

## **Ethnobotanically important plants of Kishanpur Wildlife Sanctuary, Uttar Pradesh, India**

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### **Abstract**

The present paper deals with the enumeration of 63 ethnobotanically important plant species used by local inhabitants of Kishanpur Wildlife Sanctuary (KWLS). Located in the Terai region of Indo-Nepal border, KWLS harbours rich biodiversity. All the species have been provided the correct nomenclature, local names, habit and their uses against various ailments by local inhabitants. Local communities mainly use whole plants (17 spp.), followed by leaves (16 spp.), root/rhizome (11 spp.), stem (11 spp.), flowers, fruits, seeds (6 spp. each) and least by bark (5 spp.). The mostly represented plant family is Fabaceae (8), which is followed by Poaceae (5), Asteraceae (4), Amaranthaceae (4), Euphorbiaceae, Solanaceae, Tiliaceae (3 each), Convolvulaceae, Lamiaceae (2 each), Acanthaceae, and Papaveraceae (1 each). The sanctuary is facing anthropogenic pressure due to Tourism, Agriculture, Grazing, and overexploitation of medicinal plants those are posing threats to its flora and vegetation and this need to be addressed through effective management and conservation strategies.

**Key words:** Kishanpur Wildlife Sanctuary, protected area, ethnobotanical plants, conservation

### **INTRODUCTION**

India, one of the mega-biodiversity countries, is rich in biological diversity and associated traditional knowledge (Mittermeier *et al.* 1997). It occupies only 2.4% of the world land area but accounts for 7-8% of recorded species of the world. The wide variety of geographical, climatic, topographical conditions have resulted in a number of habitats and ecosystems such as mountain, coastal, marine (mangrove and coral reef) and deserts, each with rich biodiversity characteristics of its own (Balachandhran & Arora 2006). India is losing its biodiversity at an alarming rate, both in terms of decline in the population of individual species, as well as in the degradation of ecosystems. The foremost, amongst the responsible factors, are manmade, such as clearance of forest, fragmentation, degradation, and loss of habitat due to land use changes and over-utilization of biological resources. India shares this problem with rest of the world, with rapidly increasing population whose need for food, fuel, fodder, recreation, and economic development must be met from a fixed land resulting in decline in the forest area, productivity and biodiversity (Holthausen & Sawarkar 2002).

India, one of the major biodiversity centers of the world, has a long history of biodiversity conservation on the basis of different reasons, but rapid decline in wild-life population during first half of last century forced conservationists and environmentalists to bring wild-life

protection program with some legal means in the 1970's. On these lines of conservation program, wild life protection act was promulgated in 1972 and resulted in the declaration of national parks and wild life sanctuaries. Similarly, Kishanpur Wild Life Sanctuary (KWLS) was established in the year 1972 for the protection of an endangered elusive cat, Bengal Tiger (*Panthera tigris tigris* L.), having an area of *ca.* 227 km<sup>2</sup>, which lies between 28° 24'01" N and 80° 22'01" E, in Gola Tehsil of Lakhimpur District and the Powayan Tehsil of Shahjahanpur District in Uttar Pradesh (Figure 1). In 1987, KWLS alongwith Dudhwa National Park was brought under per view of "Project Tiger" as "Dudhwa Tiger Reserve". Therefore, Dudhwa Tiger Reserve has two core areas, Dudhwa National Park and Kishanpur Wildlife Sanctuary. These are 15 km apart, with agricultural land in between. After that Katarniaghat Wild Life Sanctuary was added in the year 2000. This beautiful emerald sanctuary situated in Tarai forests supports rich flora and fauna. It is a home for Tiger, leopard, Swamp Deer, Hog Deer, Barking Deer, Bengal Floricon and other fauna.

