An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar

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An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar

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In Partial fulfilment of the Requirement for the degree of Master of Science (Forestry) In Natural Resource Management

BY

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CERTIFICATE I

This to certify that the thesis entitled **"An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar"** submitted in partial fulfilment of the requirements for the award of the degree of **Master of Science (Forestry) in Natural Resource Management** to the Orissa University of Agriculture Technology is a faithful record of *bonafide* and original research work carried out by **Saikh Sartaj Mohammed, Adm. No.03 NRM/15** under my guidance and supervision. No part of this thesis has been submitted for any other degree or diploma.

It is further certified that the assistances and help received by him from various sources during the course of investigation has been duly acknowledged.

Bhubaneswar **(Dr. Dhirendra Kumar Nayak)**

Date: CHAIRMAN ADVISORY COMMITTEE

CERTIFICATE II

This to certify that the thesis entitled **"An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar"** submitted by **Saikh Sartaj Mohammed (Adm. No. 03NRM/15), College of Forestry** to the Orissa University of Agriculture Technology, Bhubaneswar in partial fulfilment of the requirements for the degree of **Master of Science (Forestry) in Natural Resource Management** has been approved by the students' advisory committee and the external examiner.

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Date: **SAIKH SARTAJ MOHAMMED**

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ABSTRACT

Man has used plants to alleviate suffering and disease since times immemorial. According to Charaka, the father of medicine, no plants in the world exist without some medicinal properties, with some having more properties than others. The state of Odisha is endowed with rich plant resources of more than 7000 plant species. The most commonly found species includes Neem, Teak, Mango, Bamboo, Karanj, Kangada, Piasal, Jamun, etc. Since immemorial times the tribals in the state utilize large number of plant species as herbal medicine for curing various diseases and health disorders. The present study entitled **"An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar"** attempts to explore and document the medicinal plants used to cure different diseases by the tribes residing in Bhubaneswar. The observations on medicinal plants have been recorded as per the information received from the migrated tribes residing in the slum areas of Bhubaneswar. The investigation led to the documentation of 369 medicinal plant species belonging to 267 genera and 100 families used to cure about 93 diseases / ailments. This enumeration includes a list of trees (134 species), shrubs (116 species), herbs (96 species), vines (17 species), climbers (10 species), grasses (06 species), twiners (03 species), creeper (01 species) and fern (01 species) along with their medicinal uses with the most common ailments being treated are Cold, Cough, Jaundice, Diarrhea, Piles, Fever, Malaria, Stomach disorders, Skin diseases, Cuts, Wounds, Snakebite, Scorpion sting, Insect sting, Ulcers and Asthma etc. The investigation recorded the use of 18 plant parts out of which the maximum utilization was of leaves (228 times) followed by roots (184 times), barks (128 times), seeds (91 times), fruits (90 times), flowers (87 times), whole plant (76 times), rhizomes (28 times), latex (12 times), gum (9 times), tubers (8 times), heartwoods (8 times), Resins (5 times), Pods (3 times), Shoots (3 times), Juice (twice) and Trichome (once).

INTRODUCTION

Man has used plants to alleviate suffering and disease since times immemorial. The use of medicinal plants is as old as human civilization. Medicinal plants have been the subjects of man's curiosity since time immemorial. Almost every civilization has a history of medicinal plant use. Approximately 80% of the people in the world's developing countries rely on traditional medicine for their primary health care, and about 85% of traditional medicine involves the use of plant extracts.

Indigenous people of different parts of the world have a vast knowledge of and capacity for developing innovative practices and products from their surroundings. Indigenous knowledge goes from close inter dependence between knowledge, land, environment and other aspects of culture in the indigenous societies and the oral transmission of knowledge in accordance with well understood cultural principles and rules regarding secrecy and sacredness that govern the management of knowledge.

Ethno botany broadly means, all aspects of direct relationship of plants with man, it's the study of all forms of vegetation used by aborigines. Man has been using flora and fauna since time of his emergence on this planet. He gained the knowledge of useful and harmful plants. This knowledge becomes an integral part of his culture. Studies in archaeology, paleobotany, and ethnography revealed the close relationship between plants and man. In India 2000 - 1000 BC mentions are there in Rig-Veda and Atharveda about the uses of plants. Since then man knows the importance of plants.

Ethnobotanical information on medicinal plants and their uses by indigenous cultures is useful not only for the conservation of traditional knowledge and biodiversity, but also to promote community health care, and might serve in drug development. The information can provide a guide for drug development, assuming that a plant that has been used by indigenous people over a long period of time may well have an allopathic application.

One fifth of all the plants found in India are used for medicinal purpose. The world average stands at 12.5% while India has 20% plant species of medicinal value and which are in use. Although it is difficult to estimate the total number of medicinal plants present worldwide, the fact remains true that India with rich biodiversity ranks first in per cent flora, which contain active medicinal ingredient. A total of 560 plant species of India have been included in the International Union for Conservation of Nature and Natural Resources

(IUCN) Red List of Threatened species, out of which 247 species are in the threatened category. On a global basis, the IUCN has estimated that about 12.5% of the world's vascular plants, totalling about 34000 species are under varying degrees of threat.

With about 1,100 plants species frequently being used in Indian system of healthcare and medicines for preparation of ayurvedic, unani and homeopathic drugs, India is rich in medicinal plant diversity which is distributed in different geographical, environmental conditions and associated tribal & folk knowledge systems. The tribal people mostly depend on forests for their livelihood and up to 70% of the rural population still depends on traditional medicine as a primary healthcare source. India has nearly 67.8 million tribal people belonging to 550 communities of 227 ethnic groups and they lead a nomadic life in about 5000 forested villages. The tribals contribute 8.10% of the total population of India. Each tribal community has its own social and cultural identity. In India, about 116 different dialects and 227 subsidiary dialects are spoken by tribal communities.

In India much literature, relevant to ethnobotany can be traced in the Vedic literature, Charak and Shusruta and Charak samhita appeared as the most important works. A large portion of this country was covered with forests which yielded a number of medicinal plants. These plants were initiated extensively in Ayurvedic system of medicine since many centuries.

Very little organised work had been done in the country till about thirty years ago. Organised field work and other studies in the subject were started in the Botanical Survey of India (BSI). Also there has been a resurgence of interest developed in ethnobotanical research in various institutions. Dr. E.K. Janaki Aromal initiated researches on ethnobotany in BSI. Dr. S.K. Jain from BSI started intensive field work among the tribals of Central India. He devised methodology for ethnobotany particularly in the Indian context. The publications from this group in the early sixties triggered the ethnobotanical activity in many other centres, particularly among botanists, anthropologists and medical practioners etc. in India. During the last four decades similar work has been initiated at various centres Sucn as National Botanical Research Institute (NBRI) at Lucknow, National Bureau of plant Genetic Resources (NBPGR) at Delhi, Central Council of Research in Unani Medicines (CCRUM), Central Council of Research in Ayurveda and Siddha (CCRAS) and in some other institutions.

Since the age of Ramayana and Mahabharata, the tribals occupy a putative role and the Jagannath cult of Odisha is interwoven with the tribal religion which has given genesis to

a paradigm of assimilation. The Sabaras of Odisha are the early worshipers of Lord Jagannath and till today they have been performing dominant role in the religio-cultural norms of Jagannath temple. Tribals of Odisha are known as Adivasi, Vanabasi, and Girijana.They are described as aboriginals of Odisha in Anthropological literature. The Adivasi (aborigine), Vanabasi (forest dweller) and Girijana (mountain dweller) constitute 22.13% population of Odisha.

Odisha has the third largest tribal population in India. As many as 62 tribal communities inhabit the state of Odisha and this diversity provides ample scope for ethnobiological studies. Out of 62 notified Scheduled Tribes, only 8 Scheduled Tribes are declared as Primitive Tribal Groups by the Government of India. Those tribes are Juang, Bondo Poraja, Lodha, Didayi, Mankidia, Birhor, Kharia and Soura.

Keeping in view the above facts the present investigation was done with the following objectives:

1. To document plants of medicinal values for treating various health problems.
2. To document the plant parts used to treat health problems.
3. To assess the medicinal plant biodiversity of the area with particular emphasis on trees and shrubs.

REVIEW OF LITERATURES

Murthy *et al.* (1986) carried out study on tribal remedies for snakebite from Odisha and presented an account of usage of 13 species of plant in the treatment of snakebite by the tribals of Odisha.

Das and Misra (1987) presented the ethnomedicinal use of 35 plants by the tribals of Koraput district to cure 25 diseases they suffer from, along with a note on the vegetation pattern, tribal population and geography of the district in their study entitled "some ethnomedicinal plants of Koraput district Odisha."

Mohanta *et al.* (2005) studied the ethnomedicinal plant resources of Similipal biosphere reserve, Odisha, India and documented about 29 medicinal plant species along with their local names, family, part (s) used and dosage for treatment of various diseases like malaria, snake bite, jaundice, dysentery, cold fever, ear ache, head ache, scabies, tuberculosis, and colic pain.

Pattnaik *et al.* (2006) attempted to evaluate plants used for medicare by the tribal people of Koraput district, Odisha and revealed the indigenous medicine uses of 39 plant species belonging to 37 genera and 30 famiies. These plants were used for curing a total of 23 diseases ranging from simple cuts and wounds to highly female disorders. Out of all plants, 15 were herbs followed by 10 trees, 7 climbers and shrubs. Combretaceae and Euphorbiaceae families had the more number of plants used.

Sahu *et al.* (2010) studied the potential medicinal plants used by the tribal of Deogarh district of Odisha and revealed the medicinal plants of 50 species and 49 genera belonging to 40 families, which are commonly used for various ailments of various tribes like Gonda, Munda, Kondha, etc.

Sahu and Dhal (2010) studied the floristic composition, diversity and status of threatened medicinal plants in tropical forests of Malyagiri hill ranges, Eastern Ghats, India. A total of 1063 trees belonging to 57 species were recorded from 60 sample plots. The dominant tree species found in descending order of IVI were *Shorea robusta* Gaertn.f.

(44.67), *Terminalia alata* Heyne ex Roth. (31.98), *Madhuca indica* Gmel. (17.3), *Anogeissus latifolia* (Roxb. Ex DC.) Wall.ex Guill. & Perr. (15.64), *Diospyros melanoxylon* Roxb. (13.41). They also documented 2 critically endangered, 6 endangered and 10 vulnerable medicinal plant species along with their botanical name, voucher specimen number, family, locality, local name, life form, distribution and IUCN status.

Namsa *et al.* (2011) documented 50 plants species belonging to 29 families used for treating 22 human and 4 veterinary ailments during their study of ethnobotany of the Monpa ethnic group at Arunachal Pradesh, India. Of the medicinal plants reported, the most common growth form were herbs (40%) followed by shrubs, trees, and climbers. Leaves were most frequently used plant parts.

Prakash (2011) enlisted 20 medicinal plants species belonging to 14 families along with different plant parts used for different diseases by several tribes in his survey work entitled "uses of some threatened and potential ethnomedicinal plants among the tribals of Uttar Pradesh and Uttrakhand in India".

Mohanty *et al.* (2011) studied the use of plant diversity in household and rituals by tribal people of Dhenkanal district, Odisha, India and reported 43 species comprising 21 families for household and 11 families for rituals. The most important families were Arecaceae, Euphorbiaceae, Poaceae and Fabaceae.

Survase and Raut (2011) carried out an ethnobotanical study of some tree medicinal plants in Marathwada, Maharashtra and revealed that the local people of Marathwada region were using 50 species of medicinally important plants belonging to 30 families commonly used to treat various diseases like cold, fever, cough, diarrhea, dysentery, skin diseases, toothache, indigestion, leprosy, and as an antidote for poisons and in wound healing.

Rai and Lalramnghinglova (2011) in their study entitled "Ethnomedicinal Plants of India with Special Reference to an Indo-Burma Hotspot Region: An overview" identified 304 plants from 96 families as medicinal. The family Fabaceae (25) followed by Asteraceae (16) contributed the highest number of medicinal plants.

Nath *et al.* (2011) reported 34 medicinal plant species belonging to 33 genera from 29 famiIies used by the Dimasa tribe of Barak Valley, south Assam to cure 8 types of major

diseases. Among the 29 families, family Mimosaceae, Papillionaceae, Moraceae, Menispermaceae and Lamiaceae represents the highest number of plants with 2 species each and rest 24 families represent only 1 species each.

Sahu *et al.* (2011) carried out an ethnobotanical study in the coastal districts of Odisha to document the medicinal utility of plants. They enlisted traditional uses of 46 plant species belonging to 44 genera and 32 families along with correct botanical identification, local names, parts used and mode of administration in respect to different diseases. Euphorbiaceae was the most dominant family (5 species) followed by Combretaceae (3 species), Fabaceae, Acanthaceae, Rubiaceae (2 species each). The documented ethnomedicinal plants were mostly used to cure skin diseases, diarrhoea, jaundice, piles and urinary troubles.

Khan *et al.* (2012) enlisted a total of 56 medicinal plant species belonging to 36 families in their ethnobotanical study about medicinal plants of Poonch valley Azad Kashmir. The study revealed that Acanthaceae, Asteraceae, Lamiaceace, Liliaceae, Ranunculaceae and Verbenaceae were the families most frequently present in study area, while Brassicaceae, Caesalpinaceae, Mimosoideae and Cyperaceae were almost absent. The uses of the recorded species related to minor ailments mainly those of the urinary tract infection (UTI) and kidney stone (13 species), diarrhoea (12 species), respiratory disorder (10 species), Asthma (9 species) and rheumatic (6 species).

Mallik *et al.* (2012) studied the traditional herbal practices by the Ethnic People of Kalahandi district of Odisha, India and reported the uses of parts of 111 plant species belonging to 105 genera of 59 families, against 68 human ailments, diarrhea, dysentery, scabies, tiny worm, hook worm, gastrointestinal disorders, venereal disease, gynae disorders, gingivitis, rheumatism, joint pains, wounds, cut injuries, climacteric troubles, ear diseases, acute eye infections, foot inflammation, foot crack and eczema, particularly.

Raut *et al.* (2012) conducted an ethnobotanical survey of medicinal Plants in Semiliguda block of Koraput district, Odisha, India that revealed a wealth of traditional knowledge on medicinal plants and their uses amongst the local Godaba healers. The study included 50 species with most dominant family being Euphorbiaceae and Myrtaceae. New records of plants that were locally used *viz. Caryota urens, Curcuma montana Cardiospermum helicacabum, Sansiveria roxiburghiana, Atylosia scarabaeoide, Argyreia*

Speciosa, Chenopodium ambrosioides, Euphorbia tirucalli L. *Pongamia glabra, Sesbania grandiflora, Stephania hernandifolia, Elephantopus scaber, Acorus calamus* L. and *Lawsonia inermis* confirmed that the medical ethnobotany of Semiliguda block was earlier incompletely recorded.

Abe *et al.* (2012) carried out an ethnobotanical study of medicinal plants and traditional therapies on Batan Island, the Philippines and described the therapeutic effects of 112 plant species used medicinally against 13 categories of ailments. The highest ICF value (1.00) was cited for diseases of the ear and respiratory system and for use during pregnancy, childbirth and the postnatal period. The maximum FL of 100% was found for *Carica papaya*, *Stachytarpheta jamaicensis*, *Musa sapientum*, and *Pedilanthus tithymaloides*, used for the treatment of constipation, cuts and wounds, diarrhea, and dislocations and fractures, respectively. The highest UV was for *Hibiscus rosa-sinensis* (0.67). All plants with high UV were used for exogenous diseases, certain infectious and parasitic diseases, injuries, poisonings and other consequences of external factors, and diseases of the skin and subcutaneous tissues. In addition to its use for endogenous disease and lifestyle-related diseases and illnesses, *Moringa oleifera* was also used for diseases of the circulatory system, with a UV of 0.57 and *Cocos nucifera* was used for diseases of the genitourinary system, with a UV of 0.56.

Panda *et al.* (2012) studied the ethnomedicinal uses and anti-diarrheal properties of medicinal plants used by the tribal people of District Mayurbhanj, Odisha, India. Aqueous and methanol extracts of 72 plants were tested for antibacterial activity using agar well diffusion (sample concentration of 100 mg/ml) against eight pathogenic bacteria responsible for diarrheal diseases. The results indicated that out of 77 plants species, 47 species exhibited antibacterial activity against one or more test organisms. Out of 168 extracts, 54 methanolic and 43 aqueous extracts expressed antibacterial properties. Nineteen plants were newly reported to have ethnomedicinal uses to treat diarrheal diseases. Among these, *Bombax ceiba, Buchanania lanzan, Butea superba*, *Coccinia grandis, Curculigo orchioides, Eleutherine bulbosa, Ficus racemosa, Flemingia nana, Helicteres isora, Lannea coromandelica, Mesua ferrea, Semecarpus anacardium* and *Smilax zeylanica* experimentally proved to inhibit the diarrhea causing bacteria.

Singh (2012) based on the findings of ethnobotanical surveys conducted in the entire Lahaul-Spiti region of Indian western Himalaya revealed the use of 86 medicinal plant species belonging to 69 genera and 34 families to cure about 70 different ailments by the native people. Maximum number of plant species used in herbal formulations belonged to families Asteraceae, Apiaceae, Gentianaceae and Polygonaceae.

Alagesaboopathi (2012) reported 44 medicinal plant species belonging to 40 genera and 28 families of angiosperms used for the treatment of various illness by the tribes of Sirumalai hills of Eastern Ghats, Dindigul district of Tamil Nadu.

Ranganathan *et al.* (2012) made an ethnobotanical survey on the utilization of medicinal plants among the people of selected six villages from Jawadhu hills, in Tamil Nadu. A total of 25 medicinal plant species representing 25 angiospermic plant families used by Malayalis in their day-to-day life to cure various diseases was documented. The common diseases treated were diarrhoea, dysentery, whooping cough and malaria.

Gritto *et al.* (2012) conducted an ethnomedicinal survey of threatened plants in Panchamalai hills of Tiruchirappalli district in Tamil Nadu and reported 15 species belonging to 15 different families used to cure 20 diseases in local health traditions such as asthma, ulcers, diarrhea, indigestion, hemorrhage, stomach troubles, skin diseases, heart diseases, etc.

Johnsy *et al.* (2012) studied the indigenous knowledge of medicinal plants used for the treatment of skin diseases by the Kaani tribe of Kanyakumari district in Tamil Nadu and documented 55 medicinal plant species belonging to 38 families of which Fabaceae contributed maximum of five species. For curing the skin disease, the use of aboveground plant parts were found to be higher (83.33%) than the underground plant parts (16.67%). Of the aboveground plant parts, leaves were used in the majority of cases (19 species), followed by whole plants (11 species).

Padal and Raju (2013) documented the traditional uses of 50 plant species belonging to 41 genera and 27 families along with correct botanical identification, local names, parts used and mode of administration in respect to different diseases in their study titled "ethnomedicinal plants used by tribals of Rayagadda district, Odisha state, India." The documented ethno-medicinal plants were mostly used to cure sciatica, bone fracture, asthma, rheumatism, hiccups, galactogauge, jaundice, boils, skin disease, centipede bite, wounds,

snake bite, anthelmintic, headache, anemia, gonorrhea, vigour and vitality, ear pain, dysentery, fertility, chicken pox, tooth decay, etc.

Sharma and Kumar (2013) listed several medicinal plants with their uses by some tribals of Rajasthan in their review work titled "traditional medicinal plants of Rajasthan used in tribal medicine: a review."

