



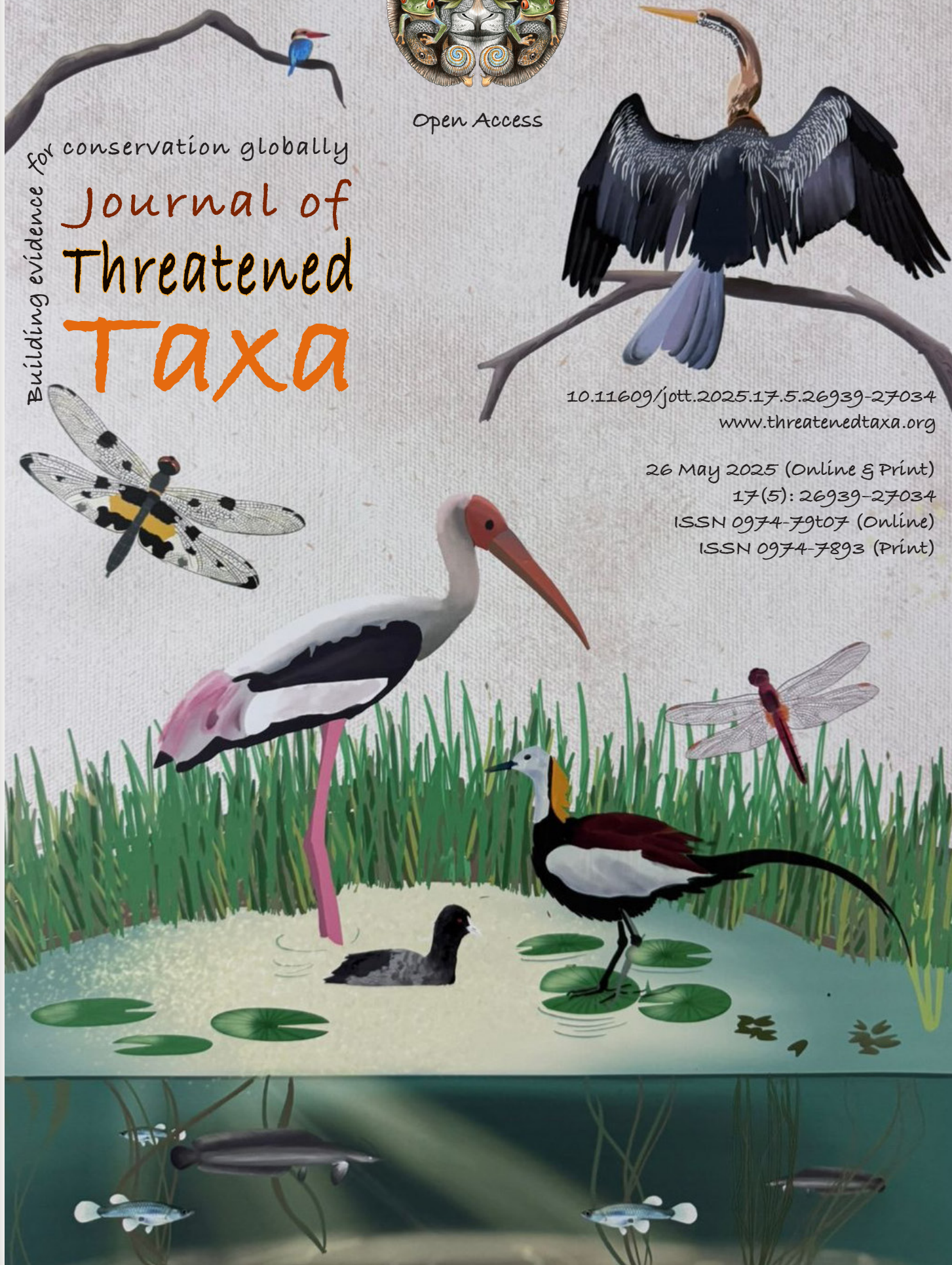
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continued on the back inside cover

Cover: A digital art of water birds of Noyyal River and its wetlands in Coimbatore District by Megha A. Kashyap.



## Plant composition and species diversity in Delhi NCR of India

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**Abstract:** The present study provides a first major step in documenting and conserving the local plant diversity in Delhi NCR, which witnessed high species richness within a relatively small, localized area and harbors many high-value medicinal plants used in Ayurveda and other Indian traditional systems of medicine. The local hotspot areas that serve as a unique ecosystem for flora are being depleted day by day as a result of anthropogenic pressure. Hence, there is a need to conserve the species hotspots involving local communities who always interact with these ecosystems. The present study documents 272 plant species belonging to 204 genera and 69 families from the Delhi NCR of India. The aquatic and terrestrial vegetation in the study area was surveyed frequently throughout the year in different seasons, and plant collections were made. The majority of species documented were flowering plants, which comprised 216 dicots, 53 monocots, and three species belonged to lycophytes and fern groups. Fabaceae was the most dominant family with 39 plant species, followed by Poaceae (31 species), Asteraceae (25 species), Convolvulaceae (14 species), and Amaranthaceae and Malvaceae (12 species each). Genus *Ipomoea* is recorded to have the highest number of species (7), followed by *Euphorbia* and *Cyperus*, having five species each. Overall, the herbaceous community of species was greater in numbers than other life forms.

**Keywords:** Biodiversity documentation, diverse habitats, high-value herbs, local flora, rare plants, sustainable utilization, village panchayat, western Uttar Pradesh, wild plants.

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**Author contributions:** AKT carried out the field survey, compiled data, captured photographs and prepared the manuscript. JKS, as a principal investigator, mentored the whole research work, reviewed, and edited the manuscript. Both authors approved the final submitted manuscript.

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## INTRODUCTION

Floristic surveys and subsequent documentation play an important role in the conservation of biodiversity (Sharma et al. 2018). Repeated surveys in any area in different seasons increase the chances of documenting rare and unique species, but the absence of knowledge about the species present and taxonomic identification of individual species makes it difficult to assess the richness of plant diversity.

Western Uttar Pradesh, within Delhi NCR (National Capital Region) has some demographic, economic, and cultural patterns that are distinct from other parts of Uttar Pradesh, and more closely resemble those of Haryana & Rajasthan states. A major part of western Uttar Pradesh falls within National Capital Region (NCR) of India and is experiencing rapid economic growth due to intensive agriculture and infrastructure development; hence, it is imperative to document and conserve the floristic wealth of these areas before the plant species are threatened and lost (Sharma et al. 2018).

Very few studies (Singh 1969; Vardhana 2007; Ahamed & Gupta 2010; Shishodia 2013; Malik 2015) are available supporting the floristic studies of western Uttar Pradesh, which come under Delhi NCR. The first major step in documenting and conserving the local plant diversity is the survey of the flora of that region. There is a need for proper inventory and documentation of all plants available in the western Uttar Pradesh NCR region, which will help formulate a much-needed strategy for conservation.

The present study has been carried out in Delhi NCR of western Uttar Pradesh. The study provides baseline information on floristic diversity with some unique, rare, and new species record that will help in updating the flora of India. The study also highlights many high-value medicinal herbs growing in the area. The present work is the first exhaustive study of its kind in Delhi NCR and is vital for the conservation of local flora and also for increasing awareness among local people.

## MATERIAL AND METHODS

### Study area

The study area is the Chithara Village Panchayat including the campus of Shiv Nadar University, Gautam Buddha Nagar District in western Uttar Pradesh (Figure 1); it is the eastern part of Delhi NCR. This region falls in the Gangetic plains, which are one of the most fertile regions of the country and equally rich in wild

plant diversity. Geographically, Chithara lies between 28.516–28.55 °N and 77.55–77.58 °E, and is one of the 56 Panchayats under Dadri Block Panchayat/Tehsil and covers an area of 7.7 km<sup>2</sup>. The village has a population of 7,656 of which 4,098 are males while 3,558 are females as per Population Census 2011. The village is divided into mohallas largely based on communities. Gujjar and Jatav communities are prominent in the village.

Chithara is a sub-urban area with a semi-arid climate. The climate is typically monsoonal with three distinct seasons, namely, summer (March–June), rainy (July–September), and winter (October–February). It experiences the hottest weather in June, with maximum temperature around 45°C. The coldest month is January, with minimum temperature around 5°C. August is usually the wettest month during the rainy season.

The soil is fertile alluvial, whose pH ranges between 7.64–9.38 with reasonably good maximum water holding capacity. Nutrient-wise the soil contained organic carbon (0.299–0.400%), which is within the desirable range of soils of upper Gangetic Plain. The village is surrounded by agricultural fields and several wetlands. The wild date palm tree, *Phoenix sylvestris* (L.) Roxb., is scattered as individual trees, in small groups, and in large groves. The village has an agriculture-based economy, mainly having wheat, and paddy cultivation.

