

Pharmacodynamic appraisal of wound-healing herbs of *Sushruta Samhita*

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Abstract

Background: In *Sushruta Samhita*, various medicinal plants as single and compound formulations having *Vrana-Shodhana* (wound cleansing) and *Vrana-Ropana* (wound healing) potential are enumerated. There are no published data available on these wound-healing medicinal plants of *Sushruta Samhita*. The effective management of wound is necessary in the immunocompromised and chronic wounds patients as they take more time to heal. **Aim:** To review and systematically analyze wound-healing medicinal plants and their *modus-operandi* on the basis of pharmacodynamics attributes, i.e., *Rasa* (taste), *Veerya* (potency), and *Vipaka* (biotransformation) in the various stages of healing. **Materials and methods:** Review of *Sushruta Samhita* was done to gather wound-healing medicinal plants; pharmacodynamics attributes were gathered from various *Nighantus* to understand their role in wound healing. The contemporary information about wound-healing mechanism was gathered from PubMed to interpetate the rational use of plants in the various stages of wound healing. **Results:** The study suggests that 43 medicinal plants have *Vrana-Shodhana* activity, 48 have *Vrana-Ropana* and 62 have both *Vrana-Shodhana* and *Vrana-Ropana* potential. Medicinal plants with *Vrana-Shodhana* category are having predominance of *Katu* (pungent), *Tikta* (bitter) and *Kashaya* (astriagent) *Rasa*. Plants under *Vrana-Ropana* are having *Madhura*, *Kashaya Rasa* (sweet taste), *Madhura Vipaka* (sweet biotransform) and *Sheeta Veerya* (cold potency). **Conclusion:** Plants having *Tikta*, *Kashaya Rasa*, *Katu Vipaka*, and *Sheeta Veerya* may be useful in the inflammatory stage, plants having *Madhura*, *Kashaya Rasa* and *Sheeta Veerya* may be useful in the proliferatory stage and plants having *Madhura Rasa*, *Sheeta Veerya*, and *Madhura Vipaka* may be useful in the remodeling stage. The present review will help to give the directions to the researchers for the development of effective wound-healing medicines for wounds.

Keywords: *Ayurveda*, pharmacodynamic attributes, *Sushruta Samhita*, *Vrana-Ropana*, *Vrana-Shodhana*, wound

Introduction

The understanding of action of drugs is essential for their rational use. In *Ayurveda*, this is explained on the basis of *Rasa* (taste), *Guna* (properties), *Veerya* (potency) and *Vipaka* (biotransformation), known as pharmacodynamics attributes of the drugs. In the present scenario, extensive work has been done on medicinal plants, but the understanding of their action on the basis of classical *Ayurveda* doctrines is still lacking. This is also true for wound healing plants. Published literatures are available for wound-healing plants but the comprehensive review of medicinal plants (*Vrana-Shodhana* [wound cleansing] and *Vrana-Ropana* [wound healing]) mentioned in *Sushruta Samhita* along with pharmacodynamics and their *modus-operandi* is not available. It is reported that chemical constituents of plants i.e., tannins, flavonoids, sterols, polyphenols, saponins,

and tri-terpanoids have specific role in wound healing due to astringent, antimicrobial, antioxidant, free scavenging activities, and improvement in vascularity.^[1] Therefore, in the present study, an attempt has been made to gather the relevant information of wound-healing medicinal plants from *Sushruta Samhita*. In *Sushruta Samhita*; *Nidana* (causative factors),^[2] *Shatkriyakala* (pathogenesis),^[3] classification,^[4] *Lakshana* (symptoms)^[5] *Shashtiupakarma* (sixty therapeutic procedures)^[6] of wound are described in detail. Thus, the

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elaborated description of wound and treasure of medicinal plants mentioned in *Sushruta Samhita* is a valuable asset in the effective management of wounds.

It is also evident that in the conventional medical system, few common procedures are used for wound management, i.e., wound dressing (non resorbable, occlusive dressings, hydrophilic, and hydrogels), topical application of antimicrobials (antibiotics, antiseptics and super oxidized solutions), enzymes (collagenase and papain-urea combination),^[7] surgical procedures such as suturing, skin grafting, and flaps.^[8] Many advance modalities have been also adopted by contemporary science such as negative pressure wound therapy, hyperbaric oxygen therapy, electrical stimulation, diathermy, growth factors, acellular matrix tissues, human dermis, human pericardium, placental tissues, bioengineered allogeneic cellular therapies, stem cell therapies and hyalomatrix (hyaluronan),^[9] but still the gold standard of wound healing is lacking. The ancient treasure of wound-healing plants may be utilized for further researches to develop promising wound-healing drugs.^[10] For more specific use of medicinal plants, it is also important to know that which medicinal plant is essential for a particular stage and type of wound. Therefore, *modus-operandi* of wound-healing medicinal plants on the basis of *Ayurveda* pharmacodynamics and also as per the various stages of wound healing is necessary for their rational use as *Vrana-Shodhana* (wound cleansing) and *Vrana-Ropana* (wound healing).

The present attempt may help to utilize the ancient wisdom of *Sushruta Samhita* to find out the favorable strategy for effective wound management. Further, it is also observed that among various wound-healing plants of *Sushruta Samhita*, only few have been screened for their wound-healing activity scientifically and many of them are still unexplored.^[10] Therefore, the present review will fascinate the scientific community toward these unexplored potential Ayurvedic medicinal plants and their rational use in wound healing.

Materials and methods

The review of medicinal plants enumerated for *Vrana-Shodhana* and *Vrana-Ropana* action was done from *Sushruta Samhita Dalhana Tika* (2014). The pharmacodynamic attributes (*Rasa*, *Guna*, *Veerya* and *Vipaka*) of selected medicinal plants was collected from various Ayurvedic *Nighantus* and reputed books of *Dravyaguna*, i.e., *Dhanvantari Nighantu* of Jharkhande Ojha (2004), *Kaidev Nighantu* of P V Sharma (2013), *Madanpala Nighantu* of Gayanendra Pandey (2012), *Raj Nighantu* of Indradeva Tripathi (2010), *Bhavaparkasha Nigantu* of K C Chunekar (2015), and *Dravyagunavijyana* part 2 of P V Sharma (2015). Recent scientific names and family of the plants were mentioned from “The plantlist.org.”^[11] The contemporary review was done from the principles and practice of wound care,^[7,8] Schwartz’s principles of surgery,^[12] and the articles published in PubMed journals in recent 10 years. The entire information was systematically analyzed and evaluated on the basis of pharmacodynamics attributes. The plants are

presented in alphabetical order according to their Sanskrit name with their pharmacodynamics attributes.

Observations

The observations revealed that the plants mentioned under *Nyagrodhadi*,^[13] *Kakolyadi*,^[14] *Surasadi*,^[15] *Aaragvadhadi*,^[16] *Arkadi*,^[17] *Lakshadi*^[18] and *Priyanguambasthadi Gana* (group)^[19] are attributed with *Vrana-Shodhana* and *Vrana-Ropana* potential.

Total 43 medicinal plants are attributed with *Vrana-Shodhana* activity and 48 medicinal plants are having *Vrana-Ropana* potential. However, 62 medicinal plants are having both *Vrana-Shodhana* and *Vrana-Ropana* potential. [Tables 1-3 and Figure 1]

The dominant *Rasa*, *Veerya* and *Vipaka* in *Vrana-Shodhana*, *Vrana-Ropana* and *Vrana-Shodhana-Ropana* categories are presented in Tables 4-6 respectively.

Discussion

In Ayurveda action of any drug is defined under the umbrella of *Dravyaprabhava* (specific effect of drug) and *Gunaprabhava* (effect of drug due to its *Rasa*, *Guna*, *Veerya* and *Vipaka* attributes). *Dravyaprabhava* is the specific nature inherited in any drug due to the specific configuration of *panchmahabhoot* thus known as *Dravyaprabhava*. On the other hand, under *Gunaprabhava*, the actions of the drugs can be explained on the basis of *Rasa*, *Guna*, *Veerya* and *Vipaka*, known as pharmacodynamic attributes. *Dravyaprabhava* is specific to the drug and may not be explained by its pharmacodynamic attributes. Thus, for the judicious use of drugs, understanding of *Dravyaprabhava* and *Gunaprabhava* is necessary.^[20] This may help for rational and judicious use of these drugs with supported explanation for their action.

