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# DOCUMENTATION OF GRASS SPECIES IN KODAGU DISTRICT, KARNATAKA, INDIA

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**Abstract:** This study has been undertaken to explore the biodiversity richness of Poaceae in the Kodagu district. Total number of 68 grass species belonging to 44 genera has been documented between June 2020 and March 2022. Different regional floras were used and Dr K.G Bhat helped in the identification process. The herbaria specimens are deposited and preserved at Department of Studies in Botany, Mysore University, Mysore, Karnataka, whose voucher number is specified in Table 1.

**Key words** - Grass species, Herbaria, Kodagu, Poaceae.

## I. INTRODUCTION

Poaceae or Gramineae is a large and majorly ubiquitous family of monocotyledonous flowering plants, well known as grasses. It is the fifth largest plant family, with around 780 genera and 12,000 species. It is the most economically important plant family, providing staple foods from domesticated cereal crops. India constitutes 1506 species, including its infraspecific taxa under 266 genera of grasses. 266 genera, represents about one third of the 711 (Kellogg, 2015b) to 768 (Soreng et al., 2017) genera currently recognized in the family (Kellogg et al., 2020). Keshava Murthy and Yoganarasimhan, 1990 had recorded a total number of 135 species and 5 varieties under 64 genera of Poaceae family from Kodagu district in the 'Flora of Coorg'. Kodagu district is commonly called as the 'Kashmir of south India' is thick wooded grandeur on the eastern slopes of Western Ghats. It is the most beautiful hill station of Karnataka known for its varied biodiversity habitat.

Gupta et al., 2016 stated that in India, family Poaceae is the first largest family with 1,334 species. Recent findings of Kellogg et al., 2020 showed that India consists of 1,506 species, accounting for about 12.5% of grass species and about 34% of its genera currently recognized under Poaceae family all over the world. But among twelve grass subfamilies, only ten are represented in India, except for Anomochlooideae, which is found only in the New World (America), and Pueliodeae, which is restricted to Africa

Boyina and Subbaiah, 2017 while documenting the grasses of arid zone of peninsular India, reported that Karnataka region (eight districts located in north-eastern region of the state) harbours 204 taxa of Poaceae, which represents 54% of the wild and naturalized grasses of the state. Study carried out by Abhijit, 2020 provides a checklist of grass flora in Kundadri Hill of central Western Ghats, Karnataka, where he documented 78 species belonging to two sub-families, 12 tribes, and 43 genera of Poaceae.

Kodagu is the smallest district of Karnataka state in Southern India. It has approximately 65% of its geographical area under tree cover, making it one of the most densely forested districts in the country. It is a hilly district. High hill tops are generally grassy with valley of dense mixed jungles. Low hill ranges are generally under cultivation of paddy, coffee, pepper plantations etc. Higher altitudes consist of Shola forest patches. Sholas are surrounded by grasslands. Grassland found in Coorg is called as Montane Grassland and it is a habitat type.

Literatures on grasses of the district are limited to their documentation and are very few. For example, Keshava Murthy and Yoganarasimhan, 1990 records in the 'Flora of Coorg'; Banerjee, 1985 reports 11 new records of grass species in Coorg district. Therefore, the study was undertaken to record its present biodiversity status and abundance.

## II. MATERIALS AND METHODS

**Study Area:** Ecologically, Kodagu district has been identified as a Micro hotspot of biodiversity under the larger Western Ghats region. Whole district falls under the eastern slopes of Western Ghats. It is situated between northern latitude  $11^{\circ} 56'$  to  $12^{\circ} 56'$  and east longitude  $75^{\circ} 22'$  to  $76^{\circ} 11'$ , with an area of 4,102 km<sup>2</sup> (Ranga Prasad, 2016) of the Western Ghats (Prakash et al., 2017)

