

Ecotaxonomical and pharmacological studies on some medicinal plants of Bhadohi District, Uttar Pradesh, India

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ABSTRACT

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The present paper presents, for the first time, an illustrated account of some medicinal plants from Bhadohi District, Uttar Pradesh with the objective to conserve the diminishing traditional knowledge regarding medicinal plants of this area. A total of 40 species belonging to 40 genera and 26 families have been described with brief notes on salient taxonomic features of each species and their conservation.

Keywords: Herbaria, keystone plants, biodiversity, Bhadohi, Uttar Pradesh, India.

INTRODUCTION

Over the past decade, it is evident that pharmacological studies have climbed to prominence in drug development research. There should be involvement of all pharmaceutical scientists in the drug discovery process, whether in academia or industry, conducting fundamental research or translational research from preclinical studies to hospital pharmacy. India is one of the main world centres of biodiversity after eastern and southern tropical Africa and the Mediterranean Basin (García-Vega & Newbold 2020, Singh & Ranjan 2021) where rich diversity of medicinal

plants has been recorded. The traditional uses of medicinal plants in healthcare practices are providing clues to new areas of research and so its importance is well recognized. In recent times, the medicinal plants have been explored and recorded from various parts of country by various workers. However, information on the uses of plants for medicine has not been given enough attention from many areas of Uttar Pradesh including Bhadohi District. So, we describe here medicinal plants ecotaxonomically for the first time from Bhadohi District of Uttar Pradesh, India with special reference to their pharmacological potential.

STUDY SITES

Bhadohi (Lat. 25.387270° N, Long. 82.568031° E), situated in eastern Uttar Pradesh, lies in Indo-Gangetic plains at an average elevation of 133 m above the mean sea level. This district is drained by Ganga, Varuna and Morva rivers, making it a suitable habitat for vegetation. Climate of the area is humid sub-tropical, temperature ranges from 12°C to 32.8°C and annual rainfall is about 892 mm. About 85% of the annual rainfall is received from south-west monsoon during July to September. It is surrounded by Jaunpur district to the north, Varanasi district to the east, Mirzapur District to the south, and Prayagraj District to the west with an area of 1055.99 km² and with impact of dry climatic condition. This district is divided into three tehsils, viz. Aurai, Bhadohi and Gyanpur, with six blocks, Bhadohi, Suriyawan, Gyanpur, Deegh, Abholi and Aurai (Figure 1). Inattentive exploitation of herbal plants by agricultural activities, overgrazing and habitat loss leads to depletion of vegetation cover of the area. Authors have tried to study medicinal plants of the remote areas of district that would be beneficial in their systematic utilization along with making conservation strategy in the future.

MATERIALS AND METHODS

The study was carried out in rural areas of Aurai, Bhadohi and Gyanpur which includes Bhadohi, Suriyawan, Gyanpur, Deegh, Abholi and Aurai (Figure 1). Local experienced persons and traditional herbal practitioners were consulted to know about the use of various medicinal plants growing in their localities. Field trips (during 2019–2023) were made to the sites by one of the author (Saumya Mishra) and vouched specimens of plants, identified as medicinally important, were collected when encountered for the first time and again when they were flowering or fruiting, for easy identification. Species identification was achieved by comparison with specimens of Indian

herbarium, digital herbaria (e-Floras 2008, WCSP 2012, The Plant List 2013, POWO 2019, GBIF 2020, JSTOR 2020 and The Herbarium Catalogue 2021) and perusal of relevant literature. Medicinal values of these plants were compared with various studies especially from among the rural and tribal communities (Jain 1973, 1989, 1991, Maheshwari et al. 1981, 1986, Khanna 2002, Kumar et al. 2003, 2012, Maliya 2004, 2007, Nigam & Kumar 2005, Mukherjee et al. 2006, Modak et al. 2007, Singh et al. 2007, 2010, 2016, Singh & Singh 2008, Verma et al. 2008, Malaviya et al. 2010, Menghani et al. 2010, Singh 2011, Maurya & Srivastava 2011, Lakra et al. 2012, Murthy et al. 2012, Saravanamuttu & Sudarsanam 2012, Tiwari et al. 2012, Mukesh & Namita 2013, Ranjan et al. 2014, 2016, Yadav et

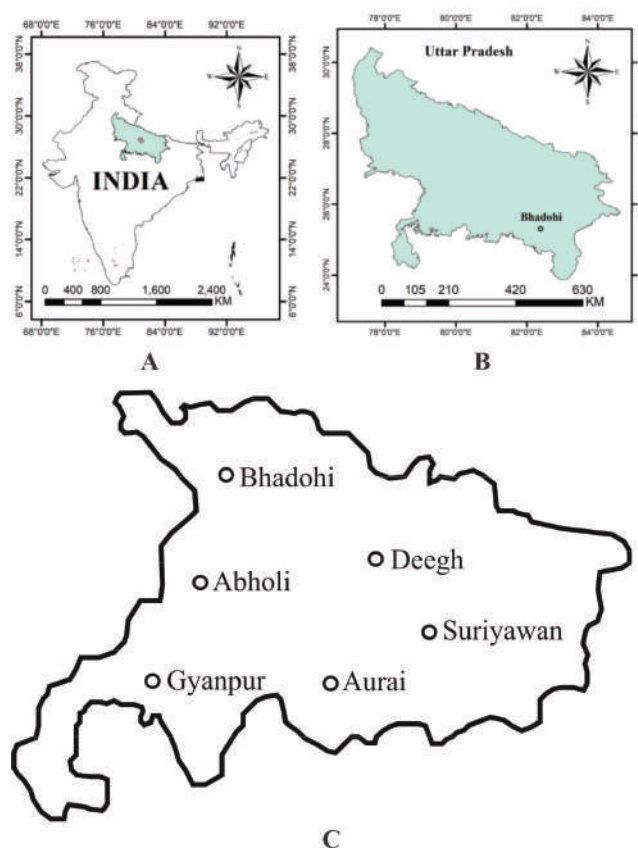


Figure 1. A. Map of India showing location of Uttar Pradesh. B. Map of Uttar Pradesh showing location of Bhadohi District. C. Map of Bhadohi District (study area) showing localities of medicinal plants collection.

al. 2014, 2015, 2021, Maina et al. 2015, Mishra et al. 2016, 2017, 2019, 2021, Mishra & Mishra 2017, 2018a, b, 2019, 2023a, b, Saleem et al. 2019, 2022). The voucher specimens have been deposited in the herbarium of the Department of Botany, K.N. Government Postgraduate College, Gyanpur, Uttar Pradesh, India.

RESULTS AND DISCUSSION

In the present investigation, 40 plant species belonging to 40 genera and 26 families were recorded, which have been enumerated below along with their ecotaxonomical and pharmacological details (Figure 2). Habitat-wise, 23 species belong to herbs, 7 species belong to shrubs, 7 species belong to trees and 3 species belong to climbers. Percentage representation of various families of

Table 1. Percentage of various families of medicinal plants in Bhadohi District, Uttar Pradesh, India.