This principle of Ayurveda is also true for the medicinal plants mentioned in *Sushruta Samhita* under *Vrana-shodhan*, *Vrana-Ropana*, and *Vrana-Shodhana-Ropana* category. *Acharya Sushruta*, the father of surgery, has given 153 plants

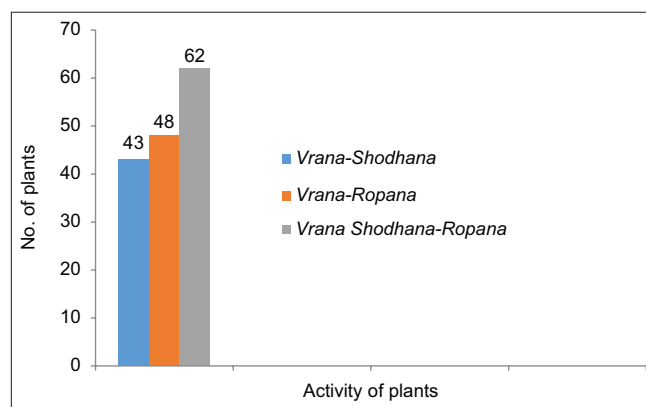


Figure 1: Number of medicinal plants having *Vrana-Shodhana*, *Vrana-Ropana* and *Vrana-Shodhana-Ropana* properties

Table 1: Vrana-Shodhana (43) mentioned in Sushruta Samhita and their pharmacodynamic attributes

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Amrataka</i> <i>Spondias pinnata</i> [L. f.] Kurz	Anacardiaceae	<i>Amla</i> sour	<i>Ushna</i> hot	<i>Amla</i>	B.P.Ni., <i>Aamaradiphala Varga</i> , 19-20, pg. 541	<i>Su. Chi.</i> 8/47	<i>Su. Chi.</i> 8/47, <i>Su. Chi.</i> 21/3 and 7
<i>Aaragvadha/</i> <i>Aareveta</i> <i>Cassia fistula</i> L.	Leguminosae	<i>Madhura</i> sweet	<i>Sheeta</i> cold	<i>Madhura</i>	B.P.Ni., <i>Haritakyadi Varga</i> , 149-150, pg. 66	<i>Su. Su.</i> 37/17-18, <i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 8/30	<i>Su. Chi.</i> 21/3 and 7
<i>Ankotha</i> <i>Alangium salvifolium</i> [L.f.] Wangerin	Cornaceae	<i>Katu</i> pungent, <i>Kashaya</i> astringent	<i>Ushna</i>	<i>Katu</i>	P. Ni., <i>Guduchayadi Varga</i> , 139, pg. 350	<i>Su. Su.</i> 37/12, <i>Su. Chi.</i> 19/14	<i>Su. Chi.</i> 21/3 and 7
<i>Bala Sida cordifolia</i> L.	Malvaceae	<i>Madhura</i>	<i>Sheeta</i>	<i>Madhura</i>	B.P.Ni., <i>Guduchayadi Varga</i> , 144, pg. 351	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20
<i>Bhallataka</i> <i>Semecarpus anacardium</i> L.f.	Anacardiaceae	<i>Kashaya</i>	<i>Ushna</i>	<i>Madhura</i>	Dh. Ni., <i>Chandanadi Varga</i> , 129, pg. 153	<i>Su. Chi.</i> 19/14, <i>Su. Chi.</i> 19/17	<i>Su. Chi.</i> 20/54-55
<i>Bilvamoola</i> <i>Aegle marmelos</i> [L.] Correa	Rutaceae	<i>Kashaya</i> , <i>Tikta</i> bitter	<i>Ushna</i>	<i>Katu</i>	B.P.Ni., <i>Guduchayadi Varga</i> , 13, pg. 162	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20
<i>Chitraka</i> <i>Plumbago zeylanica</i> L.	Plumbaginaceae	<i>Katu</i>	<i>Ushna</i>	<i>Katu</i>	Dh. Ni., <i>Shatpushpadi Varga</i> , 81, pg. 114	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 1/79	<i>Su. Chi.</i> 21/3 and 7
<i>Danti</i> <i>Baliospermum sonalifolium</i> [Burm.] Suresh	Euphorbiaceae	<i>Katu</i>	<i>Ushna</i>	<i>Katu</i>	Ka. Ni., <i>Aushadhi Varga</i> , 1010, pg. 187	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/39, <i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 8/42	<i>Su. Chi.</i> 8/41
<i>Daruharidra</i> <i>Barberis aristata</i> DC.	Berberidaceae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	Dh. Ni., <i>Guduchyadi Varga</i> , 60, pg. 30	<i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 37/19, <i>Su. Su.</i> 38/79-80, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/41	<i>Su. Su.</i> 37/25, <i>Su. Su.</i> 37/26, <i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 8/43-44
<i>Dasi</i> <i>Barleriastrigose</i> Willd.	Acanthaceae	<i>Tikta</i> , <i>Madhura</i>	<i>Ushna</i>	<i>Katu</i>	B.P.Ni., <i>Pushpa Varga</i> , 52-53, pg. 489	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Dhava</i> <i>Anogeissus latifolia</i> [Roxb. ex DC.] Wall. ex Guillem. and Perr.	Combretaceae	<i>Madhura</i>	<i>Sheeta</i>	<i>Madhura</i>	B.P.Ni., <i>Vatadi Varga</i> , 52-53, pg. 528	<i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 37/27-28
<i>Ela Elettaria cardamomum</i> [L.] Maton	Zingibaraceae	<i>Katu</i> , <i>Madhura</i>	<i>Sheeta</i>	<i>Madhura</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga</i> , <i>Dahaprashamana Varga</i> , pg. 720	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16	<i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 8/43-44, <i>Su. Chi.</i> 20/54-55
<i>Eranda</i> <i>Ricinus communis</i> L.	Euphorbiaceae	<i>Madhura</i>	<i>Ushna</i>	<i>Madhura</i>	D.G part 2, 1 st <i>Adhayaya Medhyadi Varga</i> , <i>Vedanasthapana Varga</i> , pg. 60	<i>Su. Chi.</i> 18/7	<i>Su. Su.</i> 16/6
<i>Gojihva</i> <i>Launea nudicaulis</i> Hook.F.	Compositae	<i>Kashaya</i> , <i>Tikta</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Su. Su.</i> 46/262-263	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20

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Table 1: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Gopghonta Pughbhedha</i>		<i>Kashaya, Madhura</i>	<i>Ushna</i>	<i>Katu</i>		<i>Su. Su. 38/6-7</i>	<i>Su. Chi. 21/3 and 7</i>
<i>Guduchi</i> <i>Tinospora sinensis</i> [Lour] Merr. D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga, Rasayana Varga</i> , pg. 762.	Menispermaceae	<i>Tikta, Katu, Kashaya</i>	<i>Ushna</i>	<i>Madhura</i>		<i>Su. Su. 38/6-7</i>	<i>Su. Su. 37/23, Su. Chi. 2/68, Su. Chi. 18/7-8, Su. Chi. 21/3 and 7, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13</i>
<i>Haridra Curcuma longa</i> L.	Zingiberaceae	<i>Tikta, Katu</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 2 nd <i>Adhayaya Chakshushyadi Varga, Kusthaghanda Varga</i> , pg. 163	<i>Su. Su. 37/15-16, Su. Su. 37/19, Su. Su. 38/79-80, Su. Chi. 2/89-92, Su. Chi. 8/30, Su. Chi. 8/41, Su. Chi. 8/42, Su. Chi. 17/19-20</i>	<i>Su. Su. 37/25, Su. Su. 37/26, Su. Chi. 2/38, Su. Chi. 8/41, Su. Chi. 8/43-44, Su. Chi. 17/19-20</i>
<i>Himsra Cappris sepieria</i> L.	Capparaceae	<i>Katu, Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 3 rd <i>Adhayaya Hridayadi Varga, Sothara Varga</i> , pg. 230	<i>Su. Chi. 17/19-20</i>	<i>Su. Chi. 17/19-20</i>
<i>Indrayava Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	<i>Katu</i>	<i>Sheeta</i>	<i>Katu</i>	<i>B.P.Ni. Haritakyadi Varga</i> , 258, pg. 73	<i>Su. Su. 38/6-7</i>	<i>Su. Chi. 21/3 and 7</i>
<i>Kala Tagara Valeriana jatamansi</i> Jones	Caprifoliaceae	<i>Katu, Tikta, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 1 st <i>Adhayaya Medhyadi Varga, Vednasthapana Varga</i> , pg. 65	<i>Su. Chi. 8/30</i>	<i>Su. Su. 37/26, Su. Chi. 2/68, Su. Chi. 20/54-55</i>
<i>Kantaki/Khadir Acacia catechu</i> [L.f.] Willd.	Leguminosae	<i>Tikta, Kashaya</i>	<i>Sheeta</i>	<i>Katu</i>	D.G part 2, 2 nd <i>Adhayaya Chakshausyadi Varga, Kusthghana Varga</i> , Pg. 159	<i>Su. Su. 38/6-7</i>	<i>Su. Chi. 21/3 and 7, Su. Chi. 21/6</i>
<i>Karanja Pongamia pinnata</i> [L.] Pierre	Leguminosae	<i>Tikta, Katu, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 2 nd <i>Adhayaya Chakshausyadi Varga, Kandughana Varga</i> , pg. 145	<i>Su. Su. 38/6-7, Su. Su. 38/16-17, Su. Chi. 2/89-92, Su. Chi. 18/18-19, Su. Su. 37/13-16</i>	<i>Su. Chi. 21/3 and 7</i>
<i>Putikaranja Holoptelea integrifolia</i> Planch.	Ulmaceae	<i>Tikta, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga, Lekhana Varga</i> , pg. 817	<i>Su. Su. 38/6-7, Su. Su. 38/16-17, Su. Chi. 2/89-92, Su. Chi. 18/18-19, Su. Su. 37/13-16</i>	<i>Su. Chi. 21/3 and 7</i>
<i>Karveera/ Ashvamara Nerium oleander</i> L.	Apocynaceae	<i>Katu, Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 4 th <i>Adhayaya Hridayadi Varga, Hridaya Varga</i> , pg. 212	<i>Su. Su. 37/12, Su. Su. 38/79-80</i>	<i>Su. Chi. 21/3 and 7</i>
<i>Katphala Myrica esculenta</i> Buch.-Ham. ex D. Don	Myricaceae	<i>Kashaya, Tikta, Katu</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 7 th <i>Adhayaya Vrushyadi Varga, Shukra Shodhana Varga</i> , pg. 576	<i>Su. Su. 38/18-19, Su. Su. 38/79-80, Su. Chi. 1/79</i>	<i>Su. Su. 37/24</i>

