Ethnobotanical knowledge of wetlands dependent communities of Koshi Tappu Wildlife Reserve, Nepal

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Research

Abstract

Background: This study documents the ethnobotanical knowledge of wetlands dependent ethnic communities (Bantar/Sardar, Mallaha, Musahar, Rajput, and Tharu) residing in the buffer zones of the Koshi Tappu Wildlife Reserve (KTWR) which includes sections of the Sapta Koshi River and its floodplains. Despite KTWR's ecological importance, systematic research on traditional plant use remains limited. This work addresses that gap by capturing community-based knowledge on plant resource utilization.

Methods: Fieldwork (April to May 2024) employed participatory methods, including semi-structured interviews, key informant surveys, and focus group discussions with 105 respondents who were residents at the buffer zone of KTWR and obtained information was interpreted using Use Value (UV) and Fidelity (FL). Plant specimens were collected and identified using reference materials, herbarium samples from the National Herbarium and Plant Laboratories (KATH) and Tribhuvan University Central Herbarium (TUCH), and experts' consultation.

Results: A total of 101 vascular plant species were documented, utilized by ethnic groups for medicinal, timber, fodder, edible, ethno-veterinary, religious/ritual, utensils and handicrafts. They utilized more plant species to in traditional healthcare systems (herbal remedies and traditional healing practices, while a smaller number of species were utilized for ethnoveterinary and other purposes. *Aegle marmelos, Mangifera indica, Bombax ceiba, Cynodon dactylon, Dalbergia sissoo,* and *Shorea robusta* were significantly valued for communities.

Conclusions: The findings support the preservation of the traditional ecological knowledge vital for biodiversity management. However, the current changing ecological and social conditions have transformed traditional knowledge, and assessment of changes in ethnobotany helps aid conservation of culture and traditional knowledge.

Keywords: Plant uses, traditional knowledge, caste/ethnic groups, Tarai origin, buffer zone,

Background

Since time immemorial, humans developed an ability to identify, collect and use plants as a basic survival strategy (Cunningham 2001). Plants have long been collected for subsistence use, primary health care, culture and household economy (Kunwar *et al*. 2015, Pyakurel *et al*. 2019). The collection and use knowledge of indigenous and ethnic groups following apprenticeship pedagogy predates to that of other groups (Brown *et al*. 2018), and the collection of formers is considered sustainable and wise (Kunwar & Bussmann 2008). Indigenous people have unique knowledge systems, beliefs, and practices about the plant collection, utilization and conservation in the benefit to the human and natural environment (UNPFII 2006). The traditional knowledge on plant utilization assumed to play an important role in adaptation of any culture to its environment. However, amidst the climatic uncertainties and sociocultural transformation, indigenous groups and traditional knowledge have been subject to a combination of social and climatic vulnerability. To respond to the alterations, some communities are better adapted while some are restringent and follow the traditional practices. The indigenous knowledge and resources have diminished during the cross-cultural adaptation among the indigenous communities in the light of socioeconomic transformation, land use change and climate change are utmost (Kunwar *et al*. 2016). During ethnobotanical knowledge adaptation, some communities adopt the ethnobotanical traits of new community referred to as acculturation; while some community loss the original cultural habits referred to as deculturation (Kim 2001). Moreover, the transfer of ethnobotanical knowledge within the group and across the caste is dilapidated in context of urbanization, outmigration, and disinterest of youths, lack of conservation initiatives (Chaudhary *et al.* 2017) and inadequate consultations with the traditional healers (Kunwar *et al*. 2015).

Wetlands are among the most productive and essential ecosystems on earth. Despite freshwater wetlands constituting 1% of total wetlands, they house over 40% of the world's biodiversity (Mitra *et al*. 2003). In Nepal, wetlands cover approximately 5% of the country's total land area (MoFE 2018) and record a total of 720 (approx. 12 %) vascular plant species from wetland and adjoining areas of Tarai alone (Siwakoti 2006); among them, 215 species were utilized for ethnobotanical purposes. Similarly, 117 vascular plant species were recorded as ethnobotanically useful wetland plants from central Nepal (Dangol *et al*. 2015). This shows a large number of wetland plant species provide a range of ecosystem services to wetland-dependent indigenous communities.

Koshi Tappu Wildlife Reserve (KTWR) encompasses a portion of the Sapta Koshi River and its flood plains. The River associates many wetlands, grasslands, woodlands and riverine forests. Koshi Tappu Wildlife Reserve is protected under the National Parks and Wildlife Conservation Act (1973), Nepal. Therefore, harvesting resources from the core area is strictly prohibited, only permitted from the buffer zone area. Buffer zone user committees have been established to conserve and promote plant-based resources and fisheries in buffer zones (KTWR 2018). Although limited to utilizing resources within buffer zones after the establishment of KTWR, their traditional knowledge for dependency on wetland resources, particularly on plant resources has scarcely been documented. Among the wetland dependent indigenous communities, the *Tharu* people mostly reside in the Tarai region at the vicinity of rivers for centuries, bequest the earliest evidence of settlement in Tarai (Krauskopff 2000). They made it possible to transform from marshy, malarial, forestland into the present form (Chaudhary 2003). *Tharu* people are adapted to several environmental changes in water, agriculture, forest and biodiversity in the Tarai for centuries (Chaudhary 2008). During the course of adaptation, some ethnic people are well ahead and have diversified their preferences while some are neither better to adapt nor to retain the original cultural habits in the changing context. In this context, we have documented the traditional knowledge and the status of acculturation and deculturation of five wetland dependent communities of KTWR about utilization of local plant resources. This study is well justified, because the wetlands of KTWR and its resources are experiencing a high degree of degradation and destruction due to siltation, invasive alien plant species, overgrazing, pollution, agricultural runoff, and insufficient management interventions (HMGN/MFSC 2002).

Materials and Methods

Study area

The Koshi Tappu Wildlife Reserve (KTWR) is a protected area in the Tarai region of eastern Nepal (Figure 1). It is the Nepal's smallest Wildlife Reserve and Nepal's first Ramsar site that covers 176 km² of area in the Sunsari, Saptari, and Udayapur districts, between 86°55'-87°05'E longitudes and 26°34'-26°45'N latitudes. The Reserve encompasses a portion of the Sapta Koshi River and its floodplain, which is distinguished by extensive mudflats, reed beds, and freshwater marshes. The Reserve has a tropical bioclimate, with altitude ranging from 75 to 100 meters above sea level (KTWR 2018). The reserve is surrounded by buffer zone of 173.5 km² of five municipalities (Kanchanrup, Saptakoshi, Belaka, Brahakshetra and Hanumannagar Kankalani) and a rural municipality (Koshi rural municipality). There are 469 buffer zone user groups, nine buffer zone user committees, and one buffer zone management committee for management of buffer zones of the reserve.

The study sites included four villages (Kushaha and Haripur of Koshi municipality, Prakashpur of Baraha municipality, and Badgamma of Kanchanrup) of KTWR buffer zone.