Gireesha and Raju (2013) carried out an ethnobotonical survey of plants species in Biligiri Rangana hills (BR hills) of Chamarajanagar district, Karnataka, India. This survey revealed some of the important medicinal plants used by the tribes and local practioners for their health care practices. Around 38 medicianl plant species belongs to 26 families, in which 17 species of herbs (45%), 10 trees (26 %), 9 shrubs (24 %) and the 2 climbers (5%) were identified and documented. Among the recorded, 10 species belonging to 9 families were categorized as highly prioritized due to their potentiality in curing various diseases and gradually these species are at the verge of extinction due to its over exploitation, encroachment of their natural habitat etc.

Hassan *et al.* (2013) discussed the ethno medicinal use of 24 plant species belonging to 15 families and 24 genera along with their vernacular name and part/parts used to cure various diseases in their research article titled "an ethnobotanical study in Budgam district of Kashmir valley: an attempt to explore and document traditional knowledge of the area." The maximum number of species (5 species) belonged to family Lamiaceae followed by family Asteraceae with 4 species. The 24 plant species belonged to different plant groups, of which 21 species were dicotyledons, 2 monocotyledons and 1 pteriodophyte.

Xavier *et al.* (2013) carried out the ethnobotanical study of Kani tribes in Thoduhills of Kerala, South India and documented a total of 35 medicinal plant species belonging to 28 families and 34 genera that were used to treat various diseases and ailments grouped under 14 disease categories, with the highest number of species (7) being used for liver problems, circulatory system and dermatological disorders, followed by skeletomuscular system disorders (6), and fever (5).

Shil *et al.* (2013) studied the Indigenous knowledge of medicinal plants used by the Reang tribe of Tripura state of India and presented a total of 125 medicinal plants species belonging to 116 genera and 59 families used for treating 42 different ailments. The major plant parts used were leaves and most of the remedies were suggested to take orally. The

greatest parts of plants used for curing various ailments were found locally. The consensus analysis revealed that the fever and gastro-intestinal diseases had the highest informant consensus factor F_{IC} of 0.79 followed by the dermatological problems (F_{IC} 0.78). It was equal (F_{IC} 0.77) for both general health problems and inflammation and pain while urinogenital problems showed relatively low levels of consensus (F_{IC} 0.63). The study analyzed the disease categories to highlight some of the important plant species in terms of Fidelity level. Greater parts of the plant species achieve highest fidelity level, while only 4% acquire lower FL. The species with high citation and informant concurrence value were reasonably significant. *Cyathea*, a rare tree fern used for major cuts or wounds for immediate blood coagulation.

Kumar (2014) tabulated 120 species of plants from 46 families which are being potentially exploited by the Indian population for oral health care in his review titled "Ethno medicinal plants used for oral health care in India". Stem, young twigs, leaves, bark, fruit, spines, seeds and latex are the parts of trees being exploited for oral health care.

Chatterjee (2014) in his study of ethno-medicinal plants among the tribals of Surguja region of Chattisgarh recorded medicinal uses of 26 plants species belonging to 17 families along with various parts of plants used in treating different diseases. Among the recorded species, 4 were trees, 7 climbers, 12 herbs and 3 shrubs.

Prabhu *et al.* (2014) carried out the documentation and quantitative analysis of the local knowledge on medicinal plants in Kalrayan hills of Villupuram district, Tamil Nadu, India in accordance with some of the aspects of their previous surveys and recorded the usage of 81 species, which in turn yielded 1073 use reports. The major illness category 'aphrodisiac, hair care and endocrinal disorders' held a high F_{ic} values. Among the other illness categories, gastro-intestinal ailments, genito-urinary ailments and dermatological infection ailments had a high percentage of use reports. Eye ailments, general health, kapha ailments, psychologicaln ailments and skeleton muscular system ailments were the other illness categories with high F_{ic} values. Some of the claims viz., *Argyrolobium roseum* (aphrodisiac ailments), *Rosa brunonii* (eye ailments) *Hibiscus surattensis* (dermatological infections ailments), *Bauhinia variegate* (neurology Ailments), *Cotinus coggygria* (circulatory system/cardiovascular ailments) and *Uvaria narum* (gastro-intestinal ailments) which had relatively high consensus could be taken up for further biomedical studies, since no substantial studies had been conducted on them.

Verma (2014) reported a total of 41 plant species in 39 genera and 25 families were used traditionally with various plant parts and their combinations for the treatment of more than 36 diseases in their study titled "An ethnobotanical study of plants used for the treatment of livestock diseases in Tikamgarh District of Bundelkhand, Central India." Trees (17 species) were found to be the most used Ethnoveterinary medicinal plants followed by herbs (15 species), shrubs (6 species) and grasses (3 species). The most common diseases cough, diarrhea and fever were treated by 4 ethnoveterinary medicinal plant species.

Kumar and Kumar (2014) studied the Medicinal Plant Diversity in Tungal Valley of District Mandi, Himachal Pradesh (India) and recorded 20 medicinal plants belonging to 17 families of which herbs (9 spp) constituted the highest proportion of medicinal plants to be utilized followed by shrubs (5 spp), trees (3 spp) and climbers (3 spp). The collected plant species were used for curing various ailments like asthma, blood pressure, chest congestion, cough, cuts, dental problems, dysentery, furuncles, headache, insect bite, internal injury, mouth ulcer, pimples, skin disorders, stomach disorders, throat infection, urinary problems, vomiting and some diseases of cattle. The leaves were most frequently used (44%) plant parts, followed by stem (15%), roots and latex (7% each), whole plant, seeds, bark, flowers, rhizome, fruits and tuber (4% each).

Sharma and Kumar (2014) presented a review article titled "tribal medicines of India" in which they documented several medicinal plant species and their therapeutic uses by several tribes of different states and union territories of India.

Kalaiselvan and Gopalan (2014) conducted ethnobotanical studies on selected wild medicinal plants used by Irula tribes of Bolampatty valley, Nilgiri biosphere reserve (NBR), southern western ghats, India and reported 28 valuable wild medicinal plant species belonging 23 families of which majority of plant species were observed belonging to families of Acanthaceae, Rutaceae, Liliaceae, Asclepidaceae and Solanaceae. The common diseases were treated by the herbal practitioner for diuretic, snake bites, jaundice, piles, ulcer, swellings, weight loss, diabetics, cough & cold, body pain, diarrhea as anti-inflammatory and anti-cancerous.

Sharma and Thokchom (2014) in a review on endangered medicinal plants of India and their conservation, mentioned some 20 endangered and economically important

medicinal plants of India belonging to 18 families. They also enlisted 22 medicinal plant species of conservation concern identified for West Bengal.

Dikshit and Kala (2014) studied the traditional utilization and harvesting practices of medicinal plants used by local people of Ghughri block in Mandla district of Madhya Pradesh through questionnaire survey. The study resulted in the documentation of 43 medicinal plants of whose 95% was used by traditional healers for curing various diseases. Tree species were used in maximum cases, followed by herbs and shrubs. Tree bark was the most used plant part for medicinal purpose, followed by root.

Sahu *et al.* (2014) reported some new and less known ethno medicinal uses of 104 plants species representing 85 families of the tribes of Geedam block of Dantewada, Dakshin Bastar, Chattisgarh in different ailments. The dominant families were Fabaceae, Cucurbitaceae, Euphorbiaceae and Asteraceae. Leaves were the most widely (35%) used plant part of the reported medicinal plant uses, followed by root (28%), seed (19%), fruit (15%) and bark (13%).

Dhal *et al.* (2014) conducted ethnomedicinal studies in Nawarangpur district of Odisha and reported a total of 69 plant species belonging to 43 families. Out of 69 plants recorded from study area, highest number of plants belongs to herb (25 species) and trees (25 sp.) followed by shrubs (9 sp.), climbers (6 sp.), small tree (3 sp.) and creeper (1 sp.). The members of the family Fabaceae were the most commonly used plants for the treatment of various diseases. Other families like Euphorbiaceae Lamiaceae, Verbanaceae, and Liliaceae were also dominant.

Sharma *et al.* (2015) conducted a survey to study the diversity, utilization pattern and indigenous uses of floristic diversity in Murari Devi and surrounding areas of Mandi disrtict in Himachal Pradesh. Ethnobotanical uses of 220 plant species belonging to 184 genera and 88 families were recorded. These medicinal plants comprised of 31 trees, 134 herbs, 50 shrubs and 05 ferns. From the total, 35 were near endemic to Indian Himalayan Region (IHR).

Marandi and Britto (2015) recorded 101 plant species belonging to 63 genera under 43 families which are commonly used by the *Oraon* community of Jharkhand in their research on medicinal properties of edible weeds of crop fields and wild plants eaten by Oraon tribals of Latehar district, Jharkhand.

Kumar *et al.* (2015) reported approximately 100 plants belonging to 43 families used by the local healers in their study of biodiversity and indigenous uses of medicinal plant in the Chandra Prabha Wildlife Sanctuary, Chandauli district, Uttar Pradesh. The plant species with the highest fidelity level (Fl) were *Holarrhena antidysenterica*, *Lawsonia inermis, Gymnema sylvestres, Dalbergia sissoo*, *Cassia fistula*, *Butea monosperma*, *Boerhaavia diffusa*, *Albizia lebbeck*, *Aegle marmelos*, *Sphaeranthus indicus,* and *Solanum surattense*. The most frequent ailments reported were hepatitis, jaundice, constipation, and skin and urinary problems. The parts of the plants most frequently used were fruit, roots, and whole plants (17%) followed by leaves (16%) and bark (15%).

Sen and Behera (2015) enlisted various ethnomedicinal uses of *Haldinia cordifolia (Roxb.) Ridsd.* also locally known as *Halan,* a sacred medicinal plant considered by some of the tribes such as Binjhal, Gond, Kondh, Kharia, Kisan and Kol of western Odisha.

Singh and Teron (2015) documented ethnobotanical knowledge and management of wild edible plants in their study of diversity of wild edible plants used by the Angami-Nagas in Kohima District of Nagaland, India. Their report presented the uses of 84 wild edible plants belonging to 68 genera from 40 families.

Kalita *et al.* (2015) inventoried Traditionally used medicinal Plants of Bajali Sub-division, Barpeta District, Assam and documented about seventy six (76) different kinds of traditionally used medicinal plants species out of which 25% herbs, 34.21% shrub, 30.26% tree, 5.26% climber, 3.95% grass and 1.32% were under tree grass category plants (Based on life forms). Maximum phyto species were used against different affliction, such as cough, diarrhoea, dysentery, jaundice, menstrual problem, piles, snakebite, diabetes, tonsillitis, blood purification, asthma, fever and skin diseases etc. The most important medicinal plant families were Asteraceae, Lamiaceae, Rutaceae, Apocynaceae, Araceae, Poaceae, Solanaceae and Piperaceae.

Roy (2015) carried out an ethnobotanical study on the medicinal plants used by Rajbanshis of Coochbehar district, West Bengal, India and recorded twenty-nine plant specimens under twenty-eight genera and twenty-one families used by them for various therapeutic purposes.

Padhy and Dash (2015) through interviews with well-structured questionnaire to aboriginals and tribal's (informants) of the localities, conducted medico-Folklore Study on Some Pteridophytes from Kerandimal Hills of South Odisha with Emphasis on *Drynaria quercifolia* (Linn.)J. Smith, and reported 08 species under 08 genera and 07 families of pteridophytes with focused medico-folklore use amongst which *Drynaria quercifolia* of family Polypodiaceae, a new report from south Odisha itself, found with highest therapeutic claim.

Biswas *et al.* (2016) carried out inventorization of some ayurvedic plants and their ethnomedici-nal use in Kakrajhore forest area of West Bengal with an aim to inventorize the ayurvedic medi-cinal plant recourses and explore the traditional knowledge of tribal people of Kakrajhore forest to treat several diseases along with the sustainable management and conservation of medicinal plants and identified 57 numbers of ethno-medicinal plants belonging to 39 families, used for preparing medicinal remedies. The habit of the plants included 35% trees, 28% shrubs, 23% herbs and 14% climbers. The most frequently utilized plant parts were the Roots & Tuber roots (26%), Stem which includes Bark, Tubers, Bulb, Rhizome, Gum, Wood & Young shoots (24%), Leaves (18%), Fruits (13%), and Seeds (10%). The most frequent happening ailments were asthma and bronchitis, constipation and dyspepsia, diarrhea, dysentery, ulcer, rheumatism, arthritis, fistula and piles troubles. Most of the Plants (88%) had more than a single therapeutic use. The most important plant species on the basis of use value were *Smilex ovalifolia, Emblica officinalis, Curculigo orchioides, Croton roxburghii, Asparagus racemosus, Ziziphus nummularia, Ichnocarpus frutescens, Cisssus adnata, Buettneria herbacea, Litsea glutinosa, Vernonia anthelmintica and Chlorophytum borivilianum*. There was a strong agreement among the informants related to the usage of the plants (ICF 0.65–0.93). As per the standard literature in Ayurveda, maximum numbers of documented species (33) were found to be used for 'digestive system disorder' which was analogous to ethnomedicinal use (30), followed by 'skin related problem' i.e. 13 and 20 respectively.

Ratan *et al.* (2016) studied ethnobotany of the Galo community of Arunachal Pradesh, India and recorded 77 plant species of wild food, medicinal and cultural plants belonging to 55 genera and 39 families used by the *Galo* community of West Siang District. Of the total 77 species recorded, 24 were trees, 20 were herbs, 19 were shrubs, 11 were climbers, 2 were lianas and 1 grass species. Among these, 43 species were locally edible plants, 37 species

were used as ethno-medicinal agents, 13 species were used as pisicidal agents, 2 species were poisonous plants, and 12 species recorded were invariably used for other purposes such as washing and cleaning, socio-cultural, house construction, handicraft, firewood, spiritual healing, broom and tobacco substitutes.

Panigrahy *et al.* (2016) carried out the ethnomedicinal study of some medicinal plants from Kandhamal district, Odisha dominated by two tribal groups such as dongria and desia (kui language) and documented the traditional uses of 40 ethnomedicinal plant species belonging to 37 genera and 28 families along with correct botanical identification, local names, parts used and mode of administration in respect to different diseases. The documented ethno medicinal plants were mostly used in skin diseases, gastrointestinal diseases, cold and cough and dysuria etc.

Das (2016) studied the biodiversity of ethnomedicinal plants used by the ethnic tribal people of Barpeta district of Assam, north east India. During his survey a total of 66 plants species belonging to 57 genera and 47 botanical families were recorded as traditional medicinal plants used by the local villagers. The highest number of plant species belonging to the family Solanaceae (5 species) were used as traditional medicine and followed by Rubiaceae, Euphorbiaceae, Apocynaceae and Lamiaceae (3 species each) for medicinal purposes.

Sharma and Ekka (2016) carried out a survey work on the diversity of medicinal plants in Pt. Ravishankar Shukla university campus, Raipur, Chhattisgarh, India. Total 184 medicinal plants species were identified which belonged to 68 families. Out of 184 medicinal plants 56 were reported to be trees, 36 shrubs and 92 were herbaceous species. It was also noted that Pt. Ravishankar Shukla University campus was rich in plants of Fabaceae family that is 23 plants and the Euphorbiaceae family was the second largest plant family of the campus, of which 14 plants were reported.

Kannadhasan *et al.* (2016) carried out an ethnobotanical study of medicinal plants used By Malaiyali In Pachaimalai hills area of Trichirappalli district, Tamil Nadu, India and revealed that about 61 plant species belonging to 38 families find use in day to day life including medicinal, aromatic and cultural. The common diseases treated by the herbal practitioner were asthma, digestive problems, paralyzes, skin diseases, diabetes, jaundice, fever, rheumatism, piles, stomachache and eye disease.

Pattnayak *et al.* (2016) recorded eighty nine medicinal plants belonging to 49 different families used as anti-malarials in their ethnobotanical survey of antimalarial plants of Odisha, India. Asclepiadaceae, Apocynaceae and Fabaceae families were found to be the most represented followed by other families.

Gitika and Kumar (2016) identified a total of 66 plant species belonging to 30 families on the basis of their ethnomedicinal importance revealed by the local informants of Haryana state. The study showed that the most dominating families of the area was Apocyanaceae with 7 species followed by Asteraceae, Moraceae and Solanaceae each with 6 species, then Euphorbiaceae and Papilionaceae with 5 species each, Cucurbitaceae, Lamiaceae and Verbenaceae each with 4 species, Caesalpiniaceae. Combretaceae, Malvaceae and Poaceae each with 3 species, Acanthaceae, Apiaceae, Asclepiadaceae, Brassiaceae, Chenopodiaceae, Lilaceae, Mimosaceae, Myrtaceae and Rutaceae with 2 species each, Aizoaceae, Amaranthaceae, Cactaceae, Cannabaceae, Cannaceae, Capparidaceae, Caricaceae, Casuarinaceae, Moringaceae, Polygonaceae, Punicaceae, Sapotaceae and Simaroubaceae are represented by one species only.

Qureshi *et al.* (2017) studied the ethnobotany of medicinal plants used by traditional health practitioners and villagers of Garhphulghar Gram, Chhattisgarh and documented a total of 30 plant species belonging to 20 families found to be useful in the treatment of skin problems, cold, fever, cough, headache, diarrhoea, toothache, stomach ache, wounds, diabetes, rheumatism, asthma, dysentery, hair loss and poisoning (snake, scorpion and insect bites).

Sen and Behera (2017) carried out an ethnobotanical study on the wild medicinal plant species used by the tribal as well as local rural inhabitants of Bargarh district in western Odisha (India) for child healthcare. A total of 30 plant species belonging to 25 families were reported based on an ethnobotanical field study. The five major life forms found were herbs, shrubs, climbers, creepers and trees. Trees made the highest proportion (11) followed by herbs (9), shrubs (5), climbers (3) and creepers (2). These plants are used for the treatment of anthelmintic, cold, cough, delayed teeth formation, diarrhoea, dysurea, earache, indigestion, mouth ulcer, navel swelling, navel wound, prevent child from breast feeding, pus formation in the ear, ulcer in head, stomachache, and vomiting.

MATERIALS AND METHODS

The details of the study site, materials used and methodologies followed are discussed in this chapter.

3.1. Study site

The study was conducted in 8 selected slum areas of Bhubaneswar where some tribes live in patches. They are not native to Bhubaneswar, rather they have migrated here from various other districts of Odisha in search of vocation and with them have brought their traditional knowledge of plants. The geographical location, climate and physiographic features of the study area are given below.

3.1.1. Geographical location and physiography

Bhubaneshwar, the capital city of Odisha, India, lies at an elevation of about 45 meters (148 feet) above the mean sea level (MSL) covering a geographical area of 124.74 sq. km. It is situated in the eastern coastal plains and coordinates at 21° 15' North Latitude and 85° 15' East Longitude south-west of the river Mahanadi and is surrounded by its tributaries like the Daya River and the Kuakhai River in the south and east, respectively.

3.1.2. Climate and weather

Geographically, Bhubaneshwar lies in the tropical zone and experiences a tropical climate. The three seasons that dominates the city are summer, winter, and monsoons. The summers are hot and the winters are dry. The monsoons are awfully humid. Both heat and cold waves sweep through the city in the summer and winter months every year.

Bhubaneswar experiences summer from the months of March to May when the mercury reaches to a maximum of 40 °C to 45 °C. Monsoons are brought about by the south-east monsoon winds in the month of June and continues till October. July and August receives the maximum rainfall. The average annual rainfall recorded in the city is 1,500 mm. December and January are chilly because of the chilly winds descending from the north and north-east. The average temperature wavers between 15°C to 18°C in the winter.