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Table 1: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Kiratatika Chirayata Swertia chirayita</i> [Roxb.] Buch.-Ham. ex C.B.Clarke	Gentianaceae	Tikta	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jwaraghana Varga, pg. 692	Su. Su. 38/6-7	Su. Chi. 21/3 and 7
<i>Kulahala/ Shrivani/ Bhumikadamba/ Mundatika Sphaeranthus indicus</i> L.	Compositae	Tikta, Katu	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktaprashadana Varga, pg. 805	Su. Su. 38/18-19, Su. Chi. 1/79, Su. Chi. 2/89-92	Su. Su. 37/27-28
<i>Kurantaka Barleria prionitis</i> L.	Acanthaceae	Tikta, Madhura	Ushna	Katu	D.G part 2, 2 nd Adhayaya Chakshusayadi Varga, Kusthaghana Varga, pg. 185	Su. Su. 38/6-7	Su. Chi. 21/3 and 7
<i>Kustha Saussurea costus</i> [Falc.] Lipsch.	Compositae	Tikta, Katu, Madhura	Ushna	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, ShukraShodhana Varga, pg. 573	Su. Chi. 8/39, Su. Chi. 8/42	Su. Chi. 8/43-44
<i>Kutaja/Vrikshaka Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	Tikta, Kashaya	Sheeta	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Aamhara Varga, pg. 465	Su. Su. 38/79-80, Su. Su. 37/17-18	Su. Chi. 21/3 and 7
<i>Kutaki Picrorhiza kurrooa</i> Royle	Scrophulariaceae	Tikta	Sheeta	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Tikshanaviraechana Varga, pg. 442	Su. Su. 37/15-16, Su. Chi. 17/19-20	Su. Chi. 17/19-20
<i>Langali Kalihari Gloriosa superba</i> L.	Colchicaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, Garabhasayasankochaka Varga, pg. 603	Su. Su. 37/13-14, Su. Su. 37/15-16, Su. Chi. 2/89-92, Su. Chi. 8/39	Su. Chi. 8/43-44
<i>Madanphala Catunaregam spinosa</i> [Thunb.] Tirveng.	Rubiaceae	Kashaya, Madhura, Tikta, Katu	Ushna	Madhura	D.G part 2, 5 th Adhayaya Deepanadi Varga, Vamana Varga, pg. 377	Su. Su. 38/6-7, Su. Chi. 1/79	Su. Chi. 21/3 and 7
<i>Manjistha Rubia cordifolia</i> L.	Rubiaceae	Tikta, Kashaya, Madhura	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktaprashadana Varga, pg. 801	Su. Chi. 8/41	Su. Su. 16/6, Su. Su. 38/45-47, Su. Chi. 8/41, Su. Chi. 8/43-44
<i>Mudagarni Vigna trilobata</i> [L.] Verdc.	Leguminosae	Madhura	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jivaniya Varga, pg. 746	Su. Su. 38/6-7, Su. Chi. 1/79	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Nimba Azadirachta indica</i> A.Juss	Meliaceae	Tikta, Kashaya	Sheeta	Katu	D.G part 2, 2 nd Adhayaya Chakshusayadi Varga, Kandughanadi Varga, pg. 150	Su. Su. 37/17-18, Su. Su. 38/6-7, Su. Su. 38/79-80, Su. Chi. 1/66-67, Su. Chi. 2/89-92, Su. Chi. 8/41	Su. Chi. 1/66-67, Su. Chi. 8/41, Su. Chi. 20/54-55, Su. Chi. 21/3 and 7
<i>Nirgundi Harenu Vitex negundo</i> L.	Lamiaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 1 st Adhayaya Medhyadi Varga, Vedanasthapana Varga, pg. 67	Su. Su. 38/18-19, Su. Chi. 1/79	Su. Chi. 8/43-44,

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Table 1: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Palasha Butea monosperma</i> [Lam.] Taub.	Leguminosae	<i>Katu, Tikta, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 5 th <i>Adhayaya Deepanadi Varga, Krimighana Varga</i> , pg. 507	<i>Su. Chi.</i> 2/86-88, <i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 38/45-47
<i>Patha/Ambastha Cissampelos pareira</i> L.	Menispermaceae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 7 th <i>Adhayaya Vrusyadi Varga, StanyaShodhana Varga</i> , pg. 627	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7, <i>Su. Su.</i> 38/45-47
<i>Patla/Mushkaka Stereospermum chelonoides</i> [L.f.] DC.	Bignoniaceae	<i>Tikta, Kashya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 3 rd <i>Adhayaya Hridayadi Varga, Shothara Varga</i> , pg. 224	<i>Su. Su.</i> 38/6-7, <i>Su. Su.</i> 37/17-18	<i>Su. Chi.</i> 21/3 and 7
<i>Patola Trichosanthes dioica</i> L.	Cucurbitaceae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga, Jwaraghanadi Varga</i> , pg. 698	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Pipali Piper longum</i> L.	Piperaceae	<i>Katu</i>	<i>Anushnasheeta</i>	<i>Madhura</i>	D.G part 2, 4 th <i>Adhayaya Chaedanadi Varga, Kasahara Varga</i> , pg. 277	<i>Su. Chi.</i> 8/42	<i>Su. Chi.</i> 8/43-44
<i>Rasana Pluchea lanceolata</i> [DC.] C.B.Clarke	Compositae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 1 st <i>Adhayaya Medhyadi Varga, Vednasthapana Varga</i> , pg. 39	<i>Su. Su.</i> 38/16-17	<i>Su. Chi.</i> 18/7-8
<i>Sankhini Euphorbia dracunculoides</i> Lam.	Euphorbiaceae	<i>Tikta</i>	<i>Sheeta</i>	<i>Katu</i>	<i>B.P.Ni. Guduchyadi Varga</i> , 79, pg. 296	<i>Su. Su.</i> 37/12	<i>Su. Chi.</i> 21/3 and 7
<i>Saptaparna/Saptachada Alstonia scholaris</i> [L.] R. Br.	Apocynaceae	<i>Tikta, Kashya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga, Vishmjwaraghana Varga</i> , pg. 703	<i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 19/14, <i>Su. Su.</i> 38/79-80	<i>Su. Chi.</i> 21/3 and 7
<i>Sarangeshta Dregea volubilis</i> [L.f.] Benth. ex Hook.f.	Apocynaceae	<i>Tikta, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	<i>Ka. Ni., Aushadhi Varga</i> , 969-970, pg. 179	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Sehunda Snuhi Euphorbia neriifolia</i> L.	Euphorbiaceae	<i>Katu</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 5 th <i>Adhayaya Deepanadi Varga, Tikshanavirechana Varga</i> , pg. 431	<i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 2/89-92	<i>Su. Chi.</i> 8/43-44
<i>Sumana Jati/Malti Jasminum grandiflorum</i> L.	Oleaceae	<i>Tikta, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 2 nd <i>Adhayaya Chakshayadi Varga, Kushthaghana Varga</i> , pg. 179	<i>Su. Su.</i> 37/12, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/79-80, <i>Su. Chi.</i> 19/14	<i>Su. Su.</i> 37/25, <i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 20/54-55, <i>Su. Chi.</i> 21/3 and 7
<i>Sushvi Karela Momordica charantia</i> L.	Cucurbitaceae	<i>Tikta</i>	<i>Sheeta</i>	<i>Katu</i>	<i>B.P.Ni., Shaka Varga</i> , 63, pg. 670	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Suvarchala Hulhula Cleome gynandra</i> L.	Cleomaceae	<i>Tikta, Kashaya, Katu</i>	<i>Ushna</i>	<i>Katu</i>	<i>B.P.Ni., Guduchyadi Varga</i> , 286, pg. 450	<i>Su. Su.</i> 37/12	<i>Su. Chi.</i> 21/3 and 7
<i>Tejovati Zanthoxylum armatum</i> DC.	Rutaceae	<i>Katu, Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 4 th <i>Adhayaya Chedanadi Varga, DantaShodhana Varga</i> , pg. 328	<i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/41	<i>Su. Chi.</i> 8/41

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Table 1: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Tila Sesamum indicum</i> L.	Pedaliaceae	Madhura	Ushna	Madhura	D.G part 2, 2 nd Adhayaya Chakshayadi Varga, Keshya Varga, pg. 121	Su. Su. 37/17-18, Su. Chi. 2/89-92, Su. Chi. 8/39, Su. Chi. 8/42, Su. Chi. 1 8/7, Su. Chi. 18/11, Su. Chi. 18/18-19	Su. Su. 11/22, Su. Su. 16/6, Su. Chi. 1/67
<i>Sunthi Zingiber officinale</i> Roscoe	Zingiberaceae	Katu	Ushna	Madhura	B.P.Ni., Haritakyadi Varga, 50-63, pg. 14-18	Su. Su. 37/13-14, Su. Su. 37/15-16	Pipali moola Su. Chi. 20/54-55
Maricha Piper nigrum L.	Piperaceae	Katu	Anushna	Madhura	B.P.Ni., Haritakyadi Varga, 50-63, pg. 14-18.	Su. Su. 37/13-14, Su. Su. 37/15-16	Pipali moola Su. Chi. 20/54-55
Pippali	Piperaceae	Katu	Unatiushna	Madhura	B.P.Ni., Haritakyadi Varga, 50-63, pg. 14-18	Su. Su. 37/13-14, Su. Su. 37/15-16	Pipali moola Su. Chi. 20/54-55
Triphala i Amlaki Phyllanthus emblica L.	Phyllanthaceae	Amla pradhan-Panchrasa Alavana sour predominant all taste except salt	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Rasayana Varga, pg. 759	Su. Su. 37/15-16, Su. Chi. 8/42, Su. Chi. 1/79	Su. Su. 37/27-28, Su. Chi. 37/29, Su. Chi. 20/58, Su. Chi. 21/6
Haritaki Terminalia chebula Retz. Iii	Combretaceae	Kashaya Pradhana, Pancharasa, Alavana astringent predominant all taste except salt	Ushna	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Rasayana Varga, pg. 755	Su. Su. 37/15-16, Su. Chi. 8/42, Su. Chi. 1/79	Su. Su. 37/27-28, Su. Chi. 37/29, Su. Chi. 20/58, Su. Chi. 21/6
Bhibhitaki Terminalia bellirica [Gaertn.] Roxb.	Combretaceae	Kashaya	Ushna	Madhura	D.G part 2, 4 th Adhayaya chedanadi Varga, chedana Varga, pg. 240	Su. Su. 37/15-16, Su. Chi. 8/42, Su. Chi. 1/79	Su. Su. 37/27-28, Su. Chi. 37/29, Su. Chi. 20/58, Su. Chi. 21/6
Trivrita/ Suvaha/Shyama Operculina turpethum [L.] Silva Manso	Convolvulaceae	Tikta, Katu	Ushna	Katu	D.G part 2, 5 th Adhayaya deepanadi Varga, Sukhviraachna Varga, pg. 421	Su. Su. 37/13-14, Su. Su. 37/15-16, Su. Chi. 2/89-92, Su. Chi. 8/39, Su. Chi. 8/41, Su. Chi. 8/42, Su. Chi. 16/9	Su. Chi. 8/41, Su. Chi. 18/7-8
Vacha Acorus calamus L.	Acoraceae	Katu, Tikta	Ushna	Katu	D.G part 2, 1 st Adhayaya Medhyadi Varga, Sangyasthapana Varga, pg. 29	Su. Su. 37/19, Su. Chi. 8/39	Su. Chi. 8/43-44
Vidanga Embelia ribes Burm.f.	Primulaceae	Katu, Kashaya	Ushna	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Krimighana Varga, pg. 504	Su. Su. 37/13-14, Su. Su. 37/15-16, Su. Su. 38/18-19, Su. Chi. 2/89-92, Su. Chi. 1/79	Su. Chi. 18/7-8