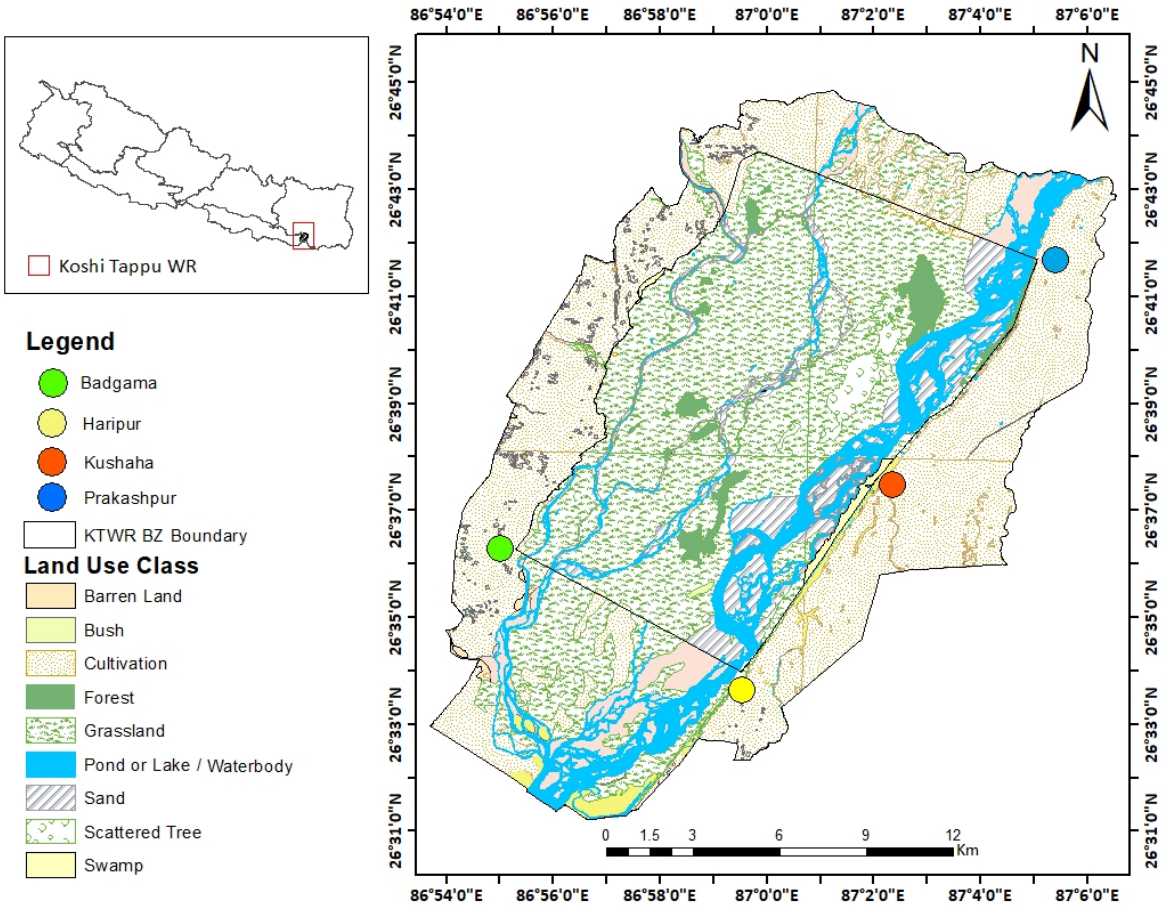

Figure 1. Study area showing study sites (Kushaha, Haripur, Prakashpur, and Badgamma).

Sample communities

A total of 105 respondents above the age of 40 years representing five ethnic communities (Bantar/Sardar, Mallaha, Musahar, Tharu, and Rajput) were selected for questionnaire survey following the purposive sampling. These sample groups are highly dependent on wetland resources (Dhakal *et al*. 2022) and have long been resided at the buffer zone of KTWR (KTWR 2018). We collected field data during the month of April-May, 2024 by conducting two to three focus group discussions for each sample group. A total of 8-12 knowledgeable persons in each group took part in the discussion. We also selected five traditional healers as key persons to verify the data of medicinal uses.

Data collection and analysis

The questionnaire survey was followed by semi-structured interviews, focus group discussions and key informant surveys. The questionnaire survey was followed after the informal introduction with respondents for informing the scope and objectives of the study to obtain the consent and rapport building as well as creating a conducive environment. The survey focused on collecting the information on ethnobotanical and cultural use. The different uses of plants, parts used, methods of preparation, and doses in case of medicinal plants, usefulness of plants for rituals and their significance in case of religio-cultural plants were recorded. Questionnaire survey, propping method (showing the collected voucher specimens to the participants) and walk-in-the-forest were adopted to ensure the collection of quality data/ information. The survey form subjected to collect scientific name of plants, local name used by the selected communities, family and habit of taxa along with use category and remarks, if any is given in the Appendix 1.

Plant collection, identification and deposition

The useful plant specimens were collected and identified at the field, while discussing with the respondents. Herbarium specimens were prepared by following Bridson and Forman (1992). Field notes and photographs were recorded for each specimen prior to data collection. The voucher specimens are preserved at the National Herbarium and Plant Laboratories

(KATH) and Tribhuvan University Central Herbarium (TUCH). Identification was made by using Grierson and Long (1983-2001), Siwakoti and Varma (1999) as well as consulting with experts, which was confirmed by cross checking with herbarium specimens at TUCH and KATH. Plants of the World Online (POWO), Rajbhandari *et al*. (2020) and Shrestha *et al*. (2022) were followed for recent nomenclature.

Data interpretation

Use Values (UV)

Use value is the ratio of the number of times use of an individual species is reported to the total number of species used. It is calculated by using the formula Use value (UV) = (NU/n)100, where NU is used in reports and n is the total number of plant species.

Fidelity Level (FL)

Fidelity Level (FL) is calculated by dividing the number of communities that suggested the uses of the species by the total number of studied communities (i.e., 5 in this study). It is calculated by using the formula Fidelity Level (FL) = nr/n.

Where nr is the number of communities suggested for use of species, n is the total number of studied communities.

For statistical analysis, data is represented in binary numbers. If a species was used by an ethnic community, it was given 1, and if not used, then 0. The plant use reports were classified into seven categories (medicinal, timber, fodder, edible, ethno-veterinary, religious, utensils and handicrafts) and presented in Chord diagram (Figure 4) using R program software. Furthermore, a biplot was created using the use value and fidelity to clearly visualize the relative importance and specificity of use.

Results and Discussion

Ethnobotanical richness

Altogether, 101 vascular plant species belonging to 91 genera and 48 families were found useful which is nearly 50 % of the total species utilized for ethnobotanical purposes in wetlands and associated areas of Tarai (Siwakoti 2006), nearly equal to the number of species recorded from lowland Nepal, although the composition is different (Dangol *et al*. 2015, Sharma *et al.* 2020). Among 48 families, Fabaceae was dominant with 14 species, followed by Lamiaceae and Moraceae, each having seven species (Figure 2). Likewise, in the present study, Fabaceae were reported as the dominantly used family in Tharu ethnic communities in previous studies (Acharya & Acharya 2009, Yadav & Chaudhary 2022). Among the species, 73 species were native and 28 species as naturalized including seven invasive alien plant species (IAPS): *Amaranthus spinosus* L., *Xanthium strumarium* L., *Mimosa pudica* L., *Senna occidentalis* (L.) Link, *Mesosphaerum suaveolens* (L.) Kuntze, *Argemone mexicana* L. and *Pontederia crassipes* Mart. (Appendix 1). These are dual-impact IAPS, which have both characters: potential traditional medicines & wild edibles, and threats to ecosystems make them interesting. Among the 101 plants, 45 species were trees, 30 species herbs, 13 species shrubs followed by four species each as woody climbers, subshrubs and herbaceous climbers, one species from fern category. The tree life form was found to be most dominant, maybe due to the multipurpose use of trees like timber, wild fruits, fodder, etc.

Figure 2. Plant families with three or more species used by the communities.

