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## Plants used against snakebite by tribal people of Koraput district of Odisha, India

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### Abstract

The aim of the present study is to provide a comprehensive picture of the medicinal plants with anti-snake venom activity that is used by the tribal people of Koraput district, Odisha. Information on ethno-medicinal plants were collected from eight indigenous communities viz. *Paraja, Bhumia, Gadaba, Bhatra, Kondha, Gouda, Mali* and *Paika* in eighteen villages under six community development blocks (Boipariguda, Kundra, Koraput, Jeypore, Similiguda and Nandapur) of Koraput district. During the survey a total of 38 plants species belonging to 36 genera and 29 families were identified as being used for treatment of snakebite. The plants were enumerated alphabetically according to their scientific name, habit, local name, family, parts used and mode of preparation of medicine. Maximum number of medicinal plants used for snakebite was recorded under the family Apocynaceae and 68% of plants were used orally or internally, where as 32% of plants were externally applied to the affected area. The most commonly used species for treatment of snakebite was *Rauvolfia serpentina* with highest use value among tribals followed by *Curcuma longa, Achyranthes aspera* and *Mimosa pudica*. The plant with very less use value reported from study area were *Rauvolfia tetraphylla, Bryophyllum pinnatum, Andrographis paniculata, Asparagus racemosus, Musa paradisiaca, Nyctanthes arbortristis* and *Piper longum*. Further work is suggested to elucidate the possible mechanism of action of these plant extracts against snake venom.

**Keywords:** Ethnomedicinal plant, snakebite, tribes

### 1. Introduction

Medicinal plants have been used for centuries as remedies for venomous bites, due to the presence of therapeutic components. Traditional healing system plays an important role in maintaining the physical and psychological well being of majority of tribal people in India. Traditional medicine includes all kinds of folk medicine, unconventional medicine and indeed any kind of therapeutic method that had been handed down by the tradition of a community or ethnic group [1, 31]. Snakebite is an important and serious medico legal problem and Global economic health hazard in many parts of the world, especially in South Asian countries. The importance of community-based ethnobotanical knowledge is ever increasing for designing strategies for sustainable use and conservation of plant wealth as well as standardization of appropriate drugs and dose-illness relationship [29]. These indigenous groups possess their own distinct culture, religious rites, food habit and rich knowledge of traditional medicine [3, 11, 14, 27, 30]. Even today, indigenous and certain local communities practice herbal medicine to cure variety of diseases, with plants particularly used as folk medicine to treat snakebite [12, 19, 37]. Envenomations due to snakebites are commonly treated by parenteral administration of horse or sheep-derived polyclonal anti-venoms aimed at neutralization of toxins. However, despite the widespread success of this therapy, it is still important to search for different venom inhibitors, either synthetic or natural, that could complement or substitute for the action of anti-venoms. Plants are reputed to neutralize the action of snake venom, with a plethora of plants claimed to be antidotes for snakebites in folk medicine [15]. A large number of plants have been found to be effective as antidotes against snake venoms in India [2, 7, 15, 16, 26, 39]. However, in most cases the efficacy of this traditional treatment regimen is unproven. Thus, the study of herbal antidotes against snake venom is of great importance in the management of snakebite. There are few survey reports that reveal the practice of herbal medicine by either folk or indigenous communities [4, 11, 27]. To date, only a few species have been scientifically investigated with characterization of their active components both structurally and functionally.

Odisha state in India, is known as a genetic paradise for its diversity in plant genetic resources, notably the Koraput district is blessed with rich and diverse cultural heritage and the tribal people possess rich knowledge and wisdom regarding plants including their usage for treating common ailments [23]. During the recent years, more attention have been paid to the ethnobotanical survey and pharmacological screening of medicinal plants traditionally used for the treatment of snakebite patients as well as isolation and characterization of active compounds possessing anti-ophidian property from natural resources. There are few reports on the ethno-botanical flora of the district in relation to various diseases [18, 17, 21-24] and plants used against snakebite by the tribal community [32]. The rich tribal areas of South Odisha particularly Koraput have received less attention in relation to ethnomedicinal plants used against snakebite. However, most of these reports are incomplete and inadequate. Hence, the focus of the present study is on the preliminary survey of medicinal plants for therapeutic application of snakebite and its extensive traditional use by the tribal communities and traditional healers in Koraput.