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Table 1: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Yasthimadhu</i> <i>Glycyrrhiza</i> <i>glabra</i> L.	Leguminosae	<i>Madhura</i>	<i>Sheeta</i>	<i>Madhura</i>	D.G part 2, 4 th <i>Adhayaya</i> <i>Chedanadi Varga</i> , <i>Chedana Varga</i> , pg. 254	<i>Su. Chi.</i> 18/11	<i>Su. Su.</i> 38/45-47, <i>Su.</i> <i>Chi.</i> 2/38, <i>Su.</i> <i>Chi.</i> 8/43-44, <i>Su. Chi.</i> 18/7-8, <i>Su.</i> <i>Su.</i> 37/23, <i>Su.</i> <i>Su.</i> 37/24, <i>Su.</i> <i>Su.</i> 37/25, <i>Su.</i> <i>Chi.</i> 20/7-8, <i>Su. Chi.</i> 20/9- 10, <i>Su. Chi.</i> 20/13

B.P.Ni.: Bhavaprakasha Nighantu, Dh. Ni.: Dhanvantari Nighantu, Ka. Ni.: Kaideva Nighantu, D G part 2: Dravyagunavijyana part 2, Su. Su.: Sushruta Samhita Sutra Sthana, Su. Chi.: Sushruta Samhita Chikitsasthana

for the wound management in different forms in *Sushruta Samhita* which is particularly devoted toward injuries and wounds.

The literary meaning of *Vrana Shodhana* is cleansing of vitiated/contaminated wound^[21] while *Vrana Ropana* is the process of wound healing.^[22]

Thus, we may understand the pharmacodynamics of wound-healing herbs. It is observed that in *Vrana-Shodhana* category, most of the plants are having predominance of *Katu*, *Tikta* and *Kashaya Rasa*. *Tikta* and *Katu Rasa* have the *Krimighana* action (anti-bacterial and anti-fungal action).^[23,24] Thus, to start the management of chronic nonhealing wounds, *Katu Rasadravya* (medicinal plants) may be used first for *Vrana-Shodhana*. *Katu Rasa* also has *Shothahara* action (anti-inflammatory effect).^[25] *Tikta* and *Kashaya Rasa dravyas* are beneficial because both have moisture reducing action,^[26,27] which may be helpful in reduction of excessive exudate and *Tikta*, *Kashayarasa Dravyas* also have the property of drying^[28] which is also good in wound healing and reduces the long phase of inflammation which is a cause of delayed healing of wounds. Most of the *Dravyas* (substances) of *Tikta* and *Kashaya Rasa* are of *Sheeta Veerya*^[29] and *Sheeta Veerya* has *Stambhana* (haemostasis) property so it is more important during the process of clotting at inflammatory phase.^[29] It is also reported that most of the plants are from *Arkadi Gana* which is enumerated for its *Krimighana* and *Vrana-Shodhana* potential which means they help to make wound clean and free from infections.^[17]

It is a well reported fact that wound healing takes place in three phases, i.e., inflammatory phase, proliferative phase and re-modeling phase (maturation phase) and each phase requires specific conditions for proper healing of wounds. Further infection leads to delay healing or nonhealing and most of the wounds are infected.^[12] Thus, *Vrana-Shodhana* is essential initial step to be done to enhance wound healing. *Katu Rasa*, *Ushna Veerya* and *Katu Vipaka* plants can be

utilized as most of *Vrana-Shodhana* plants are of these properties. [Tables 4-6]

For the further processing of wound healing, the damaged *Dhatu* (tissue) needs to be replaced thus, proliferation of cells is needed for *Vrana-Ropana*. The analysis of *Vrana Ropana* herbs indicates predominance of *Madhura*, *Kashaya Rasa* plants having *Madhura Vipaka* and *Sheeta Veerya*. It may be due to the fact that *Kashaya Rasadravyas* due to their *Sandhanakarma* (tissue binding action) helps in wound closure^[27] and *Madhura Rasa* helps in *Dhatu Poshana* (tissue regeneration).^[30] Further *Kashaya* and *Madhura Rasa* also gives strength and tissue granulation to the wound^[31] thus, helpful during the proliferative phase. Further for complete healing and remodeling phase, *Madhura Rasa*, *Sheeta Veerya* and *Madhura Vipaka Dravyas* may be taken because *Madhura Rasa* provides wound strength and also helpful in tissue granulation [Figure 2].

TIME framework is the concept of wound healing in contemporary science which has been developed since the last decades.^[32,33] The pharmacodynamics of wound-healing herbs mentioned in *Sushruta Samhita* has provided insights on wound bed preparation fulfilling TIME framework as a practical tool.^[33,34] “T” stands for tissue management^[33,34] *Shodhana* (purification) herbs remove devitalized tissue from a wound through scrapping ability and in *Kashaya* (medicated decoction for cleansing) form thus, helps in debridement process and better preparation of wound bed either through autolytic or mechanical process along with *Shashthi Upakramas*.^[34] “I” stands for the control of infection and inflammation.^[33] It is reported that most of the wound-healing herb are also having anti-microbial potential.^[35] Moisture balance is denoted by ‘M’ and is a significant factor for healing.^[33] *Tikta*, *Kashaya Rasa* of herbs helps in moisture balance.^[26,27] Here among *Shashthi Upakramas*, *Avachurnana* (sprinkled with powder) helps in the absorption of exudate while other *Varti* (therapeutic wick for wound) and *Tail* (oil based medicines) helps in moisture balance of dry wounds.^[34] *Kashaya Rasa* helps in *Ropana* (healing) and plays a major role in healing process

Table 2: Ropana (48) plants mentioned in Sushruta Samhita and their pharmacodynamic attributes

