

VRANA SHODHANA AND VRANA ROPANA PROPERTIES OF ARAGWADHADI GANA - A BRIEF REVIEW

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Abstract

To aim of wound care Acharya Sushruta mentioned many of herbs or herbo-mineral combinations for a Vrana shodhana and ropana activity. For proper care of wound; it is essential to decrease microbial burden, removing unhealthy slough, necrotized tissue, and maintenance of wound moisture. Presence of replicating microorganism results in pus, foul odour and discharges leads to delayed wound healing. In Ayurvedaa texts Vrana shodhana and ropana upakrama are mentioned to manage wound as wound care principle. The current review focus on Aragwadhadi Gana (group of drugs) and its potential to antimicrobial properties to minimise microbial burden in wound. In Sushruta Samhita different formulations in form of Kashaya, kalka, varti, rasakriya, taila, etc. are being used for vrana chikitsa as a part of shashti upakramas. Topical application of formulations helps to healing of wound. In general *E. coli*, *S. aureus*, *P. auregunosa*, are common isolated microorganisms in infected wound. Most of drugs are highly susceptible against above mentioned bacteria. The drugs mentioned in the Aragwadhadi Gana were individually isolated in-vitro and in-vivo for their antimicrobial activity, which was reviewed in this paper. Hence this review helps to understand the antimicrobial potential of drugs that should be taken as antiseptic solution for use in Ayurvedaa in the management of wound care unit.

Keywords: Aragwadhadi gana; Antimicrobial; Ropana; Shodhana; Vrana; Wound.

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INTRODUCTION

Infected wounds (Vrana) are always a problematic issue in surgical practice. Healing of Vrana is a natural process, but due to the interference of vitiated doshas, Vrana becomes Dusta and normal healing process gets delayed.^[1] Wound infection is defined as the presence of replicating microorganisms within a wound with a subsequent host response that leads to delayed healing. Because of this it is important that infection is recognized as early as possible. The signs and symptoms of local infection are redness (erythema), warmth, swelling, pain, and loss of function. Foul odour and pus may accompany this. There are several factors known to affect the bacterial burden of chronic wounds and increase the risk of infection. These include the number of microorganisms present in the wound, their virulence, and host factors.

Experimental studies have demonstrated that regardless of the type of microorganism, impairment of wound repair may occur when there are more than 1×10^5 organisms per gram of tissue.^[2] Certain factors that influence wound healing include bacterial infection, nutritional deficiency, drugs, site of wound etc.

Vrana shodhana dravyas mentioned in classical texts of Ayurveda which are used as primarily for cleaning of wound in form of decoction either it for the aim to reduce microbial load or to remove dead, necrotised tissue which are responsible to infection. Acharya Sushruta mentioned 60 different procedure for treating wound in which these seven i.e. Kashaya,^[3] Varti,^[4] Kalka, Sarpi, Taila, Rasakriya and avachurnan are specially detailed for proper wound care. Especially Kapha dosha^[5] vitiated wound should be treated with Aragwadhadi gana in different forms due to having Kaphanashaka, kandughna and vrana shodhana properties.^[6]

Kapha dosha involvement can be predict with characteristics features of wound discharge^[7] should be in smooth consistency like navneeta (butter), kasis (Ferrous sulphate), majja-pishta (Bone-marrow), tila (Sesamum); appearance like narikelodaka (Coconut water) and varah-vasa (fat of pig).

Pharmacological evaluation of antimicrobial activity of Aragwadhadi gana (AG) dravya

The review of AG dravyas was identified for their antimicrobial potential that can be said the drugs having Vrana shodhana and vrana ropana properties as mentioned in classic. All of the drugs included under the Aragwadhadi gana are summarized in Table 1.

Aargwadha (*Cassia fistula* Linn.)

Cassia fistula Linn. is widely used for mild laxative suitable for children and pregnant women. The fruits, stem bark, and leaves of this plant contain anthraquinones, alkaloid, saponin, terpenoids, flavonoids, glycosides, tannin, reducing sugar and steroids. The fruit and stem bark extract shows various activities like anti-inflammatory, anti-microbial, antipyretic, hepato-protective, antioxidant, antidiabetic, hypolipidemic.