## 2. Materials and Methods

### 2.1 Observation, Documentation and Plant Identification

Information on ethno-medicinal plants were collected from eight indigenous communities viz. *Paraja, Bhumia, Gadaba, Bhatra, Kondha, Gouda, Mali and Paika* in eighteen villages under six community development blocks (Boipariguda, Kundra, Koraput, Jeypore, Similiguda and Nandapur) of Koraput district based on proximity to forests or rivers. The study was carried out from January to June, 2015. The information on herbal medicinal plants against snakebite was collected through questionnaire and personal interviews with traditional healers and knowledge holders. The medicinal plants were collected from the field. While collecting the plants one of the healers was accompanied to make sure that the correct plant is collected. The plants were identified with the help of flora books [10, 36] and visiting the Herbarium of the IMMT (RRL), Bhubaneswar. Plants were enumerated alphabetically according to their scientific name with latest available nomenclature.

### 2.2 Analysis of Use value (UV) and Similarity Index (SI)

The relative importance of each plant species known locally to be used as herbal remedy is reported as use value (UV) and it was calculated using the following formula [28]

$$UV = \Sigma U/n$$

Where, UV is the use value of a species, U is the number of use reports cited by each informant for a given plant species and n is the total number of informants interviewed for a given plant. The UV is helpful in determining the plants with the highest use (most frequently indicated) in the treatment of an ailment. UVs are high when there are many use-reports for a plant and low when there are few reports related to its use.

The use reports of ethnomedicinal plants used as snake antidotes were analyzed to find out the percentage of similarity of species used among eight indigenous communities by using Bray-Curtis similarity index [20].

## 3. Results and Discussion

The result of the present study on ethno medicinal plants used for snakebite showed that the tribal people of Koraput district have very good knowledge and wisdom on plants and their medicinal importance. The present paper provides information

about ethno-botanical and scientific evidences of 38 plants species belonging to 36 genera and 29 families, which were identified as being used for treatment of snakebite. The plants are enumerated alphabetically according to their scientific name, habit, local name, family, parts used, mode of preparation and medicinal uses (Table 2). A high degree of informant consensus for each species was observed.

In the present study, most of the plants (n=11 species) were reported for the first time used against snakebite. However, no plant was reported as a new medicinal plant as the plants were reported with other use earlier. The reported plants were used by more than one ethnic group. Similar to this study, some of these plants like *Embllica officinalis* Linn [35], *Hemidesmus indicus* L. [6], *Tamarindus indicus* (L.) [38], *Rauvolfia serpentina* (L.) Benth. ex Kurz [9] have been earlier reported to have anti-snake venom activity in various ethno medicinal studies.

From this study it has been observed that out of 29 families, maximum number of medicinal plants used for snakebite was recorded in the family Apocynaceae followed by Leguminosae, Asparagaceae and Lamiaceae. But, some others reported that most of the plants used for snakebite belong to the families Rubiaceae and Euphorbiaceae [18], Acanthaceae, Amaranthaceae and Mimosaceae [25] and Fabaceae [13].

Most of the traditional medicines were prepared by the healers, from fresh material collected from the wild. However, in some cases, sun dried stored plant materials were used for the treatment of snakebite. In the present study Paraja tribe of Koraput was found to use more number of plants resources for snakebite in comparison to other tribes (Fig. 2). Maximum use of roots for treatment of snakebite was revealed during the present study as similar to other published reports [13]. Preparation of paste for the treatment of diseases is a common practice among some tribal communities in India [34]. In the present study, most of the medicines for treatment of snakebite were given internally (68%), which were mostly in the form of paste. The paste was prepared by grinding the fresh or dried plant parts with oil or water or milk. The decoction was obtained by boiling the plant parts in water or ghee until the volume reduced to minimum or required amount. The medicinal preparations were made from a single plant part or with some other additives like *Mimosa pudica* with raw rice water. They were using specific plant parts and specific dosages for the treatment of snakebite and the dose given to the patient depends on age, physical status and health conditions and times. Before treatment, the traditional healer observed condition of the patients carefully and then medicine was given. The most commonly used species was *Rauvolfia serpentina* having highest use value of 0.333 with six use-reports (tribe specific) by 18 informants. Several earlier studies also revealed that *Rauvolfia serpentina* is the most important plant for antidote of snakebite [5, 9, 35]. For treatment of snakebite reported in the study area are *Rauvolfia tetraphylla*, *Bryophyllum pinnatum*, *Andrographis paniculata*, *Asparagus racemosus*, *Musa paradisiaca*, *Nyctanthes arbor-tristis* and *Piper longum* for treatment of snakebite was reported in the study area. This is because of less availability of the plants in the study area leads them to low use value among the tribes [33]. Consumption of medicinal plants among different communities depends on their availability and knowledge of their practices. On the basis of plant use, the Bay- Curtis similarity index showed that the tribal communities of Koraput form three super clusters (Fig 3). Gauda and Paika form one super cluster with 30% similarity and Gadaba and Bhumia with nearly 30% similarity form

another super cluster. In the third super cluster, Kondha, Mali and Bhatra form one sub-cluster and Paraja as one sub-cluster with 25% similarity between the sub-clusters. Bhatra and Mali have 50% similarity with strong affinity to Kondha and Paraja

on the use of medicinal plants. It is due to these aspects of plant use and sustainable use of plant resources, tribal communities are living in same geographic regions.