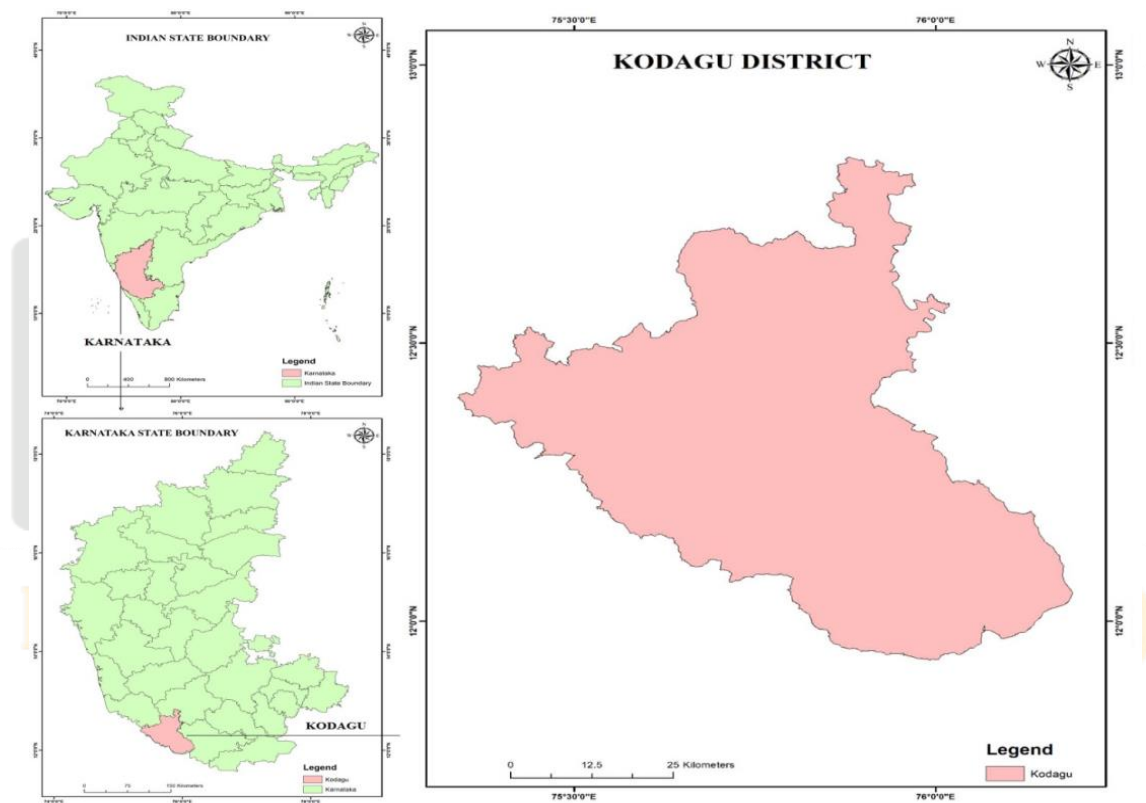


Figure 1: Kodagu district map.

### Collection of plant material:

Specimen representative of the plant population bearing all the parts necessary for its identification was collected. Each specimen is stored in a separate plastic bag; a tag is attached with the collection number.

### Materials required:

Camera, GPS, trowel, secateurs, digger, ruler, field notes, plastic covers, marker, tags, hand lens etc.

### Essential field note points noted are:

Collection date, location, habitat, height of the plant, root type, shape of leaves and inflorescence, texture of leaf blade, sheath, presence of sheath hair/leaf hair, presence of auricles, ligules, awns and their type, details of rachis, spikelet, glumes, florets, lemmas, paleas, lodicules, awns, stamens, pistil, grain etc.

### Identification and documentation of grass species:

- Unique characters of each fresh specimen were noted down in the field notes using magnifying lens. Necessary drawing was made; photographs were taken.
- To conclude into species level of any grass type, thorough and detailed observations of its morphological features is a must, which was done using binocular stereo and dissection microscopes.
- In the Morphological description, vernacular names, habitat, and overall plant parts details were specified, which was later compared with taxonomical handbook of grasses and herbaria for its identification.

### Taxonomical and grass identification key books referred are as follows:

- Flora of Coorg (Kodagu) Karnataka, India: with data on medicinal plants and chemical constituents by Keshava Murthy and Yoganarasimhan, 1990.
- Flora of South Kanara (Dakshina Kannada and Udupi Districts of Karnataka) by Dr. K. Gopalakrishna Bhat, 2014.
- Guidance of Dr. Gopalakrishna Bhat, then retired professor of Proona Prajna College, Udupi was taken, who helped in the identification and confirmation of these grass specimens.
- Further cross-verified with the help of preserved authentic herbarium specimens at Department of Studies in Botany, Mysore University, Manasagangothri, Mysore.

### Herbaria specimen's preparation:

- Herbarium specimens were prepared specifying its species nomenclature, Collection number, Date of collection, Place of collection, Collectors name etc.
- Herbarium specimen preparation was done soon after the collection of grass samples. Grass samples collected in its plastic cover were placed between blotting papers, newspapers were also used to cover them, and then heavy weight were placed uniformly over it and allowed for drying. Every 2<sup>nd</sup> day the papers were changed with new ones. After 8-10 days the specimens were completely dried. These were stitched to the herbarium sheets of standard size (42 cm x 28 cm).
- All the 68 herbaria specimens have been deposited at Department of Studies in Botany, Mysore University, Manasagangothri, Mysore, which is been authenticated with its respective voucher number.

### III. RESULTS AND DISCUSSION:

Table 1: List of Grass species collected from Kodagu district with their voucher specimen number.

