An Ethnobotanical Assessment of some Medicinal plants in Pradhanpat waterfall and its adjoining regions of Deogarh (Odisha), India

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Abstract
The present investigation is intensive as well as extensive floristic ethnobotanical studies conducted in the Pradhanpat waterfall and its adjoining region of Deogarh District of Odisha. From the study, it is evident that the Traditional indigenous knowledge regarding different medicinal plant is very sound. The ethnic groups are still utilizing various plants and plant products for the treatment of various diseases like Malaria, typhoid, diarrhoea, cholera, worm infection, jaundice, diabetes, dysentery, skin diseases, cold and cough, snake bites, asthma, piles, constipation, wound etc. In this present contest, it has to be identified the underutilized medicinal plants and plant products which provide relevant information regarding the Indigenous knowledge of the traditional people. It will be much useful for patenting the plants and plant products, which is an urgent need of the hour.

Keywords: Ethnobotany, Medicinal plants, Indigenous, Ancient, Traditional.

1. Introduction
The study of the interaction between plants and the people with reference to traditional knowledge of tribal people is known as ethnobotany. To record the indigenous uses of plant and plant products is the main objectives of ethnobotanical research. The plant having properties to cure the disease and have same properties of Pharmaceutical drugs are called medicinal plants. Basically, these plants are rich in those ingredients which are used in the preparation of medicine [1]. Medicinal plants are being used for the treatment of various diseases by the tribal people since generation. Medicinal plants are the essential part of human health care system because of less expensive, lesser side effect and toxicity [2]. Sometimes, the medicine is also called herbal medicine due to its properties. The tribal people prefer to use medicinal plant and plant based medicine because of the cheap price and easy availability as compared to costly pharmaceuticals [3]. These people have inherited indigenous knowledge of medicinal plant from their ancestors since time immemorial; and they discover the therapeutic activity of medicinal plants against diseases through their traumatic experiences [4]. The rudimental knowledge of medicinal plants is scientifically and culturally very significant to the society. According to the local people, plants not only have nutritional value but also have medicinal and ritual values. These plants play a vital role in the development of drugs. The plants having medicinal properties should be utilized carefully before they become extinct for all times to come. According to WHO, three-fourths of the world population depends upon the traditional medicines? About 60% of modern clinical or allopathic drugs are plant based origin. Hence; they play an important role in the pharmaceutical science. The whole world has inclined their attention towards the use of herbal medicines. Hence, high priority should be given to the documentation of this indigenous knowledge of plants for their conservation as well as propagation for a Holistic health care system that will help present and the posterity [5, 6].

The main objective of this study is to identify and assess the indigenous knowledge of the medicinal plants present in the Pradhanpat waterfall and its adjoining region of Deogarh District of Odisha. And to popularize the use of these plants for preparing low cost medicines

The present piece of work has following objectives

- To identify the medicinal plants and determine their present status
- To impart knowledge to the society of the present and for future generation
- To gather ethnobotanical information from the local ethnic groups of this region
- To promote ecotourism in this region
2. Materials and Methods

Study Area: Deogarh District is located in the north-western part of the state and it is one of the 30 administrative districts of Odisha. It is connected with NH6 and NH200. The city is 90 km distance from Sambalpur and 265 km from Bhubaneswar. The district is entirely a hilly region. The soil groups of this district are mainly sandy, loamy and red. The district covers an area of 2781.66 km² with forest land 1560.22 km² and population around 312,164. Among various biodiversities, "Pradhanpat" and "Kurukuti" waterfalls, a rich and ecological balanced location, have a tremendous historical importance. Kurukuti is one of the earliest places where hydroelectricity was generated in Asia. Pradhanpat waterfall is surrounded by hills and dense forest. The water dropping is just like spraying someone from the top of the hill and this is one of the best waterfalls in Odisha. In the whole year, we can see people coming here for its scenic beauty and to enjoy its alluring sight of nature. From tourism point of view, this place has been well maintained with abundant facilities required for the tourist.

