Traditional Phytotherapy of Jajpur Forests of Eastern Ghat, Odisha

[1]*Usha Devi,
[1]Himanshu Dwivedi,
[2]Aminuddin,
[1]Mohammad Zakir
and
[1]Hakimudin Khan

[1]Regional Research Institute of Unani Medicine, Bhadrak-756100, Odisha

[2]Central Council for Research in Unani Medicine, 61-65, Institutional Area, Janakpuri, New Delhi - 110058

Abstract

Ethnopharmacological surveys conducted in Jajpur forests of Odisha during 2014 and 2015 have resulted into collection of first-hand data on 68 folk medicinal species belonging to 60 genera and 40 families for treatment and cure of many diseases and conditions. The information on therapeutic uses of plants have been recorded through interviews of forest ethnics and traditional folk healers commonly known as "Vaidyas". Each species enumerated has been provided with the information on plants' scientific name, family, habitat, local name, locality with voucher specimen number, recipe and part(s) used in folk medicine, medical efficacy claimed, mode of administration, name of informant(s) and occurrence. Need for conservation and protection of such species under threat on account of their over-exploitation has been re-stressed. It's likely that data presented will contribute significantly to discover new drugs of natural origin for many of the diseases having no satisfactory cure in modern medicine, thus far.

Keywords: Traditional phythotherapy, Jajpur forests, Medicinal plants, Odisha.

Introduction

Since time immemorial traditional herbal medicines are using to cure various ailments. Besides playing a crucial role in the primary health care, medicinal plants have been also one of the important sources of modern drug discoveries (Balunas and Kinghorn, 2005). Many modern medicine drugs were initially used in crude form in traditional or folk healing practice and other potentially useful biological activity (Iwu *et al*., 1999 and Maitera *et al*., 2011). This can be explained by the fact that 80% of 122 plant-derived drugs developed between 1981 and 2001 were related to their original ethnopharmacological uses (Fabricant & Farnsworth, 2001 and Wangchuk & Tobgay, 2015). Therefore documentation of indigenous knowledge is not only useful in highlighting locally important plant species but it is also helping to discover a new crude drug sources (Cox, 2000, Lahlou, 2013 and Newman, 2008). Presently, the study of indigenous knowledge of plants has become imperative facet of ethno medical research which is increasingly valuable in the development of healthcare and conservation programs in different parts of the world (Kunwar and Bussmann, 2008 and Shukla *et al*., 2010.).

Medicinal plants are an integral part of indigenous system of Indian medicine and form a rich source of knowledge (Nadkarni, 1982, and Singh *et al*., 2013).

[1]*Author for correspondence; Email: usharudhyan18@gmail.com

India harbours about 15 percent (3000–3500) medicinal plants out of 20,000 globally listed medicinal plants by World Health Organization (WHO) (Ramya *et al*., 2012 and Thaware and Saoji, 2013). It is worthwhile to note that, about 53.8 million tribal people with 427 different tribal communities are still dependent on traditional medicinal plant therapy for meeting their health care needs (Ghimire *et al*., 2004). Odisha is regarded as the homeland of the tribals having a total tribal population of about 7 million of 62 different ethnic groups, inhabiting in the dense and thick tropical forest areas and possesses rich empiric knowledge about plants wealth (Prusti, and Behera, 2007). Jajpur, a district of Odisha, is situated towards the north eastern region of the state. It lies between $20^0$35'-$21^0$10' N latitudes and $85^0$40'-$86^0$40' E longitudes. According to census (2011) about 95.5% populations of the district are rural and live in villages and the rest 4.5% live in urban areas. The district harbors a number of rural and tribal communities such as Munda, Shabar, Kolha, Jaung, Gond, Santal, Saora etc. which are living in remote hills of Jajpur district and a rich reservoir of natural resources of medicinal plants in its forests, wastelands, and grazing grounds, hedges and as agricultural weeds in crop fields. Many rural and tribal villages on the hills are without proper roads and primary health centers. They largely depend upon the ethno-botanical resources for their livelihood and primary healthcare and possess vast and important knowledge about many plants and their uses. However, traditional knowledge of plants is being constantly eroding due to urbanization and loss of traditional cultural systems. Therefore, many traditionally used medicinal species which can lead to new drug discovery may be lost in absence of proper documentation and identification. Keeping this in view, the present study was conducted with a view to identify knowledgeable resource persons and document their knowledge on the utilization of medicinal plants in the study area.

Material and Methods

Field surveys were conducted during August – September of 2014 and 2015 to collect the information on ethnomedicinal plants from the study area. The plant specimens are collected, dried, mounted on herbarium sheets and preserved for further analysis. Standard procedures were adopted for collection, preserving and identifying the specimens (Jain and Rao, 1977). Plant specimens were identified on the basis of field notes, with the help of flora of Odisha (Saxena and Brahmam, 1996), Botany of Bihar & Orissa (Haines, 1921-25), other regional floras and online literature as well as through comparison with previous authenticated herbarium specimens of Survey of Medicinal Plant Unit (SMPU) of Bhadrak and deposited in the Herbarium of the SMPU of Regional Research Institute of Unani Medicine (RRIUM), Bhadrak, Odisha, for future reference.

Data on ethnomedicinal information were collected from the rural pockets of *Tomka, Sukinda, Dalijoda, and Jajpur road forest ranges of Jajpur district* through semi-structured interviews with the local knowledgeable rural and tribal people and traditional healer '*Vaidyas'* who were familiar with traditional uses of medicinal plants. Total 41 knowledgeable people, (of which 33 are male and 8 are female, between age group 20 to 76 years), were identified and interviewed. Details for local names of the plants, parts used, ailments treated, mode of administration, curative properties, source of the information and status were recorded. Status of plant species were noted on the bases of their occurrence in the nature. The species which found frequently are considered common (C); species found after wider distance in small patches were considered scattered (S); and thinly distributed species found in a few places were noted rare (R).