Sl. No.	Grass specimens code	Grass species	Voucher Number
1	G1	<i>Alloteropsis cimicina</i> (L.) Stapf	UOMBOT22G01
2	G2	<i>Apluda mutica</i> L.	UOMBOT22G02
3	G3	<i>Arthraxon hispidus</i> (Thunb.) Makino	UOMBOT22G03
4	G5	<i>Arundinella ciliata</i> Nees ex Miq	UOMBOT22G04
5	G6	<i>Arundinella purpurea</i> laxa Bor	UOMBOT22G05
6	G7	<i>Arundinella pumila</i> (Hochst. ex A. Rich.) Steud	UOMBOT22G06
7	G8	<i>Arundinella setosa</i> Trin	UOMBOT22G07
8	G9	<i>Axonopus compressus</i> (Sw.) P. Beauv.	UOMBOT22G08
9	G21	<i>Bambusa arundinacea</i> (Retz.) Willd.	UOMBOT22G09
10	G22	<i>Bambusa vulgaris</i> Schrad. ex J. C. Wendl	UOMBOT22G10
11	G23	<i>Brachiaria distachya</i> (L.) Staf	UOMBOT22G11
12	G31	<i>Chloris barbata</i> (Sw.)	UOMBOT22G12
13	G32	<i>Chloris virgata</i> (Sw.)	UOMBOT22G13
14	G33.	<i>Chrysopogon hackelii</i> (Hook.f.)	UOMBOT22G66
15	G34	<i>Chrysopogon zizanioides</i> (L.) Roberty	UOMBOT22G14

16	G37	<i>Coix lacryna – jobi</i> L.	UOMBOT22G17
17	G35	<i>Cynodon dactylon</i> (L.) Pers	UOMBOT22G15
18	G36	<i>Cyrtococcum oxyphyllum</i> (Steud.) Stapf	UOMBOT22G16
19	G51	<i>Dactyloctenium aegyptium</i> (L.) Willd	UOMBOT22G18
20	G55	<i>Dichanthium huegillii</i> (Hack.)	UOMBOT22G62
21	G52	<i>Digitaria ciliaris</i> (Retz.) Koeler	UOMBOT22G19
22	G53	<i>Dimeria ornithopoda</i> Trin.	UOMBOT22G20
23	G54	<i>Dimeria pubescens</i> Hack.	UOMBOT22G21
24	G77	<i>Echinochloa colona</i> (L.) Link	UOMBOT22G28
25	G78	<i>Echinochloa crus-galli</i> (L.) Beauv	UOMBOT22G64
26	G71	<i>Eleusine coracana</i> Gaertn.	UOMBOT22G22
27	G72	<i>Eleusine indica</i> (L.) Gaertn.	UOMBOT22G23
28	G73	<i>Eragrostis tenella</i> (Linn.) P.Beauv.	UOMBOT22G24
29	G74	<i>Eragrostis tenuifolia</i> (A. Rich.) Hochst. ex Steud.	UOMBOT22G25
30	G75	<i>Eragrostis uniloides</i> (Retz.) Nees ex Steud.	UOMBOT22G26
31	G76	<i>Eulalia trispicata</i> (Schult.) Henrard	UOMBOT22G27
32	G91	<i>Garnotia arundinacea</i> Hook.f.	UOMBOT22G29
33	G101	<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	UOMBOT22G30
34	G113	<i>Imperata cylindrical</i> (L.) P. Beauv.	UOMBOT22G65
35	G111	<i>Isachne globosa</i> (Thunb.) Kuntze	UOMBOT22G31
36	G112	<i>Ischaemum rugosum</i> Salisb.	UOMBOT22G32
37	G131	<i>Jansenella griffithiana</i> (C. Muell.) Bor	UOMBOT22G33
38	G136	<i>Leersia hexandra</i> Sw.	UOMBOT22G34
39	G141	<i>Melinis minutiflora</i> P. Beauv	UOMBOT22G35
40	G142	<i>Melinis repens</i> (Willd.) Zizka.	UOMBOT22G36
41	G151	<i>Oplismenus burmannii</i> (Retz.) P.Beauv	UOMBOT22G37
42	G152	<i>Oplismenus compositus</i> (L.) P.Beauv.	UOMBOT22G38
43	G153	<i>Oryza sativa</i> L.	UOMBOT22G39
44	G171	<i>Panicum maximum</i> Jacq.	UOMBOT22G40
45	G172	<i>Panicum psilopodium</i> Trin.	UOMBOT22G41
46	G180	<i>Paspalidium flavidum</i> (Retz.) A.Camus	UOMBOT22G48
47	G173	<i>Paspalum canarae</i> (Steud.)	UOMBOT22G42
48	G174	<i>Paspalum conjugatum</i> Berg.	UOMBOT22G43
49	G175	<i>Pennisetum hohenackeri</i> Hochst. ex Steud.	UOMBOT22G44
50	G176	<i>Pennisetum pedicellatum</i> Trin.	UOMBOT22G45
51	G177	<i>Pennisetum polystachion</i> (L.) Schult.	UOMBOT22G46
52	G178.	<i>Pennisetum purpureum</i> (Schumach.)	UOMBOT22G67
53	G179	<i>Pseudanthistiria umbellata</i> (Hack.) Hook.f.	UOMBOT22G47
54	G211	<i>Saccharum officinarum</i> L.	UOMBOT22G49
55	G212	<i>Sacciolepis indica</i> (L.) Chase	UOMBOT22G50
56	G221	<i>Sacciolepis interrupta</i> (Willd.) Stapf	UOMBOT22G70
57	G213	<i>Setaria intermedia</i> Roem. & Schult.	UOMBOT22G51
58	G214	<i>Setaria italica</i> (L.) Beauv.	UOMBOT22G52
59	G215	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	UOMBOT22G53
60	G216	<i>Sorghum bicolor</i> L. Moench	UOMBOT22G54
61	G218	<i>Sporobolus diander</i> (Retz.) P. Beauv.	UOMBOT22G55
62	G220	<i>Sporobolus indicus</i> (L.) R.Br.	UOMBOT22G57
63	G219	<i>Sporobolus tenuissimus</i> (Mart. ex Schrank) Kuntze	UOMBOT22G56

