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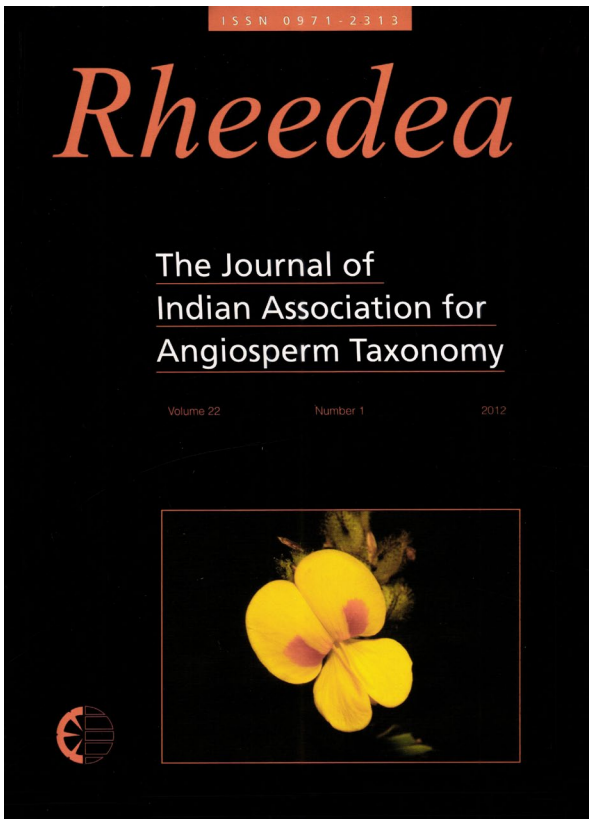
Lekhak M.M. & S.R. Yadav



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Herbaceous vegetation of threatened high altitude lateritic plateau ecosystems of Western Ghats, southwestern Maharashtra, India

M.M. Lekhak* and S.R. Yadav
Angiosperm Taxonomy Laboratory, Department of Botany, Shivaji University,
Kolhapur – 416 004, Maharashtra, India.
*E-mail: mlekhak@gmail.com

Abstract

High altitude lateritic plateaus (locally known as *sadas*) are found throughout the northern Western Ghats. Despite their rich floral diversity, these plateaus are highly neglected due to their high seasonality. They are isolated landscapes that are subjected to edapho-climatic harshness and anthropogenic pressures. A floristic survey of ten such lateritic plateaus in southwestern Maharashtra, revealed the presence of 356 species and 5 varieties of herbaceous plants distributed in 61 angiospermous families under 27 orders. Of the 67 endemic species reported from these habitats, 39 (58%) are restricted to plateaus only. Poaceae show high level of endemism (22 species). These plateau vegetations have varied microhabitats that support distinct plant communities depending primarily on soil and moisture availability. These unprotected unique ecosystems, rich in floral diversity and endemism are in need of immediate conservation priority.

Keywords: Endemism, Habitats, Northern Western Ghats, Plateaus

Introduction

Lateritic plateaus or plateaux (locally known as *sadas*) are a distinct geographical feature of northern Western Ghats (Surat to Goa), India. Based on altitude, the plateaus of Maharashtra, can be categorized into two types: i) low altitude lateritic plateaus (below 100 m) commonly found in Konkan region and ii) high altitude lateritic plateaus (above 800 m) mainly concentrated in the Western Ghats of Satara, Kolhapur and Ratnagiri districts. These flat-topped landscapes have been variously termed as duricrusts, ferricretes, laterites or table-lands. Duricrust is a general term for a hard crust formed at or near the ground surface, irrespective of the composition (Ollier & Sheth, 2008). Laterites are iron-rich duricrusts which have formed directly from the breakdown of materials in their immediate vicinity, and so do not contain any readily identifiable allochthonous component, whereas, ferricretes are duricrusts which incorporate materials non-indigenous to the immediate locality (Widdowson, 2003). Table-lands is a general term for a flat elevated region. Lateritic plateaus are also popularly known as rock outcrops, i.e., habitats where portions of freely exposed bedrocks protrude above the soil level due to natural reasons (Watve, 2009). In the present article we have consistently used the term plateaus to refer to these landforms.

Plateaus in northern Western Ghats lack proper substrate (soil) and exhibit extreme climatic conditions. Their environment usually share a series of stressful characteristics, such as high UV exposure, daily thermal variation, constant winds, high evapotrasnspiration, low water retention and impermeable soils (Porembski & Barthlott, 2000; Scarano, 2002). Plant communities here are basically edaphically controlled and show adaptation for water accumulation, such as succulence and poikilohydry, carnivory in response to the lack of nutrients (N, P and S) in the soil and the presence of subterranean organs (bulbs, corms, tubers and rhizomes) to overcome extreme temperature during summer. Fair amount of literature on botany, ecology and phytogeography is available for tropical outcrops. The best-studied are granitic and gneissic outcrops, known as inselbergs in Africa and South America (Porembski & Barthlott, 2000). In Maharashtra, Watve (2003, 2009), Porembski & Watve (2005) and Watve & Thakur (2006) have conducted ecological studies on the plateaus. However, floristic work solely on the plateaus has never

been attempted before as many of the plateaus are in remote areas. Secondly, the flora on the plateaus comprises mainly ephemeral and seasonal herbaceous elements and hence gets neglected by the botanists.

The present study was carried out to document the diversity of herbaceous angiosperms and rare, endemic and threatened taxa of the plateaus. The baseline data generated in this study will greatly help in both highlighting the need and planning for conservation ecology of fragile flora of the plateaus.

Study Area

Geomorphology: High altitude lateritic plateaus form a common geomorphological feature in the northern Western Ghats, particularly in the districts of southwestern Mahrashtra, viz., Satara, Kolhapur and Ratnagiri. These duricrusts result from impregnation of saprolite (rock weathered *in situ*) with iron oxides and hydroxides (Ollier & Sheth, 2008). They occur between the latitudes 16^0 and 17^0 N in Maharashtra at an altitude of more than 850 m. These plateaus are isolated summits and are often referred to as terrestrial islands. The surface of these plateaus is strongly weathered and uneven that enables to support various habitats.

In the present study 10 plateaus, namely, Chalkewadi, Kas, Panchgani Tableland, Thoseghar (Satara district), Barki, Kondushi, Masai, Morjai, Shelap (Kolhapur district) and Gothane (Ratnagiri district) were studied (**Fig. 1**). The size of the studied plateaus varied from 0.27 km^2 to 9.67 km^2 and the altitude from 897 m to 1317 m.

Climatic conditions: Climatological data, particularly for the plateaus are lacking. The climate is characterized by monsoon and the year can be divided into three climatic periods or seasons *viz*. rainy season (June – October), winter season (November – February) and summer season (March – May). Thus the monsoon is followed by a considerable stretch of dry period between November and May. During monsoon, plateaus experience very high rainfall (6000 – 7000 mm) that results in relative humidity often reaching up to 90%. Nevertheless, humidity is just 14% during the dry period, when the temperature of the exposed rock surface is very high (58^0C) in summer (Watve, 2009).

Methods

At least three field visits were made during different seasons: summer (March – May), monsoon (June – October) and winter (November – February) between June 2008 and February 2012. Each plateau was GPS marked. The data on latitude and longitude thus obtained was calibrated with Google Earth 6.2 (http://www.google.com/earth/index.html) for getting the images/maps of the plateaus. The images so obtained were traced to mark the outline of the plateaus. This outline was then printed on a graph paper and the area (sq. km.) for the respective plateau was calculated. Plant specimens were collected and identified using local and regional floras. The identity was confirmed at BSI, Pune and BLAT, Mumbai. Voucher specimens were deposited at SUK. Life-forms have been classified as per Raunkiaer (1934). Phenology was also recorded. The status of the species was assessed as per the IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2001).

Results and Discussion

Types of Habitat and Vegetation

Plants on the plateaus are adapted to various microhabitats and each of these microhabitats is unique in its edaphic properties, water availability and species composition. The most common habitat types (**Fig. 2**) observed on plateaus are described below by following a fairly established categorization for rock outcrops by Porembski & Barthlott (2000) and Jacobi *et al.* (2007) with some modifications.

Boulders (B): They are large rocks either isolated or in groups. They are usually covered by mossess. Some typical plants found are *Aerides crispa, Begonia crenata, B. trichocarpa, Dendrobium barbatulum* and *Eria reticosa.*

Crust Edges or Cliffs (C): They are edges of the plateaus inhabited by *Begonia crenata*, *B. trichocarpa*, *Impatiens acaulis*, *Piper* spp., *Sonerila scapigera, Tripogon lisboae* and *T. pungens*.

Ephemeral Flush Vegetation (EFV): It occurs on rocks where water seeps continuously through the rainy season and soil deposition is negligible. It occupies a large area on plateaus, colonized predominantly by *Drosera indica, Eriocaulon* spp., *Fimbristylis tenera, Kohautia aspera, Murdannia semiteres, Rhamphicarpa longiflora, Utricularia albocaerulea*, *U. praeterita, U. reticulata* and *U. purpurascens*.

Exposed Rock Surfaces (ERS): They are flat or uneven surfaces, exposed to direct sunlight. They gradually get covered by grasses during monsoon. Some common plants of the habitat are: *Eriocaulon eurypeplon, E. minutum, E. odoratum, E. stellulatum,*

