

## WOUND HEALING APPLICATIONS AS PER BASAVARAJEEYAM

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Article Received on 12/05/2022

Article Revised on 02/06/2022

Article Accepted on 22/06/2022

## ABSTRACT

Wound is one of the common reasons for hospital visit. The number of people having different kinds of ailments are increasing over the years and when these people get wound their treatment becomes challenging. Also, the cost of wound treatments has become expensive. The scope for wound management in the modern science is a little limited compared to the extensive formulations of *Ayurveda*. *Basavarajeeyam* is an Ayurvedic text which has dedicated separate chapter for the management of wound. Treating the wound can be made painless with the help of *Lepa kalpana*. Application of *lepa* is easy and cost effective. The resources available for using different *lepa* in wounds are also many. Hence a physician treating wound would have many options based on the nature of the wound and such other conditions. The present review is an attempt to explore around 22 different formulations mentioned by "*Basavarajeeyam*" whose individual drugs have shown good wound healing properties as per various research works. These *lepa* would help an Ayurvedic practitioner a wide variety of choice for treating different kinds of wound.

**KEYWORDS:** Lepa, Basavarajeeyam, wound, Ayurveda.

## INTRODUCTION

A wound is one of the common reasons of visiting a hospital. With the increasing number of people with diseases like diabetes, high blood pressure, etc. the number of people with non-healing wounds have increased. Even with respect to the cost of treating the wound, it is very expensive. Especially if the patients suffer from surgical and diabetic wounds. It is estimated that wound management approximately costs close to \$98 billion every year.<sup>[1]</sup> Wound is defined as a break in the skin or other body tissues caused by injury or surgical incision (cut). It's not just acute wounds but even chronic wounds have become very difficult to treat because of other pre-existing health conditions. A wound which does not go through the normal healing process for more than a month is called chronic wound.

Treating a patient with wound can be challenging. Though there are many options available for treating the wound but still they seem limited in the modern science. Wound in Ayurveda has been given special importance especially in the text books which mainly emphasize on the Ayurvedic surgery i.e., *Shalya tantra*. Treatises like *Sushruta samhita*, *Astanga Hridaya*, *Astanga Sangraha* have given a lot of importance regarding the treatment of wounds. As Ayurveda progressed through the ages the

scholars of *Ayurveda* began developing many simple remedies for the different diseases mentioned in *Ayurveda* which also included wounds. Treatises like *Basavarajeeyam* came into existence after 15<sup>th</sup> century and they have given some of the good valuable contributions to *Ayurveda*. Especially with respect to treatment they have given some simple formulations which can be practiced easily and also can be related to the present era.

Dressings are very commonly employed in the management of wounds. There are a wide variety of options in topical wound care. However, none can be considered as the ultimate wound healer. In *Ayurveda*, *lepa kalpana* are mainly indicated to be applied locally over a part of the body. As for wounds there are many different topical applications which can be used for the management of wounds. In *Basavarajeeyam*, many such applications have been told based on the types of wound and also based on the method of treatment which is to be employed. In this review an attempt has been made to compile the different topical applications which can be used in the management of wounds.

