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Research article

An annotated checklist of the vascular plants of the Udaipur wildlife sanctuary, West Champaran, Bihar, India

Anand Kumar¹, Saurabh Sachan¹, Tanay Shil¹ and Onkar Nath Maurya^{2*}

¹Central National Herbarium, Botanical Survey of India, P.O. Botanic Garden, Howrah-711103, West Bengal, India

²Botanical Survey of India, CGO Complex, Salt Lake City, Kolkata-700064, West Bengal, India

*Corresponding Author: onkar98@gmail.com

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Abstract: The Udaipur forest was notified as a wildlife sanctuary in 1978 and is situated around the Sareyaman Lake in West Champaran district of Bihar. The sanctuary is known for the migratory birds who visit the Sareyaman Lake during the winter season. Field surveys were conducted periodically in 2017–2018 in the Sanctuary to access the plant diversity. A total of 283 taxa under 225 genera are enumerated from 71 families. It includes one species, endemic to India and two species listed in appendix-II of CITES. Poaceae is the most dominant family with high species representation, followed by Fabaceae, Asteraceae, Lamiaceae, Cyperaceae, Apocynaceae, Rubiaceae, Euphorbiaceae, Malvaceae, Acanthaceae, Boraginaceae, Convolvulaceae and Cucurbitaceae. In addition, 23 species belonging to 23 genera and 14 families were new additions to the 'Flora of West Champaran district, Bihar'.

Keywords: Bihar - Checklist - Udaipur Wildlife Sanctuary - Vascular plants.

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INTRODUCTION

India is one of the 18 mega diverse nations in the world in terms of biodiversity with its rich and diverse floral wealth, ranking 10th among the top 25 species rich countries. With only 2.4% of the world's geographical area, it accounts for 7–8% of the world's recorded plant and animal species (IUCN 2019). At present, the country has 869 protected areas, including 104 National Parks, 551 Wildlife Sanctuaries, 87 Conservation Reserves and 127 Community Reserves. In addition, 18 Biosphere Reserves, 32 Elephant Reserves and 50 Tiger Reserves are also found in India (WII 2019). Protected areas are one of the well-recognized *in situ* conservation methods to protect the biodiversity across the world.

Bihar covers an area of 94,163 km², of which about 7,305 km² is under forest cover that constitutes 7.76% of total geographical area (FSI 2019). The state has 11 Wildlife Sanctuaries and a National Park (Singh & Singh 2002, WII 2019) covering about 3280 km². Previous documentation includes enumeration of the flora of Udaipur forests from Champaran district (Thothathri *et al.* 1966) and flora of West Champaran (Bhattacharya & Sarkar 1998). Moreover, new additions to the state and district flora were also published (Thothathri 1965, Singh 2005). The present survey has been conducted to study the vegetation/flora of Udaipur wildlife sanctuary, West Champaran, Bihar, India. Since, the documentation of the area was carried out 55 years ago (Thothathri *et al.* 1966) before its notification as Sanctuary in 1978. Therefore, the present study is one such effort to document all floral elements and assess the vascular plants diversity of the Sanctuary.

MATERIALS AND METHODS

Study area

The Udaipur forest was notified as a wildlife sanctuary in 1978 under Wildlife (Protection) Act, 1972 (Figs. 1–3). It was earlier owned by the erstwhile Bettiah Estate with shooting facilities. The name of the sanctuary was coined in the memory of Sri Udai Singh, one of the successors of Bettiah Estate and owners of these forests before independence. The sanctuary is situated 14.5 km west of Bettiah town in the West Champaran district of

Bihar and lies between 26° 46'42" N to 26° 49'15" N and 84° 24'24" E to 84° 27'15" E. It is predominantly forested wetland, located on both sides of an Oxbow Lake (Sareyaman Lake) and covers an area of 8.87 km². The soil is of immature riverain type and it is clayey, sandy loam and greyish with slightly alkaline in nature. Annual average rainfall is 1201 mm (Roy 2016). The sanctuary was created to protect the bird diversity in the area and to also conserve the ecosystem functions as it is one of the most important wetland in this highly urbanized landscape. The main attraction of the sanctuary is the Sareyaman Lake where migratory birds visit during the winter season and the lake acts as wintering sites for these migratory birds. The area is one of the recognized important bird area and a centre for conservation, education and recreation in the State. Tourists, school and college students visit the sanctuary for watching migratory bird in winter (November to March) and collecting information on floral and faunal diversity to study the ecosystem. The vegetation falls under four categories such as mixed deciduous forest, vegetation in plantation, grasslands and aquatic vegetation.

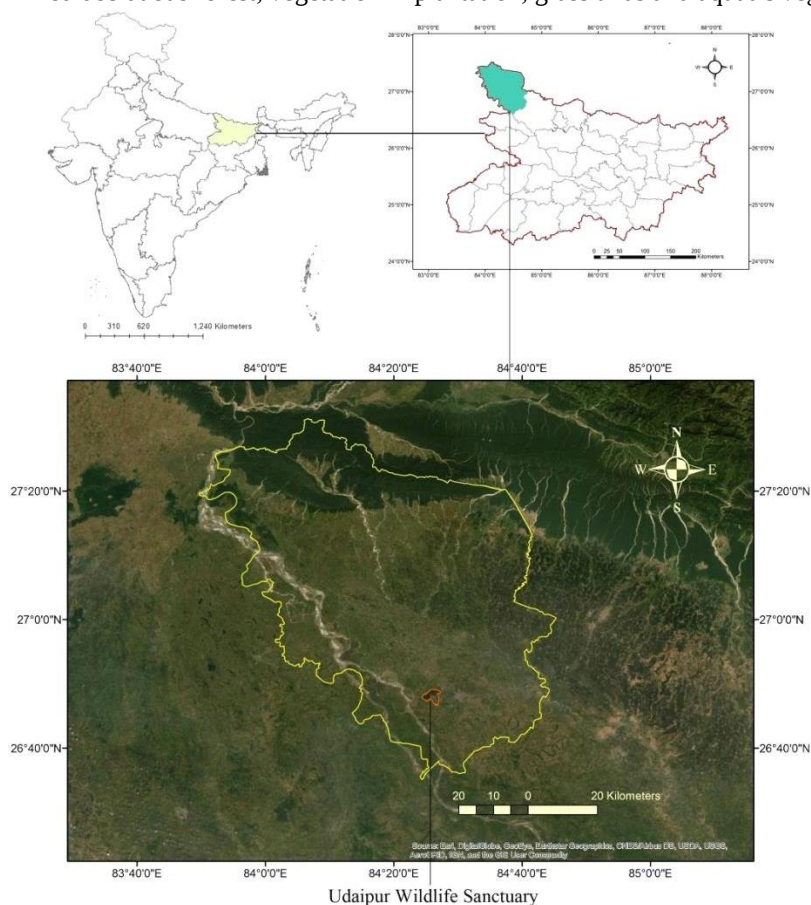


Figure 1. Location map of the Udaipur wildlife sanctuary, West Champaran, Bihar, India.

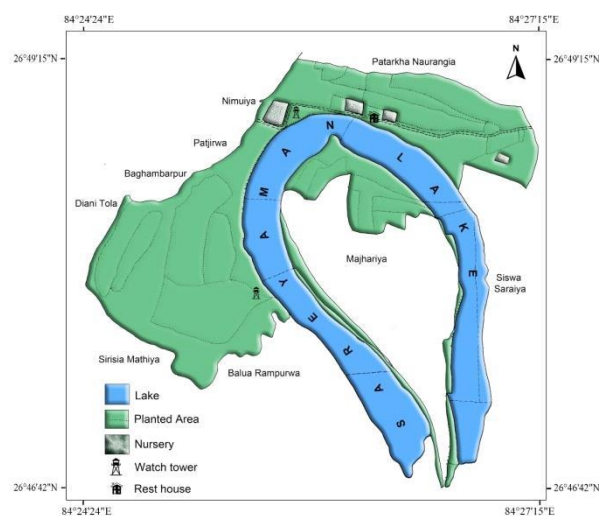


Figure 2. Udaipur wildlife sanctuary, West Champaran, Bihar, India.



Figure 3. Udaipur wildlife sanctuary, West Champaran, Bihar, India (Satellite view).

Data collection

Literature pertaining to the flora of Udaipur wildlife sanctuary, West Champaran district, Bihar was collected from published works prior to undertaking explorations. Specimens collected by K. Thothathri and B.V. Shetty exclusively from Udaipur forests deposited at Central National Herbarium (CAL) were studied during the present documentation. Field surveys were undertaken periodically in the sanctuary during 2017–2018 and plant samples with flowers and fruits were collected during field surveys. The collected specimens were processed following standard herbarium techniques (Bridson & Forman 1998). Specimens were identified using national and regional floras (Hooker 1872–1897, Haines 1921–25, Hajra *et al.* 1995a, 1995b, Rajendran & Daniel 2002, Balakrishnan *et al.* 2012, Bandyopadhyay 2014) and also compared with authentic specimens deposited at CAL. A set of voucher specimens duly labelled are deposited at CAL. The Angiosperm Phylogeny Group (2016) system of classification is followed in the present documentation. The species under a family have been arranged in alphabetical order. The nomenclature of plants has been updated using Plants of the World Online (2019) and International Plant Name Index (2019). Authors of Plant Names have been given according to Brummitt & Powell (1992).

RESULTS

The flora comprises 283 taxa (angiosperms: 278, pteridophytes: 5) belonging to 225 genera and 71 families (Table 1). The study of literature (Thothathri 1965, Bhattacharya & Sarkar 1998, Singh *et al.* 2001) revealed that out of the 283 taxa, 23 species belonging to 23 genera and 14 families are new additions to the ‘Flora of West Champaran district, Bihar’. Poaceae with 31 species followed by Fabaceae (27 species), Asteraceae & Lamiaceae (15 spp. each), Cyperaceae (13 spp.), Apocynaceae & Rubiaceae (11 spp. each), Euphorbiaceae & Malvaceae (10 spp. each) and Acanthaceae, Boraginaceae, Convolvulaceae & Cucurbitaceae (7 spp. each) are the dominant families with high species representation (Fig. 4). *Cyperus* is the most dominant genus with 5 species, followed by *Euphorbia*, *Fimbristylis* & *Solanum* (4 spp. each) and *Alysicarpus*, *Commelina*, *Ipomoea*, *Ficus* and *Phyllanthus* (3 spp. each) (Fig. 5). An analysis on the life-form composition of the flora reveals that there are 189 herbaceous species that constitute 66.8% of flora, followed by 34 tree species (12%), 31 species of shrubs (11%) and 29 species of climbers (10.2%) (Fig. 6). Photographs of habitats and important plants have also been provided in photoplates (Figs. 7–13).

Table 1. Checklist of vascular plants of the Udaipur wildlife sanctuary, West Champaran, Bihar, India.