3.1.3. Soil

Bhubaneswar is topographically divided into western uplands and eastern lowlands with hillocks in the western and northern parts. The soils of Bhubaneswar are 65 per cent laterite, 25 per cent alluvial and 10 per cent sandstone. They belong to the taxonomic order of *Areic propaquepts*. These are acidic in soil reaction (*i.e.*, low pH) and their organic carbon content ranges from low to high. Available nitrogen (N) content is low, whereas avalable phosphoros (P), potassium (K) and sulfur (S) varies between low to medium.

3.1.4. Vegetation and Flora

Floral diversity is distributed in 6 types, viz., secondary moist miscellaneous semi-evergreen forests, moist Kangada (*Xylia xylocarpa*) forests, Coastal Sal forests (*Shorea robusta*), thorny bamboo brakes (Bambusa bambos), planted Teak and Eupatorium scrub. Main tree species are Kochila, Kalicha, Bela, Kangada, Giringa, Sunari, Sal, Kumbhi, Jamu, Karanja, Teak and Sidha. Male bamboo (*Dendrocalamus strictus*) has a very restricted distribution. Common medicinal plants found here are Duramari, Baidanka (*Mucuna pruriens*), Brudhadaraka, Bhuin limba, Guluchi lata, Salparni (*Desmodium gangeticum*), Satabari, Bhuin kakharu, Indrajaba, Thalkudi, Apamaranga, Kurchi, Patalgaruda etc.

3.1.5. Ethnic groups of the study area

The major tribal communities residing in the study area are given below:

- **Kondha**
- **Saora**
- **Gadaba**
- **Juang**
- **Bonda**
- **Munda**

3.2. Sample and sampling procedure

3.2.1. Selection of slums

In Bhubaneswar, those slum areas where some tribals dwell were identified by consulting the office of Bhubaneswar Municipal Corporation. The nearby tribal slums,

mostly those close to the forest area (Chandaka forest), were selected randomly for the study purpose. In this way, 8 slums namely, Patia Jali Munda Sahi; Birsa Nagar; Bhoisahi, Shampur; Behera Basti; Adivasi Basti; Birsha Munda Slum; Nandini Palli Munda Sahi and Jalisahi & Saliasahi, Patia were considered for this study. Rest of the slums were situated far away from the forest area, due to which they prefer to go to hospital.

3.2.2. Selection of respondents

Out of total tribal families in each selected slum, a representative sample of 10 per cent (approximately) was selected randomly for the study. The tribal respondents and the tribal medicinemen which were incorporated in this study for collection of data are illustrated in the Table below:

Table 1. Slum wise number of sample households selected

Slum Name	Total no. of households	No. of households selected
Patia Jali Munda Sahi	96	10
Birsa Nagar	200	20
Bhoisahi, Shampur	74	8
Behera Basti	102	10
Adivasi Basti	70	7
Birsha Munda Slum	94	10
Nandini Palli Munda Sahi	150	15
Jalisahi & Saliasahi, Patia	228	22

3.2.3. Method of enquiry and collection of data

Information about the use of plants is secret treasure of the aboriginal tribes and they do not easily part with it unless a very close contact and friendship is established with them.

The enquiry was conducted by survey method and collection of information was based on primary data. The investigation was based on participant observation with medicinemen and interview with the tribal families in the study area. The information was gathered through interview using a standard questionnaire (Figure 1). Information regarding common diseases and their cure with available wild medicinal plants was recorded. Some of

the tribal herbalists were persuaded and taken individually to the nearby places (from where they collect these herbs) or herbal/ medicinal gardens where they pointed out the herbs that they use to cure different ailments. Prior to the interview, the respondents were taken into confidence by revealing the actual purpose of the study and also full care was taken to develop good rapport with them. The interview was conducted in the most informal and friendly atmosphere without any complication. During the field trips, information was collected by making repeating queries from time to time. The plants were identified with the help of floras and other available literatures. Nearby medicinal gardens were also consulted whenever ambiguity arises in order to correctly identify the plants species.

3.2.4. Method of plant sample collection for biodiversity assessment

Random points were chosen near the study area *i.e.,* the slums, where vegetation in fair amount was clearly observed. In those selected points quadrats were laid down with the help of ropes and poles. These quadrats were laid in different dimensions depending upon the habit of plants to be identified. For instance, a floral cover of 10m X 10m was created for the identification of tree species. Similarly, for the identification of shrubs and herbs, the floral cover of 5m X 5m dimensions were created. In this way, four quadrats (2 quadrats for counting tree species and another 2 quadrats for counting shrubs and herbs) were laid down in each of the study area. This area was then surveyed by getting a thorough count of the number of plants in it. Any unknown plant species was either photographed or collected in order to get it identified later on. Rest were identified, enumerated and documented.

The Quadrat method is one of the oldest as well as the most effective method of getting a comprehensive idea about the floral cover in a place. The Quadrat method is defined as the method in which a definite circumscribed area is used to count the number of individuals of a plant species present in it. This definitive circumscribed area can be achieved with the help of anything that can be molded into a fixed area viz. a wooden frame or ropes and poles etc. This frame is then placed on the area, the floral cover of which has to be studied. The individual species of plants that come within the enclosed area were counted and noted down.

3.2.4.1. Species diversity calculation

In each quadrat, data was gathered by manually counting the different species of plants – trees, shrubs, herbs, etc. The data were collected, classified and analyzed to calculate

diversity index and evenness quotient of the most predominant species found in all the quadrats.

Species diversity is defined as the measure of the diversity within an ecological population that includes both species richness (the number of species in a community) and the evenness of species' abundances.

Species richness is one of the most important elements in biodiversity, because the number of species existing at a site is a quantitative measure of biodiversity and it allows comparison with other sites.

3.2.4.1.1. Shannon-Wiener Index

It is one of the most popular diversity indices used to measure species diversity. Shannon and Wiener independently derived the function which has become known as Shannon index of diversity. Under the assumption that all species are represented in a sample and that the sample is taken randomly, the Shannon-Weiner Index calculates the uncertainty of a set of species. It is influenced by the number of species and their evenness among each other. For a given number of species, it reaches its maximum if all species are represented with the same number of individuals. Higher values of Shannon index indicate that a particular community has more information. The value of Shannon diversity is usually found to fall between 1.5 and 3.5 and only it rarely surpasses 4.5. It has been reported that under log normal distribution, 105 species will be needed to produce a value of Shannon diversity more than 5.

The Shannon-Weiner Index (H') is calculated by the following formula:

$$\mathbf{H' = -\Sigma\ [\ (pi)\ x\ (ln\ pi)\ ]} \qquad 0 < H < 5$$

Where, H' = Shannon index of species diversity

ρi = the proportion of total sample belonging to the i^{th} species (ni/N)

ln = natural log

ni = No. of individuals of each species

N = Total number of species

3.2.4.1.2. Species evenness index (Pielou, 1966)

Another method of species richness is called species evenness. Evenness index is also an important component of the diversity indices. This expresses how evenly the individuals are distributed among the different species. The relative abundance of rare and common species is called evenness.

Pielou's evenness index is commonly expressed as:

$$\mathbf{E = \frac{H'}{\log S}}$$

Where, E = Evenness index

S = Number of species

H' = Shannon's index

Questionnaire for collecting information on plants used by tribal people for medicinal purpose

Place (Present & Native):

Informer's Name:

Position in Society: Medicine man / General

Tribe/ Caste:

Age:

No. of Family Members	Gender	Education
	Male	
	Female	
	Children	
Total		

Plants Used In Medicine:

Disease	Plant Used (Local Name)	Botanical Name	Parts Used	Source

(Figure 1)

Some ethnic groups (tribes) of the study area

Plate 1 (Munda)

Plate 2 (Kondh)

Plate 3 (Saora)

Plate 4 (Juang)

PHOTOPLATES

Some commonly found medicinal plants in the study area

Plate 5 ***(Asparagus racemosus)***

Plate 6 ***(Azadirachta indica)***

Plate 7 ***(Bauhinia variegate)***

Plate 8 ***(Clitoria ternatea)***

Plate 9 ***(Coleus barbatus)***

Plate 10 ***(Curcuma angustifolia)***

PHOTOPLATES

Plate 11 ***(Cymbopogon flexuosus)***

Plate 12 ***(Emblica officinalis)***

Plate 13 ***(Ervatamia divaricate)***

Plate 14 ***(Hibiscus rosa-sinensis)***

Plate 15 ***(Jatropha gossypiifolia)***

Plate 16 ***(Lantana indica)***

PHOTOPLATES

Plate 17 ***(Mangifera indica)***

Plate 18 ***(Mimosa pudica)***

Plate 19 ***(Moringa oleifera)***

Plate 20 ***(Neolamarckia cadamba)***

Plate 21 ***(Nyctanthes arbortristis)***

Plate 22 ***(Ocimum kilimandscharicum)***

PHOTOPLATES

Plate 23 ***(Saraca asoca)***

Plate 24 ***(Solanum violaceum)***

Plate 25 ***(Pterospermum xylocarpum)***

Plate 26 ***(Ocimum sanctum)***

Plate 27 ***(Rauvolfia serpentine)***

Plate 28 ***(Plumeria rubra)***

PHOTOPLATES

Plate 29 ***(Ziziphus jujube)***

Plate 30 ***(Wedelia chinensis)***

Plate 31 ***(Terminalia bellerica)***

Plate 32 ***(Strychnus nux vomica)***

Plate 33 ***(Tridax procumbens)***

Plate 34 ***(Spilanthes paniculata)***

PHOTOPLATES

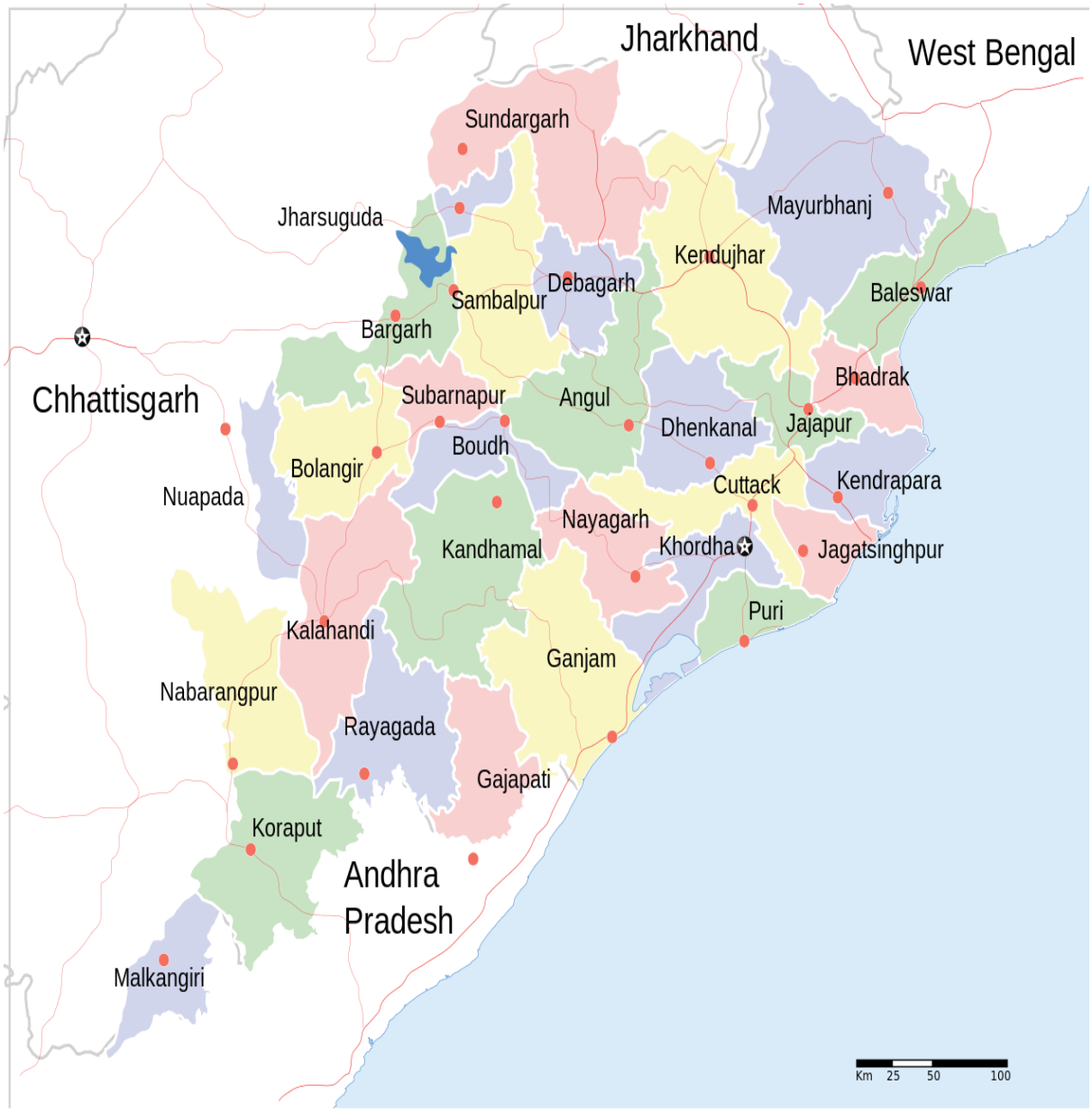
Laying down of quadrats in the study area

Plate 35

Plate 36

PHOTOPLATES

ODISHA MAP


Jharkhand
West Bengal
Sundargarh
Jharsuguda
Mayurbhanj
Kendujhar
Debagarh
Sambalpur
Baleswar
Bargarh
Chhattisgarh
Bhadrak
Subarnapur
Angul
Dhenkanal
Jajapur
Boudh
Bolangir
Cuttack
Kendrapara
Nuapada
Nayagarh
Kandhamal
Khordha
Jagatsinghpur
Puri
Kalahandi
Ganjam
Nabarangpur
Rayagada
Gajapati
Koraput
Andhra
Pradesh
Malkangiri
Km 25 50 100

DISTRICT MAP OF KHORDHA

MAP OF BHUBANESWAR (STUDY AREA)

RESULTS

The result of the study is being done under the following headings:

4.1 Documentation of plants of medicinal values for treating various health problems.

4.2 Documentation of the plant parts used to treat health problems.

4.3 Assessment of the medicinal plant biodiversity of the area with particular emphasis on trees and shrubs.

4.1. Documentation of plants of medicinal values for treating various health problems

The plants observed in the study area have been enumerated and documented in Table 2 with their local names and family names. The plants were observed and their growth habits have also been recorded. It has been mentioned what parts of plants are used for treating diseases. Finally, their ethnobotanical uses have been documented that have been gathered through questionnaire survey of local people as well as through various literature surveys.

A total number of 369 medicinal plant species belonging to 267 genera and 100 families have been identified and documented here. Fabaceae (21 species) followed by Lamiaceae (19), Euphorbiaceae (14), Zingiberaceae (11), Asteraceae (10), Malvaceae (10), Rutaceae (9) and Solanaceae (9) are the dominated families. Dominant genera includes the genus *Solanum* with 6 species followed by 5 species each of *Curcuma*, *Ocimum* and *Jasminum* and 4 species each of *Cassia*, *Clerodendrum*, *Dillenia* and *Terminalia*.

Table 2. Documented medicinal flora of Bhubaneswar along with their family, habit, parts used and therapeutic uses

Sl. No.	Scientific name	Local name	Family	Habit	Parts used	Therapeutic uses
1.	*Solanum nigrum*	Kakamachhi/ Nunnunia	Solanaceae	Herb	Whole plant	Tonic, Leprosy, Piles, Fever, Itching, Acne, Asthma
2.	*Solanum indicum*	Denga bheji	Solanaceae	Shrub	Flower, Fruit, Root, Leaves	Fever, Cough, Vomiting, Urinary problem, Asthma
3.	*Solanum surattense*	Bheji baigana	Solanaceae	Shrub	Whole plant	Cough, Cold, Asthma
4.	*Cocculus hirsutus*	Dahidahiaa/ Jalajamari	Menispermaceae	Shrub	Leaves, Roots	Urinary problem, Swelling, Cough, Rheumatism, Digestive, Bronchitis
5.	*Crinum asiaticum*	Arsha/ Nagadamoni/ Hatikalia	Amaryllidaceae	Shrub	Flower, Leaves, Bulb, Rhizome	Tumor, Vomiting, Snake bite, Urinary disorder
6.	*Holarrhena pubescens*	Indrajaba/ Kurei/ Kutaja	Apocyanaceae	Tree	Bark, Flowers, Seeds, Leaves	Intestinal worm, Lung diseases, Anthelmintic, Antiamoebic, Antibacterial
7.	*Urginea dubius*	Bana piaja	Asparagaceae	Herb	Bulb	Laxative, Expectorant, Asthma, Jaundice, Convulsions

8.	*Curcuma angustifolia*	Bana haldi	Zingiberaceae	Herb	Leaves, Rhizome	Cough, Bronchitis, Antibacterial properties
9.	*Cyperus scariosus*	Nagara mutha	Cyperaceae	Herb	Tuber, Root, Rhizome	Anti-inflammatory, Antimicrobial, Astringent, Hepatoprotective, Anti-diabetic
10.	*Cynodon dactylon*	Duba ghasa	Poaceae	Grass	Leaves	Antiseptic, Fever, High blood pressure, Diarrhea, Dysentery, Vomiting, Nervine tonic
11.	*Desmostachya bipinnata*	Kusha	Graminae	Grass	Whole plant	Cooling, Asthma, Jaundice, Dysentry
12.	*Cymbopogon martini*	Roja ghasa	Poaceae	Grass	Leaves, Root, Stem	Rheumatism, Hair Loss, Arthritis, Lumbago, Spasms
13.	*Cymbopogon flexuosus*	Dhanantwari	Poaceae	Grass	Leaves, Whole plant	Rheumatism, Cold, Debility, Cough, Fever, Fatigue, Constipation, Indigestion
14.	*Vetiveria zizanoides*	Bena/ Khas khas	Poaceae	Grass	Root, Leaves	Diaphoretic, Fever, Digestive, Debility, Menstrual Disorder, Stimulant

15.	*Glinus oppositifolius*	Pita saga	Aizoaceae	Herb	Whole Plant	Digestive, Promotes salivation, Bowel Complaints
16.	*Cyperus rotundus*	Mutha	Cyperaceae	Shrub	Root, Rhizomes	Blood dysentry, Fever, Cough, Indigestion, Wound, Skin disease, Insect bites
17.	*Evolvulus alsinoides*	Sankha pushpi/ Bicchamalia	Convolvulaceae	Vine	Whole plant	Anxiety, Brain tonic Insanity, Epilepsy, Insomnia
18.	*Trianthema portulacastrum*	Shweta puruni	Aizoaceae	Herb	Root, Leaves	Anemia, Cough, Heart disease, Beriberi
19.	*Mentha spicata*	Podina	Lamiaceae	Herb	Leaves, Seed	Digestive, Diuretic, Mouth & Teeth diseases, Antiseptic, Stimulant, Cold & Cough
20.	*Mentha arvensis*	Bana podina	Lamiaceae	Herb	Whole plant except root	Flatulence, Coughs, Digestive problems,
21.	*Withania somnifera*	Aswagandha	Solanaceae	Shrub	Root, Leaves, Fruit, Seeds	General debility, Insomnia, Diuretic Rheumatism, Fever, Asthma

