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COMMUNICATION

DISTRIBUTION AND DIVERSITY OF CLIMBING SPECIES IN PAPUM PARE DISTRICT OF ARUNACHAL PRADESH, INDIA

Soyala Kashung, Padma Raj Gajurel & Binay Singh

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Distribution and diversity of climbing species in Papum Pare District of Arunachal Pradesh, India

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Abstract: An investigation on the taxonomic diversity of climbing plants occurring in Papum Pare District, Arunachal Pradesh, northeastern India was conducted. A total of 187 species distributed over 55 families and 117 genera were collected and identified from the various forest areas of the district. Apart from one gymnosperm and five pteridophytes, all species belong to the angiosperm group. Fabaceae, Cucurbitaceae, Convolvulaceae, Vitaceae, and Apocynaceae were found to be the most dominant. *Piper*, *Dioscorea*, *Ipomoea*, and *Rubus* were dominant at the genus level. The study also revealed that majority of the climbers adopted twining mechanisms (43.85%) to ascend their host. It was found that a majority of the species were distributed below 500m with a decrease in diversity with altitudinal increment. The diversity of species above 1,500m was very limited where only 23 species were reported. Habitat degradation because of rapid developmental activities with limitation of the supporting tree species was found to be a serious threat to climbing plants.

Keywords: Climbing mechanism, diversity elevation zones, habitats, herbaceous vine, liana, northeastern India.

Editor: Anonymity requested.

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Author contribution: PRG and BS designed the objectives and plan of work. SK carried out the fieldwork, analyzed the data and wrote the manuscript. PRG and BS helped in data analysis, interpretation and manuscript correction.

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INTRODUCTION

Around 50% of the families of vascular plants comprise climbing plants (Putz 1984). They occur in all forest ecosystems with its occurrence highest in tropical and sub-tropical forests (Quigley & Platt 2003; Bongers et al. 2005). The presence of over 8,000 climbing species under 130 families was predicted by Gentry (1991). Globally, studies on climbing species were focused primarily on lianas occurring in tropical forest communities by most researchers (Schnitzer et al. 2000; Ibarra-Manríquez & Martínez-Ramos 2002; Reddy & Parthasarathy 2003; Yuan et al. 2009; Muthumperumal 2011; Naidu et al. 2014). Despite the ecological and economic importance, the works on herbaceous vines are very limited and carried out only by a few researchers (Gallagher et al. 2011; Kumar et al. 2013; Suthari et al. 2014; Singh et al. 2015). Study on the diversity and distribution of climbing plants is still scanty in the Indian scenario when compared to their study worldwide. Despite having large forest covers under tropical and subtropical vegetation and rich diversity and density of the climbers, sufficient attention has not been paid to this group in India. Only a few studies have been carried out in the country in some selected sites particularly in the Eastern and Western Ghats, coastal and inland tropical dry evergreen forest and eastern Himalaya (Muthuramkumar & Parthasarathy 2000; Chittibabu & Parthasarathy 2001; Reddy & Parthasarathy 2003; Muthumperumal & Parthasarathy 2009; Chettri et al. 2010; Barik et al. 2015; Singh et al. 2015; Dvivedi et al. 2016). Majority of the work on climbing plants in India were reported from the Eastern and Western Ghats including some specific parts of southern states like Tamil Nadu, Pondicherry, Andhra Pradesh, and Andaman. Likewise, from the Himalayan and adjacent parts a few studies are available from Allahabad, Jharkhand, Uttar Pradesh, Arunachal Pradesh, Meghalaya, Sikkim, and Tripura (Chettri et al. 2010; Kumar et al. 2013; Darlong & Bhattacharyya 2014; Barik et al. 2015; Singh et al. 2015; Dvivedi et al. 2016).

The state of Arunachal Pradesh by virtue of its location in the eastern Himalayan range and its distinct phytogeographical unit is a confluence point of many floristic elements harboring a unique composition of plant species. The state is recognized as one among the 200 globally important ecoregions (Olson & Dinerstein 1998). The state is estimated to harbor at least 5,000 flowering plants belonging to 192 families and 1,295 genera thereby catering to more than 26% of Indian flora (Singh & Dash 2016). Many economically and

ecologically important vines and lianas are distributed in the region including some rare and endemic species. Papum Pare District being the capital city located in the district, many forest areas are degrading at a faster rate for various developmental activities. Many of the climbers having surface rooting systems are also greatly affected due to the prolonged drought which sometimes leads to drying and death of the population of many species. Unless specific studies are designed and undertaken to explore the climbing species of the region, it could be difficult to assess the real diversity and distribution of these valuable components of the ecosystem.

The present study provides an account of the diversity and distribution of climbing plants of Papum Pare District of Arunachal Pradesh, India.

Study site

The study is confined to the Papum Pare District of Arunachal Pradesh, India, where the capital of the state, Itanagar, is located. The district covers a geographical area of 3,462 km² and is located between 26.936–27.595 °N and 93.212–94.225 °E. It is bounded in the north by Lower Subansiri District, west by East Kameng District, east by West Siang District, and south by North Lakhimpur District of Assam (Figure 1). As the state is uniquely situated in the transition zone between the Himalayan and Indo-Burmese regions, a major part of the Papum Pare District is covered by thick forest with tropical, sub-tropical, and humid type of vegetation. Because of its geographical location, the district possesses a phenomenal range of biological diversity in flora and fauna and is also home to numerous tribal populations. The district is dominantly inhabited by the Nyishi tribe.