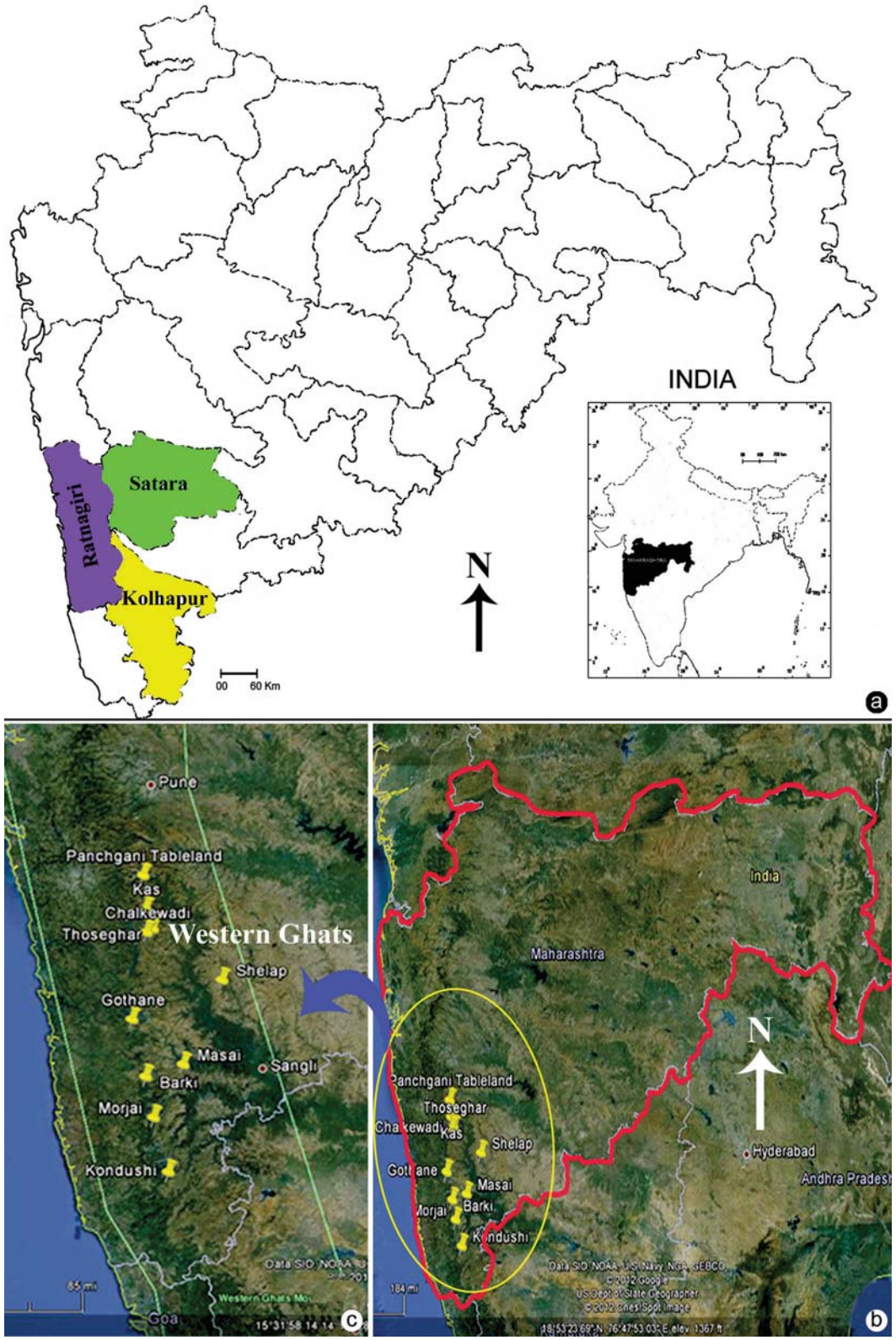

Fig. 1. Map showing study area: a. Coloured areas indicating districts under present study in Maharashtra; b. Satellite image of Maharashtra, boundary of the state is highlighted and studied plateaus are GPS marked; c. Enlarged satellite image showing the GPS location of plateaus across the Western Ghats.

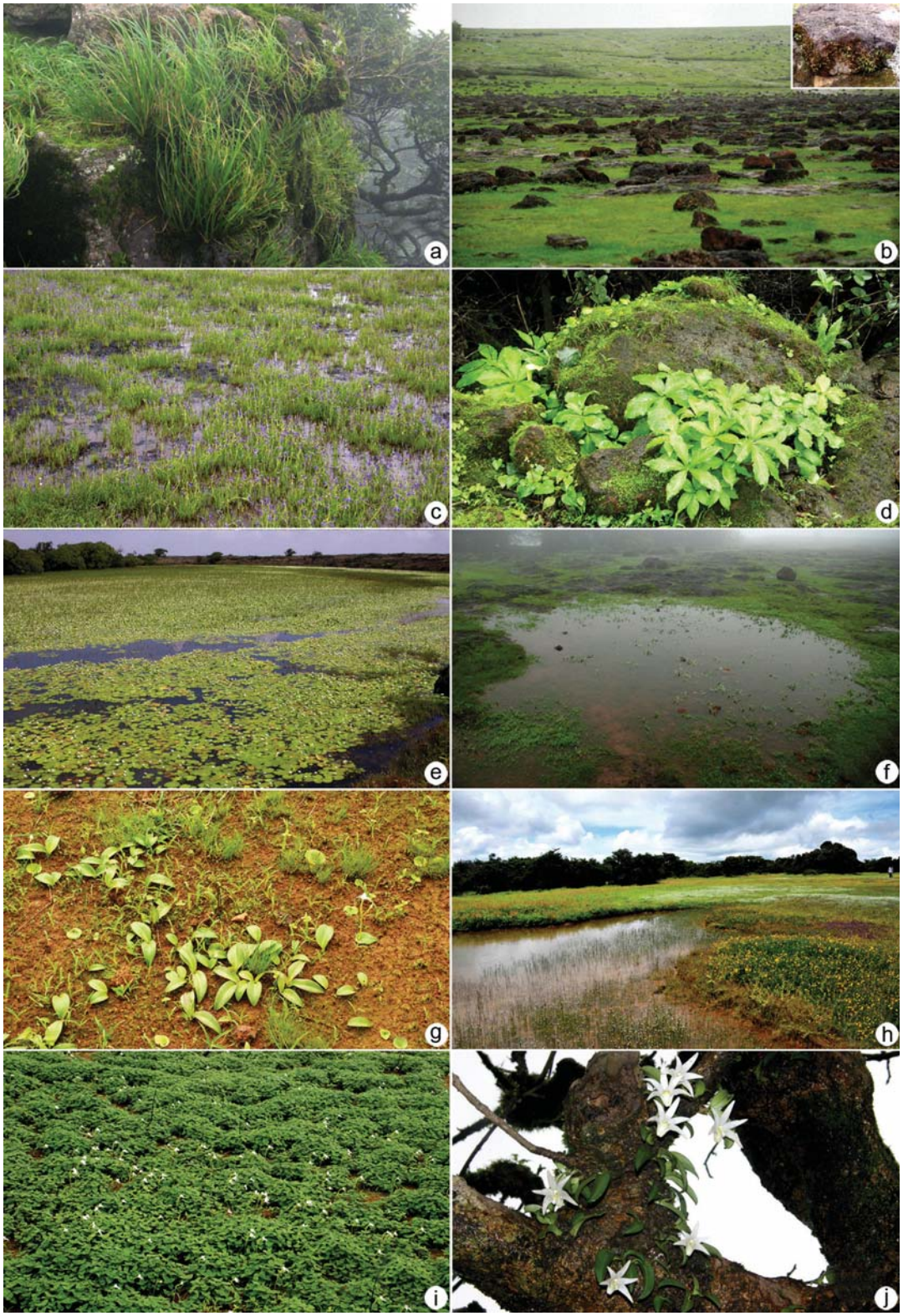

Fig. 2. Habitat types on lateritic plateaus: a. Crust edges/cliffs; b. Exposed rock surfaces and boulders, inset shows a boulder covered with *Eria reticosa*; c. Ephemeral vegetation; d. Rock crevices or fissures; e. Seasonal ponds; f. Small ephemeral pools; g. Soil-covered areas; h. Soil-filled depressions; i. Soil-rich areas; j. Tree trunk with *E. reticosa*.

Habenaria rariflora, Indopoa paupercula, Neanotis foetida, Utricularia albocaerulea, U. praeterita and *U. purpurascens*.

Rock Crevices/Fissures (RC): They are frequent on plateaus providing a unique niche. Many species such as *Arisaema leschenaultii, Ceropegia jainii, Flemingia nilgiriensis*, *Indigofera dalzellii, Murdannia lanuginosa, Neanotis foetida* and *Remusatia vivipara* occupy these habitats.

Seasonal Ponds (SP): They are small ponds formed only during the monsoon. Common aquatic angiosperms of the ponds are *Nymphoides indica*, *Myriophyllum oliganthum, Persicaria glabra* and *Rotala ritchiei.*

Small Ephemeral Pools (SEP): They are shallow depressions which remain filled with water during monsoon. There is hardly any soil deposition and plateau crust can be seen easily. *Aponogeton satarensis* is the typical member of this habitat.

Soil-covered Areas (SCA): These are areas in which the soil thickness is 10 – 20 cm. The surface is occupied by *Curculigo orchioides*¸ *Drosera burmannii, Dipcadi ursulae*, *Habenaria grandifloriformis, H. heyneana, Hypoxis aurea, Impatiens lawii*, *I. tomentosa, Iphigenia stellata, Peristylus densus* and *P. stocksii*.

Soil-filled Depressions (SFD): These are depressions that accumulate soil and water. *Aponogeton satarensis, Dopatrium junceum, Eriocaulon tuberiferum, Isachne lisboae, Oryza rufipogon, Paspalum canarae* var. *canarae, Pogostemon deccanensis*, *Pycreus sanguinolentus, Rotala densiflora* and *Smithia racemosa* are commonly found in such areas.

Soil-rich Areas (SRA): These are habitats with more than 20 cm soil-thickness and covered by mats of *Pleocaulus sessilis*. The gaps left between mats are occupied by *Adenoon indicum, Curculigo orchioides, Flemingia nilgiriensis, Fimbristylis dichotoma*, *Hypoxis aurea, Ipomoea barleriodes, Murdannia lanuginosa* and *M. simplex*.

Tree Cover and Tree Associated (T): Some tree species occur on soil-rich areas of plateaus. The covered shady areas provide a habitat which is entirely different from the harsh environmental conditions prevailing on the exposed surfaces of plateaus. Certain plant species grow under the cover of these trees are *Iphigenia stellata, Liparis nervosa*, *L. rheedei, Neanotis montholoni* and *Nervilia* species. Similarly, high humidity during monsoon makes the tree trunk or branches of tree a good substrate for seed germination. As a result mossess and other plants like *Begonia crenata, Dendrobium barbatulum, Eria dalzellii*, *E. reticosa*, *Impatiens acaulis*, *Garnotia arborum* and *Utricularia striatula* grow on tree trunks.

Floristic Composition: A total of 356 species and 5 varieties of angiosperms were recorded from the plateaus studied. These plants are distributed in 61 families from 27 orders according to APG III (2009). The most speciose-families in the plateaus are Poaceae (68), Orchidaceae (28), Asteraceae (21), Fabaceae (21), Commelinaceae (15), Acanthaceae (14), Cyperaceae (11), Gentianaceae (10), Asparagaceae (9) and Eriocaulaceae. The first four represent more than 35% of the total flora. The largest genus was *Habenaria* (11 species), followed by *Eriocaulon* with 9 species and *Isachne* and *Murdannia* with 8 species each. The most speciose-families mentioned above are either therophytes or cryptophytes. Table 1 provides information on the life-form, habit, habitat and phenology of all the species recorded during the present study.