The forests and grasslands of the *terai* region are the most important biodiversity hotspots of this State. The protected areas of the *terai* (Dudhwa, Kishanpur, Katarniaghat and Reserve forests) remain strong and vital reservoirs of *terai* biodiversity, and are important social and economic assets (Kumar *et al.* 2002). Despite intense human pressure, the persistence of most species indicates that management has been adequate. However the effect of the annual burning and spread of invasive species such as *Tiliacora acuminata* are not fully known. Changes in river hydrology, associated siltation, and excessive ground water exploitation are causing changes in forest and grassland composition and structure (Kumar *et al.* 2002). Encroachment of forestland is still a major issue and vital corridors are still being lost (e.g. Dudhwa and Katarniaghat, and Dudhwa and Kishanpur). Livestock grazing is a major problem, especially in sanctuaries. Rivers Sharada, Gerua, Ull and several ponds (*Taal*) provide specific microhabitat for number of rare and threatened taxa. Thus, the effective and scientifically sound management of PA is need of the day for sustainable conservation of the remaining natural resources. Further, detailed assessment of diversity and status of plant and animal communities is the immediate requirement for planning and formulation of management policies and programs (Dubey 1999). Ethnobotanical surveys have developed focus on the relationship between the use of plants and indigenous communities (Balick & Cox 1996; Ford *et al.* 1994). The medicinal plants occupy an important and potential role from the primitive past to present at world level. In developing countries this provide a real alternative for primary health care while in many underdeveloped communities traditional medicines are still recognized as the primary health care system due to their effectiveness, lack of modern medical alternatives and cultural preferences (Tabuti *et al.* 2003). In India, about 65% of total (Timmermans 2003) and 85% of the rural (Jain 1994) population depends on such traditional knowledge for healthcare. In the recent past, attention has been paid on various aspects of ethnobotany and several studies have been done in other parts of Uttar Pradesh (Singh *et al.* 1987; Singh & Maheshwari 1992; Kumar *et al.* 2006, 2012, 2013a; Singh *et al.* 1979; Maheshwari *et al.* 1981; Maliya & Datt 2011; Mohammad *et al.* 2011; Kumar *et al.* 2013b) but till date, no study has been made on the ethnobotanical importance of the flora of KWLS. This has prompted us to initiate the study on the ethnobotanically important plants of KWLS.

## METHODOLOGY

### Study area

The study was conducted in Kishanpur Wildlife Sanctuary (situated about 28° 24'01" N and 80° 22' 01" E) straddles in Gola Tehsil of Lakhimpur District and the Powayan Tehsil in Shahjahanpur District in Uttar Pradesh, India (Fig. 1). It lies on the southern side of the

Sharda River and covers an area of 227 km<sup>2</sup>. The area of the Sanctuary was once part of the South Kheri Forest Division, and the Sharada River flows along a section of its eastern boundary. This site is also a constituent area of Dudhwa Tiger Reserve, and is connected with South Kheri Forest Division. KWLS represents a typical Terai ecosystem characterized by extensive alluvial plains, wetlands, hygrophilous grasslands, woodlands and moist forests. The vegetation of the area can be categorized into riverine forests, mixed Sal forest, teak (*Tectona grandis*) plantation, woodlands and alluvial grasslands. Except riverine forests, which are characterized by the dominance of moist evergreen species, all other categories are deciduous in nature (Tripathi & Singh 2009). The sanctuary is the home to large animals like tiger, elephant, leopard and Gangetic dolphin, and is regarded as an important habitat of the Critically Endangered *Gavialis gangeticus*. In addition, Gharial (*Gavialis gangeticus*), Maggar crocodile (*Crocodilus palustris*), Gangetic softshell turtle (*Aspiderus gangeticus*) and many species of fishes are found in the river Gerua that flows through the sanctuary area (Jha 2005).

### Plant and data collection

During the years 2015 – 2016, frequent botanical tours were conducted to explore the floristic diversity of Kishanpur Wildlife Sanctuary. Plants were collected either in flowering and fruiting stage to facilitate correct identification and had been further processed as per routine herbarium techniques recommended by Lawrence (1951) and Jain & Rao (1977). The specimens were identified with the help of floras, revisions and other published literature (Duthie 1903-29; Singh 1997; Maliya & Datt 2010; Maliya 2011, 2012a, 2012) and consultation of different herbaria (LWG, CIMAP, BSA). The plants have been deposited at LWG in the form of herbarium specimens for future reference. The ethnobotanical claims have been gathered from local communities through personal communication following Jain (1991). Further, the list was prepared alphabetically with their correct nomenclature, vernacular name, part used and uses.

## RESULT AND DISCUSSION

A total of 63 species having ethnobotanical uses, which are listed in Table 1 along with their botanical names, vernacular/local names, voucher number, part used and uses have been recorded from the Kishanpur Wildlife Sanctuary. These 63 species are belongs to 58 genera from 31 families, of which, herbs are dominating with 29 species followed by shrubs (14), trees (15 species), undershrub (4) and climber (1) (Fig. 2). Local communities mostly use whole plants (17 species) followed by leaves (16), root/rhizome (11), stem (11), flower, fruit, and seeds (6 each) and least by bark (5) for the treatment of their various ailments (Fig. 3). The distribution of these plants/parts in the taxonomical families is dominated by Fabaceae (8), followed by Poaceae (5) and Asteraceae (4), Amaranthaceae (4), Euphorbiaceae, Solanaceae, Tiliaceae (3 each), Convolvulaceae, Lamiaceae (2 each), Acanthaceae, Papaveraceae (1 each) (Fig. 4.). The local people of the area also recognize most of the plant species by their own vernacular names as has been provided in Table 1. These plants are heavily exploited by the local people mostly due to their high nutrient and medicinal values. Many of these species have high medicinal values in Indian system of medicine due to their potential chemical constituents. There are many water bodies and rivers within the Kishanpur Wildlife Sanctuary viz. Jhadi taal, Sharda river, Ull river etc., which help in supporting the rich biodiversity of the area. Many medicinal plants like *Curculigo orchioides*, *Helminthostachys zeylanica* have luxuriant growth in moist, water rich conditions. Local communities are generally poor and live in thatched mud houses nearby areas of forests. Therefore, they heavily depend on forest products such as fibre, fuel, fodder, medicine, and