Serial number	Family name	Percentage (%)
1	<i>Acanthaceae</i>	3
2	<i>Amaranthaceae</i>	5
3	<i>Asclepiadiaceae</i>	3
4	<i>Asteraceae</i>	10
5	<i>Apocynaceae</i>	3
6	<i>Cannabaceae</i>	3
7	<i>Chenopodiaceae</i>	3
8	<i>Combretaceae</i>	3
9	<i>Convolvulaceae</i>	3
10	<i>Euphorbiaceae</i>	8
11	<i>Fabaceae</i>	8
12	<i>Lamiaceae</i>	3
13	<i>Loganiaceae</i>	3
14	<i>Malvaceae</i>	3
15	<i>Meliaceae</i>	3
16	<i>Menispermaceae</i>	3
17	<i>Moraceae</i>	3
18	<i>Moringaceae</i>	3
19	<i>Nyctaginaceae</i>	3
20	<i>Oxalidaceae</i>	3
21	<i>Papaveraceae</i>	5
22	<i>Rutaceae</i>	3
23	<i>Sapotaceae</i>	3
24	<i>Solanaceae</i>	13
25	<i>Verbenaceae</i>	3
26	<i>Vitaceae</i>	3

medicinal plants in Bhadohi District is presented in Table 1. Ecotaxonomical and pharmacological account of these plants is given in Table 2.

SALIENT FEATURES OF TAXA

1. *Abrus precatorius* L. (*Fabaceae*), Syst. Nat., ed. 12. 2: 472. 1767.

Deciduous woody twinner, stipule linear; leaf rachis bristle-tipped, hairy; leaflets are oblong, measuring 2.5 cm long and 8–20 pairs, oblong, rounded and apiculate at apex, glabrous above, appresses hairy beneath. Racemes axillary, pedunculate. Flowers pale-violet, turning red; pedicels short. Calyx appressed-hairy outside; teeth very short. Corolla: vexillum clawed, wings falcate shorter than keel. The plant produces short and stout brownish pods, which curl back on opening to reveal pendulous red and black seeds, 4–6 peas in a pod.

Flowering and fruiting: September–January.

Phytochemicals: Abrasine, abruslactone, abrus agglutinin APA-1, Abrus agglutinin APA-2, abrusgenic acid. In leaf, abrine, abrusoside-A and abrusoside-B.

Pharmacological uses: Dried seeds are taken in malaria. Dried leaves and roots are applied to the eye for eye diseases and tuberculosis.

2. *Abutilon indicum* (L.) Sweet (*Malvaceae*) in Hort. Brit.: 54. 1826.

Figure 2.A

A robust herb or under shrub, branches many, leaves ovate to orbicular-cordate, soft. Flower buds drooping. Flowers orange-yellow on long pedicels. Ripe carpels 15–20, black at maturity, reniform, short beaked, seeds black, tubercled.

Flowering and fruiting: September–March.

Phytochemicals: Gossypetin-8 and 7-glucosides, cyanidin 3-rutinoside, alkanol, b-sitosterol, tocopherol, asparagines and p-coumaric acid.

Table 2. Ecotaxonomical and pharmacological account of some medicinal plants of Bhadohi District, Uttar Pradesh, India.

Serial No.	Botanical Name	Vernacular Name	Family	Phytochemicals	Parts used	Pharmacological properties
1	<i>Abrus precatorius</i> L.	Ratti, Gunja Indian liquorice	<i>Fabaceae</i> / climber	Abrussic acid, Kaempferol	Seeds, root, paste	Stiffness of shoulder joints, cures malaria
2	<i>Abutilon indicum</i> (L.) Sweet	Kanghi, Atibala	<i>Malvaceae</i> / shrub	Glucosides, gossypectin	Leaves	Diuretic and anti-inflammatory activities, piles, ulcers, fever
3	<i>Acalypha indica</i> L.	Kuppi	<i>Euphorbiaceae</i> / Herb	Sterols, kaempferol	Leaves	Leprosy, jaundice, skin cure, arthritis
4	<i>Achyranthes aspera</i> L.	Chirchira, Latjira	<i>Amaranthaceae</i> / Herb	Achyranthin, saponin, oleonilic acid	Leaf, root	Toothache, cough, cold, Relief during delivery, Amenorrhoea
5	<i>Ageratum conyzoides</i> L.	Goat weed	<i>Asteraceae</i> / Herb	Flavonoides, aurnone, chalcone, flavonol	Leaves	Used in burns, headache, analgesic, asthma, spasmodic
6	<i>Amaranthus viridis</i> L.	Chaulai	<i>Amaranthaceae</i> / Herb	Spinasterol	Root	Gonorrhoea, Menorrhoea
7	<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees	Kalmegh	<i>Acanthaceae</i> / Herb	Andrographin, caffeic acid	Root, leaf	Cures fever, dysentery, dyspepsia, snake bites, liver
8	<i>Argemone mexicana</i> L.	Peelikateri, Satyanashi	<i>Papaveraceae</i> / Herb	Succinic acid, angoline, coptisine, allocin	Leaf	Cures Leucorrhoea, appetizer, diuretic, aphrodisiac
9	<i>Azadirachta indica</i> A. Juss.	Neem	<i>Meliaceae</i> / Tree	Azadirachtin	Whole plant	Vaginal infection, antiseptic, cures skin diseases
10	<i>Boerhavia diffusa</i> L.	Punarnava	<i>Nyctaginaceae</i> / Herb	Punarnavine, b-sitosterol, glucosides	Stem, root, leaf	Relief delivery, cures dyspepsia, tumors, anaemia, jaundice
11	<i>Cannabis sativa</i> L.	Bhang	<i>Cannabaceae</i> / Herb	Cannabidiolic acid, eugenol, cannabinol	Leaves	Smoking, antiepileptic, anti-inflammatory
12	<i>Calotropis gigantea</i> (L.) W.T. Aiton	Madar	<i>Apocynaceae</i> / Shrub	Calotropin, calotoxin, uscharidin	Root	Cures leprosy, leucoderma, ulcer, piles
13	<i>Chenopodium album</i> L.	Bathua	<i>Amaranthaceae</i> / Herb	Saponins, glucosides	Leaf	Contraceptive dyspepsia
14	<i>Cissus quadrangularis</i> L.	Hadjor	<i>Vitaceae</i> / Creeper	Quadrangularin	Leaves, root paste	Bonesetter
15	<i>Datura metel</i> L.	Dhatura	<i>Solanaceae</i> / Herb	Hyoscyamine daturanalone, atropine	Root, whole plant	Cures sterility, rheumatism, anaemia, narcotic, antiseptic
16	<i>Diospyros malabarica</i> (Desr.) Kostel.	Tendu	<i>Ebenaceae</i> / Tree	Lanceolarin	Ripened fruit	Ripened fruit cures cough
17	<i>Eclipta alba</i> (L.) Hassk.	Bhringraj	<i>Asteraceae</i> / Herb	Palmitic acid, nicotine, ecliptin, phytosterol	Leaves, stem	Emetic, purgative, anodyne, asthma, treat liver, jaundice
18	<i>Euphorbia hirta</i> L.	Duddhi	<i>Euphorbiaceae</i> / Herb	Sitosterol	Leaf	Asthma and urinogenital disorders
19	<i>Evolvulus nummularius</i> (L.) L.	Safed shankpusphi	<i>Convolvulaceae</i> / Herb	B-sitosterol, mannitol	Leaf	Nervine complaints, fever
20	<i>Madhuca indica</i> J.F. Gmel.	Mahua	<i>Sapotaceae</i> / Tree	Saponin, sapogenin	Fruit	Antidiabetic, hepatoprotective

