

## Grass Species Diversity and Conservation in Shivaram Wildlife Sanctuary, Telangana, India

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### ABSTRACT

*This study delves into the diversity of grass species within the Shivaram Wildlife Sanctuary, located in Telangana State, identifying 51 species belonging to 36 genera and 7 tribes. Among the seven tribes, Andropogoneae dominated with 18 species and 15 genera, followed by Paniceae with 12 species and 9 genera, Cynodonteae with 9 species and 8 genera and Eragrostideae, Aristideae, Paspaleae, and Bambuseae are represented by each single genus and 6, 3, 2, and 1 species respectively. Preserving this diversity is vital for ecosystem resilience amid environmental changes. Conservation efforts are needed to safeguard the sanctuary's grasslands, which are ecologically and culturally significant. Our research informs wildlife management and habitat restoration strategies, emphasizing holistic biodiversity conservation and sustainability approaches.*

**Keywords:** Biodiversity, Grasslands, Conservation, Poaceae, Protected area.

### INTRODUCTION

Grasses embody a distinctive facet of biodiversity within Telangana state, showcasing genetic traits and adaptations unique to the region's environmental dynamics. Preserving this genetic diversity is a crucial endeavour, pivotal in upholding the resilience of local ecosystems and facilitating their capacity to navigate forthcoming environmental shifts. Moreover, grasses play indispensable ecological roles, including soil

stabilization, erosion mitigation, and provisioning of habitat and sustenance for a myriad of plant and animal species. The diversity among grass species intricately shapes the presence and dynamics of herbivore populations within ecosystems. Consequently, comprehensive studies concerning their behaviours, habitats, and ecological associations are imperative for enhancing wildlife management in our habitats.

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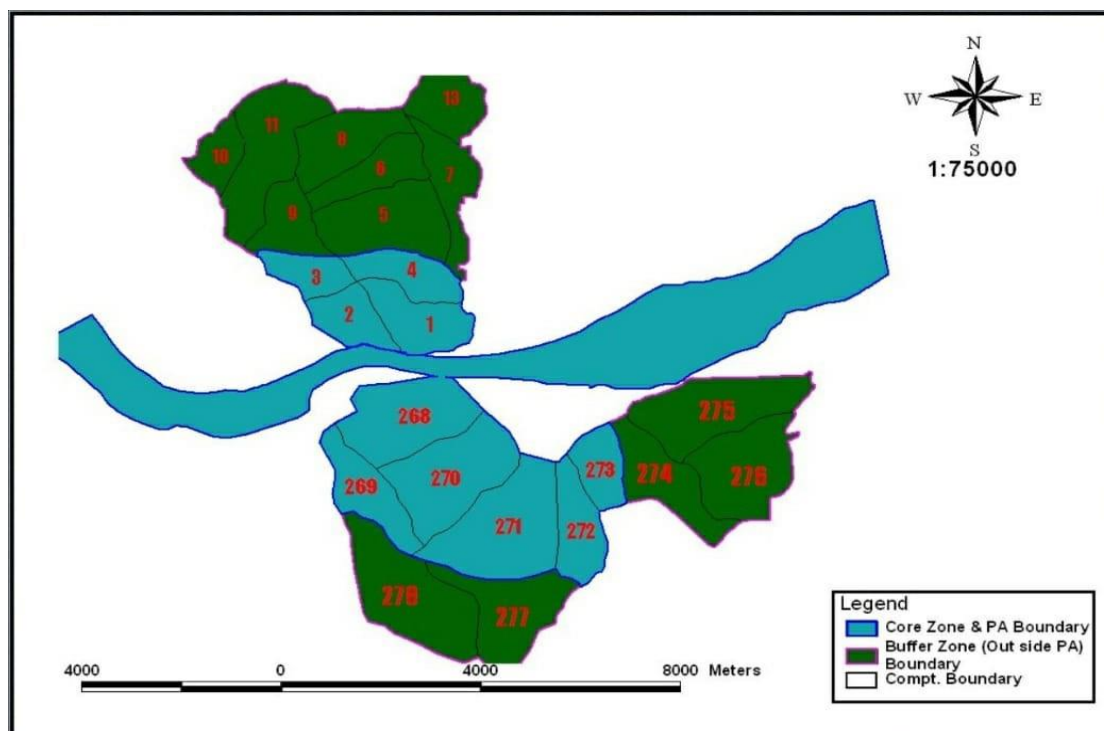
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Significantly, grasses substantially augment ecosystem productivity and carrying capacity. However, due to various anthropogenic activities, grassland habitats have undergone degradation. Restoring these degraded habitats necessitates thorough examinations of grass species and the development of grasslands based on prey-predator relationships or ecological affinities (Swamy et al., 2020; & Jalander & Swamy, 2024). Consequently, this study aims to document the diversity of grasses within the Shivaram Wildlife Sanctuary. The documentation and conservation efforts concerning grasses substantially contribute to the holistic well-being and functionality of the Shivaram Wildlife Sanctuary ecosystem. Furthermore, these grass species hold significant cultural value in northern Telangana, integral to traditional customs, rituals, and the livelihoods of local communities. The systematic cataloguing and preservation of grasses within

