

Geographical Distribution of *Sageraea laurina* Dalzell.

Balasaheb Shantilal Kale^{1*}, Sanjay Appaji Khairnar²

¹Assistant Professor, Department of Botany, S. V. K. T. Arts, Science and Commerce College, Deolali Camp, Nashik, M.S, India

²Associate Professor, Department of Botany, S. V. K. T. Arts, Science and Commerce College, Deolali Camp, Nashik, M.S, India

***Address for Correspondence:** Balasaheb S. Kale, Assistant Professor, Department of Botany, S. V. K. T. Arts, Science and Commerce College, Deolali Camp, Nashik, M.S, India

E-mail: kaleunipune@gmail.com

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ABSTRACT

Background: The Western Ghats is one of the Mega Biodiversity hot spots at the global level due to its high number of endemic plant species. That plant species, especially the endemics, have been reported and published in Red Data Book regularly. *Sageraea laurina* Dalzell. belongs to the plant family Annonaceae. It is endemic to Western Ghats of India. The International Union for Conservation of Nature (IUCN) provided the status of this plant which is present in the Western Ghats. This is coming under near threat in the Western Ghats. The present distribution of *S. laurina* is only restricted to the Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu states only.

Methods: For primary data collection used repeated surveys of some areas under study using GPS.

For secondary data collection used different literature such as Floras, database and herbarium consultation from BSI and ARI, Pune. Their taxonomy was re-investigated to confirm their taxonomic distinctness and Identification and classification of *S. laurina* Dalzell by using different Floras.

Results: During the study, 118 different GPS localities were noted in the Western Ghats of India. The population distribution of this species covered the Northern (81%), Central (16%), and Southern (3%) Western Ghats of India.

Conclusion: In the present study, we are generating primary and secondary data to stand a species in the IUCN category. Generated data used for conservation of this species. The major goal of the species recovery programme will be to re-establish the populations within their natural habitat

Key-words: Endemic, Geographic distribution, *Sageraea laurina* Dalzell, Western Ghats

INTRODUCTION

The Western Ghats is one of the 34 biodiversity hot spots at the global level due to its high number of endemic plant species. The plant family Annonaceae comprises 135 genera and 2500 species and Annonaceae is one of the chemically least known families ^[1]. In India, the family have contained 24 genera and 123 species, were the composition of *Sageraea* in India total taxa 6 and endemic taxa are 4 ^[2]. Worldwide distribution of the *Sageraea* genus consists of 9 species, where *Sageraea* distribution ranges from Peninsular India and Sri Lanka

to Indonesia and the Philippines and distribution in India as endemic concern for Western Ghats of India (Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu) ^[3]. It is endemic to the Western Ghats of India. This plant is found under canopy tree species of the evergreen forest of Western Ghats ^[4- 6]. *S. laurina* Dalzell plant coming under lower risk/near threat in the Western Ghats of India ^[7]. *S. laurifolia* is known to be endangered, vulnerable, or rare but where there is not enough information to say which of the three categories is appropriate for the species ^[8]. *S. laurina* wood is yellow or red and its special characteristics are heavy, hard, tough, elastic. This plant wood is used for making furniture and agricultural equipment. Sometimes these plant wood are used for an as alternative purpose. Leaves morphology similar to laurel medicinal plants so, sometimes these medicinal plants use as adulterants ^[9].

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Sageraea sp. wood is helpful for the construction timber of buildings ^[10]. Alkaloids, saponins, and terpene chemicals were reported in the bark of *Sageraea* sp. ^[11]. In Karnataka state, Shimoga district lives a tribal people. *S. laurifolia* is extremely endangered, where tribal people use this plant disease treatment leaves, bark, and seeds use as dysentery, and peptic ulcer treatment ^[12]. The leaves have medicinal value ^[13]. *S. laurifolia* leaves are used as a treatment for rheumatism and ripened fruits are eaten by tribal peoples ^[14]. The genus *Sageraea* is used for the treatment of AIDS disease ^[15].