Enumeration

A total of 68 ethnomedicinal plants species collected and identified are used in the study area to cure various ailments. The listing represents botanical name with family, habit, local name, locality with voucher number, part(s) used, medical efficacy claimed, mode of application with informant(s) name and occurrence (C-Common, S-Scattered, R-Rare):

Abrus precatorius L. (Fabaceae); Climber; Runjo; Amiyajhari-10416; Fruit; Hair loss; Fruits of *Abrus precatorius* L., leaves of Gritkunvari (*Aloe barbadensis* Mill.), fruit of Badi ambla *(Phyllanthus amarus* Schum. & Thonn.), leaves of Dhoob grass *(Cynodon dactylon* (L.) Pers.), leaves of Nimbu (*Citrus aurantifolia* (Christm. & Panz.) Swingle), leaves of Brahmi (*Bacopa monnieri* (L.) Pennell.), and rice (seed of *Oryza sativa* L.), all are mixed, grinded and made into paste. The paste is applied on scalp for hair loss (Smt. Mandiri Nayak/Gond) C.

Abutilon indicum (L.) Sweet. syn. *Abutilon albidum* (Willd.) Sweet (Malvaceae); Shrub; Pidpidika; Bairi-10406; Leaf; Stomacheache and jaundice; Leaves of Pirpidika are mixed with termeric powder (*Curcuma longa* L.) and made into paste. The paste is consumed for stomacheache. Powder of leaves is used for jaundice (Shri. Dhamodar Dass) C.

Achyranthes aspera L. (Amaranthaceae); Herb; Apamarango; Sukinda-10364; Whole plant; Kidney stone; Whole plant dried, burned and made into ash. Leaves of Gangosuli (*Nyctanthes arbor-tristis* L.), leaves of Basongo (*Justicia adhatoda* L.), leaves of Pasaruni (*Paederia foetida* L.), sonth (dried rizhome of *Curcuma longa* L.), leaves of pepal (*Ficus religiosa* L.), Kali mirchi (*Piper nigrum* L.), leaves of Bel patra *(Aegle marmelos* Corr.), all are soaked in water for whole night and water is filtered in next morning. One table spoon ash of Apamarang is taken with filtered water for kidney stone (Shri. Sudershan Mahnto) C.

Acorus calamus L. (Araceae); Herb; Goda-Vacha; Sansailu-10384; Rhizome; Join pain and diarrhea; About one table spoon of rhizome powder is given for joint pain. Decoction of rhizome is used for diarrhea (Shri. Sudershan Mahnto) S.

Adiantum lunulatum Burm. syn. *Adiantum philippense* L. (Adiantaceae); Herb; Chhata gass, Kachandu; Gobarghati-10393; Leaf; Skin problem (boils, eczema); Leaves of *Adiantum lunulatum* Burm, rhizome of kachi haldi *(Curcuma longa* L.), jada tel (seeds oil of *Ricinus communis* L.) are made into paste. The paste is applied topically to cure skin problem (boils and eczema) (Shri. Saro Patro) S.

Aerva lanata (L.) Juss. *ex* Schults. (Amaranthaceae); Herb; Pichhudi Sago; Ashokajhar-10367; Leaf and whole plant; Eye complaint, joint pain/joint inflammation.; Fresh leaves crushed and squeezed and the juice of crushed leaves is used as eye drop for running eye complaint. Whole plant dried and made into fine powder. One table spoon of powder is given for joint pain and joint inflammation (Shri. Palu Murmur/ Santal and Shri. Sudershan Mahnto) C.

Ageratum conyzoides L. (Asteraceae); Herb; Puru; Kuila-10349; Leaf; Cut/wound; Extraction of fresh leaves is applied on cuts and wounds for healing purpose (Shri. Kulo Ram Munda) C.

Ampelocissus latifolia (Roxb.) Planch. (Vitaceae); Climber; Kanzi; Kauliholi-10326; Leaf; Cut/wound and boil; Leaves paste is applied on cuts/wounds and boils (Smt. Jashoda Mahnto and Shri. Sudershan Mahnto) S.

Andrographis paniculata (Burm.f.) Wall. ex Nees (Acanthaceae); Herb; Bhuieneem; Rankia-10348; Whole plant; Diabetes; Decoction of whole plant is used for diabetes (Shri. Budhu Ram Munda) C.

Annona reticulata L. (Annonaceae); Tree; Atto; Kurkora-10011; Root; Boils; Paste prepared from the fresh root is use as poultice to cure boils (Shri Jayant Kumar Mishra) C.

Annona squamosa L. (Annonaceae); Tree; Atto, Badhal; Burudisahi-10317; Root and Leaf; Snake bite, skin problem (itching, boils) and wound; Root paste is applied on snake bite. Extraction of fresh leaves is topically applied on wounds and skin problem (itching and boil) as antiseptic (Smt. Arti Patra and Shri Jayant Kumar Mishra) C.

Arisaema tortousum (Wall.) Schott. (Araceae); Herb; Ulo; Saruabilli-10318; Bulb; Bloody dysentery; Boiled bulbs of plant are consumed by local people to stop bloody dysentery (Smt. Kunti Mahnto) S.

Atylosia scarabaeoides Benth. (Fabaceae); Climber; Bankulthi; Gobarghati-10473; Seed; Kidney stone; Decoction of seeds is taken for kidney stone (Shri. Sudershan Mahnto) C.

Bacopa monnieri (L.) Pennell. (Scrophulariaceae); Herb; Brahmi; Gobarghati-10394; Leaf and whole plant; Headache and to increase memmory; Leaves of Brahmi (*Bacopa monnieri* (L.) Pennell.), leaves of Nimbu (*Citrus aurantifolia* (Christm. & Panz.) Swingle), Dhoob grass (*Cynodon dactylon* (L.) Pers.), Mehandi leaves *(Lawsonia inermis* L.), Gritkunvari leaves (*Aloe barbadensis* Mill.) and rice (seed of *Oryza sativa* L.), all are mixed and made into paste and the paste is applied for headache. Whole plant cooked with cow ghee and consumed to increase the memmory (Shri. Saro Patro and Shri. Sudershan Mahnto) S.