Widely consumed wild edibles by the *Tharu* community were *Aegle marmelos* (L.) Corrêa, *Mangifera indica* L., *Ziziphus mauritiana* Lam. and *Syzygium cumini* (L.) Skeels. Mallaha and Bantar/Sardar were used to cook the immature fruits of the *Bombax ceiba* L. as vegetables. Rajput community consumes *Amaranthus spinosus* as a leafy vegetable. Similarly, *Diplazium esculentum* (Retz.) Sw., a leafy fern, is widely used as vegetable. All group except Mushar used the *Tinospora sinensis* (Lour.) Merr. and *Cannabis sativa* L. to treat various ailments, including skin infections and digestive issues. While three species (*Justicia adhatoda* L., *Cannabis sativa* L. and *Datura metel* L.) were recorded for ethnoveterinary treatment. Many plant species including *Ficus religiosa* L. and *Cynodon dactylon* (L.) Pers. are used for various religio-cultural ceremonies. *Shorea robusta* C.F.Gaertn. is used for timber, utensils, and construction materials. While *Mangifera indica* L. provides timber, edible fruit and ritual materials. Other most frequently used timber species were *Dalbergia sissoo* Roxb. ex DC., *Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb., *Tectona grandis* L.f., and *Neolamarckia cadamba* (Roxb.) Bosser. Among them, *Shorea robusta* and *Tectona grandis* were rare in distribution. Similarly, the most commonly used fodder plant was *Melia azedarach* L.; however, it's not a good fodder for cattle. Other commonly used fodder plants are *Ficus hispida* L.f. and *Terminalia anogeissiana* Gere & Boatwr. *Typha angustifolia* L., *Cyperus* spp., both are aquatic plant species, are being used for making households crafts including mats, which support the household economy of Bantar/Sardar and Mallaha communities (Figure 3).

Figure 3. A, B. Households crafts being used in Bantar/Sardar community are prepared from *Typha angustifolia.* A. Woman holding handmade mat. B. Households items (baskets, stool and mats).

This study also highlights the ethnobotanical significance of various plants, demonstrating their diverse utility across cultural practices. The identified uses range from culinary applications, such as those of *Momordica charantia* L**.,** *Syzygium cumini,* and *Aegle marmelos* to medicinal remedies, including the stem decoction of *Tinospora sinensis* and the fruit and bark paste of *Moringa oleifera* Lam. Furthermore, timber yielding species like *Neolamarckia cadamba* and *Shorea robusta* is employed for construction and wooden crafts, while the herbaceous plants *Desmostachya bipinnata* and *Cynodon dactylon* hold cultural, ecological and medicinal significance. The inclusion of aquatic species such as *Pontederia crassipes* and pteridophytes like *Diplazium esculentum* underscores the breadth of resource use. This diversity reflects the profound traditional knowledge communities possess regarding plant biodiversity, which plays a vital role in sustaining their livelihoods and cultural heritage.

The Use Value (UV) vs. Fidelity Level (FL) biplot clearly differentiates culturally significant multipurpose species from those with specialized or minimal usage among the surveyed communities. Species such as *Magnifera indica* occupy in the high UV and high FL quadrant (top right), indicating their vital role in local ethnobotanical practices. Additionally, the species *Aegle marmelos, Bombax ceiba, Cynodon dactylon, Dalbergia sissoo,* and *Shorea robusta,* positioned at the same (Figure 4) revealing their maximum FL and UV values and significance to the wetland dependent communities particularly to the Tharu people as these all five species are frequently used in rituals and culture of Tharu. The most used species in this study are also noted by other research as the most useful species of Tharu culture in the country, such as Yadav and Chaudhary (2022) in Banke and Dangol and Gurung (1991) in Chitwan district; they mentioned also *Dalbergia sissoo*. Likewise, Gharti *et al.*

(2024) identified *Aegle marmelos* as the most used species in western Nepal, and Acharya and Acharya (2009) reported *Aegle marmelos, Bombax ceiba*, and *Cynodon dactylon* from Rupandehi, Nepal.

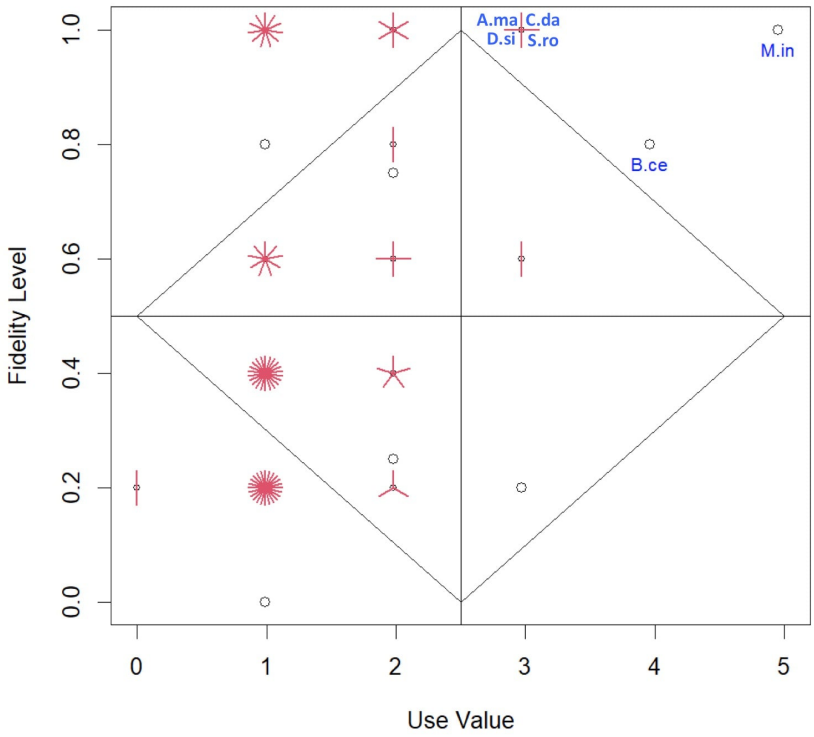

Figure 4. Sunflower plot diagram with four quadrants and the top right quadrant shows the highly useful plant species (*A.ma = Aegle marmelos, M.in = Mangifera indica; B.ce = Bombax ceiba; C.da = Cynodon dactylon, D.si = Dalbergia sissoo; S.ro = Shorea robusta*)

Categories of useful plants

Among the 101 useful species, 45 species were used for medicinal purposes, 12 species for timber, and 13 species for fodder, followed by 24 species as edibles, 3 for ethnoveterinary care, 31 for rituals and religious ceremonies, and 14 for making utensils/ handicrafts. Among these, 22 species were used by all communities for multiple purposes across all seven categories (medicinal, timber, fodder, edible, ethno-veterinary, religious/ritual, utensils and handicrafts). The Tharu community used nine plants for religious/ritual purposes, which is a much higher number of plants used among the selected five communities. Musahar and Rajput seem to be more connected with religious and medicinal uses. The overlapping ribbons highlight shared plant uses across different communities, emphasizing how cultural practices intersect in utilizing forest resources. Wider ribbons indicate dominant uses, such as medicinal and religious/ritual, showing these are critical to multiple groups. Some categories like ethnoveterinary (E-vet), fodder and timber have fewer or thinner connections, suggesting underutilized or specialized plant use (Figure 5).

The dominance of ethnomedicinal plants underscores the vital role of traditional medicine in human health. Their uses span various aspects of life, including food, religious rituals, medicine, utensils and handicrafts, showcasing the diverse ways plants support subsistence and daily living. While the use categories like ethnoveterinary, fodder and timber appear less frequent, their roles are still crucial in specific cultural contexts. Highest number of plants were used for ethnomedicinal purpose, which resembles the results of Chaudhary *et al*. (2020) and Mallik *et al*. (2020) in Ramdhuni municipality of Sunsari district in similar caste/linguistic groups. Studies by Dangol and Gurung (1991), Gharti *et al.* (2024) and Yadav and Chaudhary (2022) in the Tharu community also found that plants are important resource for the health care and social lives of these people. The prominence of medicinal uses emphasizes reliance on traditional healthcare practices, while significant dependence on timber indicates potential pressure on forest resources, necessitating sustainable management. Categories like religious/ritual use present opportunities for cultural preservation or eco-tourism.

