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Ethnobotanical study of medicinal plants used to treat human diseases in Kuldiha wild life sanctuary of Balasore district of Odisha

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Abstract
An ethnomedicinal survey on the traditional knowledge of tribes and other non-tribal communities of Kuldiha Wild Life Sanctuary of Balasore district of Odisha was undertaken by visiting 14 tribal-rich villages located in and around the sanctuary. The study was focused on ethnomedicinal plants used to treat various common diseases by the tribal communities reside in the study area. This communication deals with traditional use of 81 plant species belonging to 78 genera and 43 families along with correct botanical identification, local names, mode of administration in respect to different ailments. Crushing of plant or plant part(s) and extraction of juice was the widely used mode of preparation of remedies where oral administration was the principal route. Ethnomedicinal data were collected through semi-structured interviews with the native herbal practitioners and elderly knowledgeable persons using standard questionnaire and group discussion. Local inhabitants in the study were found to possess vast knowledge on medicinal plants to treat various human ailments. The use of these traditional medicines was observed to be widespread and prevalent over the modern medicines in the area. However, deforestation and lack of interest of young generation became the major threat to medicinal plants diversity in the area under study. It is, therefore, suggested to preserve this indigenous knowledge on ethnomedicines by proper documentation, identification of plant species and herbal preparation. The results of the present investigation further emphasize to take appropriate conservation measures to facilitate sustainable utilization of these plant resources.

Keywords: ethnomedicinal plant, common ailments, kuldiha wildlife sanctuary, odisha

Introduction
Bio-resources especially plants have remained an integral part of human society throughout the history. After fulfilling the primary needs like food and shelter, man has searched for a suitable remedy among plants for curing various diseases [1]. Nature has been a source of therapeutic bio-molecules of plant origin for thousands of years. In the past decades there was renewed interest in the use of traditional medicine all over the world. The World Health Organization (WHO) has indicated that traditional medicine is an important contributor to its health goals.
Traditional medicine has been used for thousands of years with great contributions made by practitioners to human health, particularly as primary health care providers at the community level and has maintained its popularity worldwide [2]. According to Sofowora [3], about 60-85% of the population in every country of the developing world has to rely on traditional medicine. The practice of traditional medicine is widespread in the countries like China, India, Japan, Pakistan, Sri Lanka, Thailand, and Korea [4]. Traditional healers known by different names in different parts of India are the principal players in the curative aspect of traditional medicine practice. In India, rural communities are utilizing a variety of herbs for effective curing of various ailments. However, the plant parts used, preparation and administration of drugs vary from one place to other.
Urbanization and development activities have resulted in the decline of interest in traditional culture as well as natural vegetation in India [5]. Forest degradation process adversely affected the resource of medicinal plants. The rural poor, whose dependency on these products is very heavy, and hence, the loss of such diversity directly affecting the rural community adversely. Unfortunately, much of the ancient knowledge and many valuable plants are being lost at an alarming rate and are at the verge of extinction. It is estimated that 10% of all plant species are currently endangered in India [6]. Therefore, it is very essential to document the plants that have been used in the traditional healing systems, from which the management strategy could be developed to preserve the treasure chest of medicinal plants of native habitats, before they become extinct.
In Odisha, 62 different tribes are living in remote mountainous forests of different districts. The tribal communities such as Adivasis, Bhumijas, Mankidias, Santalas, Kolhas and Majhis are found residing in different tribal villages namely Balianal, Natapada, Risia, Raudia, Basanal, Vegibut, Takabandha, Barakheda, Antadahi, Putibandha, Chekamohra, Kalakad, Ambajhara and Siadimala in the Kuldiha Sanctuary region. They possess a good amount of knowledge on the native medicinal plants for treating different common ailments. However, the ethnobotanical knowledge on treating different ailments by the rural populace of the study area has not been properly documented so far. The present study was initiated to document the information on the use of some medicinal plants by local tribal and atribal communities inhabited in and around Kuldiha Wildlife Sanctuary located in Balasore district of Odisha.