Endemism of the flora and its status: Among the species recorded from the plateaus studied, 67 are endemic to Western Ghats, of which, 39 species (58%) are confined to plateaus of the study area. Maximum number of endemics (41) was reported from Kas (Satara) while the lowest count (6) was recorded from Barki (Kolhapur) and Chalkewadi (Satara). The family Poaceae has largest number of endemic species (22 species), followed by Fabaceae with 5 species and Apiaceae, Apocynaceae and Asteraceae with 4 species each. Irwin & Narasimhan (2011) in their review of endemic genera of angiosperms in India also mentioned that Poaceae exhibit highest generic endemism owing to its earlier stages in evolution and dynamism. Similar pattern was obtained by Joshi & Janarthanam (2004) in their study on endemics of Goa region. In addition, they reported largest number of endemics from plateaus. As opined by Joshi & Janarthanam (2004) recent critical studies on these plateaus have added many new species from these plateaus (Potdar *et al.,* 2004; Salunkhe & Potdar, 2004; Malpure & Yadav, 2009; Yadav *et al.*, 2008, 2009) which indicate the sheer need of floristic studies on plateaus in northern Western Ghats.

A total of 305 species fell in Least Concern (LC) category as per the IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2001). One species each was Data Deficient (DD) and not evaluated (NE) while three species were Critically Endangered (CR), 16 were Endangered (EN), 13 were Near Threatened (NT) and 12 were Vulnerable (V).

Life-forms: An analysis on the life-form reveals that nearly 70% of the species recorded were Therophytes, followed by Cryptophytes (18.28 %),

Chaemephytes (8.31 %), Phanerophytes (4.71 %) and Hemicryptophytes (1.11 %) as shown in **Fig. 3**. Out of 361 species, 337 (93%) are erect herbs and 24 (7%) are climbers. Terrestrial habitat supports 95% of angiosperms recorded from the study area. The dominance of therophytes is possibly due to their greater ability to survive under disadvantageous environmental conditions (Porembski, 2000). Due to their short life-cycle and high reproduction rate, they are well-adapted to extreme environments and high levels of disturbances. They survive the dry spell as dormant seeds in the seed bank. Therophytes may face high risk of mortality if rain fails or if rain is followed by a drought as these species are highly susceptible to drought without specific adaptations. However, the balance in the survival rate is achieved by their good dispersal abilities and production of high number of propagules (Krieger *et al.*, 2003).

Seasonal succession and phenology: Plant communities on the plateaus continuously changing with respect to changing regimes of the climate (**Fig. 4**). Seasonal or phenological phenomena with respect to plateaus are studied inadequately in India except a study by Joshi & Janarthanam (2004). Isichei & Longe (1984) observed distinct phenological differences concerning species number and the dominance patterns of plant species in a rock community in Nigeria. The growing season starts with the dominance of ephemerals and this was later replaced by perennials. Both the number of species and the number of individuals declined after a peak at the beginning of the growing season. Similar pattern is observed on the plateaus in India. The season starts with annuals which are mainly grasses and ends with perennials. Based on the phenology of the plants four phases can be recognized. The first being the pre monsoon phase (June – July) is characterized by the growth of grasses on the plateaus. The grass genera which are quite common are *Eulalia*, *Eragrsotis*, *Glyphochloa*, *Isachne* and *Paspalum*. (**Fig. 4a, b**).

In the monsoon phase (August – September) mainly geophytes such as *Curculigo orchioides*, *Dipcadi ursulae*, *Eriocaulon tuberiferum, Flemingia nilgiriensis, Habenaria grandifloriformis*, *Hypoxis aurea, Iphigenia stellata*, *Murdannia lanuginosa* and members of the ephemeral vegetation such as *Fimbristylis tenera, Utricularia* spp., *Murdannia semiteres*, *Kohautia aspera*, *Eriocaulon* spp. and *Smithia hirsuta* come in flowering. This is the peak flowering period on the plateaus (**Fig. 4c**).

In the post monsoon phase (October – December) *Arundinella spicata, Eulalia shrirangii, Indopoa paupercula*, *Ischaemum* species, *Bhidea burnsiana*, *Dimeria* species, *Rotala densiflora, R. occultiflora* and *Striga gesnerioides* come in flowering (**Fig. 4d**).

The fourth phase (January – May) is the dry summer during which only a few species such as *Blumea eriantha, B. malcolmii*, *Crinum pratense, C. woodrowii, Drimia polyantha, Euphorbia fusiformis*, *Gnaphalium luteoalbum, Lepidgathis cuspidata, L. prostrata* and *Pancratium triflorum* flower (**Fig. 4e**) .

Observations on the phenology of the plants revealed that maximum number of species (57 species) complete their reproductive cycle between August and December. This is well understood as nearly 70% of the species are annuals and hence complete their life-cycle during the favourable edapho-climatic conditions prior to the onset of a long dry spell.

Adaptive Traits: Harsh environmental conditions on the plateaus have given rise to plants with certain traits that allow them to overcome environmental adversities. These traits help the plants to overcome major environmental stresses such as drought, high temperature and light intensities and nutrient deficiency. A detailed account on the adaptation/ecophysiology of vasular plants of rock outcrops is provided by Kluge and Brulfert (2000). Some well-known adaptive traits that have been observed in the vascular plants on plateaus are mentioned below (modified after Biedinger *et al.*, 2000).

1. Carnivory: It is a means to overcome the scarcity of N, P and S in the soil. Carnivorous plants are extremely calcifuge and need acidic and wet soils (Kluge and Brulfert, 2000). This kind of microhabitat is provided by plateaus. *Drosera burmannii, D. indica*, *Utricularia* species are the common carnivores on the plateaus. These species comprise ephemeral vegetation where soil deposition is negligible.
2. Succulence: Succulent plants store water in different organs. Succulence is a dessication-avoidance strategy in xeric habitats. Typical leaf succulents of the plateaus are *Cyanotis concanensis, C. fasciculata* var. *fasciculata* and *Euphorbia fusiformis*. These plants prefer dry and exposed surfaces.
3. Poikilohydry: These are plants in which water content varies with the varying humidity in the environment. Dessication tolerance is mainly a protoplasmic property (Gaff, 1980). Kluge and Brulfert (2000) refers to a bulk of literature on physiological, biochemical, and molecular-biological aspects of dessication

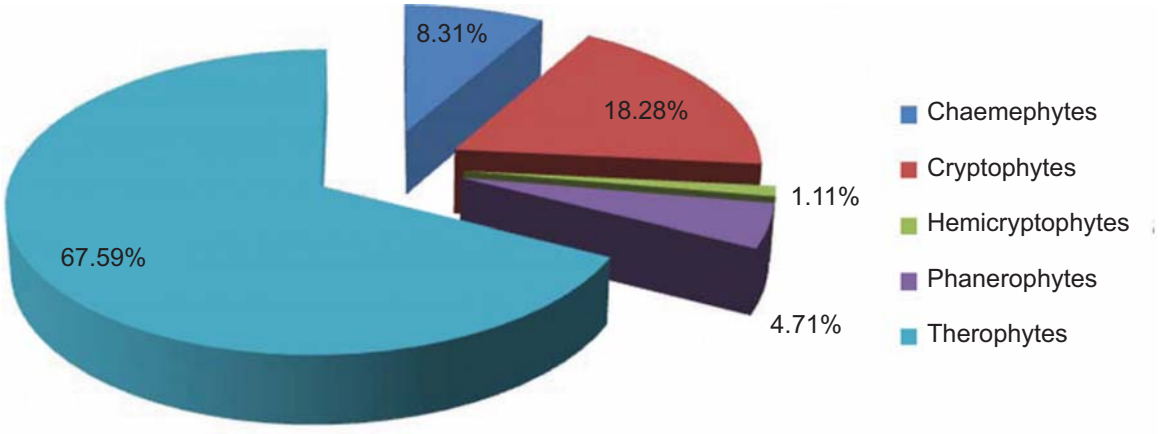

Fig. 3. Life-form spectrum.

tolerance. On the plateaus, grasses like *Tripogon lisboae* and *T. pungens* are some poikilohydrous resurrection grasses.

4. Subterranean perennating organs: They are yet another adaptive strategy of the plants of the plateaus in the form of underground perennation organs like corms, rhizomes, bulbs and tubers. Geophytes like *Ceropegia* spp., *Cyanotis concanensis*, *Dipcadi ursulae*, *Eriocaulon tuberiferum*, *Euphorbia fusifomis*, *Flemingia nilgiriensis*, *Habenaria* spp., *Hypoxis aurea*, *Iphigenia* spp., *Peristylus* and *Zingiber* spp. fall in this category. Majority of these species complete their reproductive cylce during the monsoon and survive the dry season in the form of underground storage organs. *Eriocaulon tuberiferum* unlike other *Eriocaulon* species develops root tubers (in addition to seeds) at the end of rainy season which remain embedded in dry mud and sprout in the following rainy season.

5. Vegetative propagation: Vegetative propagules such as bulbs and bulbils formed at the leaf tips are an adaptation of some plants of plateaus. *Scilla hyacinthina* and *Curculigo orchioides* develope such propagules that ensure high reproductive success in these habitats.

Phytogeographic affinities: Geomorphological features like lateritic plateaus in South Western Maharashtra occur over a vast geographic range. They are quite common in Africa and South America and are known as inselbergs. Some genera like *Burmannia*, *Ceropoegia*, *Cyanotis*, *Dipcadi*, *Drosera*, *Fimbristylis*, *Lindernia*, *Rhamphicarpa*, *Rotala* are common in African outcrops (Watve, 2003). However, in overall floristic composition these all are very different. Lateritic plateaus are dominated by Poaceae, Orchidaceae, Asteraceae and Fabaceae. Their counterparts in Africa are recognized by high percentage of Fabaceae, Scrophulariaceae and Lentibulariaceae while in South America Melastomataceae, Orchidaceae, Cactaceae and Bromeliaceae dominate (Porembski *et al.*, 1997). Lateritic plateaus resemble African inselbergs in terms of life-form composition. Both represent therophytes as the pedominant life-forms. However, phanerophytes dominate the American inselbergs. In addition, the African outcrops are granitic while lateritic plateaus in South Western Maharashtra are made up of basalt (Watve, 2003).