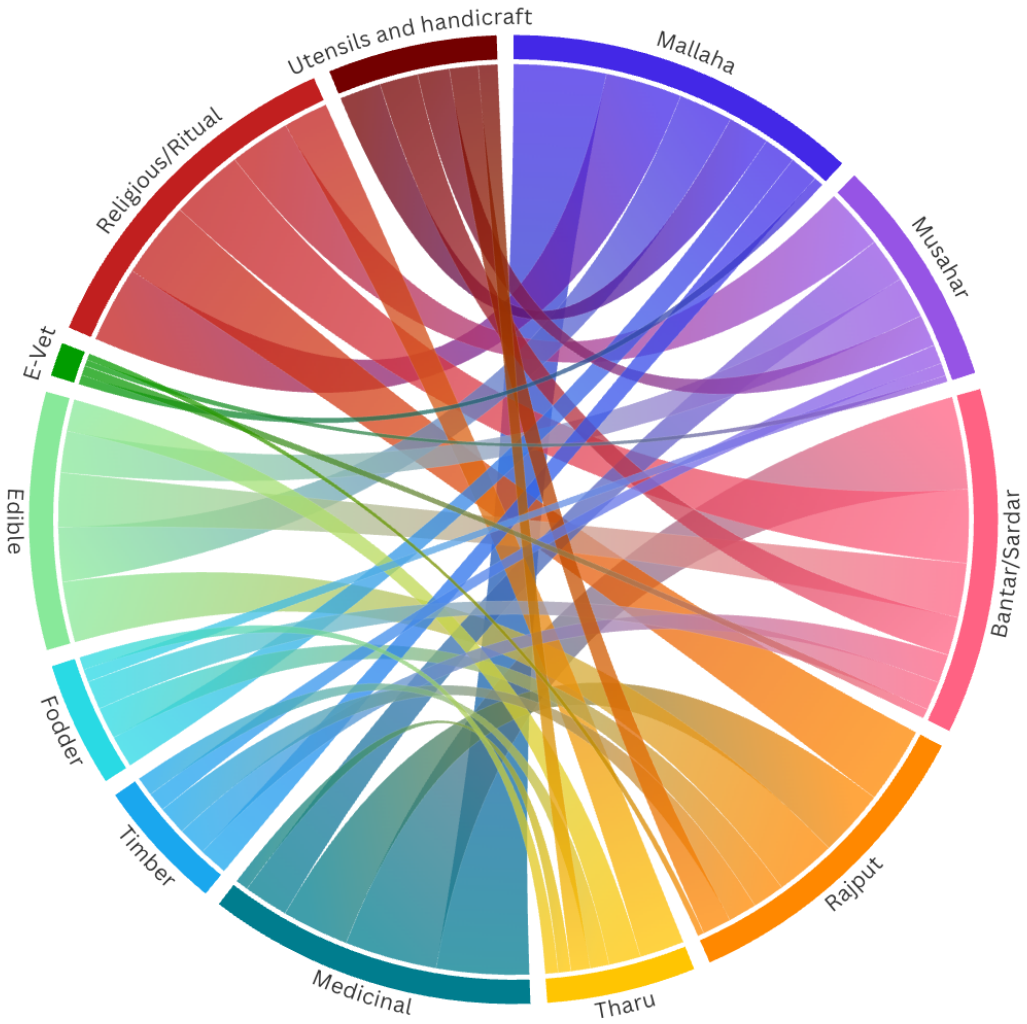

Figure 5. Chord diagram showing relationship between ethnic group and utilization of plants in different purpose.

Culture and Cross-cultural adaptation

Among the 101 plant species documented, their utilization varied across different communities. The Tharu community utilized 24 species for various purposes, while the Rajput, Mallaha, Musahar, and Bantar/Sardar communities utilized 59, 67, 43, and 66 species, respectively. The Tharu people have historically settled in the areas are more connected to the rivers and wetland ecosystem, yet they are found to use the smaller number of plants grown around in the Koshi Tappu wetlands. This may be due to their shift from a gathering and hunting lifestyle to farming (Müller-Böker 1999). When the KTWR was established in 1976, the indigenous Tharu communities were forced to dislocate from their place, and they were restricted to entry forests and fishing in the rivers. To harmonize the reserve and indigenous people, a Park-People programme was launched in 1994 that made the Tharu people less dependent on forest and rivers, resulting in Tharu livelihood rather less dependent on wetland (Heinen, 2009), resulting in using a smaller number of wetland plants. Rivers were central to settlement and sociocultural frontier of Tharu community before introducing protected area system in the country (Krauskopff 1995, McLean 1999); however, the new livelihood strategies offered by Park-People programme have now altered the traditional practices of both the Tharu and wetland-dependent communities.

Regarding the demographic composition of respondents, 20% identified as indigenous Tharu, whereas the remaining 80% (Rajput, Mallaha, Musahar, and Bantar/Sardar) belonged to non-Tharu communities. As the Tharu population is least in eastern Tarai, the eastern Tarai is heterogeous and inhabited by more than 100 ethnic groups (CBS 2021), resulting that the region is an ethnic mosaic promoting diversity in ethnobotanical uses (Kunwar *et al.* 2023). The diversity of knowledge could also be influenced by tourism, as the region is one of Nepal's most attractive tourist destinations (Poudel et al. 2022). The flow of knowledge in this area is persistent and dynamic (Khadka et al. 2025). Cross-cultural ethnobotanical knowledge adaptation is more likely in such area where people are daily confronted with diverse ethnic groups.

The cross-cultural use and adaptation of plant species in KTWR demonstrated diverse applications and shared knowledge across various ethnic communities, highlighting cultural exchanges and adaptations in plant use. Stem decoction of *Tinospora sinensis* was used to treat fever in all five sample groups, the stem decoction was also used to treat stomachaches in Mallaha and Bantar/Sardar ethnic communities. Timber species such as *Shorea robusta* and *Dalbergia sissoo* were widely used by all communities for construction of their houses and agricultural tools, reflecting a shared reliance on these species for durable property. *Melia azedarach* was commonly fed to cattle and goats, indicating similar adaptations to local livestock needs. Shared dietary preferences were evident in the use of similar wild edibles. The used of similar ritual plants (*Ficus religiosa* and *Cynodon dactylon)* indicated broad cultural importance across ceremonies such as births, marriages, and funerals. Wood of certain species, *Lannea coromandelica* (Houtt.) Merr. used for funeral rituals and twigs of *Bombax ceiba* used in marriage ceremonies, these were culturally adapted for unique practices within specific groups (e.g., Rajput).

Adaptations in plant use reflect both shared cultural knowledge and individual community needs, especially considering restricted access to KTWR's core area. For instance, leaves of *Typha angustifolia* collected from buffer-zone, used for making mats and household items, support the economies of local communities (Mallaha, Musahar, and Bantar/Sardar). Similarly, multipurpose plants are identified, giving 1 and 0 scores based on whether they are used or not used across different categories (Table 1). Some plants such as *Mangifera indica* and *Bombax ceiba* are adopted by all communities for varied uses such as timber, utensils/handicrafts, wild edibles and religious/rituals practices, demonstrating their importance in sustaining livelihoods and maintaining cultural practices (Table 1). The delicious fruit of *Mangifera indica* has a high economic value, and the leaves are religiously important and scarcely used as fodder. *Bombax ceiba* is the most common species and has fast-growing, lightweight timber and is also religiously important; therefore, the utilization of these species might be high.

Table 1. Number of plants used and primary applications among different communities.