Perumal Samy et al. (1998)^[8] have reported that *Cassia fistula* leaf extracts showed antibacterial activity against a wide spectrum of bacteria such as *E. coli*, *Klebsiella aerogenes*, *P. aeruginosa* and *Proteus vulgaris*. Phongpaichit, S., et al. (2004)^[9] reported about petroleum ether and ethyl acetate extracts of leaves show activity against *B. megaterium*, *S. haemolyticus*, *S. typhi* and *P. aeruginosa*.

The methanol extract of leaves had 100% antifungal activity against *Trichophyton rubrum*, *Microsporium gypseum* and *Penicillium marneffeii*.

Table 1: Contents of Aragwadhadi Gana

Sl. No.	Sanskrit Name	Latin Name	Family
1	Aargwadha	<i>Cassia fistula</i> Linn.	Caesalpinaceae
2	Madanphal	<i>Randia spinosa</i> Poir.	Rubiaceae
3	Gopghanta	<i>Zizyphus oenoplia</i> Mill.	Rhamnaceae
4	Kantaki	<i>Caesalpinia bonducella</i> (Linn.) Flam.	Caesalpinaceae
5	Kutaj/ Indrayava	<i>Holarrhynia antidysentrica</i> Wall.	Apocynaceae
6	Patha	<i>Cissampleos pareira</i> L.	Menispermaceae
7	Patla	<i>Stereospermum suaveolens</i> DC.	Bignoniaceae
8	Murva	<i>Sansevieria roxburghiana</i> Schult.	Agavaceae
9	Saptaparna	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae
10	Nimba	<i>Azadiracta indica</i> A. Juss.	Meliaceae
11	Kurantak	<i>Barleria prionitis</i> Linn.	Acanthaceae
12	Dasi-kurantak	<i>Barleria cristata</i> Linn.	Acanthaceae
13	Guduchi	<i>Tinospora cordifolia</i> (Thunb.) Miers.	Menispermaceae
14	Chitrak	<i>Plumbago zeylanica</i> Linn.	Plumbaginaceae.
15	Shangestra	<i>Dregia volbulis</i> Linn.	Asclepiadaceae
16	Karanj	<i>Pongamia pinnata</i> (L.) PIERRE.	Papilionaceae
17	Puti karanj	<i>Holoptelia integrifolia</i> Roxb.	Ulmaceae
18	Patol	<i>Trichosanthes dioica</i> Linn.	Cucurbitaceae
19	Kirattikta	<i>Swertia chirata</i> Ham.	Gentianaceae
20	Sushvi	<i>Momordia charantia</i> Linn.	Cucurbitaceae

Yogesh M et al. (2006)^[10] reported about antimicrobial activity against *S. aureus* and *P. Aeruginosa* to Alcoholic extract of leaves. Duraipandiyar et al. (2007)^[11] also reported antibacterial activity of methanol and water extract of flowers against *S. aureus*, *S. epidermidis*, *B. subtilis*, *E. faecalis* and *P. aeruginosa*. Author concluded that antimicrobial effect of *C. fistula* is related to their components and secondary metabolites like phenolic compounds.^{[12][13][14]} Bhalodia N, et al. (2011)^[15] reported that hydro-alcohol and chloroform extracts of flower showed broad spectrum antibacterial effect for both Gram positive and Gram negative human pathogen bacterial strains.

Bhalodia et.al, (2011)^[16] reported antibacterial and antifungal activities of hydro-alcohol extracts of *Cassia fistula* leaves. Results revealed that for antibacterial activity, *S. pyogenes* and *S. aureus* microorganism were more sensitive than *E. coli* and *P. aeruginosa*. For antifungal activity, *C. albicans* shows good result than *A. niger* and *A. clavatus*. Author concluded that these activities are due to presence of tannin and phenolic compounds in *C. fistula* leaves.

Seyyed Mansour et al. (2014)^[17] reported that ethanol extracts of *C. fistula* flowers exhibited highest antibacterial activity against *E. coli* and lowest against *B. cereus* and *S. aureus*. SM Satpute et al., (2015)^[18] reported that the aqueous pulp extract showed effective against *S. typhimurium* and *P. aeruginosa* and ineffective against *B. subtilis* and *S. aureus* while ethanolic extract of pulp was effective against above all four bacterial pathogens.

Madanphala (*Randia spinosa* Poir.)

Randia spinosa Poir. is a deciduous, thorny shrub or a small tree. Madanphala is bitter, emetic, antipyretic, carminative, aphrodisiac and cures abscesses, ulcers and Skin disease. The fruits contain a saponins, leucocyanidin and mannitol, randialic acid, Oleanolic acid, Ursosaponin, Randianin.