21	<i>Melilotus indicus</i> (L.) All.	Ban-methi, Senje	<i>Fabaceae</i> / Herb	Coumarin, saponins, sitosterol, glucosides	Stem, root	Plant is emollient, cures swellings, poultice, diarrhea
22	<i>Mimosa pudica</i> L.	Lajwanti, Chhuimui	<i>Fabaceae</i> / Shrub	L-mimosine, b-sitosterol, d-pinitol	Root	Cures uterine disorders
23	<i>Moringa oleifera</i> Lam.	Sehjan	<i>Moringaceae</i> / Tree	Tetramethylheptadecan-4-olide, 3-5-bis (1, 1-dimethylethyl) – phenol	Whole plant	Cures excess menstruation, arthritis, rheumatic disorders
24	<i>Morus alba</i> L.	Shahtut	<i>Moraceae</i> / Tree	N-butanol, b-gamma hexanol, n-butyl aldehyde	Leaf, fruit	Diabetes, neuro-protective, ulcers
25	<i>Murraya koenigii</i> (L.) Spreng.	Meethi neem	<i>Rutaceae</i> / Shrub	Girinimbine, mahanimbin, isomahanimbine	Leaves, bark	Leaves cure cough, astringent, stomach, acidity
26	<i>Nicotiana plumbaginifolia</i> Viv.	Jangli tambakhu	<i>Solanaceae</i> / Herb	Glycosides, solanine, dulcamarin, dulcamaretinic acid	Leaves, stem	Cough, stomach
27	<i>Ocimum indicum</i> B. Heyne ex Roth.	Kali Tulsi, Munjariki	<i>Lamiaceae</i> / Herb	Ocimene, Ceneol, Methyl chavicol	Leaf paste	Cough and cold
28	<i>Oxalis corymbosa</i> DC.	Khatmithi	<i>Oxalidaceae</i> / Herb	phenol, tannin, lignin, glycosides, flavonoids	Leaf	Dysentery, diarrhea
29	<i>Papaver somniferum</i> L.	Afeem	<i>Papaveraceae</i> / Herb	Glucosides, somniferin	Fruit	Analgesic, narcotic and hypnotic activity.
30	<i>Phyllanthus niruri</i> L.	Bhui-amla	<i>Phyllanthaceae</i> / Herb	Gallic acid, phyllanthin	Leaf, root	Dropsy, jaundice
31	<i>Putranjiva roxburghii</i> Wall.	Putranjiva	<i>Putranjivaceae</i> / Tree	Putranjuadione, putranjiodiol, palmitic acid	Leaf	Cold, fever, anti-inflammatory, gastrointestinal, antibacterial
32	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Sargandha	<i>Apocynaceae</i> / Shrub	Reserpine, alkaloids	Root	Powdered root with black pepper in cup of water given to women during labour pain, hypertension
33	<i>Solanum nigrum</i> L.	Mokoiya	<i>Solanaceae</i> / Herb	Soladulcidine, tomatidine	Berries	Laxative, liver ailments
34	<i>Spilanthes radicans</i> Jacq.	Acmella	<i>Asteraceae</i> / Herb	Spilanthol, b-sitosterol	Fruit	Analgesic, diuretic
35	<i>Sonchus arvensis</i> L.	Dodak	<i>Asteraceae</i> / Herb	B-sitosterol, quercetin, palmitic acid	Leaf	Sedative, anti-inflammatory
36	<i>Strychnos nux-vomica</i> L.	Kuchla	<i>Loganiaceae</i> / Tree	Strychnine, isobrucine	Root	Fever, nervine tonic
37	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun	<i>Combretaceae</i> / Tree	Arjugenin, Arjunolic acid, elagic acid	Bark	Cardiotonic, diabetes
38	<i>Tinospora cordifolia</i> (Willd.) Hook. f. & Thomson	Giloy	<i>Menispermaceae</i> / Climber	Giloin, glucosides	Whole plant	Jaundice, diabetes, cough, cold, lungs
39	<i>Vitex negundo</i> L.	Nirgundi	<i>Lamiaceae</i> / Shrub	Vitexin	Leaf	Anthelmintic, stomach disorders, spleen, bronchial treatment
40	<i>Withania somnifera</i> (L.) Dunal	Ashwagandha	<i>Solanaceae</i> / Shrub	Withanin, somniferin, withanolide, lupeol	Root	Dry root powder with cow milk given to increase fertility, ulcer, cough, dryness

Pharmacological uses: Plant is used as tonic, anthelmintic, febrifuge, diuretic and anti-inflammatory activities. Plant is prescribed for piles, fever, lumbago, urinary discharge, dysentery, bronchitis and stones of urinary bladders.

3. *Acalypha indica* L. (*Euphorbiaceae*) in Sp. Pl.: 1003. 1753.

Figure 2.B

Erect, annual herb, 30–70 cm height, with many spreading or ascending branches, leaves membranous, 5 × 4 cm, ovate or rhomboid ovate, serrate, cuneate at base, arranged in a mosaic; flowers small, greenish, in lax erect, axillary, spikes; male clustered towards the top; females solitary or paired, each enclosed by a foliar, 6 × 6 mm bract, capsular concealed by persistent bracts, seeds ovoid, pale brownish, shining.

Flowering and fruiting: September–January.

Phytochemicals: Kaempferol, b-sitosterol, y-sitosterol, acalyphine, acalyph-amide, sterols, quinines and glycosides.

Pharmacological uses: The entire plant, including leaves, is used to cure arthritis, bedsores, wounds, skin disorders, eye, ear diseases, leprosy, jaundice and heart diseases.

4. *Achyranthes aspera* L. (*Amaranthaceae*) in Gen. Pl. [Jussieu]: 87. 1789. nom. cons.

Figure 2.C

Erect annual herb, leaves large, ovate, acute or acuminate, glabrous. Flowers greenish white, deflexed, in terminal spikes elongating in fruits, bracts and bracteoles persistent, ending in a spine, utricle oblong, seeds sub cylindrical, brown.

Phytochemicals: Achyranthin saponin A & B, ecdysterone, ecdstone, inokosterone, amino acids and hentriacontane.

Pharmacological uses: Plant is carminative, diuretic, purgative, bitter and pungent. Whole plant is used in snake bite and also cure from poisonous insects. The powder from the root is

used in wounds, sores, toothache, leprosy, ulcer and menstrual disorders.

5. *Ageratum conyzoides* L. (*Asteraceae*) in Sp. Pl.: 839. 1753.

Figure 2.D

Erect, branched, hairy herb up to 90 cm high. 5.0–8.0 × 2.5–5.5 cm, crenate, ciliate, densely pilose beneath. Corolla purple, infundibuliform, 5 lobed. Style branches slightly exerted. Pappus scales 5.1.5–3.0 cm long; tipped with scabrous setae. Achenes black, sharply angled.

Flowering and fruiting: Throughout the year.

Phytochemicals: Imethyls, aurone, chalcone, flavones, flavonol, leucoanthocyanins, glycosides, saponins, tannins, phenols, steroids, cumarins, 6-viny 1–7-methoxy-2, 2-dimethyl chromene, dihydroencecalin, dihydrodemethoxy-encecalin, demethoxy-encecalin, imethyl-encecalin and 2–2 methyl-6, 7-dimethoxychromene.

Pharmacological uses: Plant is used in treatment of various ailments, such as burns and wounds, headaches pneumonia, analgesic, inflammation, asthma, spasmodic.

6. *Amaranthus viridis* L. (*Amaranthaceae*) in Sp. Pl., ed. 2: 1405. 1763.