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Ropana activity references
		Rasa	Veerya	Vipaka		
<i>Aatmagupta (Kapikacchu) (Mucuna pruriens [L.] DC.)</i>	Loganiaceae	Madhura, Tikta	Sheeta	Madhura	B.P.Ni., Guduchayadi Varga, 130, pg. 341	Su. Su. 37/25
<i>Aguru (Aquilaria agallocha Roxb.)</i>	Thymelaeaceae	Katu, Tikta	Ushna	Katu	B.P.Ni., Karpuradi Varga, 22, pg. 185	Su. Su. 37/26
<i>Ashwagandha (Withania somnifera [L.] Dunal)</i>	Solanaceae	Tikta, Kashaya	Ushna	Madhura	B.P.Ni., Guduchayadi Varga, 190, pg. 379	Su. Su. 37/23
<i>Ashwakarna (Dipterocarpus alatus Roxb. Ex G. Don)</i>	Dipterocarpaceae	Katu, Tikta	Ushna	Katu	Ka. Ni., Aushadhi Varga, 844-845, pg. 157	Su. Su. 37/27-28
<i>Brihati (Solanum indicum L.)</i>	Solanaceae	Katu, Tikta	Ushna	Katu	B.P.Ni., Guduchayadi Varga, 37, pg. 275	Su. Su. 37/26, Su. Chi. 20/54-55
<i>Chandana (Santalum album L.)</i>	Santalaceae	Tikta	Sheeta	Katu	B.P.Ni., Karpuradi Varga, 93, pg. 187	Su. Su. 38/45-47, Su. Chi. 2/38, Su. Chi. 2/68, Su. Chi. 20/54-55
<i>Devdaru (Cedrus deodara [Roxb. ex D. Don] G. Don)</i>	Pinaceae	Tikta	Ushna	Katu	B.P.Ni., Karpuradi Varga, 25, pg. 187	Su. Su. 37/26
<i>Dhataki (Woodfordia fruticosa [L.] Kurz)</i>	Lythraceae	Katu, Kashaya	Sheeta	Katu	B.P.Ni., Haritakyadi Varga, 187, pg. 105	Su. Su. 38/45-47, Su. Chi. 8/43-44
<i>Dhirghamoola (Fagonia Arabica L.)</i>	Zygophyllaceae	Tikta, Kashaya, Madhura	Sheeta	Katu	Dh. Ni., Guduchyadi Varga, 21, pg. 20	Su. Su. 38/45-47
<i>Jeevaka (Malaxis muscifera [Lindl.] Kuntze)</i>	Orchidaceae	Madhura	Sheeta	Madhura	B.P.Ni. Haritakyadi Varga, 124-125, pg. 59	Su. Su. 37/24, Su. Su. 38/45-47
<i>Jivanti (Leptadenia reticulata [Retz.] Wight and Arn.)</i>	Apocynaceae	Madhura	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jivaniya Varga, pg. 744	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Kakoli (Roscoea purpurea Sm.)</i>	Zingiberaceae	Madhura	Sheeta	Madhura	B.P.Ni. Haritakyadi Varga, 137, pg. 59	Su. Su. 37/22
<i>Kanguka (Setaria italic [L.] P. Beauv.)</i>	Poaceae	Kashaya, Madhura	Anushna	Katu	B.P.Ni., Dhanya Varga, 174-175, pg. 643	Su. Su. 37/27-28
<i>Kantakari (Solanum surattense Burm. f.)</i>	Solanaceae	Tikta, Katu	Ushna	Katu	D.G part 2, 4 th Adhayaya Chedanadi Varga, Kasahara Varga, pg. 280	Su. Chi. 20/58
<i>Karkatshringi (Pistacia chinensis subsp. Integerrima [J. L. Stewart ex Brandis] Rech. F.)</i>	Anacardiaceae	Kashaya, Tikta	Ushna	Katu	D.G part 2, 4 th Adhayaya Chedanadi Varga, Kasahara Varga, pg. 285	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Kasmarda (Senna occidentalis [L.] Link)</i>	Leguminosae	Tikta, Madhura	Ushna	Katu	D.G part 2, 4 th Adhayaya Chedanadi Varga, Kasahara Varga, pg. 287	Su. Chi. 21/6
<i>Katvanga (Oroxylum indicum [L.] Kurz)</i>	Bignoniaceae	Madhura, Tikta, Kashaya	Ushna	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Aamhara Varga, pg. 470	Su. Su. 38/45-47
<i>Kola (Ziziphus jujuba Mill.)</i>	Rhamnaceae	Madhura	Ushna	Madhura	B.P.Ni., Aamradi Varga, 74-75, pg. 559	Su. Chi. 20/58
<i>Koshataki (Luffa acutangula [L.] Roxb.)</i>	Cucurbitaceae	Madhura	Sheeta	Katu	B.P.Ni., Shaka Varga, 68, pg. 671	Su. Chi. 20/58
<i>Ksheerkakoli (Lilium polyphyllum D. Don)</i>	Lilliaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 137, pg. 59	Su. Su. 37/24, Su. Su. 38/45-47
<i>Kumbhik (Pistia stratiotes L.)</i>	Araceae	Tikta	Sheeta	Katu	B.P.Ni., Pushpa Varga, 20, pg. 472	Su. Su. 38/45-47
<i>Lodhra (Symplocos resimosa Roxb.)</i>	Symplocaceae	Kashaya	Sheeta	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, Aartavsangrahanaya Varga, pg. 616	Su. Su. 37/26, Su. Su. 37/27-28, Su. Chi. 2/38, Su. Chi. 8/43-44, Su. Chi. 21/6
<i>Mahameda (Polygonatum verticillatum [L.] All.)</i>	Asparagaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 131, pg. 59	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13

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Table 2: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Ropana activity references
		Rasa	Veerya	Vipaka		
<i>Mashparni</i> (<i>Teramnus labialis</i> [L.f.] Spreng.)	Leguminosae	Madhura, Tikta	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jivaniya Varga, pg. 747	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Meda</i> (<i>Polygonatum cirrhifolium</i> Wall. Royle)	Asparagaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 131, pg. 59	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Mocharasa</i> (<i>Bombax ceiba</i> L.)	Malvaceae	Kashaya	Sheeta	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Purishvirajaniya Varga, pg. 492	Su. Su. 38/45-47
<i>Mridvika</i> (<i>Vitis vinifera</i> L.)	Vitaceae	Madhura	Sheeta	Madhura	D.G part 2, 2 nd Adhayaya Chakshushyadi Varga, Shnehopaga Varga, pg. 134	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Mudagparni</i> (<i>Vigna trilobata</i> [L.] Verdc.)	Leguminosae	Madhura	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jivaniya Varga, pg. 746	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Nagapushap</i> (<i>Mesua ferrea</i> L.)	Calophyllaceae	Kashaya, Tikta	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktastambhana Varga, pg. 784	Su. Su. 38/45-47
<i>Nandivrikash</i> (<i>Ficus retusa</i> L.)	Moraceae	Madhura, Tikta, kashya	Sheeta	Katu	B.P.Ni., Vatadi Varga, 7, pg. 503	Su. Su. 38/45-47
<i>Padamkeashara</i> (<i>Nelumbium speciosum</i> Willd.)	Nelumbonaceae	Kashaya	Sheeta	Katu	B.P.Ni., Pushpa Varga, 11, pg. 468	Su. Su. 38/45-47, Su. Chi. 8/43-44
<i>Padmaka</i> (<i>Prunus cerasoides</i> Buch.-Ham. ex D.Don)	Rosaceae	Kashaya, Tikta	Sheeta	Katu	D.G part 2, 1 st Adhayaya Medhyadi Varga, Vedanasthapana Varga, pg. 44	Su. Chi. 2/38, Su. Chi. 2/68, Su. Chi. 8/43-44, Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Prapondrik</i> (<i>Nelumbo nucifera</i> Gaertn.)	Nelumbonaceae	Madhura, Tikta, Kashaya	Sheeta	Madhura	B.P.Ni., Karpuradi Varga, 131, pg. 255	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Prithakparni</i> (<i>Uraria picta</i> (Jacq.) DC.)	Leguminosae	Madhura, Tikta	Ushna	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Angmaradprashamana Varga, pg. 822	Su. Su. 37/25, Su. Chi. 16/9
<i>Priyangu</i> (<i>Callicarpa macrophylla</i> Vahl)	Lamiaceae	Tikta, Kashaya, Madhura	Sheeta	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktastambhana Varga, pg. 782	Su. Su. 37/26, Su. Su. 37/27-28, Su. Su. 38/45-47, Su. Chi. 2/38, Su. Chi. 8/43-44
<i>Raktachandana</i> (<i>Pterocarpus santalinus</i> L.f.)	Leguminosae	Tikta, Madhura	Sheeta	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Dahaprasamana Varga, pg. 718	Su. Su. 37/22
<i>Ridhi</i> (<i>Habenaria intermedia</i> D.Don)	Orchidaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 141, pg. 60	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Rishbhaka</i> (<i>Crepidium acuminatum</i> [D.Don] Szlach.)	Orchidaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 125, pg. 58	Su. Chi. 8/47, Su. Chi. 20/13

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Table 2: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Ropana activity references
		Rasa	Veerya	Vipaka		
Samanga (Lajjalu) (<i>Mimosa pudica</i> L.)	Leguminosae	Kashaya, Tikta	Sheeta	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Sandhaniya Varga, pg. 749	Su. Su. 37/22, Su. Su. 37/29
Sarala (<i>Pinus palustris</i> Mill.)	Pinaceae	Katu, Tikta, Madhura	Ushna	Katu	D.G part 2, 4 th Adhayaya Chedanadi Varga, Shaleshmputihara Varga, pg. 309	Su. Su. 37/24
Sariva (<i>Hemidesmus indicus</i> [L.] R. Br. ex Schult.)	Apocynaceae	Madhura, Tikta	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktaprasadana Varga, pg. 799	Su. Chi. 8/43-44
Sarja (<i>Shorea robusta</i> Gaertn.)	Dipterocarpaceae	Kashaya	Sheeta	Katu	D.G part 2, 7 th Adhayaya, Vrushyadi Varga, Mutrasangrahiya Varga, pg. 672	Su. Su. 37/27-28, Su. Chi. 8/43-44
Soma (<i>Tinospora senensis</i> [Lour.] Merr.)	Menispermaceae	Tikta, Kashaya	Ushna	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Rasayana Varga, pg. 762	Su. Su. 37/23, Su. Su. 37/24
Tinduka (<i>Diospyros malabarica</i> [Desr.] Kostel.)	Ebenaceae	Kashaya	Sheeta	Katu	D.G part 2, 2 nd Adhayaya Chakshayadi Varga, Udardaprashmana Varga, pg. 191	Su. Chi. 21/6
Tugakshiri (<i>Bambusa bambos</i> [L.] Voss)	Poaceae	Madhura, Kashya	Sheeta	Madhura	D.G part 2, 7 th Adhayaya, Vrushyadi Varga, Aartavjanan Varga, pg. 613	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
Utpala (<i>Nymphaea alba</i> L.)	Nymphaeaceae	Madhura	Sheeta	Madhura	Ka. Ni., Aushadhi Varga, 1448-1451, pg. 268	Su. Chi. 2/38
Vridi (<i>Habenaria acuminata</i> [Thwaites] Trimen)	Orchidaceae	Madhura	Sheeta	Madhura	B.P.Ni., Haritakyadi Varga, 142, pg. 60	Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
Yava (<i>Hordeum vulgare</i> L.)	Poaceae	Kashaya, Madhura	Sheeta	Madhura	B.P.Ni., Dhanya Varga, 28-29, pg. 628	Su. Su. 16/6, Su. Chi. 1/67

B.P.Ni.: *Bhavaprakasha Nighantu*, Dh. Ni.: *Dhanvantari Nighantu*, Ka. Ni.: *Kaideva Nighantu*, D G part 2: *Dravyagunavijyana* part 2, Su. Su.: *Sushruta Samhita Sutra Sthana*, Su. Chi.: *Sushruta Samhita Chikitsasthana*

with the intent of wound closure^[36] thus, takes care for Edge (E) factor.^[34]

In this way, we may say that the rational and judicious collection of wound healing herbs of *Sushrut Samhita* can also be explained on the basis of many contemporary domines (chemical constituents, TIME framework) of science and extended studies on these herbs may pave a path for rearch of potential wound healing agents.