S.N.	Family/ Plants name	Flowering and Fruiting	Habit	Specimens examined
NYMPHAEACEAE				
1.	<i>Nymphaea nouchali</i> Burm. f.	Aug.–Dec.	Herb	ONM, AK & SS 85567
2.	<i>Nymphaea pubescens</i> Willd.	Sept.–Nov.	Herb	ONM, AK & SS 85608
PIPERACEAE				
3.	<i>Peperomia pellucida</i> (L.) Kunth	April–Sept.	Herb	ONM, AK & SS 74784

ANNONACEAE

4. *Milium tomentosum* (Roxb.) Finet & Gagnep.* March–June Tree ONM, AK & SS 65570

ARACEAE

5. *Colocasia esculenta* (L.) Schott Aug.–Dec. Herb ONM, AK & SS 85627

ALISMATACEAE

6. *Caldesia parnassifolia* (L.) Parl. May–Oct Herb K. Thothathri 9902

HYDROCHARITACEAE

7. *Hydrilla verticillata* (L.f.) Royle April–Dec. Herb ONM, AK & SS 65582; K. Thothathri 9941
8. *Najas marina* L. Aug.–Sept. Herb ONM, AK & SS 65584, 85536
9. *Nechamandra alternifolia* (Roxb. ex Wight) Thwaites Aug.–Nov. Herb ONM, AK & SS 85606
10. *Ottelia alismoides* (L.) Pers. Nov.–April Herb B.V. Shetty 197

POTAMOGETONACEAE

11. *Potamogeton nodosus* Poir. July–Sept. Herb ONM, AK & SS 65583, 85512, 85544; K. Thothathri 9939

DIOSCOREACEAE

12. *Dioscorea bulbifera* L. Sept.–March Climber ONM, AK & SS 85516
13. *Dioscorea glabra* Roxb. Sept.–Jan. Climber ONM, AK & SS 85550

ORCHIDACEAE

14. *Habenaria plantaginea* Lindl.* Aug.–Oct. Herb ONM, AK & SS 74776, 85515
15. *Vanda tessellata* (Roxb.) Hook. ex G. Don April–July Herb ONM, AK & SS 85529

HYPOXIDACEAE

16. *Curculigo orchoides* Gaertn. April–Aug. Herb ONM, AK & SS 85530

ARECACEAE

17. *Calamus tenuis* Roxb. July–Dec. Shrub ONM, AK & SS 74708
18. *Phoenix sylvestris* (L.) Roxb. March–June Tree ONM, AK & SS 85634

COMMELINACEAE

19. *Commelina benghalensis* L. June–Nov. Herb ONM, AK & SS 85541
20. *Commelina longifolia* Lam. Aug.–Nov. Herb ONM, AK & SS 65525, 74767
21. *Commelina undulata* R.Br.* May–July Herb ONM, AK & SS 85578
22. *Murdannia nudiflora* (L.) Brenan Aug.–Nov. Herb ONM, AK & SS 65519, 85542

PONTEDERIACEAE

23. *Pontederia crassipes* Mart. July–Nov. Herb ONM, AK & SS 65517, 74733
24. *Pontederia vaginalis* Burm.f. July–Nov. Herb ONM, AK & SS 85575

CYPERACEAE

25. *Cyperus alopecuroides* Rottb July–March Herb ONM, AK & SS 85515, 85572
26. *Cyperus articulatus* L. Throughout the year Herb ONM, AK & SS 85506, 85559
27. *Cyperus exaltatus* Retz.* July–March Herb ONM, AK & SS 85572
28. *Cyperus niveus* Retz May–Aug. Herb ONM, AK & SS 65567, 85602
29. *Cyperus platystylis* R. Br. May–Nov. Herb ONM, AK & SS 85605
30. *Eleocharis geniculata* (L.) Roem. & Schult. Throughout the year Herb B.V. Shetty 242
31. *Fimbristylis aestivalis* (Retz.) Vahl Sept.–Nov. Herb ONM, AK & SS 65565
32. *Fimbristylis dichotoma* (L.) Vahl May–Oct. Herb ONM, AK & SS 85569
33. *Fimbristylis falcata* (Vahl) Kunth* June–Nov. Herb ONM, AK & SS 85587
34. *Fimbristylis ovata* (Burm.f.) J. Kern March–Dec. Herb ONM, AK & SS 65543
35. *Kyllinga squamulata* Vahl* Aug.–Sept. Herb ONM, AK & SS 85571
36. *Pycnus sanguinolentus* (Vahl) Nees Oct.–March Herb ONM, AK & SS 85560
37. *Schoenoplectus lateriflorus* (J.F. Gmel.) Lye* Oct.–March Herb K. Thothathri 9948

POACEAE

38. *Brachiaria reptans* (L.) C.A. Gardner & C.E. Hubb. July–March Herb ONM, AK & SS 85534, 85565
39. *Brachiaria subquadrifida* (Trin.) Hitchc.* July–Feb. Herb ONM, AK & SS 74757
40. *Chrysopogon aciculatus* (Retz.) Trin. Throughout the year Herb ONM, AK & SS 85570

41.	<i>Chrysopogon zizanioides</i> (L.) Roberty	Sept.–Feb.	Herb	ONM, AK & SS 65514, 85601
42.	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W. Watson*	July–April	Herb	ONM, AK & SS 74723
43.	<i>Cymbopogon nardus</i> (L.) Rendle	July–April	Herb	ONM, AK & SS 65559
44.	<i>Cynodon dactylon</i> (L.) Pers.	Throughout the year	Herb	ONM, AK & SS 85588, 855611
45.	<i>Cyrtococcum patens</i> (L.) A. Camus*	Throughout the year	Herb	ONM, AK & SS 65511
46.	<i>Dactyloctenium aegyptium</i> (L.) Willd.	June–Oct.	Herb	ONM, AK & SS 85552
47.	<i>Desmostachya bipinnata</i> (L.) Stapf	Aug.–Sept.	Herb	ONM, AK & SS 65566
48.	<i>Digitaria stricta</i> Roth	Oct.–Dec.	Herb	ONM, AK & SS 85538; B.V. Shetty 140
49.	<i>Echinochloa colonum</i> (L.) Link	Throughout the year	Herb	B.V. Shetty 195
50.	<i>Echinochloa stagnina</i> (Retz.) P. Beauv.	June–March	Herb	B.V. Shetty 191
51.	<i>Enteropogon dolichostachyus</i> (Lag.) Keng*	Sept.–March	Herb	ONM, AK & SS 65513
52.	<i>Eragrostis amabilis</i> (L.) Wight & Arn.	Almost throughout the year	Herb	ONM, AK & SS 74778, 85540
53.	<i>Hemarthria compressa</i> (L.f.) R. Br.	July–Feb.	Herb	ONM, AK & SS 85590
54.	<i>Imperata cylindrica</i> (L.) Raeusch.	Throughout the year	Herb	K. Thoathathi 9977
55.	<i>Leersia hexandra</i> Sw.	June–March	Herb	ONM, AK & SS 65510
56.	<i>Oplismenus compositus</i> (L.) P. Beauv.	July–March	Herb	ONM, AK & SS 74766
57.	<i>Oryza rufipogon</i> Griff.	Oct.–March	Herb	ONM, AK & SS 74771; B.V. Shetty 212
58.	<i>Panicum curviflorum</i> Hornem.*	May–Feb.	Herb	ONM, AK & SS 85533, 85562, 85564
59.	<i>Panicum repens</i> L.	Throughout the year	Herb	ONM, AK & SS 65512, 85568
60.	<i>Paspalidium flavidum</i> (Retz.) A. Camus	May–March	Herb	ONM, AK & SS 85589
61.	<i>Paspalum scrobiculatum</i> L.	Aug.–Nov.	Herb	ONM, AK & SS 65516, 65561, 85591
62.	<i>Perotis indica</i> (L.) Kuntze	Almost throughout the year	Herb	ONM, AK & SS 74780, 85523
63.	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	June–March	Herb	ONM, AK & SS 74709, 74772
64.	<i>Saccharum narenga</i> (Nees ex Steud.) Hack.	Sept.–Dec.	Herb	ONM, AK & SS 65544
65.	<i>Saccharum spontaneum</i> L.	July–April	Herb	ONM, AK & SS 85626
66.	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Throughout the year	Herb	ONM, AK & SS 85580; B.V. Shetty 172
67.	<i>Setaria verticillata</i> (L.) P. Beauv.*	June–April	Herb	ONM, AK & SS 65547, 85598
68.	<i>Sporobolus diandrus</i> (Retz.) P. Beauv.	Sept.–Jan.	Herb	ONM, AK & SS 74752
CERATOPHYLLACEAE				
69.	<i>Ceratophyllum demersum</i> L.	June–Sept.	Herb	ONM, AK & SS 65585, 85603
MENISPERMACEAE				
70.	<i>Cissampelos pareira</i> L.	Aug.–Oct.	Climber	ONM, AK & SS 65539
71.	<i>Stephania japonica</i> (Thunb.) Miers var. <i>discolor</i> (Blume) Forman	March–Dec.	Climber	ONM, AK & SS 85556
72.	<i>Tiliacora acuminata</i> (Lam.) Miers	April–Dec.	Climber	ONM, AK & SS 65540
73.	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomson	Aug.–Nov.	Climber	ONM, AK & SS 65548
RANUNCULACEAE				
74.	<i>Clematis gouriana</i> Roxb. ex DC.	Sept.–Dec.	Climber	ONM, AK & SS 74793; B.V. Shetty 102
NELUMBONACEAE				
75.	<i>Nelumbo nucifera</i> Gaertn.	March–Dec.	Herb	ONM, AK & SS 85505

VITACEAE

76. *Ampelocissus latifolia* (Roxb.) Planch. April–Dec. Climber ONM, AK & SS 65587
 77. *Cayratia trifolia* (L.) Domin Aug.–Dec. Climber ONM, AK & SS 65592
 78. *Cissus adnata* Roxb.* June–Sept. Climber ONM, AK & SS 74704, 74775
 79. *Leea indica* (Burm. f.) Merr.* Aug.–Dec. Herb ONM, AK & SS 65563, 85596

