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### Asha Arora

Department of Biotechnology, BN  
University, Udaipur, Rajasthan, India

### Sonu Jain

Department of Biotechnology, PAHER  
University, Udaipur, Rajasthan, India

## Ethnomedicinal documentation of antimicrobial plants from south east Rajasthan, India

Asha Arora\*, Sonu Jain

### ABSTRACT

South east Rajasthan houses diversified tribes belonging to primitive or aboriginal culture which inherit good deal of therapeutic information from herbal resources. Survey of ethnic localities reveals usage of plants for various purposes among which wound healing citation predominates local culture as still they inherit barren forest lives. Wound healing potential was studied along two axis-first the healing and reepithelization potential of the plant and the second in which plants either prevent localized infections or were able to reduce pus formation or help to rid of pus. Plants categorized under second axis signify antimicrobial efficacies. Field survey revealed usage of 47 plants of 29 families for wound healing practices. Among these 47 plants, 19 plants are used for acute wound healing while 10 plants are used as topical/s over non infected wounds and 18 for infected chronic wounds. These 18 plants were conferred as plants with antimicrobial efficacy but three plants were not in agreement of all informants revealing low percent fidelity levels. The field study projects usage of *Anthocephalus cadamba*, *Argyrea speciosa*, *Bacopa monnieri*, *Butea monosperma*, *Calotropis procera*, *Diospyros melanoxylon*, *Ficus glomerata*, *Holarrhena antidysenterica*, *Moringa oleifera*, *Salvadora persica*, *Senna auriculata*, *Terminalia alata*, *Terminalia arjuna*, *Vitex negundo* and *Withania somnifera* as antimicrobial plants.

**Keywords:** Wound, Antimicrobial, South-east Rajasthan, Fidelity level.

### INTRODUCTION

Among non allopathic system of therapies, traditional medicines propounds in rural and sub-rural area. These therapies has caught eyes worldwide for their efficacies, low price and safer modus operandi. Among various Indian states, Rajasthan forms an important pit for the study of ethnomedicines and their scientific validation. It is a state of differential land forms and vegetation varies among these zones invariably. Researchers had carried out *in vitro* antimicrobial studies of plants from different regions such as from arid zone <sup>[1]</sup>, Rajasthan desert <sup>[2,3]</sup> and exotic tree species of Rajasthan desert <sup>[4]</sup> while some studies are confined only to ethno-medicinal documentations <sup>[5,6]</sup>.

From last two decades antimicrobial evaluation of traditional medicinal plants have also been conducted on different prototypes. Some research counts antimicrobial activity of plants from different regions as Hadoti region <sup>[7]</sup>, Pali <sup>[8]</sup>, Nagaur <sup>[9]</sup>, Hanumangarh <sup>[10]</sup> and tree species of Sikar District <sup>[11]</sup>.

*In vitro* antimicrobial potential of some specific plants has been carried out by many workers such as *Euphorbia tirucalli* <sup>[12]</sup>, *Thuja orientalis* <sup>[13]</sup>, *Withania somnifera* and *Cenchrus setigerus* <sup>[14]</sup>, *Calotropis procera* <sup>[15]</sup> and *Acacia* species <sup>[16]</sup>. Some noted antimicrobial studies from Rajasthan also includes work on tuberous plants of Aravali hills <sup>[17]</sup>, Tiliaceous plants <sup>[18]</sup>, Capparidaceous plants <sup>[19]</sup> and Fabaceae of Rajasthan desert <sup>[20]</sup>. Antimicrobial evaluation of ethno-medicinal plants from Rajasthan against antibiotic resistant pathogenic bacteria reveals the efficacy of indigenous sources to safe guard from the microbial <sup>[21,22]</sup>.