Anthropogenic influence: Lateritic plateaus in South Western Maharashtra are highly neglected areas from conservation point of view since they remain apparently barren for at least 7 months (November-May). Secondly, majority of the flora (90%) comprises herbaceous annuals and hence they are not considered important when compared to their surrounding forest areas. However, since these plateaus have rich deposits of bauxites they are frequently mined. In addition, increasing tourism, grazing, quarrying and windmill installation are threatening the existence of these plateaus. Windmill installation is quite common on plateaus (Chalkewadi, Thoseghar) in Satara district. This has led to habitat fragmentatation. Similarly, easily accessible lateritic plateaus like Kas, Chalkewadi, Masai, Morjai and Panchgani Tableland receive lot of tourists during monsoon. This has encouraged the establishment of invasive weeds such as *Ageratina adenophora*, *Oenothera rosea* and *Sigesbeckia orientalis*. Some of the lateritic plateaus like Masai and Morjai are also associated with regional deities and hence are subjected to constant anthropogenic

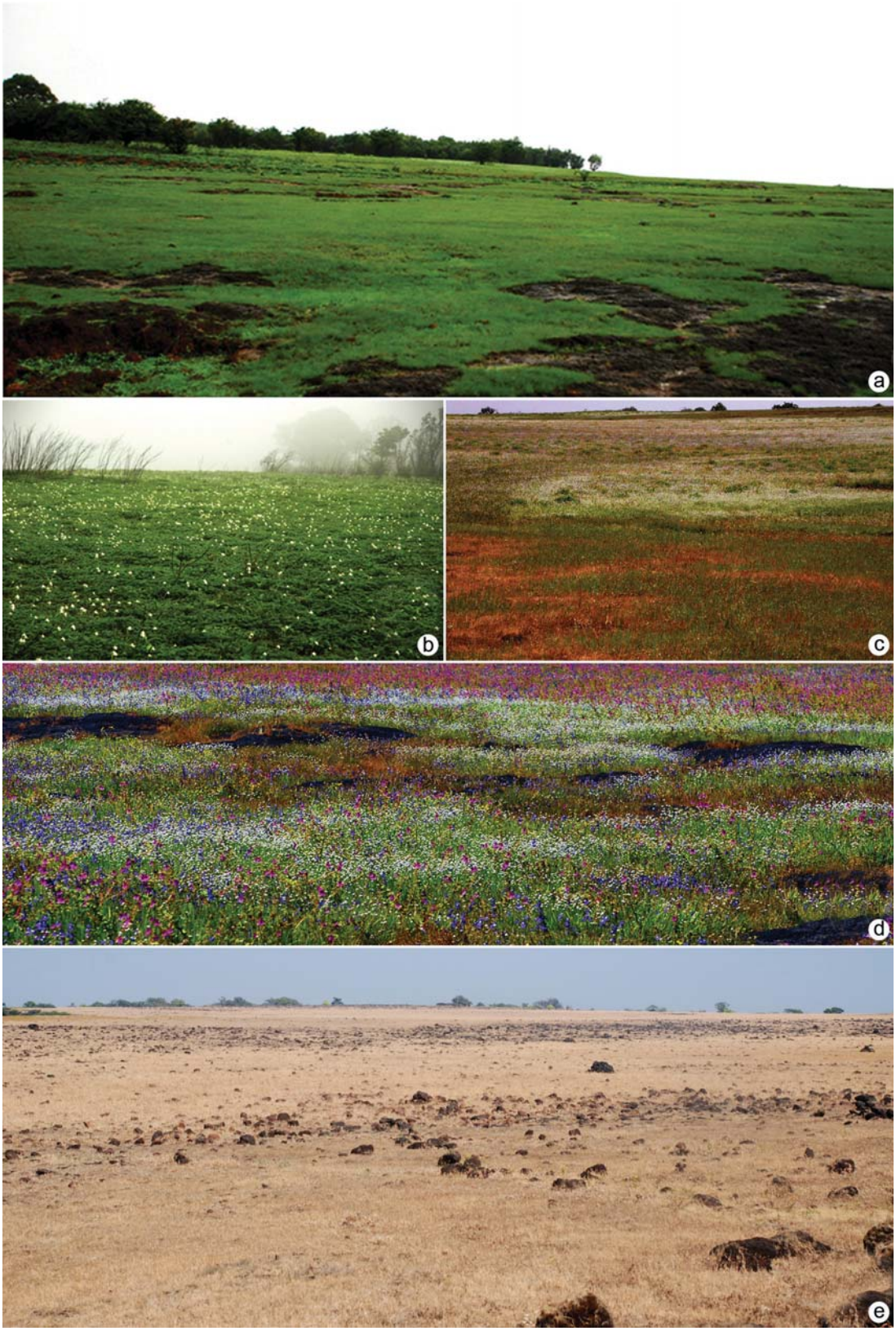

Fig. 4. Seasonal succession on plateaus: **a,b.** Pre-monsoon phase; **c.** Post-monsoon phase; **d.** Monsoon proper; **e.** Dry summer.

Table 1. Life-form, status, habit, phenology, habitat and voucher numbers of the species from ten plateaus in southwestern Maharashtra, India.

S. No.	Species	Family	LF	S	H	Phenology	Ht	Voucher number
1	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	Asteraceae	T	LC	H	Aug.-Feb.	T	MML-066
2	*Adelocaryum coelestinum* (Lindl.) Brand	Boraginaceae	T	LC	H	Aug.-Oct.	T	MML-340
3	*Adelocaryum malabaricum* (C.B. Clarke) Brand	Boraginaceae	T	LC	H	Sept.-Nov.	T	MML-342
4	*Adenoon indicum* Dalzell	Asteraceae	T	E, NT	H	Aug.-Nov.	T	MML-131, 124
5	*Aerides crispa* Lindl.	Orchidaceae	P	LC	H	Feb.-July	A	MML-221
6	*Aerides maculosa* Lindl.	Orchidaceae	P	LC	H	May.-Oct.	A	MML-011
7	*Ageratina adenophora* (Spreng.) R.M. King & H.Rob.	Asteraceae	C	LC	H	Mar.-Apr.	T	MML-007
8	*Alternanthera ficoidea* (L.) P. Beauv.	Amaranthaceae	H	LC	H	Aug.-Nov.	T	MML-318
9	*Alternanthera pungens* Kunth	Amaranthaceae	H	LC	H	Oct.-Apr.	T	MML-3142
10	*Alternanthera sessilis* (L.) R. Br. ex DC.	Amaranthaceae	H	LC	H	Jun.-Apr.	T	MML-415
11	*Alysicarpus tetragonolobus* Edgew.	Fabaceae	T	LC	H	July.-Dec.	T	MML-022
12	*Ammannia baccifera* subsp. *baccifera*	Lythraceae	T	LC	H	Aug.-Apr.	T	MML-039
13	*Ammannia multiflora* Roxb.	Lythraceae	T	LC	H	Aug.-Dec.	T	MML-042
14	*Ampelocissus latifolia* (Roxb.) Planch.	Vitaceae	C	LC	H	Jun.-Sept.	T	MML-284
15	*Anagallis arvensis* L.	Primulaceae	T	LC	H	Sept.-Jan.	T	MML-100
16	*Anagallis pumila* Sw.	Primulaceae	T	LC	H	Sept.-Jan.	T	MML-304, 354
17	**Aponogeton satarensis* Sundararagh. *et al.*	Aponogetonaceae	CR	EN, E	H	Jun.-Sept.	AQ	MML-293
18	*Argyreia boseana* Santapau & V. Patel	Convolvulaceae	C	EN, E	C	July-Dec.	T	MML-324
19	*Argyreia involucrata* C.B. Clarke	Convolvulaceae	C	LC	C	Jan.-Mar.	T	MML-283
20	*Ariopsis peltata* J. Graham	Araceae	CR	LC	H	Jun.-Sept.	T	MML-124, 421
21	*Arisaema leschenaultii* Blume	Araceae	CR	LC	H	Jun.-Dec.	T	MML-127
22	*Arisaema murrayi*(J. Graham) Hook.	Araceae	CR	LC	H	Jun.-Sept.	T	MML-401
23	*Arisaema neglectum* Schott	Araceae	CR	LC	H	Jun.-Sept.	T	MML-213, 219, 308
24	**Arisaema sahyadricum* var. *ghaticum* Sardesai *et al.*	Araceae	CR	E, NT	H	Jun.-Sept.	T	MML-420
25	**Arisaema sahyadricum* var. *sahyadricum*	Araceae	CR	NT, E	H	Jun.-Sept.	T	MML-292
26	*Arisaema tortuosum* (Wall.) Schott.	Araceae	CR	LC	H	Jun.-Dec.	T	MML-110

27	*Aristida adscensionis* L.	Poaceae	T	LC	H	Sept.-Dec.	T	MML-184
28	*Artemisia japonica* Thunb.	Asteraceae	T	LC	H	Oct.-Dec.	T	MML-302
29	*Artemisia nilagirica* (C.B. Clarke) Pamp.	Asteraceae	T	LC	H	Sept.-Jan.	T	MML-301
30	*Arthraxon hispidus* (Thunb.) Makino	Poaceae	T	LC	H	Sept.-Nov.	T	MML-390
31	**Arthraxon jubatus* Hack.	Poaceae	T	E, VU	H	Sept.-Nov.	T	MML-373
32	*Arthraxon lanceolatus* (Roxb.) Hochst.	Poaceae	T	LC	H	Sept.-Nov.	T	MML-3139
33	*Arthraxon meeboldii* Stapf	Poaceae	T	LC	H	Sept.-Dec.	T	MML-372
34	*Arthraxon raizadae* Jain *et al.*	Poaceae	T	LC	H	Sept.-Nov.	T	MML-361
35	*Arundinella leptochloa* (Nees ex Steud.) Hook. f.	Poaceae	T	LC	H	Sept.-Dec.	T	MML-237
36	*Arundinella pumila* (Hochst. ex A. Rich.) Steud.	Poaceae	T	LC	H	Aug.-Dec.	T	MML-146
37	**Arundinella spicata* Dalzell	Poaceae	T	E, VU	H	Oct.-Dec.	T	MML-248, 365
38	*Asparagus racemosus* Willd.	Asparagaceae	CR	LC	C	Jun.-Jan.	T	MML-282
39	*Asystasia dalzelliana* Santapau	Acanthaceae	T	LC	H	Nov.-Feb.	T	MML-337
40	*Begonia crenata* Dryand.	Begoniaceae	T	LC	H	Aug.-Sept.	T	MML-168
41	**Begonia trichocarpa* Dalzell	Begoniaceae	T	E, NT	H	Aug.-Sept.	T	MML-169
42	*Bergia ammannioides* Roxb.	Elatinaceae	T	LC	H	Aug.-Apr.	T	MML-040
43	*Bhidea burnsiana* Bor	Poaceae	T	E, EN	H	Aug.-Nov.	T	MML-406
44	*Blumea eriantha* DC.	Asteraceae	T	LC	H	Oct.-Feb.	T	MML-319
45	*Blumea malcolmii* Hook.f.	Asteraceae	T	LC	H	Nov.-Mar.	T	MML-199
46	*Boerhavia diffusa* L.	Nyctaginaceae	T	LC	H	Throughout	T	MML-440
47	*Buchnera hispida* Buch.-Ham ex D.Don	Orobanchaceae	T	LC	H	Aug.-Dec.	T	MML-043
48	*Burmannia coelestis* D. Don	Burmanniaceae	T	LC	H	Aug.-Dec.	T	MML-044
49	*Canscora diffusa* (Vahl) R. Br. ex Roem. & Schult.	Gentianaceae	T	LC	H	Aug.-Apr.	T	MML-312
50	*Canscora pauciflora* Dalzell	Gentianaceae	T	LC	H	Sept.-Apr.	T	MML-171
51	*Cardamine trichocarpa* Hochst. ex A. Rich	Brassicaceae	T	LC	H	July-Apr.	T	MML-167, 225, 248
52	*Celosia argentea* L.	Amaranthaceae	T	LC	H	Sept.-Mar.	T	MML-416
53	*Centella asiatica* (L.) Urb.	Apiaceae	T	LC	H	May-Dec.	T	MML-012
54	**Ceropegia jainii* Ansari & B. G. Kulk.	Apocynaceae	CR	E, CR	C	July-Sept.	T	MML-344
55	*Ceropegia media* (H. Huber) Ansari	Apocynaceae	CR	E, VU	C	July-Oct.	T	MML-345