64	G231	<i>Themeda tremula</i> (Nees ex Steud.) Hack.	UOMBOT22G58
65	G232	<i>Themeda triandra</i> Forssk.	UOMBOT22G59
66	G233	<i>Tripogon capillatus</i> Jaub. & Spach	UOMBOT22G68
67	G234	<i>Triticum aestivum</i> L.	UOMBOT22G69
68	G241	<i>Zea mays</i> L.	UOMBOT22G60

Among the 68 Grass species collected, 7 species belongs to cultivated varieties, but except *Oryza sativa* and *Saccharum officinarum*, all other species namely, *Eleusine coracana*, *Panicum maximum*, *Sorghum bicolor*, *Triticum aestivum*, *Zea mays* were collected from road side surroundings and unused lands, as people here don't cultivate these varieties for commercial purposes. Only *Oryza sativa* is grown in large scale as a food source and also for commercial purposes other than that *Pennisetum purpureum* and *Zea mays* are largely grown as fodder.

Table 2: Relative abundance of identified Grass species in Kodagu district

Sl. No.	Tribe	No. of Genera	Relative abundance %	No. of Species	Relative abundance %
1	Andropogoneae	15	34.09	18	26.47
2	Arundinelleae	3	6.81	6	8.82
3	Bambuseae	1	2.27	2	2.94
4	Cynodonteae	2	4.54	3	4.41
5	Eragrostideae	5	11.36	10	14.70
6	Isachneae	1	2.27	1	1.47
7	Oryzae	2	4.54	2	2.94
8	Paniceae	14	31.81	25	36.76
9	Triticeae	1	2.27	1	1.47
Total		44	~100%	68	~100%