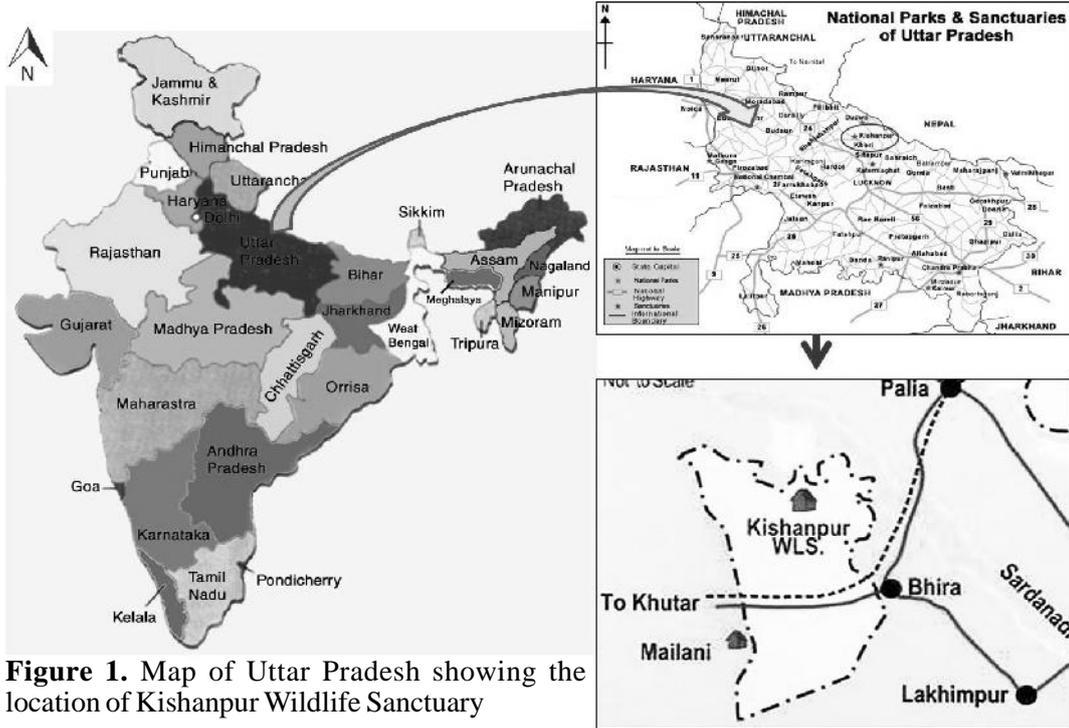


Figure 1. Map of Uttar Pradesh showing the location of Kishanpur Wildlife Sanctuary

■ Herbs ■ Shrubs ■ Tree ■ Undershrubs ■ Climber ■ Grass

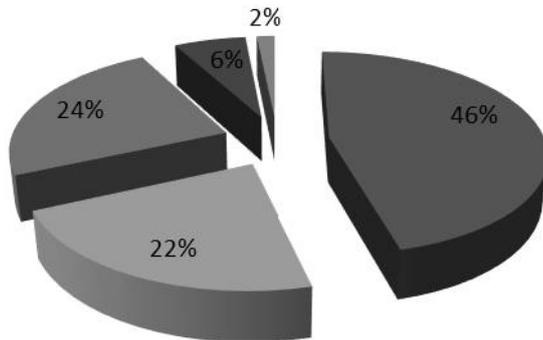


Figure 2. Habit-group distribution of Ethnobotanically important plants of Kishanpur Wildlife Sanctuary