Materials and Methods
Study Area
The Kuldiha wild life sanctuary is a paradise for nature lovers, very rich with its flora and fauna. It is situated in the southern part of the district of Balasore in the state of

Odisha, spreading to a total geographical area of 272.75 km^2. It lies between 21^0 20′ 31″ - 21^0 29′ 08″ N latitude and 86^0 25′ 23″ - 86^0 44′ 50″ E longitude (Fig. 1). The forest region of the sanctuary is linked with the Similipal Biosphere Reserve of Mayurbhanj district through the Sakhuapada and Nato Hill ranges. The maximum temperature in the summer months and the minimum temperature in the winter months are 42 ^{0}C and 6 ^{0}C respectively. The mean annual rainfall of the area is 1,568 mm. Ecologically the sanctuary falls within the Biogeographic zone of Deccan Plateau and within the Biogeographic province of Chhotanagpur Plateau [7]. The main water sources of the sanctuary are three small rivers - Tangna, Kamala and Usatal nala. The vegetation of the sanctuary is mostly tropical deciduous forest type [8] and dominated by trees of *Shorea robusta*, *Croton roxburghii* and *Terminalia tomentosa*. Santalas are the dominant tribal community residing in sanctuary region.

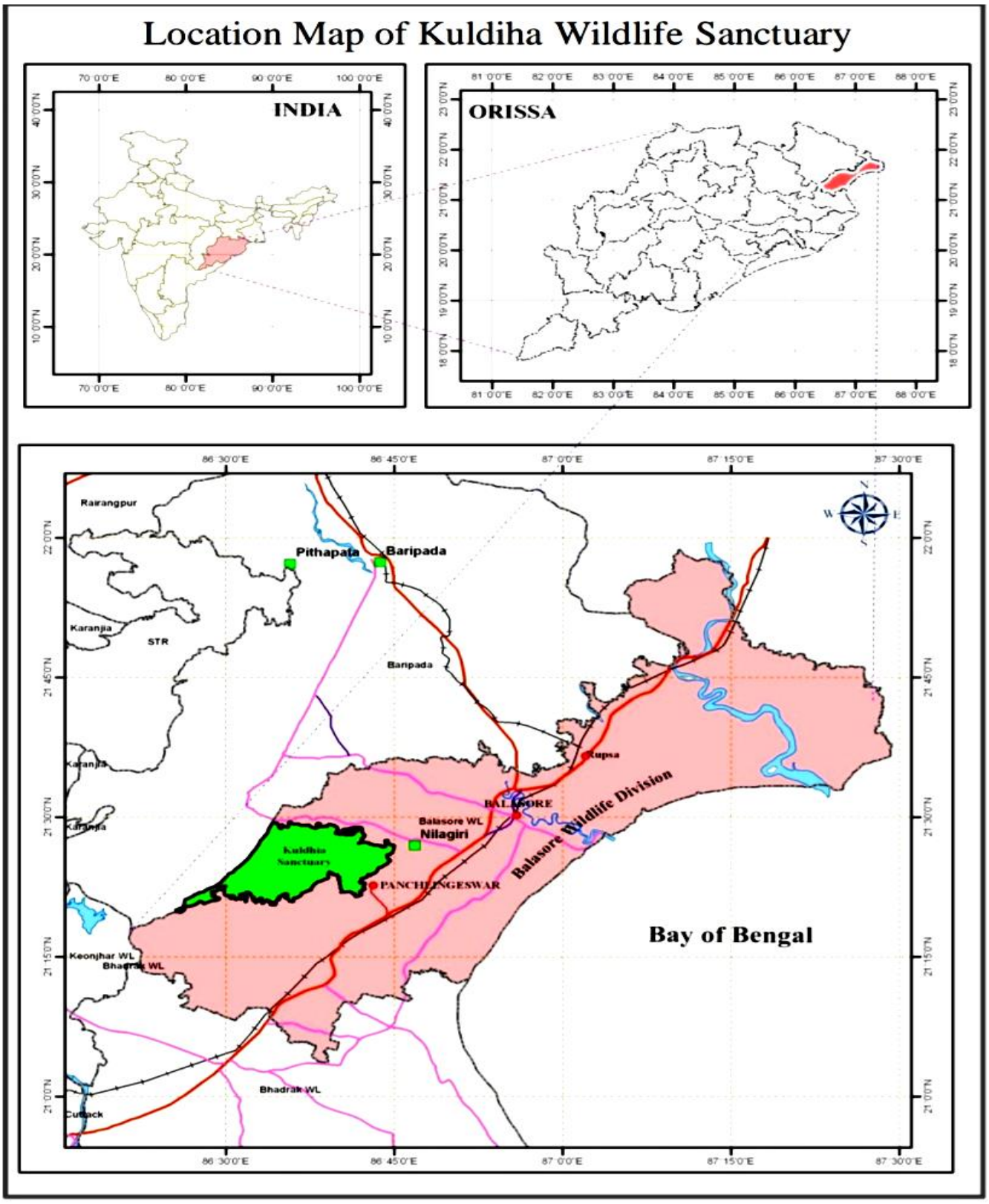

Fig 1: Showing the location of the Study area

Ethnobotanical Data Collection

Extensive field surveys were undertaken in the sanctuary covering different seasons between May 2018 to December 2020. Different study sites located in and around the sanctuary were selected on the basis of recommendation of the local knowledgeable persons, local government authorities and tribal herbal healers. Indigenous knowledge of local inhabitants about the medicinal uses of native plants was collected during field trips through readymade questionnaire. The techniques employed for data collection were semi-structured interviews and group discussion with the selected traditional healers of the locality.

All interviews were made in the local Odiya language. Information was carefully documented during an interview with a participant covering the important topics mentioned in the questionnaire. Brief group discussions were made with local inhabitants regarding the medicinal plants in the study area. Verbal consents were also obtained from the participants by performed group discussions about the objectives of the study before the interviews, and all data were gathered through their oral consents. Field observations were performed on the morphological features and habitats of each medicinal plant species in the field with the help of local herbal practitioners. Plant specimens were collected with the help of local informants to ensure that the proper plant had been obtained. The collected information was cross-checked with people in other villages practicing in or around the locality from where the plant specimens were collected.

Voucher Specimen Collection