### Methods

The biodiversity documentation of Chithara Village Panchayat was carried out during 2015–2019. Field surveys covered different types of habitats such as agricultural fields, canal bunds, roadsides, village streets, wild date palm groves, wetlands, wastelands, grasslands (Sharma et al. 2018). The aquatic and terrestrial vegetation of the area was surveyed frequently throughout the year, covering different seasons. Photographs of each species were taken in the field for identification purposes. The plants were identified with the help of available floras (Duthie 1960; Maheshwari 1966; Sharma & Dhakre 1995; Vardhana 2007) and herbaria of the Botanical Survey of India, Northern Regional Office, Dehradun, and the Forest Research Institute, Dehradun. The specimens of identified plants were deposited in the BSI herbarium, Dehradun and CESE Department, Shiv Nadar University (SNU/CESE). The taxonomic identity of the plant specimens was verified from POWO (2024). The medicinal properties and medicinal uses of each plant species were studied, and among the list, 10 highly important medicinal plants were identified, which are known for their outstanding medicinal properties and are used in Ayurveda and

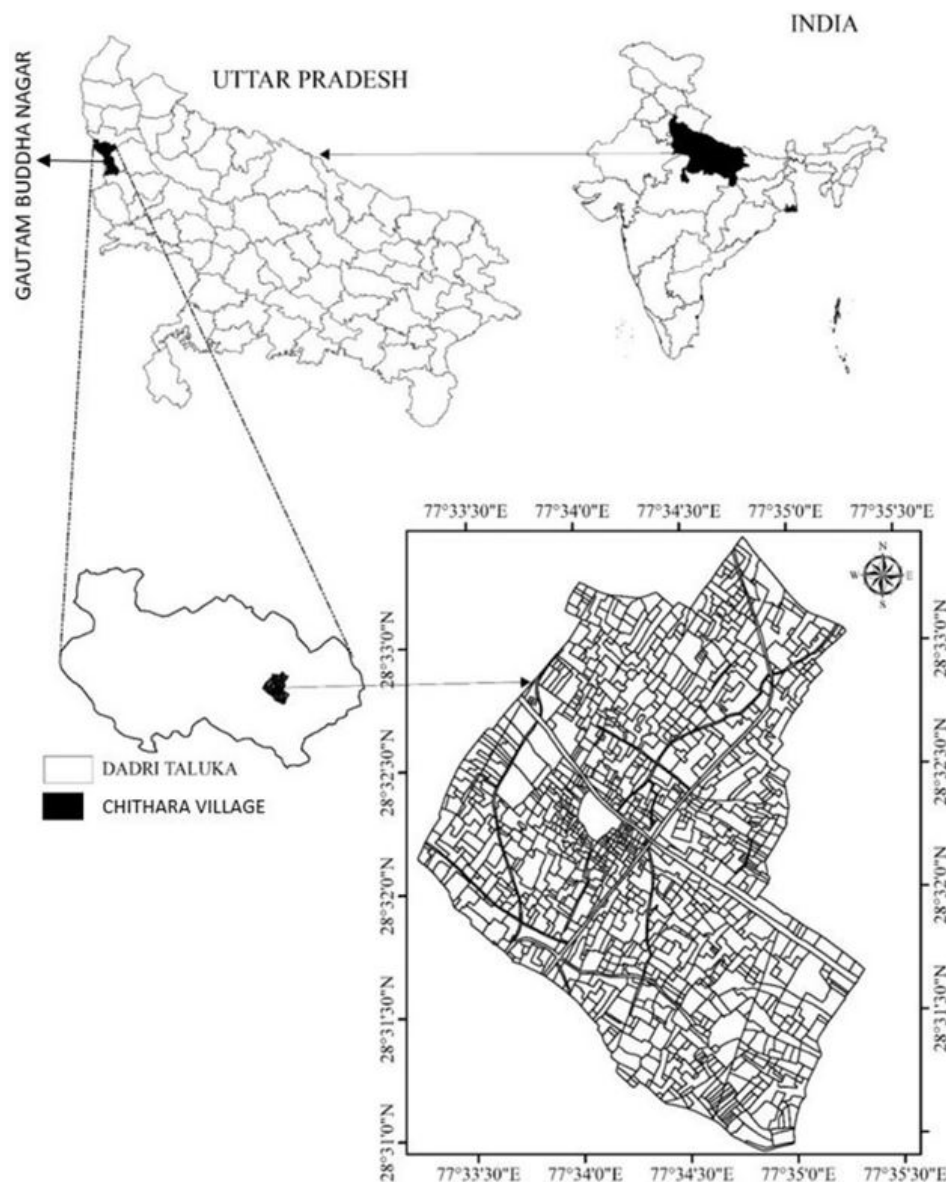


Figure 1. Location map of study area.

other traditional systems of medicine (Sharma et al. 2018). Plant species with very restricted distribution were considered locally rare.

## RESULTS AND DISCUSSION

The present study documented a total of 272 plant species belonging to 204 genera and 69 families. The majority of species were flowering plants (269 plants: dicots—216 species, monocots—53 species) and only three species belonged to lycophytes and fern categories (Table 1).

In terms of percentage, 79% of species were

dicotyledons, 20% were monocotyledons, and 1% were lycophytes & fern categories (Figure 2). There was a preponderance of tall grasses such as *Saccharum spontaneum* L., *Saccharum bengalense* Retz., and *Phragmites karka* (Retz.) Trin. ex Steud., particularly in the wetland areas, which is very typical of uncultivated lands in the region of Gangetic plains.

Previously published study reveals that the flora of Delhi had been extensively explored by Maheshwari (1963) who reported a total of 531 species from the region (Table 2). The present study reported 272 plant species (Table 1), which look-like small in number with respect to earlier work, but in terms of the geographic area, it is a very high proportion, which is only 7.7 km<sup>2</sup>

Table 1. List of the plant species in Chithara Village Panchayat, Delhi NCR.

|    | Botanical name                                         | Family           | Vernacular/ Common name   | Herbarium catalogue no. |
|----|--------------------------------------------------------|------------------|---------------------------|-------------------------|
|    | <b>Herbs</b>                                           |                  |                           |                         |
| 1  | <i>Achyranthes aspera</i> L.                           | Amaranthaceae    | Chirchita, Latjira        | SNU/CESE/188            |
| 2  | <i>Acmella paniculata</i> (Wall. ex DC.) R.K.Jansen    | Asteraceae       | Toothache Plant           | SNU/CESE/277            |
| 3  | <i>Ageratum conyzoides</i> (L.) L.                     | Asteraceae       | Billygoat-weed            | SNU/CESE/073            |
| 4  | <i>Ageratum houstonianum</i> Mill.                     | Asteraceae       | Floss Flower              | SNU/CESE/422            |
| 5  | <i>Alhagi maurorum</i> Medik.                          | Fabaceae         | Camelthorn-bush           | SNU/CESE/435            |
| 6  | <i>Alternanthera paronychioides</i> A.St.-Hil.         | Amaranthaceae    | Smooth Chaff Flower       | SNU/CESE/392            |
| 7  | <i>Alternanthera philoxeroides</i> (Mart.) Griseb.     | Amaranthaceae    | Alligator Weed            | SNU/CESE/285            |
| 8  | <i>Alternanthera pungens</i> (Kunth)                   | Amaranthaceae    | Chaff-Flower              | SNU/CESE/101            |
| 9  | <i>Alternanthera sessilis</i> (L.) R.Br. ex DC.        | Amaranthaceae    | Sessile Joyweed           | SNU/CESE/152            |
| 10 | <i>Alysicarpus monilifer</i> (L.) DC.                  | Fabaceae         | Necklace-pod Alyce Clover | SNU/CESE/130            |
| 11 | <i>Alysicarpus vaginalis</i> (L.) DC.                  | Fabaceae         | Alyce Clover              | SNU/CESE/159            |
| 12 | <i>Amaranthus viridis</i> L.                           | Amaranthaceae    | Jangali Chaulai           | SNU/CESE/002            |
| 13 | <i>Ammannia baccifera</i> L.                           | Lythraceae       | Blistering Ammannia       | SNU/CESE/236            |
| 14 | <i>Anisomeles indica</i> (L.) Kuntze                   | Lamiaceae        | Kala Bhangra              | SNU/CESE/251            |
| 15 | <i>Arabidopsis thaliana</i> (L.) Heynh.                | Brassicaceae     | Thale Cress               | SNU/CESE/316            |
| 16 | <i>Arenaria serpyllifolia</i> L.                       | Caryophyllaceae  | Thyme-leaved Sandwort     | SNU/CESE/362            |
| 17 | <i>Argemone mexicana</i> L.                            | Papaveraceae     | Satyanashi                | SNU/CESE/038            |
| 18 | <i>Artemisia scoparia</i> Waldst. & Kitam.             | Asteraceae       | Redstem Wormwood          | SNU/CESE/168            |
| 19 | <i>Avena sterilis</i> L.                               | Poaceae          | Jangali Jai               | SNU/CESE/325            |
| 20 | <i>Bacopa monnieri</i> (L.) Wettst.                    | Plantaginaceae   | Water Hyssop (Brahmi)     | SNU/CESE/220            |
| 21 | <i>Barleria prionitis</i> L.                           | Acanthaceae      | Vajradanti                | SNU/CESE/300            |
| 22 | <i>Bidens pilosa</i> L.                                | Asteraceae       | Black-jack                | SNU/CESE/071            |
| 23 | <i>Blainvillea acmella</i> (L.) Philipson              | Asteraceae       | Para Cress Flower         | SNU/CESE/208            |
| 24 | <i>Blumea laciniata</i> (Wall. ex Roxb.) DC.           | Asteraceae       | Cutleaf Blumea            | SNU/CESE/423            |
| 25 | <i>Blumea obliqua</i> (L.) Druce                       | Asteraceae       | Common Floss Flower       | SNU/CESE/269            |
| 26 | <i>Blumea viscosa</i> (Mill.) V.M.Badillo              | Asteraceae       | Sticky Blumea             | SNU/CESE/427            |
| 27 | <i>Boerhavia diffusa</i> L.                            | Nyctaginaceae    | Punarnava                 | SNU/CESE/341            |
| 28 | <i>Brachiaria ramosa</i> (L.) Stapf                    | Poaceae          | Browntop Millet           | SNU/CESE/190            |
| 29 | <i>Brachiaria reptans</i> (L.) C.A.Gardner & C.E.Hubb. | Poaceae          | Running Grass             | SNU/CESE/085            |
| 30 | <i>Caesulia axillaris</i> Roxb.                        | Asteraceae       | Pink Node Flower          | SNU/CESE/280            |
| 31 | <i>Cannabis sativa</i> L.                              | Cannabaceae      | Bhang                     | SNU/CESE/148            |
| 32 | <i>Capsella bursa-pastoris</i> (L.) Medik.             | Brassicaceae     | Shepherd's Purse          | SNU/CESE/317            |
| 33 | <i>Cardamine hirsuta</i> L.                            | Brassicaceae     | Hairy Bitter Cress        | SNU/CESE/292            |
| 34 | <i>Carthamus oxyacantha</i> M.Bieb.                    | Asteraceae       | Wild Safflower            | SNU/CESE/434            |
| 35 | <i>Celosia argentea</i> L.                             | Amaranthaceae    | Safed Murga               | SNU/CESE/054            |
| 36 | <i>Cenchrus ciliaris</i> L.                            | Poaceae          | Buffel Grass              | SNU/CESE/346            |
| 37 | <i>Centaurium pulchellum</i> (Sw.) Druce               | Gentianaceae     | Pink Centaury             | SNU/CESE/349            |
| 38 | <i>Centella asiatica</i> (L.) Urb.                     | Apiaceae         | Indian Pennywort (Brahmi) | SNU/CESE/383            |
| 39 | <i>Ceratophyllum demersum</i> L.                       | Ceratophyllaceae | Coon's Tail               | SNU/CESE/353            |
| 40 | <i>Chenopodium album</i> L.                            | Amaranthaceae    | Bathua                    | SNU/CESE/304            |
| 41 | <i>Chenopodium murale</i> L.                           | Amaranthaceae    | Jangali Bathua            | SNU/CESE/416            |
| 42 | <i>Chloris barbata</i> Sw.                             | Poaceae          | Feather Finger Grass      | SNU/CESE/439            |
| 43 | <i>Chrysopogon zizanioides</i> (L.) Roberty            | Poaceae          | Khas-khas                 | SNU/CESE/386            |