Figure 2.E

Erect or ascending herbs, up to 1.25 m high. Stem striate, often purple-tinged, hairy on young parts. Leaves ovate-lanceolate to oblong, acute or decurrent below; petiole variable in length. Flower clusters dense, lower ones exclusively female. Spikes with upper flowers all male and female flowers inter-mixed, green or crimson. Bracts and bracteoles broad or deltoid-ovate pale, membranous. Tepals elliptic or oblong-elliptic, narrowed above. Stigmas 3, erect or recurved. Capsule ovoid-urceolate, with a neck below style base. Seeds lenticular brown or black shining.

Flowering and fruiting: July–November.

Phytochemicals: Stigmasterol, campesterol,

b-sitosterol, glycosides, α -spinasterol, octacosanoate, oleanolic acid, saponin and D-glucuronic acid.

Pharmacological uses: Whole plant is used for snake-bite, burning sensation, dyspepsia, gonorrhoea and menorrhoea.

7. *Andrographis paniculata* (Burm. F.) Wall. Ex Nees (*Acanthaceae*) in Pl. Asiat. Rar. 3: 116. 1832.

Figure 2.F

An erect annual herb, 40–100 cm in height, branches herbaceous, greenish, sharply 4-angled or winged. Leaves 5–10 × 2.0–2.5 cm, ovate, lanceolate, inflorescence a lax, axillary and terminal, unilateral raceme, forming a panicle, flowers whitish, spotted with rose-purple, bracts opposite, paired, capsules tapering at ends.

Flowering and fruiting: October – March.

Phytochemicals: Andrographin, panicolin, b-sitosterol, glucoside, polyphenol, caffeic acid, andrographolide, flavonoids and apigenin.

Pharmacological uses: Plant is used to cure fever all types especially intermittent fever, dysentery, dyspepsia and spleen complaints used as curative or preventive in snake poisoning.

8. *Argemone mexicana* L. (*Papaveraceae*) in Sp. Pl.: 508. 1753.

Figure 2.G

Under shrub, stems, woody, herbaceous, leaves glaucous, prickly, sinuate-pinnatifid, flowers yellow, stigmas red, capsules erect prickly, dehiscing by valves, seeds black.

Flowering and fruiting: April–September.

Phytochemicals: Protopine, berberine nitrate, cerylalcohol, b-sitosterol, succinic acid and tartaric acid.

Pharmacological uses: Latex of the plant is applied externally to treat various skin disorders particularly ring worm. Roots and seeds are mixed

with mustard oil to treat pyroha and mouth ulcers.

Pharmacological uses: Root is bitter, tonic, aphrodisiac, diuretic, demulcent and used to cure leucorrhoea, diarrhoea, diabetes and jaundice.

9. *Azadirachta indica* A. Juss. (*Meliaceae*) in Mém. Mus. Hist. Nat. 19: 221 (1830 publ. 1831)

Figure 2.H

A large tree, leaves 20–30 cm long, crowded near the ends of the branches, pinnate. Leaflets 10–12 serrate, flowers white, scented, anthers 10, ovary 3 celled, drupes ovoid-oblong, smooth, yellow when ripe.

Flowering and fruiting: March–July.

Phytochemicals: Nimidiol, nimbolin A & B, nimbosterol, nimbin, nimbidin, nimbolide, azadiradione, azadirone, meliantriol, meldenin, meliarpin, nimbiol, quercetin and azadirachtin.

Pharmacological uses: Plants are purgative, stimulant, antiseptic, alterative, emollient and anthelmintic. Whole plant is used leprosy, skin disease, fever, rheumatism, skin disease and snakebites.

10. *Boerhavia diffusa* L. (*Nyctaginaceae*) in Gen. Pl. [Jussieu]: 90. 1789, **nom. cons.**

Figure 2.I

Diffuse herb, stem prostrate, divaricately branched, slender, purplish, swollen at nodes, spreading to 30–60 cm, leaves opposite, in unequal pairs, at each node. Larger 3–4 cm, the smaller 1–2 cm, broadly ovate, obtuse, base rounded, margins pink, undulate, petioles 2–4 cm, flowers dark pink, funnel shaped, very small, sessile, 4–10 in umbels 5–8 mm diameter, arranged in terminal panicles. Perianth 5 lobed, stamens 2–3, exserted. Plant parts used–fresh whole plant, root, leaves and flowers.

Phytochemicals: Punarnavine, sterol, beta-sitosterol, stearic acid, palmitic acid, sodium sulphate, potassium nitrate.

Pharmacological uses: This plant is used as

stimulant, antibacterial, laxative and stomachic. Leaves and roots help in urination, jaundice, asthma and internal inflammation. The root is used in diseases of hearts, kidneys, gonorrhoea, dropsy and liver. It is also an antidote to snake bite. It is blood purifier and cures cough, asthma, body heat, muscular pains, gout, etc.

11. *Cannabis sativa* L. (*Cannabaceae*) in Sp. Pl.: 1027. 1753.

Figure 2.J

A robust annual herb, leaves 3–8 foliate, long petioled; lobes lanceolate, plants flowers dioecious, male plant flowers are axillary, short paniced cymes, and the female plant flowers crowded with leafy bracts, style arms 2, filiform, nuts crustaceous.

Flowering and fruiting: November–April.

Phytochemicals: Cannabidiolic acid, cannabidiol, cannabinol, tetrahydro-cannabinol, trans-cinnamic acid, n-nonacosane, eugenol and guaiaicol.

Pharmacological uses: Plants have antidiuretic, antiemetic, antiepileptic and anti-inflammatory properties. Tribal people used its leaves for smoking.

12. *Calotropis gigantea* (L.) W.T. Aiton, (*Apocynaceae*), in Hortus Kew. 2: 78. 1811.

Medium shrub. Leaves elliptic to obovate, 10–15 cm long, amplexicaul or cordate at base, with a ring of glandular lateral hairs at the base of lamina. Flowers white, sub-umbellate cymes. Sepals cottony. Corolla campanulate, divided more than half-way down, lobes revolute and twisted in foliage. Follicles in pairs, boat shaped, with a hooked tip, cottony pubescent. Seeds with medium silky coma.

Flowering and fruiting: Throughout the year.

Phytochemicals: Calotropin, calactinic acid, calotoxin, syriogenin, uscharidin, voruscharin, and theaspirone.

Pharmacological uses: Plant is used to

cure tumor, leprosy, leucoderma, ulcer, piles and spleen disorders. Root-bark is ametic, diaphoretic, alterative and purgative.

13. *Chenopodium album* L. (*Amaranthaceae*) in Sp. Pl.: 219. 1753.

Erect, branched herb up to 1 m or sometimes more tall. Stems angular, ribbed with dark green and red streaks densely covered with powdery vesicles on younger parts. Leaves ovoid rhomboid; coarsely dentate or lobulated in lower parts; upper leaves smaller, elliptic oblong almost entire. Flowers pentamerous, arranged in paniced cluster. Perianth lobes connate at base concave. Stamen slightly exerted. Ovary depressed-globose stigmas 2. Utricle enclosed between perianth lobes, finally pappilose, seed lenticular.

Flowering and fruiting: September–May.

Phytochemicals: Ecdysteroids, b-ecdysone, polygodine, ascorbic acid, b-carotene, catechins, caffeic acid, p-coumaric acid, ferulic acid, b-sitosterol, stigmasterol, saponins and glucosides.

Pharmacological uses: Plants are used as a tonic, laxative, blood purifier, anthelmintic and diuretic. Seeds are used for liver and spleen enlargement.

