

**Original Research Article**

DOI: 10.26479/2019.0503.17

**ENDEMIC FLOWERING PLANTS OF RAJDERWADI BASALTIC ROCK  
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**ABSTRACT:** The present investigation was carried out to document Floristic diversity present on Rajderwadi basaltic rock outcrop/plateau of Northern Western Ghats. Frequent field visits were carried out to document endemic flora on this plateau. Total 105 species belonging to 35 families from 19 orders were recorded. Most of area on this plateau is inhabited by herbaceous species as well as ephemerals followed by climbers and shrubs. Black soil and exposed rock surfaces were seen everywhere on this plateau. This exposed rock surfaces are rich in Magnesium and Iron. One seasonal pond was present which is occupied by some floating and submerged aquatic species. Seasonal variation of species is seen on the plateau. During field visit voucher specimens were collected and herbariums were prepared. Herbariums are maintained in laboratory.

**KEYWORDS:** Endemism, Phenology, Habit, Habitat, Rock outcrop.

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**1. INTRODUCTION**

The Western Ghats have huge biodiversity with series of hill ranges running north-south along the west coast of India. The Ghats are divided into three parts, Surat to Goa (Northern part of Western Ghats, Goa to Nilgiris (Central part of Western Ghats), South of Palghat (Southern part of Western Ghats) 1, 2. Endemic flora of Northern Western Ghat is dominated by most of herbaceous species. There are various integral ranges of hills originated in Northern Western Ghat.eg. Satmala in Nasik District, Satmala-Ajanta in Aurangabad & Satpuda in Nandurbar district. Satmala ranges distributed

in Nasik district having various habitats like plateaus/rock outcrops, forts, caves etc. Out of these plateaus/rock outcrops are well known for their monsoon diversity and endemism. Most of the work on rock outcrops was carried out in America, Africa and Australia 3, 4, 5. In India few researchers have worked on these special habitats 6, 7, 8, 9, 10. In Maharashtra few researchers have conducted ecological studies on different plateaus of Western Ghats 11, 12, 13, 14, 15, 16. Number of new taxa is described from Plateaus of Western Ghats & associated regions viz., *Ceropegia rollae*, *Chlorophytum bharuchae*, *Ceropegia concanensis*, *Chlorophytum gothanense*, *Cucumis setosus* and *Blyxa aubertii* 17, 18, 19, 20, 21. Therefore, for the present study Rajderwadi rock outcrop/plateau of Northern Western Ghat has been chosen. The area of this plateau is small but huge monsoon diversity is found on this plateau. This plateau is specific for its altitude, climate, environment & soil conditions. According to geographical conditions this plateau having two steps, one lower step is at altitude of 900 msl (i.e. middle plateau) and second is upper step at altitude of 1100 to 1250 msl (i.e. upper plateau). Most of endemism is found on upper plateau. Various microhabitats are found on upper plateau. Most of species are herbaceous and ephemerals. Open rock surfaces on plateau are inhabited by some species of Eriocaulaceae as well as Asparagaceae (Liliaceous) family eg. *Eriocaulon setaceum*; *Dipcadi ursulae*. Different types of Ferns, Mosses are present on rocks where water seeps continuously e.g. *Nephrolepis exaltata*; *Selaginella kraussiana*; *Polytrichum commune*; Various Lichens are found on open surfaces of isolated rocks e.g. *Flavoparmelia caperata*; Also other microhabitats like seasonal ponds are dominated by *Alternanthera denticulate*; *Eclipta prostrata*; and soil cover areas are dominated by most species of family Fabaceae & Polygalaceae. eg. *Alysicarpus pubescens*; *Crotalaria nana*; *C. Calycina*; *Polygala persicariifolia* etc.

**Study Area:** For present study Rajderwadi Basaltic Plateau was selected. The Co-ordinates of this plateau are 20° 23' 12. 51"N latitude and 74° 11' 42. 69" E longitude. This plateau belongs to Satmala range of Northern Western Ghat that runs across Chandwad tehsil of Nasik district. Co-ordinates of Satmala range are 20 23'25" N latitude & 73 54'31" E longitudes. The total area of this plateau is 0.40 km<sup>2</sup> and altitude is 1275 msl. Black soil is mostly present on this plateau. Most of area on plateau is covered with Black exposed rock surfaces. Average rainfall on this plateau is 900 mm. The climate of this plateau is dry throughout the year except during the south west monsoon season. South west monsoon season starts from June and followed by winter & summer.