|    | Botanical name                                         | Family         | Vernacular/ Common name | Herbarium catalogue no. |
|----|--------------------------------------------------------|----------------|-------------------------|-------------------------|
| 44 | <i>Cirsium arvense</i> (L.) Scop.                      | Asteraceae     | Creeping Thistle        | SNU/CESE/347            |
| 45 | <i>Cleome viscosa</i> L.                               | Cleomaceae     | Pili Hurhur             | SNU/CESE/030            |
| 46 | <i>Commelina benghalensis</i> L.                       | Commelinaceae  | Kankawwa                | SNU/CESE/231            |
| 47 | <i>Commelina forskoolii</i> Vahl                       | Commelinaceae  | Kankawwa                | SNU/CESE/089            |
| 48 | <i>Convolvulus prostratus</i> Forssk.                  | Convolvulaceae | Shankhpushpi            | SNU/CESE/343            |
| 49 | <i>Corchorus aestuans</i> L.                           | Malvaceae      | Chonch                  | SNU/CESE/077            |
| 50 | <i>Corchorus olitorius</i> L.                          | Malvaceae      | Pat-Sag                 | SNU/CESE/384            |
| 51 | <i>Corchorus tridens</i> L.                            | Malvaceae      | Horn-fruited Jute       | SNU/CESE/061            |
| 52 | <i>Crotalaria medicaginea</i> Lam.                     | Fabaceae       | Trefoil Rattlepod       | SNU/CESE/045            |
| 53 | <i>Crotalaria mysorensis</i> Roth                      | Fabaceae       | Mysore Rattlepod        | SNU/CESE/209            |
| 54 | <i>Croton bonplandianus</i> Baill.                     | Euphorbiaceae  | Ban Tulsi               | SNU/CESE/005            |
| 55 | <i>Cyanotis axillaris</i> (L.) D. Don ex Sweet         | Commelinaceae  | Kana                    | SNU/CESE/174            |
| 56 | <i>Cyanthillium cinereum</i> (L.) H. Rob.              | Asteraceae     | Sahadevi                | SNU/CESE/193            |
| 57 | <i>Cynodon dactylon</i> (L.) Pers.                     | Poaceae        | Doob                    | SNU/CESE/006            |
| 58 | <i>Cyperus alopecuroides</i> Rottb.                    | Cyperaceae     | Foxtail Flatsedge       | SNU/CESE/118            |
| 59 | <i>Cyperus compressus</i> L.                           | Cyperaceae     | Mothi                   | SNU/CESE/387            |
| 60 | <i>Cyperus difformis</i> L.                            | Cyperaceae     | Small-Flowered Nutsedge | SNU/CESE/047            |
| 61 | <i>Cyperus iria</i> L.                                 | Cyperaceae     | Rice Flatsedge          | SNU/CESE/385            |
| 62 | <i>Cyperus rotundus</i> L.                             | Cyperaceae     | Motha                   | SNU/CESE/019            |
| 63 | <i>Dactyloctenium aegyptium</i> (L.) Willd.            | Poaceae        | Makra Ghas              | SNU/CESE/048            |
| 64 | <i>Datura innoxia</i> Mill.                            | Solanaceae     | Safed Dhatura           | SNU/CESE/007            |
| 65 | <i>Desmodium gangeticum</i> (L.) DC.                   | Fabaceae       | Shalaparni              | SNU/CESE/175            |
| 66 | <i>Desmodium triflorum</i> (L.) DC.                    | Fabaceae       | Tipatiya                | SNU/CESE/218            |
| 67 | <i>Desmostachya bipinnata</i> (L.) Stapf               | Poaceae        | Dabh, Kush              | SNU/CESE/367            |
| 68 | <i>Dichanthium annulatum</i> (Forssk.) Stapf           | Poaceae        | Marvel Grass            | SNU/CESE/391            |
| 69 | <i>Digera muricata</i> (L.) Mart.                      | Amaranthaceae  | Lahsuva                 | SNU/CESE/368            |
| 70 | <i>Digitaria ciliaris</i> (Retz.) Koeler               | Poaceae        | Wild Crabgrass          | SNU/CESE/194            |
| 71 | <i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants | Amaranthaceae  | Sugandha Vastooka       | SNU/CESE/096            |
| 72 | <i>Echinochloa colona</i> (L.) Link                    | Poaceae        | Shama                   | SNU/CESE/136            |
| 73 | <i>Echinochloa crus-galli</i> (L.) P. Beauv.           | Poaceae        | Sanwak                  | SNU/CESE/371            |
| 74 | <i>Eclipta prostrata</i> (L.) L.                       | Asteraceae     | Bhringaraj              | SNU/CESE/021            |
| 75 | <i>Eichhornia crassipes</i> (Mart.) Solms              | Pontederiaceae | Jal Kumbhi              | SNU/CESE/232            |
| 76 | <i>Eleusine indica</i> (L.) Gaertn.                    | Poaceae        | Jangali Marua           | SNU/CESE/112            |
| 77 | <i>Eragrostis amabilis</i> (L.) Wight & Arn.           | Poaceae        | Bharbhusi               | SNU/CESE/393            |
| 78 | <i>Eragrostis japonica</i> (Thunb.) Trin.              | Poaceae        | Pond Lovegrass          | SNU/CESE/242            |
| 79 | <i>Erigeron bonariensis</i> L.                         | Asteraceae     | Flax-leaf Fleabane      | SNU/CESE/100            |
| 80 | <i>Eriochloa procer</i> a (Retz.) C.E. Hubb.           | Poaceae        | Tropical Cupgrass       | SNU/CESE/401            |
| 81 | <i>Euphorbia heterophylla</i> L.                       | Euphorbiaceae  | Lesser Green Poinsettia | SNU/CESE/273            |
| 82 | <i>Euphorbia hirta</i> L.                              | Euphorbiaceae  | Bari Dudhi, Asthma Weed | SNU/CESE/051            |
| 83 | <i>Euphorbia hypericifolia</i> L.                      | Euphorbiaceae  | Dudh Mogra              | SNU/CESE/196            |
| 84 | <i>Euphorbia prostrata</i> Aiton                       | Euphorbiaceae  | Choti Dudhi             | SNU/CESE/008            |
| 85 | <i>Euphorbia serpens</i> Kunth                         | Euphorbiaceae  | Dudhi                   | SNU/CESE/004            |
| 86 | <i>Evolvulus nummularius</i> (L.) L.                   | Convolvulaceae | Musakarni               | SNU/CESE/394            |
| 87 | <i>Fimbristylis dichotoma</i> (L.) Vahl                | Cyperaceae     | Tall Fringe Rush        | SNU/CESE/124            |