The voucher specimens with flowers or fruits were collected onsite during guided field walk, numbered, pressed, dried and taken to the laboratory for identification. Identification of specimens was carried out in the laboratory with the help of published regional Floras [9-11] as well as comparing with already identified specimens. Voucher specimens of the collected medicinal plants with accession number have been deposited in the Herbarium of the Department of Botany, Centurion University of Technology and Management, Odisha, Bhubaneswar.

Results and Discussion

A total of 81 medicinal plant species belonging to 78 genera and 43 families were identified being used by the local communities in and around Kuldhia Wildlife Sanctuary to treat over 50 different human ailments including diabetes, jaundice, diarrhoea, dysentery, skin diseases, rheumatism,, arthritis, hypertension, insomnia, mumps, worm infestation in children, piles, common cold, whooping cough, constipation, typhoid, conjunctivitis, intermittent fever, pyorrhoea, menstrual disorder in women, speratorrhoea, dysuria etc. (Table 1). Among the angiospermic families Fabaceae constitute the maximum number of species (6) used for treating a number of common ailments (9.4%).

Various parts of the plants were utilized in the preparation of medicines for treating different diseases among the locals in this area. In majority of the species (51%) the medicines were obtained from the leaves. Except those plants from which the drugs are obtained from leaves the use of fruits, seeds, roots or stems in plants are found to be a destructive means of obtaining the herbal remedies for ailments. Some of the herbal remedies (47%) prepared for different ailments were found to be obtained from fruits, seeds, roots, stems bark and whole plant. This calls for conservation measures to facilitate sustainable utilization of these plant resources. It is interesting to note that 39.5% of remedies used in the treatment of common diseases are derived from trees followed by herbs (35.8%).

Of the ethnomedicinally important plant species that are used to treat human ailments recorded in the study area, 13 (16%) were from home gardens and 68 (84%) species were from the wild. Various ethnobotanical studies conducted in Odisha reported that most of medicinal plants or their parts are being collected from non-cultivated areas [12- 45]. The observation of the present investigation is also a good indication of the fact that the local people have not yet started cultivating most of the plant species they are using as remedies. A comparison of ethnobotanical data gathered in the present investigation with the published literature [46-56] indicated that the information regarding the mode of administration of some plants to treat common diseases are relatively new or interesting reports.

Table 1: Ethnomedicinal uses of plants of Kuldhia Wildlife Sanctuary in Balasore district of Odisha.