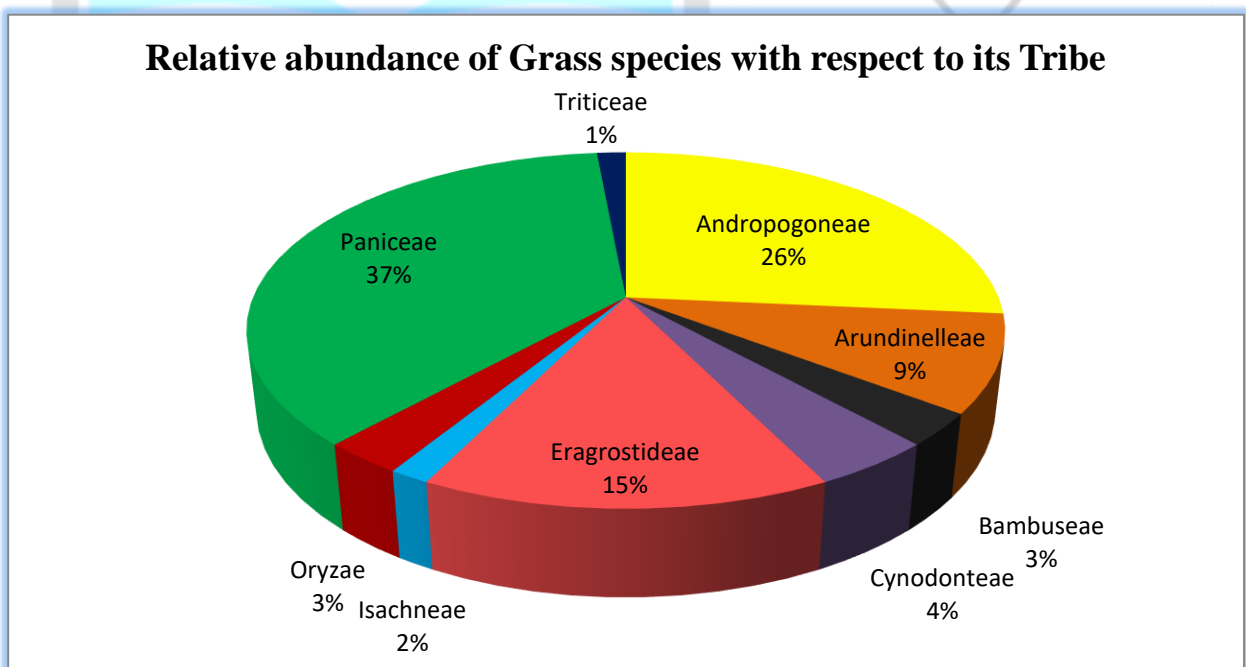
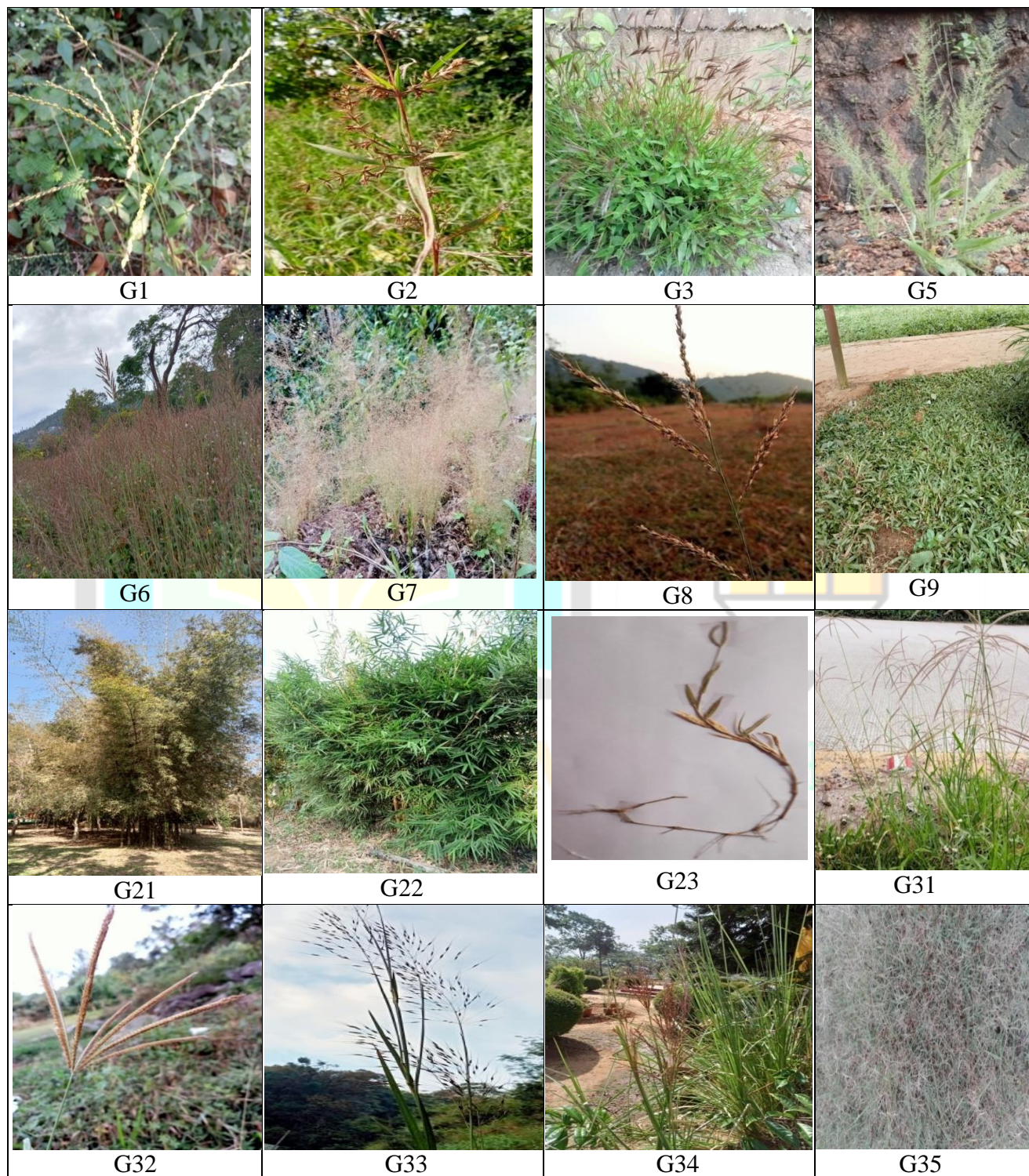


Figure 2: Relative abundance of grass species with respect to its respective tribe.