Bacterial infections are one of the major attributes of delayed wound healing in chronic wounds <sup>[23]</sup> and resistance to pathogenic bacteria is one of the deadliest challenges in the modern clinical operative procedures. Current usages of synthetic attributes have led to the series of cidal side effects and dispersive pharmacological lacunas. In addition to this the speed up mode of microbes towards existing antibiotics has been an hour of need to look beyond synthetic compounds. The present study aims collection of plants which have served and proved their efficacies as antimicrobial agent.

### Correspondence:

Asha Arora

Department of Biotechnology, BN  
University, Udaipur, Rajasthan, India  
Email: araudr[at]gmail.com

## MATERIALS AND METHODS

### A) Ethno-medicinal field survey

- For the documentation of medicinal plants with respect to their wound healing efficacy, field surveys were carried out all around the year from 2014 to 2016 in various tribal, rural and sub-rural pockets.
- For recording and documentation, field interviews were made from different practitioners through local transcends to avoid language ambiguity and data was noted specifically for infected and non infected wounds.
- In order to determine the authenticity of information collected during field visit, data was cross checked with published data of the same array and region. Data was also authenticated in criss cross manner by interviewing other informants.
- The voucher specimens of identified plants were deposited in the herbarium of Department of Biotechnology, PAHER, University, Udaipur (Raj.).

### B) Validation of documented information

- Percent fidelity level for each plant was calculated to ensure its usage and informant authenticity. It was calculated as mounted by Friedman *et al.* (1986)

$$FL (\%) = (Np/Nu) \times 100$$

Np is the number of informants that claimed a use of a species to treat a particular disease, and Nu is the number of informants that used the plants.

## RESULT AND DISCUSSION

Ethnomedicinal field survey with respect to antimicrobial potential of herbal sources was conducted in between 2014-2016 in various ethnic localities of Udaipur, Rajasamand, Bhilwara, Chittorgarh, Dungarpur and Banswara districts of south east Rajasthan. Sixty seven informants were queried for the present study which were either guni (local therapist) or bhopa (ritual therapist) of both genders and differential age groups from all dominating tribes i.e. *Bhil*, *Bhil Garasia*, *Dholi Bhil*, *Dungri Bhil*, *Dungri Garasia*, *Mewasi Bhil*, *Rawal Bhil*, *Tadvi Bhil*, *Bhagalia*, *Bhilala*, *Pawra*, *Vasava*, *Vasave*, *Bhil Mina*, *Damor*, *Damaria*, *Dhanka*, *Tadvi*, *Tetaria*, *Valvi*

and *Garasia*. In local therapies as people are not aware about microbiological concept. Therefore, to record antimicrobial plants, plants deployed over wounds were cited initially as wounds are general pools of microbial infections. Plant parts applied over wounds may function on two arrays-

- They may have healing properties as they may direct rapid hemostasis, angiogenesis and reepithelialization.
- They may check microbial growth and in turn prevent abscess formation.

To ensure antimicrobial properties, survey and documentation was carried out for three parameters-

- At first stage wound healing plants were cited.
- The wounds were categorized as acute or chronic and documentation was carried out accordingly.
- Information was category on the basis of their application i.e. for the prevention of abscess and pus formation.

The informants were queried thrice using informant note diary with complete citation of application. Eighteen informants differed in their responses in triple inquisitive. Therefore, information obtained from these informants was not included for further citation. Informant authentication factor was found to be 73.13 which was significant at 1 % and percent fidelity ranged from 23 to 80 % (Table 4.1).