Communities	**No. of plants utilized**	**Three species with the highest uses**		
Rajput	59	*Mangifera indica*	*Bombax ceiba*	*Aegle marmelos*
Mallaha	67	*Mangifera indica*	*Bombax ceiba*	*Datura metel*
Mushar	43	*Mangifera indica*	*Bombax ceiba*	*Cynodon dactylon*
Bantar/Sardar	66	*Mangifera indica*	*Bombax ceiba*	*Mallotus nudiflorus*
Tharu	24	*Mangifera indica*	*Dalbergia sissoo*	*Neolamarckia cadamba*
Total	101	Source: Field visit, 2024		

Seven invasive alien plant species (IAPS) *were* ethnobotanically used by the selected communities in KTWR. It is informed that all these communities used the petioles of *Pontederia crassipes* to make baskets and stools was exemplary use of IAPS in KTWR (Figure 6). It is considered as one of the most problematic invasive species in wetland ecosystem because it thrives in any water in very short period taking out all the space needed for other plants and animals (Lowe 2000, Villamagna & Murphy 2010). The Rajput community is reported to use those invasive species for medicinal and handicraft purposes. They used six IAPS *(Amaranthus spinosus*, *Xanthium strumarium*, *Mimosa pudica*, *Argemone mexicana*, *Senna occidentalis and Pontederia crassispes)* out of seven species. While Bantar/Sardar used only two species, *Mesosphaerum suaveolens* for cuts and wound healing and *Pontederia crassipes* for handicrafts. Similarly, Mallaha and Tharu communities used only one invasive species (*Pontederia crassipes)* for handicrafts. Selective adoption of invasive species may be due to traditional knowledge systems and cultural perceptions, socio-cultural norms, economic need and functional redundancy (Shackleton et al. 2019, Rai et al., 2012). *Iasha et al. (2024)* also concluded that *Pontederia crassipes* was used to make eco-friendly handicrafts like bags, shoes, hats, and chairs, which helped to reduce the negative environmental impact by preventing its uncontrolled growth. Adhikari (2022) and Bhatt *et al*. (2021) also emphasized that many invasive alien plants (IAPs)/ weeds hold immense ethnomedicinal value and are widely used in folklores. Ganjare and Raut (2019) also reported that *Amaranthus spinosus* is highly popular group of vegetables to which leaves, shoots, tender stems and grains are eaten as potential herb in sauces or soups, cooked with other vegetables. The Mallaha community was involved in boating and fishing including farming. As they are restringent in cultural htereogeniety, they use the plants selective, as guided by their culture, as Mallaha are adept in fish and molluscs cuisine (Subba 2012).

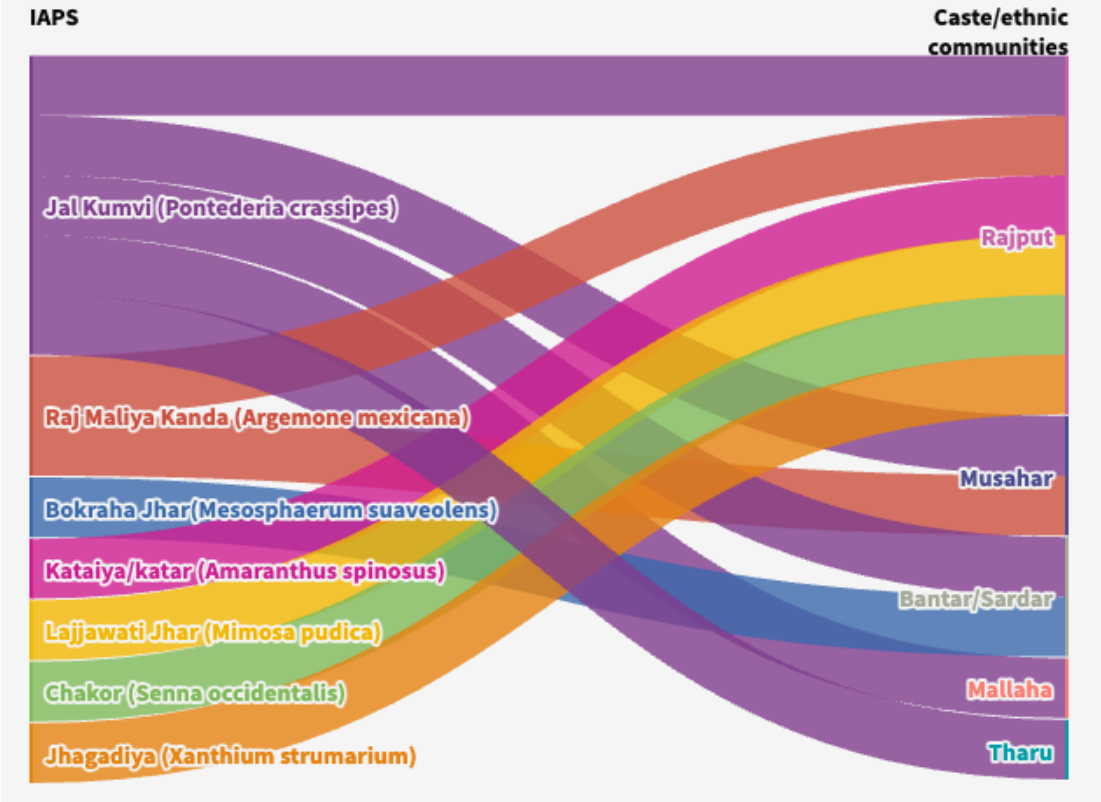

Figure 6. Sankey diagram showing relationships between ethnic groups and their utilization of invasive alien plant species (IAPS) for various purposes.

Conclusions

Out of the 101 plant species recorded, many are used for food, medicine, building materials, and livestock fodder. Some species such as *Aegle marmelos*, *Mangifera indica*, *Bombax ceiba*, *Cynodon dactylon*, *Dalbergia sissoo*, and *Shorea robusta*, are especially prized, as they possessed the high-fidelity level and use values because of their intrinsic value to the sociocultural, and livelihood of local communities. The local wetland-dependent communities such as the Mallaha, Musahar, Rajput, Bantar/Sardar, and Tharu have rich traditional knowledge system about using local plants for livelihood and primary health care, however the knowledge is being threatened by protected area management strategy and invasion of alien plant species. The changed contexts and resource management system have now altered the traditional practices of both the Tharu and wetland-dependent communities. Documenting the age-old traditions and traditional knowledge of ethnobotany is highly pressing the in the present context.

Declarations

List of Abbreviations: KTWR: Koshi Tappu Wildlife Reserve

Ethics approval and consent to participate: Informed consent was obtained from all informants before conducting the survey.

Consent for publication: Not applicable.

Availability of data and materials: All information obtained from informants are included in the manuscript.

Competing interests: No competing interests between the authors mentioned in the manuscript.

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Author contributions: N.P.G collected the data, performed preliminary analysis and interpretation, and drafted the manuscript. S. GC, K. J., and M. S. assisted with the field survey and data collection. N.P.G, K.J., and S.G.C conducted the initial analysis and interpretation and reviewed and edited the manuscript. R.K, S. K. R. and M.S designed the field methods, re-analyzed and interpreted the data, and critically reviewed the manuscript. All authors approved the final version.