Bryophyllum calycinum Salisb. syn. *Kalanchoe pinnata* Pers. (Crassulaceae); Herb; Amarpoi; Mirgichara-10396; Leaf; Dysentery; Leaves powder of the plant is mixed with fruit powder of kali mirchi (*Piper nigrum* L.); about one table spoon is given to cure dysentery (Shri. Niranjan/ Munda) C.

Calotropis gigantea R. Br. (Asclepiadaceae); Shrub; Ark; Raighati-10314; Leaf; Joint pain; Warmed leaves are applied on painful joint to get relief (Shri. Ratan Chhatar/Munda) C.

Cardiospermum helicacabum L. (Sapindaceae); Climber; Bishpatka; Bairi-10410; Leaf; Boils; Leaves paste is used for boils and on the scalp of children for suppuration (Sh. Dhamodar Dass) C.

Cassia tora L. (Caesalpiniaceae); Shrub; Chakundi; Raighati-10313; Leaf and whole plant; Eczema, diabetes and diarrhea; Leaves are made into paste and the paste is fixed with thin cloth on affected part of eczema daily till cured. Young plant is consumed as vegetable by diabetic patient to control the blood sugar. Leaves extract is used to cure diarrhea (Shri. Ratan Chhatar/Munda and Shri. Sudershan Mahnto) C.

Centella asiatica (L.) Urban (Apiaceae); Herb; Thalkudi; Kushi-10007; Whole plant, leaf, and root; Fever, brain tonic, dysentery and wounds; Decoction of whole plant is used for fever and as brain tonic. Leaves extraction is taken to cure dysentery. Paste of leaves and root is applied on wounds to kill germs (Shri. Surat Malik and Shri Ratana Kaurdass) S.

Chloroxylon swietiana DC. (Rutaceae); Tree; Bheru; Khodihudi-10327; Bark; Wound; Paste of bark is used as antiseptic on wounds (Smt. Jashoda Mahnto) S.

Chromolaena odorata (L.) King. & Robins. (Asteraceae); Herb; Poksunga, Gandhuri; Kurkora-10016; Leaf; Skin problem (acne) and cuts; Fresh leaves paste is used to cure skin problem (acne). Extraction of fresh leaves used on cuts to stop bleeding (Shri. Mangal Mohan Jaung/Jaung and Shri Bikari Charan Dass) C.

Cissampelos pareira L. (Menispermaceae); Climber; Akalbindi; Kunsai-10412; Root; Dysentery; Roots paste is used for dysentery (Shri. Mangal Mohan Jaung/ Jaung) S.

Cleome viscosa L. (Capparidaceae); Herb; Janglisarson; Gobarghati-10475; Fruit; Malaria; About one table spoon fruit powder of the plant is given to cure malaria (Shri. Sudershan Mahnto) C.

Clitoria ternatea L. (Fabaceae); Climber; Aparajita; Kushi-10004; Leaf; Skin problem (scabies and itching), swelling; Leaves paste is applied for skin problem (scabies and itching). Leaves are grinded into paste with water and applied on swelling (Shri. Ratan Chhatar/Munda and Shri Ratana Kaurdass) C.

Corchorus capsularis L. (Tiliaceae); Herb; Naudita; Kalakundiya-10390; Leaf; Boils; Leaves paste is applied to cure boils (Shri. Roymuni Mahnto and Shri. Ram Dass/Besara) C.

Cheilocostus speciosus (J.Koenig) C.D.Specht syn *Costus speciosus* (J.Koenig) Sm; (Costaceae); Herb; Keokonda, Ban makka; Satmano-10420; Rhizome; Joint pain; Paste of rhizome is applied for joint pain (Shri. Mohan Dass) S.

Croton bonplandianus Baill. syn. *Croton sparsiflorus* Morong. (Euphorbiaceae); Herb; Banmirich; Ashokajhar-10374; Latex; Cut/wound; The latex is used on cuts and wounds for healing (Shri. Palu Murmur/Santal) C.

Cymbopogon citratus (DC.) Stapf. (Poaceae); Herb; Dhanastri; Ponasia-10378; Leaf; Veterinary use (Stomachache); Leaves are given to domestic animal for stomachache (Shri. Bejanti Murmur/Santal) C.

Datura metel L. syn. *Datura fastuosa* L. (Solanaceae); Herb; Koda Dudura; Kurkora-10015; Leaf; Joint pain, boils and sores; Leaves paste is applied for joint pain. Extract of leaves is used on boils and sores (Shri Bikari Charan Dass and Shri. Budhu Ram/Munda) C.

Dioscorea bulbifera L. (Dioscoreaceae); Climber; Pita Allu; Saruabilli-10320; Bulb and tuber; Stomach problem (stomachache, indigestion, gastric problem) and cut/wound; Bulb of the plant is cooked and consumed for all type of stomach problem (stomachache, indigestion, gastric problem). Paste of tuber is applied on cuts and wounds (Smt. Kunti Mahnto and Shri. Sudershan Mahnto) S.

Dioscorea oppositifolia L. (Dioscoreaceae); Climber; Pani Aloo; Ramthenga-10328; Rhizome, tuber and leaf; Fever, stomachache and wound; Decoction of rhizome is taken internally for fever. Tuber is consumed for stomachache. Leaves paste is used as antiseptic on wound (Smt. Jashoda Mahnto) S.

Ficus hispida L.f. syn. *Ficus oppositifolia* Willd. (Moraceae); Tree; Dimuri; Raighar10430; Leaf; Skin infection; Paste of leaves is used for skin infection (Shri. Anand Kumar/Santal) S.

Gloriosa superba L. (Liliaceae); Climber; Langlangalia; Kaliapani-10298; Rhizomes; Joint pain; Rhizome crushed and boiled in mustard oil. After cooling, a lotion made and lotion is massaged on body for joint pain (Shri. Baldev Nayak) R.