Ethnomedicinal survey revealed usage of 47 plants viz. *Acacia Arabica*, *Acacia Senegal*, *Achyranthes aspera*, *Adhatoda vasica*, *Aloe vera*, *Alternanthera brasiliensis*, *Andrographis paniculata*, *Anogeissus latifolia*, *Anthocephalus cadamba*, *Argyrea speciosa*, *Aristolochia bracteolata*, *Bacopa monnieri*, *Blumea lacera*, *Butea monosperma*, *Calotropis procera*, *Cassia tora*, *Cordia perrottetti*, *Curcuma longa*, *Dendrophthoe falcate*, *Diospyros melanoxylon*, *Echinops echinatus*, *Eclipta alba*, *Eugenia jambolana*, *Ficus glomerata*, *Holarrhena antidysenterica*, *Holoptelea intigripholia*, *Ipomoea batatas*, *Moringa oleifera*, *Murraya auriculata*, *Nigella satica*, *Plumbago zeylanica*, *Punica granatum*, *Rubia cordifolia*, *Salvadora persica*, *Senna auriculata*, *Solanum nigrum*, *Terminalia alata*, *Terminalia arjuna*, *Terminalia bellirica*, *Terminalia chebula*, *Terminalia sericea*, *Tribulus terrestris*, *Tridax procumbens*, *Vernonia arborea*, *Vitex negundo*, *Wedelia trilobata* and *Withania somnifera* of 29 families (Table 4.1).

Table 4.1: Ethnomedicinal enumeration of wound healing plants for antimicrobial efficacies from south-east Rajasthan

S.No	Botanical name (Family)	Plant part/s used	Mode of Usage	Type of wound		% FL	
				Acute / Chronic	Chronic		
					N-In		In
1.	<i>Acacia arabica</i> (L.) Willd. (Fabaceae)	Bk	T-Po	Ac	✓	-	40
2.	<i>Acacia senegal</i> Willd. (Fabaceae)	Bk	T-Po	Ac	✓	-	68
3.	<i>Achyranthes aspera</i> L. (Amaranthaceae)	Ls	T-Ot	Ac	✓	-	55
4.	<i>Adhatoda vasica</i> Ness. (Acanthaceae)	Ls	T-Po	Ac	✓	-	58
5.	<i>Aloe vera</i> L. (Lilaceae)	Ls-Pu	T-Pt	Cr	✓	-	23
6.	<i>Alternanthera brasiliensis</i> (L.) Kuntz (Amaranthaceae)	Ls	T-Po	Ac	✓	-	56
7.	<i>Andrographis paniculata</i> (Burm.f.) Wall. (Acanthaceae)	Wp	T-Ot	Cr	✓	-	65
8.	<i>Anogeissus latifolia</i> Wall. (Combretaceae)	Ls	T-Po	Ac	✓	-	70