14. *Cissus quadrangularis* L. (*Vitaceae*) in Syst. Nat., ed. 12. 2: 124. 1767.

A succulent twiner, rambling shrub, stem 4–angular, glabrous, winged or margined, contracted at nodes; leaves simple, early caduceous, ovate, suborbicular, subreniform thick coriaceous; margin serrate; cymes umbellate; flower 7 cm across; greenish yellow, red-lipped; berry globose, apiculate; seed smooth.

Flowering and fruiting: April–November.

Phytochemicals: Carotene, calcium oxalate, vitamin-c, alpha-amyrone, beta-sitosterol. N-hexadecanoic acid, ethane, 1, 1-diethoxy, ethyl a-d-glycopyranoside, tetradecen-11-en-1-ol, glycerin, tetradecanoic acid and quadrangularin.

Pharmacological uses: Plant stems are used to cure of piles, fractures, irregular menstruation, asthma, treatment of eye, scurvy. Juice of plant given internally and applied externally on fractured bone. Leaves and roots are used for obesity, diabetes and control blood pressure.

15. *Datura metel* L. (*Solanaceae*) in Sp. Pl.: 179. 1753.

Figure 2.K

Erect, perennial, widely branched herb, stem flexuous, nearly glabrous or short hairy; lenticillate. Leaves ovate-triangular to elliptic, obliquely rounded at base, acute or acuminate, repand-dentate to lobed, short hairy and glabrous. Petiole 1–15 cm long, flowers 0.5–1 cm long pedicels, calyx sub terete, 5–6 cm long; lobes triangular, acuminate, corolla white or purple; lobes 5, with an acumen of 1–2 cm long; fruit pendulous, globose, glabrous or hairy, with conical prickles.

Flowering and fruiting: Throughout the year.

Phytochemicals: Hyoscyamine, hyoscyne, meteloidine, tropine, pseudotropine, scopolamine, daturaolone and fastusidine.

Pharmacological uses: Plant is bitter, acrid, astringent, anodyne, antiseptic, narcotic, sedative and used in cure of ulcer, leprosy, earache, dysuria, piles, anaemia and rheumatism.

16. *Diospyros malabarica* (Desr.) Kostel. (*Ebenaceae*) in Allg. Med.-Pharm. Fl. 3: 1099.1834.

Dense, spreading-branched trees up to 15m high, leaves distichous, up to 20 cm long, ovate-oblong to oblong, coriaceous, reddish when young, dark green above and glaucous-green beneath. Flowers dioceous, axillary, tetramerous. Female flowers solitary, drooping; calyx globose, up to 6 cm across, slightly accrescent, pubescent outside; corolla white, glabrous. Male flowers 1–5 together, with stamens and staminodes. Berry subglobose, up to 6 cm across, pulpy 4–8 seeded,

covered with rusty scurf, which brushes off at the maturity of fruit.

Flowering and fruiting: April–October.

Phytochemicals: Lanceolarin, biochanin A–7-apiosyl-glucoside, 7-hydroxy-3, 4-methylenedioxy-isoflavone and latifolin.

Pharmacological uses: Bark is bitter, acrid, astringent, styptic and used in cure of diarrhea, dysentery and intermittent fever.

17. *Eclipta alba* (L.) Hassk. (*Asteraceae*) in Pl. Jav. Rar.: 528. 1848.

Prostrate, decumbent-ascending or erect, annual herb, stem often creeping and rooting at the base, appressed-pubescent. Leaves sessile, ovate lanceolate, elliptic-oblong, acute or obtuse, narrowed to the base, entire-faintly serrate, appressed hispidulous. Heads axillary and terminal, 0.6–1 cm across, on 5–7 cm long peduncles. Marginal flowers with white, 2–dentate, 0.25 cm long ligules. Corolla of disc-flowers 0.2 cm long. Achenes oblong-turbinate, tuberculate, with a thickened margin, 0.2–0.25 cm long.

Flowering and fruiting: April–December.

Phytochemicals: Stigmasterol, a-terthienyl-methanol, eclipteine, ecliptal and apigenin.

Pharmacological uses: Whole plant is bitter, acrid, hot, emetic, purgative, anodyne and used in cure of jaundice, asthma, ulcers and wounds.

18. *Euphorbia hirta* L. (*Euphorbiaceae*) in Sp. Pl.: 454. 1753.

An annual, prostrate, hispid herb, leaves dark green or reddish, white-villous beneath elliptic or ovate-oblong with oblique bases. Cythra axillary and terminal clustered in dense, crowded cymes. Involucres stalked, cup shaped, capsule breaking into 3 cocci, seeds reddish-brown, trigonous.

Flowering and fruiting: November–April.

Phytochemicals: Beta-sitosterol, choline, taraxerol, euphorbol, b-amyrin and quercetin.

Pharmacological uses: The whole plant

is used in cure of diarrhea, amoebic dysentery, asthma and urinogenital disorders.

19. *Evolvulus nummularius* (L.) L.

(*Convolvulaceae*) in Sp. Pl., ed. 2: 391. 1762.

Slender, prostrate herbs, rooting at nodes, leaves glabrous, except the hairy nerves beneath. Pedicels erect first decurved after anthesis, calyx segments oblong-lanceolate, ciliate, corolla deeply lobed, capsule 1–4 seeded.

Flowering and fruiting: August–September.

Phytochemicals: Beta-sitosterol, glucosides, d-mannitol, ursolic acid, oleanolic acid and 3-hydroxy-olean-12-en-29-oic acid.

Pharmacological uses: The plant is used in treatment of insanity, epilepsy, nervine complaints and bleeding. Roots are used in intermittent fever.

20. *Madhuca indica* J.F.Gmel. (*Sapotaceae*) in Syst. Nat., ed. 13[bis]: 799. 1791.

A large sized, deciduous tree, bark dull black, leaves clustered at the ends of branches, elliptic, obovate or broadly lanceolate, prominently nerved beneath. Flowers cream, coloured, peculiarly musty, sweet-scented, drooping, rusty-tomentose, in dense fascicles at the ends of leafless branches.

Flowering and fruiting: February–September.

Phytochemicals: Saponin, glucoside, sapogenin, triterpenoids, steroids, flavonoids and glycosides.

Pharmacological uses: Plant is antidiabetic, antiulcer, hepatoprotective, antipyretic, anti-fertility, analgesic, antioxidant, swelling, inflammation and used in cure of piles, emetic, dermatological, wound healing and headache.

21. *Melilotus indicus* (L.) All. (*Fabaceae*) in Fl. Pedem. 1: 308. 1785.

Erect-ascending, much branched herbs; leaflets obovate, oblanceolate to cuneate, rounded or emarginated apex, flowers up to 3 mm long; calyx cleft less than half way down. Pods 1-seeded.

Flowering and fruiting: May–September.

Phytochemicals: Benzo-1, 2-pyrone, b-sitosterol, sterol, triterpenes, glucosides, coumarin and saponins.

Pharmacological uses: Plant is emollient, discutient and used in cure of swellings, poultice and diarrhea.

22. *Mimosa pudica* L. (*Mimosaceae/Fabaceae*) in Sp. Pl. 518. 1753.

Figure 2.L

Young branches red, closely ribbed, beset with short recurved prickles, rachis up to 20 cm long, prickly; pinnae with 16–20 pairs of oblong unequal sided, obtuse, mucronate, leaflets. Flower tetramerous, pink in globose, pedunculate heads at branch ends forming a leafy, terminal panicle. Stamens 8 long exerted. Pods falcate, glabrous, 4–10 jointed.

