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Studies of Some Medicinal Plants of Indo-Gangetic Plains

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Abstract: The traditional drug knowledge provides a platform to further modern research as it provides a comprehensive and multi-therapeutic view of the indigenous medicinal plants based on traditional practices. The present study aimed for exploring the flora of Indo-Gangetic plains in the context of ethnopharmacological practices by keeping in view the rich biodiversity of the region. The study comprised only significant medicinal plants in terms of their therapeutic efficacy and conservation practices adopted by local people having 114 medicinal plant species belonging to 67 families. There is ample scope for experimenting with innovative drug designing from ethnopharmacological knowledge.
Keywords: Conservation; Ethnopharmacology; Indigenous; Medicinal Plant; Therapeutic

1. Introduction

India has been the land of profuse bio-heritage since the time immemorial. Moreover, the holy and pious river Ganga has been marked as a lifeline for the densely populated masses all across the Gangetic plains. It is considered as one of the wealthiest regions of the Indian subcontinent (1). This plain is contemporarily present between Yamuna catchment in the West to the Bangladesh border in the East of India, which approximately comprises 3,57,000 sq. kms. The region is miraculous in terms of richness of biodiversity occurring because of several variables such as different elevation levels, edaphic conditions, biotic and abiotic factors (2). The variable heights of the plain above sea level (asl) are found to be from Saharanpur (276 m) of Uttar Pradesh, Roorkee (274 m), Agra (169 m), Kanpur (125 m), Prayagraj (98 m), Patna (53 m), Kolkata (6 m), and up to Sagar Island (3 m) of West Bengal (3). The Indo-Gangetic has three sub-divisions such as Upper, Middle, and Lower Gangetic plains. The upper Gangetic plain is a very productive plain of India due to the presence of Bhur sandy deposit. It comprises an area of 1,44,400 Sq. kms. having altitudes of 100-300 m. This plain includes Adhatoda, Scirpus, Aegle, Bacopa, Viola, Leonitis, Leucas, Crataeva, Adina, and Ficus species of medicinal plants. The middle Gangetic plain comprises Central and Eastern Uttar Pradesh, and Bihar having deposits of alluvial soil which make it rich in biodiversity and includes Phyllanthus, Litchi, Moringa, Amorphophallus, Artocarpus, and Sesamum species of medicinal plants. The lower Gangetic plain extends from Bihar, Darjeeling foothills, Bay of Bengal, Chotanagpur plateau, Assam, and up to Bangladesh. The valuable medicinal species of this belt are Adiantum, Carica, Terminalia, Typhonium, Punica, and Nymphaea species (4-6). The people residing in the area use medicinal and aromatic plants for the healing purposes. Ethnopharmacology is a comprehensive science which includes scientific identification of plants, biochemistry, ethnobotany, biological activity, pharmacological mode of action, and its safety profile also which are used by the indigenous people of the region (7). The term ‘Ethnobotany’ was coined by J. W. Harshberger in 1985(8). The founding father of modern

Ethnobotany is Richard Evans Schultes (9). Ethnomedicine is a sub-field of medical anthropology that deals with the study of traditional medicines—not only those with relevant written sources (e.g., Traditional Chinese Medicine and Ayurveda), but also those whose knowledge and practices have been orally transmitted over the centuries (10). The ethnic groups of various regions of the world are the real custodians of natural wealth and experts in herbal medicines (11). The traditional indigenous knowledge transferred orally for centuries is rapidly disappearing because of the technological development and changing culture of ethnic groups (12). The conservation efforts are human manipulated sustainable practices in order to persist the species in wild conditions (13).

2. Materials and Methods

The Ethnopharmacological survey of the Indo-Gangetic plain was conducted by the Extension and Research team of the Department of Medicinal Plants Sciences, Dev Sanskriti Vishwavidyalaya-Haridwar (Uttarakhand), India. It was conducted during Feb., 2018 to Jan., 2020. The well designed and validated questionnaire was used as a tool for data collection, which comprises the details of participants, vernacular name, habit, habitat, occurrence, phenological details, mode of administration, doses regimen, dosage forms, safety, toxicity, and conservation practices of the plants. The collected data was analysed and cross verified in the light of scientific evidence, expert opinions, traditional healers, and through the advice of ethno-scientific fraternity. Only some of the significant medicinal plants have been cited in the results keeping in view of paucity of time and resources.

3. Results and Discussion

The outcome of the scientific ethnopharmacological studies have been comprehensively enumerated in Table 1, while giving only some of the significant species of the medicinal plants.

Table 1: Showing ethnopharmacology and conservation of some medicinal plants

Vernacular Name	Botanical Name (Family)	Ethnopharmacology	Conservation Method
Atibala	Abutilon indicum (L.) Sweet (Malvaceae)	Leaves powder decoction is used twice a day to treat piles along with good wound healing properties. It should be avoided by pregnant women and lactating mothers.	Seeds (14)
Jangli Bhindi	Abelmoschus moschatus Medik. (Malvaceae)	The roots powder is used for curing impotence in male, and leucorrhoea in females by taking once a day for 40 days before bed. Seeds are recommended for sexually transmitted diseases. It should be used with caution in cases of general weakness and pregnancy.	Seeds (15)
Kikar	Acacia Arabica Willd. (Fabaceae)	The decoction of bark mixed with milk and dropped in the eyes twice a day for curing conjunctivitis after double filtering the decoction through cotton cloth. It should be avoided by hypertensive and glaucoma patients.	Seeds (16)
Katha	Acacia catechu Willd. (Fabaceae)	It is used twice a day along with 5 -10 ml juice of fenugreek leaves for 30 days to cure polyuria and also used for oral care. It should not be given more than 2 gm per day.	Seeds (16)