## 2. MATERIALS AND METHODS

Frequent field visits were carried out in all seasons of the year i.e. Monsoon, Winter and Summer to collect the specimens. During field visits photographs of specimens were taken by using Nikon DSLR d3400 Camera. Proper field notes on each specimen were noted which include collection number, common name, habit, habitat, distribution of species. Collected specimens were identified using local floras 22, 23, 24, 25 & regional floras 26, 27, 28, 29. Voucher specimens bring to the

laboratory and herbariums were prepared 30. GPS readings (i.e. latitude, longitude & altitude) for each specimen were taken by using Note Cam Camera of android mobile. The latitude and longitude calibrated with Google Earth 7.1 and image of plateau was obtained. The area of plateau in square kilometer was calculated by Geo Area Map Application of Android mobile.

### 3. RESULTS AND DISCUSSION

**Species Composition:** There are 105 species belonging to 35 families were documented. Out of 105 species 57 species were Endemic to Western Ghat. Fabaceae (11), Acanthaceae (11), Lamiaceae (08), Asteraceae (08), Commelinaceae (06), Scrophulariaceae (05), Asparagaceae (05), Polygaceae (05) were dominant families. Euphorbiaceae (03), Malvaceae (03), Gentianaceae (03), Cucurbitaceae (02), Convolvulaceae (02), Solanaceae (02), Zingiberaceae (01) were minor families.

**Phenology:** According to phenology most of species come in flowering during mansoon season. 22 species come in flowering during premansoon season i.e. June to July. 35 species were come in flowering during mansoon season i.e. August to September. 15 species were come in flowering during post mansoon season i.e. October to November. 11 species were come in flowering during winter season i.e. December to February and 07 species were come in flowering during summer i.e. March to May.

**Habit & Habitat:** According to Habit seventy species are herbaceous and complete their life cycle within one year. Twenty two species are shrubs followed by ten climbers. Plants were negligible on this plateau. According to habitat 102 species were terrestrial i.e. Found on soil, open rock surfaces etc. while 08 species were aquatic i.e. Floating on water or submerged.

**Table. 1.** All species were arranged according to Bentham & Hooker system of Classification

Sr. No	Species (Botanical name)	Family	Hb	Phenology	Ht	Voucher Number
1	<i>Clematis heynei</i> M. A. Rau & al.	Ranunculaceae	H	Oct-Nov	T	SWA-150
2	<i>Brassica napus</i> Napus	Brassicaceae	H	Aug-Sep	T	SWA-108
3	<i>Cleome monophylla</i> L.	Cleomaceae	H	Aug-Sep	T	SWA-159
4	<i>C. chelidonii</i> L.F.	Cleomaceae	S	Aug-Sep	T	SWA-161
5	<i>Polygala persicariifolia</i> DC.	Polygalaceae	H	Aug-Sep	T	SWA-83
6	<i>P. arvensis</i> Will D.	Polygalaceae	H	July-Sep	T	SWA-160
7	<i>Thespesia lampus</i> (Cav). Dalzell & A. Gibson	Malvaceae	S	Oct-Nov	T	SWA-146
8	<i>Sida cordifolia</i> L.	Malvaceae	S	Sep-Oct	T	SWA-133
9	<i>Grewia abutilifolia</i> Kurz.	Malvaceae	S	Aug-Sep	T	SWA-145
10	<i>Linum mysurense</i> B. Heyne ex. Benth.	Linaceae	H	Aug-Sep	T	SWA-104