22.	*Oldenlandia corymbosa*	Ghara pedia	Rubiaceae	Herb	Whole plant	Stomach disorders, Sores, Diuretic, Anthelmintic, Diaphoretic, Rheumatism, Digestive, Febrifuge
23.	*Lantana indica*	Naga aeiri	Verbenaceae	Shrub	Leaves, Root, Flower	Skin itches, Leprosy, Rabies, Measles, Chicken pox, Ulcer, Asthma
24.	*Hygrophila auriculata*	Keu keuka/ Koelekha	Acanthaceae	Shrub	Root, Seed, Leaves, Whole plant	Tooth ache, Leucoderma, Bronchitis, Itching
25.	*Lippia javanica*	Naguari	Verbenaceae	Shrub	Whole plant	Asthma, Bronchitis, Cold, Malaria, Antimicrobial
26.	*Ventilago madraspatana*	Rakta Khai	Rhamnaceae	Shrub	Root, Stem, Root bark	Carminative, Stomachic, Scabies Febrifuge, Debility, Dyspepsia, Skin diseases
27.	*Ricinus communis*	Jada/ Gaba	Euphorbiaceae	Shrub	Leaves, Seed, Root	Laxative, Stimulant, Purgative, Arthritis, Eye irritation, Skin disease
28.	*Mimosa pudica*	Lajakudi	Mimosaceae	Herb	Roots, Leaves	Urinary complaints, Sores, Piles

29.	*Ocimum canum*	Bana tulasi/ Nanda baguli	Lamiaceae	Herb	Leaves, Stem, Seeds	Cough, Fever, Fungal infections, General debility, Skin diseases, Vomiting
30.	*Euphorbia hirta*	Dudhi	Euphorbiaceae	Herb	Leaf, Stem, Whole plant	Cough, Bronchitis, Asthma, Worm infestations in children, Dysentery, Jaundice, Pimples, Gonorrhea, Digestive problems
31.	*Curcuma domestica*	Haldi	Zinziberaceae	Herb	Rhizome	Contraception, Swelling, Insect stings, Wounds, Whooping cough, Inflammation, Pimples, Injuries, Skin tonic, Jaundice
32.	*Phyllanthus fraternus*	Bhuin aonla/ Badi aonla	Euphorbiaceae	Herb	Whole plant	Urinary disease, Hepato protective, Digestive
33.	*Ocimum kilimandscharicum*	Dhala tulasi/ Karpura tulasi	Lamiaceae	Shrub	Whole Plant	Anti bacterial, Fever, Cough, Skin diseases, Vomiting, Diaphoretic
34.	*Hybanthus enneaspermus*	Madana mastaka	Violaceae	Herb	Roots, Leaves, Whole plant	Diuretic, Blood dysentery, Nervous problems

35.	*Desmodium gangeticum*	Salparani	Fabaceae	Herb	Leaves, Root, Whole plant	Chronic fever, Tonic Snake bite, Leprosy
36.	*Alocasia indica*	Mana saru	Araceae	Shrub	Leaves, Roots, Stem, Rhizome	Constipation, Scorpion sting, Burn, Abdominal disorder
37.	*Alternanthera sessilis*	Madaranga	Amaranthaceae	Herb	Root, Leaves, Whole plant	Wash for eyes, Febrifuge
38.	*Amomum dealbatum*	Bana Aleicha/ Keshadura	Zingiberaceae	Herb	Rhizome	Anti-inflammatory, Abscess, Sore throat, Indigestion, Nausea
39.	*Leucas aspera*	Dhala Gayasa	Lamiaceae	Herb	Leaves,Flower, Root, Whole plant	Insect sting, Carminative, Psoriasis, Skin eruption, Cough & Cold
40.	*Leucas cephalotes*	Kala gayasa/ Gayasa (bada)	Lamiaceae	Herb	Leaves, Whole plant	Insect sting, Cough, Cold, Skin diseases, Febrifuge, Stimulant, Diaphoretic, Anthelmintic, Jaundice
41.	*Rauvolfia serpentina*	Patala garuda/ Sarpa gandha/ Chari patria	Apocynaceae	Shrub	Root, Leaves	Hypotensive, Nervous disorder, Tranquilizer, Snake bite

42.	*Barleria prionitis*	Daskerant	Acanthaceae	Shrub	Root, Leaves, Seed, Bark	Boils, Swellings, Diaphoretic, Expectorant, Fever, Cold, Cough, Stomach Disorder
43.	*Stevia rebaudiana*	Sakarin gacha	Asteraceae	Herb	Leaves	Anti-diabetic, Sweetener
44.	*Calotropis procera*	Arakha (Dhala)	Asclepiadaceae	Shrub	Flower, Root, Leaves, Stem, Bark	Skin diseases, Cold, Cough, Asthma, Fever, Scorpion sting
45.	*Ocimum sanctum*	Kala Tulasi	Lamiaceae	Herb	Leaves, Seed	Cold, Cough, Bronchitis, Asthma, Fever, Malaria, Acne, Memory tonic, Revitalizer, Insect sting
46.	*Hyptis suaveolens*	Ganga tulasi/ Bana tulasi	Lamiaceae	Shrub	Whole plant, Root, Leaves	Laxative, Antitoxic, Febrifuge, Stomachic, Appetizer
47.	*Ocimum basilicum*	Durlabha	Lamiaceae	Herb	Leaves, Seed, Flowering tops, Roots, Whole plant	Cough, Itching, Tooth ache, Cough, Asthma, Skin diseases, Gynecological disorder, General debility
48.	*Commiphora caudata*	Jaujauka/ Gugula (Nali)	Burseraceae	Tree	Leaves, Bark	Tonic, Sexual stimulant, Laxative, Indigestion
49.	*Commiphora wightii*	Gugula (Dhala)	Burseraceae	Tree	Gum, Leaves, Bark	Rheumatism, Arthritis, Stimulant, Skin diseases
50.	*Andrographis paniculata*	Bhuin limba/ Chireita	Acanthaceae	Herb	Leaves, Root, Whole plant	Tonic, Dysentery, Dyspepsia, Fever

51.	*Murraya koenigii*	Bhrusunga	Rutaceae	Tree	Fruit, Leaves	Dysentery, Carminative, Digestive, Gastritis
52.	*Euphorbia tirucalli*	Khadi siju	Euphorbiaceae	Tree	Root, Latex	Leprosy, Asthma, Abdominal troubles
53.	*Calotropis gigantean*	Arakha (Kala)	Apocynaceae	Shrub	Flower, Root, Leaves	Stomachic, Anti- asthmatic, External Swelling, Bronchitis
54.	*Jatropha gossypiifolia*	Nali baigaba	Euphorbiaceae	Shrub	Leaf, Seed, Stem latex	Antimicrobial, Inflammation, Diarrhea, Hypertension
55.	*Piper nigrum*	Gola maricha	Piperaceae	Vine	Whole plant, Seed	Carminative, Stimulant, Digestive, Asthma, Cold, Cough
56.	*Artemisia vulgaris*	Dayana	Asteraceae	Shrub	Leaves, Root, Flower, Whole plant	Anthelmintic, Antispasmodic, Carminative, Anemia, Kidney & Liver disease
57.	*Amomum subulatum*	Bada aleicha	Zingiberaceae	Shrub	Seeds, Fruit	Stomachic, Nervine, Anti-emetic, Cough, Aphrodisiac
58.	*Plumbago zeylanica*	Sweta chitaparu	Plumbaginaceae	Shrub	Whole plant, Root, Root bark, Seed	Digestive, Piles, Cough, Leprosy, Diarrhea, Scabies, Ulcer
59.	*Plumbago rosea*	Rakta chitaparu	Plumbaginaceae	Shrub	Root, Root bark, Latex	Dyspepsia, Piles, Diarrhea, Appetizer
60.	*Coleus barbatus*	Juani/ Rukuna hathapocha	Lamiaceae	Herb	Root, Leaves	Aromatic, Carminative, Cough, Stimulant, Obesity, Allergy, Asthma

61.	*Kalanchoe pinnata*	Amarpoi	Crassulaceae	Herb	Leaves, Root, Whole plant	Bruises,Wounds, Boils, Burns, Indigestion
62.	*Datura metel*	Dudura (Kala)	Solanaceae	Shrub	Whole plant, Leaves, Flower	Pain killer, Cough, Colic, Sprain, Arthritis
63.	*Datura stramonium*	Dudura (Dhala)	Solanaceae	Shrub	Leaves, Seed, Flower	Cerebral depressant, Asthma, Arthritis
64.	*Sida cordata*	Bisirip	Malvaceae	Herb	Leaves, Root	Astringent, Piles, Stomachic, Gonorrhea
65.	*Hemidesmus indicus*	Anantamula	Asclepiadaceae	Shrub	Root, Leaves, Stem	Asthma, Blood purifier, Piles, Insect sting, Cough, Cold, Skin diseases, Revitaliser
66.	*Tylophora indica*	Antamula/ Swasamari	Asclepiadeaceae	Herb	Root, Leaves	Asthma, Cough, Fever, Blood purifier, Insect sting, Urinary disease
67.	*Bergenia ciliate*	Pathara chura	Saxifragaceae	Herb	Root, Flower, Whole plant	Cough, Cold, Haemorrhoids, Asthma, Urinary problems
68.	*Rosmarinus officinalis*	Rojamari	Lamiaceae	Herb	Leaves, Twig, Flower	Nervine, Opthalmic, Stimulant, Stomachic, Antispasmodic, Antiseptic
69.	*Abutilon indicum*	Pedi pedika	Malvaceae	Shrub	Leaves, Root, Fruit, Seed, Bark	Gout, Tuberculosis, Ulcers, Worms, Bleeding disorders

70.	*Adhatoda vasica*	Basanga	Acanthaceae	Shrub	Leaves, Root, Flower, Bark	Antispasmodic, Expectorant, Skin diseases, Menstrual disorder, Cold, Cough, Asthma
71.	*Vitex negundo*	Begunia	Lamiaceae	Shrub	Leaves, Seed, Flower, Fruit, Bark, Root	Cough, Skin diseases, Fever, Pain, Inflammation, Ear ache, Insect repellant
72.	*Gymnema sylvestres*	Gudamari	Apocynaceae	Herb	Leaves, Root, Whole plant	Diabetes, Cough, Indigestion, Piles, Worms, Jaundice, Emetic
73.	*Tinospora cordifolia*	Guluchi	Menispermaceae	Shrub	Stem, Root, Bark	Fever, Debility, Rheumatism, Heart & Chest diseases, Urinary & Skin diseases, Leprosy, Cough & cold, Diabetes
74.	*Argyreia nervosa*	Bruddha daraka	Convolvulaceae	Shrub	Root, Seed	Cardio tonic, Cough & Cold, Diabetes, Rheumatism, Skin diseases
75.	*Operculina turpethum*	Tihudi	Convolvulaceae	Shrub	Root, Bark	Antibacterial, Anti inflammatory, Paralysis, Obesity
76.	*Abrus precatorius*	Nali kaincha	Fabaceae	Shrub	Leaves, Seed	Swelling, Asthma, Astringent, Abortion
77.	*Clitoria ternatea*	Aparajita/ Sankha puspi	Fabaceae	Herb	Root, Leaves, Flower	Diuretic, Head ache, Migraine, Memory tonic, Chronic fever

78.	*Paederia foetida*	Prasaruni	Rubiaceae	Herb	Leaves, Root	Tonic, Astringent, Rheumatism, Piles, Chest pain, Spleen inflammation
79.	*Momordica dioica*	Kankada	Cucurbitaceae	Climber	Leaves, Fruit, Root	Anthelmintic, Aphrodisiac, Fever, Asthma, Leprosy, Diabetes
80.	*Momordica cochinchinensis*	Hatia kankada	Cucurbitaceae	Vine	Root, Seed, Leaves	Cough, Rheumatism, Malaria, Head lice, Bruises, Piles
81.	*Solena amplexicaulis*	Bana kunduri	Cucurbitaceae	Climber	Leaves, Root, Tuber, Whole plant	Spermatorrhoea, Diuretic, Skin Diseases, Haemorrhoids
82.	*Dioscorea pentaphylla*	Karaba	Dioscoriaceae	Twiner	Leaves, Tuber	Stomach ache, Constipation, Cold, Cough, Indigestion, Abdominal pain, Dysentery, Asthma, TB, Boils, Sunburn, Cuts and Injury
83.	*Aristolochia indica*	Pana ayiri	Aristolochiaceae	Creeper	Root, Leaves, Rhizome	Rheumatism, Blood dysentery, Fever, Analgesic, Leucoderma, Gynecological disorders
84.	*Jasminum arborescens*	Bana malli	Oleaceae	Shrub	Root, Flower, Leaves	Blood purifier, Gynecological trouble, Eczema, Menstrual disorder
85.	*Pergularia extensa*	Uturudi	Asclepiadaceae	Herb	Leaves, Root bark	Asthma, Bleeding piles, Emetic, Infantile diarrhea, Rheumatism, Snake bite
86.	*Mucuna pruriens*	Bai danka	Fabaceae	Shrub	Seed, Root, Trichome	Brain vitalizer, Aphrodisiac, Antagonist for various Snakebites

87.	*Cissus quadrangularis*	Hadajoda/ Hadabhanga	Vitaceae	Herb	Leaves, Shoot, Root	Digestive disorders, Broken bones, Scurvy
88.	*Zingiber zerumbet*	Parsu kedara	Zingiberaceae	Herb	Rhizome	Digestive, Cold & Cough, Asthma, Appetizer, Worms, Skin diseases, Stimulant
89.	*Achyranthes aspera*	Apamaranga	Amaranthaceae	Herb	Whole plant, Flowering top, Root, Seed	Astringent, Diuretic, Piles, Skin diseases, General debility, Stomachic
90.	*Tridax procumbens*	Bisalyakarani	Asteraceae	Herb	Whole plant, Leaves	Jaundice, Diarrhea, Inflammation, Anal fistula, Dysentery, Ulcers, Hemorrhoids
91.	*Lawsonia inermis*	Manjuati	Lythraceae	Tree	Root, Leaves	Jaundice, Skin infection, Hair conditioner, Blood purifier, Antifungal, Menstrual disorders, Burning sensation, Premature greying of hair
92.	*Clerodendrum indicum*	Bhargi	Lamiaceae	Shrub	Leaves, Root	Diabetes, Obesity, Hypertension, Asthma, Cough
93.	*Acorus calamus*	Bacha	Acoraceae	Herb	Rhizome	Nervine tonic, Colic, Analgesic, Cough, stomachic, Epilepsy, Convulsion, Remittent fever

94.	*Jasminum multiflorum*	Kunda	Oleaceae	Shrub	Leaves, Flower, Bark	Burn, Diuretic, Emetic, Ulcer, Laxative
95.	*Curcuma amada*	Ambakasia Ada	Zingiberaceae	Shrub	Rhizome	Appetizer, Laxative, Depurative, Sedative
96.	*Eupatorium ayapana*	Ayapan	Asteraceae	Herb	Leaves, Whole plant	Appetizer, Cough, Fever, Antiseptic, Haemostatic
97.	*Kalanchoe lanceolata*	Hema Sagar	Crassulaceae	Herb	Root, Leaves	Wounds, Fever, Dysentry, Neck pain
98.	*Boerhavia diffusa*	Rakta puruni	Nyctaginaceae	Herb	Leaves, Whole plant	Blood purifier, Joint pain, Leucorrhoea
99.	*Eryngium foetidum*	Bana dhania	Umbelliferae	Herb	Root, Whole plant	Stomachic, Tonic, Aphrodisiac
100.	*Spilanthes paniculata*	Biribiri	Asteraceae	Herb	Leaves, Root, Flower, Fruit	Toothache, Arthritis, Infections of throat and gum, Ulcer and General weakness
101.	*Wedelia chinensis*	Bhrungaraj/ Keshraj (Yellow Flower)	Asteraceae	Herb	Whole plant, Leaves, Seed, Flower	Tonic, Jaundice, Spleen enlargement, Promotes hair growth

102.	*Eclipta alba*	Bhrungaraj/ Keshraj (White Flower)	Asteraceae	Herb	Whole plant, Leaves, Seed	Anti-hepatotoxic, Promotes hair growth, Skin diseases, Headache, Jaundice
103.	*Centella asiatica*	Thalkudi	Apiaceae	Herb	Leaves, Seed	Improves memory, Brain tonic, Madness, Skin & Nerve disease
104.	*Zingiber officinale*	Ada	Zingiberaceae	Herb	Rhizome, Leaves	Bronchitis, Asthma, Antiseptic
105.	*Bacopa monnieri*	Bramhi	Scrothulariaceae	Herb	Leaves, Whole plant	Insanity, Memory loss, Revitaliser, Rheumatism
106.	*Mansoa alliacea*	Rasuna lata	Bignoniaceae	Climber	Bark, Leaves, Root	Fever, Cold, Inflammation
107.	*Artocarpus altilis*	Bilati panasa	Moraceae	Tree	Leaves, Fruit, Seed	Inflammation, Heart diseases, Anti-fungal, Anthelmentics
108.	*Semecarpus anacardium*	Bhalia	Anacardiaceae	Tree	Seed, Fruit	Digestive, Liver tonic, Leprosy, Aphrodisiac
109.	*Dillenia indica*	Ou	Dilleniaceae	Tree	Leaves, Fruit, Bark	Digestive, Purgative Laxative, Astringent Abdominal disorder
110.	*Gmelina arborea*	Gambhari	Verbenaceae	Tree	Bark, Root, Leaves, Flower	Digestive, Laxative, Blood Purifier, Laxative, Stomachic, Tonic, Antidote to poisons, Gonorrhoea
111.	*Wrightia tinctoria*	Swetakutaja / Bada kuruma	Apocyanaceae	Tree	Bark, Leaves, Seed	Skin Diseases, Piles, Diarrhea, Dysentry, Ring worm, Astringent, Anthelmentic, Aphrodisiac

112.	*Litsea glutinosa*	Medha	Lauraceae	Tree	Root, Inner bark, Leaves	Rheumatism, Boils, Sprains, Wound, Dysentry, Diarrhoea, Antibacterial, Spermatorrhoea
113.	*Manilkara hexandra*	Khirakoli	Sapotaceae	Tree	Bark, Seed	Astringent, Fever, Sweetener, Cooling, Aphrodisiac, Colic, Gingivitis, Flatulence
114.	*Terminalia bellerica*	Bahada	Combretaceae	Tree	Fruit, Seed, Bark	Jaundice, Cough & Cold, Digestive, Diarrhoea, Asthma, Expectorant, Tonic, Fever, Opthalmic, Purgative
115.	*Emblica officinalis*	Aonla	Euphorbiaceae	Tree	Fruit	Revitaliser, Cough & Cold, Diabetes, Hyperacidity, Tonic for eyes, heart, hair, Skin & brain
116.	*Terminalia chebula*	Harida	Combretaceae	Tree	Fruit, Seed, Bark	Carminative, Piles, Tonic, Laxative, Digestive, Lever trouble, Arthritis
117.	*Bridelia retusa*	Kasi	Euphorbiaceae	Tree	Bark, Root	Astringent, Skin diseases, Febrifuge Analgesic, Purgative, Purgative, Stimulant, Emmenagogue
118.	*Pterospermum acerifolium*	Muchukunda/ Kanaka champa	Sterculiaceae	Tree	Flower	Pain killer, Tumour, Inflammation, Ulcers, Blood troubles, Leprosy
119.	*Aegle marmelos*	Bela	Rutaceae	Tree	Leaves, Fruit,	Cooling, Digestive, Diarrhea,