## MATERIALS AND METHODS

Table 1: Lepa prescribed for *vrana* in general.<sup>[2]</sup>

Sl. No.	Name	Ingredients	Indication
1.	Matulungadi lepa	Matulunga ( <i>Citrus medica</i> ), agnimantha ( <i>Premna integrifolia</i> ), devadaru ( <i>Cedrus deodara</i> ), shunti ( <i>Zingiber officinale</i> ), ahimsra and rasna ( <i>Pluchea lanceolata</i> )	Vataja vrana (wound caused due to <i>vata</i> )
2.	Abhayadi lepa	Abhaya ( <i>Terminalia chebula</i> ), trivrut ( <i>Operculina turpethum</i> ), danti ( <i>Baliospermum montanum</i> ), langali ( <i>Gloriosa superba</i> ), madhu (honey), saindhava (rock salt), sushavi patra, dhatura ( <i>Datura metel</i> ), karnamota and kutoraka	Gambheera vrana shoshana (dries up the wound)
3.	Manashiladi lepa	Manashila (Realgar), manjishta ( <i>Rubia cordifolia</i> ), laksha ( <i>Laccifer lacca</i> ), Haridra ( <i>Curcuma longa</i> ) and daruharidra ( <i>Berberis aristata</i> )	Tvak vishuddhikara (improves skin texture)
4.	Karanjadi lepa	Karanja ( <i>Pongamia pinnata</i> ), nimba ( <i>Azadirachta indica</i> ) and nirgundi ( <i>Vitex negundo</i> )	Vrana krimi (infected wound)
5.	Lashuna lepa	Lashuna ( <i>Allium sativum</i> )	Vrana krimi (infected wound)
6.	Tila lepa	Tila kalka ( <i>Sesamum indicum</i> ) and madhu	Vrana ropana (healing of wound)
7.	Cirabilvadi lepa	Cirabilva ( <i>Holoptelea integrifolia</i> ), danti ( <i>Baliospermum montanum</i> ), citraka ( <i>Plumbago zeylanica</i> ), karaveera ( <i>Nerium indicum</i> ), kapotakanka and gridra mala	Vrana dharana (maintaining the wound)
8.	Yavadi lepa	Yava ( <i>Hordeum vulgare</i> ), godhuma choorna ( <i>Triticum aestivum</i> ) and kshara	Vrana dharana (maintaining the wound)
9.	Haridra lepa	Haridra bhasma choorna ( <i>Curcuma longa</i> )	Vrana dharana (maintaining the wound)
10.	Aja vit lepa	Aja vit and kshara	Vrana dharana (maintaining the wound)
11.	Tiladi lepa	Tila ( <i>Sesamum indicum</i> ), saindhava, yastimadhu ( <i>Glycyrrhiza glabra</i> ), nimba patra ( <i>Azadirachta indica</i> ), Haridra ( <i>Curcuma longa</i> ), trivrut ( <i>Operculina turpethum</i> ) and madhu	Vrana shodhana (cleansing of wound)
12.	Tiladi lepa - 2	Tila kalka ( <i>Sesamum indicum</i> ), saindhava, Haridra ( <i>Curcuma longa</i> ), daruharidra ( <i>Berberis aristata</i> ), trivrut ( <i>Operculina turpethum</i> ), ghruta, yastimadhu ( <i>Glycyrrhiza glabra</i> ) and nimba patra ( <i>Azadirachta indica</i> )	Vrana shodhana (cleansing of wound)

Table 2: Lepa specifically indicated for *dushta vrana*.

Sl. No.	Name	Ingredients	Indication
1.	Nimbadi lepa	Nimba patra ( <i>Azadirachta indica</i> ) and kolaka patra	Vrana shodhana (cleansing of wound)
2.	Nimbadi lepa - 2	Nimba patra ( <i>Azadirachta indica</i> ), tila ( <i>Sesamum indicum</i> ) and madhu	Vrana shodhana (cleansing of wound)
3.	Nimbadi lepa - 3	Nimba patra ( <i>Azadirachta indica</i> ), tila ( <i>Sesamum indicum</i> ), danti, trivrut ( <i>Operculina turpethum</i> ), saindhava and madhu	Vrana shodhana (cleansing of wound)
4.	Nimbadi lepa - 4	Nimba patra ( <i>Azadirachta indica</i> ) and madhu	Vrana shodhana (cleansing of wound)
5.	Sariva moola lepa	Sariva moola ( <i>Hemidesmus indicus</i> )	Vrana shodhana (cleansing of wound)
6.	Saptaparna lepa	Saptaparna dugdha ( <i>Alstonia scholaris</i> )	Dusta vrana shodhana and ropana (cleansing and healing of wound)
7.	Sharapunka lepa	Sharapunka kalka ( <i>Tephrosia purpurea</i> ) and madhu	Vrana ropana (healing of wound)
8.	Panchavalkala lepa	Panchavalkala choorna	Vrana ropana (healing of wound)
9.	Dhatakyadi lepa	Dhataki ( <i>Woodfordia fruticosa</i> ) and lodhra ( <i>Symplocos racemosa</i> )	Vrana ropana (healing of wound)
10.	Ayorajadi lepa	Loha bhasma (calyx of iron), kaseesa (green vitriol), triphala pushpa and daruharidra ( <i>Berberis aristata</i> )	Vrana ropana (healing of wound)