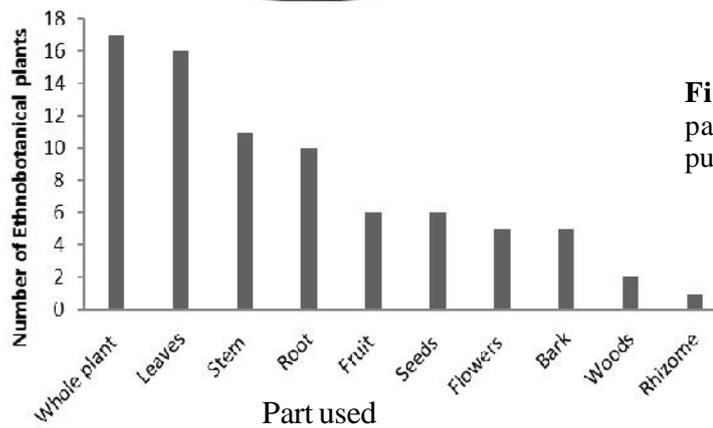


Figure 3. Distribution of plant parts used for Ehtnomedicinal purposes

**Table 1.** Ethnobotanically important plants of Kishanpur Wildlife Sanctuary used by local community.

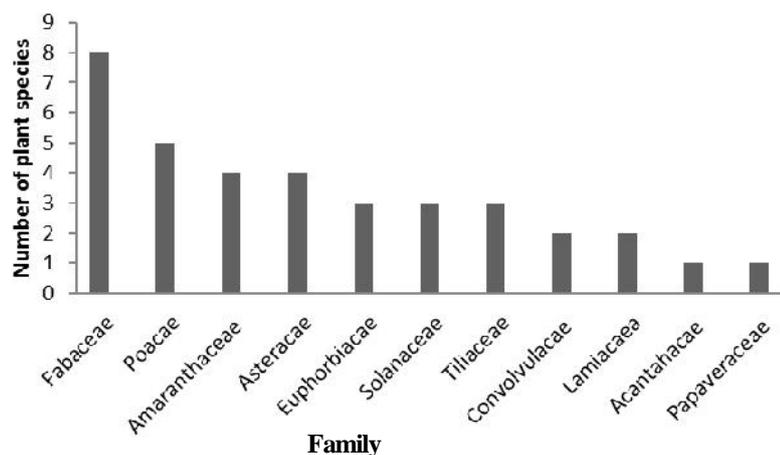
Botanical name/ Family	Local name	Habit	Part used	Uses
<i>Abutilon indicum</i> (Linnaeus) Sweet [Malvaceae]; LWG-303584	<i>Atibala, Kanghi</i>	Shrub	Leaf	Extract given early in the morning to cure kidney stone
<i>Acacia catechu</i> (Linnaeus f.) Willdenow [Fabaceae]; LWG-303565	<i>Khair</i>	Tree	Heart wood	Astringent; used in skin diseases, especially eczema
<i>Acacia concinna</i> (Willdenow) DC. [Fabaceae]; LWG-303544	<i>Shikakai</i>	Prickly liana	Pods, Seeds	Decoction used to remove dandruff, extensively used as detergent
<i>Achyranthes aspera</i> Linnaeus [Amaranthaceae]; LWG-303525	<i>Latjira, chirchita</i>	Herb	Whole plant	Used in asthma and cough; crushed plant boiled in water is given in pneumonia; paste of flowering spikes or seeds applied externally over bites of poisonous snakes and reptiles; useful in night blindness; fresh leaf paste is used for allaying pain of wasp bite
<i>Aegle marmelos</i> Correa ex Roxburgh [Rutaceae]; LWG-305509	<i>Bilpatra</i>	Tree	Fruit, leaf	Fruit juice as coolant during summer, beneficial in diarrhea, constipation, indigestion, etc.; inner fleshy pulp is cut into small thin pieces, dried under sun and then soaked in water for overnight and taken in empty stomach for 2-4 weeks during summer for cure of indigestion; leaves used to worship Lord Shiva
<i>Aerva lanata</i> (Linnaeus) A. Jussieu [Amaranthaceae]; LWG-303515	<i>Kapurija di</i>	Herb	Whole plant	Plant extract taken orally to treat cholera
<i>Ageratum conyzoides</i> (Linnaeus) Linnaeus [Asteraceae]; LWG-303506	<i>Visadodi</i>	Herb	Leaf	To treat fever and gastrointestinal ailments
<i>Albizia procera</i> Benthham [Fabaceae]; LWG-305519	<i>Safed-Siris</i>	Tree	Stem, leaf	Leaves to poultice on ulcers; wood for construction, furniture, carts and carriages, cane crushers, carvings; and as fuel
<i>Argemone mexicana</i> Linnaeus [Papaveraceae]; LWG-304029	<i>Bhadbhanda</i>	Shrub	Whole plant	Extract taken orally, 2 – 3 spoons daily for one week in jaundice; tea from dried leaves assist to quit smoking and drug abuse
<i>Artemisia indica</i> Willdenow [Asteraceae]; LWG-304023		Under-shrub	Leaf, flowering shoot	To alleviate chronic fever, dyspepsia and hepatobiliary ailments; also as antimalarial drug
<i>Barleria cristata</i> Linnaeus [Acanthaceae]; LWG-303555	<i>Vajra Danti</i>	Under-shrub	Whole plant	Infusion of whole plant given orally twice a day in fever
<i>Boerhavia diffusa</i> Linnaeus [Nyctaginaceae]; LWG-303568	<i>Punarnawa</i>	Herb	Root	Extract used to cure asthma, urinary disorders, leucorrhea, rheumatism, and encephalitis