The present study is a review and objective evidences may be created on the basis of experimental and clinical studies on various wound-healing herbs of *Shushruta Samhita*.

In contemporary science, the pharmacodynamics of herbs is explained on the basis of chemical constituents and it is well-reported that plants rich in tannins, flavonoids, saponins, sterols, phenols, and triterpinoids are likely to be wound healer.^[1] Thus, it may be said that a specific *Rasa*, *Guna*, *Veerya* and *Vipaka* of drugs indicate toward the presence of these specific phytochemicals. This is a matter

of further investigation to explain, the pharmacodynamics of the drugs on the basis of their chemical constituents with relation to specific *Rasa*, *Guna*, *Veerya* and *Vipaka*. The antioxidant, anti-inflammatory, angiogenic and cell synthesis-modulating components enhance wound healing may also be explained further on this basis.^[35,37,38] Studies also suggest that the components which enhance the collagen, tensile strength and angiogenesis while decrease the epithelialization period is effective in wound healing.^[37,39] Reviewed plants can be analyzed on the basis of these parameters.

The review was done from *Sushruta Samhita* as many other Ayurveda scripts having wound-healing plants can be reviewed and further studied in the same way.

Conclusion

A total of 153 plants are described in *Sushruta Samhita* having *Vrana-Shodhana*, *Vrana-Ropana* and

Table 3: Vrana-Shodhana-Ropana plants (62) mentioned in Sushruta Samhita and their pharmacodynamic attributes

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Aamrataka Spondias pinnata</i> [L. f.] Kurz	Anacardiaceae	Amla	Ushna	Amla	B.P.Ni., <i>Aamaradiphala Varga</i> , 19-20, pg. 541	<i>Su. Chi.</i> 8/47	<i>Su. Chi.</i> 8/47, <i>Su. Chi.</i> 21/3 and 7
<i>Aaragvadha/Aareveta Cassia fistula</i> L.	Leguminosae	Madhura	Sheeta	Madhura	B.P.Ni., <i>Haritakyadi Varga</i> , 149-150, pg. 66	<i>Su. Su.</i> 37/17-18, <i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 8/30	<i>Su. Chi.</i> 21/3 and 7
<i>Ankotha Alangium salviifolium</i> [L.f.] Wangerin	Cornaceae	Katu, Kashaya	Ushna	Katu	P. Ni., <i>Guduchayadi Varga</i> , 139, pg. 350	<i>Su. Su.</i> 37/12, <i>Su. Chi.</i> 19/14	<i>Su. Chi.</i> 21/3 and 7
<i>Bala Sida cordifolia</i> L.	Malvaceae	Madhura	Sheeta	Madhura	B.P.Ni., <i>Guduchayadi Varga</i> , 144, pg. 351	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20
<i>Bhallataka Semecarpus anacardium</i> L.f.	Anacardiaceae	Kashaya	Ushna	Madhura	Dh. Ni., <i>Chandanadi Varga</i> , 129, pg. 153	<i>Su. Chi.</i> 19/14, <i>Su. Chi.</i> 19/17	<i>Su. Chi.</i> 20/54-55
<i>Bilvamoola Aegle marmelos</i> [L.] Correa	Rutaceae	Kashaya, Tikta	Ushna	Katu	B.P.Ni., <i>Guduchayadi Varga</i> , 13, pg. 162	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20
<i>Chitraka Plumbago zeylanica</i> L.	Plumbaginaceae	Katu	Ushna	Katu	Dh. Ni., <i>Shatpushpadi Varga</i> , 81, pg. 114	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 1/79	<i>Su. Chi.</i> 21/3 and 7
<i>Danti Baliospermum sonalifolium</i> [Burm.] Suresh	Euphorbiaceae	Katu	Ushna	Katu	Ka. Ni., <i>Aushadhi Varga</i> , 1010, pg. 187	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/39, <i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 8/42	<i>Su. Chi.</i> 8/41
<i>Daruharidra Barberis aristata</i> DC.	Berberidaceae	Tikta	Ushna	Katu	Dh. Ni., <i>Guduchyadi Varga</i> , 60, pg. 30	<i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 37/19, <i>Su. Su.</i> 38/79-80, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/41	<i>Su. Su.</i> 37/25, <i>Su. Su.</i> 37/26, <i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 8/43-44
<i>Dasi Barleriastrigose</i> Willd.	Acanthaceae	Tikta, Madhura	Ushna	Katu	B.P.Ni., <i>Pushpa Varga</i> , 52-53, pg. 489	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Dhava Anogeissus latifolia</i> [Roxb. ex DC.] Wall. ex Guillem. and Perr.	Combretaceae	Madhura	Sheeta	Madhura	B.P.Ni., <i>Vatadi Varga</i> , 52-53, pg. 528	<i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 37/27-28
<i>Ela Elettaria cardamomum</i> [L.] Maton	Zingibaraceae	Katu, Madhura	Sheeta	Madhura	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga</i> , <i>Dahaprashamana Varga</i> , pg. 720	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16	<i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 8/43-44, <i>Su. Chi.</i> 20/54-55
<i>Eranda Ricinus communis</i> L.	Euphorbiaceae	Madhura	Ushna	Madhura	D.G part 2, 1 st <i>Adhayaya Medhyadi Varga</i> , <i>Vedanasthapana Varga</i> , pg. 60	<i>Su. Chi.</i> 18/7	<i>Su. Su.</i> 16/6
<i>Gojihva Launea nudicaulis</i> Hook.F.	Compositae	Kashaya, Tikta	Sheeta	Madhura	<i>Su. Su.</i> 46/262-263	<i>Su. Chi.</i> 17/19-20	<i>Su. Chi.</i> 17/19-20
<i>Gopghonta Pughbhedha</i>		Kashaya, Madhura	Ushna	Katu		<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7

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Table 3: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Guduchi Tinospora sinensis</i> [Lour] Merr. D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Rasayana Varga, pg. 762	Menispermaceae	Tikta, Katu, Kashaya	Ushna	Madhura		Su. Su. 38/6-7	Su. Su. 37/23, Su. Chi. 2/68, Su. Chi. 18/7-8, Su. Chi. 21/3 and 7, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Haridra Curcuma longa</i> L.	Zingiberaceae	Tikta, Katu	Ushna	Katu	D.G part 2, 2 nd Adhayaya Chakshushyadi Varga, Kusthaghanda Varga, pg. 163	Su. Su. 37/15-16, Su. Su. 37/19, Su. Su. 38/79-80, Su. Chi. 2/89-92, Su. Chi. 8/30, Su. Chi. 8/41, Su. Chi. 8/42, Su. Chi. 17/19-20	Su. Su. 37/25, Su. Su. 37/26, Su. Chi. 2/38, Su. Chi. 8/41, Su. Chi. 8/43-44, Su. Chi. 17/19-20
<i>Himsra Capparis sepiaria</i> L.	Capparaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 3 rd Adhayaya Hridayadi Varga, Sothara Varga, pg. 230	Su. Chi. 17/19-20	Su. Chi. 17/19-20
<i>Indrayaya Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	Katu	Sheeta	Katu	B.P.Ni. Haritakyadi Varga, 258, pg. 73	Su. Su. 38/6-7	Su. Chi. 21/3 and 7
<i>Kala Tagara Valeriana jatamansi</i> Jones	Caprifoliaceae	Katu, Tikta, Kashaya	Ushna	Katu	D.G part 2, 1 st Adhayaya Medhyadi Varga, Vednasthapana Varga, pg. 65	Su. Chi. 8/30	Su. Su. 37/26, Su. Chi. 2/68, Su. Chi. 20/54-55
<i>Kantaki/Khadir Acacia catechu</i> [L.f.] Willd.	Leguminosae	Tikta, Kashaya	Sheeta	Katu	D.G part 2, 2 nd Adhayaya Chakshausyadi Varga, Kusthaghana Varga, Pg. 159	Su. Su. 38/6-7	Su. Chi. 21/3 and 7, Su. Chi. 21/6
<i>Karanja Pongamia pinnata</i> [L.] Pierre	Leguminosae	Tikta, Katu, Kashaya	Ushna	Katu	D.G part 2, 2 nd Adhayaya Chakshausyadi Varga, Kandughana Varga, pg. 145	Su. Su. 38/6-7, Su. Su. 38/16-17, Su. Chi. 2/89-92, Su. Chi. 18/18-19, Su. Su. 37/13-16	Su. Chi. 21/3 and 7
<i>Putikaranja Holoptelea integrifolia</i> Planch.	Ulmaceae	Tikta, Kashaya	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Lekhana Varga, pg. 817	Su. Su. 38/6-7, Su. Su. 38/16-17, Su. Chi. 2/89-92, Su. Chi. 18/18-19, Su. Su. 37/13-16	Su. Chi. 21/3 and 7
<i>Karveera/Ashvamara Nerium oleander</i> L.	Apocynaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 4 th Adhayaya Hridayadi Varga, Hridaya Varga, pg. 212	Su. Su. 37/12, Su. Su. 38/79-80	Su. Chi. 21/3 and 7
<i>Katphala Myrica esculenta</i> Buch.-Ham. ex D. Don	Myricaceae	Kashaya, Tikta, Katu	Ushna	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, Shukra Shodhana Varga, pg. 576	Su. Su. 38/18-19, Su. Su. 38/79-80, Su. Chi. 1/79	Su. Su. 37/24
<i>Kiratatika Chirayata Swertia chirayita</i> [Roxb.] Buch.-Ham. ex C.B.Clarke	Gentianaceae	Tikta	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jwaraghana Varga, pg. 692	Su. Su. 38/6-7	Su. Chi. 21/3 and 7