FABACEAE

80. *Abrus precatorius* L. Aug.–March Climber ONM, AK & SS 65541
 81. *Albizia lebbeck* (L.) Benth. April–March Tree ONM, AK & SS 74702
 82. *Alysicarpus roxburghianus* Thoth. & A.Pramanik* Sept.–Dec. Herb B.V. Shetty 241
 83. *Alysicarpus rugosus* (Willd.) DC. Sept.–Jan. Herb B.V. Shetty 160
 84. *Alysicarpus vaginalis* (L.) DC. Throughout the year Herb ONM, AK & SS 85524, 85545
 85. *Bauhinia purpurea* L. Sept.–March Tree ONM, AK & SS 65504, 74779
 86. *Bauhinia racemosa* Lam. March–Jan. Tree ONM, AK & SS 74745
 87. *Cajanus scarabaeoides* (L.) Thouars Aug.–Nov. Herb ONM, AK & SS 85520
 88. *Cassia fistula* L. Feb.–April Tree ONM, AK & SS 65598
 89. *Crotalaria medicaginea* Lam. Aug.–Dec. Herb ONM, AK & SS 85583, 85584, 65546
 90. *Crotalaria prostrata* Rottler ex Willd. Sept.–March Herb ONM, AK & SS 85566; K. Thothathri 9959
 91. *Dalbergia sissoo* Roxb. ex DC. March–Nov. Tree ONM, AK & SS 85612
 92. *Desmodium gangeticum* (L.) DC. March–Oct. Herb ONM, AK & SS 74777
 93. *Desmodium triflorum* (L.) DC. Oct.–April Herb ONM, AK & SS 65560
 94. *Indigofera astragalina* DC. Aug.–Nov. Herb ONM, AK & SS 85547
 95. *Indigofera linifolia* (L.f.) Retz. Aug.–March Herb ONM, AK & SS 85553
 96. *Mimosa himalayana* Gamble Aug.–Nov. Shrub ONM, AK & SS 65538, 85532
 97. *Moullava digyna* (Rottler) Gagnon & G.P. Lewis March–April Shrub ONM, AK & SS 74706
 98. *Mucuna pruriens* (L.) DC. Sept.–April Climber ONM, AK & SS 65503
 99. *Phanera vahlii* (Wight & Arn.) Benth. March–April Liana ONM, AK & SS 85611
 100. *Pongamia pinnata* (L.) Pierre May–Feb. Tree ONM, AK & SS 85610
 101. *Senegalia rugata* (Lam.) Britton & Rose April–March Shrub ONM, AK & SS 74744
 102. *Senna occidentalis* (L.) Link Sept.–Dec. Herb ONM, AK & SS 65591, 74730, 74763
 103. *Senna tora* (L.) Roxb. Aug.–Dec. Herb ONM, AK & SS 85586
 104. *Sesbania sesban* (L.) Merr. Aug.–March Herb K. Thothathri 9968
 105. *Uraria rufescens* (DC.) Schindl. Oct.–Nov. Herb ONM, AK & SS 74786
 106. *Vachellia farnesiana* (L.) Wight & Arn. Sept.–April Shrub K. Thothathri 9932

POLYGALACEAE

107. *Polygala chinensis* L. April–Jan. Herb ONM, AK & SS 85582

RHAMNACEAE

108. *Ziziphus mauritiana* Lam. Aug.–Dec. Tree ONM, AK & SS 65555
 109. *Ziziphus oenoplia* (L.) Mill. Sept.–June. Shrub ONM, AK & SS 74707

ULMACEAE

110. *Holoptelea integrifolia* (Roxb.) Planch. Feb.–May Tree ONM, AK & SS 85632

CANNABACEAE

111. *Trema orientale* (L.) Blume March–Nov. Tree ONM, AK & SS 85633

MORACEAE

112. *Ficus benghalensis* L. Jan.–March Tree ONM, AK & SS 85624
 113. *Ficus hispida* L.f. Jan.–March Tree ONM, AK & SS 65554, 74705
 114. *Ficus religiosa* L. March–June Tree ONM, AK & SS 85625
 115. *Streblus asper* Lour. May–Aug. Tree K. Thothahri 9897

URTICACEAE

116. *Pouzolzia pentandra* (Roxb.) Benn. Aug.–Dec. Herb ONM, AK & SS 65530, 74792, 85513
 117. *Pouzolzia zeylanica* (L.) Benn. July–Oct. Herb ONM, AK & SS 65595, 74754

CUCURBITACEAE

118. *Actinostemma tenerum* Griff. July–Nov. Climber ONM, AK & SS 85607

119.	<i>Coccinia grandis</i> (L.) Voigt	Dec.–June	Climber	ONM, AK & SS 65522, 74795, 85504
120.	<i>Cucumis maderaspatanus</i> L.	Aug.–Dec.	Climber	ONM, AK & SS 65558
121.	<i>Cucumis melo</i> L.	March–Sept.	Climber	ONM, AK & SS 85522
122.	<i>Momordica charantia</i> L.	May–Oct.	Climber	ONM, AK & SS 85539
123.	<i>Momordica dioica</i> Roxb. ex Willd.	June–Oct.	Climber	ONM, AK & SS 65531, 85551
124.	<i>Trichosanthes cucumerina</i> L.	Aug.–Jan.	Climber	ONM, AK & SS 85593
OXALIDACEAE				
125.	<i>Biophytum sensitivum</i> (L.) DC.	Oct.–Jan.	Herb	ONM, AK & SS 85609; B.V. Shetty 130
126.	<i>Oxalis corniculata</i> L.	Oct.–Jan.	Herb	K. Thothathri 9870
PUTRANJIVACEAE				
127.	<i>Putranjiva roxburghii</i> Wall.	Jan.–May	Tree	ONM, AK & SS 74713
PASSIFLORACEAE				
128.	<i>Passiflora suberosa</i> L.	March–May	Climber	ONM, AK & SS 74789
SALICACEAE				
129.	<i>Casearia tomentosa</i> Roxb.	Feb.–April	Shrub	ONM, AK & SS 85615
EUPHORBIACEAE				
130.	<i>Acalypha indica</i> L.	Aug.–Feb.	Herb	ONM, AK & SS 74782, 65529
131.	<i>Euphorbia hirta</i> L.	Aug.–Oct.	Herb	ONM, AK & SS 65577, 74729
132.	<i>Euphorbia hypericifolia</i> L.	July–Nov.	Herb	ONM, AK & SS 85630
133.	<i>Euphorbia prostrata</i> Aiton	Throughout the year	Herb	ONM, AK & SS 65580
134.	<i>Euphorbia thymifolia</i> L.	July–March	Herb	B.V. Shetty 169
135.	<i>Jatropha curcas</i> L.	May–Jan.	Shrub	ONM, AK & SS 65556
136.	<i>Jatropha gossypifolia</i> L.	April–Sept.	Shrub	ONM, AK & SS 65505
137.	<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen	Feb.–Aug.	Tree	ONM, AK & SS 85514
138.	<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	Oct.–May	Tree	ONM, AK & SS 74748, 74751, 74768
139.	<i>Ricinus communis</i> L.	Sept.–June	Shrub	ONM, AK & SS 85631
PHYLLANTHACEAE				
140.	<i>Breynia vitis-idaea</i> (Burm.f.) C.E.C. Fisch.	June–Oct.	Shrub	ONM, AK & SS 74794
141.	<i>Bridelia stipularis</i> (L.) Blume	Sept.–April	Shrub	ONM, AK & SS 74701, 85535
142.	<i>Phyllanthus reticulatus</i> Poir.	Throughout the year	Shrub	ONM, AK & SS 85526
143.	<i>Phyllanthus urinaria</i> L.	July–Dec.	Herb	ONM, AK & SS 65561
144.	<i>Phyllanthus virgatus</i> G. Forst.	Aug.–Nov.	Herb	ONM, AK & SS 74737, 85507
COMBRETACEAE				
145.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	March–Sept.	Tree	ONM, AK & SS 85595
LYTHRACEAE				
146.	<i>Ammannia baccifera</i> L.	Nov.–April	Herb	B.V. Shetty 150
147.	<i>Woodfordia fruticosa</i> (L.) Kurz	Jan.–May	Shrub	K. Thothathri 9919
ONAGRACEAE				
148.	<i>Ludwigia adscendens</i> (L.) H. Hara*	June–Sept.	Herb	ONM, AK & SS 85614
149.	<i>Ludwigia hyssopifolia</i> (G. Don) Exell	Oct.–Jan.	Herb	ONM, AK & SS 65524
MYRTACEAE				
150.	<i>Syzygium cumini</i> (L.) Skeels	March–Aug.	Tree	K. Thothathri 9907
SAPINDACEAE				
151.	<i>Cardiospermum halicacabum</i> L.	March–Nov.	Herb	ONM, AK & SS 65526
152.	<i>DODONAEA VISCOSA</i> JACQ.	Jan.–Aug.	Shrub	K. Thothathri 9975
RUTACEAE				
153.	<i>Aegle marmelos</i> (L.) Corrêa	Oct.–Jan.	Tree	B.V. Shetty 199.
154.	<i>Murraya koenigii</i> (L.) Spreng.	March–Aug.	Shrub	ONM, AK & SS 65571
MELIACEAE				
155.	<i>Azadirachta indica</i> A. Juss.	Feb.–Aug.	Tree	K. Thothathri 9903
MALVACEAE				
156.	<i>Abutilon indicum</i> (L.) Sweet	Aug.–April	Herb	ONM, AK & SS 65535

157.	<i>Bombax ceiba</i> L.	Feb.–May	Tree	ONM, AK & SS 85613
158.	<i>Corchorus aestuans</i> L.	Aug.–Feb.	Herb	ONM, AK & SS 85519
159.	<i>Grewia hirsuta</i> Vahl	July–Nov.	Herb	ONM, AK & SS 85549
160.	<i>Melochia corchorifolia</i> L.	Aug.–Dec.	Herb	ONM, AK & SS 85518
161.	<i>Sida cordata</i> (Burm.f.) Borss. Waalk.	June–Nov.	Herb	ONM, AK & SS 74761, 74781, 85525.
162.	<i>Sida rhombifolia</i> L.	July–Dec.	Herb	ONM, AK & SS 85531, 85568; B.V. Shetty 129; K. Thothathri 9882
163.	<i>Triumfetta rhomboidea</i> Jacq.	Aug.–Nov.	Herb	ONM, AK & SS 65542
164.	<i>Urena lobata</i> L.	July–Oct.	Herb	ONM, AK & SS 74749, 74764, 74788; B.V. Shetty 149
165.	<i>Urena repanda</i> Roxb. ex Sm.	Aug.–Nov.	Herb	ONM, AK & SS 85528
LORANTHACEAE				
166.	<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	Nov.–March	Shrub	K. Thothathri 9911
POLYGONACEAE				
167.	<i>Persicaria barbata</i> (L.) H.Hara	May–Dec.	Herb	ONM, AK & SS 74719, 85511
168.	<i>Polygonum plebeium</i> R. Br.	Nov.–June	Herb	ONM, AK & SS 85586, 74722
169.	<i>Rumex dentatus</i> L.	May–July	Herb	K. Thothathri 9969
AMARANTHACEAE				
170.	<i>Achyranthes aspera</i> L.	Aug.–Feb.	Herb	ONM, AK & SS 65534, 65597, 85563
171.	<i>Aerva sanguinolenta</i> (L.) Blume	April–Oct.	Herb	ONM, AK & SS 65533, 74756, 85579
172.	<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	July–March	Herb	ONM, AK & SS 65509, 65581, 74718
173.	<i>Amaranthus viridis</i> L.	Aug.–May	Herb	ONM, AK & SS 65594, 74799
174.	<i>Digera muricata</i> (L.) Mart.	Aug.–Dec.	Herb	ONM, AK & SS 74800, 85543
NYCTAGINACEAE				
175.	<i>Boerhavia diffusa</i> L.	June–Dec.	Herb	ONM, AK & SS 85517
PORTULACACEAE				
176.	<i>Portulaca oleracea</i> L.	May–Sep.	Herb	B.V. Shetty 227
PRIMULACEAE				
177.	<i>Androsace umbellata</i> (Lour.) Merr.	Feb.–April	Herb	ONM, AK & SS 74712
178.	<i>Lysimachia arvensis</i> (L.) U. Manns & Anderb.	Dec.–April	Herb	ONM, AK & SS 74753
RUBIACEAE				
179.	<i>Catunaregam spinosa</i> (Thumb.) Tirveng.	May–Jan.	Tree	B.V. Shetty 124
180.	<i>Dentella repens</i> (L.) J.R. Forst. & G. Forst.	Jan.–July	Herb	K. Thothathri 9929
181.	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Aug.–May	Tree	ONM, AK & SS 85616
182.	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Aug.–April	Tree	ONM, AK & SS 85617
183.	<i>Knoxia sumatrensis</i> (Retz.) DC.,	July–Nov.	Herb	B.V. Shetty 203
184.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	April–June	Tree	ONM, AK & SS 85618.
185.	<i>Oldenlandia biflora</i> L.	Jan.–Sept.	Herb	ONM, AK & SS 65557, 65575; B.V. Shetty 189; K. Thothathri 9967
186.	<i>Oldenlandia corymbosa</i> L.	Sept.–April	Herb	ONM, AK & SS 65506, 85581
187.	<i>Spermacoce articularis</i> L.f.	Aug.–Feb.	Herb	ONM, AK & SS 85585
188.	<i>Spermacoce lasiocarpa</i> R.Br. ex Wall.*	Aug.–Dec.	Herb	ONM, AK & SS 85597; B.V. Shetty 144
189.	<i>Wendlandia heynei</i> (Schult.) Santapau & Merchant	March–April	Tree	Thothathri 9865
APOCYNACEAE				
190.	<i>Calotropis gigantea</i> (L.) W.T. Aiton	March–June	Shrub	ONM, AK & SS 65553
191.	<i>Calotropis procera</i> (Aiton) W.T. Aiton	March–Sept.	Shrub	K. Thothathri 9931
192.	<i>Cryptolepis dubia</i> (Burm.f.) M.R. Almeida	May–Feb.	Liana	ONM, AK & SS 85558