The taxonomic citation is *S. laurina* Dalz in Hook's J. Bot. Kew. Gard. Misc. 3: 207. 1851. *Guatteria laurifolia* Graham, Cat. 4. 1839, non Dunal 1817. *S. laurifolia* (Graham) Blatt., Journ. Bombay Nat. Hist. Soc. 34: 294. 1930; Debika Mitra in B. D. Sharma *et al.* Fl. India 1: 282. 1993; Sivar. & Mathew, Fl. Nilambur 42. 1997; Sasidh., Fl. Parambikulam WLS 6. 2002. *S. dalzellii* Bedd., Ic. t. 42. 1874, pp.; Gamble, Fl. Pres. Madras 12(8). 1915; Sasidh. & Sivar., Fl. Pl. Thrissur For. 33. 1996; M. Mohanan in P. Daniel, Fl. Kerala 1: 170. 2005. *Bocagea dalzellii* (Bedd.) Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1: 92. 1872, pp. The taxonomic description is tree 6 to 12 m tall in height, evergreen. Leaves 8.0 to 17.5 x 4.5–6.2 cm, elliptic, or elliptic–lanceolate or oblong to lanceolate, coriaceous, shining, apex subacute, base rounded. The flowers are creamish. Fruits size 2.5 cm across, globular, wrinkled when dry. Flowering & fruiting from October to April month observed during the study ^[16,17].

MATERIALS AND METHODS

Primary data collection- A repeated survey of some areas under study using the Global Positioning System (G.P.S.) (Fig. 1-3).

Secondary data collection- Using different literature such as Floras, India Biodiversity Portal, Survey of sacred groves of Ratnagiri district and their floristic diversity, tropical plants database etc ^[9,18,19].

Taxonomy and Morphology- Identified and classification of *S. laurina* Dalzell were done using the different Floras and other available literature ^[20,21] as well as Collected the samples and prepared to herbarium specimens (Table 1).

Herbarium consultation- The *S. laurina* Dalzell identified by using different herbarium (some deposited herbarium no. 23789, 23788, 22780, 43286, 196795, 38430, 73604,

99695, 58982 and 73606) of BSI and ARI, Pune herbaria. This plant database was gathered from the Western Ghats of India (Fig. 4).

Table 1: Taxonomy hierarchy of *S. laurina* Dalzell

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Magnoliales
Family	Annonaceae
Genus	<i>Sageraea</i>
Species	<i>S. laurina</i> Dalzell
Common names	Andi, Har-kinjal, Kiland, Sager