					Root, Bark	Dysentery, Acidity, Diabetes, Debility, Digestion, Constipation, Mouth ulcer
120.	*Sterculia urens*	Genduli	Sterculiaceae	Tree	Root, Leaves, Seeds, Gum	Constipation, Laxative, Dental fixture, Debility, Diarrhea, Lung diseases, Sore throat
121.	*Scaevola taccada*	Vadrakhya	Goodeniaceae	Shrub	Root, Leaves, Fruit	Abdominal & womb illness, Eye diseases, Menstrual cramps, Tumor, Beriberi
122.	*Averrhoa carambola*	Karamanga	Oxalidaceae	Tree	Leaves, Fruit, Seed, Flower	Chronic headache, Fever, Cough, Skin diseases, Inflammations, Diarrhoea, Infection, Ringworm
123.	*Ziziphus jujube*	Barakoli	Rhamnaceae	Tree	Fruit, Seed, Bark, Leaves	Laxative, Digestive, Poor Apetite, Night Sweats, Insomnia, Anxiety, Tuberculosis
124.	*Streblus asper*	Sahada	Moraceae	Tree	Stem Bark, Fruit, Leaves, Seed, Root, Latex	Filariasis, Leprosy, Toothache, Diarrhea, Dysentery, Wounds, Scabies, Dental Care
125.	*Bixa Orellana*	Kumkum	Bixaceae	Tree	Leaves, Seed, Root, Bark	Aphrodisiac, Emmenagogue, Expectorant, Vermifuge, Asthma, Jaundice, Bronchitis
126.	*Heterophragma adenophyllum*	Mahadhruma	Bignoniaceae	Tree	Leaves, Bark	Massage oil for muscular pain

127.	*Grewia asiatica*	Pharsakoli	Tiliaceae	Shrub	Fruit, Root, Leaves, Bark	Burning Sensation, Semirial disorder
128.	*Spondias pinnata*	Ambada	Anacardiaceae	Tree	Root, Fruit, Bark	Diabetes, Dysentry, Eye Problems, Hair fall
129.	*Tamarindus indica*	Tentuli	Caesalpiniaceae	Tree	Root, Leaves, Bark, Flower, Seed	Tonic, Diuretic, Anaemia, Cough, Epilepsy, Scurvey, Cold, Burns, Fever, Sore throat
130.	*Dillenia pentagyna*	Rai	Dilleniaceae	Tree	Leaves, Bark, Fruit, Resin	Anal fistula, Wounds, Diabetes, Pneumonia, Burning sensation
131.	*Artocarpus lakoocha*	Jeutha	Moraceae	Tree	Bark, Root, Fruit, Leaves	Gonorrhea, Liver disease, Skin disease,Vomiting, Diarrhoea, Constipation
132.	*Bombax ceiba*	Simili	Bombacaceae	Tree	Root, Gum, Bark, Leaves, Seed, Flower	Cholera, Urinary Complaints, Cough, Nocturnal Pollution, Abdominal Pain due to dysentery, Impotency
133.	*Gardenia gummifera*	Damaguruda/ Bhuruda koli	Rubiaceae	Shrub	Gum, Resin	Antiseptic, Digestive, Appetizer
134.	*Terminalia catappa*	Katha badam	Combretaceae	Tree	Leaves, Fruit	Astringent, Colic, Vermifuge, Dysentry, Headache, Indigestion
135.	*Schrebera swieteniodes*	Ekshira	Oleaceae	Tree	Root, Bark, Leaves, Fruit	Throat diseases, Anaemia, Bleeding piles, Diabetes, Hydrocele, Leprosy
136.	*Barringtonia acutangula*	Hinjala	Barringtoniaceae	Tree	Root, Leaves, Fruit, Seed	Leprosy, Plumbago, Skin diseases, Diarrhea, Flatulence, Inflammation, Haemorrhoids, Anthelmintic

137.	*Couroupita guianensis*	Naga champa/ Anantnag/ Nagalinga	Lecythidaceae	Tree	Leaves, Bark, Flower, Fruit	Antibiotic, Wounds, Antifungal, Cold, Antiseptic, Stomach ache, Analgesic, Inflammation
138.	*Diospyros melanoxylon*	Kendu	Ebenaceae	Tree	Seed, Bark, Fruit, Flower	Vomiting, Malaria, Mental disorder, Astringent, Urinary, skin & blood disease
139.	*Acacia catechu*	Khaira	Mimosaceae	Tree	Bark, Heart wood	Astringent, Blood purifier, Stomach ache, Conjunctivitis, Diarrhea, Digestive, Tonic, Skin diseases
140.	*Oroxylum indicum*	Phanaphana	Bignoniaceae	Tree	Root, Bark, Fruit, Leaves	Astringent, Diarrhea, Dysentry, Purgative, Rheumatism, Tonic, Stomachic
141.	*Cinnamomum camphora*	Karpura	Lauraceae	Tree	Bark, wood, Leaves, Whole plant	Diarrhea, Tumors, Boils, Laxative, Carminative, Inflammation, Rheumatism, Stomach ache, Aphrodisiac
142.	*Gustavia augusta*	Guyana	Lecythidaceae	Tree	Leaves, Fruit, Stem bark	Vomiting in infants, Leishmaniasis, Inflammation
143.	*Psidium guajava*	Pijuli	Myrtaceae	Tree	Leaves, Seeds, Fruit	Inflammation, Ulcer, Diabetes, Carries, Hypertension, Fever, Diarrhea, Wounds
144.	*Pandanus fascicularis*	Ketaki	Pandanaceae	Shrub	Flower, Fruit, Root, Leaves	Digestive, Greying of hair, Colic, Arthritis, Rheumatism, Chest congestion

145.	*Terminalia arjuna*	Arjuna	Combretaceae	Tree	Bark, Fruit	Uterine complain, Bleeding piles, Cardiac tonic, Blood dysentery, Chronic fever, Hypertension, Fracture, Insect sting
146.	*Plumeria acuminate*	Katha champa	Apocynaceae	Tree	Bark, Flower, Leaves, Latex	Purgative, Skin diseases, Tooth ache, Aphrodisiac
147.	*Plumeria rubra*	Katha champa (Nali)/ Frangipani	Apocyanaceae	Tree	Leaves, Bark, Root, Wood	Boils, Pimples, Skin, diseases, Antifungal, Antibacterial, Antiviral, Analgesic, Antispasmodic
148.	*Plumeria alba*	Katha Champa (Dhala)	Apocynaceae	Tree	Seed, Latex, Root, Leaves	Purgative, Skin diseases, Tooth ache, Aphrodisiac
149.	*Michelia champaca*	Champa/ Swarna champa	Magnoliaceae	Tree	Flower, Bark, Root, Stem	Fever, Cough, Colic, Leprosy, Rheumatism, Febrifuge, Purgative
150.	*Ferula asafetida*	Hengu	Apiaceae	Herb	Gum, Resin, Bark, Fruit, Leaves	Expectorant, Ulcer Laxative, Wounds, Antispasmodic, Vomiting, Burning Sensation
151.	*Santalum album*	Chandan	Santalaceae	Tree	Heart wood	Deodorant, Skin diseases, Skin rash, Revitaliser, Diuretic, Intellect promoting
152.	*Hydnocarpus kurzii*	Chal Mugura	Flacourtiaceae	Tree	Bark, Root, Seed	Deodorant, Skin diseases, Leprosy, Rheumatism, Chest complaints
153.	*Holoptelea integrifolia*	Dhauranja	Ulmaceae	Tree	Bark, Heart wood, Flower	Vision disorder, Head diseases, Wound healing

154.	*Sesbania grandiflora*	Agasthi	Fabaceae	Tree	Leaves, Fruit, Flower, Bark, Root, Shoot	Indigestion, Arthritis, Analgesic, Anti-Microbial, Anti-pyretic
155.	*Xylia xylocarpa*	Kangada	Mimosaceae	Tree	Seed, Bark, Resin	Eye diseases, Ulcers, Appetizer, Leprosy, Vomiting, Diarrhoea, Gonorrhoea
156.	*Dalbergia sisoo*	Sisoo	Fabaceae	Tree	Leaves, Bark	Eye pain, Swelling, Painful urination, Gynaecological disorders, Diabetes, Analgesic
157.	*Holarrhena antidysenterica*	Kurei	Apocyanaceae	Shrub	Stem, Bark, Leaves, Seed	Anti-amoebic, Anthelmentic, Vomiting, Malaria, Stomachic, Digestive
158.	*Chloroxylon swietenia*	Bheru	Rutaceae	Tree	Leaves, Root	Ringworm, Astringent, Wounds, Rheumatism, Snake bites
159.	*Crataeva religiosa*	Baruna	Capparaceae	Tree	Bark, Leaves, Root bark	Laxative, Arthritis, Abdominal tumor, Cough, Obesity
160.	*Strychnus nux vomica*	Kochila	Loganiaceae	Tree	Seed, Bark	Skin diseases, Ulcer, Anemia, Erectile dysfunction
161.	*Careya arborea*	Kumbhi	Barringtoniaceae	Tree	Bark, Leaves	Diarrhea, Stomach ache, Eye swelling
162.	*Hibiscus mutabilis*	Sthala padma	Malvaceae	Shrub	Leaves, Flower, Root	Swelling, Skin infection, Mucilage, Antibacterial, Antidiabetic

163.	*Murraya paniculata*	Kamini	Rutaceae	Shrub	Leaves, Bark, Flower, Root	Analgesic, Dropsy, Astringent, Diarrhoea, Dysentry, Toothache
164.	*Nyctanthes arbortristis*	Gangasiuli/ Singadahar	Oleaceae	Tree	Bark, Leaves, Flower	Malaria, Migrane, Expectorant, Fever, Arthritis, Laxative
165.	*Pongamia pinnata*	Karanja	Fabaceae	Tree	Fruit, Leaves, Root, Seed, Flower	Anaemia, Herpes, Skin diseases, Acne, Eczema, Ulcer, Scabies
166.	*Euphorbia neriifolia*	Pata siju	Euphorbiaceae	Tree	Root, Stem, Leaves, Latex	Purgative, Asthama, Cough, Ulcers, Scabies, Anti-worm, Liver ailments
167.	*Punica granatum*	Dalimba	Punicaceae	Tree	Fruit, Flower, Leaves	Diarrhea, Dysentry, Stomachic, Cooling, Astringent, Tonic, Digestive, Bleeding from nose, Piles
168.	*Diospyrous Montana*	Bias kendu	Ebenaceae	Tree	Fruit, Seed	Dysentery, Boils
169.	*Cassia fistula*	Sunari	Caesalpiniaceae	Tree	Leaves, Root, Flower, Fruit pulp	Piles, Purgation, Jaundice, Arthritis, Constipation
170.	*Tectona grandis*	Sagwan	Verbenaceae	Tree	Root, Flower, Bark, Seed	Anuria, Bronchitis, Diuretic, Liver congestion, Piles

171.	*Pterocarpus marsupium*	Piasal/ Bijasal	Fabaceae	Tree	Heart wood, Leaves, Gum, Flower, Bark	Diabetes, Skin diseases, Arthritis, Psoriasis, Analgesic
172.	*Saraca asoca*	Ashoka	Caesalpiniaceae	Tree	Bark, Seed, Flowering buds	Wounds, Piles, Jaundice, Cough, Cold, Aging, Gynic disorder, Uterine health, Arthritis
173.	*Alstonia scholaris*	Chhatiana	Apocyanaceae	Tree	Leaves, Bark, Milky juice	Expectorant, Tonic, Stomachic, Ulcer, Fever, Malaria, Asthma
174.	*Feronia elephantum*	Kaitha	Rutaceae	Tree	Leaves, Bark, Gum, Fruit	Piles, Asthma, Diarrhea, Dysentry, Hiccups, Flatulence
175.	*Cordia oblique*	Guhal	Ehretiaceae	Tree	Bark, Fruit, Seed	Pox, Hair vitaliser, Leprosy
176.	*Bauhinia variegata*	Kanchan	Fabaceae	Tree	Bark, Fruit, Leaves	Dysentery, Diarrhea, Hemorrhoids, Piles, Laxative, Anthelmintic, Anti-Leprotic, Astringent
177.	*Pterocarpus santalinus*	Rakta chandan	Fabaceae	Tree	Heart wood, Bark, Leaves	Antipyretic, Anti-Inflammatory, Anthelmintic, Tonic, Hemorrhage, Dysentery, Aphrodisiac, Diaphoretic

178.	*Morinda citrifolia*	Noni	Rubiaceae	Tree	Leaves, Root, Bark, Fruit	Diabetes, High blood pressure, Pains, Aches, Burns, Arthritis, Tumors, Viral, parasitic and bacterial infections, Inflammations
179.	*Morinda tinctoria*	Achu	Rubiaceae	Tree	Leaves, Fruit, Bark	Febrifuge, Tonic, Stimulant, Scabies, Hip pain
180.	*Abroma augusta*	Olatakamal	Sterculiaceae	Shrub	Root, Root bark, Stem, Leaves	Abortifacient, Joint pain, Diabetes, Headaches, Uterine disorders, Rheumatism
181.	*Clerodendrum fragrans*	Brajamalli	Verbenaceae	Shrub	Leaves, Flower	Diabetes, Ulcers
182.	*Solanum macranthum*	Alu gacha	Solanaceae	Tree	Flower	Asthma, Arthritis
183.	*Vitex trifolia*	Nichinda	Lamiaceae	Tree	Whole plant	Fever, Anthelmentic, Arthritis, Diuretic, Hypertension, Diaphoretic
184.	*Jambosa javanica*	Jamrul	Myrtaceae	Tree	Bark, Leaves, Root, Fruit, Flower	Asringent, Dysentry, Antibiotic, Amenorrhea, Abortifacient
185.	*Anacardium occidentale*	Phula badam/ Kaju badam	Anacardiaceae	Tree	Fruit, Bark, Nut, Leaves	Calluses, Corn, Warts, Malaria, Diarrhea, Gingivitis, Elephantiasis

186.	*Cocos nucifera*	Nadia	Arecaceae	Tree	Leaves, Root, Fruit	Antimicrobial, Antifungal, Ulcers, Kidney stones, Hair problems
187.	*Phoenix sylvestris*	Khajuri	Arecaceae	Tree	Root, Gum, Leaves, Fruit	Toothache, Fever, Gonorrhea, Cough, Abdominal complaints
188.	*Borassus flabellifer*	Tala	Arecaceae	Tree	Whole plant, Leaves, Root, Fruit	Diuretic, Gastritis, Hiccough, Gonorrhea, Skin diseases
189.	*Premna integrifolia*	Gandhani/ Agibathu/ Agnimanth	Verbenaceae	Tree	Leaves, Root, Root Bark, Stem bark	Digestive, Tonic, Stomachic, Cough, Neuralgia, Asthma, Bronchitis, Leprosy, Skin Disorders
190.	*Cissampelos pareira*	Akanabindhi	Menispermaceae	Shrub	Leaves, Root	Blood purifier, Astringent, Diuretic, Fever
191.	*Spilanthes acmella*	Akarakara	Asteraceae	Herb	Flower, Root	Toothache, Mouth diseases, Purgative, Skin diseases
192.	*Spilanthes calva*	Akarakara (Chotta)	Compositae	Herb	Branch, Root, Leaves	Tooth ache, Blood disorder, Diuretic, Constipation
193.	*Solanum xanthocarpum*	Ankaranti	Solanaceae	Shrub	Whole Plant, Root	Piles, Fever, Sun stroke, Asthma, Cough, Diuretic, Anthelmintic

194.	*Mangifera indica*	Amba	Anacardiaceae	Tree	Leaves, Bark, Fruit	Burns, Astringent, Laxative, Nutritive, Tonic, Diuretic
195.	*Capparis zeylanica*	Asadhua	Capparaceae	Shrub	Root, Leaves, Flower, Seed	Swelling, Gynic disorders
196.	*Sida cordifolia*	Bajramuli/ Bisakapuri	Malvaceae	Shrub	Root, Whole plant	Nervous disorder, Facial paralysis, Cooling, Urinary diseases, Dysentery, Astringent, Tonic
197.	*Abelmoschus moschatus*	Bana bhendi/ Kasturi bhendi	Malvaceae	Shrub	Seeds	Cough, Asthma, Aphrodisiac, Debility, Digestive, Diarrhea, Spermatorrhoea
198.	*Ochna obtusata*	Ramdhan champa	Ochnaceae	Tree	Bark, Leaves	Asthma, Leprosy, Fever, Colic, Anemia, Jaundice, Diabetes
199.	*Mimusops elengi*	Baula	Sapotaceae	Tree	Fruit, Leaves, Seed	Tooth ache, Cough, Astringent, Gum problem, Dysentery
200.	*Pueraria tuberosa*	Bhuin kakharu/ Bidari kanda	Fabaceae	Shrub	Root, Tuber	Refrigerant, Cardiac debility, Tuberculosis, Swollen joint , Rejuvenator

201.	*Clerodendrum serratum*	Bramha jasti	Verbenaceae	Shrub	Root, Leaves	Asthma, Febrifuge, Skin disease, Stimulant
202.	*Costus speciosus*	Chakra kedara	Costaceae	Shrub	Rhizome	Urinary calculi, Cough, Fever, Skin disease, Anemia
203.	*Jasminum grandiflorum*	Jaai phula	Oleaceae	Shrub	Flower, Leaves, Root, Whole plant	Anti depressant, Anthelmintic, Corn, Diuretic, Sedative, Mouth ulcer, Antioxidant
204.	*Myristica fragrans*	Jaai phala	Myristicaceae	Tree	Seed kernel	Astringent, Cold, Digestive, Acne, Carminative, Sexual debility, Depression
205.	*Asparagus racemosus*	Satavari	Aspragaceae	Herb	Leaves, Seed, Tuberous roots	Tonic, Rejuvenator, Galactogogue, Diarrhea, Dysentry, Aphrodisiac, Analgesic
206.	*Mammea suriga*	Chhuriana	Guttiferae	Tree	Bark, Leaves, Flower buds	Stimulant, Digestive, Skin diseases, Rheumatism, Arthritis
207.	*Artabotrys hexapetalus*	Chini champa	Annonaceae	Herb	Flower, Root, Leaves	Cardiac stimulant, Muscle relaxant, Bronchitis, Asthma, Bruises

208.	*Cinnamomum zeylanicum*	Dalchini	Lauraceae	Tree	Bark, Leaves	Carminative, Pain, Expectorant, TB, Stimulant, Digestive, Cough, Bleeding
209.	*Polyalthia longifolia*	Debadaru	Annonaceae	Tree	Leaves, Seed, Stem bark	Fever, Hypertension, Skin diseases, Diabetes, Intestinal parasites
210.	*Solanum violaceum*	Dengabheji/ Brihati	Solanaceae	Shrub	Flower, Fruit	Cough, Diuretic, Urinary disorder, Vomiting, Asthma, Fever, Skin diseases
211.	*Woodfordia fruticosa*	Dhatuki	Lythraceae	Shrub	Flower, Leaves, Fruit	Astringent, Skin diseases, Diarrhea, Dysentery
212.	*Ficus racemosa*	Dimiri	Moraceae	Tree	Fruit, Stem Bark, Root, Leaves, Latex	Tonic, Gastritis, Astringent, Ulcers, Bleeding nose, Leucoderma, Diarrhea, Dysentery, Diabetes
213.	*Scindapsus officinalis*	Gajapipali	Araceae	Shrub	Fruit, Shoot, Root, Leaves	Stimulant, Asthma, Carminative, Rheumatism, Cough, Aphrodisiac
214.	*kaempferia galangal*	Rama kedar/ Gandha sunthi	Zingiberaceae	Herb	Rhizome	Stimulant, Asthma, Expectorant, Sore throat, Carminative, Heart diseases, Rheumatism, Anti bacterial