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Appendix 1. Detailed ethnobotanical information of the plants used by selected ethnic groups.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Justicia adhatoda L.	Acanthaceae	Harbakas (Maithili)	Shrub	Medicinal (Mallaha and Rajput) Ethnoveterinary (Musahar)	Leaf paste juice is taken orally to cure fever and common cold. Leaf paste juice is given orally to cattles to cure swelling of stomach.
Acorus calamus L.	Acoraceae	Achhani (Maithili)	Herb	Medicinal (Mallaha and Bantar/Sardar)	Rhizome's paste mixed in cow's urine is applied to treat eye infection.
Achyranthes aspera L.	Amaranthaceae	Chirchiri/ Ulta chirchiri (Maithili)	Subshrub	Rituals (Mallaha, Rajput and Bantar/Sardar) Wild edibles (Mallaha and Bantar/Sardar)	Mandatory in funeral rituals in Mallaha ethnic group, needed in 13th days of human death. Green leaves are consumed as vegetable.
Alternanthera sessilis (L.) DC.	Amaranthaceae	Saranchi (Maithili)	Herb	Wild edibles (Mallaha and Bantar/Sardar)	Leaves are used as vegetable.
Amaranthus spinosus L.**	Amaranthaceae	Kantaiaya/ Kataar (Maithili)	Herb	Medicinal and Wild edibles (Rajput)	Vegetable of the leaves improve eyesight.
Amaranthus viridis L.	Amaranthaceae	Gebhari/ Daandi (Maithili)	Herb	Wild edibles (Rajput)	Fresh green leaves are eaten as vegetable.
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	Jiglaa (Maithili)	Tree	Rituals (Rajput)	Wood is mandatory in funeral to make stand for roasting cereal grains.
Mangifera indica L.	Anacardiaceae	Aanp (Nepali)	Tree	Timber (Mallaha, Musahar and Bantar/Sardar) Construction material (Mallaha, Musahar and Bantar/Sardar) Firewood (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Wild edibles (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu) Rituals (Rajput)	Rajput people plant the mango seedlings in the crematorium and knot the rope round mango tree in marriage ceremony. Ripe fruits are eaten.
Semecarpus anacardium L.f.	Anacardiaceae	Bhalayo (Nepali)	Tree	Fodder (Rajput)	Compulsory in religious function.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Spondias pinnata (L.f.) Kurz	Anacardiaceae		Tree	Wild edibles (Rajput)	Fruit is used as pickle.
Annona reticulata L.	Annonaceae	Atta (Maithili)	Tree	Wild edibles (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Ripe fruits are eaten.
Centella asiatica (L.) Urb.	Apiaceae	Thankuni/ Bhatpuraian (Maithili)	Herb	Medicinal (Mallaha and Rajput)	Rajput people mix the plant's paste with milk and drink it to treat intestinal problems. Mallaha and Bantar/Sardar use the juice of plant to control high blood pressure. Mallaha people use paste of *Centella* in cut and wound
Calotropis gigantea (L.) W.T.Aiton	Apocynaceae	Aankhuni (Maithili)	Shrub	Rituals (Mallaha and Bantar/Sardar) Medicinal (Mallaha, Rajput and Bantar/Sardar) Utensils and handicrafts (Mallaha and Bantar/Sardar)	Leaves are used in almost every ritual by Mallaha and Bantar/Sardar people. Milky latex of plant parts is mixed with ghee and rubbed on the areas of muscle pain. Fibers from fruit are used to fill pillows.
Catharanthus roseus (L.) G.Don	Apocynaceae	Beli (Maithili)	Herb	Religious (Musahar)	Flowers are used in worshipping gods.
Aloe vera (L.) Burm.f.	Asphodelaceae	Ghiukumari (Nepali)	Herb	Medicinal (Mallaha and Bantar/Sardar)	Leaf gel is used to cure skin diseases.
Diplazium esculentum (Retz.) Sw. *	Aspleniaceae	Niguro/ Dhakia (Maithili)	Fern/Pteridophyte	Wild edibles (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Young fronds or fiddleheads are eaten as vegetable.
Acmella uliginosa (Sw.) Cass.	Asteraceae	Bhangaiya (Maithili)	Herb	Medicinal (Musahar)	Inflorescence is chewed to cure infections in tongue.
Blumea lacera (Burm.f.) DC.	Asteraceae	Bonbakeda (Maithili)	Herb	Medicinal (Musahar)	Leaf paste is used to treat cuts and wounds
Eclipta prostrata (L.) L.	Asteraceae	Keshariaya/Bhuinraj (Maithili)	Herb	Medicinal (Rajput)	Paste of the plant is used to cure cut and wounds. Juice of the plant is taken orally to treat stomach burn and aches.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Pseudognaphalium affine (D.Don) Anderb.	Asteraceae	Ganki (Maithili)	Herb	Medicinal (Musahar)	Leaf paste is applied on wounds and cuts.
Xanthium strumarium L.**	Asteraceae	Jhagadiya/Thagra (Maithili)	Shrub	Medicinal (Rajput)	Leaf juice is taken orally to prevent vomiting.
Oroxylum indicum (L.) Kurz	Bignoniaceae	Tatelo (Nepali)	Tree	Medicinal (Mallaha and Bantar/Sardar)	Seed paste is given orally to treat white water discharge in females.
Cordia dichotoma G.Forst.	Boraginaceae	Badhed/ Laspasi (Maithili)	Tree	Glue (Mallaha and Bantar/Sardar)	Gum is used as glue.
Opuntia monacanthos (Willd.) Haw.	Cactaceae	Naakfini kaata (Maithili)	Shrub	Medicinal, Rituals, Traditional (Rajput)	Stem juice is given orally to children having the problem of cough and cold. Flowers are roasted in oil, like "pakodas" and eaten to treat back pain. The spines on the stem are used to pierce ear lobes of children. A section of stem is tied with a rope and hanged by the door to ward off evil.
Cannabis sativa L.	Cannabaceae	Gaaja (Nepali)	Herb	Medicinal (Mallaha, Rajput and Bantar/Sardar) Ethnoveterinary medicinal (Mallaha and Bantar/Sardar)	Leaves paste juice is given orally in swelling of belly of cattle.
Trema orientale (L.) Blume	Cannabaceae	Chilmili (Maithili)	Tree	Constructional material (Malaha and Bantar/Sardar)	Wood is used during preparation of temporary houses.
Terminalia anogeissiana Gere & Boatwr.	Combretaceae	Haade (Nepali)	Tree	Fodder (Mallaha, Rajput and Bantar/Sardar)	
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Barro (Nepali)	Tree	Medicinal (Rajput)	Fruit powder is taken orally to treat fever.
Terminalia chebula Retz.	Combretaceae	Harro (Nepali)	Tree	Medicinal (Rajput) Fodder (Rajput)	Fruit powder is taken orally to treat fever.
Terminalia elliptica Willd.	Combretaceae	Saaj (Nepali)	Tree	Fodder (Mallaha, Rajput and Bantar/Sardar)	

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Cuscuta reflexa Roxb.	Convolvulaceae	Amarlati (Maithili)	Parasitic climber	Medicinal (Mallaha, Rajput and Bantar/Sardar)	Keeping feet on the plant juice of plant help to treat Jaundice. Paste is applying externally to cure burn.
Momordica charantia L.	Cucurbitaceae	Jungali Karela (Nepali)	Herbaceous climber	Wild edibles (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Fruits are cooked as vegetable.
Trichosanthes dioica Roxb.	Cucurbitaceae	Jungali parbar (Nepali)	Herbaceous climber	Wild edibles (Mallaha and Bantar/Sardar)	Fruits are used as Vegetable.
Cyperus rotundus L.	Cyperaceae	Jangali mothe (Maithili)	Herb	Medicinal (Mallaha and Bantar/Sardar)	Root and tuber's paste, mixed with the paste of zinger's rhizome and black pepper is taken orally to treat diarrhoea.
Dillenia pentagyna Roxb.	Dilleniaceae	Taantari (Nepali)	Tree	Wild edibles (Rajput)	Fruits are used to make spices and pickles.
Shorea robusta C.F.Gaertn.	Dipterocarpaceae	Sakhuwa (Maithili)	Tree	Timber (Mallaha, Musahar, Rajput/Tarai Kshetriya, Bantar/Sardar and Tharu) Construction material (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Utensils and handicrafts (Rajput) Agricultural tools (Rajput)	Leaves are used to make plates by Rajput people.
Jatropha curcas L.	Euphorbiaceae	Bangadi/Bakarni (Maithili)	Shrub	Medicinal (Mallaha and Bantar/Sardar)	Plant sap is used for athlete's foot.
Mallotus nudiflorus (L.) Kulju & Welzen	Euphorbiaceae	Pithare (Maithili)	Tree	Timber (Mallaha and Bantar/Sardar) Construction material (Mallaha and Bantar/Sardar)Medicinal (Mallaha, Rajput, and Bantar/Sardar)	The fruits are first heated and then applied to feet to cure athlete's foot.
Albizia lebbeck (L.) Benth.	Fabaceae	Shirish (Nepali)	Tree	Timber (Mallaha and Bantar/Sardar)	