Data collection

The present study is the outcome of extensive periodical field surveys undertaken from 2015 to 2019 covering all the four subdivisions of the district, viz.: Balijan, Doimukh, Kimin, and Sagalee. For a better understanding of the extent of distribution of the climbing plant species of the region, the study area was subdivided based on the altitudinal range as below 500m, 500–1,000 m, 1,000–1,500 m, and above 1,500m. The presence of the climbing plants in each zone was then recorded through direct visual observation. The fieldwork comprises plant collection, taxonomic & ecological investigation including studies on their distribution, and climbing mechanisms. The collected species were identified using various taxonomic literature

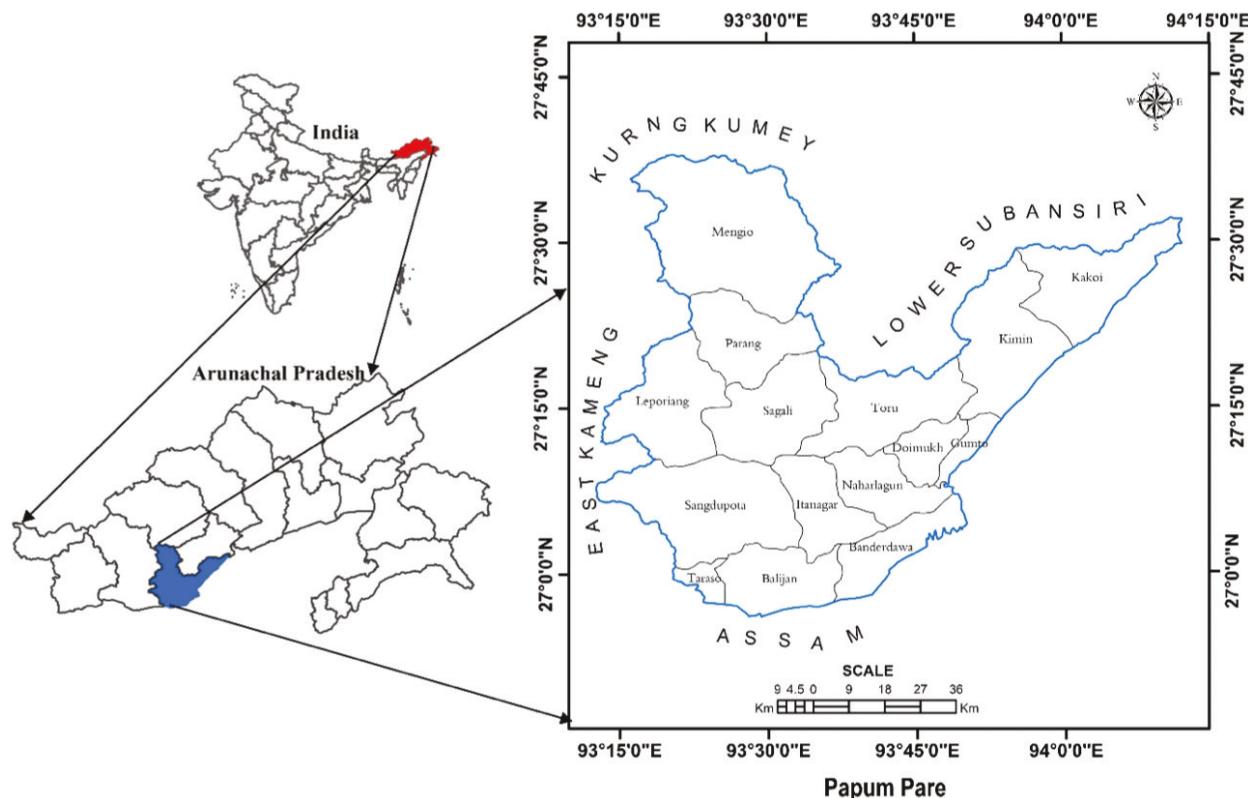


Figure 1. The study site.

(Hooker 1872–1897; Kanjilal et al. 1934–1940; Hajra et al. 1996; Giri et al. 2008–2009) and consultation with regional herbaria (ASSAM, ARUN). All the specimens were processed into mounted herbarium sheets as per the conventional methods of drying, poisoning, mounting, and labelling following Jain & Rao (1977). The processed herbarium specimens were deposited in the herbarium of the Department of Forestry, North Eastern Regional Institute of Science & Technology (NERIST), Nirjuli, Arunachal Pradesh, India.

RESULTS AND DISCUSSION

The present study revealed the rich diversity of climbing plants in Papum Pare District of Arunachal Pradesh. The exploration and field survey resulted in the documentation of 187 species belonging to 55 families and 117 genera distributed in the different forest areas of the district. Habit-wise analysis revealed that herbaceous vine constitutes the major group with 105 species followed by liana with 82 species. Majority of the species belong to Dicotyledons which comprises 150 species forming 82.87% while monocotyledon comprises 31 species forming 17.13% of the species recorded

during the study. Gymnosperm is represented by only one species, *Gnetum montanum*, while pteridophyte is represented by five species. Among the families, Fabaceae is the most dominant with 21 species followed by Cucurbitaceae with 13 species, Convolvulaceae and Vitaceae with 12 species each, Apocynaceae with 11 species, and Araceae with 10 species. The 10 dominant families in the present study are presented in Figure 2. Around 50% of the families like Actinidiaceae, Basellaceae, Berberidaceae, Dilleniaceae, Gentianaceae, Icacinaceae, Primulaceae, Schisandraceae, Stemonaceae, Urticaceae

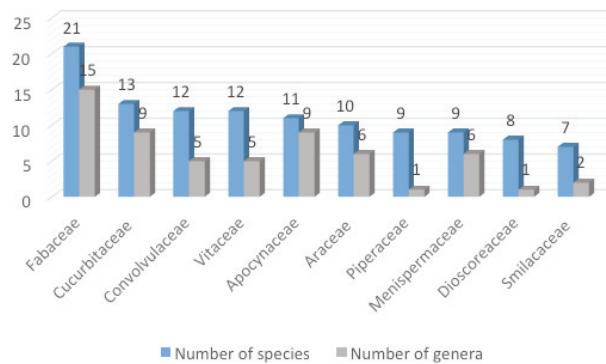


Figure 2. Dominant families with number of species and genera.

are represented by single species each. The families like Apocynaceae, Convolvulaceae, Cucurbitaceae, Fabaceae, and Vitaceae are also recorded as the dominant one in the flora of the state as well as other parts of the country (Chauhan et al. 1996; Hajra et al. 1996; Giri et al. 2008–2009; Muthumperumal & Parthasarathy 2009; Sarvalingam & Rajendran 2015). In terms of genera, *Piper* ranks the highest with nine species followed by *Dioscorea* (eight species), *Ipomoea* & *Rubus* (seven species each), *Smilax* (six species), and *Cayratia* (five species). The study by Gajurel et al. (2008) on the genus *Piper* from the state also indicated the richness of the species diversity in this genera.