193.	<i>Dregea volubilis</i> (L.f.) Benth. ex Hook.f.	March–Sept.	Liana	ONM, AK & SS 74743
194.	<i>Hemidesmus indicus</i> (L.) R.Br.	Aug.–Jan.	Climber	ONM, AK & SS 85628
195.	<i>Holarrhena pubescens</i> Wall. ex G. Don	April–Feb.	Shrubs	ONM, AK & SS 74710; K. Thothathri 9921
196.	<i>Ichnocarpus frutescens</i> (L.) W.T. Aiton	Sept.–April	Liana	AK & SS 74774; K. Thothathri 9933
197.	<i>Oxystelma esculentum</i> (L.f.) Sm.	July–Dec.	Climber	ONM, AK & SS 85557
198.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Feb.–Dec.	Herb	K. Thothathri 9900
199.	<i>Telosma cordata</i> (Burm.f.) Merr.*	July–Sept.	Climber	ONM, AK & SS 85548
200.	<i>Vallaris solanacea</i> (Roth) Kuntze	March–Sept.	Shrub	K. Thothathri 9880
BORAGINACEAE				
201.	<i>Arnebia hispidissima</i> (Sieber ex Lehm.) A. DC.	March–May	Herb	K. Thothathri 9866
202.	<i>Cordia dichotoma</i> G. Forst.	Feb.–Aug.	Tree	K. Thothathri 9908
203.	<i>Cynoglossum wallichii</i> G. Don*	May–Aug.	Herb	ONM, AK & SS 65564, 85501; K. Thothathri 9887
204.	<i>Ehretia acuminata</i> R. Br.	March–July	Tree	K. Thothathri 9934
205.	<i>Ehretia laevis</i> Roxb.	March–June	Tree	K. Thothathri 9890
206.	<i>Heliotropium indicum</i> L.	March–Sept.	Herb	ONM, AK & SS 85508
207.	<i>Heliotropium strigosum</i> Willd.	April–Dec.	Herb	ONM, AK & SS 65507, 65586; K. Thothathri 9928
CONVOLVULACEAE				
208.	<i>Cuscuta reflexa</i> Roxb.	Oct.–Jan.	Herb	ONM, AK & SS 65518; B.V. Shetty 201
209.	<i>Evolvulus alsinoides</i> (L.) L.	July–March	Herb	ONM, AK & SS 65551, 65568
210.	<i>Evolvulus nummularius</i> (L.) L.	July–Feb.	Herb	ONM, AK & SS 74765
211.	<i>Ipomoea aquatica</i> Forssk.	Nov.–April	Herb	ONM, AK & SS 74758
212.	<i>Ipomoea nil</i> (L.) Roth	June–Oct.	Herb	B.V. Shetty 106
213.	<i>Ipomoea pes-tigridis</i> L.	July–Oct.	Climber	ONM, AK & SS 85599
214.	<i>Poranopsis paniculata</i> (Roxb.) Roberty	Nov.–April	Climber	B.V. Shetty 131
SOLANACEAE				
215.	<i>Datura metel</i> L.	Aug.–Nov.	Herb	ONM, AK & SS 65532
216.	<i>Physalis minima</i> L.	Aug.–Dec.	Herb	ONM, AK & SS 65501
217.	<i>Solanum erianthum</i> D. Don	Throughout the year	Shrub	ONM, AK & SS 65536, 74730; B.V. Shetty 179
218.	<i>Solanum nigrum</i> L.	May–Nov.	Herb	K. Thothathri 9960
219.	<i>Solanum violaceum</i> Ortega	Throughout the year	Shrub	ONM, AK & SS 74725; B.V. Shetty 198
220.	<i>Solanum virginianum</i> L.	Aug.–June	Herb	ONM, AK & SS 65569, 74735; B.V. Shetty 238
OLEACEAE				
221.	<i>Jasminum sambac</i> (L.) Aiton	May–Sept.	Shrub	ONM, AK & SS 74727
PLANTAGINACEAE				
222.	<i>Adenosma indiana</i> (Lour.) Merr.	Sept.–Nov.	Herb	ONM, AK & SS 65562.
223.	<i>Bacopa monnieri</i> (L.) Wettst.	July–March	Herb	ONM, AK & SS 65520, 65599
224.	<i>Limnophila indica</i> (L.) Druce	Sept.–March	Herb	ONM, AK & SS 74731; K. Thothathri 9945
225.	<i>Mecardonia procumbens</i> (Mill.) Small	March–May	Herb	ONM, AK & SS 85574
226.	<i>Scoparia dulcis</i> L.	Sept.–Feb.	Herb	ONM, AK & SS 65572, 74728; B.V. Shetty 151
227.	<i>Veronica anagallis-aquatica</i> L.	April–Aug.	Herb	K. Thothathri 9913
SCROPHULARIACEAE				
228.	<i>Verbascum chinense</i> (L.) Santapau	Feb.–March	Herb	K. Thothathri 9885
LINDERNIACEAE				
229.	<i>Bonnaya ciliata</i> (Colsm.) Spreng.	Aug.–Feb.	Herb	ONM, AK & SS 65523
230.	<i>Torenia crustacea</i> (L.) Cham. & Schltdl.	July–Dec.	Herb	ONM, AK & SS 74760, 85577

MARTYNIACEAE

231. *Martynia annua* L. Aug.–Dec. Herb ONM, AK & SS 65545, 85527

PEDALIACEAE

232. *Sesamum indicum* L. June–Oct. Herb ONM, AK & SS 74796

ACANTHACEAE

233. *Dicliptera paniculata* (Forssk.) I. Darbysh. Aug.–March Herb ONM, AK & SS 65502; B.V. Shetty 157
234. *Hemigraphis latebrosa* (B. Heyne ex Roth) Nees* Sept.–April Herb K. Thothathri 9952
235. *Hygrophila polysperma* (Roxb.) T. Anderson Oct.–April Herb ONM, AK & SS 74742; B.V. Shetty 188; K. Thothathri 9878
236. *Ruellia prostrata* Poir. July–Dec. Herb ONM, AK & SS 74769
237. *Ruellia tuberosa* L. Sept.–Dec. Herb ONM, AK & SS 85509
238. *Rungia pectinata* (L.) Nees Nov.–April Herb ONM, AK & SS 74711; B.V. Shetty 110; K. Thothathri 9973
239. *Rungia repens* (L.) Nees Aug.–Feb. Herb ONM, AK & SS 74716

BIGNONIACEAE

240. *Oroxylum indicum* (L.) Benth. ex Kurz July–March Tree ONM, AK & SS 85619

VERBENACEAE

241. *Lantana camara* L. April–June Shrub ONM, AK & SS 85629
242. *Lippia alba* (Mill.) N.E. Br. ex Britton & P. Wilson Throughout the year Shrub K. Thothathri 9920
243. *Phyla nodiflora* (L.) Greene Throughout the year Herb ONM, AK & SS 65589; K. Thothathri 9867

LAMIACEAE

244. *Anisomeles indica* (L.) Kuntze Sept.–March Herb ONM, AK & SS 74759
245. *Callicarpa macrophylla* Vahl April–Dec. Shrub ONM, AK & SS 74762, 74773
246. *Clerodendrum cordatum* D. Don* April–June Shrub ONM, AK & SS 85620
247. *Colebrookea oppositifolia* Sm. Nov.–April Shrub ONM, AK & SS 74747
248. *Gmelina arborea* Roxb. ex Sm. Feb.–June Tree ONM, AK & SS 85621
249. *Hyptis suaveolens* (L.) Poit. Oct.–Jan. Herb ONM, AK & SS 74787
250. *Leonotis nepetifolia* (L.) R. Br. Oct.–March Herb B.V. Shetty 162
251. *Leucas aspera* (Willd.) Link July–March Herb ONM, AK & SS 85594
252. *Leucas cephalotes* (Roth) Spreng. Sept.–Dec. Herb ONM, AK & SS 65593, 74736; B.V. Shetty 161
253. *Nepeta hindostana* (B. Heyne ex Roth) Haines Aug.–March Herb ONM, AK & SS 65550, 74797; B.V. Shetty 183; K. Thothathri 9954
254. *Ocimum basilicum* L. Aug.–Feb. Herb ONM, AK & SS 74738; B.V. Shetty 156
255. *Pogostemon benghalensis* (Burm.f.) Kuntze March–April Herb ONM, AK & SS 74726
256. *Salvia plebeia* R. Br. Dec.–March Herb K. Thothathri 9896
257. *Tectona grandis* L.f. July–Jan. Tree ONM, AK & SS 85622
258. *Vitex negundo* L. June–Dec. Shrub ONM, AK & SS 85623

