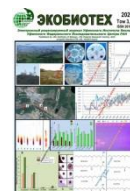




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REVIEW

ETHNOBOTANICAL APPROACH FOR IDENTIFYING THE POTENTIAL WOUND- HEALING PLANTS FROM THE FLORA OF WEST BENGAL

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The present review focuses on the wound-healing medicinal plants from the Flora of West Bengal. Literature with direct ethnobotanical studies, reviews and compilations were used to identify the most potential ones. Wound healing process is a complicated event involving several steps. Different properties are needed in each step. The present work reveals the important medicinal plants that need to be explored for the potential wound healing phytochemicals based on ethnobotanical studies.

Keywords: wound healing, ethnobotany, West Bengal

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ЭТНОБОТАНИЧЕСКИЙ ПОДХОД К ВЫЯВЛЕНИЮ ПОТЕНЦИАЛЬНЫХ РАНОЗАЖИВЛЯЮЩИХ РАСТЕНИЙ ИЗ ФЛОРЫ ЗАПАДНОЙ БЕНГАЛИИ

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Настоящий обзор посвящен ранозаживляющим лекарственным растениям из флоры Западной Бенгалии. Для выявления наиболее потенциальных была использована литература с непосредственными этноботаническими исследованиями, обзорами и компиляциями. Процесс заживления ран - это сложное событие, включающее в себя несколько этапов. На каждом этапе требуются различные свойства. Настоящая работа раскрывает важные лекарственные растения, которые необходимо исследовать на предмет потенциальных ранозаживляющих фитохимикатов на основе этноботанических исследований.

Ключевые слова: заживление ран, этноботаника, Западная Бенгалия

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INTRODUCTION

The total number of plants in India that have been reported to possess wound-healing properties is enormous. At present, this kind of plant materials are being investigated in great details throughout the world. India being Megabiodiversity country, it is important to explore such plants. Ayurveda is the Indian traditional system of medicine. Several drugs of plant, mineral, and animal origin are described in the Ayurveda for their wound healing properties under the term *Vranaropaka* [Biswas and Mukherjee, 2003]. Now-a-days various treatments are administered locally and systemically to promote wound healing which includes antibiotics, antiseptics, desloughing agents (chemical debridement, e.g., hydrogen peroxide, eusol and collagenase ointment), wound healing promoters, some substances such as tissue extracts, vitamins, and minerals and a number of plant products [Raina et al, 2008]. They primarily promote wound healing by enhancing blood clotting, fighting against infection, decreasing collagen deposition, increasing fibroblasts and fibrocytes like cells. However, the mechanism of action in case of the medicinal plants is largely unknown. In order to find it out, we will need to identify the most potentially useful plants. The present review focuses on the ethnobotanically used reported plants from the Flora of West Bengal, which is floristically a very rich region.

MATERIALS AND METHODS

The relevant literature from the databases such as Scopus, PubMed and Web of Science was consulted. Besides, the relevant available lists of medicinal plants in the form of books and Journals were also consulted. The common names, parts used and uses were along with the reference were noted. Only the extensive lists of ethnobotanical studies with at least 50 plants were used for the present review. Only those plants reported to be used by the various ethnic groups of people all over India (as per available literature) in wound and cut healing, eczema, sores, boils, animal bites, stopping blood (haemostatic), in ulcer treatment and in cancerous wounds were noted. The checklist used was the database (West Bengal menu) in the website www.medicinalplants.in maintained jointly by NMBP (National Medicinal Plants Board) and FRLHT (Foundation for Revitalisation of Local Health Traditions).

RESULTS AND DISCUSSION

Wound healing management

Wound healing process is a coordinated interdependent cellular and biochemical events which works together to improve the wound healing. Wounds have the priority to clear foreign materials and resist infection [Ueno et al, 2006; Singh et al, 2017]. Covering the wound surfaces with appropriate moisture retaining substances accelerate wound healing by preventing dehydration and scab formation [Winter, 2006]. It is also important to keep in mind that many factors are known to adversely affect wound healing eg malnutrition, hypoxia, immunosuppression, chronic disease eg diabetes, age, wound site, smoking, surgery and other associated co-morbidities [Guo and Dipietro, 2010; Oguntibeju, 2019].

Time is an important factor in wound repair. Thus, wounds can be clinically categorized as acute, chronic and complicated wounds according to their time frame of healing. The primary objective of wound management is to shorten the time needed for healing [Velnar et al, 2009].

Many synthetic drugs like Antibiotics, antiseptics, desloughing agents, extracts, etc. have been used to accelerate healing. The downside of using synthetic drugs is for their undesirable side effects [Velnar et al, 2009].

Plants as wound healers

Plants or combinations derived from plants can be a better replacement in wound healing because of lower side effects in case if it is not found to be toxic or poisonous [Karimi et al, 2015]. Studies have shown that medicinal plants improve wound healing in diabetic, infected and opened wounds [Dorai, 2012; Lordani et al, 2018; Oguntibeju, 2019].