Sl. No.	Botanical name with voucher no. and family	Vernacular name(s)	Habit	Mode of utilization with tribe
1.	*Abrus precatorius* L. [RM-407] [Fabaceae]	Runja (O)	Climber	Leaf: Leaves smeared with honey and put on the affected part to treat mumps. [Santal]
2.	*Achyranthes aspera* L. [RM-333] [Amaranthaceae]	Apamaranga (O) Buridataram (S)	Herb	Root: Root paste mixed with equal amount of butter and vermilion and applied on the body of the babies to cure dermatitis. [Santal]
3.	*Aegle marmelos* (L.) Correa [Rutaceae] [RM-354]	Bela	Tree	Fruit: The young fruit powder (2 g) mixed with sugar candy is given to children for the treatment of blood dysentery.
4.	*Alstonia scholaris* (L.) R.Br. [RM-410] [Apocynaceae]	Chhatiana (O)	Tree	Bark: Bark paste used as plaster on the affected part to treat fractured bone which can join the within 15 days. Bark decoction is sprayed on the fractured bone also show good result. [Oraon]
5.	*Ananas sativus* (L.) Meer [RM-365] [Bromeliaceae]	Sapuri (O)	Herb	Leaf: Young leaf juice (10 ml) mixed with ½ spoonful of turmeric powder given orally against intestinal worms. [Oraon]
6.	*Andrographis paniculata* (Burm.f.) Wall. ex Nees [RM-419] [Acanthaceae]	Cherayata(O) Hasa nimb (S)	Herb	Whole plant: Fresh plant juice given orally for treatment of skin diseases and to expel tape worm. Plant paste mixed with turmeric powder is applied on the body against itches. [Santal]
7.	*Artocarpus heterophyllus* Lam. [RM-362] [Moraceae]	Panasa (O)	Tree	Leaf: Ash of the mature dry leaves is rubbed on teeth to lessen tooth ache. [Oraon]
8.	*Asparagus racemosus* Willd. [RM-425] [Liliaceae]	Satabari (O) Gaichira (S)	Climber	Root: Root juice (100 ml) is given once in a day for 15 days to increase lactation in women after delivery.It is also useful in increasing milk production in cattle. [Santal] Root juice along with black pepper is taken orally in empty stomach for treatment of diabetes. [Santal]