the Shivaram Wildlife Sanctuary are not only ecologically and culturally warranted. However, they are also indispensable for bolstering resilience, biodiversity, and sustainability in the face of ongoing environmental challenges.

### STUDY AREA

The Shivaram Wildlife Sanctuary, established in 1978, is a prominent protected area in Telangana State. Located along the shared borders of Mancherial and Peddapally Districts, adjacent to the Godavari River, it spans 29.81 km<sup>2</sup> (Map 1). The sanctuary boasts diverse vegetation typical of a southern tropical dry deciduous forest, with various geological formations and soils influenced by rock types and topography. The topography is mainly undulating, except for the southern region featuring hills. The highest point is 253 meters above mean sea level, while the lowest is 150.9 meters above MSL.



**Map1. Showing core and buffer zones and compartments of Shivaram Wildlife Sanctuary, Telangana**

The climate is hot and moderately wet, with an average annual rainfall of 756 millimetres and temperatures reaching up to 45°C, occasionally peaking at 48°C in May. Relative

humidity ranges from 85 to 89% during the monsoon months but tends to be lower throughout the rest of the year.

**MATERIALS AND METHODS**

The study aimed to document the grass diversity of the Shivaram Wildlife Sanctuary due to limited botanical explorations in the region. Field trips were conducted between April 2020 and March 2023 to cover various seasons. Plant specimens, including flowers and fruits, were collected in triplicate; each assigned a unique field collection number. Standard herbarium processing methods outlined in Jain & Rao (1977) were followed. Plant identification mainly utilized national grass flora such as the grasses of Burma, Ceylon, India, and Pakistan (excluding Bambuseae) by Bor (1960) and regional Floras such as the Flora of Presidency Madras (Gamble, 1915-1935) and the Flora of Telangana (Pullaiah, 2015; Reddy & Reddy, 2016; Swamy et al., 2019, 2020; Jalander et al., 2021; & Jalander & Swamy, 2023, 2024), alongside recent revisionary studies and monographs. Voucher specimens were deposited in the Department of Botany, BESTIU, Andhra Pradesh, contributing to scientific documentation and conservation efforts for the sanctuary's flora.