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Table 3: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Kulahala/Shravani/Bhumikadamba/Mundatika Sphaeranthus indicus</i> L.	Compositae	Tikta, Katu	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktaprashadana Varga, pg. 805	Su. Su. 38/18-19, Su. Chi. 1/79, Su. Chi. 2/89-92	Su. Su. 37/27-28
<i>Kurantaka Barleria prionitis</i> L.	Acanthaceae	Tikta, Madhura	Ushna	Katu	D.G part 2, 2 nd Adhayaya Chakshusayadi Varga, Kusthaghana Varga, pg. 185	Su. Su. 38/6-7	Su. Chi. 21/3 and 7
<i>Kustha Saussurea costus</i> [Falc.] Lipsch.	Compositae	Tikta, Katu, Madhura	Ushna	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, ShukraShodhana Varga, pg. 573	Su. Chi. 8/39, Su. Chi. 8/42	Su. Chi. 8/43-44
<i>Kutaja/Vrikshaka Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	Tikta, Kashaya	Sheeta	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Aamhara Varga, pg. 465	Su. Su. 38/79-80, Su. Su. 37/17-18	Su. Chi. 21/3 and 7
<i>Kutki Picrorhiza kurroa</i> Royle	Scrophulariaceae	Tikta	Sheeta	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Tikshanaviraechana Varga, pg. 442	Su. Su. 37/15-16, Su. Chi. 17/19-20	Su. Chi. 17/19-20
<i>Langali Kalihari Gloriosa superba</i> L.	Colchicaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 7 th Adhayaya Vrushyadi Varga, Garabhasayasankochaka Varga, pg. 603	Su. Su. 37/13-14, Su. Su. 37/15-16, Su. Chi. 2/89-92, Su. Chi. 8/39	Su. Chi. 8/43-44
<i>Madanphala Catunaregam spinosa</i> [Thunb.] Tirveng.	Rubiaceae	Kashaya, Madhura, Tikta, Katu	Ushna	Madhura	D.G part 2, 5 th Adhayaya Deepanadi Varga, Yamana Varga, pg. 377	Su. Su. 38/6-7, Su. Chi. 1/79	Su. Chi. 21/3 and 7
<i>Manjistha Rubia cordifolia</i> L.	Rubiaceae	Tikta, Kashaya, Madhura	Ushna	Katu	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Raktaprashadana Varga, pg. 801	Su. Chi. 8/41	Su. Su. 16/6, Su. Su. 38/45-47, Su. Chi. 8/41, Su. Chi. 8/43-44
<i>Mudagparni Vigna trilobata</i> [L.] Verdc.	Leguminosae	Madhura	Sheeta	Madhura	D.G part 2, 9 th Adhayaya Jwaraghanadi Varga, Jivaniya Varga, pg. 746		Su. Su. 37/23, Su. Su. 37/24, Su. Su. 37/25, Su. Chi. 20/7-8, Su. Chi. 20/9-10, Su. Chi. 20/13
<i>Nimba Azadirachta indica</i> A.Juss	Meliaceae	Tikta, Kashaya	Sheeta	Katu	D.G part 2, 2 nd Adhayaya Chakshusayadi Varga, Kandughanadi Varga, pg. 150	Su. Su. 37/17-18, Su. Su. 38/6-7, Su. Su. 38/79-80, Su. Chi. 1/66-67, Su. Chi. 2/89-92, Su. Chi. 8/41	Su. Chi. 1/66-67, Su. Chi. 8/41, Su. Chi. 20/54-55, Su. Chi. 21/3 and 7
<i>Nirgundi Harenu Vitex negundo</i> L.	Lamiaceae	Katu, Tikta	Ushna	Katu	D.G part 2, 1 st Adhayaya Medhyadi Varga, Vedanasthapana Varga, pg. 67	Su. Su. 38/18-19, Su. Chi. 1/79	Su. Chi. 8/43-44
<i>Palasha Butea monosperma</i> [Lam.] Taub.	Leguminosae	Katu, Tikta, Kashaya	Ushna	Katu	D.G part 2, 5 th Adhayaya Deepanadi Varga, Krimighana Varga, pg. 507	Su. Chi. 2/86-88, Su. Chi. 1/79	Su. Su. 38/45-47

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Table 3: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Patha/Ambastha</i> <i>Cissampelos pareira</i> L.	Menispermaceae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 7 th <i>Adhayaya</i> <i>Vrusyadi Varga</i> , <i>StanyaShodhana Varga</i> , pg. 627	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7, <i>Su. Su.</i> 38/45-47
<i>Patla/Mushkaka</i> <i>Stereospermum chelonoides</i> [L.f.] DC.	Bignoniaceae	<i>Tikta</i> , <i>Kashya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 3 rd <i>Adhayaya</i> <i>Hridayadi Varga</i> , <i>Shothara Varga</i> , pg. 224	<i>Su. Su.</i> 38/6-7, <i>Su. Su.</i> 37/17-18	<i>Su. Chi.</i> 21/3 and 7
<i>Patola Trichosanthes dioica</i> L.	Cucurbitaceae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 9 th <i>Adhayaya</i> <i>Jwaraghanadi Varga</i> , <i>Jwaraghanadi Varga</i> , pg. 698	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Pipali Piper longum</i> L.	Piperaceae	<i>Katu</i>	<i>Anushnasheeta</i>	<i>Madhura</i>	D.G part 2, 4 th <i>Adhayaya</i> <i>Chaedanadi Varga</i> , <i>Kasahara Varga</i> , pg. 277	<i>Su. Chi.</i> 8/42	<i>Su. Chi.</i> 8/43-44
<i>Rasana Pluchea lanceolata</i> [DC.] C.B.Clarke	Compositae	<i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 1 st <i>Adhayaya</i> <i>Medhyadi Varga</i> , <i>Vednasthapana Varga</i> , pg. 39	<i>Su. Su.</i> 38/16-17	<i>Su. Chi.</i> 18/7-8
<i>Sankhini Euphorbia dracunculoides</i> Lam.	Euphorbiaceae	<i>Tikta</i>	<i>Sheeta</i>	<i>Katu</i>	<i>B.P.Ni. Guduchyadi Varga</i> , 79, pg. 296	<i>Su. Su.</i> 37/12	<i>Su. Chi.</i> 21/3 and 7
<i>Saptaparna/Saptachada Alstonia scholaris</i> [L.] R. Br.	Apocynaceae	<i>Tikta</i> , <i>Kashya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 9 th <i>Adhayaya</i> <i>Jwaraghanadi Varga</i> , <i>Vishmjwaraghana Varga</i> , pg. 703	<i>Su. Su.</i> 38/6-7, <i>Su. Chi.</i> 19/14, <i>Su. Su.</i> 38/79-80	<i>Su. Chi.</i> 21/3 and 7
<i>Sarangeshta Dregea volubilis</i> [L.f.] Benth. ex Hook.f.	Apocynaceae	<i>Tikta</i> , <i>Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	<i>Ka. Ni., Aushadhi Varga</i> , 969-970, pg. 179	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Sehunda Smuhi Euphorbia nerifolia</i> L.	Euphorbiaceae	<i>Katu</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 5 th <i>Adhayaya</i> <i>Deepanadi Varga</i> , <i>Tikshanavirechana Varga</i> , pg. 431	<i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 2/89-92	<i>Su. Chi.</i> 8/43-44
<i>Sumana Jati/Malti Jasminum grandiflorum</i> L.	Oleaceae	<i>Tikta</i> , <i>Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 2 nd <i>Adhayaya</i> <i>Chakshayadi Varga</i> , <i>Kushthaghana Varga</i> , pg. 179	<i>Su. Su.</i> 37/12, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/79-80, <i>Su. Chi.</i> 19/14	<i>Su. Su.</i> 37/25, <i>Su. Chi.</i> 2/68, <i>Su. Chi.</i> 20/54-55, <i>Su. Chi.</i> 21/3 and 7
<i>Sushvi Karela Momordica charantia</i> L.	Cucurbitaceae	<i>Tikta</i>	<i>Sheeta</i>	<i>Katu</i>	<i>B.P.Ni., Shaka Varga</i> , 63, pg. 670	<i>Su. Su.</i> 38/6-7	<i>Su. Chi.</i> 21/3 and 7
<i>Suvarchala Hulhula Cleome gynandra</i> L.	Cleomaceae	<i>Tikta</i> , <i>Kashaya</i> , <i>Katu</i>	<i>Ushna</i>	<i>Katu</i>	<i>B.P.Ni., Guduchyadi Varga</i> , 286, pg. 450	<i>Su. Su.</i> 37/12	<i>Su. Chi.</i> 21/3 and 7
<i>Tejovati Zanthoxylum armatum</i> DC.	Rutaceae	<i>Katu</i> , <i>Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 4 th <i>Adhayaya</i> <i>Chedanadi Varga</i> , <i>DantaShodhana Varga</i> , pg. 328	<i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/41	<i>Su. Chi.</i> 8/41
<i>Tila Sesamum indicum</i> L.	Pedaliaceae	<i>Madhura</i>	<i>Ushna</i>	<i>Madhura</i>	D.G part 2, 2 nd <i>Adhayaya</i> <i>Chakshayadi Varga</i> , <i>Keshya Varga</i> , pg. 121	<i>Su. Su.</i> 37/17-18, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/39, <i>Su. Chi.</i> 8/42, <i>Su. Chi.</i> 18/7, <i>Su. Chi.</i> 18/11, <i>Su. Chi.</i> 18/18-19	<i>Su. Su.</i> 11/22, <i>Su. Su.</i> 16/6, <i>Su. Chi.</i> 1/67
<i>Sunthi Zingiber officinale</i> Roscoe	Zingibaraceae	<i>Katu</i>	<i>Ushna</i>	<i>Madhura</i>	<i>B.P.Ni., Haritakyadi Varga</i> , 50-63, pg. 14-18	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16	<i>Pipali moola</i> <i>Su. Chi.</i> 20/54-55

Contd...