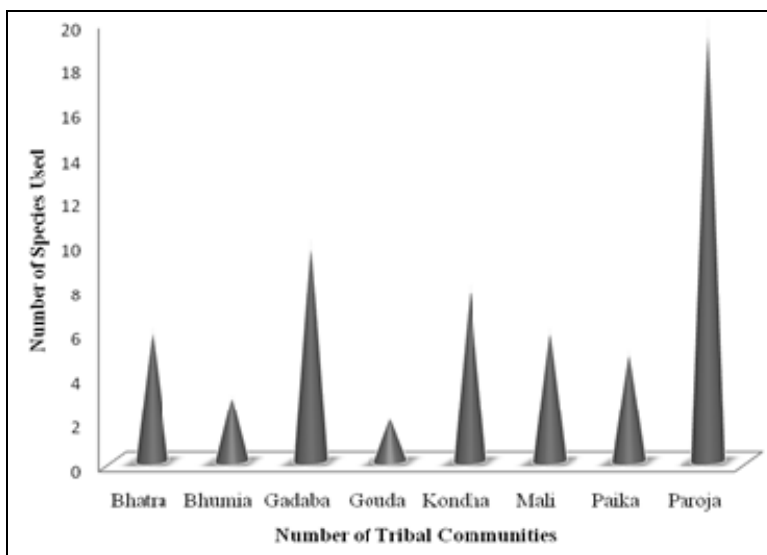


Fig 1: Number of medicinal plants used for snakebite by different tribal communities of Koraput.

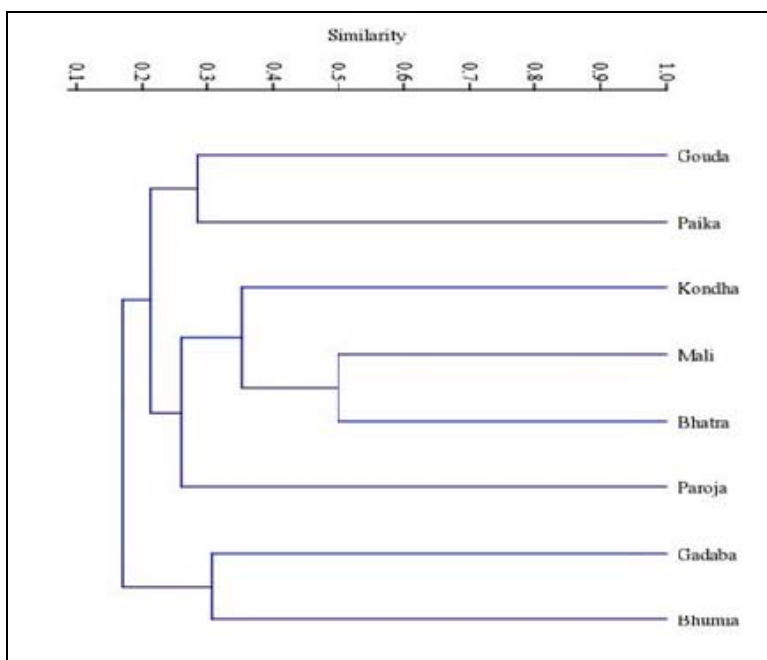


Fig 2: Dendrogram showing Bay-Curtis similarity between tribes to utilize plant species against snakebite.

Table 1: List of Ethno-medicinal plants used by the tribal people of Koraput for treatment of snakebites with their Use Value (UV).

S. No	Scientific Name	Family	Life form	Parts Used	Mode of Application	Use Value
1	<i>Achyranthes aspera</i> Linn	Amaranthaceae	Herb	Root	Root paste is used orally.	0.222
2	<i>Acorus calamus</i> Linn.	Acoraceae	Herb	Rhizome and Root	Root paste is applied on effected area.	0.111
3	<i>Andrographis paniculata</i> (Burm.f.) Nees	Acanthaceae	Herb	Root	Root paste is applied on wounded area.	0.056
4	<i>Asparagus racemosus</i> Willd.	Asparagaceae	Herb	Whole plant	Paste is used orally.	0.056
5	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Tree	Leaf and Stem	Paste is used orally.	0.056
6	<i>Bambusa arundinacea</i> (Retz.) Roxb.	Poaceae	Herb	Root	Paste is used orally and applied on the wound.	0.111
7	<i>Bryophyllum pinnatum</i> (Lam.) Kurz.	Crassulaceae	Herb	Whole plant	Paste is taken orally.	0.056