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Dalbergia sissoo Roxb. ex DC.	Fabaceae	Sisoo (Nepali)	Tree	Construction material (Mallaha and Bantar/Sardar) Timber (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Construction material (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Fodder (Rajput)	
Guilandina bonduc L.	Fabaceae	Kathgadhe (Maithili)	Woody climber	Medicinal (Mallaha and Bantar/Sardar)	Seed coats are consumed to reduce burning sensation of stomach.
Mimosa pudica L.**	Fabaceae	Lajjawati jhar (Nepali)	Subshrub	Medicinal (Rajput)	Root of *Argemone mexicana* is mixed with roots of *Mimosa pudica* and *Justicia adhatoda*, and bark of *Syzygium cumini* and then paste of the mixture is used to treat common cold and cough by Rajput.
Ougeinia oojeinensis (Roxb.) Hochr.	Fabaceae	Saajan (Nepali)	Tree	Timber (Rajput) Constructional material (Rajput/Tarai)	
Phanera vahlii (Wight & Arn.) Benth.	Fabaceae	Bhorla (Nepali)	Woody Climber	Fodder (Rajput), Household items (Tharu)	Leaf plates are prepared by Tharu peoples in ceremonies.
Pithecellobium dulce (Roxb.) Benth.	Fabaceae	Jalebi (Maithili)	Tree	Wild edibles (Mallaha and Bantar/Sardar)	Ripe fruits are eaten raw.
Saraca asoca (Roxb.) W.J.de Wilde	Fabaceae	Ashok (Nepali)	Tree	Religious (Rajput)	
Senegalia catechu (L.f.) P.J.H.Hurter & Mabb.	Fabaceae	Khaira (Maithili)	Tree	Timber (Rajput)	
Senna occidentalis (L.) Link**	Fabaceae	Jhunjhuna/ Chakor (Maithili)	Subshrub	Medicinal (Rajput)	Root extract is taken orally to cure old fever and to enhance appetite.
Spatholobus parviflorus (Roxb. ex G.Don) Kuntze	Fabaceae	Debre (Nepali)	Woody climber	Fodder (Rajput)	