## DISCUSSION

Among the various formulations which has been explained for *vrana* by *Basavarajeeyam* one *lepa* has

been specifically dedicated for *vataja vrana*. One *lepa* has been told for drying up the wound and one *lepa* for *tvak shuddhi*. Two *lepas* have been told for *vrana krimi*,

four *lepas* have for *vrana dharana*, six *lepas* for *vrana ropana* and eight *lepas* for *vrana shodhana*.

In *Matulungadi lepa* which is indicated for *Vataja vrana*, there are six drugs. *Matulunga* is said to be *vatahara* and has *amla*, *madhura rasa*.<sup>[3]</sup> As per a study aqueous and alcoholic extracts of roots (*C. media* L. var. *acida* Hook. f.) inhibited growth of *Stap. aureus*, *Kleb. pneumoniae*, *Prot. mirabilis*, *Pseudo. aeruginosa*, *Esch. coli* and *Neiss. Gonorrhoea*.<sup>[4]</sup> *Agnimantha* is *Vatahara* and has *ushna veerya*. As per a study petroleum ether, Ethyl acetate and Methanolic extracts of *Clerodendrum phlomidis* aerial parts at the doses of 100 and 200 mg/kg was evaluated for the analgesic activity using the hot plate and acetic acid induced abdominal constrictions in mice. The study showed that the methanolic and ethyl acetate extracts of *Clerodendrum phlomidis* at dose 200 mg/kg exhibited significant analgesic activity.<sup>[5]</sup> By looking at this article it can be noted that *Vata* causes different types of pain and *Agnimantha* has good analgesic property which means that it does *vata shamana*. *Devadaru* is *vatahara* and also a *vedanasthapana dravya*. It is said to possess anti-bacterial and anti-ulcer property.<sup>[6]</sup> It is indicated for many *vata vyadhi*. As per a study the antibacterial activity of water-soluble extract from pine needles of *Cedrus deodara* (WEC) was evaluated on five food borne bacteria, and its related mechanism was investigated by transmission electron microscope. In vitro antibacterial assay showed that WEC possesses a remarkable antibacterial activity against tested food borne bacteria including *Escherichia coli*, *Proteus vulgaris*, *Staphylococcus aureus*, *Bacillus subtilis* and *Bacillus cereus*, with the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values in the ranges of 0.78-12.5 mg/ml and 1.56-25 mg/ml, respectively.<sup>[7]</sup> *Ardraka* is also *vatahara*. It is mainly used internally and as nasal drops. This may increase the potency of the other drugs when combined with it. *Ahimsra* is *vatahara* and has *ushna veerya*. It is said to be useful in *vataja shotha* when applied along with *rasna*, externally. By this it can be assumed that *ahimsra* is useful in mitigating *vata*. It is a well-known fact that *Rasna* is a good *vatahara*. It is also said to possess anti-bacterial property.<sup>[8]</sup> It is indicated for *vata vyadhi*, *shoola*, etc. By looking at the individual properties of the drugs and knowing about the *vataja vrana* it can be assumed that this *matulungadi lepa* will be beneficial for *vataja vrana*.