9.	*Azadirachta indica* A. Juss. [RM-339] [Meliaceae]	Nimba (O) Neem dare (S)	Tree	Bark: A bath taken in bark decoction cures scabies. [Santal]
10.	*Barleria prionitis* L. [RM-391] [Acanthaceae]	Dasakerenta (O)	Herb	Flower: Flower paste is applied externally to cure eczema. [Santal]
11.	*Bombax ceiba* L. [RM-412] [Bombacaceae]	Simili (O)	Tree	Root: Soft root of young plants made into a paste with water and is given against spermatorrhoea. [Santal]
12.	*Calotropis gigantea* (L.) R.Br. [RM-382] [Asclepiadaceae]	Arakha (O)	Shrub	Leaf: Leaf dipped in cow ghee, warm slightly and place on the infected swelling finger to reduce pain and swelling. [Santal]
13.	*Careya arborea* Roxb. [RM-331] [Lecythidaceae]	Kumbhi (O)	Tree	Bark: Bark paste applied over fractured bones and the process repeated for few days to join the broken bones. [Santal]
14.	*Catharanthus roseus* (L.)G.Don [RM-342] [Apocynaceae]	Sadabihari (O)	Herb	Leaf: 7 young leaves taken once in a week and then 7 flower buds once for the next week early in the morning and repeat it for two months said to reduce sugar content in blood and urine in a diabetic patient. [Santal]
15.	*Centella asiatica* (L.) Urban [RM-389] [Apiaceae]	Thalkudi (O)	Herb	Whole plant: 1 -2 drops of plant juice put into the nostril against epitaxis. Plant juice (1 ml) given to babies for treatment of diarrhoea. [Santal]
16.	*Citrus medica* L. [RM-411] [Rutaceae]	Tabha (O)	Tree	Fruit: One cup of sugarcane juice mixed with 10 ml of fruit juice is given to pregnant women once in a day before meal to stop vomiting during pregnancy. [Santal]
17.	*Crataeva magna* (Lour) DC. [RM-408] [Capparaceae]	Baruna (O)	Tree	Bark: Fresh bark juice taken orally to cure dysentery. [Santal]
18.	*Cynodon dactylon* (L.) Pers. [RM-394] [Poaceae]	Duba (O)	Herb	Leaf: Leaf juice drops put into nostrils to stop bleeding from nose due to severe cold. [Santal]
19.	*Dalbergia sissoo* Roxb. [RM-421] [Fabaceae]	Sissoo (O)	Tree	Wood: Wood slices boiled in an earthen pot and the dark brown extract obtained is used externally against ringworm and eczema. [Santal]
20.	*Datura metel* L. [RM-417] [Solanaceae]	Dudura (O)	Shrub	Fruit: Juice of immature fruit is rubbed on palm to reduce excessive sweating of the body. [Oraon]
21.	*Diospyros malabarica* (Desr.) Kostel [RM-403] [Ebenaceae]	Mankada kendu (O)	Tree	Fruit: Crushed dry fruit mixed with mother's milk or goat milk given to cure diarrhoea and dysentery in babies. [Santal]
22.	*Eclipta prostrata* (L.)L. [RM-415] [Asteraceae]	Kesadura (O) Kala kesadura (Or)	Herb	Leaf: Leaf juice (10 ml) mixed with sheep's milk (10 ml) is prescribed for 2 days for curing dysentery. [Oraon]
23.	*Enydra fluctuans* Lour. [RM-360] [Asteraceae]	Hidimicha saga (O) Hamae alah (S)	Herb	Leaf: Fresh leaf juice (20 ml) mixed with black pepper powder (2 g) is taken early in the morning once a day for 7 days for reducing blood sugar in diabetic patient. [Santal]
24.	*Eryngium foetidum* L. [RM-304] [Apiaceae]	Jangli dhania	Herb	Leaf: Leaf juice mixed is prescribed orally twice a day on empty stomach against flatulence and to check the vomiting due to indigestion. [Bhumija]
25.	*Euphorbia hirta* L. [RM-381] [Euphorbiaceae]	Chitakutei (O)	Herb	Stem: Latex applied to nail corners to treat fungal infection. [Bhumija]
26.	*Euphorbia tirucalli* L. [RM-336] [Euphorbiaceae]	Nadaka siju (Bh)	Shrub	Stem: Slightly warmed succulent stem squeezed to get the extract and then the extract mixed with *Pongamia pinnata* oil applied on neck of cattle suffering from cold and mumps. [Santal] Slightly warmed stem pieces kept on side of teeth to check tooth ache. [Bhumija]
27.	*Ficus benghalensis* L. [RM-405] [Moraceae]	Bara gachha (O)	Tree	Root: Latex of prop root mixed with sugar taken for two weeks against spermatoria. [Kolha] Leaf: Young leaf crushed with rice, made into cake and given to cure diarrhoea. [Bhumij]
28.	*Ficus racemosa* L. [RM-413] [Moraceae]	Dimiri (O)	Tree	Bark: Decoction of bark is taken for diabetes. [Bathudi]
29.	*Ficus religiosa* L. [RM-314] [Moraceae]	Aswatta (O) Hesak alah (S)	Tree	Leaf: Warm leaf juice put into ear to cure ear infection and ear pain. [Santal]
30.	*Grewia helicterifolia* Wall. [RM-402] [Tiliaceae]	Kula (Bh)	Shrub	Root: Paste with water applied to wounds to hasten suppuration and as antiseptic in dressing.
31.	*Gymnema sylvestre* (Retz.) R.Br. [RM-308] [Asclepiadaceae]	Gudamari (O)	Herb	Leaf: Fresh leaf juice taken orally beneficial in diabetes. [Bhumija]
32.	*Hibiscus sabdariffa* L. [RM-390] [Malvaceae]	Kaunria saga(O) Kaunri alah (S)	Herb	Leaf: 10 g leaf paste is orally administered twice a day for 7days against dysuria. [Santal]
33.	*Holarrhena pubescens* (Buch-Ham.) Wall. ex. G.Don [RM-409] [Apocynaceae]	Kudei (K)	Tree	Bark: Fresh juice taken orally cures dysentery and stomach ache. [Kolha]
34.	*Hygrophila auriculata* (Schum.) Heine [RM-334] [Acanthaceae]	Koilikhia (O) Koelirukha (Bh, S)	Herb	Leaf: Leaf juice (10 ml) mixed with 5 drops of honey taken in early morning for 7 days increases haemoglobin content. [Bhumija]
35.	*Hyptis suaveolens* (L.) Poit. [RM-353] [Lamiaceae]	Bana tulasi (O)	Herb	Leaf: Fresh leaf juice (10 ml) mixed with equal amount of lemon juice and pinch of rock salt is given for common cold. [Santal]
36.	*Ipomoea aquatica* Forssk. [RM-416] [Convolvulaceae]	Kalama saga(O) Kalandi alah (S)	Herb	Leaf: Leaves fried and given to the mother of a new born baby for enhancing breast milk. [Santal]
37.	*Jatropha curcas* L. [RM-385] [Euphorbiaceae]	Jahaji (Bh)	Shrub	Stem: Fresh plant sap show healing property when applied to cuts and wounds for few days. Young stems used as tooth brush to cure pyorrhoea. Latex of the plant is also applied externally against fungal itching in fingers and toes.
38.	*Justicia adhatoda* L. [RM-420] [Acanthaceae]	Basanga (O) Basango (Bh)	Shrub	Leaf: Warm fresh leaf juice mixed with honey taken two times early morning for 7 days cures whooping cough. [Bhumija]
39.	*Kalanchoe pinnata* (Lam.) Pers. [RM-371] [Crassulaceae]	Amarapoi (O)	Shrub	Leaf: Fresh leaf paste applied on affected body parts of a patient suffering from sprain to reduce pain immediately. [Santal] Fresh leaf juice is also given orally to cure dysentery. [Santal]