Fig. 1: *Sageraea laurina* Dalzell Plant

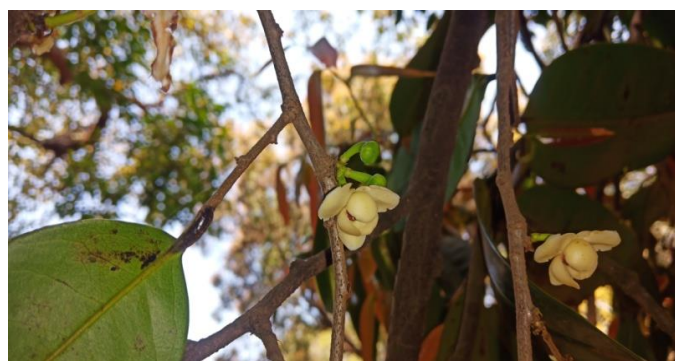


Fig. 2: *S. laurina* Dalzell flowering



Fig. 3: *Sageraea laurina* Dalzell fruiting

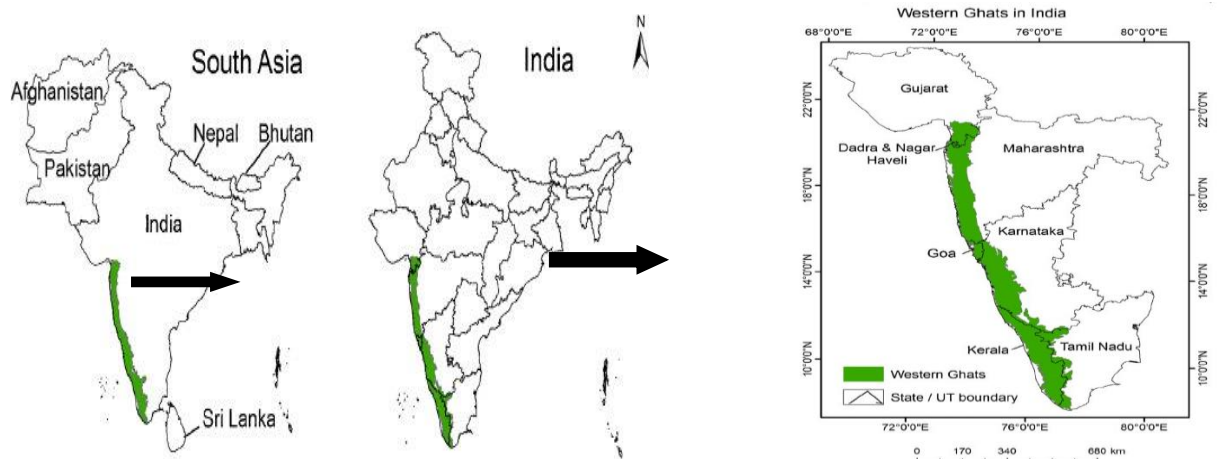


Fig. 4: Distribution of *S. laurina* Dalzell in Western Ghats of India

RESULTS

During the study, 118 different GPS localities were noted in the Western Ghats of India. The population distribution of this species covered the Northern (81%), Central (16%), and Southern (3%) Western Ghats of India. Analyzed primary and secondary database of *S. laurina* species population distribution highest from Northern Western Ghats, moderate from Central Western Ghats and least from Southern Western Ghats of India (Fig. 5). This plant population distributed above sea level altitude range is from 22 to 1000 meters. Here is a variable range of altitude levels observed. This plant has unique observation noted; these are patchy populating grown on the sea-facing sloppy mountain range of Western Ghats.

The present study brings a significant finding on the population distribution of this species; that random

sampling was done at many sites in Maharashtra states. During the survey, there is one of the important observations noted, that this plant found under canopy tree species of an evergreen forest in the Western Ghats. This Plant population distribution slope region of Western Ghats Mountains. This plant patchy population was observed during the study. Studied plant population distribution observed in states and national reserve forests that included some regions of Wildlife Sanctuary, National Parks, reserve forests, and forest ranges (Table 2).

The local tribal people used this plant wood for various purposes i.e. making agricultural instruments, furniture, and fuel. Vast range *S. laurifolia* deforestation in some regions of Western Ghats the result are plant coming under endangered/ risk IUCN category.

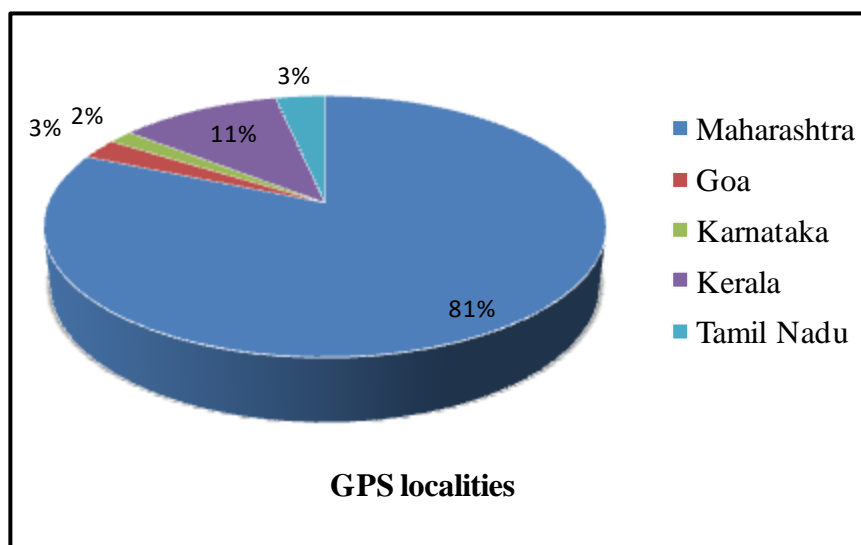


Fig. 5: G. P. S. localities of *S. laurina* Dalzell.