Field Survey: The study involved intensive exploration and study of specimens.

Plant collection and identification: Plant species were mostly collected in flowering and fruiting condition with their reproductive characters for their identity.

Local Names: Vernacular names as employed by the local people in Odia and tribal languages have been recorded.

Plant Description: All the species described are based on personal observations and critical study of the specimen in the herbarium denoting "common", "occasional", "rare", "planted" & "cultivated" species. Other features are highlighted such as habitation, the timing of flowering and fruiting.

Ethnobotanical notes: A brief note about the uses of the plants by the people of this locality has been illustrated. A minute care has been given to avoid ambiguity as regards to plant parts and has been authenticated by standard literatures on medicinal plants [7, 8].

Observation

1. Nyctanthes arbor-tristis, Local Name:- Gangaseoli, Family:- Oleaceae

2. Andrographis paniculata, Local Name:- Bhunimba, Family:- Acanthaceae

3. Achyranthes aspera, Local Name:- Apamarga, Family:- Amaranthaceae
Herb, Erect, straggling herb. Leaves ovate, elliptic, obovate, acute, obtuse, base narrowed, petiole up to 2.5cm. Spikes long, polished green colour flowers, bracteole spineces, membranous blade, entire adnate. Tepals lanceolate, very pungent tips, fruiting tepals, detaching together with the bracteoles but leaving the reflexed bracts. Utricle broadly oblong or slightly wider above, Flowering & Fruiting occurs between Oct.-Feb.

4. Rauwolfia serpentina, Local Name:- Patal garuda, Family:- Apocynaceae
Uundershrub, glabrous, about 2 feet long. Leaves whorled and opposite, elliptic-oblong, oblong, obovate, acute to acuminate,
glabrous, bright green colour, often paler beneath, membranous, petiolate. Flower small, white with pink tube, terminal, peduncle bright red cymes, bright red pedicle, and minute bract, Corolla-tube slender, long, and curved. Drupes black when ripe, globose. Flowering & Fruiting occur between May-Nov.

5. *Tinospora cordifolia*, Local Name: Gulachilata, Family:-Menispermaceae

6. *Justicia adhatoda*, Local Name:- Basango, Family Name:-Acanthaceae

7. *Desmodium gangeticum*, Local Name:-Saloporni, Family:-Papilionaceae
Undershrub, diffusely branched, about 3.5 feet tall. Stem is short and appressed hairy. Leaves are unifoliate, lanceolate, oblong, acute gray silky, glaucous, base rounded. Petiolate, stipulate. Inflorescence is elongated, lax, terminal or axillary raceme. Flowers purple, elongate, slender axillary, pediculate.calyx, teeth as long as tube, lanceolate, hairy. Fruit is a pod, beaded, six to eight jointed. Flowering and fruiting occur twice a year, from May to Jan.

8. *Paedera foetida*, Local Name:- Prasarin, Family:-Rubiaceae

9. *Aegle marmelos*, Local Name:-Bela, Family:-Rutaceae
Medium sized tree; spines, axillary, strong. Petiole long about 6cm. leaflets ovate, ovate-lanceolate3-foliolate, ovate-lanceolate, leaf terminal one larger and two smaller, entire, obtuse, glabrous and petiolate. Flower greenish-white, subterminal simple panicles. Fruits globose, woody, seeds present in clear mucilage, aromatic pulp. Flowering occurs between march-April & Fruiting ripening after one year.

10. *Azadirachta indica*, Local Name:-Limba, Family:-Meliaceae
Tree, compound Leaves, leaflets 5-9 pairs, obliquely lanceolate, acuminate, glabrous, serrate, base cuneate. Flowers white, fragrant. Staminal-tube long. Drupe ellipsoid yellow, glabrous, 1-seeded. Flowering occurs between Feb-May & Fruiting occur between June-July.