9.	<i>Anthocephalus cadamba</i> Roxb. (Rubiaceae)	Bk	T-Ot	Cr	-	✓	76
10.	<i>Argyrea speciosa</i> (Linn. f.) Sweet (Convolvulaceae)	Ls	T-Pt	Cr	-	✓	68
11.	<i>Aristolochia bracteolata</i> L. (Aristolochiaceae)	Ls	T-Pt	Ac	✓	-	56
12.	<i>Bacopa monnieri</i> L. (Plantaginaceae)	Wp	T-Pt	Cr	-	✓	60
13.	<i>Blumea lacera</i> (Burm. F.) DC. (Asteraceae)	Fr	T-Po	Ac	✓	-	50
14.	<i>Butea monosperma</i> (Lam.) Taub. (Fabaceae)	Bk	T-Ot	Cr	-	✓	75
15.	<i>Calotropis procera</i> (Ait.) R. Br. (Asclepiadaceae)	Rt	T-Ot	Cr	-	✓	80
16.	<i>Cassia tora</i> L. (Caesalpiniaceae)	Ls	T-Pt	Cr	✓	-	80
17.	<i>Cordia perrottetti</i> L. (Boraginaceae)	Bk	T-Ot	Ac	✓	-	67
18.	<i>Curcuma longa</i> L. (Zingiberaceae)	Rz	T-Ot	Cr	✓	-	70
19.	<i>Dendrophthoe falcate</i> (L.f.) Ett. (Loranthaceae)	Wp	T-Pt	Ac	✓	-	65
20.	<i>Diospyros melanoxylon</i> Roxb. (Ebenaceae)	Bk	T-Ot	Cr	-	✓	60
21.	<i>Echinops echinatus</i> Roxb. (Asteraceae)	Wp	T-Po	Cr	✓	-	80
22.	<i>Eclipta alba</i> Hassk. (Asteraceae)	Wp	T-Po	Cr	✓	-	58
23.	<i>Eugenia jambolana</i> Lam. (Myrtaceae)	Sd	T-Ot	Ac	✓	-	50
24.	<i>Ficus glomerata</i> Roxb. (Moraceae)	Bk	T-Ot	Cr	-	✓	70
25.	<i>Holarrhena antidysenterica</i> Wall. (Apocynaceae)	Ls	T-Pt	Cr	-	✓	70
26.	<i>Holoptelea intigripholia</i> Roxb. (Ulmaceae)	Bk	T-Po	Ac	✓	-	70
27.	<i>Ipomoea batatas</i> (L.) Lam. (Convolvulaceae)	Rt	T-Ot	Ac	✓	-	54
28.	<i>Moringa oleifera</i> Lam. (Moringaceae)	Ls	T-Ot	Cr	-	✓	70
29.	<i>Murraya auriculata</i> (L.) Spreng. (Rutaceae)	Ls	T-Pt	Cr	✓	-	56
30.	<i>Nigella sativa</i> L. (Ranunculaceae)	Sd	T-Ot	Ac	✓	-	45
31.	<i>Plumbago zeylanica</i> L. (Plumbaginaceae)	Rt	T-Ot	Ac	✓	-	50
32.	<i>Punica granatum</i> L. (Punicaceae)	Fr-Pl	T-Ot	Cr	-	✓	23
33.	<i>Rubia cordifolia</i> L. (Rubiaceae)	Rt	T-Pt	Cr	✓	-	50
34.	<i>Salvadora persica</i> L. (Salvadoraceae)	St	T-Pt	Cr	-	✓	65
35.	<i>Senna auriculata</i> (L.) Roxb. (Caesalpiniaceae)	Fl	T-Pt	Cr	-	✓	70
36.	<i>Solanum nigrum</i> L. (Solanaceae)	Ls	O-In; T-Po	Ac	✓	-	60
37.	<i>Terminalia alata</i> Heyne ex Roth. (Combretaceae)	Ls, Bk	T-Pt	Cr	-	✓	70
38.	<i>Terminalia arjuna</i> Wight & Arn (Combretaceae)	Fr, Bk	T-Pt	Cr	-	✓	70
39.	<i>Terminalia bellirica</i> (Gaertn.) Roxb. (Combretaceae)	Fr, Bk	T-Pt	Ac	✓	-	70
40.	<i>Terminalia chebula</i> Retz. (Combretaceae)	Bk	T-Pt	Ac	✓	-	80
41.	<i>Terminalia sericea</i> Burch. Ex DC. (Combretaceae)	Bk	T-Pt	Ac	✓	-	67
42.	<i>Tribulus terrestris</i> L. (Zygophyllaceae)	Sd	O-Dc; T-Ot	Cr	-	✓	23
43.	<i>Tridax procumbens</i> L. (Asteraceae)	Wp	T-Pt	Cr	✓	-	80
44.	<i>Vernonia arborea</i> Buch. Ham. (Asteraceae)	Bk	T-Po	Cr	-	✓	34
45.	<i>Vitex negundo</i> L. (Verbenaceae)	Ls	T-Po	Cr	-	✓	70
46.	<i>Wedelia trilobata</i> L. (Asteraceae)	Ls	T-Po	Cr	✓	-	46
47.	<i>Withania somnifera</i> Dunal (Solanaceae)	Ls	T-Pt	Cr	-	✓	64

**Abbreviations:**

Plant/Plant parts: Wp-Whole plant; Rt-Root; Rz-Rhizome; Bl-Bulb; St-Stem ; Bk-Bark ; Ls-Leaves; Fl-Flowers; Fr-Fruits; Sd-Seeds; Pl-Peel and Pu-Pulp