In *Abhayadi lepa*, there are ten drugs. *Hareetaki* has *laghu* and *rooksha guna*. It also has *lekhana karma*. It is said to contain antimicrobial, antifungal and antibacterial properties. A study was conducted to evaluate the healing effects of extract of dried fruit pulp of *Terminalia chebula* on acetic acid induced colitis in rats. *Terminalia chebula* indicated the presence of active principles with proven antioxidants, anti-inflammatory, immunomodulatory and free radical scavenging and healing properties. The, *Terminalia chebula* was found to be safe and effective in healing experimental colitis.<sup>[9]</sup>

*Trivrut* is said to be *vranahara* in nature. It also has anti-inflammatory and antibacterial properties. A study was conducted to evaluate the ulcer preventive and ulcer protective activities of HAOP and MOP stem bark extracts of *Operculina turpethum* (100 mg/kg, b.w., orally) were evaluated employing aspirin+pylorus ligation (APL) model in experimental rats. The results suggested that both extracts (HAOP and MOP) possess enhanced ulcer preventive and protective activities when compared with their standard drug ranitidine.<sup>[10]</sup> As per *Dhanvantari Nighantu*, *danti* is indicated in *vrana*. As per *Dhanvantari Nighantu*, even *Langali* is indicated in *vrana*. Honey is also a very good wound healer. As per a clinical research fifty-nine patients with wounds and ulcers most of which (80 per cent) had failed to heal with conventional treatment were treated with unprocessed honey. Fifty-eight cases showed remarkable improvement following topical application of honey. One case, later diagnosed as Buruli ulcer, failed to respond. Wounds that were sterile at the outset, remained sterile until healed, while infected wounds and ulcer became sterile within a week of topical application of honey. Honey debrided wounds rapidly, replacing sloughs with granulation tissue. It also promoted rapid epithelialization, and absorption of oedema from around the ulcer margins.<sup>[11]</sup> *Saindhava Lavana* helps in increasing the action of the ingredients present along with it. Thus, by looking into the action of individual drugs it can be inferred that most of the drugs have wound healing properties and can be a good wound healing application.

*Manashila* is said to be *varnya* and *vranahara* in nature.<sup>[12]</sup> Since it is *varnya* it can be assumed that it would be useful in *tvak vishuddhikara* action. *Haridra* is also said to be *varnya* and *vranahara*. It contains antioxidant and antimicrobial properties.<sup>[13]</sup> *Daruharidra* is also *varnya* and *vranahara*. A study was done to evaluate the antimicrobial activity of hydroalcoholic extracts of four *Berberis* species viz. *Berberis aristata*, *Berberis asiatica*, *Berberis chitria* and *Berberis lyceum*. They were tested against eleven bacterial and eight fungal strains. *B. aristata* root extract gave low MICs values against *Bacillus cereus*, *Escherichia coli*, *Staphylococcus aureus* and *Aspergillus flavus* while stem extract against *B. cereus* and *Streptococcus pneumoniae*.<sup>[14]</sup> Thus, from the above studies it can be concluded that *Manashiladi lepa* would be effective in *tvak vishuddhikara karma*.

*Karanjadi lepa* is indicated for *vrana krimi*. *Karanja* is one of the most famous drug used in the management of *krimi*. Several studies have showed the efficacy of *karanja* in the management of *krimi*. *Nimba* is said to be *krimighna* and *vranaghna*. A study was performed to analyze the antimicrobial effect of five irrigations formulated from different parts of the tree *Azardiachta indica* and compared with 2.5% sodium hypochlorite and 0.2% chlorohydrins gluconate through an agar diffusion test. A clinical isolate of *Candida albicans* was

inoculated on Seaboard Dextrose Agar and Enterococcus faecialis (ATCC 291212) on sheep blood Agar. Two neem irrigants displayed antimicrobial properties.<sup>[15]</sup> *Nirgundi* is also said to be *krimighna*. It is also antiparasitic.<sup>[16]</sup> Thus, by looking into the individual actions it can be concluded that *karanjadi lepa* would be a good formulation for *vrana krimi*.