Helicteres isora L. (Sterculiaceae); Shrub; Murmuri; Bondhopoli-10427; Fruit; Diarrhea and dysentry; Fruit powder is used to cure diarrhea and dysentery (Shri. Hari Dass) S.

Holarrhena pubescens (Buch. - Ham.) Wall. ex. G. Don syn. *Holarrhena antidysentrica* Wall. (Apocynaceae); Tree; Kurai; Kansa-10324; Seeds and root; Dysentery, cut/wound and boil; Seeds are made into paste. One table spoon paste is taken with one table spoon honey to cure dysentery in children. Roots paste is applied to cure cuts/wounds and boils (Shri. Vipro Deori) C.

Justicia adhatoda L. (Acanthaceae) syn. *Adhatoda zeylanica* Medik.; Shrub; Basang; Ashokajhar-10368; Leaf and stem; Dysentery, skin infections, cough and fever; About 20 ml extraction of leaves is used to cure dysentery. Young leaves are made into paste and applied as poultice for skin infections. Decoction of leaves and stem are used for curing cough and fever (Shri. Palu Murmur/ Santal and Shri Jayant Kumar Mishra) C.

Leucas cephalotes (Roth) Spreng. syn. *Phlomis cephalotes* Roth. (Lamiaceae); Herb; Gaso; Tomka-10307; Whole plant; Snake bite; Whole plant is dried in shade and made into powder. One table spoon of powder is given for snake bite with one glass of water for 7 days (Shri. Kumar Pradhan/Gond) C.

Limonia acidissima L. syn. *Feronia elephantum* Corr. (Rutaceae); Tree; Kaitho; Jauranasahi-10360; Fruit; Dysentery; Fruit pulp is consumed to cure dysentery (Smt. Nagi Machhi/Santal) C.

Mallotus philippensis (Lam.) Muell. - Arg. (Euphorbiaceae); Tree; Sinduri; Naya Bagopatiya-10337; Fruit; Vermifuge, skin problem (ring worm, scabies, burn); Decoction of fruit is used as vermifuge. Fruits crushed and mixed with coconut oil and applied externally for treatment of skin problem such as ringworm, scabies and burn (Shri. Sudershan Mahnto and Smt. Kunti Mahnto) S.

Martynia annua L. (Martyniaceae); Herb; Baghnakha, Gomukhi; Singhapur-10458; Fruit; Joint pain; Fruits paste is applied for joint pain. Fruit boiled in mustad oil and the oil is massaged for joint pain (Shri. Vipro Deori) C.

Mimusops elengi L. (Sapotaceae); Tree; Boalosree; Snakebite; Poichandia-10018; Stem bark; Paste of stem bark of *Mimusops elengi* L. and stem bark of *Ficus religiosa* L. is applied on snakebite (Shri Naranjan Dass) S.

Murraya koenigii (L.) Spreng. (Rutaceae); Shrub; Bhursunga; Barabati-10470; Leaf; Stomach problem (Diarrhea, dysentery and indigestion); Leaves are cooked with local dishes to cure all type of stomach problem such as diarrhea, dysentery and indigestion (Shri. Surender/Munda and Shri. Sudershan Mahnto) C.

Nyctanthes arbor-tristis L. (Oleaceae); Gangosuli/Harsingar/Saringar; Shrub; Kushi-10008; Leaf; Fever and dysentery, common cold and cough; About 10-20 ml leaves extraction is given daily for three days to cure fever. Leaves decoction is used for dysentery. Three to five leaves of *Nyctanthes arbor-tristis* L.and 2-3 black pepper seeds are boiled in one glass of water till half left. The decoction is given for common cold and cough (Shri. Jeevan Ram and Shri Narender) S.

Ocium canum Sims. (Lamiaceae); Herb; Bantulsi/Gandhtulsi; Kushi-9997; Leaf; Boil and Dysentery; Fresh leaves paste is used on boils. Decoction of leaves is given for dysentery (Shri K.C. Jaina) C.

Oxalis corniculata L. (Oxalidaceae); Herb; Sunsuniya; Kushi-9996; Whole Plant, Leaf; Indigestion and wound; Whole plant is consumed in raw form for indigestion. Leaves juice is applied as antiseptic on wounds (Shri K.C. Jaina) C.

Paederia foetida L. syn. *Paedaria scandens* (Lour.) Merr. (Rubiaceae); Climber; Pasaruni; Balukantiya-10391; Leaf; Joint pain; About 10 ml extraction of leaves is given for joint pain for two times in a day morning/evening (Shri. Ram Dass/ Besara) R.

Pergularia daemia (Forssk.) Chiov. syn. *Asclepias daemia* Forssk. (Asclepiadaceae); Climber; Utradi; Talapatia-10387; Latex and whole plant; Boils and joint pain; Latex of plant is applied on skin topically to cure boils. Whole plant is made into paste with jada oil (seed oil of *Ricinus communis* L.) and the paste is applied for joint pain (Shri. Pratap Mahnto and Shri. Ram Dass/Besara) C.

Phyllanthus fraternus Webster (Euphorbiaceae); Herb; Bhuiamla; Kushi-9999; Leaf, whole plant and Fruit; Jaundice, diabetes, wounds, sores and leucorrhoea; The fresh leaves are grinded into paste. This paste is made into a tablet which is swelled in the morning with one glass of water to cure jaundice. Whole plant is kept in water for whole night and in the morning the water is drink to cure diabetes. The fruits paste is used to cure wounds and sores. Whole plant is boiled in one glass of water when half glass of water left the decoction is given to treat leucorrhoea (Shri. K.C. Jaina, Shri. Mongu Champia Munda and Shri. Sudershan Mahnto) C.

Phyllanthus reticulatus Poir. syn. *Kirginelia reticulata* (Poir.) Baill. (Euphorbiaceae); Shrub; Janju; Kushi-10009; Stem; Diarrhea; Decoction of stem is given to cure diarrhea (Shri Narender) C.