215.	*Radermachera xylocarpa*	Garuda	Bignoniaceae	Tree	Wood oil, Root bark	Astringent, Skin infection, Antiseptic
216.	*Tribulus terrestris*	Gokhura	Zygophyllaceae	Shrub	Root, Fruit, Seed, Leaves, Whole plant	Urinary diseases, Aphrodisiac, Tonic, Heart disease, Skin diseases
217.	*Areca catechu*	Gua	Arecaceae	Tree	Fruit	Digestive, Urinary disorders, Astringent, Stimulant, Menorrhea
218.	*Curcuma longa*	Haladi	Zingiberaceae	Shrub	Rhizome, Tuber, Root	Jaundice, Antiseptic, Blood purifier, Antioxidant, Cough, Worm infections
219.	*Kalanchoe laciniata*	Himakedar/ Hemsagara/ Amarpoi	Crassulaceae	Herb	Leaves, Whole plant	Diarrhoea, Dysentery, Antipyretic, Wounds, Antiseptic
220.	*Acalypha indica*	Indramarisa	Euphorbiaceae	Herb	Seed, Whole plant	Bronchitis, Asthma, Rheumatism, Blood cancer, Ascaris, Scabies
221.	*Cassia alata*	Jadumari	Ceasalpinaceae	Shrub	Leaves, Bark, Root, Seed, Flower	Skin diseases, Ringworms, Antifunal, Antimicrobial, Abortifacient, Analgesic

222.	*Syzygium cumini*	Jamu koli	Myrtaceae	Tree	Seed, Fruit, Bark, Leaves	Diabetes, Digestive, Acne, Anthelmintic, Arthritis, Antiaging
223.	*Glycyrrhiza glabra*	Jasti madhu	Fabaceae	Shrub	Root, Stolon Rhizome, Bark	Diabetic, Intellect promoting, Cold, Cough, Rheumatism, Heart disease, Aphrodisiac
224.	*Jasminum auriculatum*	Jui	Oleaceae	Herb	Flower, Root Leaves	Astringent, Cardiac tonic, Blood purifier, Cough, Ringworm, Ulcers
225.	*Neolamarckia cadamba*	Kadamba	Rubiaceae	Tree	Stem, Bark, Fruit, Root	Febrifuge, Thirst in fever, Sun stroke, Urine problem, Aphrodisiac, Complexion promoter
226.	*Nymphaea nouchali*	Kain	Nymphaeaceae	Aquatic Herb	Flower, Whole plant	Astringent, Cardiac tonic, Tonic for general debility, Aphrodisiac, Skin diseases
227.	*Mallotus philippensis*	Kamalagundi	Euphorbiaceae	Tree	Fruit, Whole plant	Worm infection, Skin diseases, Jaundice, Insanity, Epilepsy, Fistula
228.	*Thevetia neriifolia*	Kaniar	Apocynaceae	Tree	Leaves, Roots, Bark, Flower	Emetic, Ear disease, Insect sting, Cardiac tonic, Acne, Eye diseases
229.	*Capparis sepiaria*	Kanthikapali	Capparaceae	Shrub	Fruit, Bark, Leaves	Cough, Fever, Skin diseases, Arthritis, Aphrodisiac

230.	*Nerium indicum*	Karabira	Apocynaceae	Shrub	Whole plant, Root, Leaves	Anti inflammatory, Acne, Skin disease, Insect sting, Anti fungal
231.	*Carissa spinarum*	Khirikoli/ Dudha koli	Apocynaceae	Shrub	Fruit, Root	Astringent, Ascaris, Inflammation, Snake bite, Rheumatism, Epilepsy
232.	*Passiflora foetida*	Gandha tamala/ Krushna tamala	Passifloraceae	Vine	Fruit, Leaves, Flower, Root	Emetic, Cold, Biliousness, Asthma, Diarrhea, Sleeping sickness
233.	*Passiflora incarnate*	Radha tamala	Passifloraceae	Vine	Leaves, Stem, Flower, Fruit	Mild sedative, Antispasmodic, Emmenagogue, Febrifuge
234.	*Uraria picta*	Pusniparni	Fabaceae	Shrub	Whole plant, Root, Leaves, Pod	Cough, Fever, Stimulant, Laxative, Prolapsed anus, Fracture, Dasmulla
235.	*Uraria lagopoides*	Krushnaparni	Fabaceae	Herb	Leaves, Whole plant	Tonic, Laxative, Sexual stimulant, Swelling, Wounds
236.	*Schleichera oleosa*	Kusuma	Sapindaceae	Tree	Bark, Fruit	Astringent, Skin eruption, Blood disorders, Anorexia, Bronchitis, Acne
237.	*Syzygium aromaticum*	Labanga	Myrtaceae	Tree	Flower bud	Tooth ache, Anti emetic, Cough & Cold, Carminative, Digestive, Stimulant
238.	*Butea monosperma*	Palash	Fabaceae	Tree	Bark, Seed, Flower, Leaves	Dropsy, Bowel complaints, Skin diseases, Aphrodisiac

239.	*Butea superba*	Nali Palash	Fabaceae	Shrub	Flower, Root, Seed	Skin disease, Fever, Painful urination, Aphrodisiac, Erectile dysfunction
240.	*Citrus reticulatus*	Lembu	Rutaceae	Tree	Fruit juice, Root, Bark	Stomachic, Stimulant, Appetizer, Digestive, Diarrhea, Dysentery, Antiseptic
241.	*Symplocos racemosa*	Lodha	Symplocaceae	Tree	Stem Bark, Seeds	Astringent, Acne, Ophthalmic, Ulcer, Bleeding gums, Baldness
242.	*Hiptage benghalensis*	Madhabi	Malpighiaceae	Shrub	Root, Flower, Seed, Leaves, Bark	Obesity, Aromatic, Expectorant, Skin diseases, Cardiac tonic, Hemorrhage, Wound, Asthma
243.	*Lavandula angustifolia*	Madhukar	Lamiaceae	Herb	Leaves, Oil, Flower	Stimulant, Tooth ache, Age spot, Burns, Acne, Fungal nails, Acrophobia
244.	*Madhuca indica*	Mahula	Sapotaceae	Tree	Bark, Seed, Flower, Leaves	Stimulant, Laxative, Ulcer, Bleeding gum, Stimulant, Aphrodisiac, Anthelmintic
245.	*Combretum indicum*	Malati lata	Combretaceae	Climber	Leaves, Whole plant, Flower	Antiseptic, Anthelmintic, Sedative, Cough, Ascaris, Antiseptic

246.	*Jasminum sambac*	Malli	Oleaceae	Shrub	Flower, Root, Leaves	Blood purifier, Emmanagogue, Ear, nose & throat diseases, Ulcers, Ringworm
247.	*Hibiscus rosa-sinensis*	Mandara	Malvaceae	Shrub	Flower, Root, Leaves	Antifertility, Brain tonic, Febrifuge, Diuretic, Sedative, Baldness, Anemia
248.	*Diospyros macrophylla*	Mankada kendu	Ebenaceae	Tree	Fruit, Flower, Bark	Astringent, Antibacterial, Hiccough, Anemia, Diarrhea, Dysentery, Gynic disorders
249.	*Elaenus latifolia*	Mirchakoli	Elaeagaceae	Shrub	Fruit, Flower	Astringent, Heart diseases
250.	*Helicteres isora*	Modimodika	Sterculiaceae	Shrub	Root, Bark, Fruit	Diabetes, Skin diseases, Astringent, Expectorant, Demulcent
251.	*Azadirachta indica*	Nimba/ Neem	Meliaceae	Tree	Leaves, Fruit, Flower, Bark	Antimicrobial, Antifungal, Antiviral , Antipyretic, Antiseptic, Wounds, Blood purifier, Skin diseases, Mouth diseases
252.	*Cuscuta reflexa*	Nirmuli	Convolvulaceae	Vine	Whole plant	Jaundice, Cough, Paralysis, Alterative, Aphrodisiac

253.	*Stereospermum chelonoides*	Padhel	Bignoniaceae	Tree	Root, Bark, Flower	Dasamula, Cold, Fever, Cough, Asthma
254.	*Nelumbo nucifera*	Padma	Nelumbonaceae	Aquatic Herb	Flower, Seed, Whole plant	Haemostatic, Urinary disorder, Skin & Urine diseases, Aphrodisiac, Piles, Anthelminitic
255.	*Curcuma angustifoia*	Palua	Zingiberaceae	Herb	Rhizome	Bronchitis, Asthma, Nutritious, Tonic, Carminative, Cardio tonic, Diuretic
256.	*Piper betle*	Pana	Piperaceae	Vine	Whole plant, Leaves	Digestive, Cancer, Acne, Carminative, Throat irritation, Respiratory troubles
257.	*Artocarpus heterophyllus*	Panasa	Moraceae	Tree	Fruit, Seed, Leaves, Latex	Astringent, Laxative, Immunity booster, Antioxidant, Antipyretic
258.	*Lagerstroemia speciosa*	Patali	Lythraceae	Tree	Leaves, Fruit, Bark, Seed, Root	Narcotic, Astringent, Appetizer, Diuretic, Expectorant, Fever, Rheumatism, General debility
259.	*Abutilon indicum*	Pedipedika	Malvaceae	Shrub	Root, Leaves, Seed, Whole plant	Fever, Cold, Piles, Diuretic, Nervine tonic, Fever, Cough, Rheumatism, Jaundice

260.	*Celastrus paniculatus*	Pingu	Celastraceae	Shrub	Seeds, Root, Bark, Leaves	Urination, Cough, Asthma, Alzheimer, Weak eyesight
261.	*Piper longum*	Pippali	Piperaceae	Climber	Root, Fruit, Stem	Tonic, Appetizer, Analgesic, Cough, Cold, Asthma, Piles, Rheumatism
262.	*Calophyllum inophyllum*	Polanga	Calophyllaceae	Tree	Leaves, Bark, Seed, Fruit	Carminative, Laxative, Skin disease, Baldness, Athlete foot, Acne
263.	*Polianthes tuberosa*	Rajnigandha	Agavaceae	Herb	Flower, Bulb	Diuretic, Emetic, Gonorrhea, Skin eruptions
264.	*Plumbago indica*	Rakta chita	Plumbaginaceae	Shrub	Root, Root bark	Nervous disorder, Indigestion, Leucoderma, Scorpion sting
265.	*Ocimum gratissimum*	Rama tulasi	Lamiaceae	Herb	Leaves, Seed	Rheumatism, Cough, Nervine tonic
266.	*Coleus amboinicus*	Rukuna hathapocha	Lamiaceae	Herb	Leaves, Seed, Whole Plant	Digestive, Gynecological disorder, Liver stimulant, Kidney stone
267.	*Ruta graveolens*	Ruta	Rutaceae	Shrub	Whole plant	Cough, Epilepsy, Dry socket, Backpain, Rheumatism
268.	*Catharanthus roseus*	Sadabihari (Nali)	Apocynaceae	Shrub	Whole plant, Root, Leaves	Diabetes, Cancer, Astringent, Asthma, Abortifacient

269.	*Vinca rosea*	Sadabihari (Dhala)	Apocynaceae	Shrub	Flower, Leaves	Lumbago, Cancer, Acne, Allergy, Abscess
270.	*Prosopis cineraria*	Sami	Fabaceae	Tree	Bark , Leaves, Flower, Fruit	Astringent, Anti inflammatory, Asthma, Bronchitis, Chest congestion
271.	*Bauhinia vahlii*	Siali lai/ Siali lata	Fabaceae	Climber	Leaves, Seed	Tonic, Febrifuge, Aphrodisiac, Demulcent, Mucilaginous
272.	*Dalbergia latifolia*	Pahadi sisoo	Fabaceae	Tree	Seed, Root, Leaves	Psychosis, Eye disorder, Leprosy, Toothache, Diarrhea, Indigestion
273.	*Gardenia jasminoides*	Sugandharaj	Rubiaceae	Shrub	Fruit, Leaves, Whole plant	Antispasmodic, Antihelmintic, Abdominal diseases, Abscess
274.	*Ervatamia divaricate*	Tagara	Apocynaceae	Shrub	Leaves, Root, Flower,	Skin diseases, Eye diseases, Ascaris Conjuctivitis, Diarrhea
275.	*Curculigo orchioides*	Talamuli	Hypoxidaceae	Herb	Bulb, Leaves, Rhizome	Nervine tonic, Jaundice, Asthma, Skin diseases
276.	*Cinnamomum tamala*	Teja Patra	Lauraceae	Tree	Leaves, Fruit, Stem bark	Carminative, Diabetes, Cold, Hypoglycemic , Flatulence, Debility, Dandruff

277.	*Toddalia asiatica*	Tundupoda	Rutaceae	Climber	Leaves, Root, Flower, Fruit	Mouth ulcer, Toothache, Digestive, Astringent, Antiseptic
278.	*Stephania hernandifolia*	Akanabindi	Menispermaceae	Vines	Leaves	Urination, Dysentry, Stomach complaints, Fever
279.	*Oxalis corniculata*	Ambiliti	Oxalidaceae	Shrub	Whole plant	Cough, Dysentry, Skin diseases, Cataract, Jaundice, Scurvy
280.	*Caesalpinia bonduc*	Bada gila	Caesalpinaceae	Climber	Root, Seed, Leaves, Bark	Fever, Malaria, Reduces pain after child birth
281.	*Cassia absus*	Bana kolathia	Ceasalpinaceae	Herb	Leaves, Seed, Root	Itching, Cough, Nose disease, Astringent
282.	*Amorphophallus dubius*	Bana olua	Araceae	Shrub	Root, Rhizome	Piles, Constipation, Liver tonic
283.	*Ipomoea pestigridis*	Bilei panjha/ Bilei padi	Convolvulaceae	Shrub	Root, Whole plant	Purgative, Dog bite, Carbuncles
284.	*Erythrina stricta*	Chaladhua	Fabaceae	Tree	Bark, Root, Seed	Dysentery, Apetite improvement, Joint pain, Laxative
285.	*Baliospermum montanum*	Dhanti	Euphorbiaceae	Shrub	Root, Leaves, Seed	Skin diseases, Asthama, Jaundice, Purgative, Analgesic

286.	*Cryptolepis buchananii*	Gopakani	Asclepiadaceae	Twiner	Root, Whole plant	Blood purifier, Rheumatism, Paralysis, Fracture, Abdominal disease
287.	*Heliotropium indicum*	Hathi sundha	Boraginaceae	Shrub	Whole plant, Leaves	Fever, Urticaria, Diuretic, Arthritis, Abscess
288.	*Enhydra fluctuans*	Hidimichi	Compositae	Herb	Whole Plant, Leaves	Laxative, Nerve & skin diseases, Inflammation
289.	*Stachytarpheta jamaicensis*	Jatia	Verbinaceae	Shrub	Leaves, Stem, Root, Whole plant	Purulent ulcer, Rheumatism, Dysentry, Allergy, Anxiety
290.	*Crotalaria juncea*	Jhumuka	Papilionaceae	Shrub	Pod, Leaves, Root	Cough, Skin disease, Leucorrhea, Colic, Baldness, Anemia
291.	*Lygodium flexuosum*	Kala mahajala	Lygodiaceae	Fern	Leaves, Root	Expectorant, Cut, Wounds, Eczema, Scabies, Sprains, Rheumatism
292.	*Dioscorea glabra*	Kanta alu	Dioscoriaceae	Vine	Rhizome	Swelling
293.	*Ziziphus oenoplia*	Kantei koli	Rhamnaceae	Shrub	Stem, Root bark, Fruit	Diuretic, Wound healing, Antiascarid
294.	*Thespesia lampas*	Kapasia	Malvaceae	Herb	Root, Fruit	Syphillis, Tape worms, Gonorrhea, Jaundice

295.	*Pavetta tomentosa*	Kukurchhalia	Rubiaceae	Shrub	Leaves, Root bark, Stem bark	Rheumatism, Antiasthmatic, Expectorant, Astringent, Antidiarrheal
296.	*Acacia pennata*	Lal dantari	Mimosaceae	Shrub	Bark, Root, Leaves	Asthma, Bronchitis, Flatulence, Stomach ache, Gingivitis, Head ache
297.	*Adenanthera pavonina*	Manda kaincha	Mimosaceae	Tree	Heart wood, Bark, Leaves	Rheumatism, Gout, Boils, Kidney diseases, Acne, Gonorrhea, Skin problems
298.	*Elaeagnus latifolia*	Mirza koli	Elaeagnaceae	Shrub	Fruit, Flower,	Heart diseases, Astringent, Cancer
299.	*Ipomoea reniformis*	Musakani	Convolvulaceae	Herb	Whole plant	Skin diseases, Constipation, Worm infestation, Dandruff
300.	*Smilax microphylla*	Muturi	Liliaceae	Shrub	Root, Rhizome	Arthritis, Increases sweating and urination
301.	*Gloriosa superba*	Pancha angulia	Liliaceae	Climber	Rhizome,Seed, Tuberous root	Piles, Fever, Leprosy, Worm infestation, Snake bite
302.	*Pedilanthus tithymaloides*	Patra siju/ Bilati siju	Euphorbiaceae	Shrub	Root, Latex	Leprosy, Asthma, Abdominal troubles, Skin diseases
303.	*Dioscorea bulbifera*	Pita alu	Dioscoriaceae	Vine	Tuber, Rhizome	Diarrhea, Leucoderma, Piles, Tumor
304.	*Zingiber cassumunar*	Ramkedar	Zingiberaceae	Herb	Rhizome	Asthma, Heart diseases

305.	*Sapindus emarginatus*	Ritha	Sapindaceae	Tree	Fruits, Roots, Bark	Cough, Asthma, Leprosy, Honey bee bite, Colic
306.	*Alstonia macrophylla*	Sahajamari	Apocyanaceae	Tree	Bark, Leaves	Leprosy, Antiamoebic, Dysentry, Cholera, Antimalarial, Antiperiodic
307.	*Acacia suma*	Dhala khaira	Mimosaceae	Tree	Bark, Heart wood, Leaves, Pod	Astringent, Snake bite, Diarrhea, Conjuctivitis
308.	*Elephantopus scaber*	Mayurachulia/ Totamalia	Compositae	Herb	Root, Leaves, Flower	Bronchitis, Hepatic disorders, Aphrodisiac
309.	*Abelmoschus ficulneus*	Jangali bhendi	Malvaceae	Shrub	Fruit, Leaves, Root	Scurvy, Diarrhea, Scorpion sting
310.	*Adhatoda zeylanica*	Arushi	Acanthaceae	Shrub	Root, Leaves, Flower, Fruit	Chronic bronchitis, Asthma, Neuralgia
311.	*Aerva lanata*	Paunsia	Amaranthaceae	Shrub	Whole plant, Root	Cooling, Vermifuge, Kidney stone, Cardiotonic
312.	*Allophylus serratus*	Khandakoli	Sapindaceae	Shrub	Whole plant	Diarrhea, Anorexia
313.	*Aloe vera*	Gheekuanri	Asphodelaceae	Herb	Leaves	Skin disease, Cosmetics, Acidity, Rheumatism, Abdominal Pain