68 different grass species collected from Kodagu district under 44 genera belong to 9 varied tribe of Poaceae. It is evident that highest genera bearing tribe is Andropogoneae by constituting 15 genera out of 44 generic specimens of grasses collected from the district, showing about 34% of its relative abundance with respect to all nine tribes. Second highest genera bearing tribe is the Paniceae having 14 genera with the relative abundance of about 31%. But the tribe Paniceae constitutes the highest number of species having 25 different grass species with the major part of relative abundance of 36.76% when compared to remaining 8 tribes. Isachneae and Triticeae tribe constitute least number of species bearing 1 each out of 68 species.



Photographic images of all 68 grass species are shown in Figure 3-6.

Figure 3: G1 *Alloteropsis cimicina*. G2 *Apluda mutica*. G3 *Arthraxon hispidus*. G5 *Arundinella ciliata*. G6 *Arundinella purpurea*. G7 *Arundinella pumila*. G8 *Arundinella setosa*. G9 *Axonopus compressus*. G21 *Bambusa arundinacea*. G22 *Bambusa vulgaris*. G23. *Brachiaria distachya*. G31 *Chloris barbata*. G32 *Chloris virgata*. G34 *Chrysopogon zizanioides*. G35 *Cynodon dactylon*

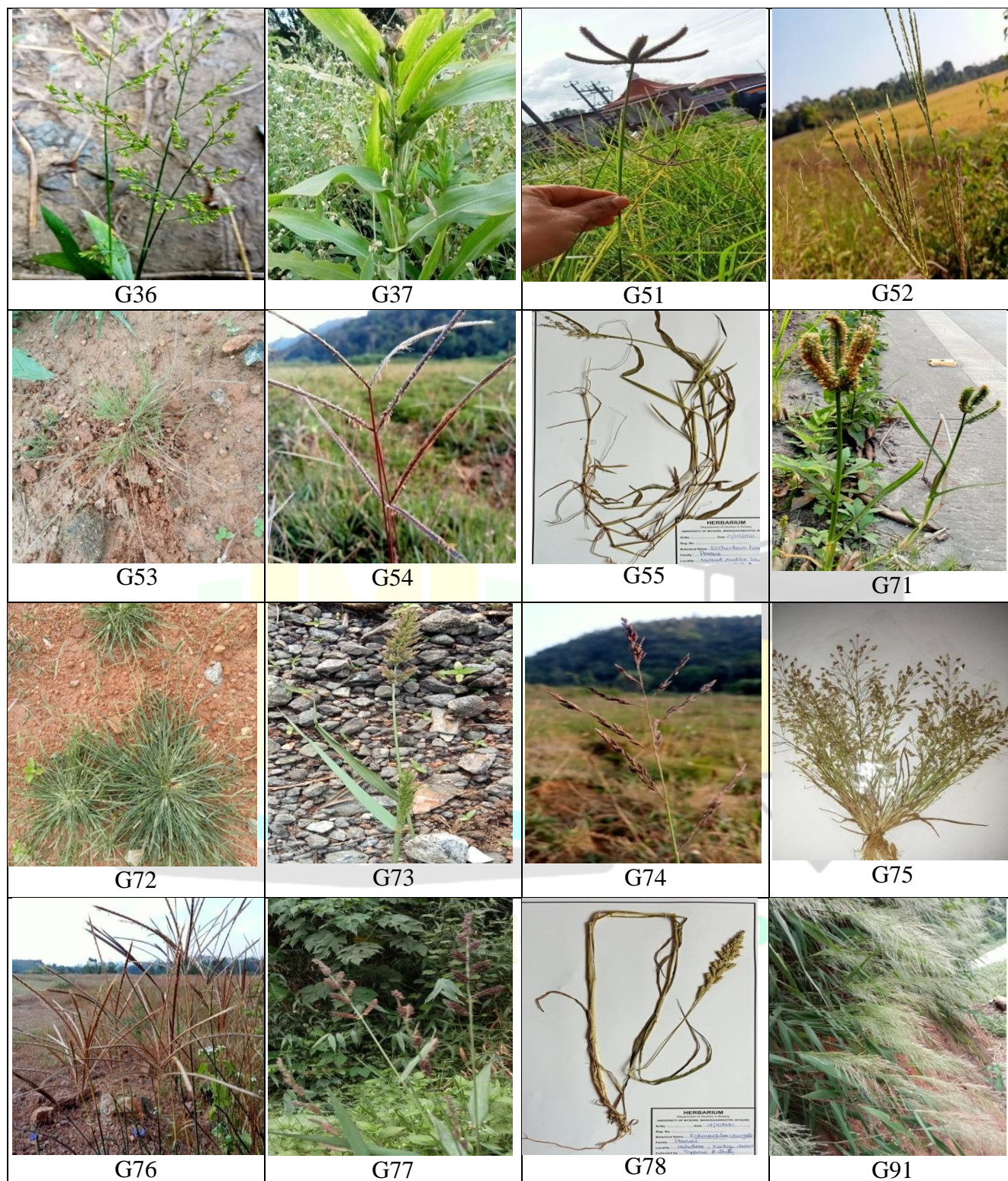


Figure 4: G36 *Cyrtococcum oxyphyllum*. G37 *Coix lacryna – jobi*. G51 *Dactyloctenium aegyptium*. G52 *Digitaria ciliaris*. G53 *Dimeria ornithopoda*. G54 *Dimeria pubescens*. G55 *Dichanthium huegii*. G71 *Eleusine coracana*. G72 *Eleusine indica*. G73 *Eragrostis tenella*. G74 *Eragrostis tenuifolia*. G75 *Eragrostis uniloides*. G76 *Eulalia trispicata*. G77 *Echinochloa colonum*. G78 *Echinochloa crus-galli*. G91 *Garnotia arundinacea*.



Figure 5: G101 *Heteropogon contortus*. G111 *Isachne globosa*. G112 *Ischaemum rugosum*. G131 *Jansenella griffithiana*. G136 *Leersia hexandra*. G141 *Melinis minutiflora*. G142 *Melinis repens*. G151 *Oplismenus burmannii*. G152 *Oplismenus compositus*. G171 *Panicum maximum*. G172 *Panicum psilopodium*. G173 *Paspalum canarae*. G174 *Paspalum conjugatum*. G175 *Pennisetum hohenackeri*. G176 *Pennisetum pedicellatum*. G177 *Pennisetum polystachion*.