Prasanth Kumar et al.^[19] (2006) reported significant antimicrobial activity of methanolic extract of fruit. Movalia Dharmishtha et al. (2009)^[20] also reported about Methanolic extract of fruit of *Randia dumetorum* Lam. and concluded that it inhibit

of the bacterial growth more pronounced on *E.coli*.

Gopghanta (*Zizyphus oenoplia* Mill.)

Zizyphus oenoplia Mill. is a thorny straggling shrub found in whole India. The plant is reported to contain Zizyphine, Amphibine, frangulofline, Maurine alkaloids in the stem bark. Traditionally the root is used for the treatment of epilepsy.^[21]

Ramalingam R et al.^[22] (2010) reported antibacterial activity of *Zizyphus oenoplia* root. Ethyl acetate, ethanol and water extracts of root powder were used for the study. During qualitative analysis of extracts carbohydrates, alkaloids, phenolic compounds, tannins, and saponins were reported. Antimicrobial activity was observed against *B. subtilis*, *S. aureus*, *E. coli* and *P. aeruginosa* by agar ditch diffusion method. Author concluded in this study that only Ethanolic extract showed minimal antibacterial activity against *S. aureus*.

Kantaki [*Caesalpinia bonducella* (Linn.) Flam]

Caesalpinia bonducella is a prickly shrub. Traditional nuts, root, bark and leaves are used by practitioners for treatment in fever, urinary problems, wound, and worms.

Lakshmidivi N, et al. (2015)^[23] reported Hexane, ethyl acetate and methanol extracts of *Caesalpinia bonducella* (Leaf, root and bark). For this study *S. aureus*, *P. aeruginosa*, *E.coli*, *S. mutans*, *P. mirabilis* and *C. albicans* microorganism were isolated from swabs. Phytochemical screening of extracts revealed presence of sterols, triterpenes, alkaloids, glycosides, saponins, flavonoids, phenolics, tannins, proteins, amino acids, carbohydrates, fixed oils and fats were present. Author concluded that among these entire tests extracts only ethyl acetate leaf extract and methanolic root extract of *Caesalpinia*

bonducella showed a moderate antimicrobial activity against virulent microorganisms isolated from wound infections in chronic diabetic patients.

Kutaj (*Holarrhena antidysenterica* Wall.)

Holarrhena antidysenterica Wall. is a deciduous shrubby tree found throughout tropical India. Seeds are linear or oblong concave with a long coma, are light brown in colour. The stem bark which is commonly known as “*Kurchi*” in the Indian subcontinent and is used in traditional medicine to treat amoebic dysentery.

Iqbal Ahmad et al. (1998)^[24] reported about antimicrobial effect of Aqueous and alcoholic extract of bark. Aqueous extract have antimicrobial effect against *Staph. Aureus*, *E. coli*, *P. aeruginosa*, *S. typhimurium* and *Proteus vulgaris* and alcoholic extract possess against *S. Aureus* and *P. aeruginosa*. Ballal et al.^[25] (2001); Raman, et al^[26] (2004); Chakraborty and Brantner^[27] (1999) also studied of alkaloids present in methanolic extract of bark. Iqbal Ahmad et al. (2001)^[28] also reported antimicrobial activity of ethanol extract of bark and concluded that it exhibits broad-spectrum antibacterial activity against certain multi drug-resistant bacteria including *S. aureus*, *S. paratyphi*, *E. coli*, *Shigella dysenteriae* and *Candida albicans*. Suchitra Mahato et al.^[29] (2013) reported Methanolic extract of Bark, seed and callus against *S. aureus*, *S. typhimurium* and *E. coli*. Author concluded that this extract shows potential antibacterial activity against *S. aureus*, *Salmonella* and *E. coli*. Shakti Rath et al. (2014) reported that leaf extracts with chloroform, methanol, water; ethyl acetate, acetone, and ethanol possess antibacterial activities.^[30]

Patha (*Cissampelos pareira* L.)

Cissampelos pareira is a sub-erect or climbing herb of Indian traditional medicine. This

herbs^[31] is abundance of Alkaloids (hayatine, hayatinine, hayatidine, berberine, cissampeline) and saponins.