Physalis minima L. syn. *Physalis indica* Lamk (Solanaceae); Herb; Phutka; Mirgichara-10397; Leaf; Fever; Leaves extraction is used to cure fever (Shri. Niranjan/Munda) C.

Plumbago zeylanica L. (Plumbaginaceae); Herb; Rangchita; Ponasia-10379; Root; Rheumatoid arthritis and wound/cut; Dried roots are grinded into powder and about 10-15 gm powder are given for rheumatoid arthritis. A handful of roots made into paste and applied to heal on cuts and wounds (Smt. Bejanti Murmur/ Santal and Smt. Nagi Machhi/Santal) S.

Rauvolfia serpentina (L.) Benth. Ex Kurz. (Apocynaceae); Shrub; Patalgaruda; Burudisahi-10316; Root; Snake bite and stomachache; Fresh roots are made into paste and paste is feed slowly to the patient for snake bite. Extraction of fresh roots is used for stomachache (Shri. Sudershan Mahnto) R.

Rauvolfia tetraphylla L. (Apocynaceae); Shrub; Patalgrud; Tomka-10306; Leaf and root; Stomachache; About 8-10 ml extraction of fresh leaves and roots is used for stomachache (Shri. Kumar Pradhan/Gond) S.

Sida acuta Burm.f. (Malvaceae); Herb; Bajramuli; Kushi-10006; Leaf; Gastric problem, fever and wound; A handful of leaves are boiled with full glass of water, when half glass of water left, the decoction is used for gastric problem and fever. Paste of leaves applied on wounds for quick healing (Shri. Surender Kumar Tiria and Shri Ratana Kaurdass) C.

Streblus asper Lour. (Moraceae); Tree; Shahda; Champajharo-10309; Leaf; Piles, diarrhea, dysentery; One table spoon of leave powder is taken with water twice in a day for piles. Decoction of leaves is used for diarrhea and dysentery (Shri.Surender Kumar Tiria and Shri. Sudershan Mahnto) C.

Strychnos nux-vomica L. (Strychnaceae); Tree; Kochila; Kurkora-10014; Leaf; Boils; Leaves paste is applied externally to cure boils (Shri Bikari Charan Dass) S.

Tephrosia purpurea (L.) Pers. (Fabaceae); Herb; Chakundo; Kaliapani-10300; Root and whole plant; Stomachache and skin problem (boils, acne); About 10 gm root powder is taken with water to get relief from stomachache. Paste of whole plant is applied to cure skin problem such as boils and acne (Shri. Baldev Nayak and Shri. Kumar Pradhan/Gond) C.

Terminalia arjuna Wight. &Arn. syn. *Pentaptera arjuna* Roxb. ex DC. (Combretaceae); Tree; Arjun; Chandia-10467; Bark; Fever; Decoction of bark is used for fever (Shri. Mangat Ram/Santal) C.

Terminalia bellirica (Gaertn.) Roxb. (Combretaceae); Tree; Baheda; Baliapal-10334; Fruit; Indigestion and piles; Dried fruit powder is used to cure indigestion and piles (Shri. Chaitan Pradhan/Gond) C.

Terminalia catappa L. (Combretaceae); Tree; Pestabadam; Darapan-10404; Bark; Dysentery; Decoction of bark is used for dysentery (Shri. Jeevan Ram) C.

Terminalia chebula Retz. (Combretaceae); Tree; Harad; Patharbondo-10330; Fruit; Stomachache and indigestion; Dried fruits of Harad *(Terminalia chebula* Retz.), Ambla *(Phyllanthus emblica* L.), and Baheda *(Terminalia bellirica* (Gaertn.) Roxb.) are taken in equal quantity, and grinded into powder. One tablespoon of powder is taken for stomachache and indigestion (Smt. Lakshmi Chatar/Munda) C.

Terminalia tomentosa (Roxb. *ex* DC.) Wight. & Arn. syn. *Terminalia alata* Heyne ex Roth (Combretaceae); Tree; Asan; Patabali-10331; Bark; Itching; Paste of bark is applied on itching (Shri. Geda Suagan/Santal) C.

Tragia involucrata L. (Euphorbiaceae); Climber; Bichati; Ashokajhar-10375; Whole plant; Cough; The whole plant mixed with wheat flour and *Roti* (bread) made of flour is consumed to cure cough (Shri. Palu Murmur/Santal) C.

Trewia nudiflora L. (Euphorbiaceae); Tree; Pithal/Jandakhai; Kalana-10461; Fruit; Wound healing; Paste of fruit is used for wound healing (Sh. Surat Malik) S.

Trichosanthes tricuspidata Lour. (Cucurbitaceae); Climber; Mahakala; Amiyajhari-10415; Leaf; Joint point; Leaves of Mahakala *(Trichosanthes tricuspidata* Lour.), leaves of Begonia (*Vitex negundo* L.), and leaves of Ark *(Calotropis gigantea* R. Br.) are mixed with jada oil (seed oil of *Ricinus communis* L.) and made into paste. The paste is applied for joint point (Smt. Mandiri Nayak/Gond) S.