56	**Ceropegia sahyadrica* Ansari & B. G. Kulk.	Apocynaceae	CR	E, VU	C	July-Oct.	T	MML-210
57	*Ceropegia vincifolia* Hook.	Apocynaceae	CR	E, EN	C	July-Sept.	T	MML-343
58	*Chlorophytum glaucoides* Blatt.	Asparagaceae	CR	E, LC	H	Aug.-Oct.	T	MML-077
59	*Chlorophytum glaucum* Dalzell	Asparagaceae	CR	LC	H	Sept.-Oct.	T	MML-3141
60	**Chlorophytum gothanense* Malpure & S.R.Yadav	Asparagaceae	CR	E, NT	H	Aug.-Oct.	T	MML-120, 151
61	*Chlorophytum laxum* R.Br.	Asparagaceae	CR	LC	H	Aug.-Oct.	T	MML-078
62	*Chlorophytum nimmoni* Dalzell	Asparagaceae	CR	LC	H	Aug.-Oct.	T	MML-183, 411
63	*Christisonia calcarata* Wight	Orobanchaceae	T	NE	H	Jun.-Sept.	T	reported on authority
64	**Chrysopogon castaneus* Veldkamp ex Salunkhe	Poaceae	T	E, EN	H	Aug.Oct.	T	MML-148, 430
65	*Cissus elongata* Roxb.	Vitaceae	C	LC	C	May.-Nov.	T	MML-165
66	*Cissus ternata* J.F.Gmel.	Vitaceae	C	LC	C	Jun.-Nov.	T	MML-018
67	*Clematis gouriana* Roxb. ex DC.	Ranunculaceae	C	LC	C	Oct.-Dec.	T	MML-313
68	*Clematis hedysarifolia* DC.	Ranunculaceae	C	DD	C	Oct.-Dec.	T	MML-3143
69	*Clematis wightiana* Wall.	Ranunculaceae	C	DD	C	Oct.-Dec.	T	MML-3144
70	*Cleome chelidonii* L.f.	Cleomaceae	T	LC	H	Aug.-Jan.	T	MML-069
71	*Cocculus hirsutus* (L.) Diels	Menispermaceae	T	LC	C	Aug.-Jan.	T	MML-070
72	**Coelachne minuta* Bor	Poaceae	T	E, EN	H	July-Oct.	T	MML-245
73	*Coelachne simpliciuscula* (Wight et. Arn. ex. Steud.) Munro. ex. Benth.	Poaceae	T	LC	H	Nov.-Jan.	T	MML-108
74	*Coldenia procumbens* L.	Boraginaceae	T	LC	H	Aug.-Apr.	T	MML-041
75	*Commelina forsskalaei* Vahl	Commelinaceae	T	LC	H	July-Feb.	T	MML-136
76	*Commelina kurzii* C.B. Clarke	Commelinaceae	T	LC	H	July-Feb.	T	MML-378
77	*Commelina maculata* Edgew.	Commelinaceae	T	LC	H	Aug.-Nov.	T	MML-134
78	*Commelina paludosa* Blume	Commelinaceae	T	LC	H	Aug.-Nov.	T	MML-137, 156
79	*Conyza stricta* Willd.	Asteraceae	T	LC	H	Throughout	T	MML-192
80	*Crinum pratense* Herb.	Amaryllidaceae	CR	LC	H	May.-Oct.	T	MML-203
81	**Crinum woodrowii* Baker	Amaryllidaceae	CR	E, CR	H	May.-Oct.	T	MML-418
82	*Crotalaria filipes* Benth.	Fabaceae	H	LC	H	Aug.-Dec.	T	MML-182

83	*Crotalaria hebecarpa* (DC.) Rudd.	Fabaceae	T	LC	H	July-Feb.	T	MML-031
84	*Crotalaria mysorensis* Roth	Fabaceae	T	E, LC	H	Oct.-Jan.	T	MML-160
85	*Crotalaria nana* Burm. f.	Fabaceae	T	E, LC	H	Oct.-Jan.	T	MML-3149
86	*Crotalaria retusa* L.	Fabaceae	T	LC	H	Oct.-Jan.	T	MML-3150
87	*Cryptocoryne spiralis* (Retz.) Fisch. ex Wydler	Araceae	CR	LC	H	Aug.-Dec.	T	MML-207
88	*Cucumis indicus* Ghebret. & Thulin	Cucurbitaceae	T	LC	C	Aug.-Dec.	T	MML-297
89	*Cucumis ritchiei* (C.B.Clarke) Ghebret. & Thulin	Cucurbitaceae	T	LC	C	Aug.-Dec.	T	MML-205
90	*Curculigo orchioides* Gaertn.	Hypoxidaceae	CR	LC	H	Jun.-Nov.	T	MML-214
91	*Curcuma inodora* Blatt.	Zingiberaceae	CR	LC	H	Aug.-Feb.	T	MML-067
92	*Curcuma neilgherrensis* Wight	Zingiberaceae	CR	E, DD	H	May-Aug.	T	MML-202
93	**Cyanotis concanensis* Hassk.	Commelinaceae	T	E, NT	H	July-Dec.	T	MML-212
94	*Cyanotis fasciculata* var. *fasciculata*	Commelinaceae	T	LC	H	Aug.-Oct.	T	MML-211
95	*Cyanotis tuberosa* (Roxb.) Schult. & Schult. f.	Commelinaceae	CR	LC	H	Jun.-Nov.	T	MML-019
96	*Cyclea peltata* Hook. f. & Thomson	Menispermaceae	T	LC	C	Feb.-May	T	MML-006
97	*Cynarospermum asperrimum* (Nees) Vollesen	Acanthaceae	T	LC	H	Sept.-Apr.	T	MML-087
98	*Cynoglossum zeylanicum* (Lehm.) Brand	Boraginaceae	T	LC	H	Aug.-Oct.	T	MML-079
99	*Cyperus distans* L. f.	Cyperaceae	T	LC	H	Aug.-Sept.	T	MML-083
100	*Cyperus michelianus* (L.) Delile	Cyperaceae	T	LC	H	Aug.-Sept.	T	MML-179
101	*Cyperus pangorei* Rottb.	Cyperaceae	T	LC	H	July-Mar.	T	MML-037
102	*Decaschistia trilobata* Wight	Malvaceae	C	E, LC	H	Aug.Jan.	T	MML-068
103	*Dendrobium barbatulum* Lindl.	Orchidaceae	P	LC	H	Jan.-Aug.	A	MML-004
104	*Dendrobium microbulbon* A. Rich.	Orchidaceae	P	LC	H	Dec.-May	A	MML-438
105	*Dendrobium nanum* Hook.f.	Orchidaceae	P	LC	H	July-Apr.	A	MML-026
106	*Dentella repens* (L.) J.R. Forst. & G. Forst.	Rubiaceae	T	LC	H	Apr.-Oct.	T	MML-008
107	**Desmodiastrum belgaumense* (Wight) A. Pramanik & Thoth.	Fabaceae	T	NT	H	Oct.-Dec.	T	MML-3145
108	*Desmodium triflorum* (L.) DC.	Fabaceae	T	LC	H	Oct.-Dec.	T	MML-3146
109	*Dichanthium oliganthum* (Hochst. ex Steud.) Cope	Poaceae	T	LC	H	Aug.-Oct.	T	MML-242, 332, 359
110	**Dichanthium panchganiense* Blatt. & McCann	Poaceae	T	E, EN	H	Aug.-Oct.	T	MML-080

111	**Dichanthium paranjpyeanum* (Bhide) Clayton	Poaceae	T	E, EN	H	Sept.-Oct.	T	MML-253
112	*Dicliptera foetida* Blatt.	Acanthaceae	T	LC	H	Mar.-May	T	MML-189
113	*Dimeria blatteri* Bor	Poaceae	T	E, VU	H	Oct.-Nov.	T	MML-3151
114	*Dimeria deccanenis* Bor	Poaceae	T	LC	H	Oct.-Nov.	T	MML-239
115	*Dimeria hohenackeri* Hochst. ex Miq.	Poaceae	T	LC	H	Oct.-Nov.	T	MML-263
116	*Dimeria ornithopoda* var. *megalantha* Bor	Poaceae	T	LC	H	Oct.-Nov.	T	MML-3152
117	*Dimeria ornithopoda* var. *ornithopoda*	Poaceae	T	LC	H	Sept.-Nov.	T	MML-235
118	*Dimeria stapfiana* C.E. Hubb. ex Pilg.	Poaceae	T	LC	H	Oct.-Dec.	T	MML-134
119	*Dioscorea bulbifera* L.	Dioscoreaceae	CR	LC	H	July-Dec.	T	MML-135
120	*Dioscorea oppositifolia* L.	Dioscoreaceae	C	LC	C	July-Dec.	T	MML-027
121	*Dioscorea pentaphylla* L.	Dioscoreaceae	C	LC	C	July-Mar.	T	MML-154
122	**Dipcadi ursulae* Blatt.	Asparagaceae	CR	E, EN	H	Apr.-Aug.	T	MML-119, 268, 323
123	*Dopatrium junceum* (Roxb.) Buch.-Ham ex Benth	Plantaginaceae	T	LC	H	Aug.-Feb.	T	MML-294
124	*Drimia polyantha* (Blatt. & McCann) Stearn	Asparagaceae	CR	LC	H	Mar.-Jun.	A	MML-201
125	*Drosera burmanni* Vahl.	Droseraceae	T	LC	H	Dec.-Feb.	T	MML-144
126	*Drosera indica* L.	Droseraceae	T	LC	H	July-Nov.	T	MML-143
127	*Elatine ambigua* Wight	Elatinaceae	T	DD	H	Feb.-Apr.	T	MML-005
128	**Eleocharis wadoodii* S. R. Yadav *et al.*	Cyperaceae	T	E, NT	H	Aug.-Mar.	T	MML-072
129	*Elephantopus scaber* L.	Asteraceae	T	LC	H	Aug.-Nov.	T	MML-073
130	*Eragrostiella bifaria* (Vahl) Bor	Poaceae	T	LC	H	Aug.-Nov.	T	MML-279
131	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	T	LC	H	Aug.-Dec.	T	MML-246
132	*Eria dalzellii* Lindl.	Orchidaceae	P	LC	H	July-Oct.	A	MML-118, 123
133	*Eria microchilos* Lindl.	Orchidaceae	P	LC	H	July-Oct.	A	MML-111
134	*Eria reticosa* Wight	Orchidaceae	P	LC	H	Jun.-Mar.	A	MML-112, 222, 261
135	**Eriocaulon apetalum* Punekar, Malpure & Lakshmin.	Eriocaulaceae	T	E, DD	H	July-Oct.	T	MML-388
136	*Eriocaulon cuspidatum* Dalzell	Eriocaulaceae	T	LC	H	July-Sept.	T	MML-038
137	*Eriocaulon dalzellii* Körn.	Eriocaulaceae	T	LC	H	July-Dec.	T	MML-028
138	*Eriocaulon elenorae* Fyson	Eriocaulaceae	T	LC	H	July-Nov.	T	MML-422

