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A survey of ethnomedicinal plants used by the paudi bhuiyan tribals of adjoining areas of Khandadhar waterfall, Bonai subdivision of Sundergarh district, Odisha, India

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Abstract
Documentation of the indigenous knowledge of a primitive tribal group through ethnobotanical studies is important for the conservation of knowledge of traditional medicines should be preserved of various before it is permanently lost. In order to the documentation of the indigenous traditional knowledge and uses of the medicinal plants in the different diseases used by the Paudi Bhuiyan of adjoining villages of the Khandadhar waterfalls of Bonai subdivision of Sundergarh district of Odisha, the present study has been done. The Paudi Bhuiyan resides here are mostly dependent upon natural products for their day to day use and medicinal uses as well. An extensive survey is carried out in the area to highlight some of the major medicinal plants and their uses through an appraisal approach with the local peoples. About 44 plants belonging to 40 genuses studied under 27 families have been found to be used frequently against different diseases.

Keywords: ethnobotanical studies, Paudi Bhuiyan, Khandadhar waterfalls, Bonai, traditional knowledge

Introduction

Ethno-botany is the branch of botany direct relationship of plants with the human. Ethno-biology must have been the first knowledge which the early man perhaps had acquired by sheer intuition, observation, experimentation, and the necessity for survival. It has been recognized as a multidisciplinary study among the tribals and rural people for recording many interesting and useful aspects of plant science, history, anthropology, culture and literature, the search for new resources of herbal drugs, edible plants, food, shelter, clothing and other aspects of plants including conservation of the plants. (Doley *et al.*, 2014; Jain and De, 1966) [5, 7] Since time immemorial the human society has developed in close association, with the plant life (De, 1968) [2]. A majority of world's population still dependent on medicinal plants to fulfill their healthcare problems after so many developments of medicinal sciences. The tribal people are the storehouses of traditional knowledge on the multiple uses of plants. However such traditional knowledge is rapidly disappearing. There is an urgent need to document this knowledge, as otherwise it will be lost forever. Ethnomedicine part of ethnobotany deals with the traditional medical systems and it involves the identification of plants which are used in traditional remedies, and into folk systems of classifying medicinal plants from the beginning of the time (R.K. Mohanta *et al*., 2006) [13]. India is one of the most ethno -medico-culturally diverse countries in the world where the tradition of honoring and worshiping medicinal plant before use, is found even today.

Study Site

Pauri bhuiyan, is one of the four primitive classes of Bhuyan tribe of Odisha mostly found in Bonai, Talcher, and Pallahara subdivisions.This tribe is divided into 4 principal classes namely Desh Bhuyan, Khandait Bhuyan, Rajkoli Bhuyan and Paudi Bhuiyan. The desh or Pahariya Bhuyan generally live in hills and known as Paurdi or Hill Bhuiyan which is the present clan and retains all most all characteristics of the tribe. Paudi Bhuiyans are the primitive and backward tribal group of

Fig1: Map of Bonai subdivision and Khandadhar waterfalls of Bonai subdivision of Sundergarh district of Odisha, India.

Odisha and is classified under the Mundari groups of tribals.
The Bonai hills of Bonai subdivision of Sundergarh district is the homeland of the primitive Paudi Bhuinyas. Most of the Paudi Bhuiyans are living near the Khandadhar waterfall hill regions. Khandadhar is a glittering waterfall created by a perennial rivulet called Koraipani Nala located at Nandapani, Bonaigarh in Sundergarh district in the Indian State of Odisha, which is the 12th highest waterfall in India. It is 244 meters in height and said to be the highest waterfall in Odisha. The Khandadhar waterfalls is 104 km from Rourkela via 19kms far from Bonaigarh and 54 km from Keonjhar. Nearby the local tribals worship a deity known as Goddesses Kanta.There are 22 villages present where Pauri Bhuiyan families reside around Khandadhar waterfalls. Due to, Paudi Bhuiyan tribals are being tribal and forest dwellers, they depend on forest directly for their livelihood. They collect NTFPs, timbers, fuels, fodders, medicines and foods as well as wild plants in scarcity which is having edibility values too. Minor forest products like honey, sal seed, mahua flower, amla, char seeds are mostly collected, consumed and sold by the Paudi bhuinyas in local markets and in nearby weekly fairs (Mohapatra, 1991). Though the tribes of this area are socioeconomically backward and below the poverty line, they depend on the traditional medicines for their primary health care. It is observed that the forest of this area is degrading and reducing rapidly along with the medicinal herbs threating the health services of the tribes, as they are not in a position to take a help of modern health facilities. Presently ethno botany has become increasingly valuable in the development of healthcare and conservation programs in different parts of the world. Study of literature in the hand suggests that little attention has been paid on the ethnobotany of this area (Shukla *et al.*, 2010) [23].