|     | Botanical name                                        | Family           | Vernacular/ Common name   | Herbarium catalogue no. |
|-----|-------------------------------------------------------|------------------|---------------------------|-------------------------|
| 88  | <i>Fimbristylis ferruginea</i> (L.) Vahl              | Cyperaceae       | West Indian Fimbry        | SNU/CESE/079            |
| 89  | <i>Fumaria indica</i> (Hausskn.) Pugsley              | Papaveraceae     | Pittpapra                 | SNU/CESE/307            |
| 90  | <i>Gnaphalium purpureum</i> L.                        | Asteraceae       | Purple Cudweed            | SNU/CESE/319            |
| 91  | <i>Gomphrena celosioides</i> Mart.                    | Amaranthaceae    | Prostrate Globe-amaranth  | SNU/CESE/062            |
| 92  | <i>Gonostegia pentandra</i> (Roxb.) Miq.              | Urticaceae       | Narrow-Leaf Pouzol's Bush | SNU/CESE/097            |
| 93  | <i>Grangea maderaspatana</i> (L.) Poir.               | Asteraceae       | Mustaru                   | SNU/CESE/358            |
| 94  | <i>Heliotropium ellipticum</i> Ledeb.                 | Boraginaceae     | Hathisund                 | SNU/CESE/010            |
| 95  | <i>Hemarthria compressa</i> (L.f.) R.Br.              | Poaceae          | Whip Grass                | SNU/CESE/125            |
| 96  | <i>Hydrilla verticillata</i> (L.f.) Royle             | Hydrocharitaceae | Hydrilla                  | SNU/CESE/354            |
| 97  | <i>Hydrocotyle sibthorpioides</i> Lam.                | Araliaceae       | Lawn Pennywort            | SNU/CESE/126            |
| 98  | <i>Mesospaerum suaveolens</i> (L.) Kuntze             | Lamiaceae        | Vilaiti Tulsi             | SNU/CESE/249            |
| 99  | <i>Imperata cylindrica</i> (L.) Raeusch.              | Poaceae          | Blady Grass               | SNU/CESE/041            |
| 100 | <i>Indigofera astragalina</i> DC.                     | Fabaceae         | Silky Indigo              | SNU/CESE/400            |
| 101 | <i>Indigofera linifolia</i> (L.f.) Retz.              | Fabaceae         | Ratnamala                 | SNU/CESE/250            |
| 102 | <i>Indigofera tinctoria</i> L.                        | Fabaceae         | Neel                      | SNU/CESE/149            |
| 103 | <i>Indigofera tsiangiana</i> Metcalf                  | Fabaceae         | Birdsville Indigo         | SNU/CESE/432            |
| 104 | <i>Justicia japonica</i> Thunb.                       | Acanthaceae      | Common Small Justicia     | SNU/CESE/139            |
| 105 | <i>Lathyrus aphaca</i> L.                             | Fabaceae         | Jangali Matar             | SNU/CESE/330            |
| 106 | <i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal | Asteraceae       | Peeli Duddhi              | SNU/CESE/011            |
| 107 | <i>Lemna perpusilla</i> Torr.                         | Araceae          | Minute Duckweed           | SNU/CESE/411            |
| 108 | <i>Lepidium didymum</i> L.                            | Brassicaceae     | Jangali Hala              | SNU/CESE/302            |
| 109 | <i>Leptochloa panicea</i> (Retz.) Ohwi                | Poaceae          | Sprangletop               | SNU/CESE/441            |
| 110 | <i>Leucas cephalotes</i> (Roth) Spreng.               | Lamiaceae        | Guma                      | SNU/CESE/197            |
| 111 | <i>Lindernia ciliata</i> (Colsm.) Pennell             | Linderniaceae    | Fringed False Pimpernel   | SNU/CESE/086            |
| 112 | <i>Lindernia crustacea</i> (L.) F.Muell.              | Linderniaceae    | Brittle False Pimpernel   | SNU/CESE/087            |
| 113 | <i>Ludwigia hyssopifolia</i> (G.Don) Exell            | Onagraceae       | Ban Long                  | SNU/CESE/198            |
| 114 | <i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven          | Onagraceae       | Ban Long                  | SNU/CESE/226            |
| 115 | <i>Lysimachia loeflingii</i> F.J.Jiménez & M.Talavera | Primulaceae      | Krishnaneel               | SNU/CESE/106            |
| 116 | <i>Malva parviflora</i> L.                            | Malvaceae        | Panirak                   | SNU/CESE/320            |
| 117 | <i>Malvastrum coromandelianum</i> (L.) Garcke         | Malvaceae        | Kharenti                  | SNU/CESE/018            |
| 118 | <i>Mazus pumilus</i> (Burm.f.) Steenis                | Phrymaceae       | Japanese Mazus            | SNU/CESE/023            |
| 119 | <i>Mecardonia procumbens</i> (Mill.) Small            | Plantaginaceae   | Baby Jump Up              | SNU/CESE/083            |
| 120 | <i>Medicago monantha</i> (C.A.Mey.) Trautv.           | Fabaceae         | Single-Flowered Medick    | SNU/CESE/335            |
| 121 | <i>Medicago lupulina</i> L.                           | Fabaceae         | Black Medic               | SNU/CESE/294            |
| 122 | <i>Medicago polymorpha</i> L.                         | Fabaceae         | Toothed Medic             | SNU/CESE/424            |
| 123 | <i>Melilotus albus</i> Medik.                         | Fabaceae         | Safed Ban Methi           | SNU/CESE/337            |
| 124 | <i>Melilotus indicus</i> (L.) All.                    | Fabaceae         | Ban Methi                 | SNU/CESE/287            |
| 125 | <i>Melochia corchorifolia</i> L.                      | Malvaceae        | Chitrabeej                | SNU/CESE/050            |
| 126 | <i>Mollugo nudicaulis</i> Lam.                        | Molluginaceae    | Naked-stem Carpetweed     | SNU/CESE/164            |
| 127 | <i>Murdannia nudiflora</i> (L.) Brenan                | Commelinaceae    | Kansura                   | SNU/CESE/177            |
| 128 | <i>Nepeta hindostana</i> (B.Heyne ex Roth) Haines     | Lamiaceae        | Billi Lotan               | SNU/CESE/200            |
| 129 | <i>Nicotiana plumbaginifolia</i> Viv.                 | Solanaceae       | Jangali Tambakoo          | SNU/CESE/012            |
| 130 | <i>Nymphaea pubescens</i> Willd.                      | Nymphaeaceae     | Kumud                     | SNU/CESE/276            |
| 131 | <i>Nymphoides cristata</i> (Roxb.) Kuntze             | Menyanthaceae    | Kumudini                  | SNU/CESE/275            |