Phytochemicals are nonnutritive substances present in plants which when applied on the wounds enhances tissue remodeling by its angiogenic property when applied on wounds surfaces. Plant and herbal extracts produce their therapeutic effects, which are due to some specific phytochemicals or their synergic actions.

With the increased resistance of known pathogens to antibiotics and antiviral agents, search for anti-infective agents have gained momentum and interest. The biological effects, of many natural compounds have been well substantiated. Hence, there is an increased demand for the reevaluation of biological effects of natural compounds in wound healing [Georgesku et al., 2016].

Plant Metabolites

Plants produce essential principal metabolites which are needed for their vital functions. They also produce many organic compounds, known as secondary metabolites, which do not participate directly in maintaining their vital functions. These are distributed in various proportions in the taxonomic groups of the plant kingdom. Many of their functions are unknown. They have complex chemical structures and the biosynthetic pathways which are very special and unique. [Georgesku et al., 2016].

Many of these compounds help the plants with various functional properties : 1) helps in their defense 2) acts as an insecticide, 3) serves as an antimicrobial, and 4) serves as a repellent 5) acts as attractant for pollinators. These properties help them to survive within the diverse environment. [Georgesku et al., 2016].

Various studies on the potential of plant metabolites with anti-inflammatory, antioxidant, antibacterial and pro-collagen synthesis properties for wound healing agents have been conducted. The natural bioactive phytochemical constituents such as alkaloids, essential oils, flavonoids, tannins, saponins, and phenolic compounds contribute to their medicinal properties. [Ibrahim et al, 2018]. Various phytochemical and herbal products have been used in dentistry and medicine for wound management and as analgesics with good and promising result [Kumar et al, 2013].

Plant Resources in West Bengal

West Bengal encompasses a large area with a wide range of environmental conditions and thus harbours an enormous amount of medicinal plants with wound-healing properties [Das et al, 2010].

The list of the plants of West Bengal Flora reported by the scientists to be used by various ethnic groups is given in Table 1. This is by no means an exhaustive list of such plants. A total of 119 species of angiosperms and one genus (*Musa spp*) have been enlisted. They belong to 58 Families (10 Monocotyledonous Families and 48 Dicotyledonous Families). The most abundant Family was Asteraceae with 8 species. The next abundant were Acanthaceae, Euphorbiaceae and Solanaceae with 6 genera each.

Table 1. Plants from West Bengal Flora found to possess some important wound-healing properties as evidenced from Ethnobotanical studies, reviews and other resources

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
1. <i>Acacia catechu</i> (L. f.) Willd. (Mimosaceae)	Cuts and wounds, burns, boils and skin eruptions, bleeding from nose (bark, root, dry resin)	Khayer	[Raj et al, 2018]
2. <i>Acacia nilotica</i> (L.) Delile (Mimosaceae)	Burns (bark)	Babla	[Raj et al, 2018]
3. <i>Acmella calva</i> (DC) R K Jansen (Syn <i>Spilanthus calva</i> DC) (Asteraceae)	Mouth sores (whole plant, caputula)	Kalijhar	[Ghosh, 2017]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
4. <i>Acorus calamus</i> L (Araceae)	Sores and wounds (root, rhizome)	Boch	[Das et al,2008] [Ghosh, 2017]
5. <i>Ageratum conyzoides</i> L. (Asteraceae)	Cuts and wounds(whole plant)	Uchanti	[Raj et al, 2018] [Salam et al, 2009]; [Murugesan et al,2011]; [Bose et al, 2015];[Ghosh, 2017] [Pala et al, 2019]
6. <i>Alocasia indica</i> (Roxb) Schott. (Araceae)	Mouth ulcer(rootstock) Stop bleeding (sap of leaves) Burn wounds (decaying petioles with coconut oil)	Mankachu	[Raj et al, 2018]
7. <i>Aloe vera</i> L. Burm.f. (Liliaceae)	burns, cut and wound, eczema (fleshy leaf part , mucilage)	Ghritakumari	[Das et al,2008] [Raj et al, 2018] [Ghosh, 2017] [Pala et al, 2019]
8. <i>Alstonia scholaris</i> R.Br. (Apocyanaceae)	Haemostatic (bark) Sores, ulcers tumours (bark juice)	Chhatim	[Das et al,2008] [Ghosh, 2017] [Pala et al, 2019]
9. <i>Ananas comosus</i> L (Bromeliaceae)	Wound (basal soft part of leaf)	Anarosh	[Debnath et al, 2019]
10. <i>Andrographis paniculata</i> (Burm f) Nees (Acanthaceae)	Ulcer, Burnt skin (leaf paste)	Kalo kechari Kalomegh	[Das et al,2008] [Debnath et al, 2019]
11. <i>Annona squamosa</i> L. (Annonaceae)	Boils (leaves and unripe fruit)	Ata	[Paria, 2005]
12. <i>Areca catechu</i> L (Arecaceae)	Bleeding from nose	Supari	[Raj et al, 2018]
13. <i>Argemone mexicana</i> L (Papaveraceae)	Latex is applied on blisters; Eczema	Siyalkata	[Murugesan et al , 2011] [Ghosh, 2017]
14. <i>Artocarpus hetrophyllus</i> Lam (Moraceae)	ulcers and wound (fruit, latex)	Kathal	[Raj et al, 2018]
15. <i>Asparagus racemosus</i> Willd. (Liliaceae)	Cuts and wounds (paste of tuberous roots)	Shatamuli	[Paria, 2005]; [Pala et al, 2019]
16. <i>Azadirachta</i>	boils, cut and wounds, ulcer	Nim	[Paria, 2005]; [Das