Table 2: Geographic distribution of *S. laurina* Dalzell.

S.No.	G.P.S. location	Altitude (Meter)	Locality	Reserve forest Type
1.	N 19.437811, E 72.920842	614	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary, Maharashtra
2.	N 19.436688, E 72.917619	507	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary
3.	N 19.432964, E 72.917324	468	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary
4.	N 19.433691, E 72.920631	460	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary
5.	N 19.447794, E 72.954448	100	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary
6.	N 19.401387, E 72.978545	100	Tungareashwar Road, Usgaon, Maharashtra	Tungareashwar Wildlife Sanctuary
7.	N 19.1498559, E 73.528431	277	Sidhgad, Maharashtra	Shri Bhimashankar Jyotirlinga Wildlife Reserve
8.	N 19.152012, E 73.529095	500	Sidhgad, Maharashtra	Shri Bhimashankar Jyotirlinga Wildlife Reserve
9.	N 19.033822, E 73.297659	230	Komal Wadi, Neral, Maharashtra	
10.	N 19.437811, E 72.920842	220	Jummapatti, Neral, Maharashtra	
11.	N 18.772724, E 73.374103	500	Tiger Valley Forest, Lonavla Maharashtra	
12.	N 18.750758, E 73.395499	600	Thombrewadi, Lonavla, Maharashtra	
13.	N 18.641368, E 73.408884	710	Devghar, Aamby Valley City, Maharashtra	
14.	N 16.380903, E 73.799371	200	Phondaghat, Kankavli, Maharashtra	Dajipur Wildlife Sanctuary
15.	N 15.928689, E 73.985662	750	Kegad, Maharashtra	
16.	N 15.935044, E 73.993494	730	Kegad, Maharashtra	
17.	N 15.970457, E 74.019934	755	Amboli, Sindhudurg, Maharashtra	
18.	N 15.790660, E 74.108455	100	Terwan, Maharashtra	
19.	N 15.819029, E 74.086618	400	Terwanmedhe, Maharashtra	
20.	N 15.814250, E 74.125741	200	Bambarde, Maharashtra	
21.	N 15.654184, E 74.090422	600	Virdi, Maharashtra	
22.	N 18.641368, E 73.408884	710	Devghar, Maharashtra	
23.	N 18.782275, E 73.370418	500	Battery Hills, Lonavla,	

24.	N 16.891528, E 73.659881	200	Palu, Maharashtra	Chandoli National Park
25.	N 16.745414, E 73.740320	200	Karavali, Maharashtra	Chandoli National Park
26.	N 17.630953, E 73.202066	150	Agar Vaigani, Dapoli, Maharashtra	
27.	N 17.889646, E 73.156420	185	Dauli, Dapoli, Maharashtra	
28.	N 17.849028, E 73.227139	111	Dhankoli, Dapoli, Maharashtra	
29.	N 17.729611, E 73.169556	157	Gavhe, Dapoli, Maharashtra	
30.	N 17.907389, E 73.128389	231	Vanzloli, Dapoli, Maharashtra	
31.	N 17.410861, E 73.564333	140	Kudap, Dapoli, Maharashtra	
32.	N 17.543306, E 73.709806	174	Nandivase, Dapoli, Maharashtra	
33.	N 17.523444, E 73.673222	134	Ovali, Dapoli, Maharashtra	
34.	N 17.589311, E 73.668926	150	Tivare, Dapoli, Maharashtra	
35.	N 17.574476, E 73.696630	409	Tivadi, Dapoli, Maharashtra	
36.	N 17.258917, E 73.428667	71	Vir, Dapoli, Maharashtra	
37.	N 17.840889, E 73.475111	219	Dahivali, Khed, Maharashtra	
38.	N 17.847222, E 73.460889	225	Ghogare, Khed, Maharashtra	
39.	N 17.601028, E 73.649722	165	Kuravalkhed(Gavthan), Khed, Maharashtra	
40.	N 17.783139, E 73.545000	96	Nandivali, Khed, Maharashtra	
41.	N 17.635886, E 73.664835	162	Sapirli, Khed, Maharashtra	
42.	N 17.648111, E 73.598417	228	Talavat pal, Khed	
43.	N 17.831951, E 73.535200	197	Vadgaon Kh., Khed, Maharashtra	
44.	N 16.782472, E 73.656833	88	Aargaon, Lanja, Maharashtra	
45.	N 16.807556, E 73.468750	146	Bapere, Lanja, Maharashtra	
46.	N 16.862667, E 73.525167	144	Devrai, Lanja, Maharashtra	
47.	N 16.815566, E 73.670252	122	Hardakhale, Lanja, Maharashtra	
48.	N 16.849139, E 73.469056	114	Kante, Lanja, Maharashtra	
49.	N 16.871596, E 73.731361	171	Khorninko, Lanja, Maharashtra	
50.	N 16.943600, E 73.682479	115	Kochari, Lanja, Maharashtra	
51.	N 16.788167, E 73.436306	119	Panore, Lanja, Maharashtra	