Table 3: Contd...

Drug name	Family	Pharmacodynamic attributes			Pharmacodynamic attributes reference	Shodhana activity references	Ropana activity references
		Rasa	Veerya	Vipaka			
<i>Maricha Piper nigrum</i> L.	Piperaceae	<i>Katu</i>	<i>Anushna</i>	<i>Madhura</i>	B.P.Ni., <i>Haritakyadi Varga</i> , 50-63, pg. 14-18	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16	<i>Pipali moola Su. Chi.</i> 20/54-55
<i>Pippali</i>	Piperaceae	<i>Katu</i>	<i>Unatiushna</i>	<i>Madhura</i>	B.P.Ni., <i>Haritakyadi Varga</i> , 50-63, pg. 14-18.	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16	<i>Pipali moola Su. Chi.</i> 20/54-55
<i>Triphala i Amlaki Phyllanthus emblica</i> L.	Phyllanthaceae	<i>Amla pradhan-Panchrasa Alavana</i>	<i>Sheeta</i>	<i>Madhura</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga</i> , <i>Rasayana Varga</i> , pg. 759	<i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 8/42, <i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 37/27-28, <i>Su. Su.</i> 37/29, <i>Su. Chi.</i> 20/58, <i>Su. Chi.</i> 21/6
<i>Haritaki Terminalia chebula</i> Retz. iii	Combretaceae	<i>Kashaya Pradhana, Pancharasa, Alavana</i>	<i>Ushna</i>	<i>Madhura</i>	D.G part 2, 9 th <i>Adhayaya Jwaraghanadi Varga</i> , <i>Rasayana Varga</i> , pg. 755	<i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 8/42, <i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 37/27-28, <i>Su. Su.</i> 37/29, <i>Su. Chi.</i> 20/58, <i>Su. Chi.</i> 21/6
<i>Bhibhitaki Terminalia bellirica</i> Gaertn. Roxb.	Combretaceae	<i>Kashaya</i>	<i>Ushna</i>	<i>Madhura</i>	D.G part 2, 4 th <i>Adhayaya chedanadi Varga</i> , <i>chedana Varga</i> , pg. 240	<i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 8/42, <i>Su. Chi.</i> 1/79	<i>Su. Su.</i> 37/27-28, <i>Su. Su.</i> 37/29, <i>Su. Chi.</i> 20/58, <i>Su. Chi.</i> 21/6
<i>Trivrita/Suvaha/ Shyama Operculina turpethum</i> [L.] Silva Manso	Convolvulaceae	<i>Tikta, Katu</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 5 th <i>Adhayaya deepanadi Varga</i> , <i>Sukhviraachna Varga</i> , pg. 421	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 8/39, <i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 8/42, <i>Su. Chi.</i> 16/9	<i>Su. Chi.</i> 8/41, <i>Su. Chi.</i> 18/7-8
<i>Vacha Acorus calamus</i> L.	Acoraceae	<i>Katu, Tikta</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 1 st <i>Adhayaya Medhyadi Varga</i> , <i>Sangyasthapana Varga</i> , pg. 29	<i>Su. Su.</i> 37/19, <i>Su. Chi.</i> 8/39	<i>Su. Chi.</i> 8/43-44
<i>Vidanga Embelia ribes</i> Burm.f.	Primulaceae	<i>Katu, Kashaya</i>	<i>Ushna</i>	<i>Katu</i>	D.G part 2, 5 th <i>Adhayaya Deepanadi Varga</i> , <i>Krimighana Varga</i> , pg. 504	<i>Su. Su.</i> 37/13-14, <i>Su. Su.</i> 37/15-16, <i>Su. Su.</i> 38/18-19, <i>Su. Chi.</i> 2/89-92, <i>Su. Chi.</i> 1/79	<i>Su. Chi.</i> 18/7-8
<i>Yasthimadhu Glycyrrhiza glabra</i> L.	Leguminosae	<i>Madhura</i>	<i>Sheeta</i>	<i>Madhura</i>	D.G part 2, 4 th <i>Adhayaya Chedanadi Varga</i> , <i>Chedana Varga</i> , pg. 254	<i>Su. Chi.</i> 18/11	<i>Su. Su.</i> 38/45-47, <i>Su. Chi.</i> 2/38, <i>Su. Chi.</i> 8/43-44, <i>Su. Chi.</i> 18/7-8, <i>Su. Su.</i> 37/23, <i>Su. Su.</i> 37/24, <i>Su. Su.</i> 37/25, <i>Su. Chi.</i> 20/7-8, <i>Su. Chi.</i> 20/9-10, <i>Su. Chi.</i> 20/13

B.P.Ni.: Bhavaprakasha Nighantu, Dh. Ni.: Dhanvantari Nighantu, Ka. Ni.: Kaideva Nighantu, D G part 2: Dravyagunavijyana part 2, Su. Su.: Sushruta Samhita Sutra Sithana, Su. Chi.: Sushruta Samhita Chikitsasthana

Table 4: Rasa predominance in Vrana-Shodhana, Vrana-Ropana and Vrana-Shodhana-Ropana plants

Rasa	Vrana-Shodhana	Vrana-Ropana	Vrana-Shodhana Ropana
Madhura	5	22	7
Amla (sour)	0	0	2
Katu	18	5	19
Tikta	12	10	26
Kashaya	7	11	8
Not mentioned	1	0	0

*Sequence of dominant Rasa for Vrana-Shodhana, *Katu* > *Tikta* > *Kashaya*, for Vrana-Ropana, *Madhura* > *Kashaya* > *Tikta* and for Vrana-Shodhana-Ropana, *Tikta* > *Katu* > *Kashaya*

Vrana-Shodhana-Ropana properties. The pharmacodynamic attributes of the herbs indicate that *Katu* and *Tikta Rasa* are useful in *Vrana Shodhana*, *Madhura*, *Kashaya* and *Tikta Rasa* for *Ropana* and *Tikta, Katu Rasa* for *Vrana-Shodhana-Ropana*. However, the specific wound-healing potential of herbs is not only due to *Rasa* but also due to specific phytochemical constituents. A reverse pharmacological approach may be taken to generate more scientific evidences for wound-healing potential of classical wound-healing herbs mentioned in Sushruta Samhita. The present comprehensive review may help reserches to work in the field of wound healing in a more precise way.

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Table 5: Predominance of Veerya in Vrana-Shodhana, Vrana-Ropana and Vrana-Shodhana-Ropana plants

Veerya	Vrana-Shodhana	Vrana-Ropana	Vrana-Shodhana Ropana
Sheeta	20	33	15
Ushna	32	14	44
Anushnasheeta	0	0	1
Anushna	0	1	1
Anatiushna	0	0	1
Not mentioned	1	0	0

*Sequence of dominant Veerya for Vrana-Shodhana, *Ushna* > *Sheeta*, for Vrana-Ropana, *Sheeta* > *Ushna* and for Vrana-Shodhana-Ropana, *Ushna* > *Sheeta*

Table 6: Vipaka component of Vrana Shodhana, Ropana and Vrana-Shodhana-Ropana plants

Vipaka	Vrana-Shodhana	Vrana-Ropana	Vrana-Shodhana-Ropana
Madhura	2	22	19
Amla	0	0	1
Katu	40	26	42
Not mentioned	1	0	0

*Sequence of dominant Vipaka for Vrana-Shodhana *Katu*, for Vrana-Ropana, *Katu* > *Madhura* and for Vrana-Shodhana-Ropana, *Katu* > *Madhura*

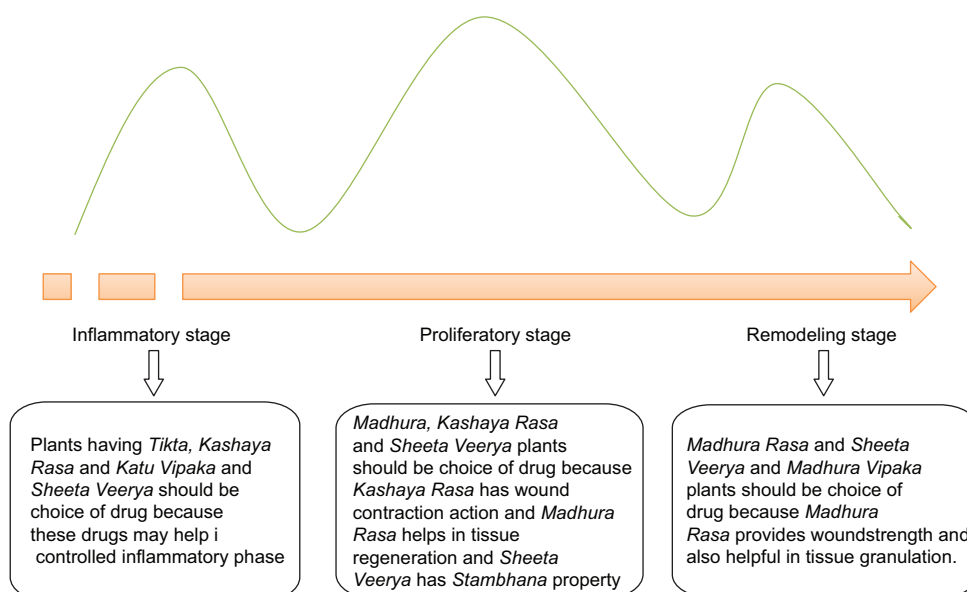


Figure 2: Possible utility of plants in different phases of wound healing based on pharmacodynamics attributes

Conflicts of interest

There are no conflicts of interest.

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