Hema TA et al.^[32] 2013 reported antibacterial activity of acetone, ethanol and propanoal extract of *Cissampelos pareira* L. leaves investigated against *B. subtilis*, *E. aerogenes*, *E. coli*, *K. pneumoniae*, *Proteus*, *P. aeruginosa*, *S. typhi*, *Shigella* sp., *S. aureus* and *Streptococcus* sp. Author observed that ethanolic and propanoalic extracts of *Cissampelos pareira* leaf showed antibacterial activity against most of the tested organism. On *Shigella* sp. revealed most sensitive. Author concluded that it may be due to the presence of alkaloids, phyto-sterols, or tannins.

Patla (*Stereospermum suaveolens* DC.)

Stereospermum suaveolens DC. is a medicinal tree species native to India, Bangladesh and Myanmar belongs to Bignoniaceae family. Traditional healers used this in vomiting, piles, acidity, diarrhoea, gonorrhoea and fever etc. Plant contains Lapachol, Beta-sitosterol, n-triacontanol, dehydro á-Lapachone, dehydrotectanol, 6-o- glucosylscutellarein, dinatin-7-glucuronides.

Vijaya bharathi et al.^[33] (2010) reported Antibacterial and Antifungal activity of leaves of another species of Patla i.e. *Stereospermum colais* Mabb. Author used different solvent extracts viz., n-hexane, chloroform, ethyl acetate, ethanol and water. *Entero cocci*, *S. aureus*, and *Acinetobacter*, *citrobacter*, *E. coli*, *K. pneumoniae*, *P. aureginosa*, *S. typhi* and *S. paratyphi.*; *A. flavus*, *A. fumigatus*, *A. niger* and *Candida albicans* etc. microorganism were used. Author concluded that ethanol and chloroform extract showed maximum antibacterial activity followed by ethyl acetate, aqueous and n-hexane. The ethanol extract showed inhibitory effect against all fungi except *Aspergillus flavus*. Chloroform extract showed activity against

Candida albicans. Athige Rajith Neloshan Silva et al.^[34] (2015) reported that Aqueous extracts of *Stereospermum suaveolens* stem possessed no antibacterial activity against *S. aureus*, *B. cereus*, *P. aeruginosa*, *E. coli*, and *S. typhimurium*.

Murva (*Sansevieria roxburghiana* Schult.)

The whole plant is traditionally used as a purgative, tonic, expectorant, febrifuge, and in rheumatism. The leaf sap is applied directly to infected sores, cuts and grazes.

Hanumanth kumar G, et al.^[35] (2015) reported antimicrobial activity of different fractions (Acetone, Ethanol, Methanol, Chloroform, and ether) of leaf. The phytochemical screening of all extracts of *S. roxburghiana* leaves showed presence of alkaloids, steroids, terpenoids, tannins and phenols contains. For this study *E. coli*, *K. pneumoneae*, *P. aeuroginosa*, *S. typhi*, and *P. vulgaris* organism were taken. Author observed different fractions showed good antibacterial activity but methanol leaf extract exhibited highest antimicrobial activity among all fractions.

Saptaparna [*Alstonia scholaris* (L.) R.Br.]

Alstonia scholaris (L.) R.Br. is an evergreen tropical Tree. Stem bark is traditionally used as a remedy against bacterial infection, rheumatism, malarial fever, toothache, snake bite, bowel disorder etc. and latex is used in treating sores.

Goyal, M.M. et al.^[36] 1995 reported that the chemical constituents of *Alstonia scholaris* (alkanes, sterols and alkanols) are responsible for its antimicrobial property. Khyade et al.^[37] (2009) reported about antimicrobial activity of methanol, chloroform, acetone, and petroleum ether extract of leaves. Author concluded that methanol extract showed higher antimicrobial activity against followed by decreasing order to *Bacillus subtilis*, *E.coli*, and *S. aureus*. Amole OO, et al.^[38] 2010 reported

antimicrobial activities of aqueous and ethanol extracts of stem bark of *Alstonia boonei*. Author concluded that ethanol extract given highest activity against *B. subtilis* and *P. aeruginosa*. Misra, C.S et al.^[39] (2011) reported antimicrobial activity of methanol extract of root, leaves, and stem bark and found most efficacious against *E.coli*.

Nimba (*Azadirachta indica* A. Juss.)