Chirchita	Achyranthes aspera Linn. (Amaranthaceae)	The roots are tied on the uterus during labour pain for easy and timely delivery. It should be removed immediately just after delivery to avoid serious complications.	Seeds, and Vegetative methods (17)
Bach	Acorus calamus L. (Acoraceae)	The rhizomes paste is applied on the forehead to cure headache and also as nervine tonic. It should be used after Sodhana (purification) if taken internally.	Seeds, and Vegetative methods (18)
Adusa	Adhatoda vasica Nees. (Acanthaceae)	The swaras (5-10 ml) and decoction of the leaves are used for curing tuberculosis, bronchitis, and eradicating cyst forming bacterias. The overdose may cause hepatotoxicity.	Seeds, and Vegetative methods (19)
Hanspadi	Adiantum lunulatum Burm.F. (Adiantaceae)	Fresh leaves (5gms) decoction is given to cure irregular menstrual disorder. It should be avoided by lactating mothers.	Vegetative methods (20)
Haldu	Adina cordifolia (Willd. Ex. Roxb.) Benth. (Rubiaceae)	The leaves Swaras (2-4 drops) dropped in the nasal cavity to expel out chronic cough in order to cure sinusitis. It is highly nutritious. Its oral intake should be avoided by the hyperuricemia patients.	Seeds, and Vegetative methods (21)
Bel	Aegle marmelos Correa Ex. Roxb. (Rutaceae)	The Sharbat of fruit is used to prevent heat waves in extreme summers. Food- sensitive people should consume it in limited quantities.	Seeds, and Vegetative methods (22)
Mirchagandh	Ageratum conyzoides Linn. (Asteraceae)	The leaves juice is applied on wounds and cut for fast healing even in diabetic patients. Further, useful in treating (2-3 ml) postpartum uterine haemorrhage. The patients of hepatic disorders should avoid its oral administration.	Seeds (23)
Siris	Albizia lebbeck (L.) Benth (Mimosaceae)	The leaves juice (q.s.) is an antidote of scorpion and snake poisoning. Its twig is used to hang on doors in order to prevent anxiety and psychosomatic disorders. Its oral intake should be done with caution by the hypotensive patients.	Seeds (24)
Saptaparni	Alstonia scholaris R. Br. (Apocynaceae)	The seeds (1-2 gm) are used as male contraceptives when administered with lukewarm water and bark decoction (5-10 ml) is used in rheumatism and convulsion. Overdose may cause skin allergic reactions and permanent infertility.	Seeds (25)
Lal Saag	Amaranthus gangeticus L. (Amaranthaceae)	The whole plant swaras (8-10 ml) is used for curing inflammation, skin rashes, stomachache, and boils. The excess dose may cause digestive disturbances.	Seeds, and Vegetative methods (26)
Akarkara	Anacyclus pyrethrum (L.) D.C. (Asteraceae)	The leaves paste is applied on the forehead twice a day for 20 days to cure migraine. It may exaggerate hyper allergic reactions.	Seeds, and Vegetative methods (27)
Kalmegh	Andrographis paniculata (Burm.F.) Wall. ex. Nees (Acanthaceae)	The decoction of the whole plant is wonderful immunomodulatory and cures fever of all the genesis (antimalarial, antiviral, antibacterial). When used in high doses may cause swollen lymph glands and elevation of liver enzymes.	Seeds, and Vegetative methods (28)
Shatavar	Asparagus racemosus Willd. (Asparagaceae)	The tuberous roots powder blended with dried milk (Mawa) to form Peda (sweet dish) for physical and mental strength. Excess dose may cause constipation.	Seeds, and Vegetative methods (29)
Neem	Azadirachta indica A. Juss. (Meliaceae)	The twig is hung over doors as antibacterial, antimalarial, antiviral, and insecticidal agent. It's swaras are given for healing circulatory complaints. The long-term regular uses may cause impotency.	Seeds (30)