Methodology

The field work was conducted in villages Killinda, Sannuagaon, Badanuagaon, Uparginia, Patamund, Nagaria, Kulposh which are adjoining to Khandadhar waterfall areas where major Paudi Bhuiyan are living.Ethnomedicinal data were collected following standard methods. The questionnaire survey, field observations, personal interviews and group discussion aimed at gathering information on present and past status of medicinal plants and their traditional uses in various diseases of plants was obtained through interviews. Routine field notes, laboratory description, identification, and classification were made using standard herbarium procedures. The nomenclature and identification of the plants listed were identified with the help of flora books (Haines, 1925; Brahman & Saxena, 1996) [21].

Result

Enumerations of the Ethnomedicinal plants

Abutilon indicum (L) Sweet
Family- Malvaceae
Local name: Pedipedica
Uses: The paste of seven leaves with seven black pepper is taken in empty stomach with rice washed water to treat Jaundice. The root paste taken in the early morning in empty stomach cures jaundice too.

Acorus calamus L.
Family- Araceae
Local Name: Bachha
A piece of rhizome is tied on neck or waist to keep away evil spirits.

Adhatoda vasica
Family-Acanthaceae
Local Name: Basanga
Leaves are boiled with water and the boiled water is taken to get relief from fever.

Acacia nilotica (L.) Willd.ex.Del.
Family- Mimosaceae
Local Name: Babul
Uses: the stem is used as the toothbrush to get relieved from a toothache.

Adiantum philippense L.
Family-Adiantaceae
Local name: Lenkudi
Uses: The fine paste of the whole plant is applied on the bone fracture area and bandage properly to cure bone fracture.

Aegle marmelos (L.) Correa
Family- Rutaceae
Local name: Bel
Uses: Fresh young leaves are taken in empty stomach with black pepper to cure gastric problems. The fruit pulp is given in blood dysentery and diarrhea.

Andrographis paniculata (Burm.f.) Wall. Ex Nees
Family-Acanthaceae
Local name: Bhuin nimba
Uses: The leaf paste of this plant is boiled properly and one or two cups of the boiled juice is taken twice in a day to cure malaria. The leaf paste is also used to cure scabies, itches and viral fever.

Ardisia solanacea Roxb.
Family-Myrsinaceae
Local name: Tinkoli
Uses: The water extracted from root is given internally to cure blood dysentery.

Argemone mexicana L.
Family-Papaveraceae
Local name: Agara
Uses: The fine paste of fresh root of this plant is applied to the carries teeth to get relief from a toothache. The small pieces of the whole plant are fried properly on fire till it turns into ash, which is used to drive away bed bugs. The oil from seeds is used in an earache.

Asparagus recemosus Willd.
Family-Liliaceae
Local name: Satabari
Uses: The root paste is massaged on head and then washes properly to cure a headache. Root powder is given in gastric trouble.

Azadirachta indica A. Juss.
Family-Meliaceae
Local name: Nimba, Neem
Uses: The mixture of leaf paste and turmeric paste apply on the body to cure smallpox, chickenpox and several skin diseases. The patient suffered from smallpox and chickenpox sleep on neem leaves. Powder of the bark is applied on boils, hurt and blisters.

Calotropis gigantea R.Br.
Family-Asclepiadaceae
Local name: Arakha
Uses: The fresh root paste of this plant mixed together with milk of cow and taken as an antidote for snakebite and also used to cure a migraine. Leaf is coated with oil and warmed and tied as bandage on joints to cure pain. The latex is used in conjunctivitis.

Careya arborea Roxb.
Family- Lecythidaceae
Local name: Kumbhgacch
Uses: The fresh bark is grounded and the juice is given in the treatment of diarrhea.

Celastrus paniculata Willd.
Family-Celastraceae
Local name: Pengu
Uses: The oil of this plant is applied on the body to cure scabies. Seed oil is applied locally on chest pain.

Cissus quardrangula L
Family- Vitaceae
Local name- Hadabhanga
The stem paste is applied on bone crack and bone fracture. Tender stems and crushed leaves with milk given to infants in fever.

Croton bonplandianus Baill.
Family- Euphorbiaceae
Local Name: Banamaricha
Uses: Stem latex is applied on the cut and fresh wounds.