The forests in the study sites are mainly tropical and subtropical with an intricate mosaic of habitats including open forests, dense forests, wasteland areas, riverine areas, and disturbed sites. The analysis of the habitat-wise distribution of species revealed a significant difference among the different habitats. The highest number of species was recorded from forest areas along the roadside and forest edges with 97 and 84 species,

respectively. While a lesser number of species was recorded from inside the undisturbed dense forest (23 species) and disturbed forest (33 species) areas (Figure 3).

The distribution of the climbing species was found to be concentrated mainly in the lowest elevation zone of ≤ 500 m with 136 species followed by 102 species in 500–1,000 m. The least distribution was observed in 1,000–1,500 m and above 1,500m with 51 and 23 species, respectively. The present observation of reduction in the number of species with increasing altitude is also in accordance with many workers who have also documented such findings worldwide (Schnitzer & Bongers 2002; Parthasarathy et al. 2004; Zhu 2008; Homeier et al. 2010). Along with the general distribution of the species, exclusivity of species distribution in different elevation zones was also observed. The exclusivity of the species distribution in ≤ 500 m and $> 1,500$ m zones was found higher with 44.85 % and 21.74%, respectively. While the exclusivity in the two intermediate zones of 500–1,000 m and 1,000–

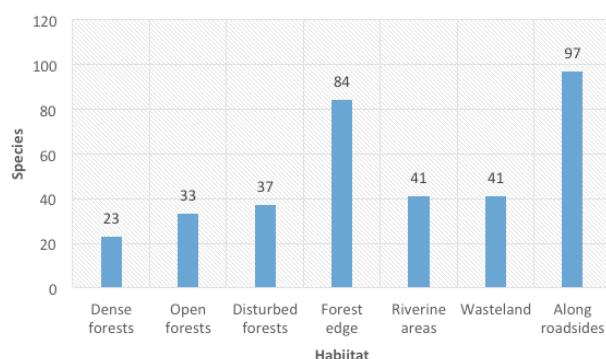


Figure 3. Different habitat types of climbing plants in Papum Pare.

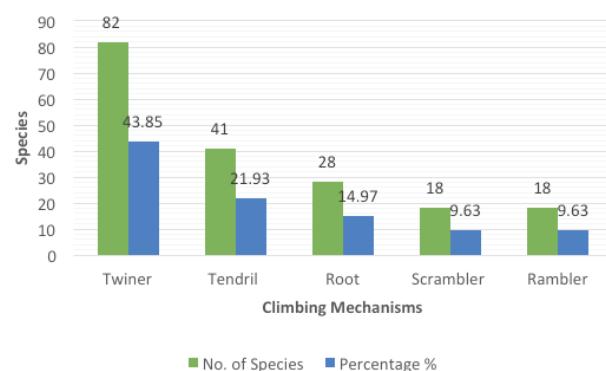


Figure 5. Climbing mechanisms.

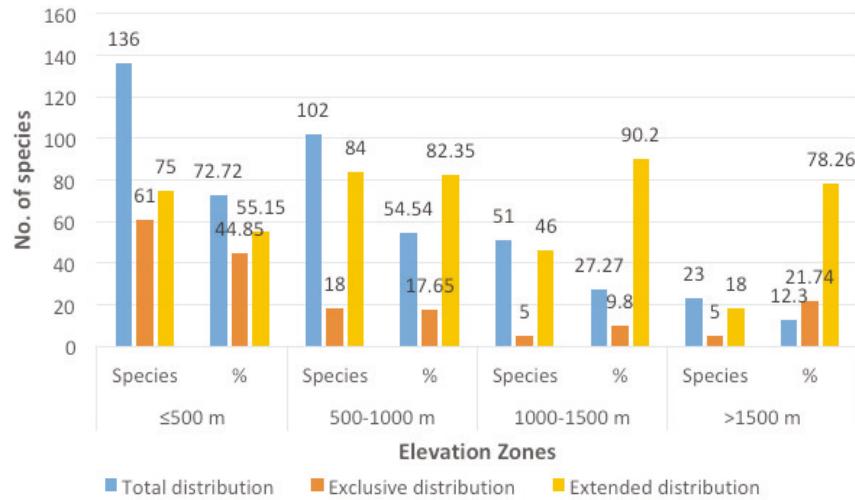


Figure 4. Distribution of climbing plants in different elevation zones of Papum Pare.

1,500 m was found comparatively less. Altogether, 99 species were found commonly distributed in more than one altitudinal range while the remaining 88 species were found restricted to a certain altitude only, including species like *Anredera cordifolia*, *Ampelocissus barbata*, *Anamirta cocculus*, *Cryptolepis sinensis*, *Dalhousiea bracteata*, *Decalepis khasiana*, *Embelia floribunda*, *Heterosmilax japonica*, *Lygodium flexuosum*, *Macroptilium atropurpureum*, *Myxopyrum smilacifolium*, *Natsiatum herpeticum*, and *Piper haridasanii*. The total species representation in the different elevation zones with its exclusive representation is provided in Figure 4 for easier observation and detection.

Species like *Argyreia nervosa*, *Caesalpinia cucullata*, *Cissampelos pareira*, *Cuscuta reflexa*, *Hedyotis scandens*, *Mikania micrantha*, *Paederia foetida*, and *Thunbergia grandiflora* were found most abundantly distributed in the study site. The invasive species like *Mikania micrantha*, *Thunbergia grandiflora*, and *Cuscuta reflexa* were found diversely distributed throughout the entire study area creating ecological and forest regeneration disturbances. Some species like *Ipomoea quamoclit*, *Macroptilium atropurpureum*, and *Pueraria montana* var. *lobata* although known to be highly invasive in other parts of the country (Reddy et al. 2008) were found restricted to only a few areas of the study site. The rare climbing species of the study area include *Abrus pulchellus*, *Anredera cordifolia*, *Anamirta cocculus*, *Argyreia capitiformis*, *Cryptolepis sinensis*, *Decalepis khasiana*, *Hodgsonia heterocilita*, and *Myxopyrum smilacifolium*.