Piya bansa	Barleria prionitis Linn. (Acanthaceae)	The decoction (5-20 ml) of the whole plant is useful for respiratory, circulatory disorders and for curing general body inflammation. It may cause indigestion when taken in excess.	Seeds, and Vegetative methods (31)
Brahmi	Bacopa monnieri (L.) Wettst. (Scrophulariacea)	The whole plant infusion (10-15 ml) is used as a nervine tonic and antiaging agent. On long term use it may cause skin rashes, nausea, dry mouth, and fatigue.	Vegetative methods (32)
Daru-haldi	Berberis aristata D.C. (Berberidaceae)	The decoction of roots (10 ml) is used as febrifuge and litholysis. It should be avoided by hypotensive and cardiac patients.	Seeds, and Vegetative methods (33)
Sinduri	Bixa Orellana Linn. (Bixaceae)	The leaves infusion (5 ml) is recommended twice a day for healing the jaundice patients. The high doses may be toxic.	Seeds, and Vegetative methods (34)
Punarnava	Boerhavia diffusa Linn. (Nyctaginaceae)	The whole plant decoction (10-20 ml) is recommended to promote immunity. It should be avoided during breastfeeding.	Vegetative methods (35)
Kumra	Bidens pilosa L. (Asteraceae)	The whole plant decoction (5-10 ml) is an immune-modulating anticancer agent. It may cause ataxia in higher doses.	Seeds (36)
Semal	Bombax ceiba Linn. (Bombacaceae)	The leaves paste is applied for healing the wounds and shows analgesic effect. Its flowers are used as vegetables to cure various feminine disorders. The excess dose may cause hirsutism.	Seeds, and Vegetative methods (37)
Kankra	Bruguiera gymnorrhiza Lamk. (Rhizophoraceae)	The roots and fruit decoction (20-40 ml) given twice a day to treat diarrhoea. The excess intake may cause chest burning.	Seeds, and Vegetative methods (38)
Palash	Butea monosperma (Lam.) Taub. (Fabaceae)	The root swaras (10-15 ml) with mustard oil is given twice a day for treating filaria. It should be avoided during pregnancy and the breast-feeding stage.	Seeds, and Vegetative methods (39)
Priyangu	Callicarpa macrophylla Vahl. (Verbenaceae)	The bark powder (3-5 gm) is recommended with honey twice a day for curing syphilis and gonorrhoea. The excess may cause toxicity.	Seeds, and Vegetative methods (40)
Aak	Calotropis gigantea R. Br. (Asclepiadaceae)	The paste of leaves and flowers is applied on sprains, swellings, and on rheumatic inflammation. It shows dose dependent toxicity.	Seeds, and Vegetative methods (41)
Bhang	Cannabis sativa Linn. (Cannabaceae)	It's whole plant decoction (2-5 ml) is used for removing anxiety, indigestion, and psychosomatic disorders. The excess dose may cause drowsiness.	Seeds, and Vegetative methods (42)
Papita	Carica papaya Linn. (Caricaceae)	The fruit pulp is given twice a day to cure menstrual cramps. The latex is applied against scabies. The overdose may cause loose motion.	Seeds, and Vegetative methods (43)
Amaltas	Cassia fistula Linn. (Caesalpiniaceae)	The Gulkand of its flowers is recommended twice a day after meals to cure constipation and polyuria. The overdose may cause renal disorders.	Seeds, and Vegetative methods (44)
Chakramard	Cassia tora Linn. (Fabaceae)	The infusion of leaves (8-10 ml) is given twice a day during the rainy season as a vermicidal agent. The excess dose may cause dizziness, and vertigo.	Seeds (45)
Malkangni	Celastrus paniculatus Willd. (Celastraceae)	The nutraceutical agent is prepared from the seeds, and given thrice a day for curing backache, dementia, leucorrhoea, and epilepsy. The overdose may cause sedation.	Seeds, and Vegetative methods (46)
Jalneem	Centella asiatica (L.) Urban. (Apiaceae)	The leaves infusion (10-15 ml) is prescribed for curing asthma, dementia, and skin problems. Long term intake may cause hypersensitivity reactions.	Vegetative methods (47)

Kali jeeri	Centratherum anthelminticum (L.) Kuntze. (Asteraceae)	It is used in management of Diabetes mellitus when seed powder (1-3 gms) is prescribed with fenugreek seed powder twice a day before meal. It may induce vomiting in overdoses and should be avoided by pregnant women.	Seeds (48)
Bathua	Chenopodium album Linn. (Chenopodiaceae)	The leaves' swaras (10-20 ml) are used to treat roundworms and hookworms. The overdose may cause indigestion. It should be avoided by kidney stone patients.	Seeds (49)
Patha	Cissampelos pareira Linn. (Menispermaceae)	The whole plant infusion (10-15 ml) is recommended for curing meningitis and applied as paste on the forehead also. The excess intake may cause indigestion.	Vegetative methods (28)
Nimbu	Citrus limon (L.) Burm.F. (Rutaceae)	The juice (5-7 ml) is recommended with garlic juice (2-3 ml) twice a day for a week in order to cure arthritis. The excess dose of lime juice may cause rhinitis.	Seeds, and Vegetative methods (50)
Hulhul	Cleome viscosa Linn. (Capparidaceae)	The swaras of leaves (2-4 drops) is dropped in ears to cure earache and shows antipyretic, analgesic, and sudorific activities. The excess intake may cause nausea and vomiting.	Seeds (28)
Bharangi	Clerodendrum serratum Linn. (Verbenaceae)	The decoction of leaves (10-15 ml) may be recommended for curing cephalgia and ophthalmia. The overdose may cause lethargy and hypotension.	Seeds, and Vegetative methods (24)
Koshpushpi	Commelina benghalensis (L.) Maton (Commelinaceae)	The dried powder of leaves (1-3 gm) is given with lukewarm water to treat various stomach disorders. It should be given with caution in case of lactating and pregnant women.	Vegetative methods (51)
Lasora	Cordia dichotoma Forst. F. (Ehretiaceae)	The ripened fruits are eaten in the form of pickles to cure worm infestation. It should be avoided in pregnant women.	Seeds, and Vegetative methods (52)
Dhania	Coriandrum sativum Linn. (Apiaceae)	The infusion (10-20 ml) is recommended for curing thyroid, hyperacidity, obesity and kidney infiltration problems. Long term use may cause infertility.	Seeds (53)
Varuna	Crateva nurvala Buch. Ham. (Capparaceae)	The leaves decoction (10-15 ml) is prescribed twice a day for treating benign prostatic hyperplasia. The intake of overdose may cause excess thirst and fatigue.	Seeds, and Vegetative methods (54)
Sudarshan	Crinum latifolium Linn. (Amaryllidaceae)	The swaras of leaves are dropped (2-3 drops) in ears for curing earache and fungal infections of the skin. The long-term usage may suppress the cardiovascular system.	Seeds, and Vegetative methods (55)
Doob	Cynodon dactylon(L.)Pers. (Poaceae)	The swaras (5-10 ml) is recommended once daily in an empty stomach for 45 days for angiogenesis. The swaras may cause allergic reactions in hypersensitive people.	Vegetative methods (56)
Motha	Cyperus rotundus L. (Cyperaceae)	The decoction (10-15 ml) of rhizomes is prescribed as an immune-modulator and for curing remittent fever. The overdose may cause loss of appetite and weight of the body.	Vegetative methods (57)
Sheesham	Dalbergia sissoo Roxb. ex. DC. (Fabaceae)	The swaras of leaves (10-15 ml) is given once a day in an empty stomach to cure uterus infection. It should be avoided during menses.	Seeds, and Vegetative methods (58)
Salparni	Desmodium gangeticum DC. Pennel. (Fabaceae)	The roots decoction (10-20 ml) is recommended for curing bronchitis, asthma, rheumatic arthritis, and erectile dysfunction. It should not be prescribed to diabetic patients.	Seeds, and Vegetative methods (59)