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
<i>indica</i> A. Juss. (Meliaceae)	(leaves, fruits)		et al,2008] [Raj, 2018] [Ghosh, 2017]
17. <i>Bambusa tulda</i> Roxb (Bambusaceae)	Deep wound (outer coat of stem)	Makla bansh	[Debnath et al, 2019]
18. <i>Barleria lupulina</i> Lindl. (Acanthaceae)	Fresh cuts,wounds and ulcers, haemostatic (crushed leaves)	Kanta Bishalyakarani	[Paria, 2005]; [Das et al,2008]
19. <i>Barleria strigosa</i> Willd. (Acanthaceae)	Ulcers, inflammation	Neel jhanti	[Paria, 2005];
20. <i>Basella sp</i> (Basellaceae)	Skin burns. Crushed leaves are mixed with cottage cheese and applied on burns	Pui shak (white,red)	[Saikia et al , 2006] [Raj et al, 2018]
21. <i>Bauhinia purpurea</i> L. (Caesalpinaceae)	Root powder with mustard oil applied on cuts and wounds' ulcer	Raktakanchan	[Paria, 2005]; [Ghosh, 2017]
22. <i>Bryophyllum pinnatum</i> Lam(Oken) (Crassulaceae)	Burn injuries, cuts and wound (leaf juice)	Patharkuchi	[Raj et al, 2018] ;[Pala et al, 2019]; [Debnath et al, 2019]
23. <i>Biophytum reinwardtii</i> (Zucc) Klotzsch (Oxalidaceae)	Wounds (whole plant)	Rani lajjabati	[Ghosh, 2017]
24. <i>Calotropis gigantea</i> (L) R.Br.ex Ait (Syn. <i>Asclepias gigantea</i> L) (Asclepiadaceae)	Leprotic wounds (root powder with country liquor) Septic wounds of cattle (latex) Dog or cat bite (flowers) Eczema	Akanda	[Paria, 2005]; [Das et al,2008]
25. <i>Calotropis procera</i> R. Br. (Asclepiadaceae)	leaves are used to treat wounds	Akondo	[Raj et al, 2018] [Bose et al, 2015]
26. <i>Cannabis sativa</i> L. (Cannabinaceae)	Haemorrhage (leaf)	Vang	[Ghosh, 2017]
27. <i>Carica papaya</i> L. (Passifloraceae)	The gum from the fruit is directly applied on the burns	Pepe	[Saikia et al, 2006]
28. <i>Catharanthus roseus</i> (L) G Don	Cancerous wound (whole plant) ,septic wounds (root	Nayantara	[Das et al,2008] [Paria, 2005];

