Ethnomedicinal Study of Some Medicinal Plants of Boudh District, Odisha

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Abstract

An ethnobotanical survey was undertaken to collect information on the use of ethnomedicinal plants in Boudh district of Odisha state in March, 2017. The exploration revealed folk use of 65 species of plants distributed in 64 genera belonging to 35 families to treat various ailments. The indigenous knowledge of local traditional healers and the native plants used for medicinal purposes were collected through questionnaire and personal interviews during the field trip. In this study the most dominant family was Euphorbiaceae and leaves were most frequently used for the treatment of diseases. Maximum species were used to cure dermatological conditions. The study enriches our existing knowledge on ethnopharmacopoea of this region of Odisha state which likely will contribute significantly to develop and discover new drugs of natural origin.

Key Words: Folk medicines, Medicinal plants, Survey, Boudh, Odisha.

Introduction

The use of plants as medicine is slowly increasing in the developed world because they have minor or no side effects (Bernal *et al*., 2011; Ekor, 2013; George, 2011; Jordan *et al*., 2010). It is estimated that 80% of the population of developing countries relies on traditional medicines, mostly plant drugs, for their primary health care needs as they are easily available and cheaper (Mahmoud and Gairola, 2013; Shrestha and Dhillion, 2003; WHO., 2013). Modern pharmacopoeia still contains at least 25% drugs derived from plants (Rao *et al*., 2004).

Ethnobotany is not new to India because of its rich ethnic diversity. Jain (1991) pointed out that there are over 400 different tribal and other ethnic groups in India and traditional herbal medicines form an important part of their health care system. It is reported that in India traditional healers use 2500 plant species among them around 100 species of plants serve as regular sources of medicine (Pei, 2001). Documentation of Medicinal plants and their use by indigenous cultures is not only helpful for conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future (Ayyanar, 2012; Pei, 2001).

Odisha is endowed with quite rich plant resources in general and medicinal plants in particular. Nearly 62 different ethnic groups, inhabiting in the dense and thick tropical forest areas of Odisha state (Pattanayak *et al*., 2016). They have faith in their traditional system of health care and have their own traditional physicians who have rich and outstanding traditional knowledge and wisdom regarding plants use as their materia medica. Boudh district is one of the centrally located

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districts of Orissa. It lies between 20º22'N and 20º50'N latitudes and between 83º34'E and 84º49'E longitudes. It is bounded on the north by the districts of Sambalpur and Anugul, on the east by Anugul and Nayagarh, on the south by Nayagarh and Kandhamal and on the west by Balangir and Sonapur. Out of the Sixty-two tribal communities for the state, as many as 25 tribes are found in the district (Sahu *et al*., 2013a), where tribes such as Kondh, Gond, Saora, Kol, Binjha, Munda, etc. are predominantly inhabited in the study area. Due to less communication means, poverty, ignorance and unavailability of modern health facilities, most people especially tribal people are still forced to practice traditional medicines for their common ailments. They have their own diverse religious culture and social traditions where elders still possess good knowledge of the healing properties of local flora, acquired in the course of long experience and association with the forests.

Previously floristic and ethnobotanical study of area has been done by few workers (Behera and Nayak, 2012; Sahu, 2016; Sahu *et al*., 2013a,b&c), however, area is dominantly inhabited by various tribal and indigenous castes group which give more scope to record more and more information on traditional medicinal use of plants prevalent among the native people. Thus the aim of present exploration is to report widely used medicinal species with ethnomedicinal information with a view to contribute material to the rich herbal heritage of Odisha in an attempt to develop and discover novel plant-based pharmaceuticals.

Methodology

An ethnobotanical survey was carried out in the month of March, 2017 with a view to investigate the medicinal plants diversity and to record the folk wisdom of tribal and other rural people of the study area. The exploration was carried out in Puranakatak (Charichhak) Forest Range and Madhapur Forest Range of Harabhanga Block of Boudh Forest Division. Plant specimens were collected, pressed dried and mounted on herbarium sheets and 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 folk medicinal were gathered through questionnaire and personal interviews of reliable medicine men (Vaidhya) and other knowledgeable tribal and rural people of the study area.

Folk Medicinal Plants

The plants used by the inhabitants in the study area are arranged in alphabetic order by their scientific names. Each entry provides information on correct

botanical name, family, local name, unani name (if any), locality, voucher specimen number, part used, ailment treated and folk medicinal use(s) with mode of administration and source are given in sequence (name of tribe & other native caste group). As far as possible, the probable dosage and duration of these crude drugs are also given.

Acalypha indica L. (Euphorbiaceae); Indramarish; Kuppi; Burbi RF-10898; Leaves; Cut/wounds and scabies; Leaves paste is applied on cut, wounds and scabies (Kondh/ST).

Achyranthes aspera L. (Amaranthaceae); Apamarango; Ankumah, Khare Vazanun, Chirchita; Tooth cavity, tooth infection, fever, cuts, wound & eczema; Digsira-10949; Inflorescence and fruit; Powder of inflorescence mixed with fruit powder of Gokharu (*Tribulus terrestris* L.) in equal quantity and use as tooth powder to prevent tooth cavity and tooth infection. About 10-15 ml whole plant extraction mixed with one teaspoon honey and the remedy is taken to cure fever. Extraction of whole plant is applied on cuts, wound and eczema (Kondh/ ST & Tonla/SC).

Acorus calamus L. (Acoraceae); Jaisanda, Devosando; Waj Turki; Burbi RF-10905; Rhizome; Diarrhea, dysentery and indigestion; Decoction of rhizome is used for diarrhea, dysentery and indigestion in children (Kondh/ST).