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Tamarindus indica L.	Fabaceae	Imili (Nepali)	Tree	Wild edibles (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Ripe fruits are eaten raw and sometimes used to make pickles.
Vachellia farnesiana (L.) Wight & Arn.	Fabaceae	Shani kath (Maithili)	Tree	Religious (Mallaha and Bantar/Sardar)	Compulsory in all rituals and religious function and it is also believed that by hanging in main door of home it prevents evil eyes. Similarly, by worshipping it bad effects of Saturn can be reduced.
Vachellia nilotica (L.) P.J.H.Hurter & Mabb.	Fabaceae	Baabool (Maithili)	Tree	Medicinal (Rajput)	Leaf buds juice mixed with milk when taken orally enhance appetite. Paste of leaf buds are mixed with the paste of bark of *Syzygium cumini and Moringa oleifera*, and goat's dropping and then applied to cure external wounds and prevent bleeding.
Clerodendrum infortunatum L.	Lamiaceae	Bhait (Maithili)	Shrub	Medicinal (Musahar)	Leaf paste juice is taken orally in stomach pain. Branchlets are used to clean teeth.
Leucas zeylanica (L.) W.T.Aiton	Lamiaceae	Dulfi (Maithili)	Herb	Rituals (Mallaha and Bantar/Sardar)	Flowers are used in funeral rituals.
Mesosphaerum suaveolens (L.) Kuntze**	Lamiaceae	Bokraha Jhar (Maithili)	Herb	Medicinal (Bantar/Sardar)	Leaf paste is applied on wounds and cuts.
Ocimum tenuiflorum L.	Lamiaceae	Tulashi (Nepali)	Herb	Medicinal (Mallaha, Musahar and Bantar/Sardar)	Leaf decoction is used to cure common cold and fever.
Pogostemon benghalensis (Burm.f.) Kuntze	Lamiaceae	Rudilo (Nepali)	Shrub	Medicinal (Mallaha and Bantar/Sardar)	Decoction of leaves, *Ocimum tenuiflorum*, *Aegle marmelos*, salt, turmeric is taken orally to cure fever.
Tectona grandis L.f.	Lamiaceae	Teak (Maithili)	Tree	Timber (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Vitex negundo L.	Lamiaceae	Sinuwar (Maithili)	Shrub	Medicinal (Mallaha and Bantar/Sardar) Fodder (Mallaha and Bantar/Sardar)	Branchlets are used to clean teeth.
Careya arborea Roxb.	Lecythidaceae	Kumbhi (Nepali)	Tree	Fodder (Rajput)	
Duabanga grandiflora (Roxb. ex DC.) Walp.	Lythraceae	Lampate (Nepali)	Tree	Timber (Rajput) Constructional material (Rajput)	
Bombax ceiba L.	Malvaceae	Simar (Maithili)	Tree	Utensils and handicrafts (Mallaha and Bantar/Sardar) Rituals (Rajput) Wild edibles (Mallaha and Bantar/Sardar)	Fruit fibers are used to fill pillows. Twigs of branches are compulsory in Marriage ceremony Young fruits are used as vegetable.
Sida cordata (Burm.f.) Borss.Waalk.	Malvaceae	Baliyar (Maithili)	Subshrub	Medicinal (Mallaha, Musahar and Bantar/Sardar)	Fruit is grinded and its juice in water is used to treat uterus prolapse and diarrhoea by Mallaha and Bantar/Sardar. Leaf paste is used to treat cuts and wounds by Musahar.
Azadirachta indica A.Juss	Meliaceae	Neem (Nepali)	Tree	Medicinal (Mallaha, Rajput and Bantar/Sardar)	The leaves are chewed for controlling high blood pressure in Rajput ethnic group The leaves are chewed for fever in Bantar/Sardar and Mallaha ethnic group
Melia azedarach L.	Meliaceae	Bakaino (Nepali)	Tree	Fodder (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu) Timber (Musahar)	Wood is used during house building.
Tinospora sinensis (Lour.) Merr.	Menispermaceae	Guraj lati (Maithili)	Woody climber	Medicinal (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Stem decoction is used to treat fever in Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu ethnic groups. Stem decoction is used to treat fever and stomach aches in Mallaha and Bantar/Sardar ethnic groups.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Ficus benghalensis L.	Moraceae	Bar (Nepali)	Tree	Rituals (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Rajput people knot the rope round in Batasabitri Aushi
Ficus benjamina L.	Moraceae	Sam (Maithili)	Tree	Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	branchlets are used during Hom/Hawan.
Ficus hispida L.f.	Moraceae	Khasreto (Nepali)	Tree	Fodder (Mallaha, Musahar, Rajput and Bantar/Sardar)	
Ficus racemosa L.	Moraceae	Dumri (Nepali)/ Guler (Maithili)	Tree	Fodder (Mallaha, Rajput and Bantar/Sardar) Religious (Rajput)	Compulsory in religious function.
Ficus religiosa L.	Moraceae	Pipal (Nepali)	Tree	Rituals (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	leaves are compulsory in all rituals.
Morus australis Poir.	Moraceae	Tuit (Maithili)	Tree	Wild edibles (Mallaha, Musahar and Bantar/Sardar)	Ripe fruits are eaten raw and unripen fruits are used as pickle.
Streblus asper Lour.	Moraceae	Saawar (Maithili)	Tree	Fodder (Mallaha and Bantar/Sardar) Medicinal (Mallaha)	Branchlets are used to cleaning teeth.
Moringa oleifera Lam.	Moringaceae	Sajanaa (Maithili)	Tree	Wild edibles (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu), Medicinal (Rajput)	Fruit is cooked as vegetable. Bark paste is applied externally to cure cut and wound.
Syzygium cumini (L.) Skeels	Myrtaceae	Jaamun (Nepali)/ Jom (Maithili)	Tree	Wild edibles (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Ripe fruits are eaten raw.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Mirabilis jalapa L.	Nyctaginaceae	Sanjha ful (Sardaar/ Chandan (Musahar, Maithili)	Herb	Cultural (Musahar)	Seeds are rubbed on stone and used to make tika of it.
Nyctanthes arbor-tristis L.	Oleaceae	Parijaat (Nepali)/ Raatrani (Maithili)	Tree	Medicinal (Mallaha and Bantar/Sardar) Rituals (Mallaha)	Decoction of leaves, ginger, salt and ghee is taken orally to cure fever. Seeds are used in rituals.
Argemone mexicana L.**	Papaveraceae	Raajmaliya kaada (Sardaar), Kataar (Musahar)	Herb	Medicinal (Musahar and Rajput)	Plant sap is used to cure conjunctivitis by Musahar. Root of *Argemone mexicana* is mixed with roots of *Mimosa pudica* and *Justicia adhatoda,* and bark of *Syzygium cumini* and then paste of the mixture is used to treat common cold and cough by Rajput.
Phyllanthus reticulatus Poir.	Phyllanthaceae	Siquet (Maithili)	Shrub	Medicinal (Mallaha and Bantar/Sardar)	The sap that is obtained by heating the root is beneficial to ear.
Scoparia dulcis L.	Plantaginaceae	Misrikan (Maithili)	Herb	Medicinal (Mallaha and Bantar/Sardar)	Leaves juice is taken orally for cooling effect in body. Leaf paste is applied externally to cure skin infection
Cynodon dactylon (L.) Pers.	Poaceae	Dubo (Nepali)	Herb	Medicinal (Musahar) Rituals (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Traditional, culture and festivals (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Plant juice is used to treat fever. Plant paste is used to cure cut and wounds. It is used in almost all rituals (birth to death) and religious activities.
Dactyloctenium aegyptium (L.) Willd.	Poaceae	Madwaini (Maithili)	Herb	Medicinal (Musahar)	Roots paste is applied on tooth aches.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Desmostachya bipinnata (L.) Stapf	Poaceae	Kush (Nepali)	Herb	Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Rituals (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Compulsory in all rituals and religious functions.
Eleusine indica (L.) Gaertn.	Poaceae	Kode jhar (Nepali)	Herb	Medicinal (Rajput)	Juice of root with black pepper when putting in the opposite ear of the eye that has been hurt, the eye injury will get cured.
Imperata cylindrica (L.) Raeusch.	Poaceae	Daabi (Maithili)	Herb	Fodder (Musahar) Construction material (Mallaha, Musahar, Bantar/Sardar and Tharu)	Plant is used to thatch the roof of traditional houses.
Saccharum spontaneum L.	Poaceae	Kaans (Nepali)	Herb	Utensils and handicrafts (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Fodder (Mallaha and Bantar/Sardar)	Plant is used to thatch the roof and wall of traditional houses.
Persicaria barbata (L.) H.Hara var. *gracilis* (Danser) H.Hara	Polygonaceae	Birkhaar (Maithili)	Herb	Fish poison (Mallaha and Bantar/Sardar)	Leaf paste is used as a fish poison.
Pontederia crassipes Mart.**	Pontederiaceae	Jalakumbhi (Nepali)	Herb	Handicrafts and Utensils	Petioles are used to make baskets and stools.
Ziziphus mauritiana Lam.	Rhamnaceae	Bayar (Maithili/ Nepali)	Tree	Wild edibles (Malaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Fruits are eaten raw and sometimes used to make pickles.
Adina cordifolia (Roxb.) Brandis	Rubiaceae	Karmain (Maithili)	Tree	Timber (Mallaha and Bantar/Sardar)	
Neolamarckia cadamba (Roxb.) Bosser	Rubiaceae	Kadam (Nepali)	Tree	Timber (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Agricultural tools (Rajput)	Wood is used to make Plough.

Plant Name	Family	Local Name	Habit	Use Category	Remarks
Paederia foetida L.	Rubiaceae	Ganpaser (Maithili)	Herbaceous climber	Medicinal (Mallaha, Musahar and Bantar/Sardar)	Salt mixed leaf decoction is orally taken to cure common cold.
Aegle marmelos (L.) Corrêa	Rutaceae	Bel (Nepali)	Tree	Medicinal (Mallaha and Bantar/Sardar) Religious (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu) Wild edible (Mallaha, Musahar, Rajput, Bantar/Sardar and Tharu)	Mallaha and Bantar/Sardar people use leaf paste juices to treat infertility problems in females.
Murraya koenigii (L.) Spreng.	Rutaceae	Kadipatta (Maithili)	Shrub	Wild edibles (Rajput)	Leaves are used as condiments.
Schleichera oleosa (Lour.) Oken	Sapindaceae	Kushum (Nepali)	Tree	Wild edibles (Rajput)	Ripe fruits are eaten raw.
Datura metel L.	Solanaceae	Dhaturo (Nepali)	Shrub	Rituals (Mallaha and Bantar/Sardar) Medicinal (Musahar) Ethnoveterinary medicinal (Musahar)	Leaves are used in almost all rituals by Mallaha and Bantar/Sardar people. Warmed leaves are applied externally on bone aches. Seed powder is mixed with water and given orally to cattle to treat diarrhoea.
Solanum americanum Mill.	Solanaceae	Kathgaini/ Bhutkumia (Maithili)	Herb	Medicinal (Mallaha and Bantar/Sardar) Wild edibles (Musahar)	Seed paste is used for tooth ache. Green leaves are eaten as vegetable.
Solanum virginianum L.	Solanaceae	Kathgaini/ Bhutkumia (Maithili)	Shrubs	Medicinal (Mallaha and Bantar/Sardar)	Seed paste is applied on tooth aches.
Tamarix dioica Roxb. ex Roth	Tamaricaceae	Jhauwa (Maithili)	Shrub	Utensils and handicrafts (Mallaha and Bantar/Sardar)	Twigs are used to make broom.
Typha angustifolia L.	Typhaceae	Pater (Nepali)	Herb	Household items (Mallaha, Musahar and Bantar/Sardar) Contribution in household economy (Bantar/Sardar)	The plant is used to make mats by Bantar/Sardar people, which they use in their daily life and sometimes sell in the local market that cost from Rs. 200-500.
Zingiber officinale Roscoe	Zingiberaceae	Aduwa (Nepali)	Herb	Medicinal (Musahar).	Half cooked zinger is taken orally to cure diarrhoea.

* Pteridophyte & **IAPS