Ramphal	Dillenia indica L. (Dilleniaceae)	The juice of fruit mixed (30-50 ml) with water for curing heat stroke and fever. It causes diarrhoea in excess doses.	Seeds, and Vegetative methods (35)
Suran	Dioscorea bulbifera Linn. (Dioscoreaceae)	It's tuber powder (5-10 gms) is given with milk and honey to cure male infertility. Long term intake may cause renal disorders.	Vegetative methods (60)
Bhringraj	Eclipta alba (L.) Hassk. (Asteraceae)	It's decoction (20-30 ml) detoxifies the liver when taken with black pepper (1 gm) powder. Its oil is applied on the scalp for promoting hair growth and alleviating mental stress. It should be avoided in breastfeeding women.	Seeds, and Vegetative methods (61)
Mandua	Eleusine coracana (L.) Gaertn. (Poaceae)	Its seed powder is used to make chapati to boost immunity and as a supplement of iron, calcium, and other micro-macro minerals. The overdose intake may cause kidney complications and constipation.	Seeds (62)
Vaividang	Embellia ribes Burm. F. (Myrsinaceae)	The nasya of dried mature fruit is prescribed to cure headache and worm infestation. It should not be used during pregnancy.	Seeds (63)
Amla	Emblica officinalis Gaertn. (Euphorbiaceae)	The juice of gooseberry is given with juice of carrot and beetroot for restoring the compromised immunity. It should be taken cautiously by the diabetic patients.	Seeds, and Vegetative methods (64)
Jod-tod	Equisetum arvense Linn. (Equisetaceae)	The paste of the whole plant is applied on sprains and joint problems. The decoction (50-60 ml) is given orally for healing the fractures and cartilages twice a day for 15 days. The overdose may cause hypercalcemia.	Vegetative methods (65)
Safeda	Eucalyptus globulus L. (Myrtaceae)	The oil is used for curing inflammation, bacterial infection, fungal infection, and asthmatic attack also on topical application. The excess application may cause dermatitis.	Vegetative methods (66)
Dudhi	Euphorbia hirta L. (Euphorbiaceae)	The whole plant decoction is given to cure intestinal worms. The overdose intake may cause nausea and vomiting.	Seeds, and Vegetative methods (67)
Sehund	Euphorbia neriifolia Linn. (Euphorbiaceae)	The latex is dropped (2-3 drops) into ears for curing earache, warts and used as analgesic also. It is strictly prohibited for pregnant women.	Seeds, and Vegetative methods (68)
Bargad	Ficus benghalensis Linn. (Moraceae)	The latex (2-3ml) is used for curing impotency and general body weakness. The overdose may cause restlessness.	Seeds, and Vegetative methods (69)
Gular	Ficus glomerata Roxb. (Moraceae)	The decoction of leaves (50-60 ml) given twice a day to cure dysmenorrhoea and intestinal ulcer. It should not be taken by allergic and pneumonic patients.	Seeds, and Vegetative methods (70)
Pippal	Ficus religiosa Linn. (Moraceae)	The bark ash is mixed with honey to cure hiccups. The decoction of leaves (20-30 ml) has antitumor activity also when taken in an empty stomach once a day for 45 days. It should be avoided during respiratory complaints.	Seeds, and Vegetative methods (71)
Gambhari	Gmelina arborea Roxb. (Verbenaceae)	The decoction of roots (20-30 ml) is given once a day in an empty stomach for curing the abdominal tumours. The overdose may cause abortion.	Seeds (72)
Silver Oak	Grevillea robusta A. Cunn.ex R.Br. (Proteaceae)	The paste of leaves is applied for curing eczema, and for cooling purposes. The pollen grains may exacerbate the allergic reactions.	Seeds (73)
Gudmar	Gymnema sylvestre R. Br. (Asclepiadaceae)	The swaras (30-50 ml) is given twice a day before meals to cure diabetes. The excess intake may cause digestive disturbances.	Seeds (74)