Aegle marmelos Corr. (Rutaceae); Bel; Belgiri, Safarjal-e-Hindi; Pudoh RF-10925; Leaves; Gastric problem, diarrhea, dysentery; Leaves decoction is used for gastric problem. Fruit pulp is taken to cure diarrhea and dysentery (Kondh/ST).

Aerva lanata (L.) Juss. ex Schults. (Amaranthaceae); Pichhudi Sago; Biseributi; Kupmundia Forest-10945; Cough; Whole plant; About one teaspoon powder of whole plant is used to cure cough (Kondh/ST & Paradhan/Other villagers).

Andrographis paniculata (Burm.f.) Nees (Acanthaceae); Bhuineem; Kalmegh; Arakhapadar RF-10847; Leaves, whole plant; Vermifuge, cough, diarrhea, malarial fever, itching, blood purification, diabetes; Leaves paste is taken with water as vermifuge in empty stomach. Decoction of whole plant is used to cure cough, diarrhea and malarial fever. Leaves paste is applied for itching. Whole plant extraction or powder is used for blood purification, diabetes and malaria (Kondh/ST).

Argemone mexicana L. (Asteraceae); Nirpania; Satyanasi; Jhadarajing-10870; Seed; Iitching, wound, scabies, eczema; Seed paste with mustered oil applied for itching and wound. Root paste is applied to cure scabies and eczema (Kondh/ST).

Asparagus racemosus Willd. (Liliaceae); Gaichira, Satabari; Shaqaqul, Satawar; Kutnijharo-10856; Root; Stomachache, dyspepsia, acidity, spermatorrhea, leucorrhoea, menstruation problem, diabetes; Root paste with mishri (rock sugar)

is taken for stomachache and dyspepsia. One teaspoon root powder with cow milk is taken for dyspepsia and acidity. Root bark immersed in water for whole night and next morning paste of bark with mishri (rock sugar) taken empty stomach for spermatorrhea. Root powder of plant mixed with root powder of 'Aswaganha' (*Withania somnifera* (L.) dunal) in equal quantity and about one teaspoon is taken to cure leucorrhoea, menstruation problem and spermatorrhea problem. Roots powder of *Asparagus racemosus* Willd., Ashwagandha (*Withania somnifera* (L.) dunal), Gokharu (*Tribulus terrestris* L.), Bidonko (*Mucuna prurita* Hook.), Talmuli (*Curculigo orchioides* Gaertn.), Ambla (*Phyllanthus emblica* L.), Koilikhia (*Hygrophilla auriculata* (Schum.) Heine) mix all in equal quantity and added some mishri (rock sugar). One teaspoon of this herbal preparation taken for spermatorrhea and without mishri taken for diabetes (Tonla/SC, Kondh/ST).

Atylosia scarabaeoides (L.) Benth. (Fabaceae); Bankulthi; Arakhapadar RF -10843; Root; Diarrhea; About one table spoon of root paste is taken to cure diarrhea (Kondh/ST).

Azadirachta indica A. Juss. (Meliaceae); Nimbo; Neem; Badalasahi-10887; Leaves; Skin infection & eczema; Leaves paste is applied for skin infection and eczema (Kondh/ST).

Bixa orellana L. (Bixaceae); Kamlagundi; Biranarsinghpur Nursery -10961; Leaves; Blister, boils, eczema; Leaves paste is applied on skin problems such as blister, boils & eczema (Kondh & Tonla).

Buchanania lanzan Spreng. (Anacardiaceae) syn. *Buchanania latifolia* Roxb.; Charogachha; Chironji; Pudoh RF-10921; Seed and Gum; Cut, wounds & toothache; Seeds paste used on cut and wounds. Gum is applied for tooth ache (Jena/SC & Kondh/ST).

Butea monosperma (Lam.) Taub. syn. *Butea frondosa* Koen. ex Roxb. (Fabaceae); Marda, Bhuikakheru; Dhak, Tesu; Kupmundia Forest-10942; Flower and seed; Scabies, eczema, diarrhea, dysentery & blood pressure; Paste of flower is applied on scabies and eczema problem. About one small teaspoon seed powder is taken to cure diarrhea and dysentery. Decoction of flower is taken for blood pressure (Paradhan /Other villagers).

Butea superb Roxb. (Fabaceae); Buduli, Phalsa; Burbi RF-10906; Flower; gastric problem; Flower powder mixed with leaves powder of Belpatra (*Aegle marmelos* Corr.) and leaves powder of Neemo (*Azadirachta indica* A. Juss.) in equal quantity. One teaspoon powder is taken for gastric problem (Kondh/ST).

Capparis zeylanica L. (Capparaceae); Asadhua; Arakhapadar RF-10831; Fruit; Diabetes; Fruit powder is used for diabetes (Kondh/ST).

Careya arborea Roxb. (Lecythidaceae); Kumbhi; Kumbhi, Baukhamba; Madhapur-10888; Bark; Dysentery and skin infection; Bark decoction used to cure dysentery. Paste of bark paste is applied for skin infection (Kondh/ST).

Caryota urens L. (Arecaceae); Salpo; Pudoh RF-10929; Plant sap; General weakness and constipation; Plant sap (Toddy) is consumed to cure constipation and as a tonic for general weakness (Kondh/ST).

Centella asiatica (L.) Urban (Apiaceae); Thalkundi; Brahmi; Pudoh RF-10912; Leaves and root; Blood pressure and to increase memory; One teaspoon leaves paste with honey taken empty stomach to boost memory. Leaves powder of plant with root of Patalgarud (*Rauvolfia tetraphylla* L.) and 5-6 Black pepper (*Piper nigum* L.) powder made tablet with honey and one tablet taken for high blood pressure daily (Kondh/ST).