139	**Eriocaulon epedunculatum* Potdar *et al.*	Eriocaulaceae	T	E, LC	H	Aug-Sept.	T	MML-423
140	*Eriocaulon eurypeplon* Körn.	Eriocaulaceae	T	LC	H	July.-Oct.	T	MML-025
141	*Eriocaulon odoratum* Dalzell	Eriocaulaceae	T	LC	H	July-Feb.	T	MML-032
142	*Eriocaulon stellulatum* Körn.	Eriocaulaceae	T	LC	H	Sept.-Feb.	T	MML-299
143	**Eriocaulon tuberiferum* A.R. Kulk. & Desai	Eriocaulaceae	CR	E, LC	H	July-Sept.	AQ	MML-298, 351, 389
144	*Eulalia fimbriata* (Hack.) Kuntze	Poaceae	T	LC	H	Sept.-Nov.	T	MML-265
145	**Eulalia shrirangii* Salunkhe & Potdar	Poaceae	T	E, NT	H	Oct.	T	MML-234
146	*Eulalia trispicata* (Schult.) Henrard	Poaceae	T	LC	H	Sept.-Nov.	T	MML-133, 175, 186
147	*Eulophia nuda* Lindl.	Orchidaceae	CR	LC	H	Apr.-Sept	A	MML-010
148	*Euphorbia fusiformis* Buch.-Ham. ex D. Don	Euphorbiaceae	CR	E, NT	H	Mar.-May	T	MML-106, 229
149	*Euphorbia laeta* Aiton	Euphorbiaceae	T	LC	H	Sept.-Mar.	T	MML-228
150	*Euphorbia pycnostegia* Boiss.	Euphorbiaceae	T	LC	H	Sept.-Mar.	T	MML-223
151	*Exacum lawii* C. B. Clarke	Gentianaceae	T	LC	H	Sept.-Dec.	T	MML-089
152	*Exacum pedunculatum* L.	Gentianaceae	T	LC	H	Sept.-Mar.	T	MML-173
153	*Exacum petiolare* Griseb.	Gentianaceae	T	LC	H	Dec.-Mar.	T	MML-170
154	*Exacum pumilum* Griseb.	Gentianaceae	T	LC	H	Aug.-Dec.	T	MML-172
155	*Exacum tetragonum* Roxb.	Gentianaceae	T	LC	H	Aug.-Dec.	T	MML-045
156	*Fimbristylis dichotoma* (L.) Vahl	Cyperaceae	T	LC	H	Aug.-Dec.	T	MML-376, 409
157	*Fimbristylis tenera* Roem. & Schult.	Cyperaceae	T	LC	H	Aug.-Dec.	T	MML-316,375
158	*Fimbristylis tetragona* R.Br.	Cyperaceae	T	LC	H	July-Feb.	T	MML-033
159	**Flemingia nilgiriensis* Wight ex Cooke	Fabaceae	CR	E, NT	H	Aug.-Oct.	T	MML-114, 330
160	*Flemingia strobilifera* (L.) R. Br.	Fabaceae	T	LC	H	Feb.-May	T	MML-196
161	*Garnotia arborum* Stapf	Poaceae	T	LC	H	Sept.-Nov.	T	MML-3140
162	*Garnotia tenella* (Arn. ex Miq.) Janowski	Poaceae	T	LC	H	Sept.-Nov.	T	MML-426
163	*Geissaspis cristata* Wight & Arn.	Fabaceae	T	LC	H	Sept.-Dec.	T	MML-177
164	*Geissaspis tenella* Benth.	Fabaceae	T	LC	H	Sept.-Dec.	T	MML-090
165	*Girardinia diversifolia* (Link) Friis	Urticaceae	T	LC	H	Sept.-Dec.	T	MML-285
166	*Glinus lotoides* L.	Molluginaceae	T	LC	H	Sept.-Dec.	T	MML-091
167	*Gloriosa superba* L.	Colchicaceae	CR	LC	H	July-Nov.	T	MML-270

168	*Glossostigma diandrum* (L.) Kuntze	Phrymaceae	T	LC	H	Sept.-Dec.	T	MML-092
169	**Glyphochloa divergens* (Hack.) Clayton	Poaceae	T	E, NT	H	Sept.-Nov.	T	MML-178
170	*Glyphochloa forficulata* (C.E.C. Fisch.) Clayton	Poaceae	T	E, DD	H	Sept.-Nov.	T	MML-333, 362, 409
171	*Glyphochloa maharashtraensis* Potdar & S. R. Yadav	Poaceae	T	E, DD	H	Sept.-Nov.	T	MML-404
172	*Glyphochloa mysorensis* (Jain & Hemadri) Clayton	Poaceae	T	E, VU	H	Aug.-Nov.	T	MML-334, 427, 428
173	*Gnaphalium luteoalbum* L.	Asteraceae	T	LC	H	Jan.-Mar.	T	MML-198
174	*Gnaphalium polycaulon* Pers.	Asteraceae	T	LC	H	Dec.-Mar.	T	MML-104
175	*Gnaphalium pulvinatum* Delile	Asteraceae	T	LC	H	Dec.-Mar.	T	MML-105
176	*Grangea maderaspatana* (L.) Poir.	Asteraceae	T	LC	H	Dec.-may	T	MML-439
177	*Gymnema sylvestre* (Retz.) Schult.	Apocynaceae	P	LC	H	Apr.-Oct.	T	MML-009
178	*Gynura bicolor* (Roxb. ex Willd.) DC.	Asteraceae	T	LC	H	July-Dec.	T	MML-349
179	*Habenaria crassifolia* A.Rich.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-266
180	*Habenaria crinifera* Lindl.	Orchidaceae	P	LC	H	Aug.-Dec.	T	MML-046
181	*Habenaria digitata* Lindl.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-047
182	*Habenaria foliosa* var. *gibsonii* (Hook. f.) Bennet	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-048
183	*Habenaria foliosa* var. *foetida* (Blatt. & McCann) Bennet	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-049
184	*Habenaria grandifloriformis* Blatt. & McC.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-128, 216, 258
185	*Habenaria heyneana* (Lindl.) Lindl.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-129, 259
186	*Habenaria longicorniculata* J. Graham	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-394
187	*Habenaria marginata* Colebr.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-050
188	**Habenaria panchganiensis* Santapau & Kapadia	Orchidaceae	CR	E, EN	H	Aug.-Dec.	T	MML-109, 121, 347
189	*Habenaria rariflora* A. Rich.	Orchidaceae	CR	LC	H	Aug.-Dec.	T	MML-117, 218, 260
190	*Heliotropium indicum* L.	Boraginaceae	T	LC	H	Oct.-Feb.	T	MML-130
191	*Hemidesmus indicus* (L.) R. Br. ex Schult.	Apocynaceae	T	LC	H	Aug.-Dec.	T	MML-051
192	*Hemigraphis latebrosa* (Roth) Nees	Acanthaceae	T	LC	H	Dec.-Feb.	T	MML-138
193	**Heracleum grande* (Dalzell & A. Gibson) Mukhop.	Apiaceae	CR	E, LC	H	Aug.-Dec.	T	MML-052
194	*Heracleum sprenglianum* Wight & Arn.	Apiaceae	CR	LC	H	Aug.-Dec.	T	MML-383
195	*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.	Poaceae	T	LC	H	July-Jan.	T	MML-280

196	*Heteropogon polystachyus* (Roxb.) Schult.	Poaceae	T	LC	H	July-Jan.	T	MML-036
197	*Heteropogon ritchiei* (Hook. f.) Blatt. & McCann	Poaceae	T	LC	H	Aug.-Nov.	T	MML-074
198	*Hitchenia caulina* (J. Graham) Baker	Zingiberaceae	CR	E, VU	H	Aug.-Oct.	T	MML-220, 274
199	*Hoppea dichotoma* Willd.	Gentianaceae	T	LC	H	Oct.-Mar.	T	MML-247
200	*Hypoxis aurea* Lour.	Hypoxidaceae	CR	LC	H	July-Jan.	T	MML-115
201	*Impatiens acaulis* Arn.	Balsaminaceae	T	LC	H	July-Dec.	T	MML-379
202	*Impatiens balsamina* L.	Balsaminaceae	T	LC	H	Mar.-Oct.	T	MML-113
203	**Impatiens dalzellii* Hook. f. & Thomson	Balsaminaceae	T	E, EN	H	Aug.-Oct.	T	MML-081
204	*Impatiens kleiniformis* Sedgw.	Balsaminaceae	T	LC	H	Aug.-Dec.	T	MML-053
205	**Impatiens lawii* Hook. f. & Thomson	Balsaminaceae	T	E, EN	H	Aug.-Dec.	T	MML-396
206	*Impatiens minor* (DC.) S.M. Almeida	Balsaminaceae	T	LC	H	Aug.-Sept.	T	MML-310
207	*Impatiens tomentosa* B. Heyne	Balsaminaceae	T	LC	H	Aug.-Dec.	T	MML-311
208	**Indigofera dalzellii* T. Cooke	Fabaceae	T	E, LC	H	Jun.-Nov.	T	MML-107, 206, 215
209	**Indopoa paupercula* (Stapf) Bor	Poaceae	T	E, LC	H	Aug.-Oct.	T	MML-240
210	*Iphigenia indica* (L.) Kunth	Colchicaceae	CR	LC	H	Jun.-Oct.	T	MML-149
211	*Iphigenia pallida* Baker	Colchicaceae	CR	LC	H	Jun.-Oct.	T	MML-020
212	**Iphigenia stellata* Blatt.	Colchicaceae	CR	E, VU	H	Jun.-Oct.	T	MML-269. 358
213	*Iphigenia magnifica* Ansari & R.S.Rao	Colchicaceae	CR	E, VU	H	Jun.-Oct.	T	MML-150
214	*Ipomoea barleioides* (Choisy) Benth. ex C.B. Clarke	Convolvulaceae	C	LC	C	Sept.-Dec.	T	MML-132
215	*Isachne bicolor* Naik & Patunkar	Poaceae	T	E, EN	H	Aug.-Dec.	T	MML-241, 336, 369
216	*Isachne borii* Hemadri	Poaceae	T	E, EN	H	Aug.-Dec.	T	MML-153
217	*Isachne elegans* Dalzell	Poaceae	T	LC	H	Aug.-Dec.	T	MML-250
218	*Isachne globosa* (Thunb. ex Murray) Kuntze	Poaceae	T	LC	H	Sept.-Nov.	T	MML-249
219	*Isachne gracilis* C. E. Hubb.	Poaceae	T	LC	H	Aug.-Oct.	T	MML-331
220	*Isachne lisboae* Hook. f.	Poaceae	T	E, EN	H	Aug.-Nov.	T	MML-244
221	*Isachne miliacea* Roth	Poaceae	T	LC	H	Sept.-Oct.	T	MML-145
222	*Isachne swaminathanii* V. Prakash & S. K. Jain	Poaceae	T	E, VU	H	Sept.-Oct.	T	MML-251
223	*Ischaemum impressum* Hack.	Poaceae	T	LC	H	Sept.-Oct.	T	MML-236