Azadirachta indica A. Juss. is used in folk medicine to cure burns, fever, diarrhea and skin disease and syphilis. Alkaloids, flavonoids, triterpenoids, phenolic compounds, carotenoids, steroids and ketones are chemical constituents and biologically most active compound is azadirachtin. Above chemical constituents play role in the inhibition of growth of numerous microbes such as viruses, bacteria, and pathogenic fungi. The role of neem in the prevention of microbial growth is described individually as follows.

Jyothi Gerige, et al.^[40] (2007) reported antimicrobial activity of Leaf, bark, and seed. Author concluded that aqueous extract of leaf, and bark exhibits strong antimicrobial activity against bacteria and fungi. Saseed A. Khan, et al.^[41] (2008) also reported that methanol and ethanol extract of leaves found effective against *Bacillus pumillus*, *P. aeruginosa* and *S. aureus*. Aarati et al.^[42] (2011) reported that Aqueous and ethanolic extract of leaves were also found effective against *Candida albicans*. Grover, et al.^[43] (2011) also reported about petroleum ether and methanol extract of leaves which were highly effective against *Candida albicans*. Shrivastava DK, et al.^[44] (2014) also reported methanolic leaf extract against *Aspergillus flavus*. Abalaka, et al. (2012)^[45] reported about methanol extract of leaves and hexane extract of bark and concluded that methanol leaves extract is effective against *B. subtilis*, *S. aureus*, *P.vulgaris*, *S. typhi*. And hexane extract from bark shows antimicrobial activity against *E.coli*.

Kurantaka (*Barleria prionitis* L.)

Barleria L. (Acanthaceae) is a large, wide spread, pan tropical genus of herbs and shrubs comprising of over 300 species. India is represented by 26 to 32 species, some species includes: *B. prionitis*, *B. cristata*, *B. longifolia*, *B. obtuse* etc. are being used traditionally for a wide variety of ethnomedical properties. *Barleria prionitis* (BP) Linn., commonly known as Vajradanti. Some uses of the plant and various parts of the plants are in toothache, asthma, whooping cough, fever, scabies, boils, sciatica, gout, rheumatism, piles, ulcers, leucoderma and as wound healing. Plant species contains Flavonoids type phenolic compounds, especially apigenin, quercetin, quercetin-3-O- β -D-glucoside, naringenin, luteolin, and apigenin glucuronide.

T. Aiswarya, et al.^[46] (2014) conducted in vitro antibacterial activity of petroleum ether and ethanol leaf extract. Author concluded that petroleum ether extract found most effective against *Pseudomonas putida* and *Bacillus subtilis*. Whether ethanol extract was also found effective against *Pseudomonas putida*.

Dasi kurantak (*Barleria cristata* Linn.)

Martini A, et al.^[47] 2004 reported about antibacterial study of the *Barleria cristata* ethanolic extract of bark which showed strong inhibitory activity against *S. aureus*, *B. subtilis*, *S. mutans* but it didn't give any inhibition against *E. coli*.

Guduchi [*Tinospora cordifolia* (Thunb.) Miers.]

Tinospora cordifolia (Thunb.) Miers is a climbing shrub. The plant mainly contains alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic compound, essential oils, mixture of fatty acids and polysaccharides. The alkaloids include berberine, bitter gilonin, non-glycoside giloningilosterol.^[48]

Thatte, et al. (1987)^[49] have observed protective effects of an Indian medicinal plant *T. cordifolia* as compared to gentamicin in *E. coli* induced peritonitis. Their results suggested that *T. cordifolia* exhibited no in vitro antibacterial effect at any strength. Similarly, the serum from treated animals also showed no antimicrobial effects but in our data ethanol extract of root of *T. cordifolia* exhibited significant zone of inhibition against *Bacillus subtilis*, *Escherichia coli*, *Bacillus cereus*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Extract of plants has also exhibited in vitro inactivating property against Hepatitis B and E surface antigen.^[50] This extract showed maximum zone of inhibition than reference standard drug Amoxicillin and Cloxacillin.

Chitrak (*Plumbago zeylanica* Linn.)