*Lashuna* as a single drug is also told for *vrana krimi*. *Lashuna* is said to be *jantughna*. It is also disinfectant in nature.<sup>[17]</sup> A study was done to assess the antibacterial effect of different concentrations of garlic extract against human dental plaque microbiota. All bacterial strains were inhibited by all test materials. The inhibitions zones of the different concentrations of garlic extract were not significantly different for *S. mutans*, *S. sanguis*, and *S. salivarius*. For *P. aeruginosa* and *Lactobacillus* spp. the inhibition zones of 5%, 10% and 20% concentrations were not significantly different from one another, but they were significantly more than that of the 100% extract.<sup>[18]</sup> Hence, by looking into the above factors *lashuna* can be given in *vrana krimi*.

In *tila lepa*, *tila kalka* and *madhu* are used. *Tila* is said to be *vrana hara* in nature. A study was taken to verify the effect of *S. indicum* seeds and its oil on experimentally induced incision wound, excision wound, burn wound and dead space wound model in rats. Seeds and oil treatment (250 mg and 500 mg/kg; po) in dead space wound model, produced significant increase in the breaking strength, dry weight and hydroxyproline content of the granulation tissue.<sup>[19]</sup> Honey as a good wound healer has already been discussed above. Thus, by looking into the various studies it can be said that *tila kalka* along with *madhu* is a good *vrana ropaka*.

In *Chirabilvadi lepa*, *Chirabilva* is having *tikta* and *kashaya rasa*. *Danti* has *guru guna* and is also useful in *vrana*. *Chitraka* has a synonym called as “*vylala*” which means it can tear apart unwanted tissue growth. *Karaveera* is said to possess *vrana hara* property. It is mainly indicated in *dusta vrana*. Based on all these factors it can be said that *chirabilvadi lepa* is good in healing the wound.

In *Yavadi lepa*, *Yava*, *Godhuma choorna* and *kshara* have been mentioned. Both *Yava* and *Godhuma* are told by *Acharya Sushruta* as *pathya ahara* in persons suffering from wound. *Kshara* has been said to be working as a chemical debridement agent.<sup>[20]</sup> A study also found that barley accelerates the process of healing by favoring migration versus proliferation of human dermal fibroblasts.<sup>[21]</sup>

In *Haridra lepa*, *Haridra bhasma choorna* is used. The wound healing properties of turmeric has already been discussed above. In *Aja vit lepa*, the stools of goat are applied along with *kshara*. The benefits of *kshara* in *vrana* has already been described. The benefits of *Aja vit* are a subject of research.

In *tiladi lepa*, the wound healing effects of *tila* are already discussed. *Saindhava lavana* helps in removing the dead cells from skin<sup>[22]</sup>. *Yastimadhu* is said to be *vrana hara* in nature. It is also said to be anti-microbial, anti-viral, anti-ulcer and anti-inflammatory in nature.<sup>[23]</sup> The wound healing properties of *Haridra*, *trivrut* and *madhu* have already been discussed above. The *vrana hara* action of *nimba patra* will be discussed below. Hence, it can be said that *tiladi lepa* would be beneficial in *vrana shodhana*.

In *tiladi lepa – 2* the wound healing properties of all the drugs have been discussed. Individual drugs are said to have a good wound healing action hence the overall formulation might also have a beneficial wound healing action.

In *Nimbadi lepa*, *Nimba patra* is also said to be *vrana hara*. The wound healing properties of *Nimba* has already been described. Even in *Sharagadhara Samhita*, it is mentioned that the *kalka* of *nimba* is a good *vrana shodhaka* and *ropaka*. A study was conducted titled “In vitro antibacterial activities of crude extracts of *Garcinia kola* seeds against wound sepsis associated *Staphylococcus* strains” in which they finally concluded that extracts of *Garcinia kola* seeds can potentially be useful in the treatment of staphylococcal wound infections.<sup>[24]</sup>

In *Nimbadi lepa – 2*, *nimba patra*, *tila* and honey are present. The wound healing properties of these individual drugs have already been discussed. In *Nimbadi lepa – 3*, *nimba patra*, *tila*, *danti*, *trivrut*, *saindhava* and honey are present. The wound healing properties of the individual drugs have already been discussed. In *Nimbadi lepa – 4*, *nimba patra* and honey are present. The wound healing properties of these have already been discussed.