224	*Ischaemum indicum* (Houtt.) Merr.	Poaceae	T	LC	H	Aug.-Jan.	T	MML-400
225	*Iseilema laxum* Hack. ex Duthie	Poaceae	T	LC	H	Aug.-Dec.	T	MML-054
226	*Jansenella griffithiana* (Müll. Stuttg.) Bor	Poaceae	T	LC	H	Sept.-Dec.	T	MML-262
227	*Jansenella neglecta* S.R. Yadav *et al.*	Poaceae	T	E, LC	H	Sept.-Dec.	T	MML-243, 407
228	*Juncus bufonius* L.	Juncaceae	T	DD	H	Sept.-Dec.	T	MML-3896
229	*Kohautia aspera* (Heyne ex Roth) Bremek.	Rubiaceae	T	LC	H	Aug.-Sept.	T	MML-338, 377
230	*Laportea interrupta* (L.) Chew.	Urticaceae	T	LC	H	Throughout	T	MML-441
231	*Lavandula bipinnata* Kuntze	Lamiaceae	P	LC	H	Sept.-Jan.	T	MML-139
232	*Lavandula lawii* Wight	Lamiaceae	P	LC	H	Sept.-Jan.	T	MML-3135
233	*Lecanthus peduncularis* (Wall. ex Royle) Wedd.	Urticaceae	T	LC	H	Aug.-Nov.	T	MML-166, 286
234	*Lepidagathis cristata* Willd.	Acanthaceae	C	LC	H	Sept.-Jan.	T	MML-271, 350
235	*Lepidagathis prostrata* Dalzell	Acanthaceae	C	LC	H	Aug.-Dec.	T	MML-191
236	*Lepidagathis cuspidata* Nees	Acanthaceae	C	LC	H	Jan.-May	T	MML-126, 187
237	*Leucas stelligera* Wall. Ex Benth.	Lamiaceae	C	LC	H	Nov.-May	T	MML-3151
238	*Limnophila heterophylla* (Roxb.) Benth.	Plantaginaceae	T	LC	H	Aug.-Dec.	AQ	MML-055
239	*Lindenbergia muraria* (Roxburgh ex D. Don) Brühl	Orobanchaceae	T	LC	H	Aug.-Dec.	T	MML-056
240	*Lindernia antipoda* (L.) Alston	Linderniaceae	T	LC	H	Sept.-Jan.	T	MML-3136
241	*Lindernia ciliata* (Colsm.) Pennell	Linderniaceae	T	LC	H	Aug.-Dec.	T	MML-057
242	*Lindernia hyssopioides* Haines	Linderniaceae	T	LC	H	Oct.-Feb.	T	MML-3148
243	*Lindernia tenuifolia* (Colsm.) Alston	Linderniaceae	T	LC	H	Sept.-Feb.	T	MML-097
244	*Linum mysorense* B.Heyne ex Wall.	Linaceae	T	LC	H	July-Dec.	T	MML-141
245	*Liparis nervosa* (Thunb.) Lindl.	Orchidaceae	CR	LC	H	Aug.-Sept.	T	MML-084
246	*Liparis rheedei* Lindl.	Orchidaceae	CR	LC	H	Aug.-Sept.	T	MML-122, 223
247	*Lobelia alsinoides* Lam.	Campanulaceae	T	LC	H	Oct.-Dec.	T	MML-3147
248	*Ludwigia octovalvis* (Jacq.) P.H. Raven	Onagraceae	T	LC	H	Aug.-Oct.	T	MML-082
249	*Mecardonia procumbens* (Mill.) Small	Plantaginaceae	T	LC	H	Throughout	T	MML-442
250	*Microcarpaea minima* (Retz.) Merr.	Plantaginaceae	T	LC	H	July.-Nov.	T	MML-024
251	*Microchloa indica* (L. f.) P. Beauv.	Poaceae	T	LC	H	July-Aug.	T	MML-368

252	**Mneisethea veldkampii* Potdar *et al.*	Poaceae	T	E, NT	H	Oct.-Nov.	T	MML-3153
253	*Mollugo pentaphylla* L.	Molluginaceae	T	LC	H	Sept.-Jan.	T	MML-226, 371
254	*Mukia maderaspatana* (L.) M. Roem.	Cucurbitaceae	T	LC	C	Sept.-Jan.	T	MML-3137
255	*Murdannia brownii* Nandikar & Gurav	Commelinaceae	T	E, DD	H	Sept. Nov.	T	MML-306
256	*Murdannia crocea* ssp. o*chracea* (Dalzell) Faden	Commelinaceae	T	LC	H	Oct.	T	MML-217
257	**Murdannia lanuginosa* G. Brückn.	Commelinaceae	CR	E, EN	H	May-Oct.	T	MML-287
258	*Murdannia loriformis* (Hassk.) R.S. Rao & Kammathy	Commelinaceae	C	LC	H	June-Nov.	T	MML-332
259	*Murdannia nudiflora* (L.) Brenan	Commelinaceae	C	LC	H	Jun.-Nov.	T	MML-419
260	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae	T	LC	H	Jun.-Nov.	T	MML-288
261	*Murdannia simplex* (Vahl) Brenan	Commelinaceae	C	LC	H	Jun.-Nov.	T	MML-157
262	*Murdannia versicolor* G. Brückn.	Commelinaceae	C	LC	H	Aug.-Nov.	T	MML-289, 325
263	*Myriophyllum oliganthum* (Wight & Arn.) F. Muell.	Haloragaceae	T	LC	H	Aug.-Feb.	AQ	MML-290
264	*Neanotis foetida* (Dalzell) W.H. Lewis	Rubiaceae	T	LC	H	Aug.-Sept.	T	MML-193, 328
265	*Neanotis montholoni* (Hook. f.) W.H. Lewis	Rubiaceae	T	LC	H	Aug.-Nov.	T	MML-174, 194
266	*Nervilia aragoana* Gaudich.	Orchidaceae	CR	LC	H	May-Sept.	T	MML-013
267	*Nervilia plicata* (Andr.) Schltr.	Orchidaceae	CR	LC	H	May-Sept.	T	MML-014
268	*Nervilia prainiana* (King & Pantl.) Seidenf.	Orchidaceae	CR	LC	H	Aug.-Sept.	T	MML-085
269	*Nymphoides indica* (L.) Kuntze	Menyanthaceae	CR	LC	H	Oct.-Apr.	T	MML-152
270	*Oberonia recurva* Lindl.	Orchidaceae	C	LC	H	Sept.-Aug.	T	MML-088
271	*Oenothera rosea* L'Hér. ex Aiton	Onagraceae	T	LC	H	Sept.-May	T	MML-385
272	*Oryza rufipogon* Griff.	Poaceae	T	LC	H	Sept.-Dec.	AQ	MML-364, 413
273	*Oxalis corniculata* L.	Oxalidaceae	T	LC	H	Sept.-Dec.	T	MML-093
274	*Pancratium triflorum* Roxb.	Amaryllidaceae	CR	LC	H	Apr.-Sept.	T	MML-204
275	*Panicum antidotale* Retz.	Poaceae	T	LC	H	Aug.-Nov.	T	MML-075
276	*Panicum paludosum* Roxb.	Poaceae	T	LC	H	Aug.-Dec.	T	MML-058
277	*Paspalum canarae* var. *canarae*	Poaceae	T	LC	H	Aug.-Dec.	T	MML-147, 363, 431
278	*Paspalum canarae* var. *fimbriatum* (Bor) Veldkamp	Poaceae	T	LC	H	Aug.-Dec.	T	MML-059
279	*Pennisetum alopecuroides* (L.) Spreng.	Poaceae	T	LC	H	Aug.-Dec.	T	MML-366
280	*Pentanema indicum* (L.) Ling	Asteraceae	T	LC	H	Aug.-Mar.	T	MML-142