Botanical name/ Family	Local name	Habit	Part used	Uses
<i>Butea monosperma</i> Lamarck [Fabaceae]; LWG-304092	<i>Jhula, Dhak</i>	Tree	Flower, seed	Seeds in scorpion bite; a dye extracted from flowers
<i>Cannabis sativa</i> Linnaeus [Cannabaceae]; LWG-304051	<i>Ganja</i>	Herb	Leaf, seed	Whole plant is narcotic, sedative, tonic and refrigerant; leaf juice mixed in milk and nuts to make <i>Thandai</i> - a pleasant drink for excitement and as astringent
<i>Cassia fistula</i> Linnaeus [Fabaceae]; LWG-304078	<i>Amaltash</i>	Tree	Flower	Decoction given orally twice a day in chronic fever
<i>Chrysopogon zizanioides</i> (Linnaeus) Roberty [Poaceae]; LWG-303546	<i>Khas</i>	Herb	Root	Vetiver oil or khus-khus oil extracted from roots used in perfumery
<i>Cissampelos pareira</i> Linnaeus [Menispermaceae]; LWG-304077	<i>Bhatvel</i>	Twinn- ing shrub	Leaves, root	Extracts of root/ leaves used in asthma
<i>Corchorus capsularis</i> Linnaeus [Tiliaceae]; LWG-303577	<i>Jute</i>	Herb	Stem	Freshly harvested stem yields fiber on retting
<i>Corchorus olitorius</i> Linnaeus [Tiliaceae]; LWG-304043	<i>Jute</i>	Herb	Stem, Bark	Freshly harvested stem yields fiber on retting
<i>Curculigo orchioides</i> Gaertner [Hypoxidaceae]; LWG-303548	<i>Kali-Musli</i>	Herb	Root	Extract aphrodisiac, spermatogenic, hepatoprotective
<i>Cymbopogon citratus</i> (DC.) Stapf [Poaceae]; LWG-304003	<i>Gandhat rina, Lemong-rass</i>	Herb	Leaf	Citronella oil distilled from leaves
<i>Datura metel</i> Linnaeus [Solanaceae]; LWG-304048	<i>Dhatura</i>	Under-shrub	Seed, leaf, root	Seeds, leaves and roots, given in insanity, fever with catarrh, diarrhea, skin diseases and as antiseptic; dried leaves paste applied on boils, sores, in rheumatism, lumbago and sciatica
<i>Digera muricata</i> (Linnaeus) Martius [Amaranthaceae]; LWG-304044	<i>Latmahur ia, Lesua</i>	Herb	Leaf, seed	Seeds to treat urinary discharge; leaves as green vegetable
<i>Euphorbia hirta</i> Linnaeus [Euphorbiaceae]; LWG-303553	<i>Dudhi</i>	Herb	Root	Eaten to nourish lactating mother to improve milk production
<i>Euphorbia thymifolia</i> Linnaeus [Euphorbiaceae]; LWG-303552	<i>Choti-dudhi</i>	Herb	Whole plant	Paste taken twice a day in dysentery
<i>Evolvulus alsinoides</i> (Linnaeus) Linnaeus [Convolvulaceae]; LWG-303599	<i>Shankha pushpi</i>	Creeping Herb	Whole plant	Plant paste with mustard oil enhances hair growth
<i>Evolvulus nummularius</i> (Linnaeus) Linnaeus [Convolvulaceae]; LWG-303579	<i>Vishnukr antha</i>	Creeping herb	Whole plant	Paste used externally to reduce pain of tonsillitis
<i>Ficus semicordata</i> Buchanan-Hamilton ex J.E. Smith [Moraceae]; LWG-304065	<i>Khunia</i>	Tree	Aerial parts	Milky sap of aerial parts diluted once in water and given in typhoid fever.
<i>Gomphrena celosioides</i> Martius [Amaranthaceae]; LWG-303522	<i>Water globehea d</i>	Herb	Whole plant	Extract along with 4 fruits of <i>Piper nigrum</i> , little amount of ashafetid and lemon juice taken twice a day for 10 days to cure Urolithiasis