MAZACEAE

259. *Mazus pumilus* (Burm.f.) Steenis July–Dec. Herb ONM, AK & SS 74717

MENYANTHACEAE

260. *Nymphoides cristata* (Roxb.) Kuntze April–Nov. Herb K. Thothathri 9943
261. *Nymphoides indica* (L.) Kuntze Aug.–Nov. Herb ONM, AK & SS 65508; B.V. Shetty 209

ASTERACEAE

262. *Acmella ciliata* (Kunth) Cass.* Throughout the year Herb ONM, AK & SS 74715, 74740, 74785, 85503
263. *Adenostemma lavenia* (L.) Kuntze Aug.–Oct. Herb B.V. Shetty 108
264. *Ageratum conyzoides* L. Oct.–Jan. Herb ONM, AK & SS 74703, 74798
265. *Blumea axillaris* (Lam.) DC. Throughout the year Herb K. Thothathri 9895
266. *Blumea laciniata* (Roxb.) DC. March–April Herb K. Thothathri 9888
267. *Chromolaena odorata* (L.) R.M. King & H. Rob. April–Dec. Shrub ONM, AK & SS 74721

268.	<i>Cyanthillium cinereum</i> (L.) H. Rob.	Throughout the year	Herb	ONM, AK & SS 65549, 65552, 74732, 85592
269.	<i>Eclipta prostrata</i> (L.) L.	June–Feb.	Herb	ONM, AK & SS 65573, 74755
270.	<i>Elephantopus scaber</i> L.	Aug.–Dec.	Herb	ONM, AK & SS 65527, 85600
271.	<i>Erigeron asteroides</i> Roxb.	April–July	Herb	K. Thothathri 9889
272.	<i>Laggera aurita</i> (L.f.) Benth. ex C.B. Clarke	March–April	Herb	K. Thothathri 9891
273.	<i>Launaea nudicaulis</i> Hook.f.	March–Sept.	Herb	ONM, AK & SS 65574, 74724, 74799, 85521
274.	<i>Parthenium hysterophorus</i> L.	July–March	Herb	ONM, AK & SS 65537, 85576
275.	<i>Tridax procumbens</i> L.	April–July	Herb	ONM, AK & SS 65576, 74741, 74790
276.	<i>Xanthium strumarium</i> L.	March–Dec.	Herb	ONM, AK & SS 65528, 85502
APIACEAE				
277.	<i>Centella asiatica</i> (L.) Urb.	Feb.–Nov.	Herb	ONM, AK & SS 65590, 65521
278.	<i>Trachyspermum ammi</i> (L.) Sprague	May–Aug.	Herb	ONM, AK & SS 65600
PTERIDOPHYTES				
ASPLENIACEAE				
279.	<i>Diplazium esculentum</i> (Retz.) Sw.	Nov.–Feb.	Herb	ONM, AK & SS 74714
280.	<i>Thelypteris dentata</i> (Forssk.) E.P. St. John	June–Jan.	Herb	ONM, AK & SS 74746, 85546
EQUISETACEAE				
281.	<i>Equisetum debile</i> Roxb. ex Vaucher	Sept.–Dec.	Herb	ONM, AK & SS 74739
PTERIDACEAE				
282.	<i>Pteris multifida</i> Poir.	Sept.–Jan.	Herb	ONM, AK & SS 85555
MARSILEACEAE				
283.	<i>Marsilea minuta</i> L.	March–April	Herb	ONM, AK & SS 85510

Note: Plant species marked with asterisk (*) are additions to the Flora of West Champaran District, Bihar.

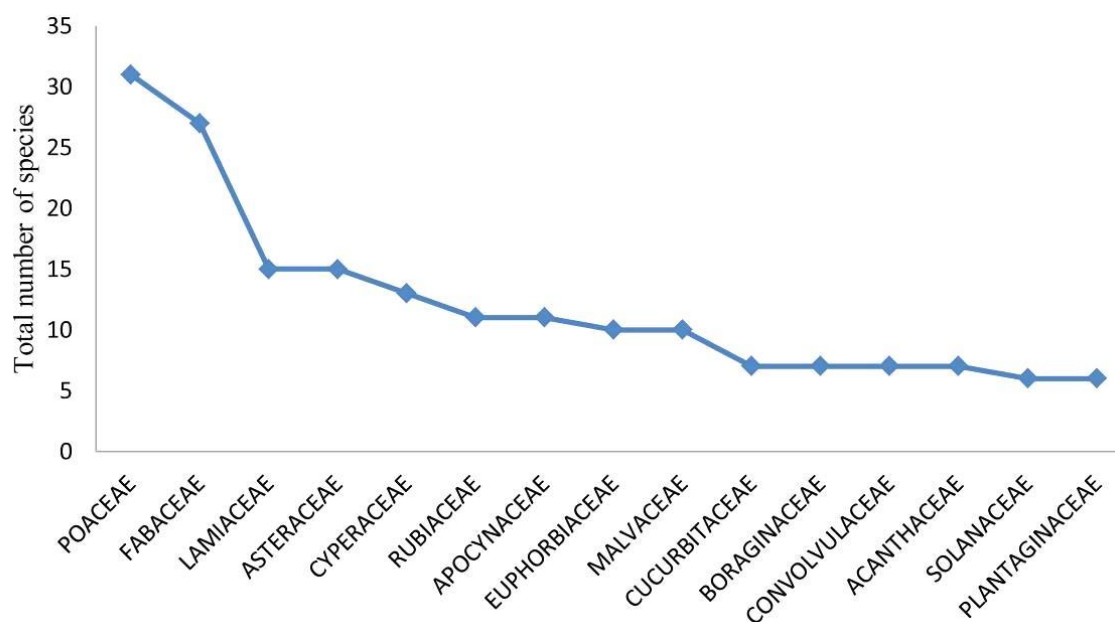


Figure 4. Dominant families with respect to number of species.

DISCUSSION

The sanctuary covers an area of about 8.87 km² (WII 2019) and the present study has established its richness in vegetation along with angiospermic and pteridophytic wealth of the sanctuary of which angiosperms are the key elements of the flora. Thothathri *et al.* (1966) reported 215 species from the area while in the present study 283 taxa have been documented. Furthermore, one species namely *Alysicarpus roxburghianus* (L.) Benth. ex Kurz endemic to India (Singh *et al.* 2015) and two species [*Rauvolfia serpentina* (L.) Benth. ex Kurz and *Vanda tessellata* (Roxb.) Hook. ex G. Don] listed in appendix-II of CITES have been documented which were not reported by Thothathri *et al.* (1966). During the present investigation, it is also noted that *Senegalia catechu*

(L.f.) P.J.H. Hurter & Mabb. reported by Thothathri *et al.* (1966) is now understory which is an important economic plant used in 'Kattha' production. 'Kattha' is an extract of heartwood and is used as an ingredient to give red color and typical flavor to betel. *Habenaria plantaginea* Lindl. and *Vanda tessellata* (Roxb.) Hook. ex G. Don are the only two orchid species recorded from the sanctuary.

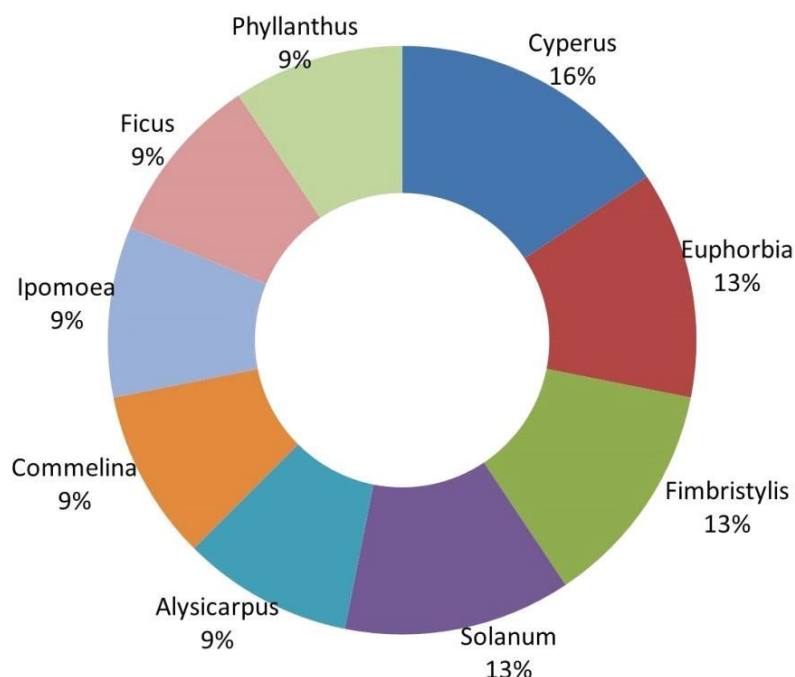


Figure 5. Dominant genera with respect to number of species.

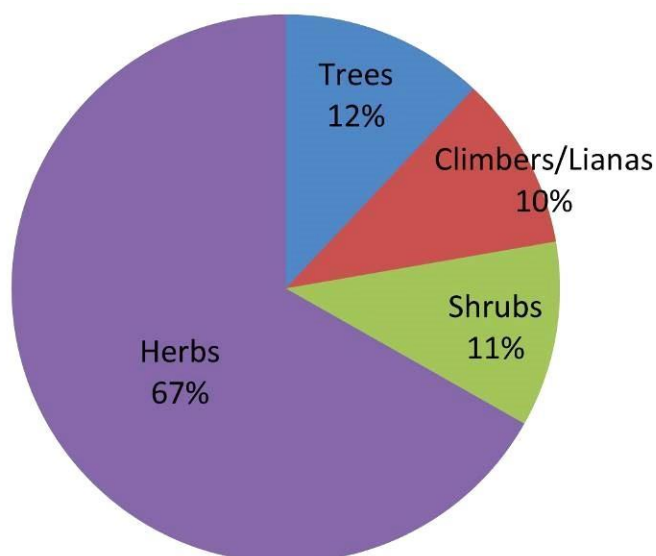


Figure 6. Life forms of the plant species occurring in the Udaipur wildlife sanctuary.