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|-----|------------------------------------------------------------|------------------|------------------------------|-------------------------|
| 132 | <i>Oldenlandia corymbosa</i> L.                            | Rubiaceae        | Daman Pappar                 | SNU/CESE/013            |
| 133 | <i>Oxalis corniculata</i> L.                               | Oxalidaceae      | Amrul, Khatti-buti           | SNU/CESE/084            |
| 134 | <i>Oxalis debilis</i> var. <i>corymbosa</i> (DC.) Lourteig | Oxalidaceae      | Khatti-mithi                 | SNU/CESE/338            |
| 135 | <i>Panicum antidotale</i> Retz.                            | Poaceae          | Blue Panic Grass             | SNU/CESE/405            |
| 136 | <i>Parthenium hysterophorus</i> L.                         | Asteraceae       | Gajar Ghas                   | SNU/CESE/014            |
| 137 | <i>Paspalum distichum</i> L.                               | Poaceae          | Knotgrass                    | SNU/CESE/440            |
| 138 | <i>Paspalum scrobiculatum</i> L.                           | Poaceae          | Kodo                         | SNU/CESE/063            |
| 139 | <i>Dicliptera paniculata</i> (Forssk.) I.Darbysh.          | Acanthaceae      | Atrilal                      | SNU/CESE/267            |
| 140 | <i>Persicaria barbata</i> (L.) H.Hara                      | Polygonaceae     | Bearded Knotweed             | SNU/CESE/398            |
| 141 | <i>Persicaria lanigera</i> (R.Br.) Soják                   | Polygonaceae     | Pink Knotweed                | SNU/CESE/024            |
| 142 | <i>Phalaris minor</i> Retz.                                | Poaceae          | Mandusi                      | SNU/CESE/326            |
| 143 | <i>Phragmites karka</i> (Retz.) Trin. ex Steud.            | Poaceae          | Narkul                       | SNU/CESE/406            |
| 144 | <i>Phyla nodiflora</i> (L.) Greene                         | Verbenaceae      | Jal Buti                     | SNU/CESE/070            |
| 145 | <i>Phyllanthus amarus</i> Schumacher & Thonn.              | Phyllanthaceae   | Bhuiaonla                    | SNU/CESE/132            |
| 146 | <i>Phyllanthus maderaspatensis</i> L.                      | Phyllanthaceae   | Hajarmani                    | SNU/CESE/043            |
| 147 | <i>Phyllanthus tenellus</i> Roxb.                          | Phyllanthaceae   | Mascarene Island Leaf-flower | SNU/CESE/437            |
| 148 | <i>Physalis angulata</i> L.                                | Solanaceae       | Rasbhari                     | SNU/CESE/037            |
| 149 | <i>Physalis peruviana</i> L.                               | Solanaceae       | Rasbhari                     | SNU/CESE/410            |
| 150 | <i>Pistia stratiotes</i> L.                                | Araceae          | Water Lettuce                | SNU/CESE/395            |
| 151 | <i>Pluchea lanceolata</i> (DC.) C.B.Clarke                 | Asteraceae       | Rasna                        | SNU/CESE/064            |
| 152 | <i>Poa annua</i> L.                                        | Poaceae          | Annual Bluegrass             | SNU/CESE/421            |
| 153 | <i>Polygonum plebeium</i> R.Br.                            | Polygonaceae     | Small Knotweed               | SNU/CESE/308            |
| 154 | <i>Portulaca oleracea</i> L.                               | Portulacaceae    | Kulpha, Noni                 | SNU/CESE/351            |
| 155 | <i>Portulaca quadrifida</i> L.                             | Portulacaceae    | Chicken Weed                 | SNU/CESE/381            |
| 156 | <i>Potamogeton crispus</i> L.                              | Potamogetonaceae | Curly-Leaf Pondweed          | SNU/CESE/412            |
| 157 | <i>Ranunculus sceleratus</i> L.                            | Ranunculaceae    | Jaldhaniya                   | SNU/CESE/352            |
| 158 | <i>Rorippa palustris</i> (L.) Besser                       | Brassicaceae     | Chamsuru                     | SNU/CESE/315            |
| 159 | <i>Rumex dentatus</i> L.                                   | Polygonaceae     | Jangali Palak                | SNU/CESE/419            |
| 160 | <i>Rumex hypogaeus</i> T.M.Schust. & Reveal                | Polygonaceae     | Three Corner Jack            | SNU/CESE/314            |
| 161 | <i>Rungia pectinata</i> (L.) Nees                          | Acanthaceae      | Comb Rungia                  | SNU/CESE/413            |
| 162 | <i>Saccharum bengalense</i> Retz.                          | Poaceae          | Munj, Sarkanda               | SNU/CESE/404            |
| 163 | <i>Saccharum spontaneum</i> L.                             | Poaceae          | Kaans                        | SNU/CESE/379            |
| 164 | <i>Sagittaria guayanensis</i> Kunth                        | Alismataceae     | Guyanese Arrowhead           | SNU/CESE/199            |
| 165 | <i>Scoparia dulcis</i> L.                                  | Plantaginaceae   | Ghoda Tulsi                  | SNU/CESE/001            |
| 166 | <i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby          | Fabaceae         | Chakwar                      | SNU/CESE/147            |
| 167 | <i>Senna occidentalis</i> (L.) Link                        | Fabaceae         | Kasundi                      | SNU/CESE/016            |
| 168 | <i>Sesamum indicum</i> L.                                  | Pedaliaceae      | Safed Til                    | SNU/CESE/184            |
| 169 | <i>Sesbania bispinosa</i> (Jacq.) W.Wight                  | Fabaceae         | Dhaincha                     | SNU/CESE/065            |
| 170 | <i>Setaria pumila</i> (Poir.) Roem. & Schult.              | Poaceae          | Bandra                       | SNU/CESE/128            |
| 171 | <i>Setaria verticillata</i> (L.) P.Beauv.                  | Poaceae          | Laptuna                      | SNU/CESE/374            |
| 172 | <i>Sida acuta</i> Burm.f.                                  | Malvaceae        | Baraira                      | SNU/CESE/068            |
| 173 | <i>Sida cordata</i> (Burm.f.) Borss.Waalk.                 | Malvaceae        | Kharenti                     | SNU/CESE/203            |
| 174 | <i>Sida cordifolia</i> L.                                  | Malvaceae        | Bala                         | SNU/CESE/215            |
| 175 | <i>Silene conoidea</i> L.                                  | Caryophyllaceae  | Cone Catchfly                | SNU/CESE/310            |
| 176 | <i>Sisymbrium irio</i> L.                                  | Brassicaceae     | Khubkalan                    | SNU/CESE/322            |

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|-----|-----------------------------------------------------|------------------|-------------------------|-------------------------|
| 177 | <i>Solanum americanum</i> Mill.                     | Solanaceae       | Makoy                   | SNU/CESE/286            |
| 178 | <i>Solanum surattense</i> Burm. f.                  | Solanaceae       | Kateli                  | SNU/CESE/032            |
| 179 | <i>Sonchus asper</i> (L.) Hill                      | Asteraceae       | Dudhi                   | SNU/CESE/311            |
| 180 | <i>Sonchus brachyotus</i> DC.                       | Asteraceae       | Dudhali                 | SNU/CESE/117            |
| 181 | <i>Sorghum halepense</i> (L.) Pers.                 | Poaceae          | Jangali Jowar           | SNU/CESE/205            |
| 182 | <i>Spergula arvensis</i> L.                         | Caryophyllaceae  | Ban Dhania              | SNU/CESE/425            |
| 183 | <i>Spermacoce articularis</i> L.f.                  | Rubiaceae        | Guthari                 | SNU/CESE/058            |
| 184 | <i>Sphenoclea zeylanica</i> Gaertn.                 | Sphenocleaceae   | Goose Weed              | SNU/CESE/204            |
| 185 | <i>Spirodela polyrhiza</i> (L.) Schleid.            | Araceae          | Common Duck Meat        | SNU/CESE/414            |
| 186 | <i>Stellaria media</i> (L.) Vill.                   | Caryophyllaceae  | Buch-Bucha              | SNU/CESE/296            |
| 187 | <i>Stuckenia pectinata</i> (L.) Börner              | Potamogetonaceae | Sago Pondweed           | SNU/CESE/433            |
| 188 | <i>Symphyotrichum squamatum</i> (Spreng.) G.L.Nesom | Asteraceae       | Annual Saltmarsh Aster  | SNU/CESE/456            |
| 189 | <i>Tephrosia pumila</i> (Lam.) Pers.                | Fabaceae         | Indigo Sauvage          | SNU/CESE/380            |
| 190 | <i>Tephrosia purpurea</i> (L.) Pers.                | Fabaceae         | Sharpunkha              | SNU/CESE/069            |
| 191 | <i>Tephrosia villosa</i> (L.) Pers.                 | Fabaceae         | Hoary Tephrosia         | SNU/CESE/388            |
| 192 | <i>Trianthema portulacastrum</i> L.                 | Aizoaceae        | Vishakhapara            | SNU/CESE/017            |
| 193 | <i>Tribulus terrestris</i> L.                       | Zygophyllaceae   | Gokhru                  | SNU/CESE/442            |
| 194 | <i>Tridax procumbens</i> (L.) L.                    | Asteraceae       | Ghamra                  | SNU/CESE/099            |
| 195 | <i>Trifolium tomentosum</i> L.                      | Fabaceae         | Tipatiya Ghaas          | SNU/CESE/283            |
| 196 | <i>Triumfetta rhomboidea</i> Jacq.                  | Malvaceae        | Chinese Bur             | SNU/CESE/234            |
| 197 | <i>Typha domingensis</i> Pers.                      | Typhaceae        | Patera                  | SNU/CESE/390            |
| 198 | <i>Utricularia stellaris</i> L.f.                   | Lentibulariaceae | Bladderwort             | SNU/CESE/408            |
| 199 | <i>Vallisneria spiralis</i> L.                      | Hydrocharitaceae | Tape Grass              | SNU/CESE/431            |
| 200 | <i>Verbascum chinense</i> (L.) Santapau             | Scrophulariaceae | Gadar Tambaku           | SNU/CESE/144            |
| 201 | <i>Verbascum thapsus</i> L.                         | Scrophulariaceae | Jangali Tambaku         | SNU/CESE/134            |
| 202 | <i>Veronica agrestis</i> L.                         | Plantaginaceae   | Field Speedwell         | SNU/CESE/288            |
| 203 | <i>Veronica anagallis-aquatica</i> L.               | Plantaginaceae   | Water Speedwell         | SNU/CESE/324            |
| 204 | <i>Vicia sativa</i> L.                              | Fabaceae         | Matri                   | SNU/CESE/298            |
| 205 | <i>Xanthium strumarium</i> L.                       | Asteraceae       | Sankhahuli              | SNU/CESE/257            |
|     | <b>Shrubs</b>                                       |                  |                         |                         |
| 206 | <i>Abutilon indicum</i> (L.) Sweet                  | Malvaceae        | Kanghi                  | SNU/CESE/157            |
| 207 | <i>Calotropis gigantea</i> (L.) Dryand.             | Apocynaceae      | Safed Aak               | SNU/CESE/365            |
| 208 | <i>Calotropis procera</i> (Aiton) Dryand.           | Apocynaceae      | Aak, Madar              | SNU/CESE/026            |
| 209 | <i>Capparis sepium</i> L.                           | Capparaceae      | Wild Caper Bush         | SNU/CESE/102            |
| 210 | <i>Clerodendrum phlomidis</i> L.f.                  | Verbenaceae      | Arni                    | SNU/CESE/247            |
| 211 | <i>Ficus palmata</i> Forssk.                        | Moraceae         | Jangali Anjir           | SNU/CESE/115            |
| 212 | <i>Ipomoea carnea</i> Jacq.                         | Convolvulaceae   | Behaya                  | SNU/CESE/271            |
| 213 | <i>Jatropha gossypifolia</i> L.                     | Euphorbiaceae    | Bellyache Bush          | SNU/CESE/436            |
| 214 | <i>Justicia adhatoda</i> L.                         | Acanthaceae      | Arus, Arusa             | SNU/CESE/333            |
| 215 | <i>Lantana camara</i> L.                            | Verbenaceae      | Raimuniya               | SNU/CESE/080            |
| 216 | <i>Mimosa rubicaulis</i> Lam.                       | Fabaceae         | Himalayan Mimosa        | SNU/CESE/207            |
| 217 | <i>Phyllanthus reticulatus</i> Poir.                | Phyllanthaceae   | Kale Madhu Ka Per       | SNU/CESE/116            |
| 218 | <i>Ricinus communis</i> L.                          | Euphorbiaceae    | Arandi                  | SNU/CESE/213            |
| 219 | <i>Solanum torvum</i> Sw.                           | Solanaceae       | Bhankatiya              | SNU/CESE/142            |