11	<i>Biophytum sensitivum</i> (L.) DC.	Oxalidaceae	H	Aug-Sep	T	SWA-01
12	<i>Impatiens balsamina</i> L. Var	Balsaminaceae	H	July-Nov	T	SWA-03
13	<i>Mundulea sericea</i> (DC.) Benth.	Fabaceae	S	Jan-Jun	T	SWA-13
14	<i>Crotalaria nana</i> Burm. f	Fabaceae	S	Sep-Oct	T	SWA-158
15	<i>C. calycina</i> Sensu Pulle, Non schrank	Fabaceae	S	Sep-Oct	T	SWA-157
16	<i>Alysicarpus tetragonolobus</i> Edgew	Fabaceae	H	July-Oct	T	SWA-45
17	<i>A. pubescens</i> J. S. Law	Fabaceae	H	Aug-Sep	T	SWA-82
18	<i>Zornia diphylla</i> (L.) Pers.	Fabaceae	H	Aug-Sep	T	SWA-87
19	<i>Aeschynomene elaphroxylon</i> (Guill & Perr.) Tavb	Fabaceae	S	Sep-Oct	T	SWA-137
20	<i>Aeschenomene indica</i> Sensu auct. p.p.	Fabaceae	S	Sep-Nov	T	SWA-165
21	<i>Desmodium cassence</i> (L.) DC.	Fabaceae	S	Oct-Nov	T	SWA-166
22	<i>A. monilifer</i> (L.) DC.	Fabaceae	H	Sep-Oct	T	SWA-138
23	<i>Smithia sensitiva</i> Aniton	Fabaceae	H	Sep-Oct	T	SWA-139
24	<i>S. hirsuta</i> Dalzell.	Fabaceae	H	Aug-Sep	T	SWA-105
25	<i>A. indica</i> Sensu auct. p.p.	Fabaceae	S	Aug-Sep	T	SWA-123
26	<i>Cassia pumila</i> (Lam.) K. Larsen	Caesalpiniaceae	H	Aug-Sep	T	SWA-96
27	<i>Cucumis setosus</i> L.	Cucurbitaceae	C	July-Aug	T	SWA-66
28	<i>Mollugo pentaphylla</i> L.	Molluginaceae	H	Aug-Sep	T	SWA-109
29	<i>Ammania latifolia</i> Willd	Lytraceae	H	Sep-Oct	A	SWA-167
30	<i>Peucedanum grande</i> C. B. Clarke.	Apiaceae	H	July-Nov	T	SWA-60
31	<i>Oenanthe javanica</i> (Blume) DC.	Apiaceae	H	July-Aug	A	SWA-69
32	<i>Neanotis lancifolia</i> (Hook. f.) W. H. Levis	Rubiaceae	H	July-Aug	T	SWA-16
33	<i>Pulicaria wightiana</i> C. B. Clarke	Asteraceae	H	July-Feb	T	SWA-50
34	<i>Synedrella nodiflora</i> (L.) Gaertn	Asteraceae	H	July-Oct	T	SWA-09
35	<i>Senecio edgeworthii</i> Hook. F.	Asteraceae	H	Jun-Oct	T	SWA-05
36	<i>Eclipta prostrate</i> (L.) L.	Asteraceae	H	July-Sep	T/ A	SWA-64
37	<i>Bidens biternata</i> (Lour) Merr.	Asteraceae	H	Aug-Sep	T	SWA-113

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38	<i>Vernonia cinaria</i> (L.) Less	Asteraceae	H	Aug-Sep	T	SWA-119
39	<i>Cyathoclin purpuria</i> (Buchham ex. D. Don) Kuntze	Asteraceae	H	Oct-Nov	T	SWA-147
40	<i>Blumia lacera</i> (Burn. F) DC	Asteraceae	H	Aug-Sep	T	SWA-106
41	<i>Plumbago zeylanica</i> L.	Plumbaginacea e	S	Sep-Oct	T	SWA-127
42	<i>Anagallis arvensis</i> L.	Primulaceae	H	Aug-Sep	T	SWA-107
43	<i>Ceropegia bulbosa</i> Roxb.	Apocynaceae	C	July-Dec	T	SWA-43
44	<i>Ceropegia vincaefolia</i> Hook.	Apocynaceae	C	Aug-Oct	T	SWA-163
45	<i>Ceropegia hirsuta</i> Wight & Arn	Apocynaceae	C	Aug-Oct	T	SWA-164
46	<i>Enicostemma axillare</i> (L.) Raynal	Gentianaceae	H	July-Sep	T	SWA-48
47	<i>Canscora diffusa</i> (Vahl). R. Br. Ex. Roam &Schult	Gentianaceae	H	Sep-Oct	T	SWA-135
48	<i>Exacum pedunculatum</i> L.	Gentianaceae	H	Oct-Nov	T	SWA-141
49	<i>Ipomoea triloba</i> L.	Convolvulaceae	C	Sep-Oct	T	SWA-129
50	<i>Ipomoea nil</i> (L). Roth	Convolvulaceae	C	Sep-Oct	T	SWA-162
51	<i>Argyreia sericea</i> Dalz & Gib	Convolvulaceae	C	Aug-Sep	T	SWA-78
52	<i>Solanum virginianum</i> L.	Solanaceae	S	July-Sep	T	SWA-56
53	<i>Nicandra physalodes</i> (L.) Gaertn	Solanaceae	H	Aug-Sep	T	SWA-115
54	<i>Kickxia ramosissima</i> (Wall) Janch	Scrophulariaceae e	C	July-Feb	T	SWA-21
55	<i>Sopubia delphinifolia</i> G. Don.	Scrophulariaceae e	H	Aug-Sep	T	SWA-116
56	<i>Mecardonia procumbens</i> (Mill) Small.	Scrophulariaceae e	H	Sep-Oct	T	SWA-128
57	<i>Striga densiflora</i> (Benth.) Benth	Scrophulariaceae e	H	July-Sep	T	SWA-41
58	<i>S. genseioides</i> (Willd.) Vakte	Scrophulariaceae e	H	July-Sep	T	SWA-42
59	<i>S. angustifolia</i> (D.Don) C. J. Saldanha	Orobanchaceae	H	Aug-Sep	T	SWA-98
60	<i>Barleria prionitis</i> L.	Acanthaceae	S	Feb-Apr	T	SWA-26
61	<i>Barleria gibsonii</i> Dalzell	Acanthaceae	S	Feb-Apr	T	SWA-169