The sanctuary lacks many forest species with economic values. Therefore, about 222.5 ha forest area was cleared for raising economically important forest species like *Dalbergia sissoo* Roxb. ex DC., *Eucalyptus saligna* Sm., *Shorea robusta* C.F. Gaertn. and *Tectona grandis* L.f. (Thothathri *et al.* 1966). Besides, *Mangifera indica* L. and *Syzygium cumini* (L.) Skeels are also raised. At present, the sanctuary is the store house of many economically important plants such as medicinal plants, timber yielding plants, wild edible plants, dye yielding plants, fish sedative and mats & baskets making plants. The medicinal plants include *Abrus precatorius* L., *Abutilon indicum* (L.) Sweet, *Achyranthes aspera* L., *Azadirachta indica* A. Juss., *Cajanus scarabaeoides* (L.) Thouars, *Centella asiatica* (L.) Urb., *Curculigo orchiodes* Gaertn., *Cuscuta reflexa* Roxb., *Cynodon dactylon* (L.) Pers., *Dalbergia sissoo* Roxb. ex DC., *Dregea volubilis* (L.f.) Benth. ex Hook.f., *Eclipta prostrata* (L.) L., *Ficus benghalensis* L., *Habenaria plantaginea* Lindl., *Hemidesmus indicus* (L.) R. Br., *Holarrhena pubescens* Wall. ex G. Don, *Leucas cephalotes* (Roth) Spreng., *Nelumbo nucifera* Gaertn., *Pongamia pinnata* (L.) Pierre, *Pouzolzia zeylanica* (L.) Benn., *Putranjiva roxburghii* Wall., *Rauvolfia serpentina* (L.) Benth. ex Kurz, *Solanum*

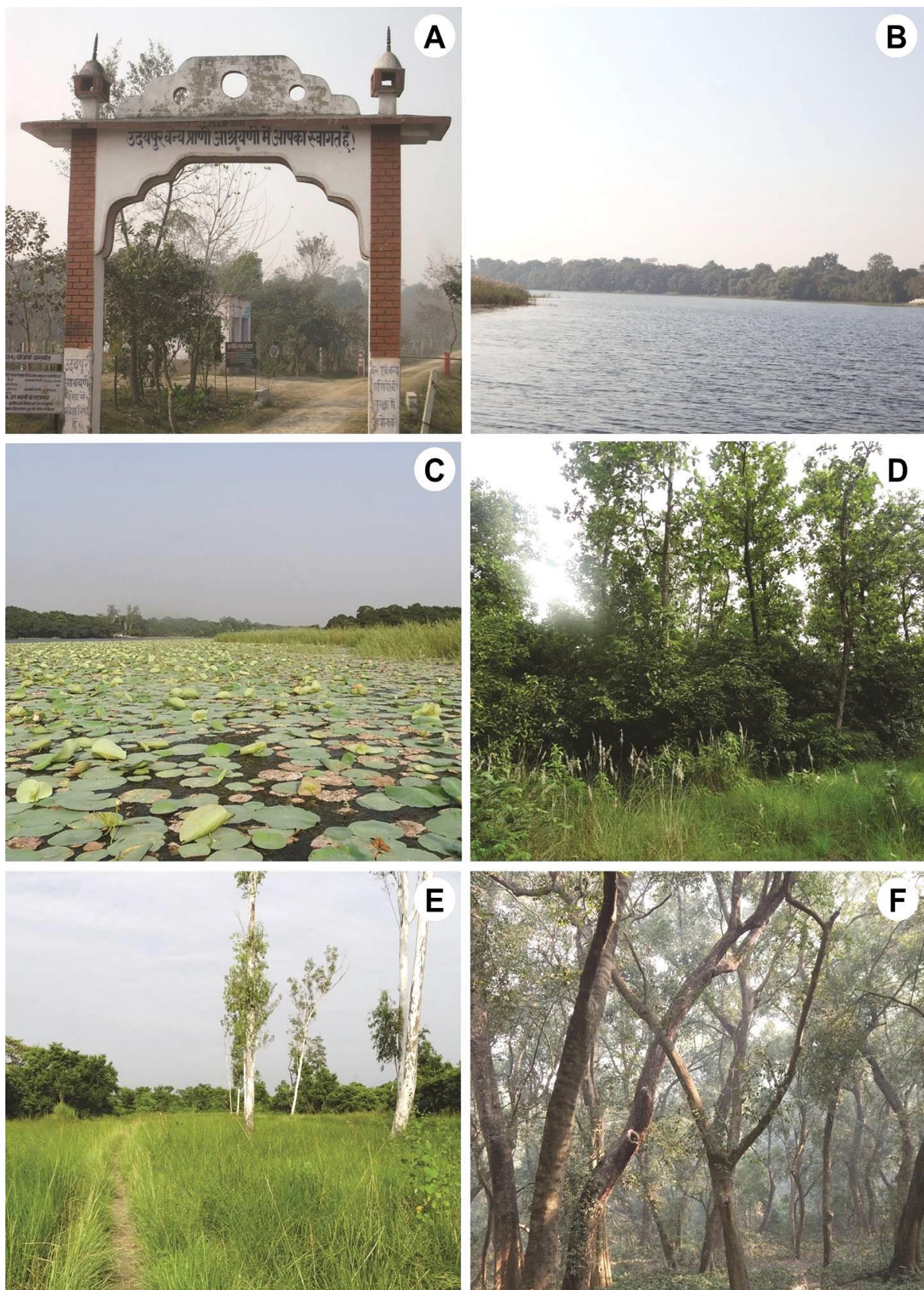


Figure 7. A, Entrance gate of the Udaipur wildlife sanctuary; B–C, Sareyaman lake; D, Mixed deciduous forest; E, Grassland; F, Patches of *Putranjiva roxburghii* Wall.

virginianum L., *Streblus asper* Lour., *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. and *Tinospora cordifolia* (Willd.) Hook.f. & Thomson (Ved et al. 2016). Timber yielding plants are *Dalbergia sissoo* Roxb. ex DC., *Gmelina arborea* Roxb. ex Sm., *Mitragyna parvifolia* (Roxb.) Korth. and *Tectona grandis* L.f. During field surveys, it was observed that the people inhabiting around the sanctuary consume wild edible plants which

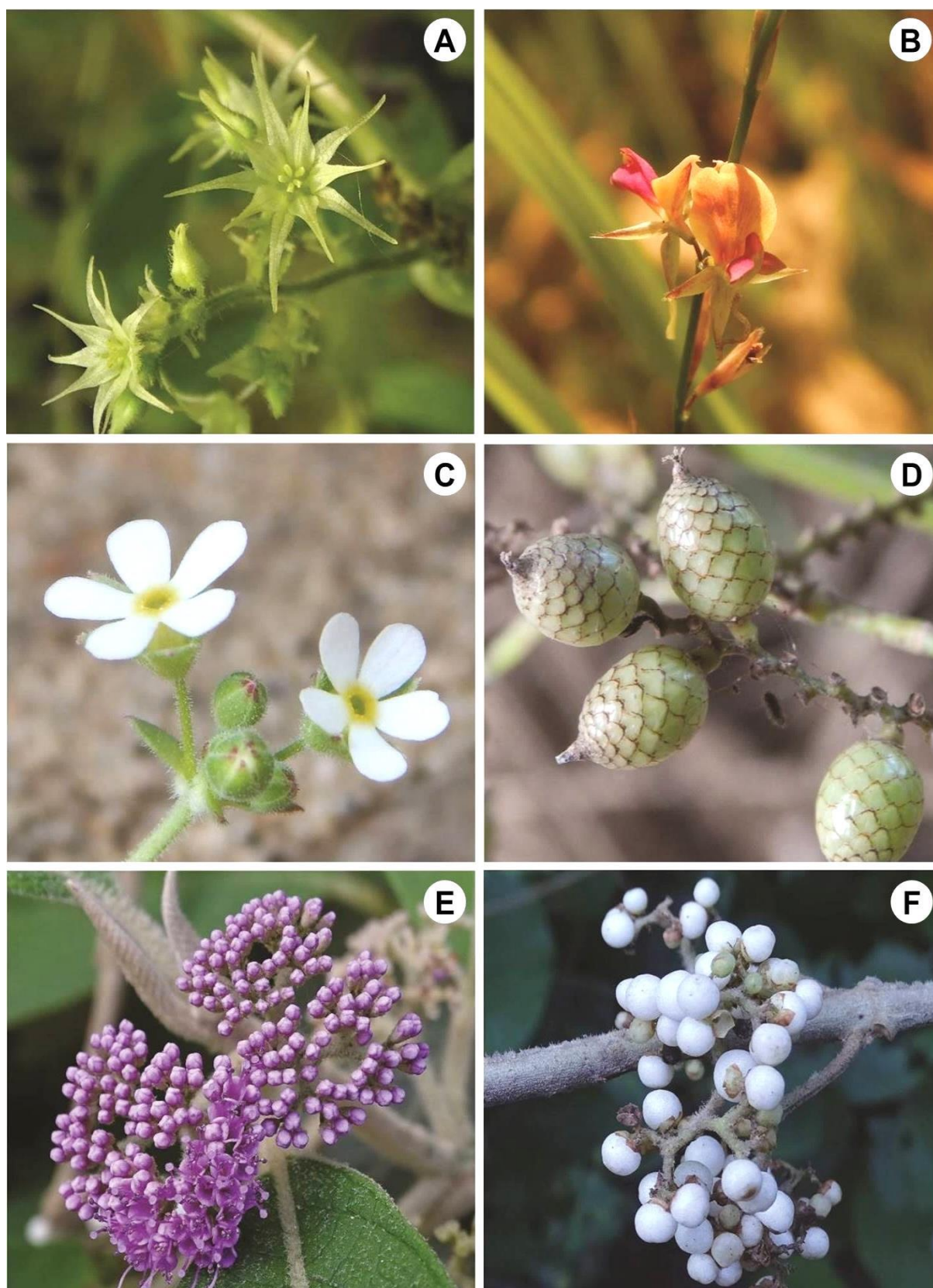


Figure 8. A, *Actinostemma tenerum* Griff.; B, *Alysicarpus roxburghianus* (L.) Benth. ex Kurz; C, *Androsace umbellata* (Lour.) Merr.; D, *Calamus tenuis* Roxb.; E–F, *Callicarpa macrophylla* Vahl.

include fruits of *Aegle marmelos* (L.) Corrêa, *Momordica charantia* L., *M. dioica* Roxb. ex Willd., *Nymphaea pubescens* Willd., *Syzygium cumini* (L.) Skeels; seeds of *Nelumbo nucifera* Gaertn.; leaves of *Amaranthus viridis* L., *Colocasia esculenta* (L.) Schott; receptacle of *Ficus hispida* L.f.; flowers of *Dregea volubilis* (L.f.) Benth. ex Hook.f.; bulbs of *Dioscorea bulbifera* L., young leaves of *Bauhinia purpurea* L.; leaves of *Bacopa monnieri* (L.) Wettst. and *Centella asiatica* (L.) Urb. Among Dye yielding plants, fruits of *Mallotus philippensis*