Marodfali	Helicteres isora Linn. (Sterculiaceae)	The bark and fruit decoction (10-15 ml) are recommended with Suhaga (2-3 gm) to cure fever generated due to heatwaves. The overdose intake may cause restlessness.	Seeds (75)
Gudhal	Hibiscus rosa-sinensis Linn. (Malvaceae)	The decoction of flowers and leaves (50-60 ml) is prescribed as litholytic. The excess intake may cause hormonal imbalance.	Vegetative methods (76)
Kutaj	Holarrhena antidysenterica Wall. ex. D.C. (Apocynaceae)	The bark decoction (20-40 ml) is given twice a day for healing the piles, amoebic dysentery, broncho-pneumonia, and dysuria. Overdose intake may cause paralysis.	Seeds, and Vegetative methods (75)
Besharam	Ipomoea carnea Jacq. (Convolvulaceae)	The leaves paste is applied on leucoderma and carbuncles. The excess intake may cause skin flare and redness.	Vegetative methods (77)
Dronapushpi	Leucas aspera (Willd.) Link. (Lamiaceae)	The paste of leaves is applied on psoriasis and swaras (15-20 ml) is administered in an empty stomach once a day for 30-40 days for curing it. It should be avoided in pregnant and breastfeeding women.	Seeds, and Vegetative methods (78)
Alsi	Linum usitatissimum Linn. (Linaceae)	The powder of seeds is used as anti-obesity, anti-inflammatory, and for healing the sprains, and broken cartilages. The long-term use may cause kidney related complications.	Seeds (79)
Meda-lakdi	Litsea glutinosa (Lour.) Binson. (Lauraceae)	The paste is applied to heal the broken bones, cartilages, wounds, and sprain when applied with amba haldi. The topical application may cause skin rashes.	Seeds, and Vegetative methods (80)
Banda	Loranthus longiflorus Linn. (Loranthaceae)	The leaves paste is applied and swaras is administered (10-15 ml) for curing skin diseases. The excess intake may cause infertility.	Seeds (75)
Mahua	Madhuca indica J.F. Gmel. (Sapotaceae)	The decoction (40-50 ml) of bark is given to cure IBS, hypertension, and dry cough. The overtake intake may cause restlessness.	Seeds (76)
Aam	Mangifera indica Linn. (Anacardiaceae)	The decoction (20-30 ml) of bark and leaves are used to cure diabetes and to provide strength to heart muscles. The overdose intake may cause constipation.	Seeds, and Vegetative methods (81)
Rijka	Medicago sativa Linn. (Fabaceae)	The juice (30-35 ml) is given with carrot juice (30-35 ml) in the morning to cure hair disorders. The excess dose may cause hypotension and stomach upset.	Seeds (82)
Lajwanti	Mimosa pudica Linn. (Mimosaceae)	The roots decoction (20-40 ml) is given twice a day to treat gravel and other urinary complaints. The overdose intake may cause loose motion.	Seeds (83)
Molsiri	Mimusops elengi Linn. (Sapotaceae)	The juice of 2-3 leaves is recommended in an empty stomach before sunrise to cure migraine. The overdose may cause colds and allergies.	Seeds and vegetative methods (84)
Sahijan	Moringa oleifera Lam. (Moringaceae)	The decoction of drum sticks (30-60 ml) is given twice a day to treat hypertension and hypercholesterolemia. The excess dose intake may cause bleeding.	Seeds and vegetative methods (85)
Shahtoot	Morus alba Linn. (Moraceae)	The fruit juice (30-50 ml) is given once a day to promote urination. The excess dose may cause diarrhoea.	Vegetative methods (86)
Kaunch	Mucuna pruriens Bak. (Fabaceae)	The roots decoction (20-30 ml) is recommended in an empty stomach to cure uterine constriction. It should be used cautiously by pregnant and lactating mothers.	Seeds (75)
Meetha neem	Murraya koenigii Spreng. (Rutaceae)	The fruits (5-7 nos) given twice a day up to 15 days for regulating blood sugar level. The excess intake may cause stomach disturbances.	Seeds and vegetative methods (87)