Flowering and fruiting: August–March.

Phytochemicals: L-mimosine, b-sitosterol, d-pinitol, nor-epinephrine, glycosides, saponins and coumarin.

Pharmacological uses: Plant is analgesic, aphrodisiac, sedative, emetic, tonic and used in cure of diarrhea, dysentery, insomnia, uterine and urinogenital disorders.

23. *Moringa oleifera* Lam. (*Moringaceae*) in Encycl. 1: 398. 1785.

Figure 2.M

A small or large tree, trunk grey white with longitudinal wrinkles. Leaves small, multipinnate, leaflets obovate or elliptic, flowers pale whitish, fragrant, pods long greenish pendulous.

Flowering and fruiting: January–June.

Phytochemicals: 16-tetrame thylheptadecan-4-olide, 3–5-bis (1, 1-dimethylethyl)-phenol, 1-hexadecanol, 3, 7, 11, 15-tetramethyl-2 hexadecene-1-ol, hexadecanoic acid, 1, 2, 3-propanetriyl ester-9 octadecenoic acid and oleic acid.

Pharmacological uses: Roots are bitter

used as expectorant, emmenagogue and diuretic, epilepsy and hysteria, rheumatic pains, sores and wounds.

24. *Morus alba* L. (*Moraceae*) in Sp. Pl.: 986. 1753.

Small tree, up to 6–8 m high, leaves broad ovate to ovate cordate, serrate, dentate, lobed, acute or acuminate, hairy on nerves beneath. Flowers monoceious. Male spikes catkin like, elongate or lax, short peduncled. Female catkin ovoid, pedunculate. Tepal 4, accrescent and succulent in female flowers. Style short and thick; stigma bifid, hairy. Fruiting calyx white, purple, variable in size and colour variety wise; up to 6 cm long.

Flowering and fruiting: February–June.

Phytochemicals: N-butanol, b-gamma hexanol, n-butyl aldehyde, isobutyl aldehyde, butylamine, quercetin, b-sitosterol, tartaric acid.

Pharmacological uses: Plant is antioxidant, antimicrobial, hepatoprotective, neuroprotective and used in cure of diabetes, cancer and skin disorders.

25. *Murraya koenigii* (L.) Spreng. (*Rutaceae*) in Syst. Veg., ed. 16. 2: 315. 1825.

Unarmed deciduous shrub or small tree. Leaves pinnate, rachis pubescent; inflorescence aniculata, corymbose, flowers small, white fragrant, berry purplish black, when ripe whitish, seeds green.

Flowering and fruiting: January–June.

Phytochemicals: Girinimbine, mahanimbin, isomahanimbine, essential oil and koeingin.

Pharmacological uses: Bark and roots are stimulant, acrid, bitter, astringent and used in cure of neurosis, dysentery, snakebite and acidity.

26. *Nicotiana plumbaginifolia* Viv. (*Solanaceae*) in Elench. Pl. Dinegro: 26. 1802.

Erect branched herbs, up to 1.25 m tall, viscid-pubescent all over; leaves 7–20 cm long; lower petiolate and in radical rosette, undulate, crispy, white dotted beneath; cauline ones sessile,

semiamplexicaul at base, the uppers gradually shorter and pass into foliar bracts, calyx 10 ribbed, lobes unequal, lanceolate, subulate. Corolla greenish white, often tinged with purple; tube linear, lobes, ovate, obtuse. Capsule ovoid, seed rugose.

Flowering and fruiting: May–November.

Phytochemicals: Glycosides, solanine, dulcamarin, dulcamaretinic acid, a, b, y-soladulcine flavones, tannins and phenolic compounds.

Pharmacological uses: The plant is used in cure of skin disease, rheumatism and urinary disorders.

27. *Ocimum indicum* B. Heyne ex Roth. (*Laminaceae*) in Nov. Pl. Sp.: 273. 1821.

A much branched, woody herb, often purplish in colour. Leaves 3–5 × 1.2 cm, ovate elliptic-oblong to oblong, entire or crenate-serrate, hairy, minutely dotted. Flowers purplish-pink, whorled, in racemes, often forming panicles. Bracts broad, ovate, acuminate, not exceeding calyx. Nutlets broad ellipsoid and smooth.

Flowering and fruiting: October–March.

Phytochemicals: Eugenol, methyl eugenol, cis-ocimene, pinene, camphor, trans-ocimene, A-pinene, camphene, beta-myrcene, ethylamyl carbinol and 1-phellandrene.

Pharmacological uses: Cures cough and cold.

28. *Oxalis corymbosa* DC. (*Oxalidaceae*) in Prodr. 1: 696. 1824.

Annual herb, petiole up to 25 cm long endent villose; leaflets minutely punctuate all over the surface, especially along the margins, ecallose. Inflorescence a long scapose, 2–12 flowered umbel, sepals 3–5 nerved with 2 orange, confluent apical calli; stigma 2 lobed papillose.

Flowering and fruiting: October–March.

Phytochemicals: Phenol, tannin, lignin, glycosides, flavonoids and alkaloids.

Pharmacological uses: Whole plant is

stimulant, hypoglycemic, chronotropic, uterine relaxant and used in cure of menstrual disorders, diarrhea and dysentery.

29. *Papaver somniferum* L. (*Papaveraceae*) in Sp. Pl.: 508. 1753.

Erect, simple or branched, hispid, annual herb, 15–40 cm tall, basal leaves petioled; higher ones sessile, without an amplexicaul base, hispidly hairy, sinuate-pinnatifid to bipinnatifid, variable in shape. Flowers solitary, terminal, long peduncled, usually dark red to blue, 5 cm across. Peduncle densely clothed with patent or erecto-patent, bristle hairs. Sepals 2, petals obovate-suborbicular, 2–3 cm long, often with darkish or white basal blotch, stigma rays 8–9. Capsule campanulate.

Flowering and fruiting: February–October.

Phytochemicals: Sangunarine, salutaridine, narceine, meconidine, codeine, somniferin, laudanine, laudanoline, neoprene, lantionine, protoprine, cytopine and oxynarcoteine.

Pharmacological uses: Fruits of the plant have analgesic, narcotic and hypnotic activity.

30. *Phyllanthus niruri* L. (*Phyllanthaceae*) in Sp. Pl.: 981. 1753.

Figure 2.N

Erect, glabrous, branched herb, up to 45 cm high, branchlets compressed trigonous. Leaves distichous, up to 2 cm long, ovate elliptic or acute, cuneate at base. Male flowers fascicled, short stalked; bracts lanceolate; perianth segments 5–6, subequal, 2–seriate; stamens 3; disc lobes 6, glandular yellowish. Female flowers solitary; styles free; capsule globose, glabrous; seeds trigonous, longitudinally ribbed, disc shallowly 5–lobed.

Flowering and fruiting: June–December.

Phytochemicals: Phyllanthin, hypophyllanthin, niranthin, nirtetralin, phenyltetralin, kaempferol, b-sitosterol, eriodictyol-rhamnopyranoside and saponins.

Pharmacological uses: Whole plant is used in cure of gonorrhoea, dyspepsia, dysentery, dropsy, jaundice and fever.

31. *Putranjiva roxburghii* Wall. (*Putranjivaceae*) in Tent. Fl. Nepal.: 61.1826.