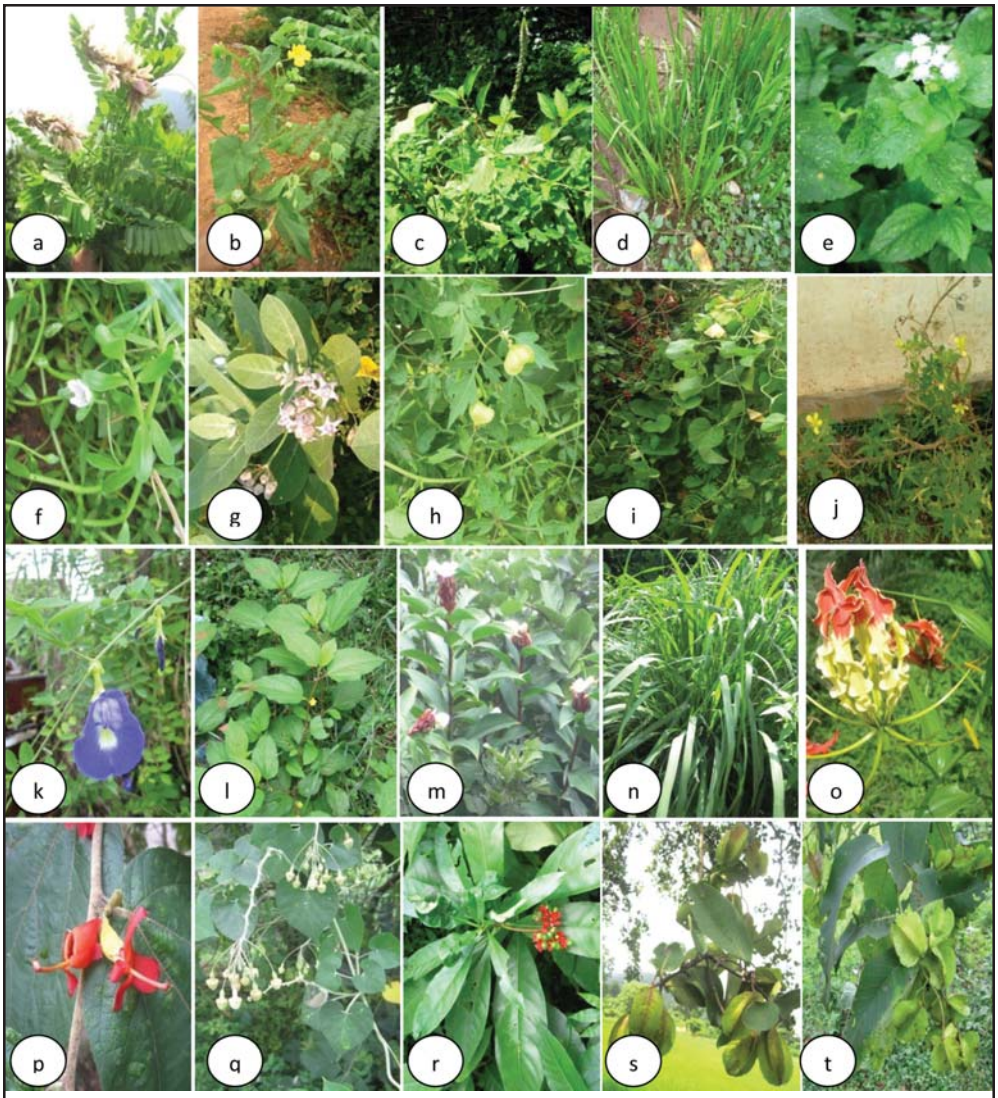
Vanda roxburghii R. Br. syn. *Vanda tessellata* (Roxb.) Hook. *ex* G. Don (Orchidaceae); Epiphyte; Madang; Patabali-10332; Whole plant; Joint pain; Fresh plant is made into paste and the paste applied for joint pain (Sh. Geda Suagan Santal) S.

Vitex negundo L. (Verbenaceae); Shrub; Begonia; Burudisahi-10315; Leaf; Joint pain, cut/wound, cold and cough; Leaves of *Vitex negundo* L. and leaves of Ark (*Calotropis gigantea* R. Br.) are made into paste. The paste is applied to cure joint pain. Fresh leaves extraction is applied for healing on cuts/wounds. Fresh leaves are boiled in water till vaporization and the vapors are inhaled to get relief from cold and cough (Smt. Arti patra, Sh. Sudershan Mahnto, and Sh. Geda Suagan/Santal) C.

Xanthium indicum Koenig syn. *Xanthium strumarium* L. (Asteraceae); Herb; Mendasiuli; Darapan-10403; Root; Eczema; Paste of root is used topically on eczema (Sh. Jeevan Ram) C.

Results and Discussion

The study area is rich with plant resources and their traditional knowledge. Most people are poor and lack the basic health care facilities. They largely depend upon the forest products for various herbal remedies. A total of 68 plant species belonging to 60 genera and 40 families were collected and are used by the rural and tribal people to cure various ailments (Figure 1). The most commonly



(a) *Abrus precatorius* L.; (b) *Abutilon indicum* (L.) Sweet.; (c) *Achyranthes aspera* L.; (d) *Acorus calamus L.*; (e) *Ageratum conyzoides* L.; (f) *Bacopa monnieri* (L.) Pennell.; (g) *Calotropis gigantea* R. Br.; (h) *Cardiospermum helicacabum* L.; (i) *Cissampelos pareira* L.; (j) *Cleome viscosa* L.; (k) *Clitoria ternatea* L.; (l) *Corchorus capsularis* L.; (m) *Costus spesiosus* (J.Koenig.) Sm.; (n) *Cymbopogon citratus* (DC.) Stapf.; (o) *Gloriosa superba* L.; (p) *Helicteres isora* L.; (q) *Pergularia daemia* (Forssk.) Chiov.; (r) *Rauvolfia serpentina* (L.) Benth. Ex Kurz.; (s) *Terminalia arjuna* Wight. &Arn.; (t) *Terminalia tomentosa (*Roxb. ex DC) Wight. & Arn.