Kalonji	Nigella sativa Linn. (Ranunculaceae)	The fumes of seeds are recommended thrice a day to cure dental cavities and decoction (10-15 ml) of its seeds is given twice a day for cleansing the uterus after delivery. The pregnant women should avoid its intake.	Seeds (88)
Harshringar	Nyctanthes arbor tristis Linn. (Oleaceae)	The leaves and flowers infusion (20-25 ml) are given twice a day for curing sciatica. The lactating mothers should not use it regularly.	Seeds and vegetative methods (76)
Sabja	Ocimum basilicum Linn. (Lamiaceae)	One tablespoon seed are soaked in water overnight, and strained seeds consumed early in the morning for losing weight. Its regular intake should be avoided by gout patients.	Seeds (89)
Changeri	Oxalis corniculata Linn. (Oxalidaceae)	The swaras of leaves (10-20 ml) is administered twice a day to cure bloody diarrhoea. It should not be recommended to children below 12 years.	Vegetative methods (90)
Golpatta	Phoenix paludosa Roxb. (Arecaceae)	The fruit pulp (30-40 gm) is used to cure general weakness when administered regularly for a month. Excess intake may cause indigestion.	Seeds and vegetative methods (91)
Hazardana	Phyllanthus fraternus G.L.Webster (Phyllanthaceae)	The fresh root decoction (20-3- ml) is recommended twice a day against jaundice, malaria, kidney and gall bladder stone. The overdose intake may cause diuresis.	Seeds (92)
Bhui-amla	Phyllanthus niruri Linn. (Phyllanthaceae)	The whole plant decoction is given twice a day to treat urinary tract infection and genito-urinary disorders when taken regularly up to 15 days. Excess intake may cause stomach upset.	Seeds (93)
Karanj	Pongamia pinnata (L.) Pierre. (Fabaceae)	The roots decoction (10-20 ml) is effective for treating gonorrhoea and vaginal infection. The overdose intake causes liver disorders.	Seeds, and Vegetative methods (94)
Mooli	Raphanus sativus (L.) Domin. (Brassicaceae)	The juice of radish (15-20 ml) mixed with a pinch of rock salt and black pepper is recommended in an empty stomach to treat neurocysticercosis.	Seeds (95)
Kandal	Rhizophora apiculata Blume. (Rhizophoraceae)	The bark decoction (20-40 ml) is given twice a day to treat dysentery. It is used as famine food. The overdose intake may cause digestive disturbances.	Seeds, and Vegetative methods (96)
Bhara	Rhizophora mucronata Lam. (Rhizophoraceae)	The decoction (15-30 ml) of bark is recommended in an empty stomach to treat blood in urine (haematuria). The overdose intake may cause restlessness.	Seeds, and Vegetative methods (97)
Kamarkas	Salvia plebeian R. Br. (Lamiaceae)	The seed powder (15-20 gm) is given with lukewarm milk for up to 15 days regularly to treat leucorrhoea. The excess dose may cause sedation.	Seeds and vegetative methods (98)
Reetha	Sapindus mukorossi Gaertn. (Sapindaceae)	The fruit juice is given thrice a day to cure epilepsy. Excess dose intake may cause indigestion. It should be prescribed with caution in promising mothers.	Seeds (77)
Kaseru	Scirpus grossus Linn. (Cyperaceae)	The roots decoction (20-30 ml) is given thrice a day to cure urinary disorders. It is also given as food because of its high nutrition value. It should be avoided in pregnant and lactating mothers.	vegetative methods (99)
Agustya	Sesbania grandiflora (L.) Pers. (Fabaceae)	The leaves decoction is used to gargle in relieving dry cough, sore throat and tongue disorders. Pregnant women should use it with care.	Seeds (100)
Makoi	Solanum nigrum Linn. (Solanaceae)	The leaves swaras (15-20 ml) are recommended twice a day up to a week to cure mouth ulcers. The excess used may cause loose motion	Seeds (101)
Padhal	Stereospermum suaveolens (Roxb.) D.C.	The flower fine powder (1-2 gm) is mixed with honey and applied to the eyes to cure eye diseases. It should be applied with care.	Seeds (102)

	(Bignoniaceae)		
Madhuparni	Stevia rebaudiana Bertoni (Asteraceae)	The decoction of leaves (20-25 ml) and mulethi powder (3-5 gms) is given in curing hyperacidity and belching. Its use is strictly prohibited for promising mothers.	Seeds and vegetative methods (103)
Sihor	Streblus aspera Linn. (Moraceae)	The branch of Sihor is used as Datun (tooth brush) for strengthening gum and teeth. Its intake should be avoided by hypotensive patients.	Vegetative methods (75)
Nirmali	Strychnos potatorum Linn. F. (Loganiaceae)	The fruit is used to purify unhygienic water, and its oil is used for massaging for relieving joint pain. Its intake should be done only after Shodhana (purification).	Seeds (104)
Mahogany	Swietenia mahagoni (L.) Jacq. (Meliaceae)	The bark decoction (20-40 ml) is given twice a day to treat malarial fever. The overdose may induce haemorrhage.	Seeds (105)
Jamun	Syzygium cumini (L.) Skeel. (Myrtaceae)	The leaves are burnt and fumes are given thrice a day to cure worm infestation and dental problems. Its excess intake may cause digestive disturbances.	Seeds (106)
Arjun	Terminalia arjuna (Roxb.) W.A. (Combretaceae)	The bark powder (7-10 gm) with milk given twice a day to maintain heart health. Its regular intake should be avoided by hypotensive patients.	Seeds and vegetative methods (87)
Bahera	Terminalia belerica (Gaertn.) Roxb. (Combretaceae)	The powder of fruit (10-15 gm) is mixed with honey and given once in a day regularly for 15 days for curing hoarseness, throat infection and skin diseases. Its regular long-term use may cause excessive hair growth.	Seeds and vegetative methods (35)
Harad	Terminalia chebula Ritz. (Combretaceae)	The fruit is rubbed on stone and this paste is given (2-3 gm) to the newborn for curing constipation. The overdose may cause loose motion.	Seeds and vegetative methods (107)
Paras Pipal	Thespesia populnea (L.) Soland. ex. Corr. (Malvaceae)	The decoction (20-25 ml) of leaves is given twice a day for curing rheumatism and urinary tract infection. The excess may cause nausea and vomiting.	Seeds (108)
Giloy	Tinospora cordifolia (Willd.) Miers. (Menispermaceae)	Fant (20-30 ml) is prescribed regularly to cure insanity. Its regular intake should be avoided by hypotensive patients.	Vegetative methods (109)
Jungle-jagni	Tridax procumbens Linn. (Asteraceae)	The decoction of the whole plant (30-50 ml) is given once a day for fatty liver, and in respiratory ailments. The excess intake may cause allergic reactions.	Seeds (110)
Methi	Trigonella foenum-graecum Linn. (Fabaceae)	The soaked seeds (2-5 gm) are recommended to the patients of diabetes and hypertension. It may cause hypoglycemia in excess doses.	Seeds (111)
Sahdevi	Vernonia cinerea Less. (Asteraceae)	The cold infusion (50-60 ml) is recommended to treat fever caused due to indigestion. It should be avoided by pregnant women.	Seeds (112)
Budu	Viscum orientale Willd. (Viscaceae)	The leaves decoction (15-20 ml) is recommended twice a day for curing the herpes. The overdose intake may cause indigestion.	Seeds (113)
Mahala	Vitex negundo Linn. (Verbenaceae)	The hot poultice of leaves is applied four times a day for instant relief in the inflammation. The excess dose may cause urine infection.	Seeds and vegetative methods (114)