281	*Peristylus densus* (Lindl.) Santapau & Kapadia	Orchidaceae	CR	LC	H	Aug.-Oct.	T	MML-433
282	*Peristylus stocksii* (Hook. f.) Kraenzl.	Orchidaceae	CR	LC	H	July-Oct.	T	MML-267
283	*Persicaria auriculata* S.K. Dixit *et al.*	Polygonaceae	C	LC	H	Nov.-Jun	T	MML-185, 317
284	*Persicaria glabra* (Willd.) M. Gómez	Polygonaceae	T	LC	H	Sept.-Apr.	T	MML-181, 397
285	*Pimpinella adscendens* Dalzell	Apiaceae	T	LC	H	Oct.-Jun.	T	MML-195
286	*Pimpinella heyneana* Wall.	Apiaceae	T	LC	H	Sept.-Dec.	T	MML-094
287	*Pimpinella tomentosa* Dalzell	Apiaceae	T	E, LC	H	Nov.-Jan.	T	MML-3154
288	*Pimpinella wallichiana* (Miq.) Gandhi	Apiaceae	T	E, LC	H	Oct.-Jan.	T	MML-382
289	**Pinda concanense* (Dalzell) P.K.Mukh. & Constance	Apiaceae	T	E, LC	H	Aug.-Dec.	T	MML-384, 392
290	*Piper hookeri* Miq.	Piperaceae	P	DD	H	Apr.-Dec.	T	MML-321
291	**Piper species*	Piperaceae	P	E, DD	H	Throughout	T	MML-197
292	**Piper species*	Piperaceae	P	E, LC	H	Throughout	T	MML-436
293	*Piper trichostachyon* (Miq.) C. DC.	Piperaceae	P	LC	H	Oct.-May	T	MML-320
294	*Pleocaulus sessilis* (Nees) Bremek.	Acanthaceae	C	LC	H	Sept.-Dec.	T	MML-274
295	**Pogonachne racemosa* Bor	Poaceae	T	E, LC	H	Sept.-Nov.	T	MML-257
296	*Pogostemon deccanensis* (Panigrahi) Press	Lamiaceae	T	LC	H	Sept.-Feb.	T	MML-140
297	*Polycarpon prostratum* (Forssk.) Asch. & Schweinf. ex Asch.	Caryophyllaceae	T	LC	H	Sept.-Nov.	T	MML-208
298	*Polygala persicariifolia* DC.	Polygalaceae	T	LC	H	Jun.-Jan.	T	MML-017
299	*Polygonum plebeium* R. Br.	Polygonaceae	T	LC	H	Oct.-Jun.	T	MML-417
300	**Pseudodichanthium serrafalcoides* (Cooke & Stapf) Bor	Poaceae	T	E, VU	H	Sept.-Nov.	T	MML-256
301	*Pseudanthistiria heteroclita* (Roxb.) Hook. f.	Poaceae	T	LC	H	Aug.-Dec.	T	MML-398
302	*Pycreus flavidus* (Retz.) T. Koyama	Cyperaceae	T	LC	H	Jun.-Dec.	T	MML-015
303	*Pycreus macrostachyos* (Lam.) J. Raynal	Cyperaceae	T	LC	H	Jun.-Dec.	T	MML-016
304	*Pycreus sanguinolentus* (Vahl) Nees ex C.B. Clarke	Cyperaceae	T	LC	H	July-Mar.	T	MML-314
305	*Remusatia vivipara* (Roxb.) Schott	Araceae	CR	LC	H	Apr.-Sept.	T	MML-346
306	*Rhamphicarpa longiflora* Wight ex Benth.	Orobanchaceae	T	LC	H	Aug.-Feb.	T	MML-303
307	*Rostellularia japonica* (Thunb.) J.L. Ellis	Acanthaceae	T	LC	H	Aug.-Oct.	T	MML-254
308	*Rotala densiflora* (Roth) Koehne	Lythraceae	T	LC	H	Aug.-Jan.	T	MML-355, 408

309	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	Lythraceae	T	LC	H	Aug.-Nov.	T	MML-076
310	*Rotala occultiflora* Koehne	Lythraceae	T	LC	H	Aug.-Nov.	T	MML-356
311	*Rotala ritchiei* Koehne	Lythraceae	T	E, CR	H	Aug.-Jan.	AQ	MML-414
312	*Rubia cordifolia* L.	Rubiaceae	C	LC	C	July-Feb.	T	MML-034
313	*Rungia crenata* T. Anderson	Acanthaceae	T	LC	H	Mar.-May	T	MML-188
314	*Rungia elegans* Dalzell & A. Gibson	Acanthaceae	T	LC	H	Sept.-Jan.	T	MML-3138
315	*Rungia pectinata* (L.) Nees	Acanthaceae	T	LC	H	Sept.-Feb.	T	MML-098
316	*Rungia repens* (L.) Nees	Acanthaceae	T	LC	H	Sept.-Jan.	T	MML-190
317	*Schoenoplectus lateriflorus* (J.F. Gmel.) Lye	Cyperaceae	T	LC	H	Aug.-Sept.	T	MML-374
318	*Scilla hyacinthina* (Roth) J.F. Macbr.	Asparagaceae	CR	LC	H	May-Sept.	T	MML-281
319	*Senecio belgaumensis* C.B. Clarke	Asteraceae	T	E, LC	H	Aug.-Jan.	T	MML-327
320	*Senecio bombayensis* N.P. Balakr.	Asteraceae	T	E, LC	H	Aug.-Dec.	T	MML-295, 326, 386
321	*Senecio edgeworthii* Hook. f.	Asteraceae	T	E, LC	H	Aug.-Nov.	T	MML-380
322	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	T	LC	H	July-Dec.	T	MML-233
323	*Sida acuta* Burm. f.	Malvaceae	C	LC	H	Sept.-Feb.	T	MML-099
324	*Sigesbeckia orientalis* L.	Asteraceae	C	LC	H	Nov.-Dec.	T	MML-387
325	**Smithia agharkarii* Hemadri	Fabaceae	T	E, VU	H	Sept.-Oct.	T	MML-163
326	*Smithia bigemina* Dalzell	Fabaceae	T	LC	H	Aug.-Dec.	T	MML-161
327	*Smithia conferta* Sm.	Fabaceae	T	LC	H	Aug.-Dec.	T	MML-060
328	*Smithia hirsuta* Dalzell	Fabaceae	T	LC	H	Aug.-Dec.	T	MML-061
329	*Smithia pycnantha* Benth. ex Baker f.	Fabaceae	T	LC	H	Sept.-Dec.	T	MML-095
330	*Smithia racemosa* B. Heyne	Fabaceae	T	LC	H	Aug.-Dec.	T	MML-162
331	*Solanum anguivi* Lam.	Solanaceae	C	LC	H	Aug.-Dec.	T	MML-062
332	*Solena amplexicaulis* (Lam.) Gandhi	Cucurbitaceae	C	LC	H	July-Dec.	T	MML-029
333	*Sonerila scapigera* Dalzell	Melastomataceae	T	LC	H	Aug.-Sept.	T	MML-164
334	*Sopubia delphinifolia* D. Don	Orobanchaceae	T	LC	H	July-Jan.	T	MML-291, 434
335	*Sporobolus pilifer* (Trin.) Kunth.	Poaceae	T	LC	H	Aug.-Oct.	T	MML-367
336	*Stephania japonica* (Thunb.) Miers	Menispermaceae	T	LC	C	Jun.-Sept.	T	MML-200

337	*Striga gesnerioides* (Willd.) Vatke	Orobanchaceae	T	LC	H	Sept.-Dec.	T	MML-155, 405
338	*Swertia densifolia* (Griseb.) Kashyapa	Gentianaceae	T	LC	H	Sept.-Feb.	T	MML-180
339	*Swertia minor* Knobl.	Gentianaceae	T	LC	H	July-Oct.	T	MML-339
340	*Themeda quadrivalvis* (L.) Kuntze	Poaceae	T	LC	H	Aug.-Dec.	T	MML-232
341	*Themeda tremula* (Nees ex Steud.) Hack.	Poaceae	T	LC	H	Sept.-Dec.	T	MML-096
342	*Thunbergia fragrans* Roxb.	Acanthaceae	C	LC	C	Aug.-Dec.	T	MML-063
343	*Trichodesma inaequale* Edgew.	Boraginaceae	T	LC	H	Aug.-Feb.	T	MML-158
344	*Trichodesma zeylanicum* (Burm. f.) R. Br.	Boraginaceae	T	LC	H	Dec.-Apr.	T	MML-437
345	*Tricholepis glaberrima* DC.	Asteraceae	T	LC	H	Aug.-Dec.	T	MML-159
346	*Tricholepis radicans* DC.	Asteraceae	T	LC	H	Aug.-Dec.	T	MML-064
347	*Tripogon bromoides* Roth	Poaceae	T	LC	H	Aug.-Nov.	T	MML-252
348	*Tripogon lisboae* Stapf	Poaceae	T	LC	H	Sept.-Nov.	T	MML-231, 335
349	*Tripogon pungens* C.E.C. Fisch.	Poaceae	T	LC	H	Sept.-Nov.	T	MML-238
350	*Triumfetta rhomboidea* Jacq.	Malvaceae	T	LC	H	July-Dec.	T	MML-125, 307
351	*Utricularia albocaerulea* Dalzell	Lentibulariaceae	T	LC	H	Aug.-Dec.	T	MML-227, 360
352	*Utricularia caerulea* L.	Lentibulariaceae	T	LC	H	Aug.-Dec.	T	MML-065
353	*Utricularia praeterita* P. Taylor	Lentibulariaceae	T	LC	H	July.-Jan	T	MML-023
354	*Utricularia purpurascens* Graham	Lentibulariaceae	T	LC	H	Aug.-Jan.	T	MML-071
355	*Utricularia reticulata* Sm.	Lentibulariaceae	T	LC	H	Aug.-Sept.	T	MML-086
356	*Utricularia striatula* Sm.	Lentibulariaceae	T	LC	H	July-Feb.	T	MML-035
357	*Verbascum chinense* (L.) Santapau	Scrophulariaceae	T	LC	H	Throughout	T	MML-443
358	*Vigna vexillata* (L.) A. Rich.	Fabaceae	CR	LC	C	Sept.-Nov.	T	MML-352
359	*Zingiber cernuum* Dalzell	Zingiberaceae	CR	LC	H	July-Dec.	T	MML-030
360	*Zingiber neesanum* (J. Graham) Ramamoorthy	Zingiberaceae	CR	LC	H	July-Sept.	T	MML-116, 296
361	*Zornia gibbosa* Span.	Fabaceae	T	LC	H	Aug.-Dec.	T	MML-425

LF = life-forms. CR = cryptophytes; C = Chaemephytes; T = therophytes. S = status. CR = critically endangered; DD = data deficient; E = endemic; EN = endangered; LC = least concern; NT = near threatened; NE = not evaluated; V = vulnerable. H = habit. H = erect herb; C = climber. Ht = habitat. A = aerial; AQ= aquatic; T = terrestrial. * indicates plants restricted to plateaus only.

pressure. Barki, Gothane, and Shelap which are remote areas and are so far free from such influences.

Conclusion

It has been noted that these plateaus differ completely from their surrounding vegetation in both physiognomy and floristic aspects. In spite of harsh environment, plateaus are unique in having various micro habitat conditions and species which are habitat specific. In the present study, it was observed that the selected plateau habitats in Satara, Kolhapur and Ratnagiri districts occupy 1.4% area of Western Ghats but harbour 4.3% of the endemics of the Western Ghats. In addition, as mentioned earlier many new taxa have been described from plateau in the recent past. Many of these newly described taxa such as *Eleocharis wadoodii, Eriocaulon epedunculatum, Mnesithea veldkampii* are restricted to these ecosystems. This is one of the reasons why these plateaus need to be thorougly screened from the biodiversity point of view.

The best represented life forms, therophytes and cryptophytes are testimony to the harsh climatic conditions which prevail on plateaus. Development of certain adaptive traits further corroborates this fact. Poikilohydry which is found to occur in certain plants on plateaus or other such ecosystems hold great promise for the future. Induction of poikilohydric nature, by traditional breeding or modern biotechnology to cereal crops, would be an important step towards reliable food production in the semiarid tropics (Gaff and Ellis, 1974; Gaff and Latz, 1978). Hence, plateaus are great reservoirs of important genetic resources. In view of their uniqueness, high species richness, endemism, and constantly increasing anthropogenic pressure observed during the study period these ecosystems seek immediate conservation measures.

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