Medium sized tree, up to 15 m high, branches drooping, leaves obliquely elliptic-oblong to ovate, coriaceous, dark–green above, glaucous beneath. Male flowers in axillary clusters, subsessile; perianth lobes 3–5; ovary tomentose; stamen pointed, very hard, deeply wrinkled, 1–seeded.

Flowering and fruiting: October–March.

Phytochemicals: Putranjivadiol, putranjivadiol, 2-ketofriedelane, 3-keto-vananol monoacetate, putranjivananol, putranjivic acid putrol and putrolic acid.

Pharmacological uses: Leaves and fruits are used in cure of cold and fever.

32. *Rauwolfia serpentina* (L.) Benth. ex Kurz (*Apocynaceae*) in Forest Fl. Burma 2: 171. 1877.

Figure 2.O

Erect, glabrous, perennial herb under shrub, leaves whorled, lanceolate or oblanceolate, acute or acuminate, narrowed into a short petiole; flowers white or pinkish, arranged in corymbose cymes, pedicels and calyx red. Bracts minute, lanceolate. Calyx lobes lanceolate, corolla tube inflated above the middle; lobes elliptic-oblong. Drupe purplish-black.

Flowering and fruiting: November–January.

Phytochemicals: Reserpilene, reserpine, sarpagine, serpinine, serpentine, ajmalin, ajmaline, ajmalicin, yohimbine, alloyohimbine, isoyohimbine, chandrine, deserpidine, isoajmaline, rauwolfifine, raunatine.

Pharmacological uses: Root is bitter, tonic, hypnotic, sedative, CNS stimulant and used in cure of psychosis, epilepsy, reduces blood pressure and dysentery.

33. *Solanum nigrum* L. (*Solanaceae*) in Sp. Pl.: 186. 1753.

Diffused much branched herbs up to 1m height; leaves ovate to ovate-lanceolate, sinuate or lobed; flower in umbeliform, extra-axillary cyme; peduncle 1–5 cm long, appressed hairy, calyx lobes ovate rounded, corolla pubescent; berries round, smooth up to 7mm across, seeds minutely pitted, yellow.

Flowering: October–June.

Phytochemicals: Solasodine, solamargine, soladulcidine, tomatidine, 5a-solasodanol and demissidine.

Pharmacological uses: Berries are bitter, pungent, laxative, tonic, diuretic and used in cure of piles, vomiting, asthma, bronchitis, fever and urinary discharges.

34. *Spilanthes radicans* Jacq. (*Asteraceae*) in Collectanea 3:229. 1791. *Acmella radicans* (Jacq.) R. K. Jansen in Syst. Bot. Monogr. 8 : 69. 1985.

Prostrate or decumbent-ascending, aromatic, viscid, annual herbs. Stem branched, with coarsely dentate winged of decurrent leaf bases, glandular pubescent. Leaves obovate-spatulate, with a narrowed base, obtuse, mucronate, coarsely double dentate, glandular-villous. Inflorescence globose-ellipsoid, 1 cm long, winged, glandular pubescent peduncles. Involucral bracts lanceolate, acute, hairy in the upper half. Corolla pale. Achenes glandular, hairy.

Flowering: February–October.

Phytochemicals: B-sitosterol, n-isobutylamide, -N-isobutylamide-2, 6, 8-decatrienamamide and spilanthol.

Pharmacological uses: Plant is used as anticonvulsant, analgesic, anti-inflammatory, toothache, vasodilation, diuretic and antimalarial activities.

35. *Sonchus arvensis* L. (*Asteraceae*) in Sp. Pl.: 793. 1753.

A perennial, erect herb 60–100 cm tall. Stems hollow, umbellately branched, glandular hairy above. Heads pale yellow to yellowish-white, umbellately corymbose. Peduncles and bracts glandular hairy. Achenes ribbed transversely rugose, brown.

Flowering: March–November.

Phytochemicals: Palmitic acid, b-sitosterol, daucosterol, quercetin, pigenin-7-o-b-glucopyranoside, luteolin-7-o-b-d-glucopyranoside, quercetin-3-o-b-D-glucopyranoside and rutin.

Pharmacological uses: Plant is sedative, antioxidant, anti-inflammatory, inhibitory, gastro intestinal activities and used in cure of kidney stone.

36. *Strychnos nux-vomica* L. (*Loganiaceae*) in Sp. Pl.: 189. 1753.

Small to medium sized tree; branches spreading, often with axillary thorns; leaves shining, opposite, broadly ovate to elliptic, rounded or slightly cordate and pentanerved at base; flowers greenish-white, in terminal, pedunculate, compound cymes. Calyx lobes acute, pubescent outside, corolla hypocrateriform, lobes minutely tomentose on margins; berry on strongly thickened branches, globular, orange red on age, seeds tetrasericous.

Flowering: November–January.

Phytochemicals: Strychnine, pseudostrychnine, strychnine N-oxide, brucine, brucine N-oxide, novacine, icajine, vomicine, isostrychnine, isobrucine, isobrucine N-oxide, brucime, brucine N-oxide.

Pharmacological uses: Root is bitter, tonic, nervine tonic, stomachic, antidiarrhoea, antidysenteric and antispasmodic. Seeds and leaves are bitter, atonic, nervine tonic and used in cure of fever, dyspepsia.

37. *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. (*Combretaceae*) in Prodr. Fl. Nov. Holland. 351. 1810. **nom. cons.**

Medium to large sized tree, up to 40 m tall; bark smooth, whitish or pinkish-grey. Leaves oblong or elliptic, hard, coriaceous, glabrescent, flowers pale yellow, calyx glabrous, fruit ovoid-oblong toughly 4–5 winged.

Flowering: April–May.

Phytochemicals: Arjunolic acid, beta-sitosterol, ellagic acid, arjugenin, arjunolone, baicalein and terminoside.

Pharmacological uses: Bark is used as astringent, cooling, cardiogenic, fractures, ulcers, leucorrhoea and diabetes

38. *Tinospora cordifolia* (Willd.) Hook. F. & Thomson (*Menispermaceae*) in Fl. Ind. 1: 184. 1855.

A glabrous, climbing shrub. Leaves cordate, petiolateous beneath, cordate and 7–nerved, membranous; flowers small, yellow; male ones in fascicled in the axils of bracts, outer 3 sepals ovate-oblong, inner 3 broadly elliptic to suborbicular, female flowers petals flat, staminode 6; carpels 3, style short, stigma lobed. Drupelets 1–3, orange red.

Flowering: February–August.

Phytochemicals: Glucosides, giloin, protoberberine, gilenin, columbin, tinocordifolin and tinosporic acid.

Pharmacological uses: Root, stem, and leaves are used as medicine. Aerial roots are used in cure of jaundice, leprosy, cough, diabetes and bleeding piles.

39. *Vitex negundo* L. (*Lamiaceae*) in Sp. Pl.: 638. 1753.

A shrub or small tree. Branchlets quadrangular, densely white-tomentose. Leaflets 3–5, petiolate, lanceolate, acuminate, white-tomentose beneath. Flowers lavender to blue, in loose clusters,

arranged in large panicle. Drupe black.

Flowering: July–February.

Phytochemicals: Vitexin, 8C-glucosylapigenin, casticin, 5, 2-dihydroxy-3, 6, 7, 4-tetramethoxy flavonoid revogenin.

Pharmacological uses: Leaves are acrid, bitter, pungent, anthelmintic, cephalic, stomachic and used in treatment of leucoderma, bronchitis, toothache and enlargement of spleen.

40. *Withania somnifera* (L.) Dunal (*Solanaceae*) in A. P. de Candolle, Prodr. 13(1): 453. 1852.