Had-jod	Vitis quadrangularis Wall. (Vitaceae)	The stem powder (4-5 gm) is mixed with dried Ginger powder (2-3 gm) for curing loss of appetite and for healing fractured bones and cartilages.	Vegetative methods (115)
Dhatki	Woodfordia fruticosa (L.) Kurz. (Lythraceae)	The decoction of flowers (20-40 ml) is given regularly once a day up to a month to cure ovarian cyst. The breastfeeding mother should avoid its use.	Seeds and vegetative methods (116)
Dhundul	Xylocarpus granatum J. Koenig (Meliaceae)	Root decoction (20-25 ml) is given in the empty stomach to treat cholera and dysentery. The overdose may cause nausea.	Seeds (117)
Adrak	Zingiber officinale Roscoe (Zingiberaceae)	The dried rhizome powder (5-7 gm) is given with jaggery and ghee to cure tinnitus. The excess intake may cause heartburn.	Vegetative methods (118)
Ber	Ziziphus mauritiana Lam. (Rhamnaceae)	The fruit decoction (25-30 ml) is recommended with Dalchini powder (2-3 gm) for curing cold and cough. It should be used cautiously by pregnant women.	Seeds (119)

The research paper published in Imperial Pharmacopoeia relating to ethnomedicinal uses of some imperative plant species including *Adhatoda vasica* (Expectorant), *Andrographis paniculata* (Febrifuge), *Calotropis gigantea* (Antipyretic), *Carica papaya* (Source of papain), *Psoralea corylifolia* (Leucoderma) and *Symplocos racemosa* (Menorrhagia) (120). There are some edible medicinal plants from 'RamcharitManas' including Kanda (tubers) of *Dioscorea bulbifera*, Mool (roots) of *Asparagus racemosus*, Fruits of Ber (*Zizyphus mauritiana*), and Bel (*Aegle marmelos*) etc. which are used even in the present era for the medicinal purposes (11). The usage of *Cissus quadrangularis* for bone fracture and *Maduca indica* for curing worm infestations in stomach, the information was cited in the ancient text. Moreover, the same usage of these plants is also observed by the researchers during the study (121). It is high time for the scientific exploration of ethnopharmacology for drug development and as a prominent tool for remediating the existing chronic and acute diseases (32). The researchers faced problems during the survey related to communication (local dialects), vernacular names of the species, and usage of different plant parts. Hence, the verification and validation of the collected data (including specimen) with the help of traditional healers, academicians, and taxonomists was done along with their cross verification from the published national and international literature, and Plants of the World online database site for promoting and standardising the ethnopharmacological practices so that their safer, effective, and optimum usage may be worked out. The standard approved terms of the formulations including Swaras, Decoction, Infusion, Paste, Kalka, and Arka have been used while explaining the ethnopharmacological uses to avert the misconception about the formulations.

4. Conclusions

The scientific ethnopharmacological study was conducted for highlighting the therapeutic importance of imperative medicinal plants along with their precautions for enhancing their safety usage. The emphasis is given on representative species of each family by keeping in view of biodiversity conservation and their propagation methods. The study represents highest number of species from the family *Fabaceae* (09), followed by *Asteraceae* (06), *Moraceae* (05), *Malvaceae* (04), *Verbenaceae* (04), *Acanthaceae* (03), *Combretaceae* (03), *Lamiaceae*