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
(Apocyanaceae)	paste); leaf for ulcer		[Ghosh, 2017]
29. <i>Cayratia trifolia</i> L. Domin. (Syn. <i>Vitis trifolia</i> L.) (Vitaceae)	Yoke sore of bull, other wounds(root paste) Fresh cuts to stop bleeding (Leaf)	Amal lata. Bundal	[Raj et al, 2018]
30. <i>Centella asiatica</i> (L.) Urb. (Apiaceae)	dog bite, ulcer, mouth ulcers , (leaf); eczma; mouth sores	Thankuni	[Paria, 2005]; [Das et al,2008] [Murugesan et al, 2011] [Ghosh, 2017] [Pala et al, 2019]
31. <i>Cinnamomum camphora</i> (L) Presl (Lauraceae)	Fresh wounds, ulcers (camphor)	Karpur	[Paria, 2005];
32. <i>Cissus quadrangularis</i> L (Vitaceae)	Burns, wounds(stem, leaf)	Harjora	[Ghosh, 2017]
33. <i>Cissus repanda</i> Vahl (Vitaceae)	cuts and wounds		[Raj et al, 2018]
34. <i>Cleome icosandra</i> L (Syn <i>Cleome viscosa</i>) (Cleomaceae)	Applied to Boils (leaf juice)	Hurhuria	[Paria, 2005];
35. <i>Clerodendrum indicum</i> (L) O Kuntze (Verbenaceae)	Septic wounds (root paste)	Bamanhati	[Raj et al, 2018]
36. <i>Clerodendrum infortunatum</i> L (Verbenaceae)	Wound (Leaves)	Vauti	[Debnath et al, 2019]
37. <i>Colocasia esculenta</i> (L) Schott (Araceae)	Wounds (Leaf)	Man Kachu	[Ghosh, 2017]
38. <i>Commelina benghalensis</i> L (Commelinaceae)	Eczema (whole plant)	Kane saag	[Ghosh, 2017]
39. <i>Costus speciosus</i> Koen.ex Retz. Smith (Costaceae)	Burn injury (rhizome and root paste)	Kemuk	[Paria, 2005]; [Das et al,2008]
40. <i>Croton bonplandianum</i> Baill. (Euphorbiaceae)	Stops bleeding, cuts and wounds (shoot, leaf)	Churchuri	[Ghosh, 2017]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
41. <i>Curcuma amada</i> Roxb (Zingiberaceae)	Boils (stem and root)	Am-ada	[Das et al,2008]
42. <i>Curcuma aromatica</i> Salisbury (Zingiberaceae)	Wounds (rhizome)	Banhaldi	[Palit and Gurung,2008]
43. <i>Curcuma caesia</i> Roxb. (Zingiberaceae)	cuts and wounds (rhizome)	----	[Raj et al, 2018]
44. <i>Curcuma longa</i> L. (Zingiberaceae)	Dried and fresh rhizome powder to treat cuts and wound, sores, boils, swelling cuts and wounds (rhizome)	Halud	[Das et al,2008] [Raj et al, 2018] [Ghosh, 2017] [Pala et al, 2019]
45. <i>Cuscuta reflexa</i> Roxb (Convolvulaceae)	Profuse bleeding during delivery (stem extract taken orally)	Alok lata	[Debnath et al, 2019]
46. <i>Cynodon dactylon</i> (L.) Pers. (Poaceae)	Cuts and wounds, bleeding, nose bleeding (shoot and leaf juice)	Durba	[Paria, 2005]; [Raj et al, 2018] [Ghosh, 2017] [Pala et al, 2019]
47. <i>Datura innoxia</i> Mill. <i>Syn Datura metel</i> L. (Solanaceae)	cut and wounds,ulcers, dog bite fresh root along with root of punarnava paste given with milk to treat dog bite	Krishna dhutra	[Paria, 2005]; [Pala et al, 2019]
48. <i>Datura stramonium</i> L (Solanaceae)	Seeds used to treat dog bite; Leaves applied to boils and sores; dog bite (powdered seeds applied locally)	Dhutra; sada dhutra	[Paria, 2005]; [Das et al,2008] [Bose et al, 2015] [Debnath et al, 2019] [Ghosh, 2017]
49. <i>Daucus carota</i> L (Apiaceae)	The root is directly crushed and applied on the the burnt place	Gajar	[Saikia et al, 2006]
50. <i>Dillenia indica</i> L (Dilleniaceae)	Mucilaginous sap of calyx applied on burn wounds	Chalta	[Paria, 2005];
51. <i>Erythrina variegata</i> L (Fabaceae)	Infected wounds of cattle (leaf, bark)	Madar	[Ghosh, 2017]
52. <i>Eupatorium odoratum</i> L.	Cuts and wound, stops bleeding (leaves)	Kalo bonmara/Asamilata	[Das et al,2008] [Raj et al, 2018];