*Sariva moola lepa* contains *Sariva moola* as the single ingredient. *Sariva* has *guru*, *snigdha guna* and *sheeta veerya*. Though researches directly pertaining to wound with the use of *sariva* was not found, one research talk about the role of *sariva* in liver injury. “Data indicate that treatment with *H. indicus* extract offers protection against free radical-mediated oxidative stress in plasma, erythrocytes and liver of animals with ethanol-induced liver injury.”<sup>[25]</sup>

In *Saptaparna lepa* only *saptaparna* latex is present. *Saptaparna* is *tridoshagna* and is also indicated in *vrana*. Preclinical studies have also shown that *saptaparna* possess anti-microbial, anti-ulcer and wound healing properties.<sup>[26]</sup>

In *Sharapunka lepa*, *sharapunka kalka* and honey are applied over the wound. *Sharapunka* has *tikta* and *kashaya rasa*. It is also used as external application for different types of wounds.<sup>[27]</sup>

In *panchavalkala lepa*, *Ashwattha*, *Udumbara*, *Parisha*, *Plaksha* and *Vata* are present. It has been observed through research that *panchavalkala* has *vrana ropana* effect when used for *vrana prakshalana*. As per a research Qualitative tests revealed absence of steroid in raw Panchavalkala samples and finished gel, while it was found present in Panchavalkala Kwatha were selected for the preparation of herbal wound healing Gel. Another study reveals that Panchavalkala kwatha is kapha shamaka, stambhaka and having the properties like astringent (kashaya rasa), antiseptic and wound healing (*vrana ropana*). Because of these properties it helps in increasing local cell immunity and prevents recurrence of symptoms in patients.<sup>[28]</sup>

In *Dhatakyadi lepa*, *Dhataki* and *Lodhra* are present. *Dhataki* has *sheeta veerya* and is said to be *vrana hara* in nature. It is haemostatic and wound healer. It is also indicated in *vrana* as per *Raja Nighantu*.

In *Ayorajadi lepa*, *loha bhasma*, *kaseesa*, *triphala pushpa* and *daruharidra* are present. As per *Rasaratnasamucchaya*, *Pushpa kaseesa* is said to be *vrana ghna* in nature. A study was conducted to assess the wound healing properties of *triphala* and the results showed that *triphala* can be used for the management of full thickness dermal wound.<sup>[29]</sup> The wound healing properties of *Daruharidra* have already been discussed.

## CONCLUSION

*Basavarajeeyam* is a well-known book which deals with many aspects of *Ayurveda*. The author has dedicated an entire chapter to explain the concepts of wound and its management. While explaining the management of wounds around twenty-two local applications have been explained for different types of wounds based on various factors like involvement of *dosha*, its severity, the stage of wound and also based on the treatment methodology. These *lepa* are easy to prepare and hence they can be made use in *Ayurveda* clinical practice in the treatment of wounds. After going through the properties of individual drugs present in the formulations and the related research articles it has been found that these formulations would be effective in healing different types of wounds.