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|-----|----------------------------------------------------------------|----------------|---------------------------|-------------------------|
| 220 | <i>Tamarix indica</i> Willd.                                   | Tamaricaceae   | Jhau                      | SNU/CESE/396            |
| 221 | <i>Urena lobata</i> L.                                         | Malvaceae      | Bachita, Lapetua          | SNU/CESE/171            |
| 222 | <i>Withania somnifera</i> (L.) Dunal                           | Solanaceae     | Ashwagandha               | SNU/CESE/145            |
| 223 | <i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.              | Rhamnaceae     | Jhar Beri                 | SNU/CESE/240            |
|     | <b>Climbers/Creepers</b>                                       |                |                           |                         |
| 224 | <i>Abrus precatorius</i> L.                                    | Fabaceae       | Ratti                     | SNU/CESE/382            |
| 225 | <i>Cajanus scarabaeoides</i> (L.) Thouars                      | Fabaceae       | Showy Pigeonpea           | SNU/CESE/222            |
| 226 | <i>Cayratia trifolia</i> (L.) Domin                            | Vitaceae       | Three-Leaved Wild Vine    | SNU/CESE/135            |
| 227 | <i>Cissampelos pareira</i> L.                                  | Menispermaceae | Patha                     | SNU/CESE/191            |
| 228 | <i>Citrullus colocynthis</i> (L.) Schrad.                      | Cucurbitaceae  | Colocynth                 | SNU/CESE/407            |
| 229 | <i>Coccinia grandis</i> (L.) Voigt                             | Cucurbitaceae  | Kundru                    | SNU/CESE/109            |
| 230 | <i>Convolvulus arvensis</i> L.                                 | Convolvulaceae | Hirankhuri                | SNU/CESE/305            |
| 231 | <i>Cucumis melo</i> L.                                         | Cucurbitaceae  | Kachariya                 | SNU/CESE/039            |
| 232 | <i>Cuscuta chinensis</i> Lam.                                  | Convolvulaceae | Amar Bel                  | SNU/CESE/034            |
| 233 | <i>Cuscuta reflexa</i> Roxb.                                   | Convolvulaceae | Amar Bel                  | SNU/CESE/301            |
| 234 | <i>Ipomoea aquatica</i> Forssk.                                | Convolvulaceae | Kalmi Sag                 | SNU/CESE/137            |
| 235 | <i>Ipomoea coptica</i> (L.) Roth ex Roem. & Schult.            | Convolvulaceae | Egyptian Morning Glory    | SNU/CESE/091            |
| 236 | <i>Ipomoea eriocarpa</i> R. Br.                                | Convolvulaceae | Tiny Morning Glory        | SNU/CESE/210            |
| 237 | <i>Ipomoea obscura</i> (L.) Ker Gawl.                          | Convolvulaceae | Obscure Morning Glory     | SNU/CESE/131            |
| 238 | <i>Ipomoea pes-tigridis</i> L.                                 | Convolvulaceae | Tiger Foot Morning Glory  | SNU/CESE/163            |
| 239 | <i>Ipomoea triloba</i> L.                                      | Convolvulaceae | Three-lobed Morning Glory | SNU/CESE/252            |
| 240 | <i>Merremia hederacea</i> (Burm. f.) Hallier f.                | Convolvulaceae | Ivy Woodrose              | SNU/CESE/244            |
| 241 | <i>Mukia maderaspatana</i> (L.) M. Roem.                       | Cucurbitaceae  | Bilari                    | SNU/CESE/127            |
| 242 | <i>Operculina turpethum</i> (L.) Silva Manso                   | Convolvulaceae | Nisoth, Pithori           | SNU/CESE/245            |
| 243 | <i>Oxystelma esculentum</i> (L. f.) Sm.                        | Apocynaceae    | Dudhialata                | SNU/CESE/166            |
| 244 | <i>Rhynchosia capitata</i> (Roth) DC.                          | Fabaceae       | Kulata, Kulthi            | SNU/CESE/211            |
| 245 | <i>Rhynchosia minima</i> (L.) DC.                              | Fabaceae       | Kulata, Kulthi            | SNU/CESE/212            |
| 246 | <i>Teramnus labialis</i> (L.f.) Spreng.                        | Fabaceae       | Van Udad                  | SNU/CESE/217            |
| 247 | <i>Trichosanthes cucumerina</i> L.                             | Cucurbitaceae  | Jangali Chachinda         | SNU/CESE/377            |
|     | <b>Trees</b>                                                   |                |                           |                         |
| 248 | <i>Acacia nilotica</i> (L.) Delile                             | Fabaceae       | Babool                    | SNU/CESE/361            |
| 249 | <i>Albizia lebbek</i> (L.) Benth.                              | Fabaceae       | Siris                     | SNU/CESE/289            |
| 250 | <i>Azadirachta indica</i> A. Juss.                             | Meliaceae      | Neem                      | SNU/CESE/348            |
| 251 | <i>Butea monosperma</i> (Lam.) Taub.                           | Fabaceae       | Dhak, Palash              | SNU/CESE/279            |
| 252 | <i>Cordia dichotoma</i> G. Forst.                              | Boraginaceae   | Lasoda                    | SNU/CESE/003            |
| 253 | <i>Crateva adansonii</i> ssp. <i>odora</i> (Buch.-Ham.) Jacobs | Capparaceae    | Barna, Barni              | SNU/CESE/095            |
| 254 | <i>Dalbergia sissoo</i> DC.                                    | Fabaceae       | Shisham                   | SNU/CESE/418            |
| 255 | <i>Diospyros montana</i> Roxb.                                 | Ebenaceae      | Bistendu                  | SNU/CESE/357            |
| 256 | <i>Ficus religiosa</i> L.                                      | Moraceae       | Peepal                    | SNU/CESE/031            |
| 257 | <i>Holoptelea integrifolia</i> Planch.                         | Ulmaceae       | Chilbil                   | SNU/CESE/438            |
| 258 | <i>Leucaena leucocephala</i> (Lam.) de Wit                     | Fabaceae       | Subabul                   | SNU/CESE/256            |
| 259 | <i>Melia azedarach</i> L.                                      | Meliaceae      | Bakain                    | SNU/CESE/098            |
| 260 | <i>Mitragyna parvifolia</i> (Roxb.) Korth.                     | Rubiaceae      | Kaim                      | SNU/CESE/092            |
| 261 | <i>Morus alba</i> L.                                           | Moraceae       | Shahoot                   | SNU/CESE/042            |
| 262 | <i>Phoenix sylvestris</i> (L.) Roxb.                           | Arecaceae      | Jangali Khajoor           | SNU/CESE/201            |

|     | Botanical name                               | Family           | Vernacular/ Common name | Herbarium catalogue no. |
|-----|----------------------------------------------|------------------|-------------------------|-------------------------|
| 263 | <i>Prosopis cineraria</i> (L.) Druce         | Fabaceae         | Khejri                  | SNU/CESE/282            |
| 264 | <i>Prosopis juliflora</i> (Sw.) DC.          | Fabaceae         | Vilayati Babul          | SNU/CESE/180            |
| 265 | <i>Salix tetrasperma</i> Roxb.               | Salicaceae       | Bed-laila               | SNU/CESE/290            |
| 266 | <i>Sesbania sesban</i> (L.) Merr.            | Fabaceae         | Rawasan                 | SNU/CESE/066            |
| 267 | <i>Streblus asper</i> Lour.                  | Moraceae         | Sihora                  | SNU/CESE/430            |
| 268 | <i>Syzygium cumini</i> (L.) Skeels           | Myrtaceae        | Jamun                   | SNU/CESE/360            |
| 269 | <i>Ziziphus jujuba</i> Mill.                 | Rhamnaceae       | Ber                     | SNU/CESE/246            |
|     | <b>Lycophytes and Fern</b>                   |                  |                         |                         |
| 270 | <i>Ampelopteris prolifera</i> (Retz.) Copel. | Thelypteridaceae | Walking Fern            | SNU/CESE/094            |
| 271 | <i>Equisetum ramosissimum</i> Desf.          | Equisetaceae     | Branched Horsetail      | SNU/CESE/113            |
| 272 | <i>Marsilea quadrifolia</i> L.               | Marsileaceae     | Chaupatiya              | SNU/CESE/140            |