314.	*Alpinia calcarata*	Agaru bacha	Zingiberaceae	Herb	Rhizome	Carminative, Colic, Appetizer, Anorexia, Dyspepsia, Stomach ache
315.	*Alternanthera philxeroides*	Kumbhira ghasa	Amaranthaceae	Shrub	Leaves	Anaemia, Eczema, Measles
316.	*Amaranthus spinosus*	Kanta leutia	Amaranthaceae	Shrub	Whole plant, Root, Leaves	Laxative, Stomachic, Bleeding Galactogogue
317.	*Amaranthus viridis*	Leutia	Amaranthaeae	Shrub	Leaves, Seed, Root, Stem	Stomach disorders, Acne, Anemia, Abscess
318.	*Annona squamosal*	Sitaphala/ Ahta	Annonaceae	Tree	Root, Bark, Seed, Leaves	Stimulant, Purgative, Fever, Diarrhea
319.	*Antigonon leptopus*	Snehalata	Polygonaceae	Vine	Tuber	Digestive, Carminative
320.	*Argemone Mexicana*	Agara	Papaveraceae	Herb	Seed, Stem, Root, Leaves	Emetic, Narcotic, Ascaris, Asthma, Aphthous ulcers
321.	*Argyreia setosa*	Brihadarika	Convolvulaceae	Shrub	Root	Veneral diseases
322.	*Artemisia nilagirica*	Dayana	Asteraceae	Vine	Leaves, Root, Flower	Malaria, Purgative, Antiseptic, Antispasmodic
323.	*Asparagus officinalis*	Mohajolo	Asparagaceae	Herb	Root, Rhizome, Tuber	Diuretic, Dropsy, Anticancer, Inflammation

324.	*Caesalpinia sappan*	Bakam	Caesalpinaceae	Tree	Heart wood, Leaves, Bark, Seed	Anti parasitic, Blood purification, Anemia
325.	*Cardiospermum halicacabum*	Futfutica	Sapindaceae	Vine	Seed	Diarrhea, Headache, Rheumatism
326.	*Senna occidentalis*	Bana chakunda	Fabaceae	Herb	Seed, Leaves, Root	Purgative, Skin diseases, Diuretic, Antiperiodic
327.	*Cassia siamea*	Sana chakunda	Fabaceae	Tree	Leaves, Seed	Anxiety, Insomnia, Stress, Beriberi, Diabetes
328.	*Albizia saman*	Bada chakunda	Fabaceae	Tree	Leaves, Inner bark	Inflammation, Sore throat, Eczema, Tuberculosis, Stomach ache
329.	*Ceiba pentandra*	Sweta simili	Bombacaceae	Tree	Leaves, Bark, Seed, Resin	Dysentery, Fevers, Veneral diseases, Asthama, Kidney diseases, Bleeding, Menstruation
330.	*Clerodendrum viscosum*	Genguti	Lamiaceae	Shrub	Leaves	Laxative, Vermifuge
331.	*Coccinia indica*	Kuamaita	Cucurbitaceae	Vine	Root, Leaves, Fruit	Vomiting, Skin eruptions, Sores, Wounds
332.	*Coccinia hirsutus*	Dahidahika	Cucurbitaceae	Vine	Root, Leaves	Laxative & Eczema

333.	*Coleus forskohlii*	Pashanbhedi	Lamiaceae	Herb	Tuber	Hypertension, Asthma, Glaucoma, Cancer, Hair restoration
334.	*Colocasia esculenta*	Saru	Araceae	Shrub	Leaves, Corm	Digestive, Nutritive
335.	*Combretum roxburghii*	Atundi	Combretaceae	Shrub	Leaves	Bilious, Haematuria, Diuretic
336.	*Delonix regia*	Krushna chuda	Fabaceae	Tree	Flowers, Seeds	Laxative, Carminative, Digestive
337.	*Ericybe paniculata*	Dura koli	Convolvulaceae	Tree	Leaves	Blood dysentery
338.	*Ficus benghalensis*	Bara	Moraceae	Tree	Stem bark, Latex, Leaves, Aerial root, Fruit	Astringent, Vulnerary Skin diseases, Diabetes, Premature ejaculation
339.	*Ficus microcarpa*	Jida	Moraceae	Tree	Bark, Fruit, Leaves	Diarrhea, Dysentry, Diabetes, Ulcer, Leprosy
340.	*Ficus religiosa*	Aswastha	Moraceae	Tree	Stem bark, Fruit, Apical bud, Latex, Root	Astringent, Gonorrhoea, Purgative, Skin disease, Laxative
341.	*Flacourtia indica*	Bhaincha	Salicaceae	Tree	Whole plant	Diuretic, Astringent

342.	*Gardenia latifolia*	Damkurud/ Kuruda	Rubiaceae	Tree	Leaf buds	Antiseptic
343.	*Garuga pinnata*	Handala mahi/ Katha kusuma	Burseraceae	Tree	Bark	Antidiabetic, Astringent
344.	*Glycosmis arborea*	Chauladhua	Rutaceae	Shrub	Whole plant	Anticancer, Hepatoprotective
345.	*Hibiscus sabdariffa*	Khatta palanga	Malvaceae	Herb	Calyces	Cooling, Digestive, Nerve diseases, Asthma, Skin problems
346.	*Holarrhena antidysentrica*	Pita korua	Apocynaceae	Tree	Leaves, Bark	Antiparasitic, Diarrhea
347.	*Jatropha curcas*	Dhala baigaba	Euphorbiaceae	Tree	Whole plant	Purgative, Leprosy
348.	*Kaempferia rotunda*	Bhuin champa	Zingiberace	Herb	Rhizome	Rheumatic, Swelling
349.	*Laportea interrupta*	Nali bichuati/ Ghoda bichuati	Urticaceae	Shrub	Leaves	Skin diseases
350.	*Millingtonia hortensis*	Akasa mali	Bignoniaceae	Tree	Bark, Leaves	Antifungal, Anti-cancer
351.	*Mirabilis jalapa*	Rangani	Nyctaginaceae	Shrub	Leaves, Stem	Wounds & Bruises
352.	*Morinda tinctoria*	Achu	Rubiaceae	Tree	Fruits	Tonic, Wound healing
353.	*Moringa oleifera*	Sajana	Moringaceae	Tree	Leaves, Root, Bark	Antibacterial, Antibiotic, Cardiotonic
354.	*Peltophorum ferrugineum*	Radha chuda	Fabaceae	Tree	Bark, Leaves, Flower	Dysentery, Gargle, Tooth ache, Muscular pain

355.	*Peperomia pellucida*	Ghusuri pana	Piperaceae	Herb	Leaves	Headache, Fever, Abdominal pain
356.	*Portulaca tuberosa*	Table golapa	Portulacaceae	Herb	Whole plant	Febrifuge, Antiseptic, Diuretic
357.	*Psoralea corylifolia*	Annapurna	Fabaceae	Herb	Seed, Root, Leaves	Aphrosidiac, Laxative, Leprosy, Psoriasis
358.	*Pterospermum xylocarpum*	Giringa	Sterculiaceae	Tree	Flower, Leaves, Root, Bark	Antimalarial, Antibacterial, Asthma, Body pain, Menstrual disorder
359.	*Ruellia prostrate*	Lata nakachana	Acanthaceae	Herb	Whole plant	Intestinal worms, Anti cancer
360.	*Ruellia tuberosa*	Nakachana	Acanthaceae	Herb	Whole plant	Emetic, Bladder stone, Chronic Bronchitis
361.	*Saccharum officinarum*	Akhu	Poaceae	Grass	Root, Stem	Gastric disorders, Cardio tonic, Galactogogue
362.	*Simarouba glauca*	Maha tila	Simaroubaceae	Tree	Kernel, Leaves, Bark	Amoeboecide, Anticancer, diarrhea, dysentery, Intestinal parasites
363.	*Stylosanthes mucronata*	Bali badama	Fabaceae	Herb	Leaves	Vermicidal, Antiparasitic, Antihelminthic
364.	*Telosma pallida*	Tokei kundei	Asclepiadaceae	Vine	Bark, Leaves, Seed	Dysentery, Throat ache, Toothache
365.	*Teramnus mollis*	Masaparni	Fabaceae	Vine	Leaves	Intestinal and Abdominal problems
366.	*Toddalia aculeate*	Tundapod	Rutaceae	Climber	Root, Leaves, Flower, Fruit	Astringent, Digestive, Tonic, Skin diseases

367.	*Tragia involucrate*	Lata bichhuati	Euphorbiaceae	Twiner	Root, Leaves	Diabetes, Diaphoretic, Alterative, Diuretic
368.	*Typhonium trilobatum*	Bana saru	Araceae	Herb	Rhizome	Bowel complaints, Rheumatic pain
369.	*Vernonia cineraria*	Chota poksunga	Asteraceae	Herb	Leaves	Febrifuge, Indigestion

4.2. Documentation of the plant parts used to treat health problems

As evident from Table 2 that plant parts ranging from a single part to a whole plant can be utilized for treating various health problems. The most used plant parts are the leaves which accounts for 61.78 per cent of the total parts used followed by roots, barks, seeds and fruits. These plant parts are highly utilized by different ethnic groups to cure about 93 diseases and ailments. The most common diseases treated are cough, cold, fever, wounds, asthma, jaundice, skin diseases, insect bites, ulcers and stomach disorders. The percentage of various plant parts used for treatment is enlisted in the Table 3 (Figure 2).

Table 3. Percentage of plant parts used for treating various diseases

Serial no.	Plant parts used	Number of plants	Percentage used
1.	Leaves	228	61.78 %
2.	Roots	184	49.86 %
3.	Barks	128	34.68 %
4.	Seeds	91	24.66 %
5.	Fruits	90	24. 39 %
6.	Flowers	87	23.57 %
7.	Whole plant	76	20.59 %
8.	Rhizomes	28	7.58 %
9.	Latex	12	3.25 %
10.	Gums	9	2.43 %
11.	Tubers	8	2.16 %
12.	Heartwoods	8	2.16 %
13.	Resins	5	1.35 %
14.	Pods	3	0.81 %
15.	Shoots	3	0.81 %
16.	Juice	2	0.54 %
17.	Twigs	1	0.27 %
18.	Trichomes	1	0.27 %

4.3. Assessment of the medicinal plant biodiversity of the area with particular emphasis on trees and shrubs

Table 4 shows the diversity of 25 most predominant medicinal plant species found near the surveyed area. These species include *Syzizium cuminii, Mangifera indica, Azadirachta indica, Anthocephalus cadamba, Lagerstroemia speciosa, Polyalthia longifolia, Mimusops elengi, Murraya koenigii, Solanum indicum, Ricinus communis, Lantana indica, Alocasia indica, Holarrhena antidysenterica, Colocasia esculenta, Lippia javanica, Glycosmis arborea, Jasminum auriculatum, Curculigo orchioides, Enhydra fluctuans, Wedelia chinensis, Tridax procumbens, Boerhavia diffusa, Mimosa pudica, Acalypha indica* and *Ipomoea reniformis.*

The data on biodiversity studies of different medicinal plant species are presented below and six plant species *i.e, Colocasia esculenta, Lippia javanica, Glycosmis arborea, Jasminum auriculatum, Tridax procumbens* and *Mimosa pudica* having Shannon-Wiener's Index (H') value as 2.07, 2.08, 2.07, 2.07, 2.07 and 2.07, respectively with the Evenness (E) 1 in each case.

The collected medicinal plants showed a different life forms (habit) - tree, shrub, herb, vine, climber, grass, twiner, creeper and fern. In the present study, trees (134 species) were the primary source of medicine followed by shrubs (116), herbs (96), vines (17), climbers (10), grasses (06), twiners (03), creeper (01) and fern (01). Figure 3 shows the biodiversity of life forms of different plant species expressed in percentage.

Table 4. Biodiversity studies of predominant medicinal plant species of the study areas

		Number of plants per Quadrat									
Localities / **Plant Species**	**Habit**	**Jali Munda Sahi, Patia (1)**	**Birsa Nagar (2)**	**Bhoisah, Shampur (3)**	**Behera Basti (4)**	**Adivasi Basti (5)**	**Birsha Munda Slum (6)**	**Nandini Palli Munda Sahi (7)**	**Jalisahi and Saliasahi, Patia (8)**	**Shannon's Diversity Index (H^I)**	**Evenness (E)**
Syzizium cuminii	Tree	8	5	3	6	7	10	7	13	1.99	0.96
Mangifera indica	Tree	12	9	7	10	9	8	5	11	2.06	0.99
Azadirachta indica	Tree	9	12	10	5	3	5	4	9	2	0.96
Anthocephalus cadamba	Tree	2	6	4	5	4	7	3	4	2.01	0.97
Lagerstroemia speciosa	Tree	5	4	2	8	5	3	4	15	1.91	0.92
Polyalthia longifolia	Tree	7	3	11	6	8	6	7	10	2.01	0.97
Mimusops elengi	Tree	7	8	5	9	3	6	2	12	1.97	0.95
Murraya koenigii	Tree	5	9	13	8	7	9	4	18	1.82	0.94
Solanum indicum	Shrub	33	42	29	47	31	48	26	62	2.03	0.98

Ricinus communis	Shrub	39	27	23	41	56	34	31	58	2.05	0.99
Lantana indica	Shrub	26	34	40	52	55	61	53	47	2.06	0.99
Alocasia indica	Shrub	51	27	34	40	46	53	21	62	2.02	0.97
Holarrhena antidysenterica	Shrub	26	42	37	49	28	31	44	32	2.06	0.99
Colocasia esculenta	Shrub	41	36	29	52	39	22	38	43	2.07	1
Lippia javanica	Shrub	107	96	121	109	87	125	103	124	2.08	1
Glycosmis arborea	Shrub	87	126	106	114	103	98	91	109	2.07	1
Jasminum auriculatum	Herb	108	86	92	112	87	118	113	131	2.07	1
Curculigo orchioides	Herb	94	98	125	92	89	131	97	127	2.03	0.98
Enhydra fluctuans	Herb	113	107	118	93	87	109	99	181	2.04	0.98
Wedelia chinensis	Herb	132	87	99	114	119	132	94	142	2.05	0.99
Tridax procumbens	Herb	89	114	90	109	95	102	91	126	2.07	1
Boerhavia diffusa	Herb	96	156	88	119	71	138	95	162	2.05	0.99
Mimosa pudica	Herb	149	99	113	128	101	87	123	147	2.07	1
Acalypha indica	Herb	128	115	98	83	96	95	131	107	2.05	0.99
Ipomoea reniformis	Herb	95	143	119	98	134	116	89	138	2.06	0.99

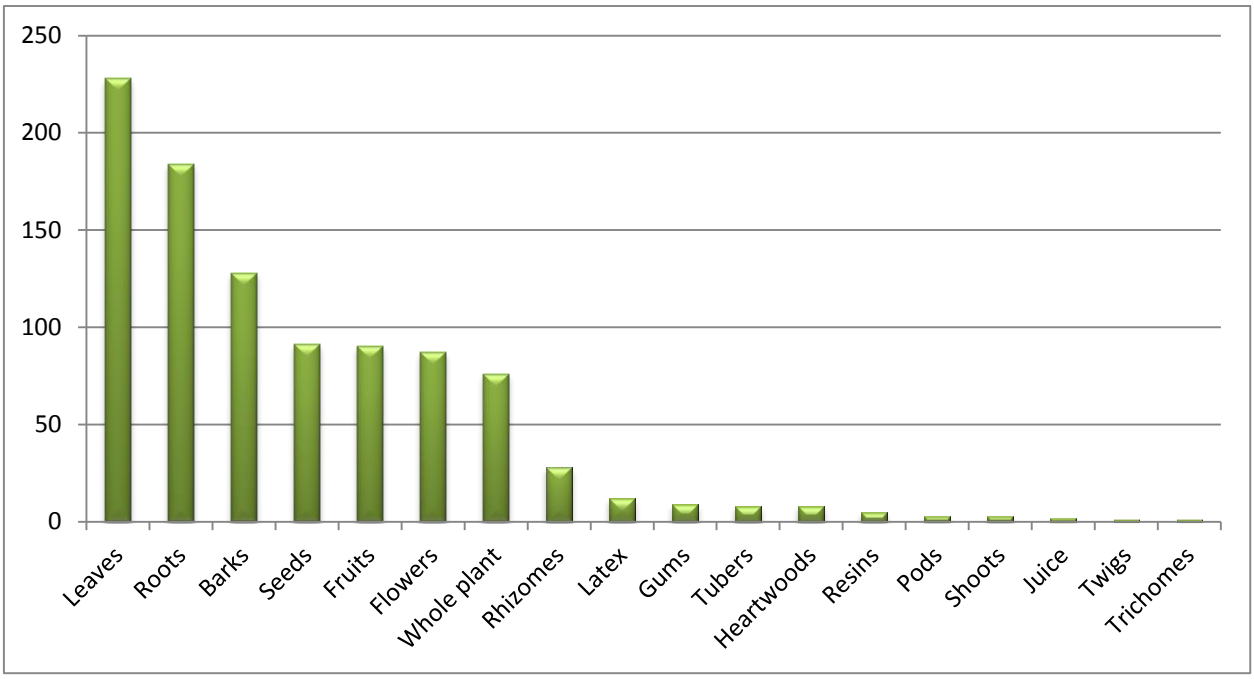


Figure 2. Frequencies of various plant parts used

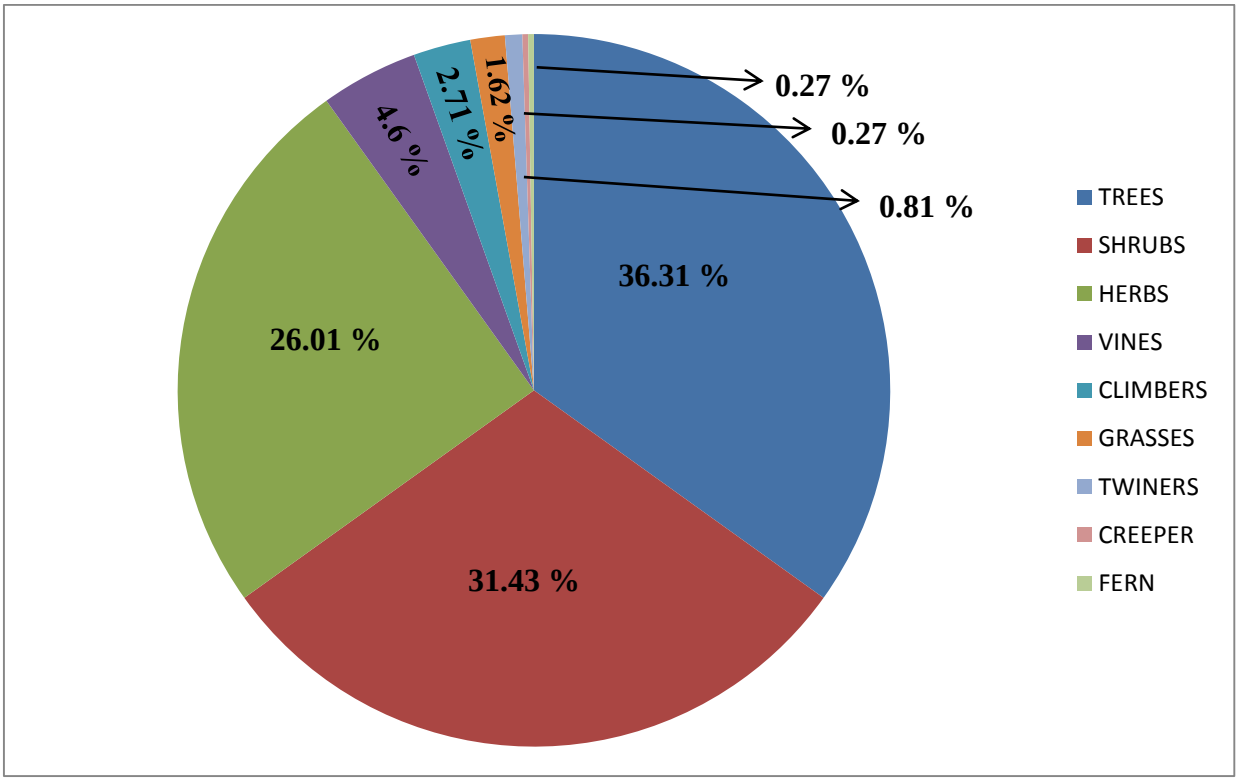


Figure 3. Life forms of different species

DISCUSSION

Odisha occupies an important place in the country having a high concentration of tribal population. As per the latest 2011 census, it is ranked third in the country in terms of tribal population that constitutes 22.8 per cent of the total population of the state and 9.2 per cent of the total tribal population of the country. Since time immemorial, the tribal people in the state utilize a large number of plant species as herbal medicines. These knowledge gets transmitted to the new places with the migration of people. Similarly the tribals who have migrated to Bhubaneswar from various remote areas of the state in search of vocation have brought with them their knowledge of the medicinal plants that they use to cure several diseases. Keeping in mind the importance of traditional medicine in the state, the present investigation entitled **"An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar"** was carried out to know the most commonly available and hidden medicinal plants. The findings in the present investigation is discussed in this chapter.