40.	*Lagenaria siceraria* (Molina) Standley [RM-396] [Cucurbitaceae]	Lau (O) Hatad alah (Bh)	Climber	Fruit: Cooked immature fruits are prescribed for increasing lactation in mother of a new born baby and it is also recommended in the diet against constipation. [Bhumija]
41.	*Lantana camara* L. [RM-400] [Verbenaceae]	Dahanimara (Ma)	Shrub	Leaf: Crushed leaves applied on fresh cuts and ulcers for the speedy cure. [Mankadia]
42.	*Lawsonia innermis* L. [RM-366] [Lythraceae]	Menjuati (S)	Shrub	Root: Dry root crushed with uncooked rice washed water and taken early morning for 7 days to treat jaundice. Leaf: Leaf paste used as poultice and applied to affected parts against inflammation. [Santal]
43.	*Leucas cephalotes* (Roth) Spreng. [RM-398] [Lamiaceae]	Gayasa (O) Dhurup alah (S)	Herb	Root: Root paste mixed with black pepper paste and given orally as antidote for snake bite and Scorpion sting. [Santal]
44.	*Litsea glutinosa* (Lour) [RM-379] [Lauraceae]	Gobinda garuda (O)	Tree	Leaf: Fresh leaf juice taken orally for treatment of dysentery and diarrhoea. [Santal]
45.	*Luffa acutangula* (L.)Roxb. [RM-388] [Cucurbitaceae]	Jahni (O, S)	Climber	Leaf: Dried leaf powder is applied to the affected area for curing external piles. [Santal]
46.	*Madhuca indica* J.F. Gmel. [RM-382] [Sapotaceae]	Mahua (S)	Tree	Seed: Oil is applied to the affected part of the body against skin diseases, rheumatic pain and headache. [Santal]
47.	*Mangifera indica* L. [RM-338 [Anacardiaceae]	Amba (O, S)	Tree	Seed: Seed powder mixed with onion juice tied in a clean cloth and given to inhale to stops bleeding from nose. [Santal]
48.	*Maranta arundinacea* L. [RM-363] [Marantaceae]	Palua (O)	Herb	Rhizome: Extract of rhizome mixed with sugar-candy and taken twice daily for three days to treat blood dysentery. (Kolha)
49.	*Marsilea quadrifolia* L. [RM-406] [Marsileaceae]	Sunsunia saga (O) Chatom alah (S)	Herb	Leaf: Leaves are boiled or fried and consumed against insomnia and to cure dysentery. Raw leaf paste is applied on the forehead to cure head reeling. [Santal]
50.	*Mentha spicata* L. [RM-356] [Lamiaceae]	Pudina (O) Pudina sakaam (S)	Herb	Leaf: 1 cup of leaf juice is taken in empty stomach in the morning for three days against hypertension. [Santal]
51.	*Mimusops elengi* L. [RM-311] [Sapotaceae]	Baula (O)	Tree	Fruit: Eating ripe fruits stops bleeding in teeth. Fruit juice (5 ml) mixed with 2-3 drops of honey and given to cure diarrhoea in babies. [Bhumij]
52.	*Momordica charantia* L. [RM-383] [Cucurbitaceae]	Kalara (O) Kaalra sakaam (S)	Climber	Leaf: Leaf juice is applied to the affected part for wound healing. [Santal]
53.	*Moringa oleifera* Lam. [RM-386] [Moringaceae]	Sajana (O) Munga alah (S)	Tree	Leaf: Leaf juice (1 teaspoonful) mixed with 3-5 drops of honey is taken once in a day in the empty stomach for lowering blood pressure. [Santal]
54.	*Murraya koenigii* (L.) Spreng. [RM-418] [Rutaceae]	Kadhi patta (Bh) Bhursunga (O)	Tree	Leaf: 50 ml of leaf juice is given in the early morning against severe acidity. [Bhumija]
55.	*Nyctanthes arbor-tristis* L. [RM-344] [Oleaceae]	Gangasiuli (O, K)	Small tree	Leaf: 2 to 3 teaspoonful of leaf juice is taken in the morning on empty stomach once in a day for 3 days to cure any type of fever including intermittent fever. [Kolha]