62	<i>Dipteracanthus patulus</i> (Jacq.) nees	Acanthaceae	H	May-July	T	SWA-20
63	<i>Justicia japonica</i> Thunb., Fl	Acanthaceae	H	July-Oct	T	SWA- 38
64	<i>J. procumbens</i> L.	Acanthaceae	H	July-Aug	T	SWA-155
65	<i>B. grandiflora</i> Dalz.	Acanthaceae	S	Oct-Nov	T	SWA-117
66	<i>Asystasia mysorensis</i> Benth	Acanthaceae	H	Aug-Sep	T	SWA-110
67	<i>Hemigraphis latebrosa</i> (Roth) Nees	Acanthaceae	H	Oct-Nov	T	SWA-142
68	<i>A. dalzelliana</i> Santapau	Acanthaceae	H	Aug-Sep	T	SWA-120
69	<i>Rungia elegans</i> Dalz.	Acanthaceae	H	Aug-Sep	T	SWA-121
70	<i>B. gibsonii</i> Dalzell	Acanthaceae	S	Oct-Nov	T	SWA-143
71	<i>Lepidagathis cristata</i> Willd.	Acanthaceae	H	Oct-Nov	T	SWA-112
72	<i>Rostellularia procumbens</i> Nees.	Acanthaceae	H	Aug-Sep	T	SWA-95
73	<i>Leucas biflora</i> (Vahl.) R.Br. ex. Sm	Lamiaceae	C	Aug-Sep	T	SWA-85
74	<i>Orthosiphon pallidus</i> Royal ex Benth.	Lamiaceae	H	Jun-Sep	T	SWA-27
75	<i>Plectranthus barbatus</i> Andrews.	Lamiaceae	S	July-Nov	T	SWA-49
76	<i>Clerodendrum serratum</i> (L.)	Lamiaceae	S	July-Oct	T	SWA-57
77	<i>P. mollis</i> (Aiton) Spreng	Lamiaceae	H	Aug-Sep	T	SWA-77
78	<i>Lavandula bipinnata</i> (Roth) Kuntze	Lamiaceae	H	Aug-Sep	T	SWA-90
79	<i>Anisomeles heyneana</i> Benth	Lamiaceae	S	Oct-Nov	T	SWA-148
80	<i>Anisochillus carnosus</i> (L.F) Wall	Lamiaceae	S	Sep-Oct	T	SWA-130
81	<i>Alternanthera denticulate</i> R. Br.	Amaranthaceae	S	July-Aug	A	SWA-71
82	<i>Euphorbia nerifolia</i> L.	Euphorbiaceae	S	Feb-Mar.	T	SWA-99
83	<i>E. thymifolia</i> L.	Euphorbiaceae	H	July-Aug	T	SWA-67
84	<i>E. laciniata</i> Panigrahi	Euphorbiaceae	H	Aug-Sep	T	SWA-81
85	<i>Habenaria grandifloriformis</i> Blatt & MacCann	Orchidaceae	H	July-Aug	T	SWA-51
86	<i>H. crassifolia</i> (Lindl.) Aitch	Orchidaceae	H	Aug-Sep	T	SWA-169
87	<i>Curculigo orchioides</i> Gaertn.	Orchidaceae	H	Jun-Aug	T	SWA-52
88	<i>Curcuma pseudomontana</i> J. Graham	Zingiberaceae	H	July-Sep	T	SWA-55
89	<i>Ottelia alismoides</i> (L.) Pers.	Hydrocharitace	H	Aug-Sep	A	SWA-122