11. *Melia azedarach*, Local Name:-Mahanimba, Family:-Meliaceae
Medium tree, about 20-40 feet long thick bark, smooth in young. Leaves are compound, mostly 3-pinnate, opposite; ovate-lanceolate, serrate, acuminate, glabrescent, dark green. The inflorescence is a panicle from leaf axils. Sepals green; Petals are pinkish lavender, ligulate, 1-1.3 cm long. Flowers lilac, small and fragrant, with five pale purple, growing in clusters, stamina tube, light yellow colour when mature, drupe yellowish, ellipsoid, hard endocarp.Flowering occurs between March-June & Fruiting occur between Oct-Dec.

12. *Terminalia chebula*, Local name: - Harida, Family:-Combretaceae
Tree, dark grey bark. Leaves are sub-opposite, entire, acuminate, base rounded, silky hairy when young, glabrous, petiolate. Flowers whitish with strong odour. Spikes, pubescent. Fruit is yellowish-green, ellipsoid, glabrous, hard, and five ribbed. Seed is globose, pale yellow in color. Flowering occurs in March–April, while fruiting occurs in winter (November–December).

13. *Terminalia bellirica*, Local Name:- Baheda, Family:-Combretaceae
Tree, dark grey bark, leaves clustered at end of the branchlets, alternate, leathery, dotted, obvate, entire, subsacate apex. Flower greenish-white, solitary axillary. Calyx tube copular, triangular, upper flowers of the spike are male, lower flowers is bisexual. Stamens along. Drupes subglobose, grey tomentose. Flowering occurs between March-May & Fruiting occur between Oct-Dec.

14. *Phyllanthus emblica*, Local Name:-Anola, Family:-Euphorbiaceae
Medium size deciduous tree, light grey bark, branchlets hairy,leaves linear, margined apiculate, glabrous, petiolate, stipulate filimbrate. Flowers monoeocious and yellowish, minute in axillary fascicles, male and females mixed, in some plant female in lower axis and male in upper axis. Tepals 6, copular in female. Males flowers:-pedicels slender, stamen-3, filament connate, anther free. Female flowers: subsessile, ovary 3 celled ovule-2style 2-fid. Drupe globose, succulent, green in young and pale yellow when ripe, 6 ridged putamen. Flowering occurs between Feb-May & Fruiting occur between Oct-Jan.

15. *Schleichera oleosa*, Local Name:- Kusum, Family:- Sapindaceae
Trees, fluted trunk, thin bark. Leave paripinnate, leaflets 2-4 pairs, opposite, sessile, elliptic, entire, rarely repand, obtuse, acuminate, glabrous. Inflorescence recemes, axillary and below the leaves, flowers yellowish, small. Stamens 6, filaments glabrous. Ovary 3 celled, basal placation. Drupe ovoid, sharply pointed. Seed slightly compressed brown, thick seed coat. Flowering occurs between Feb-March & Fruiting occur between June-Aug.
Fig 2: Nyctanthes arbor-tristis
Fig 3: Andrographis paniculata
Fig 4: Achyranthes aspera