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
(Asteraceae)			[Bose et al, 2015]
53. <i>Eupatorium adenophorum</i> Sprengel (Asteraceae)	Blood clotting (root and leaves)	Banmara	[Palit and Gurung,2008]
54. <i>Eupatorium triplinerve</i> Vahl (Syn <i>E. apayan</i>) (Asteraceae)	Intestinal ulcers (leaf, whole plant)	Ayapan	[Das et al,2008]
55. <i>Ficus benghalensis</i> L (Moraceae)	Ulcers, inflammation(latex, bark)	Bot gachh	[Palit and Gurung,2008]
56. <i>Ficus religiosa</i> L (Moraceae)	Cuts, wounds, sores, haemorrhages (leaf, bark, latex)	Pipal	[Ghosh, 2017]
57. <i>Glycosmis arborea</i> (Roxb.) DC (Rutaceae)	Root powder used to treat eczema and wounds	Ashewra	[Bose et al, 2015]
58. <i>Gloriosa superba</i> L (Liliaceae)	Ulcer (leaf, root)	Olotchandal	[Das et al,2008]
59. <i>Gmelina arborea</i> Roxb. (Lamiaceae)	ulcer, cut and wound (whole plant)	Gamari	[Raj et al, 2018]
60. <i>Gomphrena globosa</i> L (Amaranthaceae)	Leaves are used to stop bleeding from wounds	Lalchita	[Bose et al, 2015]
61. <i>Helianthus annuus</i> L (Asteraceae)	Ulcers(flowers)	Ghamful	[Palit and Gurung,2008]
62. <i>Heliotropium indicum</i> L (Boraginaceae)	Ulcer (leaf)	Hatisur	[Ghosh, 2017]
63. <i>Hemidesmus indicus</i> L.(Schult) (Asclepiadaceae)	Ulcer (root)	anantamul	[Das et al,2008]
64. <i>Hibiscus rosa sinensis</i> L. (Malvaceae)	Mennorrhagia, burn, boil, burning sensation,	Jaba	[Raj et al, 2018]
65. <i>Holarrhena pubescens</i> (Buch.Ham) Wallich ex .G. Don (Apocyanaceae)	Mouth sores, anti-inflammatory (root, bark, leaf, seed)	Kurchi	[Das et al,2008]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
66. <i>Hygrophila spinosa</i> (Schum) Heine (Acanthaceae)	Blood coagulant, anti-inflammatory (whole plant)	Kulekhara	[Das et al,2008]
67. <i>Imperata cylindrica</i> (L) Rausch Vaughan (Poaceae)	Internal bleeding (flowers, stem)	Siru	[Palit and Gurung,2008]
68. <i>Ipomoea batatas</i> (L.) Lam. (Convolvulaceae)	Burns (fleshy tuber)	Misthi alu	[Raj et al, 2018]
69. <i>Jatropha curcas</i> L. (Euphorbiaceae)	Cuts and wounds (seed, latex); The juice of leaves is mixed with egg yolk and applied on burnt place	Shada Bharenda	[Raj et al, 2018] [Saikia et al, 2006] [Ghosh, 2017] [Pala et al, 2019]
70. <i>Justicia adhatoda</i> L. (Acanthaceae)	stops bleeding, cuts and wounds; ulcer	Bashok	[Raj et al, 2018] [Ghosh, 2017] [Pala et al, 2019]
71. <i>Justicia gendarussa</i> Burm. F. (Acanthaceae)	Septic cuts and wounds; haemostatic , internal haemorrhage(leaf, whole plant)	Bishjhar	[Raj et al, 2018] [Ghosh, 2017] [Pala et al, 2019]
72. <i>Kalanchoe pinnata</i> (Lam) Pers (Crassulaceae)	Wounds and ulcers (Leaves)	Pathorkuchi	[Das et al,2008]
73. <i>Lantana camara</i> L (Verbenaceae)	Ulcerous wound (fruit, bark)	Kuttish	[Ghosh, 2017]
74. <i>Lathyrus sativus</i> L (Fabaceae)	Wound (root paste)	Kesari ghaas	[Debnath et al, 2019]
75. <i>Leucas aspera</i> (Willd.) Spreng. (Syn <i>Leucas zeylanica</i> (W) T Aiton) (Lamiaceae)	swelling, stop bleeding, cuts and wounds, swelling (leaf)	Dondokalash	[Das et al,2008] [Ghosh, 2017] [Pala et al, 2019]
76. <i>Magnolia champaca</i> (L) Baill ex Pierre (Magnoliaceae)	Sores, ulcers, boils (bark, root, flower)	Chanp	[Ghosh, 2017]
77. <i>Mangifera indica</i> L (Anacardiaceae)	Haemorrhage (bark, seed)	Aam	[Ghosh, 2017]
78. <i>Melastoma malabathricum</i> L.	Cuts and wounds, stomach ulcers,boils (leaf paste)	Futki	[Bose et al, 2015]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
(Melastomaceae)			
79. <i>Mimosa pudica</i> L. (Mimosaceae)	sores, wounds and swelling (Whole plant)	Lajjaboti	[Paria, 2005]; [Das et al,2008] [Raj et al, 2018]
80. <i>Mimusops elengi</i> L (Sapotaceae)	Wound, ulcer (bark, flower, fruit, seed)	Bakul	[Ghosh, 2017]
81. <i>Momordica charantia</i> L (Cucurbitaceae)	Ulcers (fruit, leaf)	Ucche	[Ghosh, 2017]
82. <i>Momordica dioica</i> L (Cucurbitaceae)	Ulcers, bleeding piles (fruit, leaf)	Bon karela	[Ghosh, 2017]
83. <i>Moringa oleifera</i> L. (Moringaceae)	cuts and wounds of domestic animals and humans (Leaf)	Sajna	[Raj et al, 2018] [Pala et al, 2019]
84. <i>Mucuna pruriens</i> (L) DC (Fabaceae)	Ulcer (root, leaf, seed)	Alkushi	[Das et al,2008]