56.	*Oxalis corniculata* L. [RM-358] [Oxalidaceae]	Ambiliti (O) Ambili (Or) Chomo rakoi alah (S)	Herb	Leaf: Leaf juice along with a little sugar candy powder is given to children to treat vomiting and diarrhoea. [Santal, Oraon]
57.	*Paederia foetida* L. [RM-367] [Rubiaceae]	Prasaruni (O) Gandhiali (Or)	Climber	Leaf: Decoction of leaves is taken orally to relieve body ache. Leaf paste mixed with boiled rice paste are made into cakes and this cake is eaten against rheumatoid arthritis. [Oraon]
58.	*Piper betel* L. [RM-392] [Piperaceae]	Pana (O)	Climber	Leaf: Leaf juice (1 ml) mixed with equal amount of honey given to babies cures common cold. 5 ml of leaf juice is also given twice daily for 2-3 days increases digestion. [Santal]
59.	*Plectranthus barbatus* Andr. [RM-414] [Lamiaceae]	Rukuna hata pochha (O)	Herb	Leaf: Leaf juice (5 ml) mixed with a pinch of rock salt and given to treat diarrhoea in children. [Bhumija]
60.	*Plumeria rubra* L. [RM-361] [Apocynaceae]	Katha champa (O)	Small tree	Stem: Milky sap of plant mixed with coon salt and applied externally to cure ring worms. [Santal]
61.	*Pongamia pinnata* L. [RM-337] [Fabaceae]	Karanja (S)	Tree	Seed: Seed paste is used to cure ring worms when applied externally. [Santal]
62.	*Portulaca oleracea* L. [RM-423] [Portulacaceae]	Luna saga (Bh) Bek saga (Or)	Herb	Leaf: Leaves are boiled, fried and consumed for expelling intestinal worms. [Oraon]
63.	*Psidium guajava* L. [RM-309] [Myrtaceae]	Pijuli (O)	Tree	Leaf: 7-8 leaves cut in to pieces, boiled in water and the lukewarm decoction is used for gargling to cure tooth ache. [Santal]
64.	*Pterocarpus marsupium* Roxb. [RM-359] [Fabaceae]	Piasala (O) Bijja (S)	Tree	Bark: Bark paste mixed with mother or cow's milk used as a poultice on scalp of babies cures dermatitis or eczema. [Santal]
65.	*Punica granatum* L. [RM-332] [Punicaceae]	Dalimba (O)	Small tree	Leaf: 1 drop of leaf juice put into each nostril cures epitaxis. [Santal]
66.	*Rauvolfia serpentina* (L.) Benth. ex Kurz. [RM-426] [Apocynaceae]	Patalagaruda (O) Sarpagandhi (S)	Herb	Root: Root juice lowers blood pressure. Fresh root paste (5 g) mixed with two black pepper paste given orally against snake bite. [Santal]
67.	*Saraca asoca* (Roxb.) de Wilde [RM-376] [Caesalpiniaceae]	Asoka (O)	Tree	Bark: Bark juice is given to regularize monthly cycle in women. Leaf: Leaf juice is used to reduce uterine pain during menstruation in women. [Santal]
68.	*Semecarpus anacardium* L.f. [RM-340] [Anacardiaceae]	Bhalia (O)	Tree	Fruit: The ripe fruit pulp applied on crack heels shows good result. [Santal]
69.	*Sensevieria roxburghiana* Schult & Schult.f. [RM-364] [Agavaceae]	Muruga (O)	Herb	Rhizome: Slightly heated rhizome squeezed and extract put into ear reduce ear pain due to common cold. (Santal)
70.	*Sesbania grandiflora* (L.) Poir. [RM-341] [Fabaceae]	Agasthi (O, Bh)	Tree	Leaf & Flower: Decoction of both leaves and flowers is prescribed for gargling against throat infection. [Bhumija]
71.	*Sida cordata* (Brum.f.)Borssum [RM-368] [Malvaceae]	Badianla (S)	Herb	Leaf: Fresh leaf juice mixed with sugar is taken for dysentery. [Santal]