Erect, perennial under shrub, up to 0.50–1.5 m in height, leaves elliptic oblong or ovate-rounded; base acute, recurrent, pedicels short and thick, corolla campanulate, 3–6 lobed, valvate greenish yellow, stamens attached near corolla base, ovary and style glabrous, berry, globose, reddish, seeds discoid.

Flowering: December–June.

Phytochemicals: Withanolide, withanin, somniferin, b-sitosterol, glucosides, lupeol, triterpenoids and kaempferol.

Pharmacological uses: The root is sedative, tonic, bitter, stimulant and aphrodisiac. It is used to cure ulcers, cough, dropsy, leucorrhoea and menstrual troubles. Fruit is sweet, applied to wounds, asthma and piles.

CONSERVATION STATUS

The wild herbal plants are important resource of livestock and provide just enough to survive for rural people not only in India but also at worldwide. The medicinal plants can be culturally important for human beings. The traditional medicinal floras have been over looked in most areas of Uttar Pradesh in terms of conservation. Hence, we assessed here and proposed the preliminary conservation status of the traditional medicinal plants of Bhadohi District described as ‘locally threatened’ as per the IUCN category (IUCN 2023). In recent years medicinal flora of this area

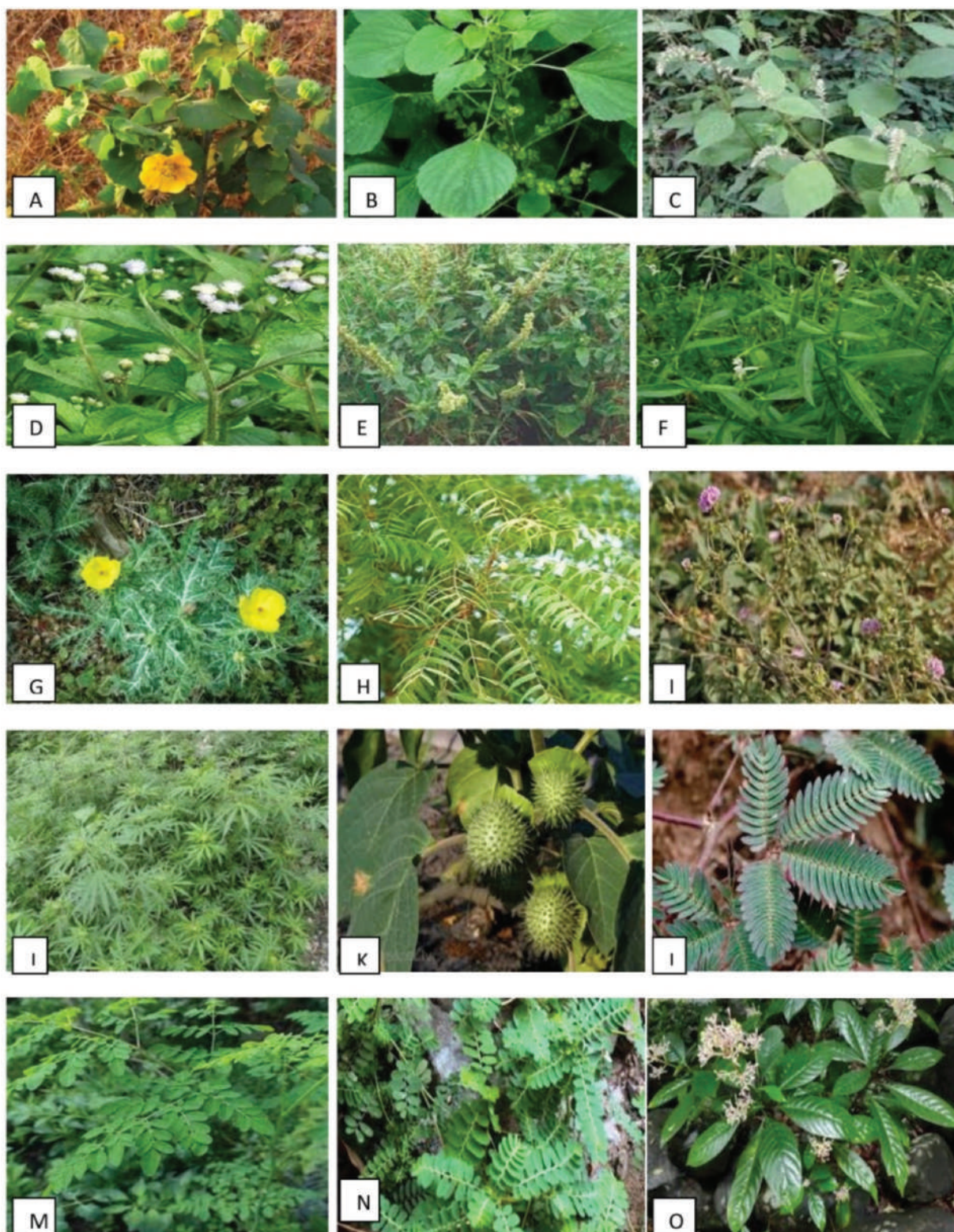


Figure 2. A. *Abutilon indicum* (L.) Sweet. B. *Acalypha indica* L. C. *Achyranthes aspera* L. D. *Ageratum conyzoides* L. E. *Amaranthus viridis* L. F. *Andrographis paniculata* Burm. f. Wall. ex Nees. G. *Argemone mexicana* L. H. *Azadirachta indica* Juss. I. *Boerhaavia diffusa* L. J. *Cannabis sativa* L. K. *Datura metel* L. L. *Mimosa pudica* L. M. *Moringa oleifera* Lam. N. *Phyllanthus niruri* L. O. *Rauvolfia serpentina* (L.) Benth. ex Kurz.

in general is threatened due to rapid increase in population and various anthropogenic activities like development of inhabitants, construction, development of agricultural lands and reduction of forest cover etc. Therefore, there is immediate need to conserve the existing species.

CONCLUSION AND FUTURE PERSPECTIVE

The present study sheds light on the ecotaxonomical patterns of some of the medicinal plants with special reference to their pharmacological potential. Our findings reveal that pharmacologically related medicinal plants tend to be used for similar therapeutic purposes across cultures. Their geographical location may have influence on ethno-botanical patterns. Here, we observe that geographically close congeneric species exhibit slightly higher correlations in their therapeutic use compared to geographically distant species. However, we also find dozens of examples of congeneric medicinal plants that have been used for the same therapeutic indications despite being located in widely separated regions of country.

Over the past decade, it is evident that pharmaceutical sciences have climbed to prominence in drug development research. There should be involvement by all pharmaceutical scientists in the drug discovery process (directly or indirectly), regardless of the domain, whether in academia or industry, conducting fundamental research or translational research from preclinical studies to hospital pharmacy. Plants are natural sources of readily available phytochemicals which possess interesting biological activities. There are a number of potential avenues for future research. Firstly, the comprehensive dataset accompanying our analysis allows prospective analyses to investigate other ethnobotany trends in the future. Many plants used in Indian system of medicine have been analyzed biotechnologically by analytical methods, isolated active and useful

components for improvement and modification which lead to the discovery of new drugs. There are number of studies on medicinal plant associated microbial communities that lean-to-light on the diversity and distribution of the world's "hidden biodiversity" and help understand the intricate link between plant taxa, their chemical profiles and relevant drug efficacy (Hao & Yang 2016, Hao et al. 2015, 2018).

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