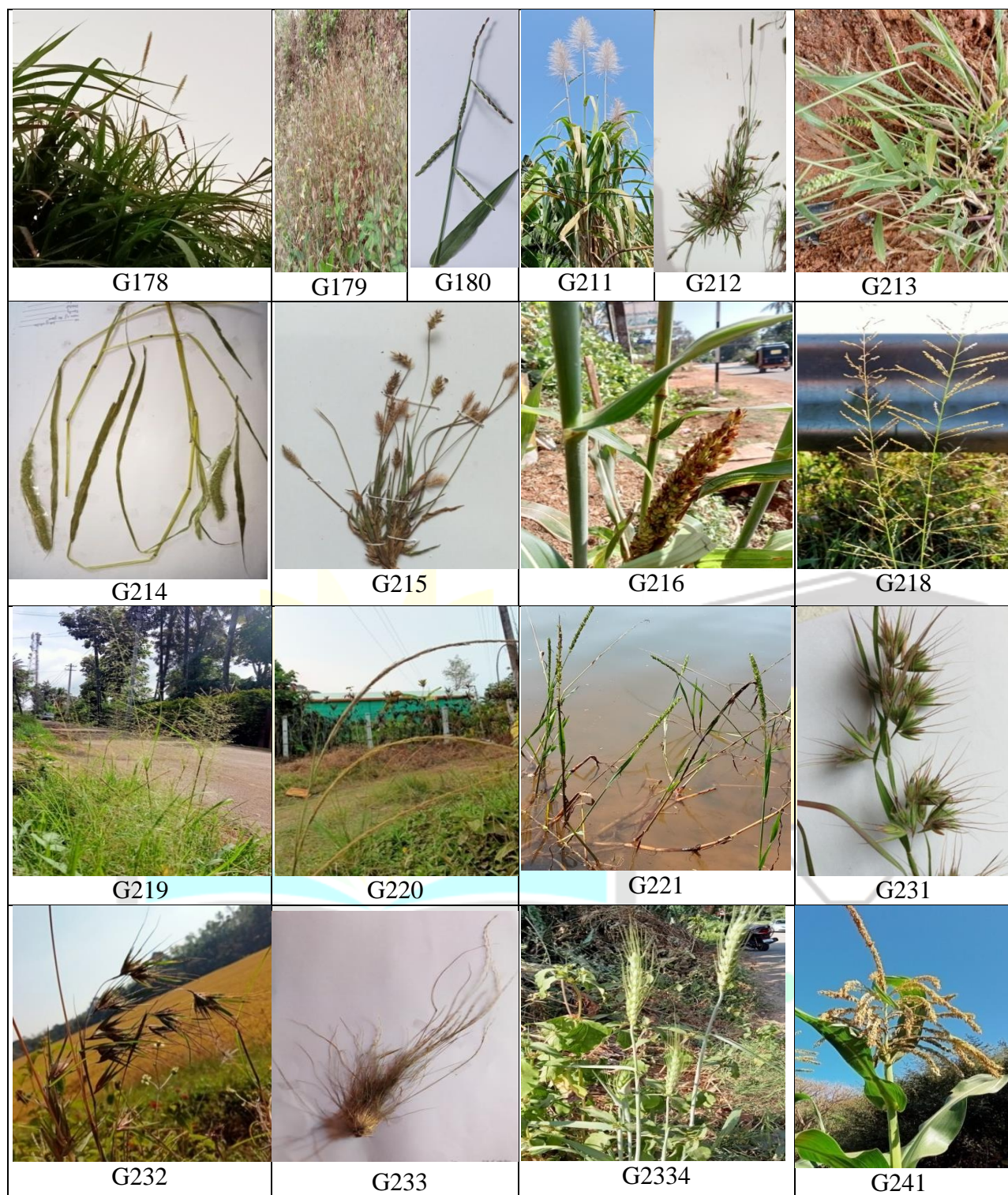


Figure 6: G178 *Pennisetum purpureum*. G179 *Pseudanthistiria umbellata*. G180 *Paspalidium flavidum*. G211 *Saccharum officinarum*. G212 *Sacciolepis indica* G213 *Setaria intermedia*. G214 *Setaria italica*. G215 *Setaria pumila*. G216 *Sorghum bicolor*. G218 *Sporobolus diander*. G219 *Sporobolus tenuissimus*. G220 *Sporobolus indicus*. G221 *Sacciolepis interrupta*. G231 *Themeda tremula*. G232 *Themeda triandra*. G233 *Tripogon capillatus*. G234 *Triticum aestivum*. G241 *Zea mays*.

### Acknowledgements

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**REFERENCES**

- [1] Abhijit, H.U. 2020. Grasses of Kundadri Hill in the Western Ghats of Karnataka, India. *Journal of Threatened Taxa*, 12(5): 15619-15630. doi:10.11609/jot.5614.12.5.15619-15630
- [2] Banerjee, B.C. 1985. On the occurrence of some grasses in Coorg district of Karnataka state. *Journal of Economic and Taxonomic Botany*, 7: 479-489.
- [3] Bhat, K.G. 2014. *Flora of South Kanara (Dakshina Kannada and Udupi Districts of Karnataka)*. Aakrithi Prints, Mangalore, 203-260.
- [4] Boyina, R.P.R., Subbaiah, K.V. and Priyadarsini, P. 2017. *Grasses of arid zone of peninsular India*. Bishen Singh Mahendra Pal Singh Publishers, 1-8.
- [5] Gupta, N., Biswas, N. and Sudhakar, J.V. 2016. Amazing world of grasses. *Rai Journal of Technology Research & Innovation*, 4 (2): 5-11.