Datura metal L.
Family-Solanaceae
Local name: Dudura
Uses: One or two cups of the root paste of this plant mixed with water is taken twice in a day to cure worm disease in children. Leaf paste is applied on hair to check early aging of hair.

Desmodium gangeticum (L.) DC
Family- Fabaceae
Local name-Shalaparni
Stem and bark paste is applied on the affected part for goiter remedy. Plant paste is applied on the bone fracture for binding it.

Desmodium triflorum (L.) DC.
Family-Fabaceae
Local name: Kuradia
Uses: The paste of the whole plant is given to lactating mother for deworming of children.

Diospyros sylvatica Roxb.
Family-Ebenaceae
Local name: Kalikendu
Uses: The bark paste is taken in Grip's disease.

Euphorbia hirta L.
Family- Euphorbiaceae
Local name: Dudhiya
Uses: Plant latex is dropped into eyes in conjunctivitis.

Gloriosa superba L.
Family-Liliaceae
Local name: Agneejhad
Uses: The root paste of this plant is mixed with the root paste of the plant *Cocculus hirsutus* and *Soymida febrifuga* and take twice in a day to cure liquid purging, dysentery and stomach-ache.

Gymnema sylvestre (Retz) R. Br. ex Sch.
Family- Asclepiadaceae
Local name –Gudamari
Uses: Dried or fresh leaf taken orally to reduce sugar level. Root paste is used in snake bite also. Root or leaf juice is used in case of intestinal worm. The decotion of leaves is used in malaria and liver disorders.

Hemidesmus indicus (L.) R.Br.
Family- Asclepiadaceae
Local name: Anantamula
Uses: The decotion of root is taken in empty stomach in sexual weakness.

Holarrhena antidysenterica Wall. ex A.DC
Family-Apocynaceae
Local name: Kurei
Uses: The latex of the bark is given internally in dysentery and also used as antidote to remove poison from snake bite.

Ipomoea aquatica Forssk.
Family-Convolvulaceae
Local name: Kalama
Uses: The leaf of this plant is eaten as vegetable regularly to increase lactation of milk in case of mother.

Melia azedarach L.
Family-Meliaceae
Local name: Mahanimba
Uses: The leaf paste of this plant is applied on the body to cure scabies and itches on the body.

Nicotiana tabacum L.
Family-Solanaceae
Local name: Dhuanpatra
Uses: The leaf powder of tobacco mixes with lime and applied on the cutting portion of the body to dry it.

Nyctanthes arbor-tristis L.
Family-Oleaceae
Local name: Gangasiuli
Uses: The leaves are boiled with water and drinking a cup of the boiled soup twice in a day to cure Malaria as well as to cure the common fever.

Pongamia pinnata (L.) Pierre
Family-Fabaceae
Local name: Karanja
Uses: The twigs of plant are used as tooth brush regularly for healthy gums and sparkling teeth. The seed oil massaged on body to escape from mosquito bites. The oil is also applied on itches and boils.

Schleichera oleosa (Laur.) Oken.
Family- Sapindaceae
Local name: Kusum
Uses: Seed oil is used for body massage and used on scabies.

Sida acuta Burm.f.
Family-Malvaceae
Local name: Bajramuli
Uses: The fine paste of the whole plant is made by mixing with rice washed water and is given internally to check diarrhea due to indigestion.

Smilax zeylanica
Family- Smilaceae
Local name: Muturi
Uses: The tender stem is used as toothbrush in pyorrhoea and toothache.

Solanum virginianum L.
Family-Solanaceae
Local name: Akaranti
Uses: The juice of the root is mixed with honey and taken internally on empty stomach to treat Asthma. The powder of seeds is also smoked in a pipe to get rid of worms in the teeth. The flower buds mixed with the washed water of sun dried rice and drink twice in a day to cure Jaundice. The boil water of this plant also helps to cure viral fever by taking one cup of that soup twice in a day.

Soymida febrifuga (Roxb.) Juss.
Family-Meliaceae
Local name: Rohini
Uses: The fine paste of the bark is taken with curds on empty stomach to cure dysentery.

Tamarindus indica L
Family- Caesalpiniaceae
Local name: Tentuli
Uses: The bark of this plant mixes with the stem of *Andrographis peniculata* and boils with water and taken one or two cups daily to relief body pain.

Tephrosia purpurea (L.) Pers.
Family-Fabaceae
Local name: Bana kolatha
Uses: Dried leaf powder is taken with the pasted rice powder in equal quantities on empty stomach followed by rice washed water to treat Haematuria.