(03), *Meliaceae* (03), *Rhizophoraceae* (03), *Rutaceae* (03), *Amaranthaceae* (02), *Apiaceae* (02), *Apocynaceae* (02), *Asclepiadaceae* (02), *Cyperaceae* (02), *Euphorbiaceae* (02), *Menispermaceae* (02), *Mimosaceae* (02), *Myrtaceae* (02), *Phyllanthaceae* (02), *Poaceae* (02), and *Sapotaceae* (02). Further, the families like *Acoraceae*, *Adiantaceae*, *Amaryllidaceae*, *Asparagaceae*, *Arecaceae*, *Berberidaceae*, *Bignoniaceae*, *Bombacaceae*, *Bixaceae*, *Brassicaceae*, *Cannabinaceae*, *Capparaceae*, *Capparidaceae*, *Caricaceae*, *Caesalpiniaceae*, *Celastraceae*, *Combretaceae*, *Commelinaceae*, *Covolvulaceae*, *Delliniaceae*, *Dioscoriaceae*, *Ehretiaceae*, *Equisetaceae*, *Linaceae*, *Loganiaceae*, *Loranthaceae*, *Lythraceae*, *Moringaceae*, *Myrcinaceae*, *Nyctaginaceae*, *Oleaceae*, *Oxalidaceae*, *Proteaceae*, *Ranunculaceae*, *Rhamnaceae*, *Rubiaceae*, *Sapindaceae*, *Scrophulariaceae*, *Solanaceae*, *Sterculiaceae*, *Viscaceae*, *Vitaceae*, and *Zingeberaceae* are represented by single species as shown in the Figure 1.

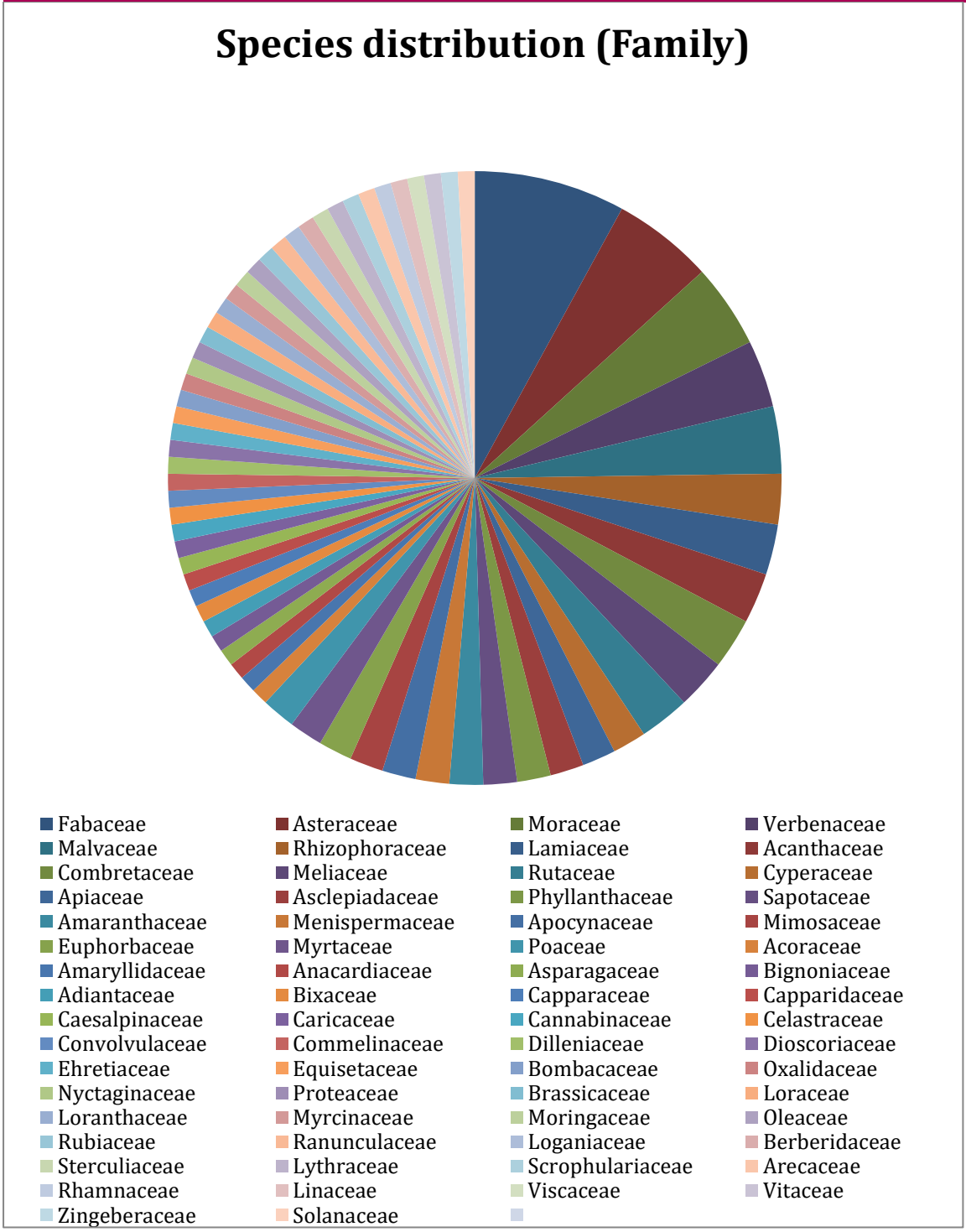

Figure 1 Showing number of species of medicinal plants from each family

There is ample scope for further research on indigenous medicinal plants ethnopharmacological studies comprising their bioactive compounds, ADME studies, toxicity profiles and using them after screening as lead molecules for innovative drug development through the assistance of in silico approaches.

5. Conflict of interest

There are no conflicts of interest reported by the authors. This article's content and writing are the responsibility of the writers.

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