The recorded plants were grouped into five types based on their climbing mechanisms used into twiner, scrambler (armed), rambler (unarmed), tendril climber, and root climber. Stem twining climber represents the highest group with 82 species (43.85 %) followed by tendril climber 41 species (21.93 %), root climber 28 species (14.97 %), and least representation by scrambler & rambler with 18 species each (9.63 %) (Figure 5). Higher diversity in the twining mechanism was also elucidated by various workers (Chittibabu & Parthasarathy 2001; Addo-Fordjour et al. 2008). One of the least diverse climbing mechanisms in the present study was climbing through hook/prickles in the scrambler group. Chittibabu & Parthasarathy (2001), however, in their work conducted in the tropical evergreen forest of Eastern Ghats had recorded a higher proportion of scrambler 23.1% diversity as compared to the tendril (19.2 %) and root climbers (3.85 %).

The list of all the recorded species with their family, habit & climbing mechanisms, threat status,

and elevation ranges of distribution are presented alphabetically in Table 1.

CONCLUSION

The present study provides an account of the rich floristic diversity of the climbing plant of Papum Pare District of Arunachal Pradesh, which contributes to the overall biodiversity of the forests. Presently, many forest areas of the district are subjected to various anthropogenic pressures due to various developmental activities and the forest areas are degrading at a faster rate. It was also noticed that the important climbers of the forests of the region like *Piper* spp., *Dioscorea* spp., *Cryptolepis sinensis*, *Hemidesmus indicus*, *Hodgsonia heterocilita*, *Entada phaseoloides*, and *Cayratia pedata* are becoming rare day by day. Therefore, there is a need to create awareness among the local people for the conservation of these plants to ensure their continued existence in the long run.

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Table 1. List of climbing plant species of Papum Pare District.

	Botanical name	Voucher no.	Family	Habit	Habitat	Climbing mode	Elevation zone (m)
1	<i>Abrus precatorius</i> L.	Soyala K 152	Fabaceae	Liana	AR	Twiner	< 500
2	<i>Abrus pulchellus</i> Thwaites	Soyala K 121	Fabaceae	Liana	FE	Twiner	< 500
3	<i>Acacia caesia</i> (L.) Willd.	Soyala K 149	Fabaceae	Liana	R, DIF	Scrambler	< 500
4	<i>Acacia pennata</i> (L.) Willd.	Soyala K 169	Fabaceae	Liana	R, OF, AR	Scrambler	< 500
5	<i>Actinidia callosa</i> Lindl.	Soyala K 159	Actinidiaceae	Liana	DF, FE, OF	Rambler	500–1500
6	<i>Aeschynanthus bracteatus</i> Wall. ex A.DC.	Soyala K 034	Gesneriaceae	Vine	R, OF, AR	Root	< 500
7	<i>Allamanda cathartica</i> L.	Soyala K 003	Apocynaceae	Liana	AR	Rambler	< 500
8	<i>Ampelocissus barbata</i> (Wall.) Planch.	Soyala K 090	Vitaceae	Liana	AR, DIF, OF	Tendrils	< 500
9	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Soyala K 161	Menispermaceae	Liana	AR, OF	Twiner	< 500
10	<i>Anredera cordifolia</i> (Ten.) Steenis	Soyala K 180	Basellaceae	Vine	AR	Twiner	< 500
11	<i>Argyreia capitiformis</i> (Poir.) Ooststr.	Soyala K 033	Convolvulaceae	Vine	WL	Twiner	< 500
12	<i>Argyreia nervosa</i> (Burm. f.) Bojer	Soyala K 034	Convolvulaceae	Vine	AR, WL, R, DIF	Twiner	< 500
13	<i>Asparagus racemosus</i> Willd.	Soyala K 115	Asparagaceae	Liana	R	Twiner	< 500
14	<i>Aspidocarya uvifera</i> Hook.f. & Thomson	Soyala K 085	Menispermaceae	Liana	DF, OF	Twiner	500–1500
15	<i>Bauhinia divergens</i> Baker	Soyala K 079	Fabaceae	Liana	FE	Tendril	500–1500
16	<i>Bauhinia khasiana</i> Baker	Soyala K 122	Fabaceae	Liana	AR	Tendril	< 500
17	<i>Bauhinia scandens</i> L.	Soyala K 165	Fabaceae	Liana	DIF, R, OF	Tendril	0–1000
18	<i>Beaumontia grandiflora</i> Wall.	Soyala K 020	Apocynaceae	Liana	AR	Twiner	< 500
19	<i>Berchemia floribunda</i> (Wall.) Brongn.	Soyala K 049	Rhamnaceae	Liana	FE	Rambler	500–1500
20	<i>Bougainvillea spectabilis</i> Willd.	Soyala K 032	Nyctaginaceae	Liana	AR	Scrambler	< 500
21	<i>Caesalpinia bonduc</i> (L.) Roxb.	Soyala K 179	Fabaceae	Liana	R, FE, OF	Scrambler	< 500
22	<i>Caesalpinia cucullata</i> Roxb.	Soyala K 171	Fabaceae	Liana	R, DIF	Scrambler	0–1000
23	<i>Calamus flagellum</i> Griff. ex Mart.	Soyala K 099	Arecaceae	Liana	R, AR	Scrambler	0–1000
24	<i>Calamus leptospadix</i> Griff.	Soyala K 142	Arecaceae	Liana	DIF	Scrambler	500–1000
25	<i>Calamus tenuis</i> Roxb.	Soyala K 127	Arecaceae	Liana	DF, DIF, OF	Scrambler	0–1500
26	<i>Cayratia corniculata</i> (Benth.) Gagnep.	Soyala K 145	Vitaceae	Vine	FE, AR	Tendril	< 500
27	<i>Cayratia geniculata</i> (Blume) Gagnep.	Soyala K 027	Vitaceae	Liana	FE, DIF	Tendril	< 500
28	<i>Cayratia japonica</i> (Thunb.) Gagnep.	Soyala K 004	Vitaceae	Vine	AR, DIF, WL	Tendril	0–1500
29	<i>Cayratia pedata</i> (Lam.) Gagnep.	Soyala K 050	Vitaceae	Vine	R	Tendril	500–1000
30	<i>Cayratia trifolia</i> (L.) Domin	Soyala K 028	Vitaceae	Vine	DIF, R, OF	Tendril	0–1500
31	<i>Centrosema pubescens</i> Benth.	Soyala K 001	Fabaceae	Vine	WL	Twiner	< 500
32	<i>Cissampelopsis volubilis</i> (Blume) Miq.	Soyala K 051	Asteraceae	Vine	FE, OF	Twiner	500–1500
33	<i>Cissampelos pareira</i> L.	Soyala K 029	Menispermaceae	Vine	AR, FE	Twiner	0–1000
34	<i>Cissus adnata</i> Roxb.	Soyala K 081	Vitaceae	Vine	AR, FE	Tendril	500–1000
35	<i>Clematis acuminata</i> DC.	Soyala K 162	Ranunculaceae	Vine	R	Tendril	< 500
36	<i>Clerodendrum splendens</i> G.Don	Soyala K 146	Lamiaceae	Liana	AR	Twiner	< 500
37	<i>Clerodendrum thomsoniae</i> Balf.f.	Soyala K 174	Lamiaceae	Vine	AR	Twiner	< 500
38	<i>Clitoria ternatea</i> L.	Soyala K 002	Fabaceae	Vine	AR	Twiner	< 500
39	<i>Coccinia grandis</i> (L.) Voigt	Soyala K 005	Cucurbitaceae	Vine	AR, FE, WL	Tendril	0–1000
40	<i>Codonopsis javanica</i> (Blume) Hook.f. & Thomson	Soyala K 172	Convolvulaceae	Vine	FE, OF	Twiner	500–1500
41	<i>Combretum decandrum</i> Jacq.	Soyala K 133	Combretaceae	Liana	DIF, FE	Twiner	0–1000
42	<i>Combretum indicum</i> (L.) DeFilipps	Soyala K 006	Combretaceae	Liana	AR	Twiner	< 500
43	<i>Crawfurdia campanulacea</i> Wall. & Griff. ex C.B.Clarke	Soyala K 052	Gentianaceae	Vine	FE, DIF, AR	Twiner	500– beyond 1500