Chromolaena odorata (L.) King & H. Robins (Asteraceae); Poksunga; Tikirasahi-10849; Leaves; Cuts , wounds; Paste of leaves is used on cuts and wounds for healing (Sahu/Other villagers)

Chrozophora rottleri (Geiseler) A. Juss. ex Spreng. (Euphorbiaceae); Bono-chaturi; Bandigado-10852; Fruit; skin itching, rashes, swelling and joint pain; Paste of dried fruit made with water, & warms it slightly, than applied it for skin itching and rashes problem. Paste also applied on swelling & joint pain and covers it with bandage. The process is repeated till cure (Jhankar / Other villagers).

Cleistanthus collinus (Roxb.) Benth. ex Hook.f. (Euphorbiaceae); Korda; Stomach inflammation in cattle; Arakhapadar RF-10846; Leaves; Dried leaves smoke inhaled for stomach inflammation in cattle (Kondh/ST).

Clerodendrum viscosum Vent. (Verbenaceae); Bhat; Pudoh RF-10914; Leaves; Diabetes, rheumatic arthritis, blood pressure, toothache, pyorrhea; Take about 15-20 ml leaves extraction of plant and added 5-6 Black pepper seed (*Piper nigrum* L.) powder and the preparation is taken to cure diabetes. Root powder is also taken to cure rheumatic arthritis. Flower decoction is used for toothache and pyorrhea. Hat woven leaves of 'Bhat' do wear during summer to control blood pressure (Kondh/ST).

Coccinia grandis (L.) Voigt. (Cucurbitaceae); Kanduri; Adenigarh-10932; Leaves; Jaundice; About one table spoon leaves extraction is taken to cure jaundice (Kondh/ST).

Cocculus hirsutus (L.) Diels (Menispermaceae); Dahidahia/Budhbudhia; Tan, Jaljamni; Arakhapadar Reserved Forest (RF)-10829; Whole plant; Headache; Paste of whole plant is applied for headache problem (Kondh/ST).

Cryptolepis buchanani Roem & Schult. (Apocynaceae); Khirkanchan; Bandigado-10853; Root; Lactation; About 5-10 gm root paste is taken for lactation two times in a day (Jhankar/ Other villagers).

Cycas circinalis L. (Cycadaceae); Arguno; Arakhapadar RF-10835; Seed; Increase sperm count; Seed are roasted in cow ghee and made into powder. One teaspoon powder is taken to increase sperm count (Kondh/ST).

Elephantopus scaber L. (Asteraceae); Tirisira; Kathokuria-10848; Root; Headache, throat cleanses and throat infection; Root paste is applied for headache. Root extraction with honey used as throat cleanses and for throat infection two times in a day (Kondh/ST).

Eryngium foetidum L. (Apiaceae); Bandhania; Digsira-10947; Leaves; Constipation and appetizer; About 20-25 ml leaves extraction is taken for constipation. Leaves chutney is taken as an appetizer (Kondh/ST & Tonla/SC).

Euphorbia hirta L. (Euphorbiaceae); Chittakuti/Dudhi; Dudhi; Kuchupaju-10908; Whole plant; Lactation; Powder of whole plant is used to increase lactation (Kondh/ST).

Feronia elephantum Corr. (Rutaceae); Kaitho; Kaith; Kupmundia Forest-10944; Bark; Fever and health tonic; Bark is boiled in a glass of water on low flame when left half, decoction is taken to cure fever. Fruits juice is taken as a health tonic (Paradhan / Other villagers).

Gardenia gummifera L.f. (Rubiaceae); Khurdau, Khurdu, Ladur; Burbi RF-10900; Leaves; Wound healing in cattle; Leaves powder is used wound healing in cattle (Kondh/ST).

Glinus oppositifolius (L.) Aug. DC. syn. *Mollugo oppositifolia* L. (Molluginaceae); Pitagama; Kupmundia forest-10936; Whole plant; Blister, itching & scabies; Paste of whole plant is applied for skin problem such as blister, itching and scabies (Kondh/ST &Paradhan / Other villagers).

Gmelina arborea Roxb. (Verbenaceae); Gambhari; Kutigarh-10826; Root; Cough, rheumatoid arthritis and acidity; Root powder of plant mixed with root powder of Bel (*Aegle marmelos* Corr.), root powder of Phanfana (*Oroxylum indicum* (L.) Vent.) in equal quantity and one teaspoon powder is taken to cure cough, rheumatoid arthritis and acidity (Gond, Kondh/ST).

Hedyotis diffusa Willd (Rubiaceae); Surphulo; Jhadarajing-10868; Whole plant; vitiligo and jaundice; Paste of whole plant with mustered oil applied for vitiligo problem. Extraction of whole plant is used to cure jaundice problem (Kondh /ST & Bahera/ Other villagers).

Helicteres isora L. (Sterculiaceae); Murmuri; Marorphali; Pudoh RF-10911; Fruit; Body and joint pain; Fruit powder with warm mustered oil massage for body and joint pain (Kondh/ST).

Hemidesmus indicus (L.) R. Br. ex Schult (Periplocaceae); Anatmuli; Ushba-e-Hindi; Arakhapadar RF-10844; Root; Spermatorrhea and urinary infection; Root paste or decoction is taken for spermatorrhea and urinary infection (Kondh/ST).

Holarrhena pubescens (Buch. - Ham.) Wall. ex. G. Don. syn. *Holarrhenaan tidysenterica* Wall. (Apocynaceae); Kurai; Kurchi, InderjoTalkh, Tewaj; Kutigarh -10825; Seed and root; Indigestion, rheumatoid arthritis; About 10-15 gm seeds are mixed with 5-7 seeds of Black pepper (*Piper nigrum* L.) and ground into powder. One teaspoon powder is taken for indigestion. Decoction of seed with black pepper is also used for indigestion. Root decoction is used for rheumatoid arthritis (Gond/ST).