- [6] Kellogg, E.A., Abbott, J.R., Bawa, K.S., Gandhi, K.N., Kailash, B.R., Ganeshaiah, K.N., Shrestha, U.B. and Raven, P. 2020. Checklist of the grasses of India. *PhytoKeys*, 163: 1-560. <https://doi.org/10.3897/phytokey.163.38393>.
- [7] Kellogg, E.A. 2015b. Poaceae. In: Kubitzki, K, ed. *Families and Genera of Vascular plants*. Springer, 1-146.
- [8] Keshava Murthy, K.R. and Yoganarasimhan, S.N. 1990. *Poaceae Flora of Coorg (Kodagu) Karnataka, India: with data on medicinal plants and chemical constituents*. Vismat Publishers, 517-562.
- [9] Prakash, M.M., Kaliprasad, C.S. and Narayana, Y. 2017. Distribution of <sup>210</sup>Po in soils of Virajpet taluk, Coorg District, Karnataka. *Journal of Radiation Research and Applied Sciences*, 10(1): 57-62.
- [10] RangaPrasad, S.N. 2016. Introduction & characteristics of the district. District industrial profile Kodagu. MSME – development institute (Ministry of MSME, Govt. of India), 6. <http://dcmsme.gov.in/dips/2016-17/Kodagu.pdf>
- [11] Soreng, R.J., Peterson, P.M., Romaschenko, K, Davidse, G., Zuloaga, F.O., Judzeiwicz, E.J., Filgueiras, T.S., Davis, J.I. and Morrone, O. 2015. A worldwide phylogenetic classification of the Poaceae (Gramineae). *Journal of Systematics and Evolution*, 53: 117-137. <https://doi.org/10.1111/jse.12150>



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