85. <i>Murraya paniculata</i> (L) Jack (Rutaceae)	Cuts and boils (root, bark, leaf)	Kamini	[Das et al,2008]
86. <i>Musa sp</i> (Musaceae)	The ripe fruit is peeled and the pieces are applied on burns; dental wound (leaves)	Kola	[Saikia et al ,2006] [Debnath et al, 2019]
87. <i>Neolamarckiana cadamba</i> (Roxb) Bosser (Rubiaceae)	Wounds (fruit, bark)	Kadam	[Ghosh, 2017]
88. <i>Oroxylum indicum</i> (L.) Vent. (Bignoniaceae)	cuts and wounds (bark)	Totola	[Raj et al, 2018] [Pala et al, 2019]
89. <i>Ocimum gratissimum</i> L (Lamiaceae)	Ulcer (inflorescence, leaf)	Ram Tulsi	[Ghosh, 2017]
90. <i>Ocimum tenuiflorum</i> L (Lamiaceae)	Mouth ulcer, crocodile bite (inflorescence, leaf)	Kalo tulsi	[Das et al,2008] [Ghosh, 2017]
91. <i>Peperomia pellucid</i> Kunth. (Piperaceae)	Whole plant paste used against boils	Luchipata	[Bose et al, 2015]
92. <i>Phoenix</i>	Wounds ,inflammation (root,	Khajur	[Raj et al, 2018]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
<i>sylvestris</i> (L.) Roxb. (Arecaceae)	seed)		[Ghosh, 2017]
93. <i>Phyllanthus amarus</i> L (Euphorbiaceae)	Ulcers (whole plant)	Bhui amla	[Ghosh, 2017]
94. <i>Phyllanthus emblica</i> L (Euphorbiaceae)	Powder of male flower used in nasal sniff against haemorrhage	Amla	[Bose et al, 2015] [Ghosh, 2017]
95. <i>Phyllanthus urinaria</i> L (Euphorbiaceae)	Ulcers (whole plant)	Bhui Amla	[Ghosh, 2017]
96. <i>Plumbago zeylanica</i> L (Plumbaginaceae)	Boils, eczema (root, leaf, shoot)	Chita	[Ghosh, 2017]
97. <i>Punica granatum</i> L. (Lythraceae)	Nose bleeding (leaves)	Anar	[Raj et al, 2018]; [Pala et al, 2019]
98. <i>Rauvolfia serpentina</i> (L.) Benth ex Kurz. (Apocyanaceae)	cuts and wounds (root)	Sarpagandha	[Das et al,2008] [Raj et al, 2018]; [Pala et al, 2019]
99. <i>Ricinus communis</i> L. (Euphorbiaceae)	wounds (human and animal), sores (dried powder of root and root bark), boils, burns (seed and seed oil); Leaf paste is applied on eczema	Rerhi	[Paria, 2005] [Saikia et al,2006] [Das et al,2008] [Raj et al, 2018]
100. <i>Rumex nepalensis</i> Sprengel (Polygonaceae)	Wounds(root paste)	Hal hale	[Palit and Gurung,2008]
101. <i>Scoparia dulcis</i> L (Scrophulariaceae)	Cuts, ulcer (seed.,leaf, whole plant)	Bondhone	[Ghosh, 2017]
102. <i>Senna alata</i> L (Roxb) (Syn <i>Cassia alata</i> L) (Caesalpiniaceae)	Wounds and cuts (leaf,root)	Dadamari	[Ghosh,2017]
103. <i>Senna occidentalis</i> (L) Link (Syn. <i>Cassia occidentalis</i> L) (Caesalpiniaceae)	Wounds and cuts (leaf, root)	Kalkashundo	[Ghosh,2017]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
104. <i>Shorea robusta</i> Gaerth f. (Dipterocarpaceae)	Cuts and wounds, burns, blood coagulant	Sal	[Raj et al, 2018]
105. <i>Sida cordifolia</i> L (Malvaceae)	Ulcers, dog bites (leaf, root)	Swet Berela	[Ghosh, 2017]
106. <i>Solanum nigrum</i> L. (Solanaceae)	cuts and wounds, boils, dog bite (root. leaf, fruit)	kakmachi	[Das et al,2008] [Raj et al, 2018]
107. <i>Solanum torvum</i> Burm.f. (Solanaceae)	Haemostatic (whole plant)	Bothbegun	[Ghosh, 2017]
108. <i>Solanum tuberosum</i> L (Solanaceae)	The tuber is peeled and crushed and smeared over burn wound (tuber)	alu	[Raj et al, 2018] [Debnath et al, 2019]
109. <i>Sonchus asper</i> (L) Hill (Asteraceae)	wounds and boils (whole plant)	--	[Bose et al, 2015]
110. <i>Tagetes erecta</i> L. (Asteraceae)	mouth ulcer, cuts and wounds (leaf paste)	Genda	[Raj et al, 2018] [Bose et al, 2015]
111. <i>Tamarindus indica</i> L. (Fabaceae)	Swelling, ulcer, swelling, wounds, boils (ash of stem bark)	Tentul	[Raj et al, 2018] [Bose et al, 2015] [Ghosh, 2017]
112. <i>Terminalia arjuna</i> (Roxb) Wight & Arnott (Combretaceae)	Wounds (bark)	Arjun	[Das et al,2008]
113. <i>Terminalia bellirica</i> (Gaertn.) (Combretaceae)	Leprotic wounds, cuts and wounds , ulcer(leaves, fruits)	Bahera	[Das et al,2008] [Paria, 2005] [Raj et al, 2018] [Ghosh, 2017]
114. <i>Terminalia chebula</i> Retz (Combretaceae)	Bleeding, gum ulcer, eczema (fruit, seed)	Haritaki	[Ghosh, 2017]
115. <i>Thespesia populnea</i> (L.) Sol. ex Corrêa (Malvaceae)	healing, cuts and wound	--	[Raj et al, 2018]
116. <i>Trigonella foenum-graecum</i> L	The seeds soaked in water are crushed and paste is used on	Methi	[Saikia et al,2006]