Botanical name/ Family	Local name	Habit	Part used	Uses
<i>Grewia asiatica</i> Linnaeus [Tiliaceae]; LWG-303563	<i>Phalsa</i>	Shrub	Fruit	As coolant with sweet water in summer
<i>Helicteres isora</i> Linnaeus [Sterculiaceae]; LWG-303532	<i>Maror-fali</i>	Small tree	Bark, fruit	Bark decoction used in dysentery; stem bark diuretic; cures various skin diseases; fruit used as beads for necklace
<i>Helminthostachys zeylanica</i> (Linnaeus) Hooker [Ophioglossaceae]; LWG-303551	<i>Kamraj</i>	Herb	Rhizome	Dried powder taken along with water to increase sexual power
<i>Holarrhena pubescens</i> Wallich ex G. Don [Apocynaceae]; LWG-304068	<i>Dudhi</i>	Tree	Bark	Decoction used to treat dysentery
<i>Ichnocarpus frutescens</i> (Linnaeus) W.T. Aiton [Apocynaceae]; LWG-303583	<i>Dudhi lata</i>	Climbing shrub	Root	Decoction given to cures diabetes
<i>Lagerstroemia parviflora</i> Roxburgh [Lythraceae]; LWG-304060	<i>Bakli</i>	Tree	Stem, bark	Bark decoction taken orally to treat Leucorrhoea; as ornamental tree
<i>Lantana camara</i> Linnaeus [Verbenaceae]; LWG-303541	<i>Nakphul</i>	Shrub	Whole plant	Extract given once orally antidote to snakebite
<i>Leonotis nepetifolia</i> (Linnaeus) Robert Brown [Lamiaceae]; LWG-304083	<i>Lal Guma</i>	Herb	Leaf	Infusion used to treat Malaria
<i>Leucas cephalotes</i> (Roth) Sprengel [Lamiaceae]; LWG-303503	<i>Gumma</i>	Herb	Whole plant	Extract mixed with fruit powder of <i>Piper nigrum</i> given twice a day in chronic fever
<i>Mallotus philippensis</i> (Lamarck) Müll.-Argoviensis [Euphorbiaceae]; LWG-303535	<i>Rohini</i>	Tree	Fruits	Seed covering traditionally used as <i>sindoor</i>
<i>Mitragyna parvifolia</i> (Roxburgh) Korthals [Rubiaceae]; LWG-304066	<i>Kaim, Guri</i>	Tree	Wood	Produce good timber used in various purposes
<i>Murraya koenigii</i> (Linnaeus) Sprengel [Rutaceae]; LWG-305517	<i>Meethi-Neem, Curry-Patta</i>	Tree	Leaf	Adds in cooked food to improve aroma
<i>Oxalis corniculata</i> Linnaeus [Oxalidaceae]; LWG-304030	<i>Chokha</i>	Herb	Whole plant	Freshly prepared juice given in dyspepsia and dysentery; also in cataract and conjunctivitis; leaves pounded in water with cumin seeds taken thrice a day against dysentery
<i>Peperomia pellucida</i> (Linnaeus) Kunth [Piperaceae]; LWG-304026	<i>Sheetal chini</i>	Herb	Whole plant	Decoction used to cure abdominal pain
<i>Phragmites karka</i> (Retzius) Trinius ex Steudel [Poaceae]; LWG-304015	<i>Narkul</i>	Herb	Leafy shoot	Thatching cottages
<i>Phyllanthus amarus</i> Schumann & Thonning [Phyllanthaceae]; LWG-303517	<i>Jangli amla</i>	Herb	Whole plant	Fresh leaf paste has wound healing capacity and used to cure white spots on skin and in jaundice; stem juice also used as wound healers; whole plant extract used in urinary problems and in swelling of liver; root extract taken to cure stomach pain