Ixora pavetta Andr. (Rubiaceae); Telkurma; Adipadar-10828; Bark; Jaundice; Bark boiled in one litter water till ¼ left. After cooling decoction is taken for jaundice (Kondh/ST).

Jatropha gossypiifolia L. (Euphorbiaceae); Lankajada; Pudoh RF-10919; Mouth ulcer, dysentery, burn, cuts, wound; Latex, seed, fruit; Latex is applied for mouth ulcer, burn, cuts and wound; Seed powder is used for dysentery. Fruit extraction or juice is applied on burn (Jena/SC & Kondh/ST).

Justicia adhatoda L. (Acanthaceae); Basongo; Suaal, Hasheeshatul, Bansa, Arusa; Kuchupaju-10909; Leaves; Cold/cough; Half cup leaves decoction of plant with 5-6 Black pepper (*Pipper nigrum* L.) powder is taken to cure cold and cough (Kondh/ST).

Lannea coromandelica (Hautt.) Merr. (Anacardiacea); Moia, Dhoka; Pudoh RF-10928; Leaves; Body pain, skin rashes bruises & cut; Leaves paste is use for body pain and skin problem such as skin rashes, bruises and cuts (Kondh/ST).

Lygodium flexuosum (L.) Sw. (Lygodiaceae); Latabari; Kutnijharo-10855; Rhizome; Dysentery and diarrhea; Rhizome paste with powder of three black pepper (*Piper nigrum* L.) is taken to cure diarrhea and dysentery (Tonla /SC)

Madhuca indica J. F. Gmel syn. *Bassia latifolia* Roxb. (Sapotaceae); Mahul; Gul-e-Chakan, Mahua; Arakhapadar RF-10834; Bark; Dysentery and diarrhea, eczema, scabies, wound healing; About 30-40 ml bark decoction of plant with one teaspoon honey is taken orally two times in a day to cure dysentery and diarrhea. Paste of bark is applied for skin problem such as eczema, scabies & wound healing (Kondh/ST).

Mallotus philippensis (Lam.) Müll. Arg. (Euphorbiaceae); Phongu, Gundi, Sinduri; Kambil, Kamel; Burbi RF-10892; Fruit red powder; Wound healing; Paste of red powder obtained from fruit is applied on wound for healing in children (Kondh/ST).

Melia azedarach L. (Meliaceae); Common; Mahaneem; Bakain; Bhimkhul-10861; Leaves; to kill lice and vermifuge; Extraction of leaves used to kill head lice. Leaves and fruit decoction is used as vermifuge (Tonla/SC & Nayak/Other villagers).

Mitragyna parvifolia (Roxb.) Korth. (Rubiaceae); Mundi, Jangli kadam; Gadimunda-10955; Root; Pimples, sore, boils; Root paste is applied to cure skin problem such as pimples, sore and boils (Kondh/ST & Tonla/SC).

Naringi crenulata (Roxb.) Nicolson (Rutaceae); Bhanta, Bamber; Burbi RF-10907; Root; Joint pain; Root decoction is used for joint pain (Kondh/ST).

Ocimum canum Sims. syn. *Ocimum americanum* L. (Lamiaceae); Nandabagudi; Bahali-10850; Seed, leaves; Eye complaint and to kill lice; Seeds are placed in eye to remove impurities such as foreign particles, to treat redness etc. Leaves paste is applied on scalp to kill lice (Jhankar / Other villagers).

Phyllanthus reticulatus Poir. syn. *Kirginelia reticulata* (Poir.) Baill. (Euphorbiaceae); Jojang; Gadimunda-10956; Leaves; Headache, cuts, wounds & sores; Leaves paste is applied for headache. Paste of leaves is applied locally to cure cuts, wounds and sores (Kondh/ST).

Plumeria rubra L. syn. *Plumeria acutifolia* Poir. (Apocynaceae); Kath champa; Pudoh RF-10924 Leaves; Vermifuge & joint pain; Leaves extraction is used as vermifuge. Leaves paste applied for joint pain (Kondh/ST).

Pterocarpus marsupium Roxb. (Fabaceae); Piasar; Bajasar, Piasal; Pudoh RF-10913; Root; joint pain; Root powder is used for joint pain (Kondh/ST).

Punica granatum L. (Punicaceae); Dalimbo; Anar; Indigestion & bloating stomach; Pudoh RF-10916; Fruit ; Unrippen fruit powder with Black pepper (*Piper nigrum*) is taken for indigestion and bloating stomach (Kondh/ST).

Santalum album L. (Santalaceae); Safed chandan; Sandal Sufaid; Biranarsinghpur Nursery-10962; Wood; Headache, wounds, sores, boils, pimples & burn; Paste of wood is applied on wounds, sores, boils, pimples burn to protect from infection and for headache (Kondh/ST)

Schleichera oleosa (Lour.) Oken. (Sapindaceae); Kusum; Kusum; Arakhapadar RF-10836; Seed; Itching; Seed oil massage for itching problem (Kondh/ST).

Shorea robusta Gaertn. (Verbenaceae); Salo; Sal; Arakhapadar RF-10841; Flower; Leucorrhoea, burn, cuts & wounds; Flower. A handful dried flower ground

into powder with 5-7 seed of Black pepper (*Piper nigrum* L.). One teaspoon of herbal preparation is taken daily to cure leucorrhoea. Resin obtained from plant used on burn, cuts and wounds (Kondh/ST).

Solanum surattense Burm.f. (Solanaceae); Bejibangan; Bahali-10851; Fruit; Cough, cold and asthma; Dried fruit paste or powder of plant is used for treatment of cough, cold and asthma (Jhankar /Other villagers).