52.	N 16.906806, E 73.489417	167	Punas, Lanja, Maharashtra
53.	N 16.775972, E 73.691583	113	Ringane, Lanja, Maharashtra
54.	N 16.925712, E 73.654901	56	Salpe, Lanja, Maharashtra
55.	N 16.799989, E 73.539606	135	Vangule, Lanja, Maharashtra
56.	N 16.781722, E 73.605056	81	Vilavade, Lanja, Maharashtra
57.	N 16.781778, E 73.604056	79	Vilavade, Lanja, Maharashtra
58.	N 16.785554, E 73.627272	85	Vhel, Lanja, Maharashtra
59.	N 17.051599, E 73.392442	144	Bhoke, Ratnagiri, Maharashtra
60.	N 16.970806, E 73.501361	171	Khanu, Ratnagiri, Maharashtra
61.	N 17.002550, E 73.454284	200	Mirjole, Ratnagiri, Maharashtra
62.	N 17.018372, E 73.305343	22	Shirgaon, Ratnagiri, Maharashtra
63.	N 17.134935, E 73.400793	157	Taraval, Ratnagiri, Maharashtra
64.	N 16.656733, E 73.593877	175	Angale, Ratnagiri, Maharashtra
65.	N 16.681087, E 73.812778	199	Kajirda, Ratnagiri, Maharashtra
66.	N 16.738599, E 73.757579	132	Karavali, Ratnagiri, Maharashtra
67.	N 16.737379, E 73.758549	136	Karavali, Ratnagiri, Maharashtra
68.	N 16.736861, E 73.760028	136	Karavali, Ratnagiri, Maharashtra
69.	N 16.737694, E 73.759083	136	Karavali, Ratnagiri, Maharashtra
70.	N 16.622333, E 73.678278	52	Kelavali, Ratnagiri, Maharashtra
71.	N 16.676533, E 73.525729	99	Kodavali, Ratnagiri, Maharashtra
72.	N 16.745535, E 73.570645	130	Mandrul, Ratnagiri, Maharashtra
73.	N 16.743333, E 73.570639	135	Mandrul, Ratnagiri, Maharashtra
74.	N 16.665250, E 73.779500	90	Moor, Ratnagiri, Maharashtra
75.	N 16.622882, E 73.490317	44	PangareKd. , Ratnagiri, Maharashtra
76.	N 16.708042, E 73.698643	55	Rayapatan, Ratnagiri, Maharashtra
77.	N 16.708361, E 73.696333	55	Rayapatan, Ratnagiri, Maharashtra