Botanical name/ Family	Local name	Habit	Part used	Uses
<i>Phyllodium pulchellum</i> (Linnaeus) Desvaux [Fabaceae]; LWG-303558	<i>Jatsalpan</i>	Shrub	Stem-bark	Decoction used against hemorrhages
<i>Physalis minima</i> Linnaeus [Solanaceae]; LWG-303573	<i>Makoi</i>	Herb	Whole plant	Plants diuretic, tonic, alterative and aperients; used in dropsy, urinary disorders, and enlargement of spleen
<i>Piper longum</i> Linnaeus [Piperaceae]; LWG-303540	<i>Pipli</i>	Herb	Fruit, root	Powdered fruits mixed in honey, taken orally to cure cough and cold; root decoction taken after delivery
<i>Saccharum spontaneum</i> Linnaeus [Poaceae]; LWG-304005	<i>Kaans</i>	Herb	Leaf	Paste along with mustard oil and rhizome paste of <i>Curcuma longa</i> applied on wounds to cure it
<i>Saccharum bengalense</i> Retzius [Poaceae]; LWG-304074	<i>Sarkanda</i>	Herb	Leafy shoot	Thatching cottages
<i>Scoparia dulcis</i> Linnaeus [Plantaginaceae]; LWG-304028	<i>Mithi Patti</i>	Herb	Root	Root juice given twice a day in fever
<i>Senna occidentalis</i> (Linnaeus) Link [Fabaceae]; LWG-304022	<i>Kasondi</i>	Under-shrub	Leaf	Leaf paste applied externally on healing wounds
<i>Sesbania sesban</i> (Linnaeus) Merrill [Fabaceae]; LWG-304058	<i>Dhaincha</i>	Shrub	Seed, whole plant	Seeds used as anti-diabetic and anti-inflammatory agent; preferred forage for cattle; widely used for green manure production
<i>Sida acuta</i> Burman f. [Malvaceae]; LWG-304071	<i>Baraira</i>	Herb	Leaf	Juice boiled in oil and applied to Elephantiasis; fresh juice also massaged to remove dandruff
<i>Solanum surattense</i> Burman f. [Solanaceae]; LWG-303582	<i>Bhatkatiya</i>	Herb	Whole plant	Decoction given in fever
<i>Syzygium cumini</i> (Linnaeus) Skeels [Myrtaceae]; LWG-	<i>Jamun</i>	Tree	Fruit, seed	Ripe fruits eaten; seeds used to treat diabetes
<i>Tectona grandis</i> Linnaeus f. [Verbenaceae]; LWG-304017	<i>Sagwan, Sagun</i>	Tree	Stem	Produce good furniture-quality timber
<i>Terminalia bellirica</i> (Gaertner) Roxburgh [Combretaceae]; LWG-304039	<i>Bahera</i>	Tree	Fruit	Fruit powder in Luke-warm water given thrice a day in fever; heals wound and sore throat, diarrhea and dysentery, gonorrhoea, piles and chronic constipation
<i>Tinospora sinensis</i> (Loureiro) Merrill [Menispermaceae]; LWG-303543	<i>Gurch</i>	Climbing succulent shrub	Stem	Jaundice is treated with stem extract
<i>Tridax procumbens</i> (Linnaeus) Linnaeus [Asteraceae]; LWG-303530	<i>Tal-muriya</i>	Herb	Leaf	Juice as insecticide and for stupefying fishes; also to heal wounds
<i>Typha angustifolia</i> Linnaeus [Typhaceae]; LWG-304033	<i>Elephant grass</i>	Marshy rhizomatous shrub	Leaf	Making baskets, mats, door mats and thatches

timber etc. KWLS represents one of the important Terai ecosystems and hence, it is of tremendous conservation concern. The main causes behind the loss of diversity are land use practices, illegal encroachment by local people, changes in agricultural practices, habitat fragmentation, invasion by alien species and clearing of forests and forest fires. Loss of diversity at alarming rate in the Terai region stressed on the requirement of studies for their conservation, including habitat fragmentation pattern, habitat regeneration pattern, and effects of climate change.



**Figure 4.** Dominant families used by the local people for Ehtnobotanical uses

Two plant species (namely *Curculigo orchioides*, *Helminthostachys zeylanica*) of KWLS are being over exploited by local people due to their high medicinal values and high demand in the market. Hence, conservation of these taxa in the long run can be done by incorporating traditional knowledge with modern approaches of technique like tissue culture practices. Some other means of conservation may also be applied like in-situ and ex-situ conservation, by propagating awareness to the local inhabitants of the area.

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#### LITERATURE CITED

- Anonymous, 2014. *India's Fifth National Report To The Convention On Biological Diversity*. Ministry of Environment and Forests Government of India. Pp. 100.
- Balick, M.J.; & Cox, P.A. 1996. *Plants, People and Culture: The Science of Ethnobotany*. Scientific American Library, New York. Pp. 228.
- Balachandhran, G. & Arora, S. 2006. *India's Third National Report to Convention on Biological Diversity: Executive Summary*. Ministry of Environment and Forest. Government of India. Centre for Environment Education. Ahmedabad. India. Pp. 21.