Terminalia arjuna (Roxb.) Wight &Arn
Family-Combretaceae
Local name: Arjun
Stem bark is soaked in water and the soaked water is taken in empty stomach in diabetes and high blood pressure.

Terminalia bellirica (Gaertn.) Roxb.
Family-Combretaceae
Local name: Bahada
Uses: The pulp of raw fruit is consumed to check dysentery. The dry powder is used as a part of Triphala to cure a cough, cold and bronchitis.

Terminalia chebula Retz.
Family-Combretaceae
Local name: Harida
Uses: The dry powder of the fruit mixed with the powder of *Terminalia bellirica and Emblica officinalis* taken a spoon, in empty time during the morning time to cure a cold and cough.

Vitex negundo L.
Family-Verbenaceae
Local name: Begunia
Uses: The vapor of boiled leaf of this plant is inhaled through mouth to reduce a cough. The fresh leaf juice is also mixed with honey and taken on empty stomach to treat Asthma. Leaves are boiled and the boiled water is used in rheumatism.

Vitex peduncularis Wall.
Family Verbenaceae
Local Name: Chadeigudi
The dry bark is boiled and decotion is taken as tea to relieve from fever, cough, Cold.

Woodfordia fruticosa (L.) Kurz.
Family- Verbenaceae
Local name: Dhatki
Uses: Leaf juice applied on cut, wounds and to remove burnt scares.

Zingiber officinale Roscoe
Family-Zingiberaceae
Local name: Adaa
Uses: The powder of dried rhizome and the whole plant of *Phyllanthus fraternus* mixed in equal quantities and is boiled in milk till the milk becomes one-fourth. Then the filtered solution is taken by pregnant woman on empty stomach only once in 7^{th}, 8^{th} and 9^{th} month to overcome pre-natal disease and for easy delivery.

Discussion

The 27 family with 44species of 40 genuses are mostly used in the preparation of ethno medicine by the tribals in these areas. Analysis of habit forms indices 12 (27%) species of herbs, tree species of 15 (34%), shrub species of 10 (23%), 6 species of

climbers (14%) and only one species of fern (02%) (Fig2). It is found that the fresh leafy crude drug preparations are mostly recommended as ethnomedicine and followed by flower and bark, whole plant, latex, stem, fruit, and rhizome.

During the course of the study, it has been seen that the local people of the studied area are having a great idea on utilization of natural products in their daily life, especially against diseases. All Ethnomedicinal plants documented in the presence study have continuously been used and also revealed that some of them are less known and some of them supplement the available earlier data. Based on their experience and common sense, they have the capability to search for a number of uses of plants. Simultaneously they have the talent to exploit the plants of even a new area they have settled. The present study concluded that the Pauribhuyan tribes of the study area possess rich knowledge on the medicinal plants and their utilization after the 70 yrs of independence. There is an urgent need for the scientific awareness about the importance of biodiversity and medicinal plants for the sustainable utilization of natural resources.

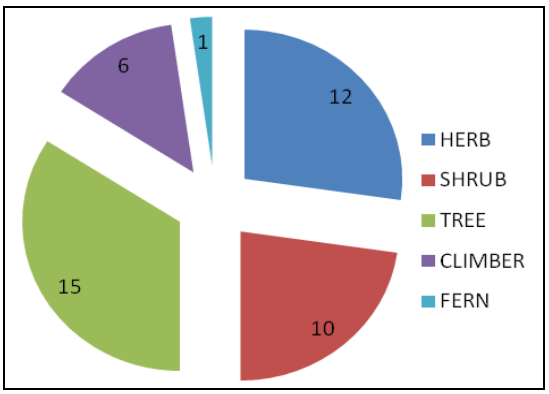

Fig 2: Category wise plants used for ethno-medicine by Paudi Bhuiyan tribal groups.

Conclusion

The traditional knowledge of such health care systems or practices remains confined to some elderly people or the tribal healers in a tribal community through their observations and experiences which are passed from generation to generation orally without being proper documentation. The traditional knowledge becomes lost when the knowledgeable person dies without disclosing about the herbal remedies of the plants to the next generation. In addition that there is need to the survey more and more areas before the habitats are threatened due to anthropogenic interferences like, over-exploitation of resources, urbanization, industrialization etc. There is also a need for in-situ conservative viable population of various species. Perhaps an awareness campaign regarding the value of natural resources and their wise use could help to maintain and preserve these species for long. The people of this region derive immense benefit by using the herbal medicines for their primary health care. So there is an urgent need to make efforts to document the existing traditional knowledge associated with the said tribal groups before it is lost forever.

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