Sl.No.Plants name (Family)	Reported Uses (part used)	Vernacular name	Reference
(Fabaceae)	burns		
117. <i>Urtica parviflora</i> Roxburgh (Urticaceae)	Haemorrhage(whole plant)	Sishnu	[Palit and Gurung,2008]
118. <i>Vitex negundo</i> L. (Verbenaceae)	bedsore, wound; ulcer (leaves, flowers)	Nishinda	[Das et al,2008] [Debnath et al, 2019] [Raj et al, 2018] [Ghosh, 2017]
119. <i>Withania somnifera</i> Dunal (Solanaceae)	Boils, wounds and sores (root, leaf, fruit, seed)	Ashwagndha	[Das et al,2008]
120. <i>Zingiber zerumbet</i> (L.) Sm. (Zingiberaceae)	septic cuts and wounds (rhizome)	Kalo Halud	[Raj et al, 2018]

CONCLUSION

Numerous ethnomedicinally used plants are vanishing fast. In order to safeguard this knowledge, it should be documented, preserved and patented [Chhetri et al, 2005]. The present review is a humble attempt on the part of the authors to compile a tentative list of the potential wound healing plants. Some of the plants which need to be explored immediately are *Ageratum conyzoides*, *Aloe vera*, *Azadirachta indica*, *Centella asiatica*, *Curcuma longa*, *Cynodon dactylon*, *Datura spp*, *Jatropha curcas*, *Ricinus communis*, *Terminalia bellirica* and *Vitex negundo*. Besides, more thorough investigation is needed to arrive at a conclusion since the kind of wound is not always mentioned in the ethnobotanical studies. A separate ethnobotanical study may be initiated for the purpose.

REFERENCES

1. Biswas T.K., Mukherjee B. Plant Medicines of Indian Origin for Wound Healing Activity: A Review // The International Journal of Lower Extremity Wounds. 2003. V. 2 (1). P. 25–39. DOI: [10.1177/1534734603002001006](https://doi.org/10.1177/1534734603002001006)
2. Bose D., Ghosh Roy J., Das Mahapatra (Sarkar) S., Datta T., Das Mahapatra S. and Biswas H. Medicinal Plants used by tribals in Jalpaiguri district, West Bengal, India // J Med Plant Studies. 2015. V. 3 (3). P. 15-21.
3. Chhetri D.R., Basnet D., Chiu P., Kalikotay S., Chhetri G., Parajuli S. Current Status of Ethnomedicinal Plants in the Darjeeling Himalaya // Current Science. 2005. V. 89 (2). P. 264–268. www.jstor.org/stable/24110573
4. Das A.P., Alam M.U., Ghosh C., Biswas R. Uttorbonge chashjoggo ekshoto veshoj Udbhid. University of North Bengal, 2008, 106 p.
5. Das A.P., Ghosh C., Sarker R, Biswas K, Choudhury, D, Lama A., Moktan, S and Choudury A. Preliminary report on the Medicinal Plants from three MPCA s in Terai and Duars of West Bengal, India // Pleione. 2010. V. 4 (1). P. 90-101.