Soymida febrifuga (Roxb.) A. Juss. (Meliaceae); Rohini; Arakhapadar RF-10830; Bark; Rheumatoid arthritis and acidity; Bark boil in about 100 ml water, when left one quarter, add one teaspoon honey. The decoction is given to cure rheumatoid arthritis and acidity (Kondh/ST).

Sphaeranthus indicus L. (Asteraceae); Indrobhita/Bonokadam/Bhuikadam/Mundi; Mundi; Arakhapadar RF-10845; Flower, Root; Boil, urinary infection, dyspepsia; Paste of flower head is applied to treat boil. Root decoction is used for urinary infection and dyspepsia (Kondh/ST).

Syzygium cumini (L.) Skeels (Myrtaceae); Jamukoli; Jamun; Digsira-10953; Bark and seed; Diarrhea, dysentery and diabetes; About one teaspoon bark powder is taken twice in a day to cure diarrhea and dysentery. About one teaspoon seed powder is taken with water in empty stomach to cure diabetes twice in a day (Kondh/ST).

Tephrosia purpurea (L.) Pers. (Fabaceae); Kulthia; Sarphoka; Root ; Stomachache; Baring-10880; About 5-6 gm root powder with 3-5 black pepper (*Piper nigrum* L.) powder is used for all type of stomachache (Kondh/ST).

Terminalia catappa L. (Combretaceae); Pestabadam; Janglibadam; Rangamatia-10933; Leaves; Skin allergy; Leaves extraction is applied for skin allergy (Kondh/ST).

Tinospora cordifolia (Willd.) Hook.f. & Thoms. (Menispermaceae); Gumbchi; Gilo; Pudoh RF-10917; Anemia, diabetes, gastric problem, joint pain, headache; Stem; Stem immersed in water for whole night in half glass of water and equal quantity of young wheat leaves extraction mixed in it. This herbal remedy is taken for anemia, diabetes, gastric and joint pain. Whole plant immersed or boiled in water on low flame. The decoction is taken for headache (Jena/SC & Kondh/ST).

Tridax procumbens L. (Asteraceae); Vishkarni; Zakhm-e-Hayat; Gadimunda-10954; Leaves; Cuts, wounds, burn, fever, cough and vermifuge; Leaves extraction is used on cuts, wounds and on burn for healing purpose. About 20 ml leaves extraction with half teaspoon honey is taken for 2-3 times in a day to cure fever, cough and as a vermifuge. About 20 ml leaves extraction mixed with half teaspoon ginger juice and half teaspoon honey and the preparation is taken to cure fever twice in a day (Kondh/ST).

Vanda tessellata (Roxb.) Hook. ex G. Don. syn. *Vanda roxburghii* R. Br. (Orchidaceae); Rasna; Bhimkhul-10860; Whole plant and leaves; joint pain, fever, bone fracture; Paste of whole plant is applied for joint pain and fever. Leaves paste is applied for bone fractures (Tonla/SC, & Nayak/ Other villagers).

Woodfordia fruticosa (L.) Kurz. (Lythraceae); Arakhapadar RF-10837; Jhatki/ Dhatuki; Gul-e-Dhawa; Root, flower; Cuts, wounds, piles, joint pain, gastric problem, diabetes; Root paste of plant is used for healing purpose on cuts and wounds. About one teaspoon root powder is taken for piles. Root powder of plant mixed with root powder of 'Hadkankdia' (*Ardisia solanacea* Roxb.) in 2:1 ratio and with cow ghee (clarified butter) powder massage for joint pain. Flower powder of plant mixed with powder of Triphala (Fruit powder of *Phyllanthus emblica* L., *Terminalia chebula* Retz. and *Terminalia bellirica* (Gaertn.) Roxb.), powder of Sonth (dried rhizome of *Zingiber officinale* Roscoe) in 2:1:1 ration and added 5-7 seed powder of Blackpepper (*Piper nigrum* L.) and one teaspoon of this herbal remedy is given for gastric and diabetic problem (Kondh/ST).

Figure 1 (i-xii): Some Ethnomedicinal Plants of Boudh District

i) *Bixa orellana* L.; ii) *Butea superb* Roxb.; iii) *Cycas circinalis* L.; iv) *Eryngium foetidum* L.; v) *Haldina cordifolia* (Roxb.) Ridsd; vi) *Ixora pavetta* Andr.; vii) *Lannea coromandelica* (Hautt.) Merr.; viii) *Madhuca indica* J. F. Gmel; ix) *Santalum album* L.; x) *Shorea robusta* Gaertn.; xi) *Soymida febrifuga* (Roxb.) A. Juss.; xii); *Tinospora cordifolia* (Willd.) Hook.f. & Thoms