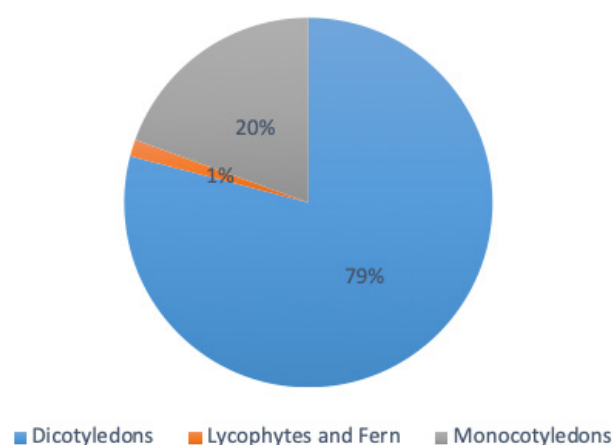


Figure 2. Percentage distribution of species under different categories.

in comparison to large geographical area of NCT of Delhi (1,483 km<sup>2</sup>).

Documentation of such a large number of species, which constitutes about 50% of flora of Delhi in such a small geographical area, clearly showed that the diverse habitats such as agricultural fields, roadsides, village streets, wetlands, canal bunds, wastelands, grasslands, and wild date palm groves, in the study area contributed to the rich plant diversity coupled with fertile soil conditions. The study area recorded many medicinal herbs growing as weeds (Tripathi et al. 2019). Sometimes, medicinal herbs growing as weeds contribute significantly to enhance the local plant diversity (Tripathi et al. 2020). The study area witnessed some prominent groves of wild date palms *P. sylvestris* associated with some other trees, herbs, and shrubs.

The floristic diversity in Delhi, and the National Capital Region (NCR) under western Uttar Pradesh was

studied from time to time (Maheshwari 1963; Singh 1969; Vardhana 2007; Ahamed & Gupta 2010; Shishodia 2013; Malik 2015) (Table 2). Compared to all these studies carried out in a specific area/district, the present study has been carried out in a village panchayat in Delhi NCR encompassing high plant diversity.

#### Family and genera dominance

With respect to families, Fabaceae was the most dominant with 39 plant species followed by Poaceae (31 species), Asteraceae (25 species), Convolvulaceae (14 species), and Amaranthaceae & Malvaceae (12 species each) (Figure 3). Euphorbiaceae & Solanaceae contributed eight species each, while Cyperaceae & Brassicaceae had seven, and six species, respectively. These families contributed approximately 60% of total plants. The dominance of these families was also reported by various authors (Duthie 1960; Vardhana 2007). Out of 272 vascular plant species, dicotyledons were represented by 56 families, 160 genera, 216 species; monocotyledons by 10 families, 41 genera, 53 species, and lycophytes & fern by three families, three genera, and three species (Figure 4). Among the dicots, the most dominant family was Fabaceae represented by 24 genera, and 39 species. Of the 10 families represented in monocotyledons, Poaceae was the most versatile family with the highest number of species belonging to 25 genera and 31 species, contributing more than 50% species of the total monocots (Table 1). Genus *Ipomoea* had the highest number of seven species. This was followed by *Euphorbia* (Euphorbiaceae) and *Cyperus* (Cyperaceae) having five species each. There were 46 genera under 23 families with at least two species each. Fourteen families had a single species each while six

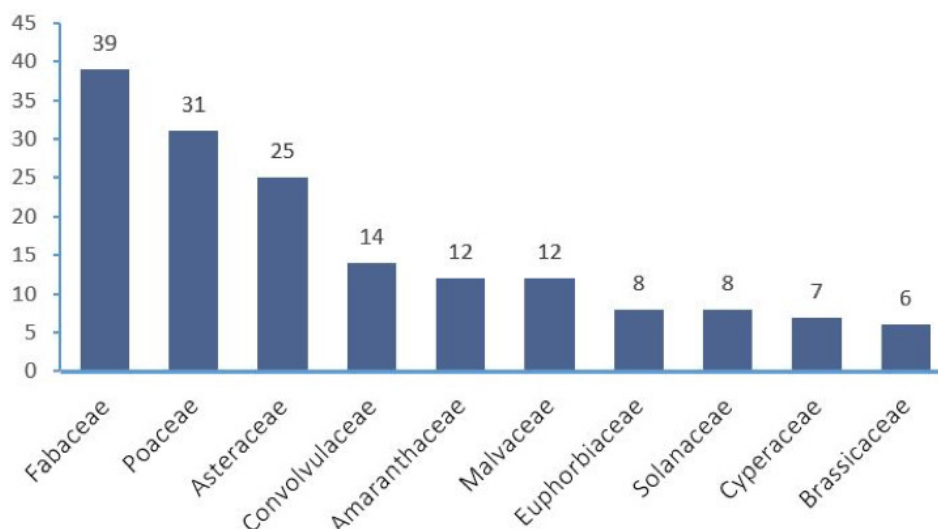


Figure 3. Top ten dominant families with number of species.

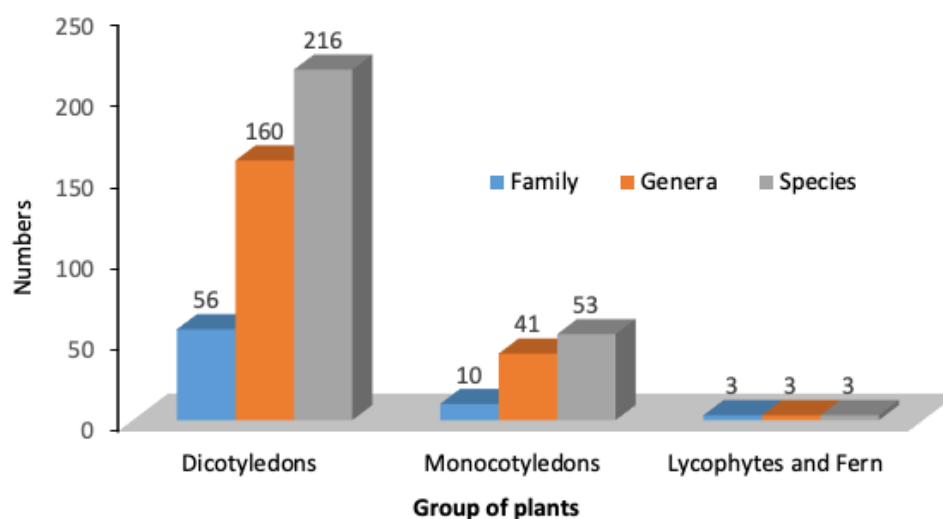


Figure 4. Family, genera and species under different categories.

families had two species each.