## REFERENCES

1. <https://www.liebertpub.com/doi/10.1089/wound.2021.0026>.
2. Gnanendra Pandey, Hindi commentary on Basavarajeeyam of Acharya Basavaraj. 1<sup>st</sup> edition. 20<sup>th</sup> chapter, Varanasi: Choukhambha Krishnadas Academy, 2010; 627-29.
3. Sastry J.L.N., Illustrated Dravyaguna Vijnana, 2<sup>nd</sup> ed., Varanasi: Chaukhambha Orientalia, 2005; 650.
4. Sastry J.L.N., Illustrated Dravyaguna Vijnana, 2<sup>nd</sup> ed., Varanasi: Chaukhambha Orientalia, 2005; 398.
5. R. Vijayamritharaj, S. Vincent and N. Senthilkumar., Analgesic activity of *clerodendrum phlomidis* linn. (Aerial parts), International Journal of Research in Pharmaceutical and Biomedical Sciences, 2011; 2(1): 120-123.
6. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 204.
7. Zeng WC, He Q, Sun Q, Zhong k, Gao H. Antibacterial activity of water-soluble extract from pine needles of *Cedrus deodara*. Int J Food Microbiol, 2012; 153(1-2): 78-84.
8. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 572.
9. Gautam MK, et.al. Curative effect of *Terminalia chebula* extract on acetic acid induced experimental colitis: role of antioxidants, free radicals and acute inflammatory marker. Inflammo-pharmacology, 2012; 7.
10. Lgnatius V, et al. Antiulcer activity of Indigenous plant *Operculina turpethum* Linn. Evid based complement alterant med. 2013; 2013:2722134, Epub Feb 11.
11. <https://doi.org/10.1002/bjs.1800750718>.
12. Jha Chandrabhushan, A textbook of Rasashastra, Varanasi: Chaukhambha Surabharati Publications, 2002; 265.
13. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 274.
14. Singh M, Srivastava S, Rawat AK. Antimicrobial activities of Indian Berberis species. Fitoterapia, 2007; 78(7-8): 574-6. Epub 2007 May 24.
15. Dutta A, Kundabala M. Antimicrobial efficacy of endodontic irrigants from *Azadirachta indica*: An invitro study. Acta adonitol scand, 2013 May 3.
16. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 510.
17. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 579.
18. Houshmand B, Mahjor F, Dianat O. Antibacterial effect of different concentrations of garlic extract on dental plaque bacteria. Indian J Dent Res, 2013 Jan-Feb; 24(1): 71-5.
19. Kiran K, Asad M. Wound healing activity of *Sesamum indicum* L seed and oil in rats. Indian J. Exp Biol, 2008 Nov; 46(11): 777-82.
20. <http://dx.doi.org/https://doi.org/10.26452/ijrps.v1i13.2755>.
21. <https://doi.org/10.1016/j.carbpol.2019.01.090>.
22. J Apeksha, J Kotangale. The Conceptual Study of Saindhava Lavana (Rock Salt) in Ayurveda and its Relevance in Moderna Era -A Review.
23. Hegde L.P, A. Harini., A Textbook of Dravyaguna Vijnana, New Delhi: Chaukhambha Publications, 2020; 756.
24. J. Med. Plants Res. DOI: 10.5897/JMPR <https://doi.org/10.5897/JMPR09.194> T. Sibanda1,

- A. O. Olaniran<sup>2</sup> and A. I. Okoh<sup>1</sup> Article Number - 943E10C17918, April 2010; 4(8): 710-716.
25. Saravanan N, Nalini N. Antioxidant effect of *Hemidesmus indicus* on ethanol induced hepatotoxicity in rats. *J. Med Food*. 2007 Dec; 10(4): 675-82.
  26. Baliga, M.S. Review of the phytochemical, pharmacological and toxicological properties of *Alstonia Scholaris* Linn. R. Br (Saptaparna). *Chin. J. Integr. Med*, 2012. <https://doi.org/10.1007/s11655-011-0947-0>.
  27. Thosar Archana C, Thosar Chandrashekhar S. International Ayurvedic Medical Journal, drug review on “sharapunkha”.
  28. Gajarmal, Amit & Mb, Shende & Ds, Chothe. (2014). A clinical evaluation of panchavalkala-a review article.
  29. Kumar MS, Kirubanandan S, Sripriya R, Sehgal PK. Triphala promotes healing of infected full-thickness dermal wound. *J Surg Res*, 2008 Jan; 144(1): 94-101. doi: 10.1016/j.jss.2007.02.049. Epub 2007 Jul 27. PMID: 17662304.