	Assam	91
99	Nerium indicum Mill	Apocynaceae	Raktak-karabi	Leave	Used in malaria, leprosy, asthma, menstrual periods, venereal disease, epilepsy.	Juice of the leaves was applied on the wound.	Panikhaiti, Guwahati	89
100	Aerides multiflora	Orchidaceae	Rongakopouful	Leaves	Used in treating cuts and wound, fractures and dislocated bones	Leaf paste are prepared to apply on the wound.	Tinsukia, Sibsagar, Lakhimpur, Karbi-Anglong	87
101	Pedlantis thymaloides	Euphorbiaceae		Whole plant	Used in inflammatory disease, tumor, hemorrhage, skin infections.	Latex of the plant applied on the wound.	Bangaghar.	89
102	Pinus roxburghii	Pinaceae	Chir	Bark	Used in intestinal disease, diuretic, hemorrhage, diaphoretic.	Bark paste is applied locally.	Arunachal Pradesh	90
103	Pongamia pinnata L.	Fabaceae	Karchaw	Seed	Used in skin infection, ulcer, gonorrhea, piles, tumor.	Seeds oil is applied topically on the wounds.	North Guwahati.	87
104	Pothos scandens L.	Araceae	Hathidhekiya	Leave	Used in epilepsy, convulsion, wound healing, rheumatic arthralgia.	Paste of leaf is applied topically on the wounds.	Golaghat	87
105	Rubiacordifolia L.	Rubiaceae	Majathi	Bark, Root	Used in diabetes, inflammatory disease.	Bark and root mostly applied on the wound.	Nagaon	87
106	Rungia repens L.	Acanthaceae		Whole plant	Used in diuretic, vermifugal, antimicrobial.	Paste of whole plant is applied on the wound.	Bangaghar, Guwahati	87
107	Scoparia dulcis L.	Srophulariaceae	Liqcorice	Leaf	Used in hypertension, skin disorder, anemia, dysentery, hemorrhoids, diarrhea.	Paste of leaf applied topically to treat wounds.	Tezpur	87

108	Termin alia chebul a	Combre taceae	Haritaki	Whole plant	Used in respiratory tract infection, cough,cold,Skin infection, hemorrhage.	Plant paste is applied on the wound.	Kamrup,Ass am	89
109	Jashmi num auricul atum	Oleacea e	Juhi	Juice of leaves	Used in headaches,diseases of oral cavity,skin infections,treatment of wounds.	Leaf paste is applied as ointment on the wound.	Kampur,Ass am	92
110	Glycyr rhiza glabra	Fabacea e	Jestho modhu	Roots	Used in respiratory disorder,hyperdipsia,e pilepsy,skin disease,jaundice,rheu matism,paralysis,stom ach ulcer.	Root paste is applied on the wounds.	Titabor,Assa m	93
111	Areca catechu	Areacea e	Betel nuts	Fruit	Used in hemorrhage, abdominal discomfort, kill intestinal parasite and other pathogens.	Area catechu oil is applied topically for burn wound healing.	Nagaon(Ass am)	89

Conclusion:-

In North East India, plant species have been used luxuriantly by the people in their daily life. In recent years the number of plant species has been decreased due to rapid fragmentation of natural habitats. Hence further studies are required to exploit the medicinal importance of these plants, which can serve as a potential for wound healing. But proper care should be taken for their conservation by both in-situ as well as ex-situ conservation.

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