8	<i>Caladium bicolor</i> (Aiton) Vent.	Araceae	Shrub	Rhizome and Root	Rhizome paste is taken orally.	0.056
9	<i>Calotropis gigantea</i> (L.) Dryand	Asclepiadaceae	Shrub	Latex	Latex is applied externally on the wound.	0.167
10	<i>Cassia fistula</i> L.	Caesalpiniaceae	Tree	Bark, Fruit and Root	Bark and root paste is applied on wound and fruit paste is given orally.	0.056
11	<i>Chionanthus mala-elengi</i> Dennest.	Oleaceae	Tree	Whole plant	Whole plant paste is applied on the wound	0.167
12	<i>Curcuma aromatica</i> Salisb.	Zingiberaceae	Shrub	Root	Root is mixed with hot water and applied on the wound.	0.056
13	<i>Curcuma longa</i> L.	Zingiberaceae	Shrub	Whole plant	Paste is taken orally and applied on the wound.	0.278
14	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb	Whole plant	Paste is taken orally and applied on the wound.	0.056
15	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Tree	Leaf	Decoction is given Orally	0.056
16	<i>Eucalyptus globules</i> Labill.	Myrtaceae	Tree	Leaf	Juice is used orally and applied on affected part.	0.056
17	<i>Hemidesmus indicus</i> (L.) R.Br.ex Schult	Apocynaceae	Climber	Whole plant	Plant juice is given orally.	0.056
18	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Herb	Leaf and Whole plant	Leaves paste is applied on the wound and given orally.	0.111
19	<i>Litsea glutinosa</i> (Lour.) C. B. Robinson	Lauraceae	Tree	Leaf and Root	Paste is given to eat.	0.056
20	<i>Martynia annua</i> L.	Martyniaceae	Shrub	Fruit and Root	Paste is used orally.	0.056
21	<i>Mimosa pudica</i> L.	Leguminosae	Creeper	Root	Paste is mixed with raw rice water and given orally	0.222
22	<i>Momordica charantia</i> L.	Cucurbitaceae	Climber	Leaf and Stem	Paste is applied on the wound.	0.056
23	<i>Moringa oleifera</i> Lam.	Moringaceae	Tree	Bark and Root	Paste is given orally.	0.056
24	<i>Musa paradisiaca</i> L.	Musaceae	Tree	Root	Paste is given orally.	0.056
25	<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	Tree	Root	Paste is given orally.	0.056
26	<i>Ocimum sanctum</i> L.	Lamiaceae	Shrub	Leaf and Root	Paste is given orally.	0.111
27	<i>Opuntia elatior</i> Mill.	Cactaceae	Shrub	Whole plant	Paste is applied on the wound.	0.056
28	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Tree	Fruit and Seed	Paste is given orally.	0.056
29	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Euphorbiaceae	Herb	Root	Paste is given orally.	0.056
30	<i>Piper longum</i> L.	Piperaceae	Creeper	Leaf	Paste is given orally.	0.056
31	<i>Pongamia pinnata</i> (L) Pierre.	Leguminosae/ Fabaceae	Tree	Seed	Oil is extracted from the seed and used orally.	0.111
32	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	Shrub	Root	Paste is used orally.	0.333
33	<i>Rauvolfia tetraphylla</i> L.	Apocynaceae	Shrub	Root	Paste is given orally.	0.056
34	<i>Sansevieria roxburghiana</i> Schult. & Schult.f.	Asparagaceae	Shrub	Root	Paste is given orally.	0.056
35	<i>Schleichera oleosa</i> (Lour.) Oken.	Sapindaceae	Tree	Bark	Paste is given orally.	0.056
36	<i>Sphaeranthus indicus</i> L.	Compositae/ Asteraceae	Herb	Leaf and Flower	Root juice is given orally.	0.056
37	<i>Tinospora cordifolia</i> (Thunb.) Miers	Menispermaceae	Climber	Root	Paste is taken orally.	0.111
38	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Shrub	Flower	Paste is applied on the wound.	0.056

#### 4. Conclusion

The present study on the ethnomedicinal resources of Korapat district of Odisha documented 38 plants species having therapeutic potential against snakebite. The most commonly used species for treatment of snakebite was *Rauvolfia serpentina* with highest use value among tribals followed by *Curcuma longa*, *Achyranthes aspera* and *Mimosa pudica*. The findings of this study suggest that some medicinal plants are promising sources of several chemical constituents and possess snake venom neutralizing potential and further work need to be carried out to elucidate the possible mechanism of action of these plant extracts against snake venom.

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