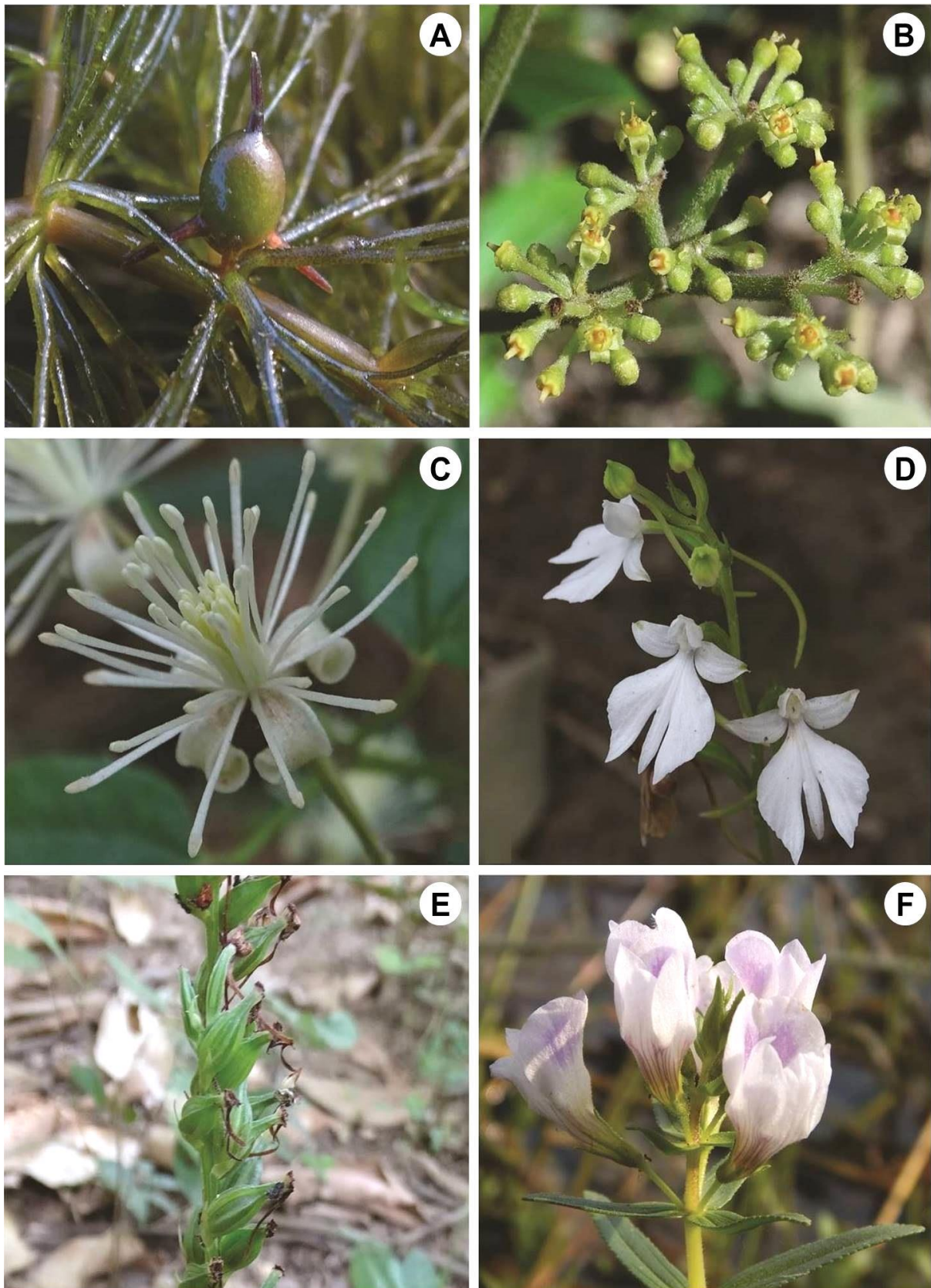


Figure 9. A, *Ceratophyllum demersum* L.; B, *Cissus adnata* Roxb.; C, *Clematis gouriana* Roxb. ex DC.; D–E, *Habenaria plantaginea* Lindl.; F, *Limnophila indica* (L.) Druce.

(Lam.) Müll. Arg. and flowers of *Woodfordia fruticosa* (L.) Kurz are used in making dyes (Singh *et al.* 2001). Furthermore, during field surveys when we crushed the fruits of *Cayratia trifolia* (L.) Domin and *Passiflora suberosa* L., we immediately get violet colour on our hand. Therefore, these two plants may also be the source of dye. *Casearia tomentosa* Roxb. and *Catunaregam spinosa* (Thumb.) Tirveng. are used as fish sedative (Kulakkattoilckal 1989, Singh *et al.* 2001). *Chrysopogon zizanioides* (L.) Roberty and *Phoenix*

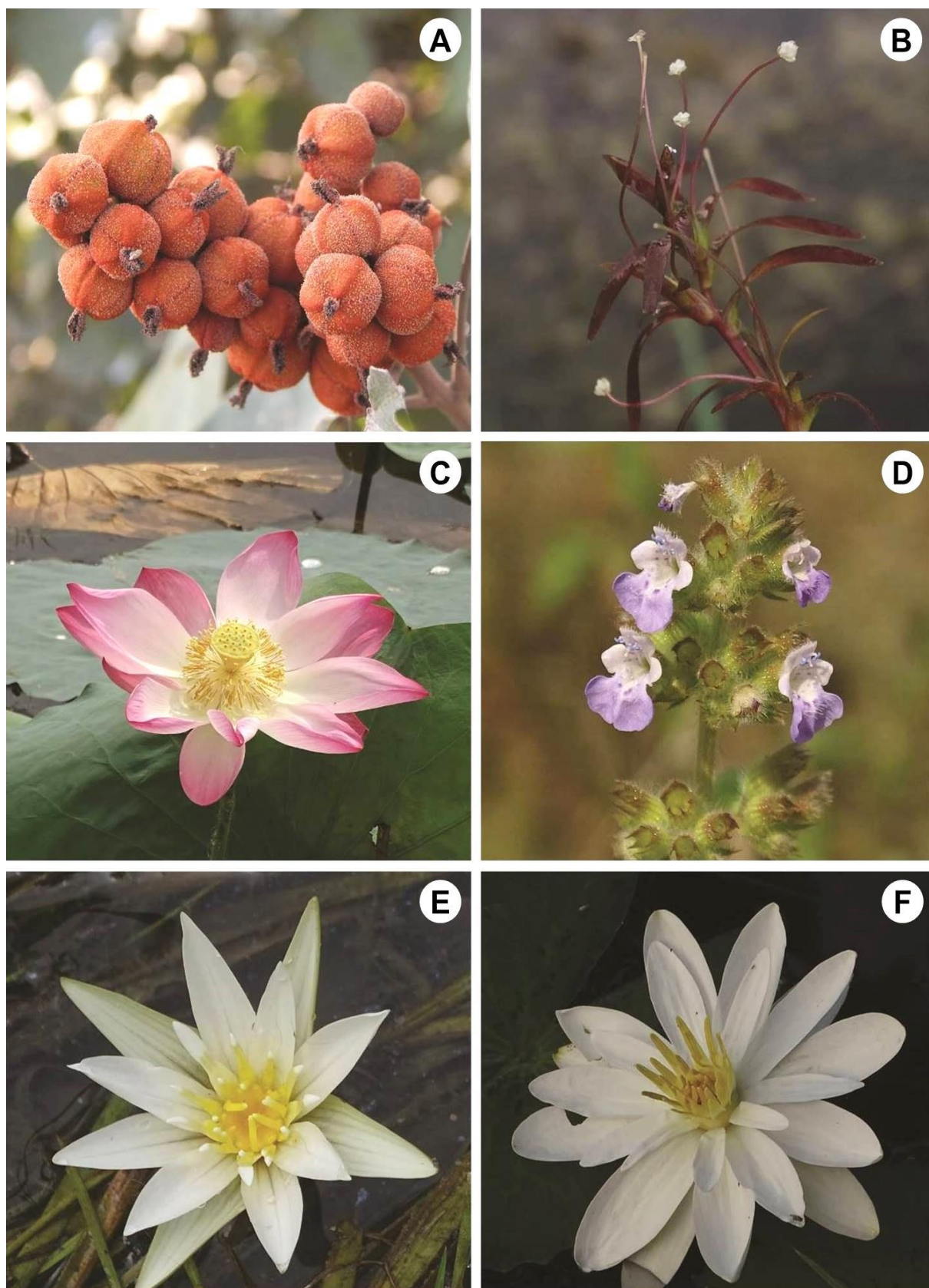


Figure 10. A, *Mallotus philippensis* (Lam.) Müll. Arg.; B, *Nechamandra alternifolia* (Roxb. ex Wight) Thwaites; C, *Nelumbo nucifera* Gaertn.; D, *Nepeta hindostana* (B. Heyne ex Roth) Haines; E, *Nymphaea nouchali* Burm. f.; F, *Nymphaea pubescens* Willd.

sylvestris (L.) Roxb. are used in mat making while *Saccharum spontaneum* L. is used in making basket. Furthermore, some cultivated or planted species such as *Alstonia scholaris* (L.) R. Br., *Calliandra surinamensis* Benth., *Eucalyptus saligna* Sm., *Euryale ferox* Salisb., *Lagerstroemia speciosa* (L.) Pers., *Mangifera indica* L. and *Nerium oleander* L. are also growing in the sanctuary.