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90	<i>Lindernia nummulariifolia</i> (D. Don) Wettst.	Linderniaceae	H	Aug-Sep	T	SWA-79
91	<i>Phyllanthus niruri</i> L.	Phyllanthaceae	H	July-Aug	T	SWA-89
92	<i>Dipcadi ursulae</i> Blatt.	Asparagaceae (Liliaceae)	H	Aug-Sep	T	SWA-155
93	<i>Gloriosa superba</i> L.	Asparagaceae (Liliaceae)	C	Aug-Sep	T	SWA-73
94	<i>Drimia indica</i> (Roxb.) Jessop	Asparagaceae (Liliaceae)	H	Feb-July	T	SWA-11
95	<i>Chlorophytum borivilianum</i> Santapau & R. R. Fem.	Asparagaceae (Liliaceae)	H	Jun-Aug	T	SWA-88
96	<i>Iphigenia stellata</i> Blatt.	Liliaceae	H	July-Sep	T	SWA-29
97	<i>Iphigenia magnifica</i> Ansari & R. S. Rao	Asparagaceae (Liliaceae)	H	July-Sep	T	SWA-40
98	<i>Cyanotis axillaris</i> (L.) D. Don. ex. Sweet	Commelinaceae	H	Aug-Sep	T	SWA-114
99	<i>Commelina coroliniana</i> Walter	Commelinaceae	C	July-Sep	T	SWA-91
100	<i>Cyanotis fasciculata</i> (B. Heyne. Ex. Roth) Schult & Schult. F.	Commelinaceae	H	Aug-Sep	T	SWA-93
101	<i>Commelina hasskarlii</i> C. B. Clarke	Commelinaceae	H	Jun-Dec	T	SWA-23
102	<i>Murdania simplex</i> (Vahl) Brenam	Commelinaceae	H	Aug-Sep	T	SWA-94
103	<i>C. cristata</i> (L.) D. Don.	Commelinaceae	H	Aug-Sep	T	SWA-74
104	<i>Solanum virginianum</i> L.	Solanaceae	S	July-Sep	T	SWA-157
105	<i>Eriocaulon setaceum</i> L.	Eriocaulaceae	H	Aug-Sep	T	SWA-156

Hb=Habit, Ht=Habitat, H=Herb, S=Shrub, C=Climber, T=Terrestrial, A=Aquatic.



**Fig. 1.** Endemic species on plateau a) *Dipcadi ursulae* Blatt. b) *Angelis ardencies* L. c) *Crotalaria calycina* Sensu Pulle, Non schrank d) *Curculigo orchioides* Gaertn e) *C. nana* Burm. F. f) *Euphorbia laciniata* Panigrahi g) *Alysicarpus pubescens* J. S. Law h) *Chlorophytum borivilianum* Santapau & R. R. Fem.

#### 4. CONCLUSION

Vast biodiversity of flowering plants found on Sadetin Rodaga plateau including lower plant groups like Algae, Lichens, Bryophytes etc. In spite of adverse environmental conditions rich biodiversity has been observed on Sadetin Rodaga Plateau. It was observed that biodiversity on plateau changes according rain fall patterns and climatic factors like moisture, humidity, temperature etc therefore seasonal succession is seen on this Plateau. Some species like *Dipcadi ursulae*; *Eriocaulon setaceum*; which are present on lateritic plateau of Satara, Kolhapur etc. Are also found on this basaltic plateau of Satmala Ranges. Most of the species are confined to their microhabitats and ephemerals. There is one noticeable threat of Over Grazing to this biodiversity so attempts should be done to save this biodiversity. As per field observations in future there is scope to find out new species as well as genera on this plateau.

#### ACKNOWLEDGEMENT

I am thankful to the Principal Dr. G. H. Jain for allowing the field visits during this research work. Assistance provided by Mr. Yogesh Gidge, Mr. Atul Zalte, Mr. Rameshwar Bidgar and Mr. Shankar Pawar is greatly appreciated. Thanks to Dr. Sharad Kambale for confirmation of the specimens. I wish to acknowledge the help of Dr. M. T. Patil and Dr. T. S. Salve.

#### CONFLICT OF INTEREST

Authors have no conflict of interest.

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