78.	N 16.696278, E 73.797056	169	Valvad, Ratnagiri, Maharashtra	
79.	N 16.747283, E 73.777524	158	Yerdav, Ratnagiri, Maharashtra	
80.	N 16.743000, E 73.777750	152	Yerdav, Ratnagiri, Maharashtra	
81.	N 16.770083, E 73.744778	197	Zarye, Ratnagiri, Maharashtra	
82.	N 17.048778, E 73.710250	105	Angavali, Sangameshwar, Maharashtra	
83.	N 17.166111, E 73.667389	128	Devole turf prachitgad, Sangameshwar, Maharashtra	
84.	N 17.123861, E 73.633500	79	Katavali, Sangameshwar, Maharashtra	
85.	N 17.032427, E 73.779613	134	Kolwan khadi, Sangameshwar, Maharashtra	
86.	N 16.972861, E 73.659389	115	Medhe, Sangameshwar, Maharashtra	
87.	N 16.966833, E 73.758167	327	Murshi, Sangameshwar, Maharashtra	
88.	N 17.079164, E 73.698277	237	Nigudwadi, Sangameshwar, Maharashtra	
89.	N 17.002111, E 73.772417	248	Ninave, Sangameshwar, Maharashtra	
90.	N 17.072250, E 73.685083	103	NiveKd. ,Sangameshwar, Maharashtra	
91.	N 17.014972, E 73.780361	168	OzareBk., Sangameshwar, Maharashtra	
92.	N 17.306611, E 73.665556	221	Ratambi, Sangameshwar, Maharashtra	
93.	N 17.061611, E 73.707056	150	Sonarwadi, Sangameshwar, Maharashtra	
94.	N 17.096403, E 73.643780	194	Talvade turf Deorukh, Sangameshwar, Maharashtra	
95.	N 17.105858, E 73.684180	141	Tamnale, Sangameshwar, Maharashtra	
96.	N 17.205917, E 73.656806	100	Tivare, Sangameshwar, Maharashtra	
97.	N 15.526692, E 74.241452	500	Pendral, Goa	Bhimgad Wildlife Sanctuary
98.	N 15.367706, E 74.294722	200	Caranzol, Goa	Bhagwan Mahaveer Sanctuary and Mollem National Park
99.	N 15.389209, E 74.227162	200	Mollem, Goa	Molem wildlife sanctuary
100.	N 12.140862, E 75.851904	400	Kodagu, Karnataka	Brahmagiri Wildlife Sanctuary

101.	N 14.914552, E 74.235619	400	Madkarni, Karnataka	Cotigao Wildlife Sanctuary
102.	N 11.490970, E 76.237772	200	Elampalari Hills, Tandamkallu, Kerala	New Amarambalam Wildlife Sanctuary
103.	N 11.425777, E 76.398297	790	Malappuram, Kerala	New Amarambalam Wildlife Sanctuary
104.	N 10.491544, E 76.441744	600	Thrissur, Kerala	Peechi -Vazhani Wildlife Sanctuary
105.	N 10.331830, E 76.675505	800	Pariyaram, Kerala	Sholayar Reserve Forest
106.	N 10.348241, E 76.661018	800	Pariyaram, Kerala	Sholayar Reserve Forest
107.	N 10.232185, E 76.703193	200	Ayyampuzha, Kerala	Idamalayar Reserve Forest, Pariyaram
108.	N 10.211680, E 76.632565	200	Ayyampuzha, Kerala	Idamalayar Reserve Forest, Pariyaram
109.	N 9.400565, E 77.004888	400	Perunad, Kerala	Goodrical Forest Range
110.	N 9.409181, E 77.044156	400	Pathanamthitta, Kerala	
111.	N 9.418844, E 77.067931	300	Sabarimala, Kerala	
112.	N 9.395689, E 77.117657	350	Mlappara, Kerala	
113.	N 8.857936, E 77.096188	200	Kollam, Kulathupuzha, Kerala	Shendurney Wildlife Sanctuary
114.	N 8.871412, E 77.109580	600	Kollam, Kulathupuzha, Kerala	Shendurney Wildlife Sanctuary
115.	N 11.470488, E 76.425666	850	Nilgiris, Nadugani, Tamil Nadu	Mudumalai National Park
116.	N 10.550112, E 76.849014	1000	Coimbatore, Chemmanampathy, Tamil Nadu	Aalliyar Reserve Forest
117.	N 8.933248, E 77.217446	400	Puliyarai R.F. Part, Tamil Nadu	Shendurney Wildlife Sanctuary
118.	N 8.918632, E 77.280703	320	Courtallam, Tamil Nadu	Shendurney Wildlife Sanctuary

DISCUSSION

In the revision of the southeast Asian genus *Sageraea* (Annonaceae) during the year 1997 by Heusden, they reported 9 species from Western India (Western Ghats), Sri Lanka, In- Indonesia, and the Philippines. The type specimen of *S. laurina* Dalzell was reported by Hooker's in J. Bot. Kew Gard. Misc. 3: 207 (1851) from India. They mentioned this plant population distribution range is only in Western India (Maharashtra, Karnataka, and Tamil Nadu), but they did not mention other localities such as Goa and Kerala.