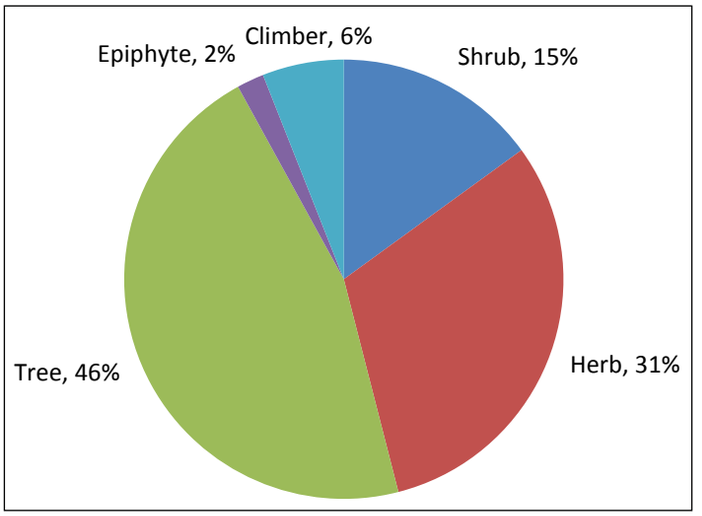

Figure 2: Showing habit pattern of different plant species

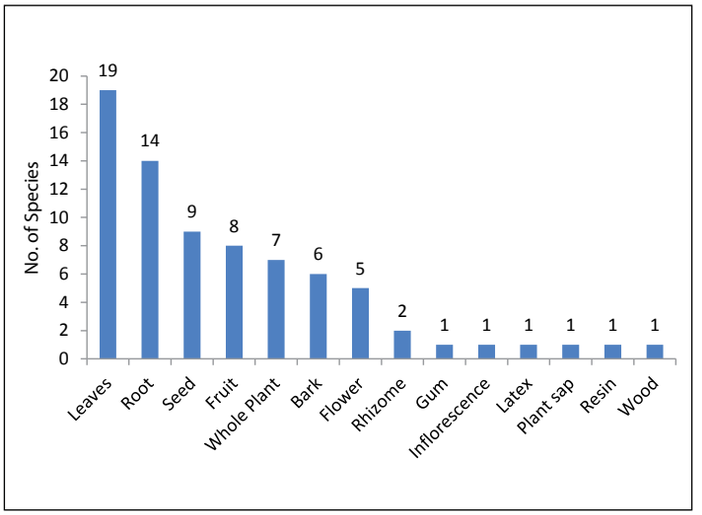

Figure 3: Different parts of medicinal plants were used for herbal preparation

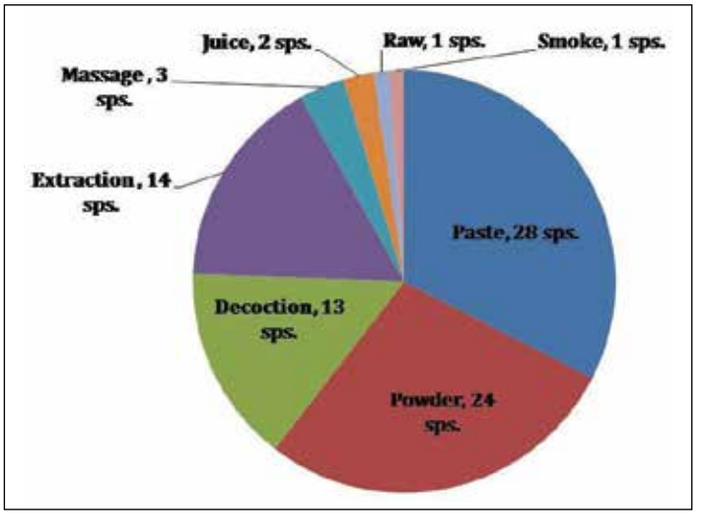

Figure 4: Method of preparation

Table 1: Ethno-medicinal plant species used to treat ailment within different ailment categories

S.No.	Ailment category	Ailment	Number of plant species to cure ailment
1.	Dermatological conditions	Eczema, scabies, wound, cut, itching burn, boil, rashes, vitiligo, skin infection, bruises, skin allergy, blister, pimples, sore, blood purification	*Acalypha indica* L., *Achyranthes aspera* L., *Andrographis paniculata* (Burm.f.) Nees, *Argemone mexicana* L., *Azadirachta indica* A. Juss., *Bixa orellana* L., *Butea monosperma* (Lam.) Taub., *Buchanania lanzan* Spreng., *Chromolaena odorata* (L.) King & H. Robins, *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng., *Careya arborea* Roxb., *Gardenia gummifera* L.f., *Glinus oppositifolius* (L.) Aug. DC., *Hedyotis diffusa* Willd, *Jatropha gossypiifolia* L., *Lannea coromandelica* (Hautt.) Merr., *Madhuca indica* J. F. Gmel, *Mallotus philippensis* (Lam.) Müll. Arg., *Mitragyna parvifolia* (Roxb.) Korth., *Phyllanthus reticulatus* Poir., *Schleichera oleosa* (Lour.) Oken., *Shorea robusta* Gaertn, *Sphaeranthus indicus* L., *Terminalia catappa* L., *Tridax procumbens* L., *Santalum album* L., *Woodfordia fruticosa* (L.) Kurz., (27 sps.).

S.No.	Ailment category	Ailment	Number of plant species to cure ailment
2.	Gastro-intestinal diseases	Indigestion. Dysentery, diarrhea, piles, gastric /acidity problem, dyspepsia, vermifuge, stomachache, bloating stomach , constipation, appetizer	*Acorus calamus* L.; *Aegle marmelos* Corr.; *Asparagus racemosus* Willd., *Atylosia scarabaeoides* (L.) *Benth..*, *Butea monosperma* (Lam.) Taub., *Butea superb* Roxb., *Careya arborea* Roxb., *Caryota urens* L., *Eryngium foetidum* L., *Gmelina arborea* Roxb., *Holarrhena pubescens* (Buch. - Ham.) Wall. ex. G. Don., *Jatropha gossypiifolia* L., *Lygodium flexuosum* (L.) Sw., *Madhuca indica* J. F. Gmel, *Melia azedarach* L., *Plumeria rubra* L., *Punica granatum* L., *Soymida febrifuga* (Roxb.) A. Juss., *Sphaeranthus indicus* L., *Syzygium cumini* (L.) *SkeelsTephrosia purpurea* (L.) Pers., *Tinospora cordifolia* (Willd.) Hook.f. & Thoms., *Tridax procumbens* L., *Woodfordia fruticosa* (L.) Kurz., *Cleistanthus collinus* (Roxb.) Benth. ex Hook.f. (26 sps.)
3.	Muscular/ skeletal	Rheumatoid arthritis, headache, joint pain, swelling, bone fracture, body pain	*Holarrhena pubescens* (Buch. - Ham.) Wall. ex. G. Don., *Gmelina arborea* Roxb., *Cocculus hirsutus* (L.) Diels, *Soymida febrifuga* (Roxb.) A. Juss., *Woodfordia fruticosa* (L.) Kurz., *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng, *Elephantopus scaber* L., *Vanda tessellata* (Roxb.) Hook. ex G. Don., *Naringi crenulata* (Roxb.) Nicolson, *Helicteres isora* L., *Pterocarpus marsupium* Roxb., *Clerodendrum viscosum* Vent., *Tinospora cordifolia* (Willd.) Hook.f. & Thoms., *Plumeria rubra* L., *Lannea coromandelica* (Hautt.) Merr., *Phyllanthus reticulatus* Poir., *Santalum album* L. (17 sps.)