Fig 5: Achyranthes aspera
Fig 6: Tinospora cordifolia
Fig 7: Justicia adhatoda

Fig 8: Desmodium gangeticum
Fig 9: Paederia foetida
Fig 10: Aegle marmel

Fig 11: Azadirachta indica
Fig 12: Melia azedarach
Fig 13: Terminalia chebula
3. Results
Plants have different medicinal value for the treatment of various diseases which are shown in Table 1. It shows 15 medicinal plant distributed in 15 genera belonging to 12 families that are usually used for the treatment of various diseases (Fig.18). As per the habit, the plants used by the people of this locality are trees, shrubs, herbs and Climber. Among them 8 species are trees, shrubs (3 species), herbs (2 species) and climbers (2 species). (Fig.17). The present work deals with 15 plant species used by the people of this locality for treatment of various diseases like Malaria, typhoid, diarrhoea, cholera, jaundice, diabetes, dysentery, skin diseases, cold and cough, snake bites, asthma, piles, constipation, worm infection, teeth infection, joint pain and chicken pox (Fig.19). The medicinal value of each plant is categorically enumerated as pattern like: Local name, Scientific name, Family, plant parts used, Disease and mode of application. Different parts of medicinal plants are being used to prepare medicines by the people of this region. Among them leaves are mostly used (27%) followed by roots (20%), Fruits (12%), seeds (12%), whole plant (9%), stem barks (8%) and stem (6%) (Fig.20). The various Method of preparation of medicine involves Decoction (26%), Paste (24%), Crushed form (17%), oil (12%), raw (8%), Juice (7%) and powder (6%) (Fig.21).
Fig 18: Distribution of plant according to their families

Fig 19: Number of remedies for various diseases

Fig 20: Plant parts used by the traditional people

Fig 21: Various methods of application of drugs
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Local name</th>
<th>Scientific name</th>
<th>Family</th>
<th>Plant part used</th>
<th>Plants Used for Treatment of</th>
<th>Mode of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Gangaseoli</td>
<td>Nycanthes arbor-iris</td>
<td>Oleaceae</td>
<td>Stem bark and leaves</td>
<td>1. Cold  2. Cough  3. Malaria  4. Bronchitis</td>
<td>1. Decoction of stem bark with common salt and honey is taken in empty stomach to cure acute diseases like cold, cough and fever. 2. To cure malarial fever decoction of shoot tips mixed with honey should be taken once a day in empty stomach for 7 days.</td>
</tr>
<tr>
<td>02</td>
<td>Bhunimba</td>
<td>Andrographis paniculata</td>
<td>Acanthaceae</td>
<td>Whole plant, Leaves and roots</td>
<td>1. Malaria  2. Worm infection of Child  3. Skin Infection  4. Swelling of foot  5. Juridine and Piles  6. Snakebite</td>
<td>1. Fresh fruit paste mixed with honey can be orally taken to cure malaria. 2. Leaf decoction is taken orally for seven days to kill intestinal worms. 3. Leaf paste with turmeric cure itching. 4. Whole plant is ground to paste and filtrate to get Juice. The juice can be used orally half cup per day, upto 4-5 days to get relief from fevers and swelling of foot in case of newly delivered mothers. 5. The whole plant is used for fresh juice to cure piles and jaundice. 6. The paste of root is applied on wounded area for snakebite.</td>
</tr>
<tr>
<td>03</td>
<td>Apamarga</td>
<td>Achyranthes aspera</td>
<td>Amaranthaceae</td>
<td>Root, stem and seed</td>
<td>1. Teeth infection  2. Vomiting  3. Dysentery  4. Dog bite  5. Cholera</td>
<td>1. To cure tooth infection the leaf along with salt can be applied on teeth. 2. Leaf paste is administered to stop vomiting. 3. Juice of root with sugar in water is taken twice a day until relief from dysentery. 4. The fruits paste is applied for mad dog bite. 5. The powdered root of the plant is useful for cholera. 6. Decoction of boiled root is given orally with honey to pregnant mothers which help in quick delivery of child.</td>
</tr>
<tr>
<td>04</td>
<td>Patal goruda</td>
<td>Rauvolfia serpentina</td>
<td>Apocynaceae</td>
<td>Root and leaf</td>
<td>1. Snake Bite  2. Malaria  3. Colic pain</td>
<td>1. The paste of root is applied to cure snake and scorpion bite. 2. Leaf extract mixed with the juice of Andrographis paniculata and bark of Azadirachta indica is given with honey to drink for seven days continuously to cure malaria. 3. Root extract is given three times a day for two to three days to cure from colic pain.</td>