### Medicinally important plants

The study area witnessed many high-value medicinal plants that play a specific role in ayurveda and other systems of medicine. The list includes *Bacopa monnieri* (L.) Wettst. (Brahmi), *Boerhavia diffusa* L. (Punarnava), *Cannabis sativa* L. (Bhang), *Cissampelos pareira* L. (Patha), *Coccinia grandis* (L.) Voigt (Kundru), *Eclipta prostrata* (L.) L. (Bhringaraj), *Euphorbia hirta* L. (Bari Dudhi), *Justicia adhatoda* L. (Arus), *Sida cordifolia* L. (Bala), *Solanum americanum* Mill (Makoy), *Tribulus terrestris* L. (Gokhru), and *Withania somnifera* (L.) Dunal (Ashwagandha) which were found to be very important

as they possess medicinal properties for treating a large number of diseases in traditional system of medicines in India and other parts of the world (Image 1). The whole plant, including root, stem, and leaves is utilized traditionally for curing various ailments such as abdominal pain, anxiety, cold, cough, bronchitis, asthma, diarrhea & dysentery, dull memory, epilepsy, eye troubles, fever, inflammation, jaundice, rheumatism, skin diseases, cardiovascular problems, sexual dysfunction, and various urinary disorders (Sharma et al. 2018). These plants have been reported to contain numerous important phytochemicals such as alkanes, amino acids, flavonoids, organic acids, polyphenolic compounds, steroids, tannins, and terpenes, which

**Table 2. Floristic details of studies undertaken in the National Capital Territory Delhi (NCT Delhi), and National Capital Region (NCR) under western Uttar Pradesh.**

| Study area                           | Floristic study              |                       |               |                       |
|--------------------------------------|------------------------------|-----------------------|---------------|-----------------------|
|                                      | Total plant species recorded | No. of plant families | No. of genera | Reference             |
| Chithara, NCR (7.7 km <sup>2</sup> ) | 272                          | 69                    | 204           | Present study         |
| NCT Delhi (1,483 km <sup>2</sup> )   | 531                          | -                     | -             | Maheshwari (1963)     |
| Baghpat (NCR)                        | 566                          | 102                   | 371           | Ahamed & Gupta (2010) |
| Bulandshahr (NCR)                    | 376                          | -                     | -             | Singh (1969)          |
| Ghaziabad (NCR)                      | 1,654*                       | 171                   | 868           | Vardhana (2007)       |
| Meerut (NCR)                         | 862                          | 118                   | 521           | Shishodia (2013)      |
| Muzaffarnagar (NCR)                  | 577                          | 77                    | 321           | Malik (2015)          |

\*included wild, cultivated, and non-native species.

All floristic details include non-native and invasive species along with native species to the region.

qualify their various medicinal properties (Tripathi et al. 2020). Certain plant species have been reported to yield potent drugs such as vasicine and vasicinone in *Justicia adhatoda*, punarnavine in *Boerhavia diffusa*, bacosoids in *Bacopa monnieri*, protodioscin in *Tribulus terrestris* and withanolides in *Withania somnifera* (Sharma et al. 2018). Sustainable utilization and conservation of these multi-purpose herbs for medicinal purposes is inevitable. Globally, traditional medicine, mostly herbal medicine, is known as a major healthcare provider in rural as well as remote areas, and a large number of people in developing, and underdeveloped countries depend on such medicine for their health (Sen & Chakraborty 2017).

#### Rare and newly recorded species

The species whose occurrence was very restricted and found only at one or two sites were considered rare species. Among the list, three species, such as *Crateva adansonii* subsp. *odora* (Buch.-Ham.) Jacobs, *Mitragyna parviflora* (Roxb.) Korth., and *Streblus asper* Lour. were rare occurrences in the study area.

The survey documented a few unique species, which were recorded for the first time in this region, such as *Rumex hypogaeus* T.M.Schust. & Reveal (earlier *Emex australis* Steinh.), *Phyllanthus tenellus* Roxb., *Equisetum ramosissimum* Desf., and *Symphytotrichum squamatum* (Spreng.) G.L.Nesom. *R. hypogaeus* belonging to family Polygonaceae, was found growing gregariously in a few places on the SNU campus of the Chithara village and it was a new record for Uttar Pradesh and upper Gangetic plains (Tripathi et al. 2018). *P. tenellus* (Phyllanthaceae), an annual herb that is common in southern India, has expanded its distribution to northern India. *E. ramosissimum* (ssp. *ramosissimum* and ssp. *debile*) was

also recorded from the study area; both subspecies were found for the first time from western Uttar Pradesh and NCR Delhi (Sharma et al. 2018). In addition, *S. squamatum*, an erect herb of the Asteraceae, was also recorded for the first time in India from the study area (Tripathi & Sharma 2019).

As a result of repeated surveys in different seasons in heterogeneous habitats of the study area, including agricultural fields, wetlands, canal bunds, wild date palm groves, and roadsides, it became possible to document many rare, and new record species. Due to anthropogenic pressure, the local hotspot areas for biodiversity, such as wild date palm groves & wetlands, which provide habitat to numerous species, are being depleted day by day. Therefore, there is a need to conserve the species hotspots and to create general awareness among local communities.

#### CONCLUSION

As a first step towards conservation and sustainable utilization of biodiversity, work on biodiversity documentation was undertaken in Chithara Village Panchayat, where so far no efforts have been made to prepare the People's Biodiversity Register as mandated in the Biological Diversity Act (2002). The extensive floristic survey of the village resulted in high species richness, which represents the diversity within a relatively small, localized area with potentially varied habitats within it. A rise in anthropogenic disturbances could threaten important plant habitats in the future, hence, local hotspot areas, such as wetlands, and wild date palm groves that serve as a unique ecosystem for

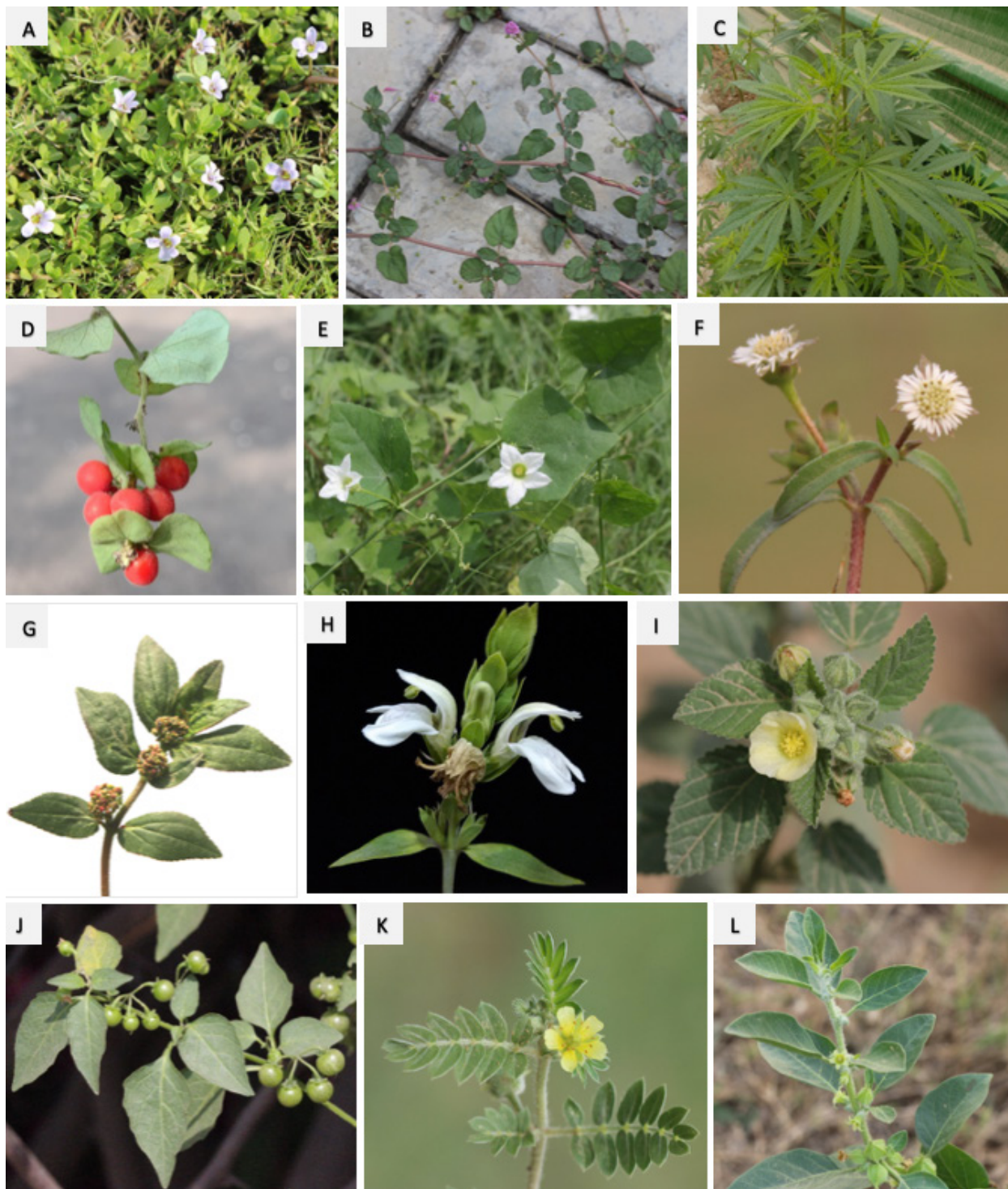


Image 1. Some high value medicinal plants recorded from study area: A—*Bacopa monnieri* | B—*Boerhavia diffusa* | C—*Cannabis sativa* | D—*Cissampelos pareira* | E—*Coccinia grandis* | F—*Eclipta prostrata* | G—*Euphorbia hirta* | H—*Justicia adhatoda* | I—*Sida cordifolia* | J—*Solanum americanum* | K—*Tribulus terrestris* | L—*Withania somnifera*. © Authors.

flora and fauna, should be restored and community-based conservation and management of flora need to be emphasized since local communities always interact with village ecosystems. The study indicates that rural India

remains rich in wild plant diversity, including high-value medicinal herbs, and may still harbor many unrecorded species. Hence, long-term, extensive documentation of flora at the village panchayat level should be prioritized.

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