- Dubey, Y. 1999. *Application of Geographic Information System in assessing habitat, resource availability and its management in Tadoba-Andhari Tiger Reserve*. Ph.D. FRI (Deemed University). Dehradun.
- Duthie, J.F. 1903. *Flora of Upper Gangetic Plains and of the adjacent Siwalik and Sub-Himalayan Tracts*. Calcutta: Botanical Survey of India. Pp. 500.
- Ford, D.; Easton, D.F.; Bishop, D.T.; Narod, S.A. & Goldgar, D.E. 1994. Risks of cancer in BRCA1-mutation carriers. *The Lancet* 343 (8899): 692 – 695.
- Holthausen, R.S. & Sawarkar, V.B. 2002. Purpose and Background. In Mathur, P.K.; Lehmkuhl, J.F.; & Sawarkar, V.B. (eds). *Management of forests in India for biological diversity and forest productivity: A new perspective*. WII-USDA Forest Service Collaborative Project Report. Volume 1: Concept, Approaches and Project Overview. Wildlife Institute of India. Dehradun. Pp. 1 - 4.
- Jain, S.K. 1991. *Dictionary of Indian Folkmedicine and Ethnobotany*. Deep Publication, New Delhi.
- Jain, S.K. & Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*. Today & Tomorrow's Printers & Publishers, New Delhi.
- Jha, R.N. 2005. *Management Plan of the Katarniaghat Wildlife Sanctuary*. In Tiger Conservation Plan Dudwa Tiger Reserve. Uttar Pradesh Forest Department. Lucknow. Pp. 479.
- Kumar H.; Mathur, P.K.; Lehmkuhl, J.F.; Khati, D.V.S.; De, Rupak.; & Longwah, W. 2002. *Management of Forests in India for Biological Diversity and Forest Productivity, A New Perspective - Volume VI: Terai Conservation Area (TCA)*. WII-USDA Forest Service Collaborative Project Report, Wildlife Institute of India, Dehradun.
- Kumar, A.; Tewari, D.D. & Tewari, J.P. 2006. Ethnomedicinal knowledge among Tharu tribe of Devipatan division. *Indian J. Tradit. Knowl.* 5: 310-313.
- Kumar, A.; Pandey, V.C. & Tewari, D.D. 2012. Documentation and determination of consensus about phytotherapeutic veterinary practices among the Tharu tribal community of Uttar Pradesh, India. *Trop. Anim. Health Prod.* 44: 863 - 872.
- Kumar, A.; Pandey, V.C.; Singh, A.G. & Tewari, D.D. 2013a. Traditional uses of medicinal plants for dermatological healthcare management practices by the Tharu tribal community of Uttar Pradesh, India. *Genet. Resour. Crop. Eval.* 60: 203 - 224.
- Kumar, R.; Singh, M.K. & Bharati, K.A. 2013b. Ethnobotany of Tharus of Dudhwa national park, India. *Mintage J. Pharmaceut. Med. Sci.* 2: 6-11.
- Lawrence, G.H.M. 1951. *Taxonomy of Vascular Plants*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
- Maheshwari, J.K.; Singh, K.K. & Saha, S. 1981. *The Ethnobotany of the Tharus of Kheri District*, Uttar Pradesh. National Botanical Research Institute, Lucknow, India.
- Maliya, S.D. & Datt, B. 2010. A contribution to the flora of Katarniyaghat Wildlife Sanctuary, Bahraich District, Uttar Pradesh. *J. Econ. Tax. Bot.* 34(1): 42–68.
- Maliya, S.D. 2011. New or less known uses of some ethnomedicinal plants of Wildlife Sanctuary Katarniyaghat of Bahraich Uttar Pradesh. *J. Econ. Tax. Bot.* 35(1): 35–38.
- Maliya, S.D. 2012a. Aquatic and wetland macrophytes of Katarniyaghat Wildlife Sanctuary of Bahraich District, Uttar Pradesh, (India). *J. Econ. Tax. Bot.* 35(1): 156–165.

- Maliya, S.D. 2012b. Additions to the flora of Katarniyaghat Wildlife Sanctuary, Bahraich district, Uttar Pradesh. *J. Econ. Tax. Bot.* 36(2): 419–426.
- Mittermeier, R.A.; Fonseca, G. A. B.; Rylands, A. B. & Mittermeier, C. G. 1997. In Mittermeier, R. A.; Robles Gil, P. & Mittermeier, C. G. (Eds.). *Megadiversity: Earth's Biologically Wealthiest Nations*, CEMEX, Monterrey, Mexico, Pp. 39 - 49.
- Mohammad, I.; Malik, V. & Pranitta. 2011. Enumeration of ethnomedicinal plants of Shakumbhari Devi region of district Saharanpur (U.P.). *J. Econ. Taxon. Bot.* 35: 837 - 845.
- Singh, K.K.; Bhati, H.S. & Maheshwari, J.K. 1979. Survey and Biological activity of economic plants of Kheri forests, Uttar Pradesh. *Indian For.* 105: 534 - 545.
- Singh, K.K. 1997. *Flora of Dudhwa National Park*. Deheradun: BishenSingh Mahendra Pal Singh, Dehradun. Pp. 516.
- Singh, K.K. & Maheshwari, J.K. 1992. Folk medicinal uses of some plants among the Tharus of Gorakhpur district, Uttar Pradesh, India. *Ethnobotany* 4: 39 - 43.
- Singh, A.K.; Singh, R.N. & Singh, S.K. 1987. Some ethnobotanical plants of Tarai region of Gorakhpur district-I. *J. Econ. Tax. Bot.* 9: 407 - 410.
- Tripathi, K.P. & Singh, B. 2009. Species diversity and vegetation structure across various strata in natural and plantation forests in Katarniyaghat Wildlife Sanctuary, north India. *Trop. Ecol.* 50(1): 191 – 200.
- Tabuti, J.; Dhillon, S.S. & Lye, K. 2003. Traditional medicine in Bulamogi County, Uganda: its practitioners, uses and viability. *J. Ethnopharm.* 85: 119 – 129.
- Timmermans, K. 2003. *Intellectual Property Rights and Traditional Medicine: Policy Dilemma at the Interface*. World Health Organization, Geneva, Switzerland.