S.No.	Ailment category	Ailment	Number of plant species to cure ailment
4.	Endocrine	Diabetes	*Capparis zeylanica* L., *Woodfordia fruticosa* (L.) Kurz., *Andrographis paniculata* (Burm.f.) Nees, *Asparagus racemosus* Willd., *Tinospora cordifolia* (Willd.) Hook.f. & Thoms., *Syzygium cumini* (L.) Skeels,, *Clerodendrum viscosum* Vent. (7 sps.)
5.	Respiratory	Cough, cold and asthma	*Gmelina arborea* Roxb., *Andrographis paniculata* (Burm.f.) Nees, *Solanum surattense* Burm.f., *Justicia adhatoda* L., *Aerva lanata* (L.) Juss. ex Schults., *Tridax procumbens* L. (6 sps.)
6.	Reproductive disorders	Spermatorrhea, increase sperm count, lactation, leucorrhoea, menstruation problem	*Cycas circinalis* L., *Shorea robusta* Gaertn, *Hemidesmus indicus* (L.) R. Br. ex Schult , *Cryptolepis buchanani* Roem & Schult., *Asparagus racemosus* Willd., *Euphorbia hirta* L. (6 sps.)
7.	Circulatory system	Blood pressure, anemia	*Centella asiatica* (L.) Urban, *Clerodendrum viscosum* Vent., *Tinospora cordifolia* (Willd.) Hook.f. & Thoms., *Butea monosperma* (Lam.) Taub. (4 sps.)
8.	Fever	Malarial fever, common fever	*Andrographis paniculata* (Burm.f.) Nees, *Vanda tessellata* (Roxb.) Hook. ex G. Don., *Feronia elephantum* Corr., *Achyranthes aspera* L. (4 sps.)
9.	Liver complaint	Jaundice	*Ixora pavetta* Andr., *Hedyotis diffusa* Willd, *Coccinia grandis* (L.) Voigt. (3 sps.)
10.	Dental care	Toothache, pyorrhea, tooth cavity, tooth infection	*Clerodendrum viscosum* Vent., *Buchanania lanzan* Spreng., *Achyranthes aspera* L. (3 sps.)
11.	Renal complaint	Urinary infection	*Hemidesmus indicus* (L.) R. Br. ex Schult, *Sphaeranthus indicus* L. (2 sps.)
12.	Hair care	To kill lice	*Ocimum canum* Sims., *Melia azedarach* L. (2 sps.)
13.	ENT	Throat cleanses and throat infection	*Elephantopus scaber* L. (1 sps.)
14.	Eye complaint	Eye problem	*Ocimum canum* Sims. (1 sps.)

S.No.	Ailment category	Ailment	Number of plant species to cure ailment
15.	Other use	Mouth ulcer, increase memory, General weakness, Health tonic	*Jatropha gossypiifolia* L., *Centella asiatica* (L.) Urban, *Caryota urens* L., *Feronia elephantum* Corr. (4 sps.)

Discussion

The present study makes an attempt to focus on the age old therapeutic methods currently employed by the tribal and rural people of Boudh forest division. It was found that a total 65 plant species (64 species of angiosperm and one species of pteridophyte) belonging to 35 families and 64 genera are commonly used to cure various ailments (Figure 1). Based on life forms there are 46 % tree, 31% herbs, 15 % shrub, 6% climber and 2% epiphyte (Figure 2). Most dominant family was Euphorbiaceae (7 sps. each) followed by Fabaceae & Asteraceae (5 sps. each), Rubiaceae (4 sps.), Apocynaceae, Meliaceae, Rutaceae, Verbenaceae (3 sps each). Rests of families were represented by two or one species. These plants were used to cure 58 different ailments viz. wound healing (13 sps.), dysentery, diarrhea, cuts (9 sps. each), gastric/acidity problem (8 sps.), cough, eczema (6 sps each), rheumatoid arthritis, headache, joint pain, scabies, itching (5 sps. each), indigestion, burn (4 sps.), blood pressure, boil, sore, fever , jaundice (3 each), dyspepsia, vermifuge, stomachache, constipation, appetizer, cold, leucorrhoea, spermatorrhea, lactation, body pain, rashes, skin infection, blister, pimples, urinary infection, toothache, to kill lice veterinary (2 each), piles, bloating stomach, anemia , throat cleanses and throat infection, asthma, increase sperm count, menstruation problem, swelling, bone fracture, blood purification, vitiligo, bruises, skin allergy, malarial fever, pyorrhea, tooth cavity, tooth infection , eye complaint, increase memory, mouth ulcer, general weakness, health tonic (1 sps. each). These ailments were grouped under 15 ailment categories where maximum species were used to cure dermatological conditions followed by gastro-intestinal diseases. muscular/skeletal, endocrine etc. (Table 1). Two species viz. *Cleistanthus collinus* (Roxb.) Benth. ex Hook.f. and *Gardenia gummifera* L.f. were used for veterinary use. Different plant parts were used for herbal preparation. Leaves (19 sps.) were most frequently used for the treatment of diseases followed by root (14 sps.) seed (9 sps.), fruit (8 sps) etc. (Figure 3). Use of leaves and roots for management and treatment of diseases has been an age long practice (Sofowara, 1982). The methods of preparation of herbal remedy fall into eight categories viz. plant parts applied as a paste (28 sps.), dried plant part powder (24 sps.), decoction (13 sps.), extraction (14 sps.) & juice (2 sps.) from the fresh plant parts, massage (3 sps.), one species consumed raw as chutney and smoke of one species used in veterinary (Figure 4). Hat woven leaves of *Clerodendrum viscosum* Vent. wear during summer