</tr>
<tr>
<td>05</td>
<td>Gulachilata</td>
<td>Tinospora cordifolia</td>
<td>Menispermaceae</td>
<td>Leaves, steam and bark</td>
<td>1. Acidity  2. Jaundice  3. Diabetes</td>
<td>1. Decoction of leaf with common salt is taken in empty stomach once a day for one month to cure from acidity in stomach[8].</td>
</tr>
<tr>
<td>06</td>
<td>Basango</td>
<td>Justicia adhatoda</td>
<td>Acanthaceae</td>
<td>Root and Leafs</td>
<td>1. Respiratory disorder like; asthma, bronchitis, coughing and tuberculosis. 2. Piles</td>
<td>1. Decoction of leaves in small amount is taken daily for three weeks to cure asthma. 2. Decoction of the leaves is given with honey twice for 7 days to cure asthma and cough. 3. The root paste with leaf paste of Achyranthes aspera is taken twice a day after meal for twenty days controls piles.</td>
</tr>
<tr>
<td>07</td>
<td>Saloporni</td>
<td>Desmodium gangeticum</td>
<td>Papilionaceae</td>
<td>Leaves Root</td>
<td>1. Typhoid  2. Asthma  3. Burning sensation in urine</td>
<td>1. Decoction of fresh leaf is taken in empty stomach once for seven days against typhoid and other fever[9]. 2. Fresh root juice about 50 ml is taken twice a day orally for asthma[9,10].</td>
</tr>
<tr>
<td>08</td>
<td>Prasarini</td>
<td>Paederia foetida</td>
<td>Rubiaceae</td>
<td>Whole plant, Leaves</td>
<td>1. Fever  2. Abdominal pain, arthritis and joint pain.</td>
<td>1. Decoctions of leaves are given orally to control fever and gout. 2. The powder of whole plant is taken twice a day for seven days during weakness to get strength and relief from joint pain. 3. The fresh leaf paste is taken along with rice cake to cure abdominal and joint pain.</td>
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</tbody>
</table>
## Discussion
During the present investigation extensive as well as intensive exploration was carried out covering different parts of its area. Information was collected on the basis of availability of medicinal plants and their uses in different indigenous therapy. Besides, the plants and their parts are used by skilled and unskilled people including their effects, side effects and negative effects on the human body which has been recorded properly. It has been observed that the rich rudiment knowledge of the medicinal plants of this region has not been recorded properly and as such there are chances of the loss of this knowledge due to the advent of the modern allopathetic system of medicines. As such this rich primitive knowledge on the medicinal plants of this locality should be incorporated in the Traditional Knowledge Digital Library (TKDL) of India for the use of the future generation. This work needs further study, to derive the full potential of these plants. The information which is helpful for the future generation is incomplete and it should be resurrected from the verge of extinction.

## Conclusion
The area of investigation is rural in nature; and the local people are highly dependant on the native plants for their health care and other requirements due to unavailability of resources. The prepared medicine by them is cost effective.

### Table

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Family</th>
<th>Uses</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Anola</td>
<td>Phyllanthus emblica</td>
<td>Euphorbiaceae</td>
<td>Fruits And juice</td>
</tr>
</tbody>
</table>
and easier to access. Moreover, this remedy does not produce any side effects as per their claims, but till now no validation is done. To test the scientific validity of the herbal preparations clinical studies are vehemently required, which will be able to establish medicinal values from this preparation for the benefit of humanity. Identification of these underutilized medicinal plants and plant products provide relevant information regarding the Indigenous Knowledge of the people of this locality. It will be more useful for patenting the plants and plant products, which is an urgent need of the hour. At present day, traditional practitioner are very old and aged. Due to lack of interest among the younger generation as well as their tendency to migrate to cities for lucrative jobs, there is a possibility of losing this treasure-trove in future. Thus, it becomes necessary to inculcate and preserve this primitive knowledge by proper documentation and identification of species.

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