6. Debnath D., Barman B.R., Choudhury D. and Das A.P. Ethnomedicobotany of Rajbanshi community in the Duars region of Jalpaiguri District, West Bengal, India // *Pleione*. 2019. V. 13 (1). P. 55-64
7. Dorai A.A. Wound care with traditional, complementary and alternative medicine // *Indian journal of plastic surgery: official publication of the Association of Plastic Surgeons of India* 2012. V. 45 (2). P. 418–424. DOI: [10.4103/0970-0358.101331](https://doi.org/10.4103/0970-0358.101331)
8. Georgescu M., Marinas O., Popa M., Stan T., Lazar V., Bertesteanu S.V., Chifiriuc M.C. Natural Compounds for Wound Healing. Ch. 4 // *Innovation in Natural and Conventional Methods* / Ed. Cesar J.V. da Fonseca, IntechOpen, 2016. DOI: [10.5772/65652](https://doi.org/10.5772/65652)
9. Ghosh C. Ethnobotanical survey in the Bamonghta Block of Malda District, West Bengal (India): II. Medicinal and Aromatic Plants // *Pleione*. 2017. V. 11 (2). P. 255-267.
10. Guo S., DiPietro L. A. Factors Affecting Wound Healing // *Journal of Dental Research*. 2010. V. 89 (3). P. 219–229. DOI: [10.1177/0022034509359125](https://doi.org/10.1177/0022034509359125)
11. Ibrahim, N.ʹ.; Wong, S.K.; Mohamed, I.N.; Mohamed, N.; Chin, K.-Y.; Ima-Nirwana, S.; Shuid, A.N. Wound Healing Properties of Selected Natural Products // *Int. J. Environ. Res. Public Health*. 2018. V. 15 (11). 2360. DOI: [10.3390/ijerph15112360](https://doi.org/10.3390/ijerph15112360)
12. Karimi A., Majlesi M., Rafieian-Kopaei M. Herbal versus synthetic drugs; beliefs and facts // *J Nephroarmacol*. 2015. V. 4 (1). P. 27-30.
13. Kumar G., Jalaluddin M., Rout P., Mohanty R., Dileep C. L. Emerging trends of herbal care in dentistry // *Journal of clinical and diagnostic research: JCDR*. 2013. V. 7 (8). P. 1827–1829. DOI: [10.7860/JCDR/2013/6339.3282](https://doi.org/10.7860/JCDR/2013/6339.3282)
14. Lordani T., de Lara C.E., Ferreira F., de Souza Terron Monich M., Mesquita da Silva C., Felicetti Lordani C. R., Giacomini Bueno F., Vieira Teixeira J. J., Lonardoni M. Therapeutic Effects of Medicinal Plants on Cutaneous Wound Healing in Humans: A Systematic Review // *Mediators of inflammation*. 2018. Article ID 7354250. DOI: [10.1155/2018/7354250](https://doi.org/10.1155/2018/7354250)
15. Murugesan M., Balusubramaniam V., Arumugasamy K. Ethnomedicinal diversity in Velliangiri hills, Western Ghats, Tamil Nadu // *Ethnobotany*. 2011. V. 23, P. 89-99.
16. Oguntibeju O.O. Medicinal plants and their effects on diabetic wound healing // *Veterinary world*. 2019. V. 12 (5). P. 653–663. DOI: [10.14202/vetworld.2019.653-663](https://doi.org/10.14202/vetworld.2019.653-663)
17. Pala N.A., Sarkar B.C., Shukla G. et al. Floristic composition and utilization of ethnomedicinal plant species in home gardens of the Eastern Himalaya // *J Ethnobiology Ethnomedicine*. 2019. V. 15. Article ID 14 DOI: [10.1186/s13002-019-0293-4](https://doi.org/10.1186/s13002-019-0293-4)
18. Palit D., Gurung S. Some phyto-remedies used traditionally by Gurungs in Darjeeling, West Bengal, India // *Pleione*. 2008. V. 2 (2). P. 171-174.
19. Paria N.D. (Ed) *Medicinal Plant Resources of South West Bengal*. Directorate of West Bengal. Kolkata: Saraswati press Ltd., 2005. 198 p.
20. Rai S.K. and Bhujel R.B. Some lesser known ethno-medicinal plants of Darjeeling Himalayan Region, India. //In: ‘Recent Studies in Biodiversity and Traditional Knowledge in India’ (Eds Ghosh C. and Das A.P.) 2011. P. 321-327.
21. Raina R., Prawez S., Verma P.K., Pankaj N.K. Medicinal Plants and their Role in Wound Healing // *VetScan*. 2008. V. 3 (1). P. 1-7. <https://journal.vetscan.co.in/index.php/vs/article/view/28>
22. Raj A.J., Biswakarma S., Pala N.A., Shukla G., Vineeta, Kumar M., Chakravarty S., Bussmann R.W.. Indigenous uses of ethnomedicinal plants among forest-dependent communities of Northern Bengal, India // *J Ethnobiol Ethnomed*. 2018. V. 14 (1). Article ID 8. DOI: [10.1186/s13002-018-0208-9](https://doi.org/10.1186/s13002-018-0208-9)

23. Saikia A.P., Ryakala V.K., Sharma P., Goswami P., Bora U. Ethnobotany used by Assamese people for various skin ailments and cosmetics // *Journal of Ethnopharmacology*. 2006. V. 10. P. 149-157.
24. Salam S., Jamir N.S. and Singh P.K. Traditional uses of medicinal plants by the Tangkhul-Naga tribe in Manipur, India // *Pleione*. 2009. V. 2 (2). P. 157-162.
25. Singh S., Young A., McNaught C. The physiology of wound healing. 2017. V. 35 (9). P. 473–477. <https://www.sciencedirect.com/science/article/abs/pii/S0263931917301369>
26. Ueno C., Hunt, T.K., Hopf, H.W. Using physiology to improve surgical wound outcomes // *Plastic and reconstructive surgery*. 2006. V. 117 (7). P. 59S–71S. DOI: [10.1097/01.prs.0000225438.86758.21](https://doi.org/10.1097/01.prs.0000225438.86758.21)
27. Velnar T., Bailey T., Smrkolj V. The wound healing process: an overview of the cellular and molecular mechanisms // *The Journal of international medical research*. 2009. V. 37 (5). P. 1528–1542. DOI: [10.1177/147323000903700531](https://doi.org/10.1177/147323000903700531)
28. Winter G.D. Some factors affecting skin and wound healing // *Journal of tissue viability*. 2006. V. 16 (2). P. 20–23. DOI: [10.1016/s0965-206x\(06\)62006-8](https://doi.org/10.1016/s0965-206x(06)62006-8)