	Botanical name	Voucher no.	Family	Habit	Habitat	Climbing mode	Elevation zone (m)
44	<i>Croton caudatus</i> Geiseler	Soyala K 176	Euphorbiaceae	Liana	AR, FE, R, DIF	Twiner	< 500
45	<i>Cryptolepis dubia</i> (Burm.f.) M.R. Almeida	Soyala K 046	Apocynaceae	Liana	DIF, AR	Twiner	0–1000
46	<i>Cryptolepis sinensis</i> (Lour.) Merr.	Soyala K 108	Apocynaceae	Liana	R, OF	Twiner	500–1000
47	<i>Cuscuta reflexa</i> Roxb.	Soyala K 055	Convolvulaceae	Vine	WL, DIF, AR	Twiner	All elevation zones
48	<i>Dalhousiea bracteata</i> (Roxb.) Benth.	Soyala K 113	Fabaceae	Liana	R, DIF, FE	Twiner	< 500
49	<i>Decalepis khasiana</i> (Kurz) Ionta ex Kamble	Soyala K 105	Apocynaceae	Liana	R	Twiner	500–100
50	<i>Derris marginata</i> (Roxb.) Benth.	Soyala K 053	Fabaceae	Liana	DF, AR, FE, R	Twiner	500–1500
51	<i>Dioscorea alata</i> L.	Soyala K 155	Dioscoreaceae	Vine	AR	Twiner	0–1500
52	<i>Dioscorea bulbifera</i> L.	Soyala K 107	Dioscoreaceae	Vine	R, FE	Twiner	0–1000
53	<i>Dioscorea esculenta</i> (Lour.) Burkill	Soyala K 177	Dioscoreaceae	Vine	AR	Twiner	< 500
54	<i>Dioscorea floribunda</i> M.Martens & Galeotti	Soyala K 183	Dioscoreaceae	Vine	FE	Twiner	< 500
55	<i>Dioscorea glabra</i> Roxb.	Soyala K 109	Dioscoreaceae	Vine	FE, AR	Twiner	500–1000
56	<i>Dioscorea hispida</i> Dennst.	Soyala K 110	Dioscoreaceae	Vine	AR	Twiner	500–1000
57	<i>Dioscorea oppositifolia</i> L.	Soyala K 007	Dioscoreaceae	Vine	FE	Twiner	< 500
58	<i>Dioscorea pentaphylla</i> L.	Soyala K 153	Dioscoreaceae	Vine	FE, AR	Twiner	0–1500
59	<i>Embelia floribunda</i> Wall.	Soyala K 075	Primulaceae	Liana	DIF, AR	Rambler	1000–1500
60	<i>Entada phaseoloides</i> (L.) Merr.	Soyala K 131	Fabaceae	Liana	DF	Twiner	500–1500
61	<i>Epipremnum aureum</i> (Linden & André) G.S.Bunting	Soyala K 031	Araceae	Liana	AR, FE	Root	< 500
62	<i>Epipremnum pinnatum</i> (L.) Engl.	Soyala K 064	Araceae	Liana	AR, DF, FE, OF	Root	All elevation zones
63	<i>Erythropalum scandens</i> Blume	Soyala K 102	Oleaceae	Liana	R	Twiner	500–1000
64	<i>Euonymus</i> sp.	Soyala K 112	Celastraceae	Liana	DIF	Root	500–1000
65	<i>Ficus hederacea</i> Roxb.	Soyala K 036	Moraceae	Liana	AR, FE, R	Root	< 500
66	<i>Ficus pumila</i> L.	Soyala K 037	Moraceae	Liana	FE, AR	Root	< 500; 1000–1500
67	<i>Fissistigma</i> sp.	Soyala K 184	Annonaceae	Liana	DIF	Twiner	< 500
68	<i>Gnetum montanum</i> Markgr.	Soyala K 101	Gnetaceae	Liana	R, DIF, DF, OF	Twiner	0–1000
69	<i>Gouania leptostachya</i> DC.	Soyala K 086	Rhamnaceae	Liana	R, AR	Tendril	0–1000
70	<i>Hedyotis scandens</i> Roxb.	Soyala K 087	Rubiaceae	Vine	AR, DIF, FE	Twiner	0–1500
71	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	Soyala K 136	Apocynaceae	Vine	DIF	Twiner	< 500; 1000–1500
72	<i>Heterosmilax japonica</i> Kunth	Soyala K 096	Smilacaceae	Vine	DF	Tendril	1000–1500
73	<i>Hodgsonia heteroclita</i> (Roxb.) Hook.f. & Thomson	Soyala K 065	Cucurbitaceae	Vine	FE	Tendrils	>1500
74	<i>Holboellia latifolia</i> Wall.	Soyala K 124	Berberidaceae	Liana	AR, DIF, R, OF	Twiner	< 500
75	<i>Holmskioldia sanguinea</i> Retz.	Soyala K 015	Lamiaceae	Liana	AR, WL	Rambler	< 500
76	<i>Hoya globulosa</i> Hook.f.	Soyala K 038	Apocynaceae	Liana	AR	Twiner	< 500
77	<i>Hoya pubicalyx</i> Merr.	Soyala K 130	Apocynaceae	Liana	DIF	Twiner	< 500
78	<i>Hydrangea anomala</i> D. Don	Soyala K 097	Hydrangeaceae	Liana	R	Root	>1500
79	<i>Ichnocarpus frutescens</i> (L.) W.T. Aiton	Soyala K 125	Apocynaceae	Liana	AR	Twiner	< 500
80	<i>Ipomoea alba</i> L.	Soyala K 060	Convolvulaceae	Vine	AR, WL	Twiner	< 500
81	<i>Ipomoea aquatica</i> Forssk.	Soyala K 039	Convolvulaceae	Vine	WL	Twiner	< 500
82	<i>Ipomoea batatas</i> (L.) Lam.	Soyala K 156	Convolvulaceae	Vine	AR, WL	Twiner	0–1000
83	<i>Ipomoea cairica</i> (L.) Sweet	Soyala K 042	Convolvulaceae	Vine	AR, WL	Twiner	< 500
84	<i>Ipomoea purpurea</i> (L.) Roth	Soyala K 092	Convolvulaceae	Vine	AR	Twiner	< 500
85	<i>Ipomoea quamoclit</i> L.	Soyala K 008	Convolvulaceae	Vine	AR	Twiner	< 500
86	<i>Ipomoea triloba</i> L.	Soyala K 014	Convolvulaceae	Vine	WL	Twiner	< 500