Mode of Usage: O-oral; Dc-Decoction; In-Infusion T-Topical, Po-Poultice; Pt-Paste and Ot-Ointment (Prepared in sesame oil)

Type of wound: Ac-Acute; Cr-Chronic; N-In-Non infected and In-Infected

% FL=Percent fidelity level

No of Informants-67

Informant Authentication factor- (49/67)\*100 = 73.13

Maximum usages were reported from family Asteraceae and Combretaceae. Different plant parts were deployed over wounds among which leaves (34.04%) were used in most applications. These reports are akin to prior studies except that current studied classifies the cited folk usages as deployed for chronic and acute wounds followed by their application over infected and non infected ruptures [1, 17].

Among 47 plants only two plants viz. *Solanum nigrum* and *Tribulus terrestris* are used both as oral and topical antimicrobials whereas all

other plants are applied topically over wounds. 16 plants viz. *Achyranthes aspera*, *Andrographis paniculata*, *Anthocephalus cadamba*, *Butea monosperma*, *Calotropis procera*, *Cordia perrottetti*, *Curcuma longa*, *Diospyros melanoxylon*, *Eugenia jambolana*, *Ficus glomerata*, *Ipomoea batatas*, *Moringa oleifera*, *Nigella sativa*, *Plumbago zeylanica*, *Punica granatum* and *Tribulus terrestris* are used as ointments. Ointments are prepared by sun heating of dried plant part in sesame oil followed by filtration and addition of melted honey wax. In many localities honey wax is not added and only oil serum is applied as ointment [23]. Other documented plants, when used

topically were either applied as paste (37 %) in aqueous condition or tied as poultice of dried powder (33 %).

41 % plants are deployed for acute wounds which are generally referred as non infectious while 21 % find application in non infected chronic wounds which take more than two weeks to resume healing and 38 % plants (18 plants) are used to treat infected wounds. According to field studies these 18 plants i.e. *Anthocephalus cadamba*, *Argyrea speciosa*, *Bacopa monnieri*, *Butea monosperma*, *Calotropis procera*, *Diospyros melanoxylon*, *Ficus glomerata*, *Holarrhena antidysenterica*, *Moringa oleifera*, *Punica granatum*, *Salvadora persica*, *Senna auriculata*, *Terminalia alata*, *Terminalia arjuna*, *Tribulus terrestris*, *Vernonia arborea*, *Vitex negundo*, and *Withania somnifera* are basically used as a source to get rid of infections and hence can be termed as antimicrobials in term of microbiology. The healing efficacy of each plant is expressible by its fidelity level (FL) which is generally expressed as percent. It is the ratio between the number of informants who independently suggest the use of a species for the same major purpose and the total number of informants who mentioned the species for any use [24]. In other words percent fidelity level measures the prevalence of specific usage among the studied group and hence notifies the frequency of usage and projects the probability for the further scientific investigation of that lineage. Among these 18 plants % fidelity level of all the plants was significant to be used for further *in vitro* evaluation except that of *Punica granatum*, *Tribulus terrestris* and *Vernonia arborea* where it was too low as 23, 23 and 34 percent.

## CONCLUSION

Present study reveals usage of *Anthocephalus cadamba*, *Argyrea speciosa*, *Bacopa monnieri*, *Butea monosperma*, *Calotropis procera*, *Diospyros melanoxylon*, *Ficus glomerata*, *Holarrhena antidysenterica*, *Moringa oleifera*, *Salvadora persica*, *Senna auriculata*, *Terminalia alata*, *Terminalia arjuna*, *Vitex negundo* and *Withania somnifera* for their antimicrobial efficacies against microbes responsible for localized wound infections. Therefore, these plants can be recommended for further *in vitro* evaluation for their antimicrobial efficacies.

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