72.	*Spermacoce articularis* L.f. [RM-305] [Rubiaceae]	Solaganthi(O) Pitua alah (S)	Herb	Root: Roots are ground and its juice is squeezed into the infected eyes to reduce swelling and redness caused due to conjunctivitis [Santal]
73.	*Spilanthes calva* DC. [RM-320] [Asteraceae]	Dantika (S)	Herb	Flower: Flower paste applied on the aching tooth to lessen pain. [Santal]
74.	*Syzygium cumini* (L.) Skeels [RM-317] [Myrtaceae	Jamu (O)	Tree	Leaf: Leaf powder mixed with clove powder and rubbed on teeth against pyorrhea and to clean black spots on its surface. [Santal]
75.	*Tagetus patula* L. [RM-424] [Asteraceae]	Gendu (O,S)	Herb	Leaf: Luke warm leaf juice (1-2 drops) put into ear cures ear infection and stop earache. Leaf juice is also applied on cuts & wounds as an antiseptic. [Santal]
76.	*Tamarindus indica* L. [RM-343] [Caesalpiniaceae]	Tentuli (O), Jojo (S)	Tree	Seed: Seeds mixed with equal amount of black cumin made in to a paste and applied externally to cure leucoderma. [Santal]
77.	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. [RM-401] [Combretaceae]	Arjuna (O)	Tree	Bark: Bark decoction is given with honey for treatment of dysentery. [Santal]
78.	*Tinospora cordifolia* (Thunb.) Miers [RM-359] [Menispermaceae]	Guluchilata (O) Koilisuta (S)	Climber	Stem: Freshly extracted stem juice is kept for some time to settle. The upper diluted part discarded and lower dense part is taken to treat burning sensation in palm and foot. [Santal]
79.	*Toddalia asiatica* (L.) Lam. [RM-395] [Rutaceae]	Tundpora (O, Bh)	Climber	Leaf: 2-3 ml leaf juice is taken orally once a day for 7 days for treatment of Typhoid and fever due to cold. [Bhumija]
80.	*Trigonella foenum-graecum* L. [RM-412] [Fabaceae]	Methi (O) Methi sakaam (S)	Herb	Seed: 10 g seed powder soaked in water given twice daily for 10 days against irregular menstruation. [Santal]
81.	*Vitex negundo* L. [RM-419] [Verbenaceae]	Begunia (O)		Leaf: Luke warm fresh leaf juice put in to ear as drops relieves pain due to common cold.

Conclusion

An extensive study on the occurrence and diversity of ethnomedicinal plants in Kuldhia Wildlife Sanctuary revealed that the native tribal communities possess vast knowledge on the medicinal plants and their used for primary healthcare. The benefit of this indigenous knowledge can be harnessed and improved upon by its appropriate use, establishing authenticity of such knowledge and integrating it with healthcare programmes. Traditional medicine preparation mostly involves a single plant or its part(s) and the method of preparation was mainly the extracts of fresh plant parts. Utilization of the whole plant or root as the plant part for traditional medicine preparation could be a threat to medicinal plant's diversity and abundance. Although the study site is protected, this forest is experiencing destruction because of the frequent visit of people from nearby villages for their daily requirements such as fuel, medicine, fodder, bamboo and other forest produce. This calls for conservation measures to facilitate sustainable utilization of these plant resources. Moreover, phytochemical and pharmacological investigation is recommended with due consideration to frequently used medicinal plants.

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