	Botanical name	Voucher no.	Family	Habit	Habitat	Climbing mode	Elevation zone (m)
87	<i>Jasminum laurifolium</i> Roxb. ex Hornem.	Soyala K 089	Oleaceae	Liana	OF	Rambler	500–1000
88	<i>Lagenaria siceraria</i> (Molina) Standl.	Soyala K 163	Cucurbitaceae	Vine	AR, FE	Tendrils	500–1500
89	<i>Luffa cylindrica</i> (L.) M.Roem.	Soyala K 009	Cucurbitaceae	Vine	AR, WL	Tendrils	< 500
90	<i>Lycopodium clavatum</i> L.	Soyala K 082	Lycopodiaceae	Vine	AR	Rambler	0–1000
91	<i>Lygodium flexuosum</i> (L.) Sw.	Soyala K 116	Lygodiaceae	Vine	AR, WL	Twiner	< 500
92	<i>Lygodium japonicum</i> (Thunb.) Sw.	Soyala K 170	Lygodiaceae	Vine	WL	Twiner	< 500
93	<i>Macroptilium atropurpureum</i> (DC.) Urb.	Soyala K 013	Fabaceae	Vine	WL	Twiner	< 500
94	<i>Mansoa alliacea</i> (Lam.) A.H. Gentry	Soyala K 040	Bignoniaceae	Liana	AR	Tendril	< 500
95	<i>Mastersia assamica</i> Benth.	Soyala K 148	Fabaceae	Liana	AR, FE, WL	Twiner	< 500
96	<i>Melocalamus compactiflorus</i> (Kurz) Benth.	Soyala K 128	Poaceae	Liana	FE	Rambler	< 500
97	<i>Melodinus cochinchinensis</i> (Lour.) Merr.	Soyala K 024	Apocynaceae	Liana	FE	Rambler	< 500
98	<i>Merremia umbellata</i> (L.) Hallier f.	Soyala K 117	Convolvulaceae	Vine	WL	Twiner	< 500
99	<i>Mikania micrantha</i> Kunth	Soyala K 095	Asteraceae	Vine	AR, DIF, FE, OF, R, WL	Twiner	All elevation zones
100	<i>Millettia pachycarpa</i> Benth.	Soyala K 143	Fabaceae	Liana	AR, DF, FE, OF	Twiner	0–1500
101	<i>Momordica charantia</i> L.	Soyala K 041	Cucurbitaceae	Vine	WL	Tendril	< 500
102	<i>Momordica dioica</i> Roxb. ex Willd.	Soyala K 061	Cucurbitaceae	Vine	R, FE	Tendril	< 500
103	<i>Mukia maderaspatana</i> (L.) M.Roem.	Soyala K 033	Cucurbitaceae	Vine	WL, R, AR	Tendril	< 500
104	<i>Myxopyrum smilacifolium</i> (Wall.) Blume	Soyala K 021	Oleaceae	Liana	FE, OF	Twiner	< 500
105	<i>Naravelia zeylanica</i> (L.) DC.	Soyala K 043	Ranunculaceae	Liana	FE, AR	Tendril	< 500
106	<i>Natsiatum herpeticum</i> Buch.-Ham. ex Arn.	Soyala K 114	Icacinaceae	Vine	AR, WL	Twiner	< 500
107	<i>Paederia foetida</i> L.	Soyala K 123	Rubiaceae	Vine	WL, R, AR	Twiner	0–1000
108	<i>Parthenocissus semicordata</i> (Wall.) Planch.	Soyala K 062	Vitaceae	Vine	R	Tendril	>1500
109	<i>Passiflora vitifolia</i> Kunth	Soyala K 154	Passifloraceae	Vine	AR	Tendril	< 500
110	<i>Pegia nitida</i> Colebr.	Soyala K 126	Anacardiaceae	Liana	AR, FE, WL	Rambler	0–1000
111	<i>Pericampylus glaucus</i> (Lam.) Merr.	Soyala K 144	Menispermaceae	Vines	FE, OF	Twiner	0–1000
112	<i>Periploca calophylla</i> (Wight) Falc.	Soyala K 063	Apocynaceae	Liana	DF, FE	Twiner	>1500
113	<i>Persicaria chinensis</i> (L.) H. Gross	Soyala K 158	Polygonaceae	Vine	AR	Rambler	0–1000
114	<i>Persicaria nepalensis</i> (Meisn.) Miyabe	Soyala K 119	Polygonaceae	Vine	AR	Rambler	< 500
115	<i>Philodendron hederaceum</i> (Jacq.) Schott	Soyala K 157	Araceae	Vine	AR, R	Root	< 500
116	<i>Phyllanthus reticulatus</i> Poir.	Soyala K 151	Euphorbiaceae	Liana	WL	Scrambler	< 500
117	<i>Piper acutistigmum</i> C.DC.	Soyala K 080	Piperaceae	Vine	FE, R	Root	0–1500
118	<i>Piper arunachalensis</i> Gajurel, Rethy & Y. Kumar	Soyala K 047	Piperaceae	Vine	FE, R	Root	500–1500
119	<i>Piper attenuatum</i> Buch.-Ham. ex Miq.	Soyala K 019	Piperaceae	Vine	AR, FE, R	Root	0–1000
120	<i>Piper betleoides</i> C.DC.	Soyala K 106	Piperaceae	Vine	AR, FE	Root	0–1500
121	<i>Piper griffithii</i> C.DC.	Soyala K 023	Piperaceae	Vine	FE	Root	< 500
122	<i>Piper haridasanii</i> Gajurel, Rethy & Y. Kumar	Soyala K 017	Piperaceae	Vine	AR, FE, R	Root	< 500
123	<i>Piper longum</i> L.	Soyala K 072	Piperaceae	Vine	AR, FE	Root	< 500
124	<i>Piper rhytidocarpum</i> Hook. f.	Soyala K 016	Piperaceae	Vine	FE, R, OF	Root	01000
125	<i>Piper sylvaticum</i> Roxb.	Soyala K 018	Piperaceae	Vine	AR, FE	Root	< 500
126	<i>Poikilospermum naucleiflorum</i> (Roxburgh ex Lindl.) Chew	Soyala K 129	Urticaceae	Liana	DF, FE	Root	0–1000
127	<i>Polygonum perfoliatum</i> L.	Soyala K 181	Polygonaceae	Vine	R, WL	Rambler	0–1000
128	<i>Pothos chinensis</i> (Raf.) Merr.	Soyala K 134	Araceae	Vine	AR, FE	Root	< 500; 1000–1500
129	<i>Pothos longipes</i> Schott	Soyala K 120	Araceae	Vine	DF, FE	Root	>1500