Plumbago zeylanica L. root mainly consists plumbagin, 3-chloroplumbagin, 3, 3'-biplumbagin, elliptinone, chitranone, droserone, zeylanone, iso-zeylanone, 1, 2 (3) -tetrahydro-3, 3' -biplumbagin plumbazeylanone.^[51]

Dhale DA, et al. (2011)^[52] reported antibacterial activity of Methanol, chloroform and alcoholic extracts of *P. zeylanica* leaves. Author concluded that alcohol leaf extract exhibits good antimicrobial activity against *P. aeruginosa* followed by *E. coli*, *B. subtilis* and *S. aureus* respectively. Subhash K, et al. (2013)^[53] reported that methanol and ethanol extract of root have moderate antibacterial activity against *S. aureus*, and *B. subtilis*.

Shangestra (*Dregea volubilis* Linn.)

Dregea volubilis (Linn.) leaves are used in Indian traditional medicines to treat rheumatic pain, cough, fever and severe cold, and as local application to treat boils and abscesses. Bark paste, mixed with hot milk is used internally for treating urinary infections.^[54]

Venkatesan Natarajan, et al.^[55] (2013) studied antimicrobial activity of Ethanolic extract of *Dregea volubilis* (Linn.) leaves. Leaves contains monoterpenes, sesquiterpenes, aromatic aldehydes and ketones. For this study *B. Subtilis*, *S. aereus*, *E.coli*, *P. aeruginosa*, *K. pneumonia*; *A. flavus*, *A. niger* organisms were taken. The antimicrobial effect was compared to ciprofloxacin and amphotericin. Author observed good antimicrobial activity at 200 mg/ml conc. of Ethanolic extracts against almost all tested micro-organism. This study showed that ethanolic extract exhibits antifungal and antibacterial activity.

Karanj [*Pongamia pinnata* (L.) Pierre.]

Pongamia pinnata (L.) [Syn. *Pongamia glabra* (Vent); *Derris indica* (Lamk.)] is a medium sized glabrous, perennial tree. Traditionally leaves, flower, bark and seeds are reported as crude drug for the treatment of haemorrhoids, tumors, skin diseases, and chronic wounds.^[56]

Savita sagwan, et al. 2012 evaluated antimicrobial activity of Methanolic extracts of different plant parts (root, stem, leaves, seeds) against *E. coli*, *E. cloacae*, *B. cereus*, *S. aureus*, and *P. aeruginosa* strains for antibacterial and *A. niger*, *A. flavus*, *A. solani*, *R. stolonifer* and *F. oxisporum* for antifungal activity. Author observed maximum antimicrobial activity of root extract against *E. coli* and *F. oxisporum*. In leaf extract maximum antimicrobial activity was observed against *S. aureus*, *B. cereus* and *A. solani*. Stem extract observed maximum antimicrobial activity against *A. niger*. Seed extracts showed minimal antimicrobial activity. R.S.A. Sorna Kumar, et al.^[57] 2016 also evaluated methanol and aqueous extract of Flowers and seeds of *P. pinnata* against *Brucella melitensis*, *Pseudomonas fluorescens*, *Neisseria meningitis* and *Bacillus cereus*. Author observed that aqueous extract of flower showed good inhibition activity against *Brucella melitensis*, and *P. fluorescens* whereas the methanolic

extract of flower activity against *P. fluorescens* on the other hand aqueous extract of seed showed maximum activity against *Brucella melitensis*.

Putikaranj (*Holoptelia integrifolia* Roxb.)

Holoptelia integrifolia Roxb. is commonly known as Indian Elm Tree. It is used traditionally for the treatment of rheumatism, haemorrhoids, leprosy, diabetes, dysmenorrhoea and intestinal worms. Paste of the stem bark is externally applied to treat scabies, ringworm the inflammation of lymph glands and fever. Stem bark contains triterpenoidal fatty acid esters holoptelin-A & holoptelin-B, alkaloids, flavonoids, tannins, saponins, glycosides phenols and reducing sugars.

Vinod, et al.^[58] (2010) reported antibacterial activity of hexane, diethyl ether, acetone, and aqueous extracts of leaves of *Holoptelea integrifolia* against lactam resistant strain of *Staphylococcus aureus*. Author concluded that diethyl ether extract has shown the highest activity and the active principle responsible for the present activity was found to be 1, 4-naphthalenedione. Paarakh PM, et al.^[59] (2011) reported antibacterial activity of chloroform, petroleum ether, methanol and aqueous extract of stem bark. Author concluded that chloroform extract found efficacious against *S. aureus*, *B. subtilis*, *E. coli* and *P. aeruginosa*. Petroleum ether extract was only effective against *E. coli* and *B. subtilis*: methanol extract was effective against *E. coli* and aqueous extract against *S. aureus*, *B. subtilis*, *E. coli* and *P. aeruginosa*. Ahmad, et al.^[60] (2012) also studied antibacterial potential of chloroform leaf extract of *Holoptelea integrifolia* against various pathogenic microorganisms *Citrobacter freundii*, *Micrococcus luteus*, *P. aeruginosa* and *P. fluorescens*. Author concluded that the overall antibacterial activity of found to be strongest against *C. freundii* followed in

descending order by *P. fluorescens*, *P. aeruginosa* and *M. luteus*.