During the survey, we reported that localities from Goa and Kerala. *S. laurina* is distributed in the northern

ranges of the Western Ghats and it's coming under the rare, endemic, and endangered category of the Annonaceae family [22]. This species was reported from Goa state as an endemic species but, they did not mention GPS localities [23]. Based on the tropical plant's database *S. laurina* is distributed only in the Western Ghats of India. Studied plant population distributed in whole Western Ghats range i.e Northern Western Ghats, Central Western Ghats and Southern Western Ghats of India. It is endemic to the Western Ghats ranges of India [24]. During the survey, we also reported this plant species' distribution range is the Western Ghats of India. Map showing the distribution of *S. laurina* in Northern

Western Ghats but during the present survey, in our result, this plant population covered the whole Western Ghats of India. During the survey, this plant population distribution was noted using locality as well as GPS locality. Already studied vegetations sites with a smaller number of localities reported but they did not report with GPS map. During the survey, we grab both types of data with more localities as well as GPS maps. Very a much smaller number of herbariums were deposited in the Western Circle of BSI, Pune and ARI, Pune. When we explore that locality by using localities, we found some localities get destroyed by deforestation. New localities were noted using the GPS map technique. About 81% of localities explore in Maharashtra State by using Primary data collection in that physical localities are noted as well as GPS localities also noted. About 11%, 3%, 3%, and 2% gather secondary data from Kerala, Goa, Tamil Nadu and Karnataka respectively. In a previous study, some localities of Western Ghats were noted only based on physical parameters, they did not mention the GPS map technique. During the study, we reported this plant vegetation population majorly from reserved forest areas such as Tungreshwar Wildlife Sanctuary, Shri Bhimashankar Jyotirlinga Wildlife Reserve, Dajipur Wildlife Sanctuary Chandoli National Park, Bhimgad Wildlife Sanctuary, Molem wildlife sanctuary, Brahmagiri Wildlife Sanctuary, Cotigao Wildlife Sanctuary, New Amarambalam Wildlife Sanctuary, Peechi-Vazhani Wildlife Sanctuary, Sholayar Reserve Forest, Idamalayar Reserve Forest, Goodrical Forest Range, Shendurney Wildlife Sanctuary, Mudumalai National Park, Aalliyar Reserve Forest and Shendurney Wildlife Sanctuary. In previous study sites of reserved forests such as Shri Bhimashankar Jyotirlinga Wildlife Reserve, Chandoli National Park and Mudumalai National Park.

CONCLUSIONS

In the present study, We generate and gather primary and secondary data to stand a species in the improve the IUCN category i.e. IUCN status will be changed from lower risk/near threatened to least concern status. Generated primary and secondary data used for conservation (*in situ* & *ex-situ* conservation) of this species. The major goal of the species recovery programme will be to re-establish the populations within their natural habitat. Considering these facts the study area is significant concerning floristic diversity in the Western Ghats.

The present survey of this plant will provide future strategies to improve conservation strategies. Using various schemes (Government and non-government) of conservation, this plant's IUCN status will change from lower risk/near threatened to least concern status.

CONTRIBUTION OF AUTHORS

Research concept- Balasaheb S. Kale

Research design- Dr. Sanjay A. Khairnar

Supervision- Dr. Sanjay A. Khairnar

Materials- Balasaheb S. Kale

Data collection- Balasaheb S. Kale

Data analysis and Interpretation- Balasaheb S. Kale

Literature search- Balasaheb S. Kale

Writing article- Balasaheb S. Kale

Critical review- Balasaheb S. Kale

Article editing- Balasaheb S. Kale

Final approval- Dr. Sanjay A. Khairnar

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