	Botanical name	Voucher no.	Family	Habit	Habitat	Climbing mode	Elevation zone (m)
130	<i>Pothos scandens</i> L.	Soyala K 091	Araceae	Vine	AR, DF	Root	< 500; >1500
131	<i>Pueraria montana</i> var. <i>lobata</i> (Willd.) Sanjappa & Pradeep	Soyala K 012	Fabaceae	Vine	AR, WL	Twiner	< 500
132	<i>Pueraria phaseoloides</i> (Roxb.) Benth.	Soyala K 094	Fabaceae	Vine	WL	Twiner	< 500
133	<i>Pyrostegia venusta</i> (Ker Gawl.) Miers	Soyala K 059	Bignoniaceae	Liana	AR	Tendril	< 500
134	<i>Pyrrosia nummulariifolia</i> (Sw.) Ching	Soyala K 056	Polypodiaceae	Vine	AR, DF, FE	Root	< 500
135	<i>Rhaphidophora decursiva</i> (Roxb.) Schott	Soyala K 132	Araceae	Liana	FE, DF, OF	Root	All elevation zones
136	<i>Rhaphidophora lancifolia</i> Schott	Soyala K 103	Araceae	Liana	DF, FE	Root	< 500; 1000–1500
137	<i>Rubia cordifolia</i> L.	Soyala K 135	Rubiaceae	Vine	AR, FE	Rambler	500–1500
138	<i>Rubia sikkimensis</i> Kurz	Soyala K 073	Rubiaceae	Vine	FE, AR, OF	Rambler	500–1500
139	<i>Rubus ellipticus</i> Sm.	Soyala K 139	Rosaceae	Liana	FE, AR	Scrambler	1000–1500
140	<i>Rubus hamiltonii</i> Hook.f.	Soyala K 069	Rosaceae	Liana	FE, AR,	Scrambler	1000–1500
141	<i>Rubus lucens</i> Focke	Soyala K 137	Rosaceae	Liana	FE, AR, OF	Scrambler	500–1500
142	<i>Rubus paniculatus</i> Sm.	Soyala K 098	Rosaceae	Liana	AR, FE	Scrambler	500–1500
143	<i>Rubus praestans</i> H.E. Weber	Soyala K 140	Rosaceae	Liana	FE, AR	Scrambler	500–1500
144	<i>Rubus rugosus</i> Sm.	Soyala K 164	Rosaceae	Liana	FE, AR	Scrambler	< 500
145	<i>Rubus sumatratus</i> Miq.	Soyala K 175	Rosaceae	Liana	AR	Scrambler	< 500
146	<i>Sabia lanceolata</i> Colebr.	Soyala K 083	Sabiaceae	Liana	FE	Twiner	500–1000
147	<i>Schefflera elliptica</i> (Blume) Harms	Soyala K 025	Araliaceae	Liana	AR, FE	Root	< 500
148	<i>Schefflera roxburghii</i> Gamble	Soyala K 057	Araliaceae	Liana	AR	Root	< 500
149	<i>Schisandra neglecta</i> A.C. Sm.	Soyala K 048	Schisandraceae	Liana	DF, R	Twiner	500–1000
150	<i>Scindapsus officinalis</i> (Roxb.) Schott	Soyala K 167	Araceae	Vine	OF, DF	Root	500–beyond 1500
151	<i>Selaginella helseri</i> Warb.	Soyala K 077	Selaginellaceae	Vine	AR	Rambler	0–1000
152	<i>Senecio scandens</i> Buch.-Ham. ex D.Don	Soyala K 074	Asteraceae	Vine	FE, OF	Twiner	1000–1500
153	<i>Shuteria involucrata</i> (Wall.) Wight & Arn.	Soyala K 100	Fabaceae	Vine	FE, OF	Twiner	500–1000
154	<i>Smilax glabra</i> Roxb.	Soyala K 078	Smilacaceae	Vine	FE	Tendril	500–1000
155	<i>Smilax lanceifolia</i> Roxb.	Soyala K 070	Smilacaceae	Vine	DIF	Tendril	500–1500
156	<i>Smilax menispermoidea</i> A.DC.	Soyala K 066	Smilacaceae	Vine	DF, OF	Tendril	>1500
157	<i>Smilax ovalifolia</i> Roxb. ex D.Don	Soyala K 044	Smilacaceae	Vine	FE, WL	Tendril	< 500
158	<i>Smilax perfoliata</i> Lour.	Soyala K 138	Smilacaceae	Vine	DIF, FE	Tendril	500–1500
159	<i>Smilax roxburghiana</i> Wall. ex A.DC.	Soyala K 067	Smilacaceae	Vine	DIF, FE	Tendril	1000–beyond 1500
160	<i>Solanum jasminoides</i> J. Paxton	Soyala K 104	Solanaceae	Vine	AR	Tendril	500–1000
161	<i>Solena heterophylla</i> Lour.	Soyala K 118	Cucurbitaceae	Vine	WL	Tendril	< 500
162	<i>Stemona tuberosa</i> Lour.	Soyala K 030	Stemonaceae	Vine	AR, R	Twiner	0–1000
163	<i>Stephania glabra</i> (Roxb.) Miers	Soyala K 186	Menispermaceae	Vine	AR, FE	Twiner	0–1000
164	<i>Stephania glandulifera</i> Miers	Soyala K 033	Menispermaceae	Vine	AR, FE, R	Twiner	< 500
165	<i>Stephania japonica</i> (Thunb.) Miers	Soyala K 034	Menispermaceae	Vine	WL	Twiner	< 500
166	<i>Stephania rotunda</i> Lour.	Soyala K 187	Menispermaceae	Vine	WL	Twiner	< 500
167	<i>Syngonium neglectum</i> Schott	Soyala K 033	Araceae	Vine	AR, WL	Root	< 500
168	<i>Tetracerata sarmentosa</i> (L.) Vahl	Soyala K 034	Dilleniaceae	Liana	R, WL, OF	Twiner	< 500
169	<i>Tetrastigma bracteolatum</i> (Wall.) Planch.	Soyala K 111	Vitaceae	Liana	FE	Tendrils	500–1000
170	<i>Tetrastigma pubinerve</i> Merr. & Chun	Soyala K 068	Vitaceae	Liana	DF, FE	Tendril	< 500; >1500
171	<i>Tetrastigma rumicispermum</i> (M.A. Lawson) Planch.	Soyala K 076	Vitaceae	Liana	DF, FE, R, OF	Tendril	500–1500
172	<i>Tetrastigma serrulatum</i> (Roxb.) Planch.	Soyala K 147	Vitaceae	Liana	DIF, OF	Tendril	< 500
173	<i>Thladiantha cordifolia</i> (Blume) Cogn.	Soyala K 035	Cucurbitaceae	Vine	AR, DIF	Tendril	< 500