Figure 1 (a-t): Some ethnomedicinal plants of Jajpur Forests

represented families are Euphorbiaceae (6 sps.), Combretaceae (5 sps.), Fabaceae (4 sps.), Apocynaceae, Asteraceae, Rutaceae (3 sps. each), Acanthaceae, Amaranthaceae, Araceae, Asclepiadaceae, Dioscoreaceae, Lamiaceae, Malvaceae, Moraceae, Solanaceae, Annonaceae (2 sps. each). Rest of the families are represented by one species each. The results of growth form analysis of medicinal plants showed that herbs made up the highest proportion with 26 species followed by trees (16 sps), climbers (13 sps), shrubs (12 sps.) and epiphyte (1 sps.) (Figure 2). A diverse use of these medicinal plants has been identified for the treatment of various diseases; among these, highest recorded number of species are used for Joint pain (12 sps.), followed by boil, dysentery (11 sps. each), wound (10 sps.), cuts (8 sps.), stomachache (7 sps.), diarrhea (6 sps.), fever (5 sps.), indigestion, snake bite (4 sps. each), cough, diabetes, eczema, itching (3 sps. each), brain tonic, cold, gastric problem, jaundice, kidney stone, piles, scabies, sore, acne (2 sps. each), bloody dysentery, burn, eye complaint, hair loss, headache, kill lice, leucorrhoea, malaria, rheumatoid arthritis, ring worm, skin infection, swelling, vermifuge (1 sps. each). Different parts of plant are used widely to treat these health problems included root, stem, leaves, latex, seeds etc. The most commonly used plant parts for herbal preparations are leaves (32 sps.) followed by whole plant (14 sps.), fruit, root (10 sps. each), bark (5 sps.), rhizome (4 sps.), bulb, latex, seed, tuber (2 sps. each) and stem (1 sps.) (Figure 3). Herbal remedies have been prepared by various methods. Most of them are prepared in paste form (34 sps.) followed by decoction (14 sps.), extraction (14 sps.), powder (12 sps.), juice (2 sps.), ash, lotion, vaporous (one sps. each). Some species are used in cooked form and consumed to cure the ailment (e.g *Arisaema tortousum* (Wall.) Schott., *Bacopa monnieri* (L.) Pennell., *Cassia tora* L., *Dioscorea bulbifera* L., *D. oppositifolia* L., *Tragia involucrata* L.). The preparation and application method of herbal medicine