to control blood pressure. External applications (mostly for dermatological conditions and muscular/skeletal problem) and internal consumption (mostly for gastrointestinal, diabetes, circulatory, liver complaint etc.) of the preparations were involved in the treatment of various diseases. Herbal medicines prescribed by local healers are either the preparations based on single plant part or sometimes a combination of several plant parts were used to cures diseases rapidly e.g. *Holarrhena pubescens* (Buch. - Ham.) Wall. ex. G. Don., *Gmelina arborea* Roxb., *Shorea robusta* Gaertn., *Lygodium flexuosum* (L.) Sw., *Tephrosia purpurea* (L.) Pers., *Clerodendrum viscosum* Vent., *Woodfordia fruticosa* (L.) Kurz., *Asparagus racemosus* Willd. *Butea superb* Roxb. *Centella asiatica* (L.) Urban, *Achyranthes aspera* L., *Punica granatum* L. were included other species plant part to made herbal remedy. These remedies were also prepared using different ingredients of non-plant origin such as water, honey, clarified butter, cow milk etc.

Comparing the present study with available literature of the state and other part of country (Ambasta, 1986; Aminuddin *et al*., 2013; Aminuddin and Girach, 1991, 1993, 1996; Aminuddin and Ahmad, 2008, Anonymous, 2001 & 2006; Ayyanara and Ignacimuthu, 2005 & 2011; Behera *et al*., 2006, 2008; Das and Choudhury, 2012; Dhal *et al*., 2014; Girach, 1992; Girach *et al*., 2008; Jain, 1991; Kandari *et al*., 2012; Khongsai *et al*., 2011; Kirtikar and Basu, 1935; Majumdar *et al*., 2006; Mallik *et al*., 2012; Mukesh *et al*., 2011, 2012, 2014a&b.; Muthu *et al*., 2006; Nadkarni, 1954; Panda, and Das, 1999; Panda *et al*., 2013; Panghal *et al*., 2010; Pandey and Rout, 2006; Patra *et al*., 2014; Prusti. and Behera, 2007; Raut *et al*., 2013; Rout *et al*, 2009 a & b; Sahu *et al*., 2010, 2013a, b & c; Sarkar *et al*., 1999; Satapathy, 2010, 2015; Satapathy and Brahmam, 1999; Satapathy & Chand, 2003; Satapathy, 2010 & 2015; Satapathy, *et al*., 2012; Sinhababu and Banerjee, 2013; Usha *et al*., 2014, 2015a & b, 2016a, b & c) it has been found that most of the folk-medicinal claims reported in the present study are already known, however, their mode of application, ingredients and parts used are different. Therefore, present work represents contemporary uses of medicinal plants by the tribals of the study area. Some information recorded in the study particularly for *Clerodendrum viscosum* Vent., *Cryptolepis buchanani* Roem & Schult., *Elephantopus scaber* L., *Hedyotis diffusa* Willd., *Ixora pavetta* Andr., *Naringi crenulata* (Roxb.) Nicolson, *Tridax procumbens* L. were found to be either not known or little known, whereas use of species such as *Achyranthes aspera* L., *Acorus calamus* L., *Aegle marmelos* Corr., *Aerva lanata* (L.) Juss. ex Schults., Argemone mexicana L., Azadirachta indica A. Juss., Centella asiatica (L.) Urban, *Chromolaena odorata* (L.) King & H. Robins , *Holarrhena pubescens* (Buch. - Ham.) Wall. ex. G. Don. , *Jatropha gossypiifolia* L., *Justicia adhatoda* L., *Madhuca indica* J. F. Gmel, *Melia azedarach* L., *Tephrosia purpurea* (L.) Pers. were found to be used very common by other tribes indicating the authenticity of their usefulness. It would be worthwhile to subject all these folk-medicinal claims

to scientific investigations through pharmacological and clinical studies. It is likely that through such investigations new drugs of natural origin may be discovered for treatment of many of the diseases for which there are no satisfactory cures in modern system of medicine.

It has also been observed that a large population of the district is still largely depends on medicinal plants for primary health care system. Tribal and rural people have vast knowledge of traditional remedy and used plenty of medicinal plants to treat a wide spectrum of human ailments. During interviews conducted in different villages, it has been observed that knowledge of medicinal plants is limited to traditional healers, herbalists and elderly persons who are living in rural areas. This knowledge is rapidly dwindling in number and there is a grave danger of traditional knowledge disappearing 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 wealth of knowledge in the near future. Therefore, it is necessary to acquire and preserve this traditional system of medicine by proper documentation and identification of specimens which can also help to boost new innovations in the pharmaceutical industry and have many beneficial applications such as new medicinal trails for some diseases like malaria, diabetes, which will develop the health care sector in India.

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