	Botanical name	Voucher no.	Family	Habit	Habitat	Climbing mode	Elevation zone (m)
174	<i>Thunbergia alata</i> Bojer ex Sims	Soyala K 160	Acanthaceae	Vine	AR, WL	Twiner	< 500
175	<i>Thunbergia coccinea</i> Wall.	Soyala K 058	Acanthaceae	Vine	FE, R, DIF	Twiner	0–1000
176	<i>Thunbergia fragrans</i> Roxb.	Soyala K 141	Acanthaceae	Vine	AR, WL	Twiner	< 500
177	<i>Thunbergia grandiflora</i> (Roxb. ex Rottl.) Roxb.	Soyala K 026	Acanthaceae	Vine	FE, WL, DIF, AR	Twiner	0–1000
178	<i>Tinospora sinensis</i> (Lour.) Merr.	Soyala K 093	Menispermaceae	Vine	R, FE	Twiner	0–1000
179	<i>Toddalia asiatica</i> (L.) Lam.	Soyala K 168	Rutaceae	Liana	FE, DF	Scrambler	500–1500
180	<i>Trichosanthes dioica</i> Roxb.	Soyala K 054	Cucurbitaceae	Vine	WL	Tendril	500–1000
181	<i>Trichosanthes tricuspidata</i> Lour.	Soyala K 185	Cucurbitaceae	Vine	AR, FE	Tendrils	0–1000
182	<i>Trichosanthes wallichiana</i> (Ser.) Wight	Soyala K 084	Cucurbitaceae	Vine	FE, OF	Tendril	500–1000
183	<i>Tropaeolum majus</i> L.	Soyala K 022	Tropaeolaceae	Vine	WL, R	Twiner	0–1000
184	<i>Uncaria sessiliflora</i> Roxb.	Soyala K 166	Rubiaceae	Liana	FE, DF	Scrambler	500–1500
185	<i>Vernonia</i> sp.	Soyala K 071	Asteraceae	Vine	FE	Rambler	1000–1500
186	<i>Vigna umbellata</i> (Thunb.) Ohwi & H.Ohashi	Soyala K 178	Fabaceae	Vine	AR, WL	Twiner	< 500
187	<i>Volkameria inermis</i> L.	Soyala K 010	Lamiaceae	Liana	WL	Rambler	0–1000

DF—Dense Forest | OF—Open Forest | DIF—Disturbed Forest | FE—Forest Edge | R—Riverine areas | WL—Wastelands | AR—Areas along roadsides | EAP—Endemic to Arunachal Pradesh | ENE—Endemic to northeastern region | EEH—Endemic to Eastern Himalaya.

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Image 1. A—*Crawfurdia campanulacea* | B—*Dioscorea oppositifolia* | C—*Melodinus cochinchinensis* | D—*Pegia nitida* | E—*Phyllanthus reticulatus* | F—*Pericampylus glaucus* | G—*Hedyotis scandens* | H—*Holboellia latifolia* | I—*Dalhousia bracteata* | J—*Uncaria sessilifructus* (hook) | K—*Croton caudatus* (twiner) | L—*Smilax menispermoidea* (tendril). © Soyal Kashung and P.R. Gajurel.



Image 2. A—*Piper arunachalensis* | B—*Decalepis khasiana* | C—*Gnetum montanum* | D—*Rubia sikkimensis* | E—*Shuteria involucrata* | F—*Cissampelopsis volubilis* | G—*Embelia floribunda* | H—*Argyreia nervosa* | I—*Myxopyrum smilacifolium* | J—*Natsiatum herpticum* | K—*Smilax glabra* | L—*Mukia maderaspatana*. © Soyala Kashung and P.R. Gajurel.



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