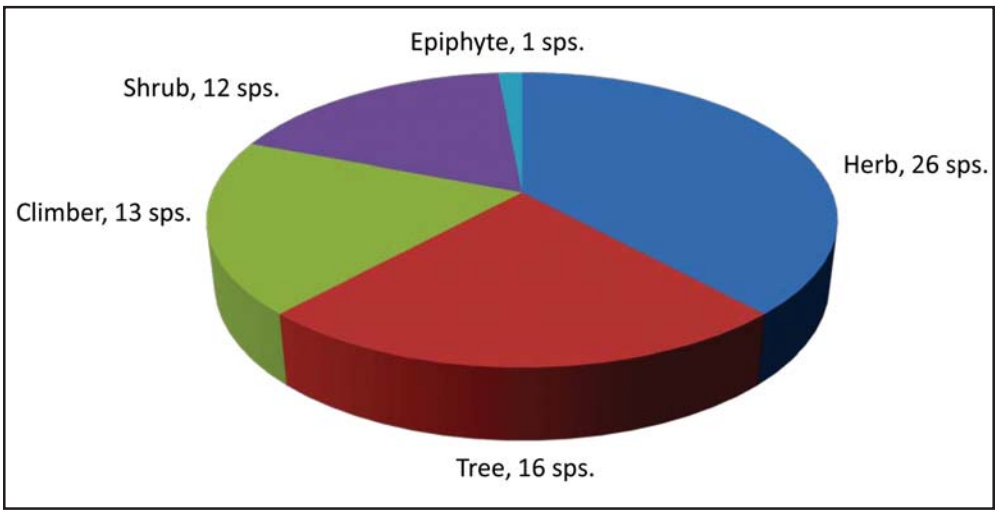


Figure 2: Pie diagram showing habit of different plant species

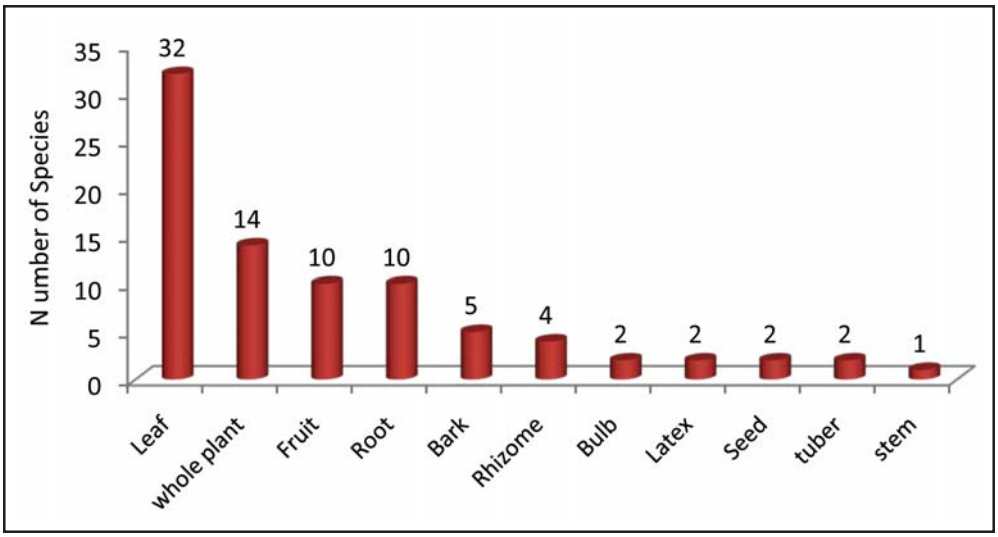


Figure 3: Different plant parts used for herbal medicine preparation

varies and is based on the type of disease treated e.g. diseases such as dysentery, stomachache, diarrhoea, fever, indigestion, diabetes, jaundice, kidney stone, leucorrhoea, malaria etc. are mostly treated by oral administration in form of decoction, powder, juice, extraction etc. Paste and lotion mostly used topically for joint pain, wound, cuts, eczema, itching, scabies, sore, acne, headache, ring worm, skin infection etc. Leaves of *Oxalis corniculata* L. and fruit pulp of *Limonia acidissima* L. are consumed in raw form to cure disease and warm leaves of *Calotropis gigantea* R. Br. directly applied for joints pain. Generally fresh plant parts are preferred to prepare the paste, extraction, decoction, and juice, however, to prepare powder mostly the plant parts are collected, dried and preserved for future use. Herbal medicines prescribed by local healers are either the preparations based on single plant part or some times a combination of several plant parts are used to cures diseases rapidly; e.g. *Abrus precatorius* L., *Abutilon indicum* (L.) Sweet., *Achyranthes aspera* L., *Adiantum lunulatum* Burm., *Bacopa monnieri* (L.) Pennell., *Bryophyllum calycinum* Salisb., *Mimusops elengi* L., *Pergularia daemia* (Forssk.) Chiov., *Terminalia chebula* Retz., *Trichosanthes tricuspidata* Lour., *Vitex negundo* L etc. are used in combination of many plant parts of different species. Comparing the present data on folk medicines with previous published literature (Ali *et al*., 2010; Aminuddin *et al*., 2013; Aminuddin and Girach, 1996; Anonymous, 2001; Behera *et al*., 2006, 2008; Brahmam. & Saxena, 1990; Devi *et al*., 2014a & 2014b; Dhal *et al*., 2014; Girach *et al*., 2008; Girach *et al*., 2011; Jain, 1991; Kandari *et al.,* 2012; Mallik *et al*., 2012; Mukesh *et al*., 2011, 2012; Mukesh *et al*., 2014a & 2014b; Murty *et al*., 1997; Panda, and Das, 1999; Panda *et al*., 2013; Pandey and Rout, 2006; Patra *et al*., 2014; Prusti, 1998; Raut *et al*., 2013; Rout *et al*, 2009a & 2009b; Sahu *et al*., 2010, 2013a & 2013b; Sarkar *et al*., 1999; Satapathy, 2010, 2015; Satapathy and

Brahmam, 1999; Satapathy & Chand, 2003; and Satapathy, *et al*., 2012), it is found that most of the folk medicinal plants recorded from the study area are either new or less known. However, their mode of administration, ingredients and parts used are sometimes different. Therefore, present study represents the contemporary uses of medicinal plants in the study area. The data presented contribute material for the discovery of new drugs of plant origin.

During the study it has been also observed that traditional knowledge of plants in many tribal and rural communities of the area is changing because of rapid urbanization, socio-economic and cultural changes. In the present study 41 resources people (33 male and 8 female) were identified who possessed good knowledge of herbal therapy. However, it has been observed that the tradition knowledge is mostly confined with the older people above age 50 years (Figure 4). The questionnaires data indicated that the number of people with sound knowledge of herbal drugs is declining due to lack of interest among the younger generation as well as their tendency to migrate to cities for lucrative jobs, therefore, and there is a possibility of losing this ancient wealth of knowledge in the near future. As indigenous knowledge of medicinal plants is transmitted orally from one generation to next generation orally without any manuscript, hence the documentation of this valuable wealth will help to preserve it for future use. Moreover, local people are largely dependent on wild plants for herbal preparations but unsustainable collection of many medicinal plants has placed them in threatened and vulnerable categories. Many mountainous regions of Jajpur forests such as Sukinda and Tomka hills are rich plant resources but with the shrinking of the forests especially due to degradation of the forest areas, mining activities, industrialization and over-exploitation, their occurrence has been badly affected. Analyzing the distribution status in the study area, it is revealed

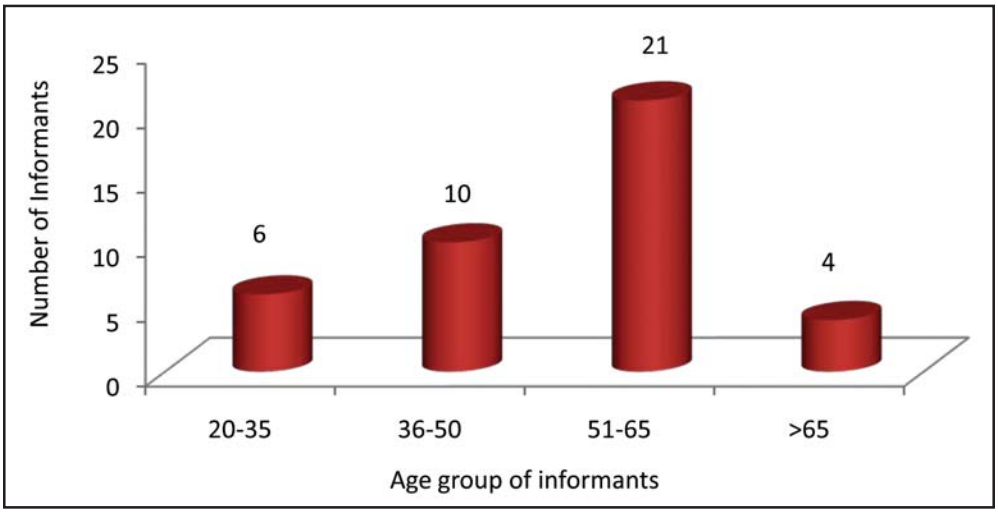


Figure 4: Demography of informants of different age group

that majority of species are common (43 sps.) followed by scattered (22 sps.) and rare (3 sps.). Most of the common species are found in vicinity of the villages and are easily available for herbal preparation. However, some species are scattered and occurred at distance in few patches. The over-exploitation and unscientific extraction of these species could lead their scarcity in nature for future use. Three species such as *Gloriosa superba, Rauvolfia serpentina, Paederia foetida* are thinly distributed in the study area and are considered rare. *Gloriosa superba and Rauvolfia serpentina* are also in endangered category at state level (Ved *et al*., 2008). However, these species are largely extracted for herbal preparations, so diversity and distribution of these rare and endangered species and their traditional knowledge needs to be tapped and preserved for future use. Efforts must also be made to protect the medicinal plants resources by involving the local communities in their preservation and conservation before these are lost permanently. Germplasm collection, cultivation and propagation through modern agronomical techniques are suggested for these valuable species. Furthermore, the extensive field studies may also help in the discovery of new plant species and also new plant uses for health care needs.

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