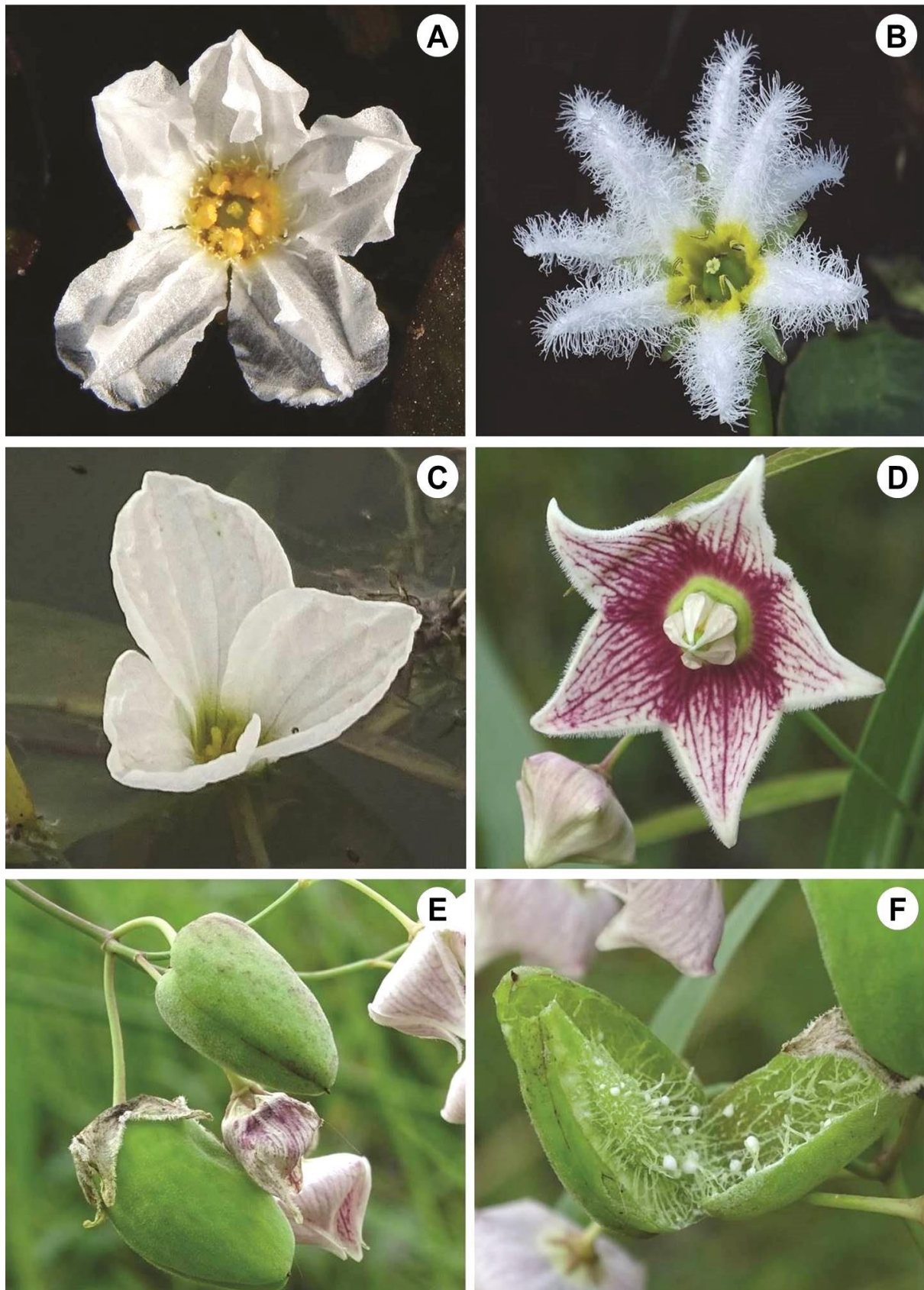


Figure 11. A, *Nymphoides cristata* (Roxb.) Kuntze; B, *Nymphoides indica* (L.) Kuntze; C, *Ottelia alismoides* (L.) Pers.; D–F, *Oxystelma esculentum* (L.f.) Sm.

The documentation of the flora is of immense help to botanists/ teachers/students in general and foresters in particular in correct identification of plants available in the sanctuary. Further, this will play a vital role in the management of the sanctuary, implementation of various conservation strategies. The data provides scientific support in planning *in-situ* conservation of available species found inside the sanctuary. Moreover, threats to the phytodiversity such as cattle grazing, fuel wood collection, invasive species, encroachment of land are identified

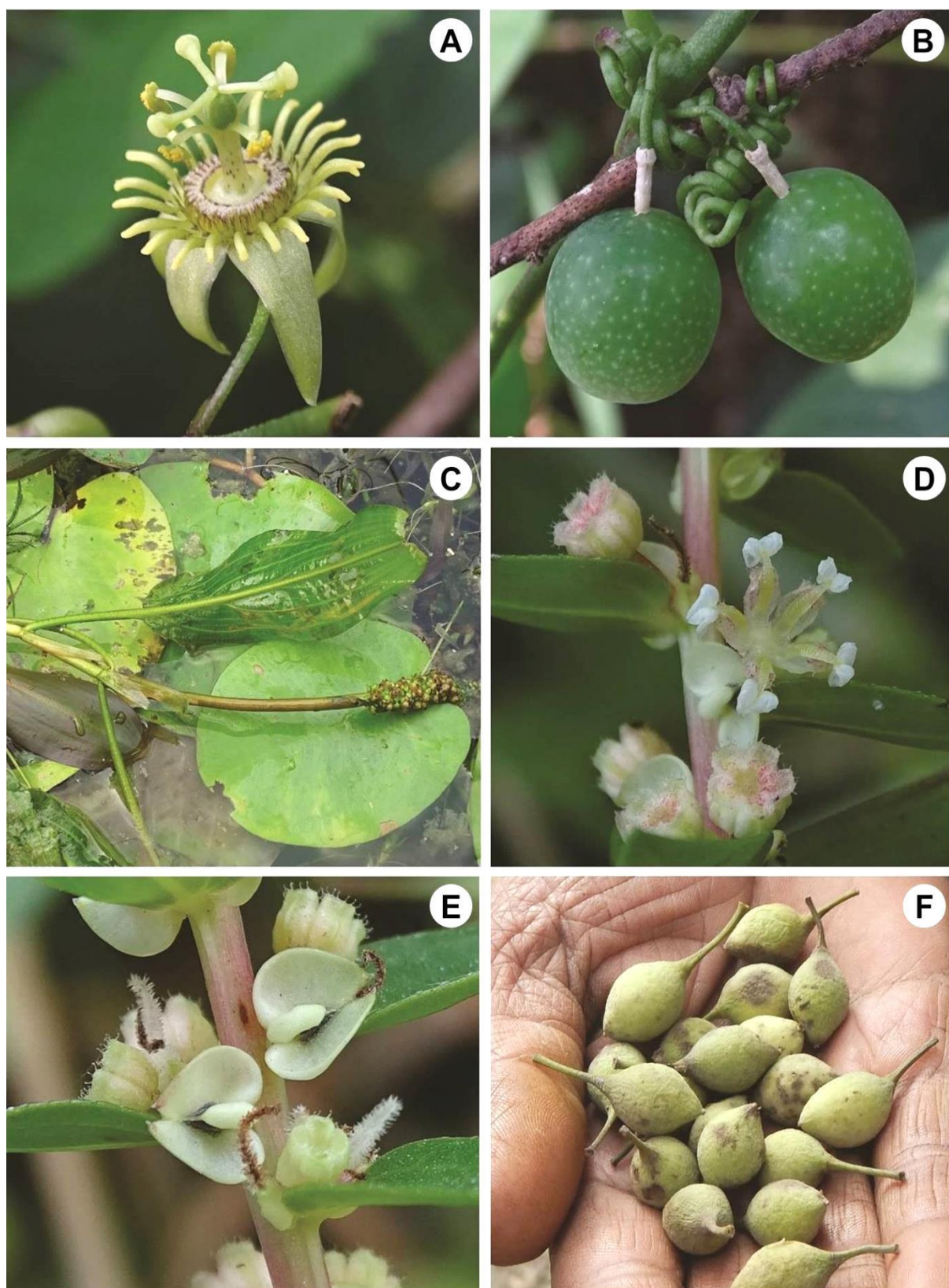


Figure 12. A–B, *Passiflora suberosa* L.; C, *Potamogeton nodosus* Poir.; D–E, *Pouzolzia pentandra* (Roxb.) Benn.; F, *Putranjiva roxburghii* Wall.

and possible conservation measures are suggested to design the conservation strategy to restore the plant genetic resources of the sanctuary keeping in view the observed threats. Cattle grazing, fuel wood collection, illegal fishing activity in Sareyaman Lake and encroachment of land should be avoided by deployment of adequate forest staffs. Invasive species need to be controlled preferably through physical methods, biocontrol and their spread is to be monitored. People's participation is also necessary and 'Van Mahotsava' should be launched to make degraded areas green and bring in awareness in local communities about the flora and fauna.

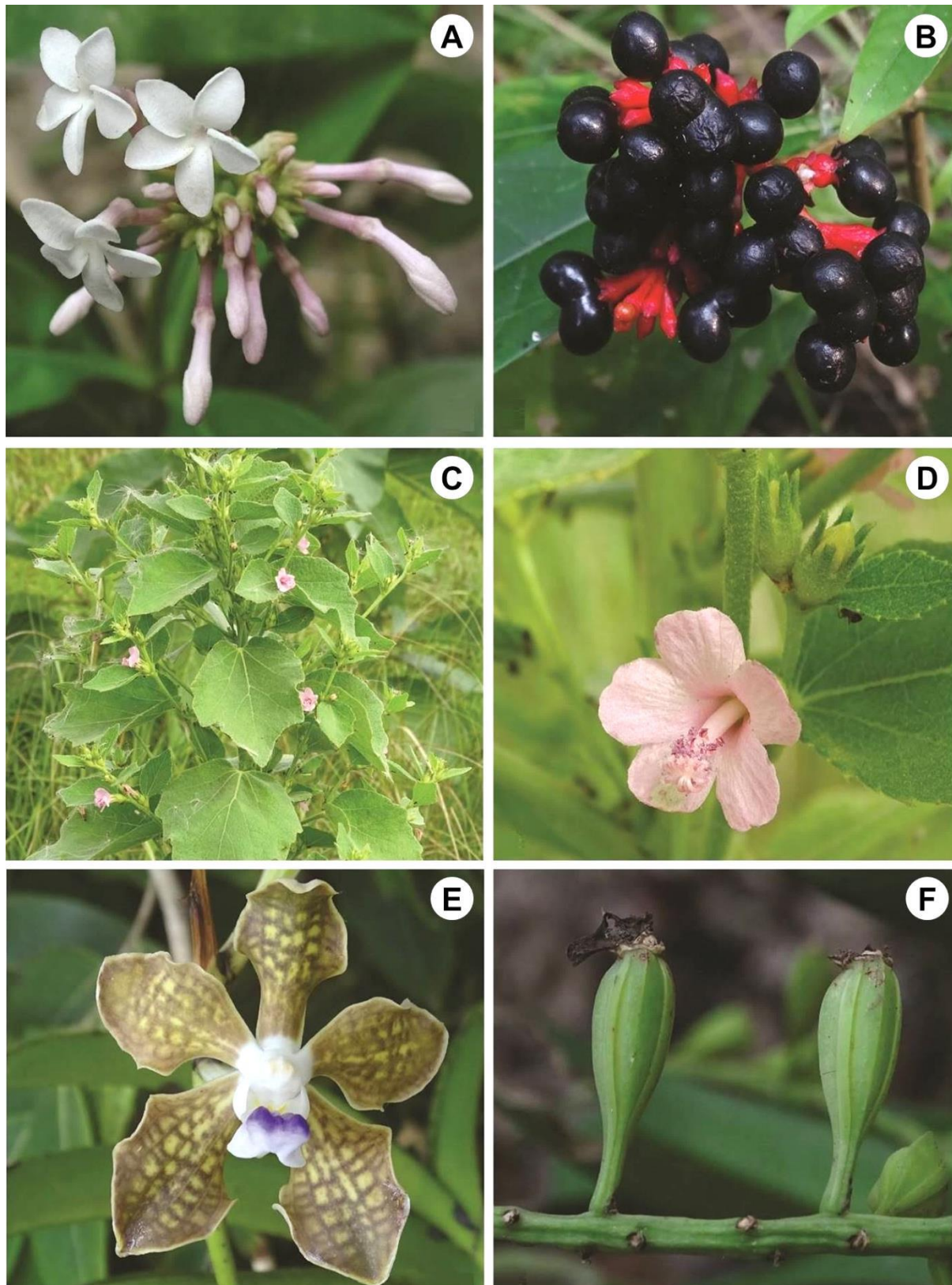


Figure 13. A–B, *Rauvolfia serpentina* (L.) Benth. ex Kurz; C–D, *Urena repanda* Roxb. ex Sm.; E–F, *Vanda tessellata* (Roxb.) Hook. ex G. Don.

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