A total of 369 plant species belonging to 267 genera and 100 families have been identified and documented from in and around Bhubaneswar. These plants are highly utilized by different ethnic groups to cure various diseases and ailments. The distribution of most of these medicinal plants in the study areas are very common. The observations on medicinal plants have been recorded as per the information received from Kondha, Saora, Gadaba, Juang, Bonda and Munda tribes residing in the nearby slum areas of Bhubaneswar. During the investigation, it has been found that some tribal medicinemen and old tribal people in the study area possess a considerable knowledge of the therapeutic properties of these medicinal plants. The information regarding the medicinal properties of enlisted plants given by the tribal people was properly recorded and was further analyzed for conclusion.

Similar investigation on documentation was also carried out by Kalit *et al.* (2015) on the traditionally used medicinal plants of Balaji sub-division, Barpeta district, Assam and reported 76 plants. While comparing the documentation of present and aforesaid investigation, fifty medicinal plants viz., *Adhatoda vasica, Aegle marmelos, Alocasia indica, Aloe vera, Amaranthus spinosus, Anthocephalus cadamba, Azadirachta indica, Areca catechu, Argemone mexicana, Bacopa monnieri, Borassus flabellifer, Bombax ceiba, Catharanthus roseus, Centella*

asiatica, Cissus quadrangularis, Clitoria ternatea, Colocasia esculenta, Costus speciosus, Cymbopogon flexuosus, Cynodon dactylon, Datura stramonium, Dillenia indica, Enhydra fluctuans, Eryngium foetidum, Hibiscus rosa-sinensis, Lawsonia inermis, Leucas aspera, Mangifera indica, Mentha arvensis, Murraya koenigii, Nyctanthes orbor-tristis, Ocimum basilicum, Ocimum sanctum, Piper betel, Piper nigrum, Plumeria rubra, Psidium guajava, Oroxylum indicum, Punica granatum, Saraca asoca, Oxalis corniculata, Paederia foetida, Solanum xanthocarpum, Spilanthes paniculata, Peperomia pellucida, Syzygium cuminii, Terminalia arjuna, Terminalia chebula, Tinospora cordifolia and *Vitex negundo* were found common among both the studies, which confirms the medicinal value of above plant species in the present investigation.

Panigrahy *et al.* (2016) conducted an ethnomedicinal study of some medicinal plants used by Dongria and Desia tribes from Kandhamal district of Odisha and documented 40 ethnomedicinal plant species in which 36 plant species namely *Acorus calamus, Aloe vera, Argemone maxicana, Asparagus racemosus, Azadirachta indica, Calotropis gigantea, Catharanthus roseus, Centella asiatica, Cissampelos pareira, Cissus quadrangularis, Clitoria ternatea, Curculigo orchioides, Curcuma longa, Cymbopogon martini, Emblica officinalis, Euphorbia tirucalli, Ficus benghalensis, Hemidesmus indicus, Hibiscus rosasinensis, Lawsonia inermis, Madhuca indica, Mesua ferrae, Mimosa pudica, Murraya koenigii, Ocimum basilicum, Ocimum sanctum, Paederia foetida, Piper nigrum, Pongamia pinnata, Pterocarpus santalinus, Rauvolfia serpentina, Saraca asoca, Terminalia arjuna, Tridax procumbens,* and *Zingiber officinale* were found common in both present and aforesaid studies. Kumar and Kumar (2014) during an study of medicinal plant diversity in Tungal valley of Mandi district, Himachal Pradesh documented 20 medicinal plant species, out of which 6 plants namely *Syzygium cumini, Vitex negundo, Tinospora cordifolia, Murraya koenigii, Mentha spicata* and *Acorus calamus* were also used for curing various diseases and ailments and in the present investigation. Thus the above findings are in confirmation with the medicinal properties of plants as documented in this investigation.

Similarly Raut *et al.* (2012) conducted an ethnobotanical survey of medicinal plants in Semiliguda of Koraput district of Odisha and documented 50 medicinal plants in which 31 plants namely *Adhatoda vasica, Asparagus racemosus, Artocarpus heterophyllus, Argemone mexicana,*

Calotropis gigantea, Colocassia esculenta, Cardiospermum halicacabum, Curcuma longa, Ocimum canum, Ricinus communis, Solanum xanthocarpum, Tamarindus indica, Mirabilis jalapa, Plumeria rubra, Zingiber officinales, Punicum granatum, Curcuma aromatic, Euphorbia tirucalli, Moringa oleifera, Pongamia glabra, Bombax ceiba, Sesbania grandiflora, Elephantopus scaber, Stephania hernandifolia, Psidium guajava, Phyllanthus emblica, Mimosa pudica, Datura stramonium, Lawsonia inermis, Mangifera indica and *Acorus calamus* were utilized by the tribes of present investigation. The results obtained by above workers are in support with our findings.

Apart from similarities with several investigations, there are some other plant species reported by the above mentioned workers which does not resemble with our documented flora. While comparing the present and aforesaid investigations it was found that some of the plants were common among these studies while others were not. This distinct distribution of flora in various agroclimatic zones is due to the fact that the habitat, geography and climatic conditions being the limiting factors.

As evident from Table 2 & 3, a total of 18 plant parts were found to be used for treating 93 diseases/ ailments in all the ethnic groups residing in the study area. The most frequently used plant part are leaves (61.78 %), followed by roots (49.86 %), barks (34.68 %), seeds (24.66 %), fruits (24. 39 %), flowers (23.57 %), whole plant (20.59 %), rhizomes (7.58 %), latex (3.25 %), gums (2.43 %), tubers & heartwoods (2.16 % each), resins (1.35 %), pods & shoots (0.81 % each), juice (0.54 %), twigs and trichomes (0.27 % each). The most common diseases treated by these parts includes Malaria, Typhoid, Jaundice, Piles, Paralysis, Arthritis, Diarrhea, Snakebites and Scorpion stings, Cough, Cold, Fever, Wounds, Stomach disorders, Asthmatic problems, etc. During the investigation, it has been observed that to cure a single disease more than one plant part of different plants is utilized, such as twelve parts are used for curing Fever, seven parts for curing Diarrhea, five parts for curing Malaria and Typhoid, six parts for curing Diabetes, six parts for curing Arthritis, nine parts for healing wounds, eleven parts for curing Asthma and Tuberculosis, four parts are used as an antidote against Snake bite and Scorpion sting and so on.

Similar investigations were carried out by Kumar and Kumar (2014) to find out the medicinal plant biodiversity in Tungal valley of Mandi district of Himachal Pradesh, India.

Results of the above investigation reported 11 plant parts from 20 medicinal plant species belonging to 17 families used for curing various ailments like asthma, blood pressure, chest congestion, cough, cuts, dental problems, headache, dysentery, insect bite, skin disorders, stomach disorders, vomiting, etc. Out of the total documented plant parts, the leaves were the most frequently used (44%), followed by stem (15%), roots and latex (7% each), whole plant, seeds, bark, flowers, rhizome, fruits and tuber (4% each). It is interesting to note that all the 11 plant parts are also used to cure same diseases and disorders with leaves being the most frequently used (61.78 %) plant part followed by roots (49.86 %) in the present investigation. The results obtained by the above workers are in accordance with our findings.

Gitika and Kumar (2016) conducted ethnobotanical study of some medicinal plants of Haryana, India and reported a total of 66 medicinal plant species belonging to 30 families on the basis of their ethno medicinal importance revealed by the local informants. Comparing the information regarding the utilization of plant parts for treating diseases with the aforesaid investigation, it was found that leaves are the most widely used medicinal part in both the studies which accounted for 19 % and 61.78 % in the aforesaid and present investigation, respectively.

Similarly Sahu *et al.* (2014) carried out study on etnomedicinal plants used in the healthcare systems of tribes of Dantewada, Chhattisgarh, India and reported 104 plant species representing 85 families used for curing various diseases and disorders by tribes of Geedam block. Out of 5 listed plant parts used from 104 species, leaves (35 %) were found to be the most widely used part followed by root (28%), seed (19%), fruit (15%) and bark (13%), which is similar to our result, in which leaves are the predominant parts used. Thus the finding of our investigation is in conformity with the findings of the above worker.

This result is in general agreement with many other ethnobotanical studies. The leaves are the main photosynthetic organs containing photosynthates which might be responsible for medicinal values. The indigenous communities throughout the world, mostly utilized leaves for the preparation of herbal medicines. Collection of leaves and then using them as medicine is very easy as compared to roots, flowers and fruits. Another reason of using leaves could be concerning conservation of the plants as digging out roots might be the cause of death of the plant and putting the species in a vulnerable condition.

Though the above discussion indicates that leaves are the most frequently utilized plant part to cure most of the diseases. But while going through the studies, it was found that the tribes originally residing in different agro climatic zones cure most of the diseases by the frequent utilization of a different plant part. Dhal *et al.* (2014) carried out ethnobotanical studies in Nawrangpur district of Odisha and reported that from a total of 69 plant species belonging to 43 families, the root was the predominant plant part used as a medicinal source by the local population followed by leaf, bark, seed, stem, fruit, whole plant, flower, tuber, twig and latex. Similarly Kumar *et al.* (2015) conducted studies on biodiversity and indigenous uses of medicinal plants in the Chandra Prabha wildlife sanctuary, Chandauli district of Uttar Pradesh and reported about 13 plant parts from 100 plants belonging to 43 families used by the local healers for treating the most frequent ailments like hepatitis, jaundice, constipation and skin and urinary problems. Dikshit and Kala (2014) in their study entitled traditional utilization and harvesting of medicinal plants in Mandla district of Madhya Pradesh reported a total of 43 medicinal plant species with bark was the most used plant part for medicinal purpose (20%), followed by roots (18%). Comparing the information regarding the utilization of plant parts for treating various diseases with the aforesaid investigation, it was found that whole plants were the most frequently used (17 %) plant part followed by leaves (16 %) and bark (15 %) in contrast to the result of our investigation, where leaves (61.78 %) were the most frequently used plant part followed by roots (49.86 %) and barks (34.68 %). While comparing the results of aforesaid and our investigation regarding the utilization of plant parts, it was found that the same diseases are cured by different plant parts.

This contradiction in the difference of percentage use of different plant parts for treating same or different diseases can be attributed to the fact that different plant parts of the same or different plant vary in their chemical compositions and thus possess different medicinal properties. Furthermore, the percentage usage of different plant parts also depends upon the knowledge possessed by the local healers for treating various diseases. The conclusion of aforesaid discussion indicates that curing of a specific disease by a particular plant part varies from area to area as per the knowledge of the local healers and availability and healing properties of the plants and plant parts.

Though the present investigation was carried out with the primary objective of assessing the medicinal plant biodiversity of the area with particular emphasis on trees and shrubs, some other life forms were also found to be having a variety of medicinal uses. Next to the trees and shrubs that find uses upto 36.31 % (134 species) and 31.43 % (116 species), respectively comes the herbs with 26.01 % (96) uses followed by 4.6 % of vines (17), 2.71 % of climbers (10), 1.62 % of grasses (06), 0.81 % of twiner (03), 0.27 % of creeper (01) and 0.27 % of ferns (01) in the present investigation.

Similar investigation was carried out by Biswas *et al.* (2016) with an aim to inventorize the ayurvedic medicinal plant recourses and explore the traditional knowledge of tribal people of Kakrajhore forest area of West Bengal to treat several diseases along with the sustainable management and conservation of medicinal plants and identified 57 numbers of ethno-medicinal plants belonging to 39 families, used for preparing medicinal remedies. The habit of the plants included 35% trees, 28% shrubs, 23% herbs and 14% climbers. The results of the aforesaid investigation resemble the outcome of our investigation, where the trees and shrubs are found to be the predominant life forms used for the medicinal purposes.

Kumar *et al.* (2015) conducted studies on biodiversity and indigenous uses of medicinal plants in the Chandra Prabha wildlife sanctuary, Chandauli district of Uttar Pradesh and reported about 100 plants belonging to 43 families used by the local healers for treating the most frequent ailments. Among the 100 recognized medicinal plants, 33% were trees. Other species used belonged to herbs (28%), followed by shrubs (17%), vine/climber (16%), and grass (6%). So, the results of our investigation are in accordance with the aforesaid study as trees are found to be the predominant habit used for medicinal purposes in our study as well.

However, the results of some other investigations reported a different predominant life form other than trees to be used for preparing medicine. Raut *et al.* (2012) conducted an ethnobotanical survey of medicinal plants in Semiliguda of Koraput district of Odisha and revealed 50 ethnomedicinal plant species distributed in 46 genera belonging to 34 different families that are frequently used for the treatment of various ailments in Semiliguda block. Herbs (38% species) were found to be the most used plants followed by trees (28% species), shrubs (28% species) and climbers (6% species) in descending order. Similarly Namsa *et al.* (2011)

studied the ethnobotany of the Monpa ethic group at Arunachal Pradesh, India and documented 50 plants species belonging to 29 families used for treating 22 human ailments. Most of the ethnobotanical plants were herbs (40%) followed by shrubs (28%), trees (26%), and climbers (6%). From the above discussion we may conclude that the ulilization pattern of various life forms of plants varies from area to area and the knowledge received from ancestors. This may also depend upon the area of interest of the study carried out. For example, the area of interest in our investigation was to assess the medicinal plant biodiversity with particular emphasis on trees and shrubs.

SUMMARY AND CONCLUSION

The present study entitled **"An ethnobotanical study of medicinal plants and their biodiversity in and around Bhubaneswar"** was conducted within a span of eight months to find out the traditional ways of utilization of medicinal plants for curing various diseases and ailments. The survey of different tribal dwelling slums was carried out with the help of questionnaire developed. The observations on medicinal plants have been recorded as per the information received from the Kondhs, Saora, Gadaba, Juang, Munda and Bonda tribes residing in the slum areas in Bhubaneswar. The information regarding the use of medicinal plants was properly recorded and was analyzed for further conclusion.

The findings of present study revealed the use of 369 medicinal plants belonging to 267 genera and 100 families. The distribution of these medicinal plants in the study area is very common. The age-old traditional knowledge about the utilization of herbal flora and its medicinal properties gained from ancestors living in their native areas are well preserved by the tribal medicinemen as well as old tribal people who have migrated to Bhubaneswar from across various remote areas of the state in search of vocation and residing mostly in the slum areas.

The present study provides an information of about 93 diseases/ ailments treated using the enlisted medicinal floras by the ethnic groups of the study area. These include the most common diseases like Cold, Cough, Jaundice, Diarrhea, Piles, Fever, Malaria, Stomach disorders, Skin diseases, Cuts, Wounds, Snakebite, Scorpion sting, Insect sting, Ulcers and Asthma etc. that are prevalent among the tribes It was observed that most of the plants were utilized to cure more than a single disease / ailment depending upon its availability.

The present study revealed that trees (134 species) were the primary source of medicine followed by shrubs (116), herbs (96), vines (17), climbers (10), grasses (06), twiners (03), creeper (01) and fern (01). Out of the 18 plant parts as recorded, the maximum utilization was of leaves (228 times) followed by roots (184 times), barks (128 times), seeds (91 times), fruits (90 times), flowers (87 times), whole plant (76 times), rhizomes (28 times), latex (12 times), gum (9 times), tubers (8 times), heartwoods (8 times), Resins (5 times), Pods (3 times), Shoots (3 times), Juice (twice) and Trichome (once).

The present study is a maiden attempt to enlist and document the uses of existing ethnomedicinal plant species found in and around Bhubaneswar. At present these rare and valuable information are available with the traditional medicinemen and the old people of this area. The investigational findings and discussion given in the preceding chapter led to following conclusions:

That a total of 369 medicinal plant species belonging to 267 genera and 100 families are used by the tribes residing in Bhubaneswar to cure various diseases and ailments.

That a total of 93 diseases/ ailments are found to be cured by the different ethnic groups in the study area. The most common among them includes Malaria, Jaundice, Piles, Diarrhea, Dysentery, Snakebite, Scorpion stings, Insect stings, Cough, Cold, Fever, Stomach disorders, Skin diseases, wounds, ulcers, etc.

That out of 369 species a total of 134 species of trees and 116 species of shrubs were predominantly found to be the primary source of medicines with leaves being the most used plant part constituting 61.78 % of the total plant parts used, followed by roots (49.86 %), barks (34.68 %), seeds (24.66 %), fruits (24. 39 %), flowers (23.57 %), whole plant (20.59 %), rhizomes (7.58 %), latex (3.25 %), gums (2.43 %), tubers & heartwoods (2.16 % each), resins (1.35 %), pods & shoots (0.81 % each), juice (0.54 %), twigs and trichomes (0.27 % each).

Suggestions for future work:

The results of present investigation relates to only eight months (November 2016 to June 2017) of data collected for this study. To reach any definite conclusion and recommendation it needs further repetition of the same work for atleast once more time. It is suggested that;

1. These ethnomedicines used for curing various diseases or ailments need extensive chemical and biological investigations from pharmaceutical point of view for the wider spectrum of human welfare.

2. These herbal resources could be a good income source and provide self employment to the aboriginals, if extensively cultivated. So, the government should initiate awareness and offer necessary financial and technical assistance to the knowledgeable tibals to prepare herbal drugs on commercial basis, which could be a potentially strong step towards improving the economic status of these people and thus help in alleviating poverty to a considerable extent.

3. This will also provide encouragement and a new avenue to other people for commercially cultivating plants of medicinal values in their own fields and gardens which could serve as a secondary source of income to them and thus will help in increasing plant cover in the nearby areas and improving microclimate of the region.

4. There should be serious efforts to explore the areas of ethnomedicines in order to record and examine the various methods, which are still in practice among the tribes. Such attempt will not only help us to know one of our most important indigenous traditional knowledge but also promises to give new dimension in the field of pharmaceutical researches.

5. The government should regularly organize exhibitions in order to popularize the medcinal knowledge of tribals and conduct training programmes for developing skills among other social groups of the country.

6. The modern generation is inclined towards the use of allopathic medicines and it seems that traditional knowledge of medicinal plant could be lost. There is a threat of losing this wealth of knowledge in the near future. The awareness and documentation about the medicinal floristic wealth or plant medicinal values will be helpful in the preservation of traditional medicinal practices and the plant wealth of the concerned site. The traditional medicinal knowledge not only play an important role in community health care, but is also important for the present and future plans for the drug development.

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