Patola (*Trichosanthes dioica* Linn.)

Trichosanthes dioica L. is an annual or perennial herb. The fruits and leaves are the edible parts of the plant. The leaves of the plants is used in edema, alopecia. Leaves are also source of Vit-A, Vit- C. this plant contains Flavonoids, Alkaloids, Saponins and tannin.

Rai PK, et al.^[61] (2010) reported antibacterial activity of leaves and fruit extract. Author concluded that antibacterial activity of leaves extract against found stronger followed by decreasing sequence i.e. *S. aureus*, *E. coli*, *K. pneumonia* and *P. aeruginosa*. Fruit extract showed antibacterial activity against in sequence *S. aureus*, *K. pneumonia*, *E. coli*, *P. aeruginosa*. Khatua, et al.^[62] (2016) also reported significant antibacterial activity of root aqueous extract of root against *Proteus mirabilis* and *Bacillus subtilis*.

Kiratatikata (*Swertia chirata*)

Swertia chirata has been reported to possess wound healing activity, anti-inflammatory activity as well as antibacterial activity. This plant contains Gentiopicrocin, Amarogetin, Swerthin (bitter glycosides); Chiratosol, Swertianin, Mangiferin (Xanthone derivatives) and Genticin, Gentiocucine (Alkaloids).

Sultana J, et al. (2007)^[63] reported antibacterial activity of rectified spirit extract of areal part against *S. aureus*, *B. megaterium* and *E. coli*. Laxmi A, et al. (2011)^[64] also reported antimicrobial study of the methanol and aqueous extract of areal part. Author concluded that methanol extract showed most significant antibacterial activity against *B. subtilis*, *E. coli*, *S. typhi* and no activity against *S. aureus*, *S. pyogenes* and *P. aeruginosa*. While Aqueous extract showed moderate activity against *E. coli* and *S. typhi*.

Sushvee (*Momordica charantia* L.)

Traditionally, its fruit powder is used to control blood glucose level in diabetic patients.

DISCUSSION

For proper care of wound, wound cleaning; as a part of Vrana-shodhana, is essential. In infected wound most commonly *S. aureus*, *P. auregenosa*, *E. coli* are most potential pathogens which are isolated in various studies/trials. AG is specially mentioned to its efficacy as vrana shodhana (clean the wound) with its different formulations. Kwatha, kalka, varti and rasakriya. After Vrana-shodhana; AG dravya can be used either in ghrita, taila, or avachurnan form for Vrana- ropana (wound healing) and should be applied as per situation of the wound. Primarily to clean the infected wound, Kwatha (decoction) formulation is helpful to remove slough / necrotized material and in some cases Kalka (Paste) or Varti (Stick) should be used in deep wound or sinuses respectively.

On reviewing the all ingredients in this Aragvadhadi Gana, most of the drugs during in-vitro studies are effective against *S. aureus*, *P. auregenosa* and *E. coli* organisms. Evaluation of particular single herb in vitro antimicrobial activity reveals that most of drugs are possessing strong antibacterial activity against responsible pathogens. In combinations ingredients mixed and create a new molecular structure that is having strong affinity to reduce growth of pathogens. Thus it can be said that the combination of these drugs in different form definitely helpful in the management of Dushtavrana (infected wounds). A synergistic antimicrobial effect leads to early disinfection of wound area. On the basis of this in-vitro or pharmacological evidence based studies which support the classical principal of shodhana and ropana karma of this Gana and further need to be tried in the human being to treat the wounds.

CONCLUSION

By thorough reviewing of each drug for their in-vitro/in-vivo antimicrobial activities, it can be concluded that Aragvadhadi gana definitely have shodhana and ropana properties and different formulations of Aragvadhadi gana needs to be tried in human beings as antiseptic solution for infected wound.

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