**RESULTS AND DISCUSSION**

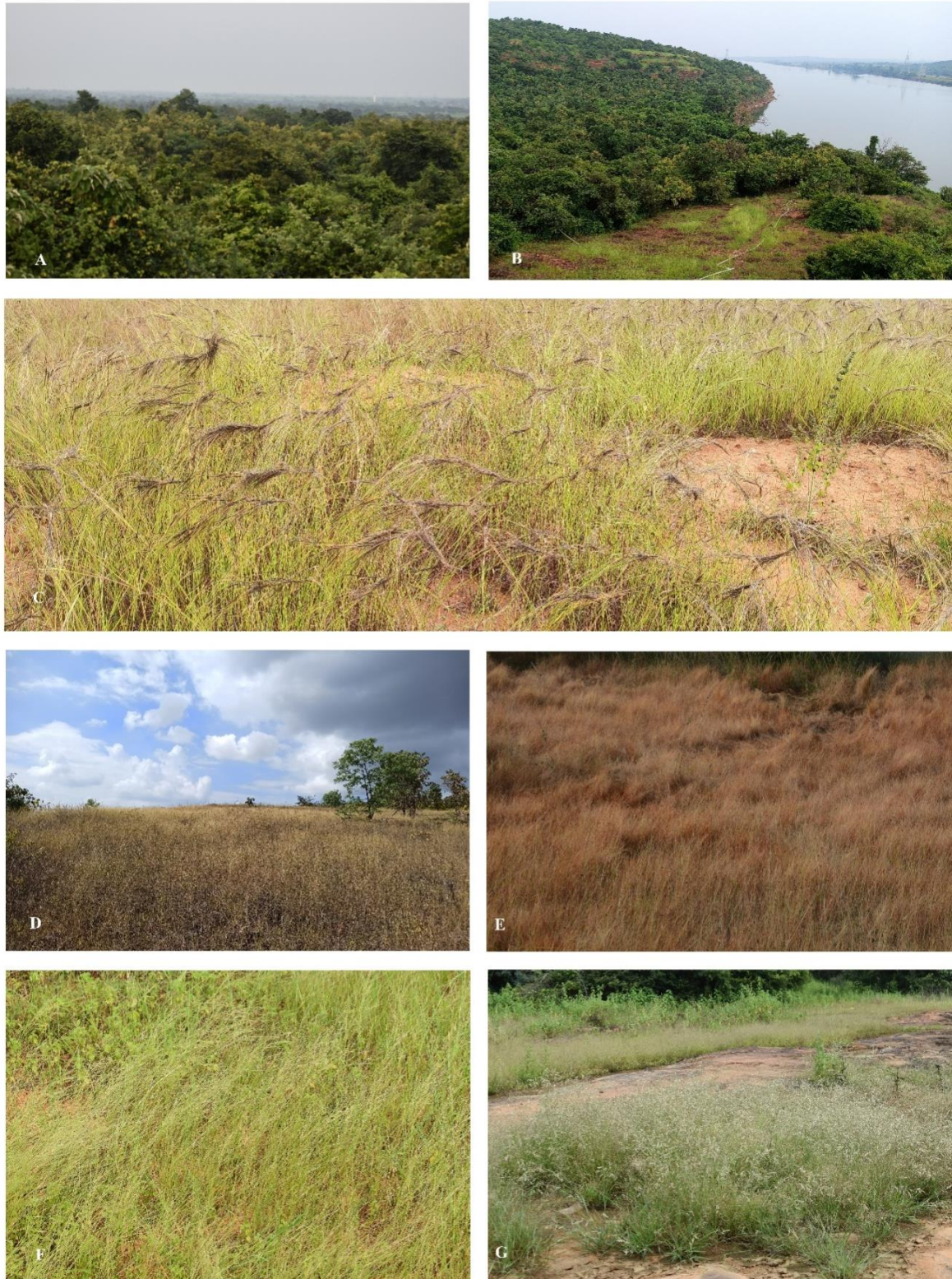
The investigation into the grass diversity of the Shivaram Wildlife Sanctuary reveals a total of 51 grass species spanning 36 genera and 7 tribes across 4 subfamilies. Notably, the subfamily Panicoideae boasts the highest representation with 32 species across 25 genera and 3 tribes, followed by Chloridoideae with 15 species spanning 9 genera and 2 tribes. Aristidoideae and Bambusoideae are represented by 3 and 1 species respectively, each belonging to one genus and tribe. The dominant tribes include Andropogoneae with 18 species across 15 genera, Paniceae with 12 species across 9 genera, and Cynodonteae with 9 species across 8 genera. Eragrostideae, Aristideae, Paspaleae, and Bambuseae are represented by 6, 3, 2, and 1 species respectively, each with one genus (Table 1).

Among the genera, *Eragrostis* stands out with 6 species, followed by *Aristida* and *Dichanthium* with 3 species each. Additionally, *Bothriochloa*, *Dinebra*, *Digitaria*, *Panicum*, *Paspalum*, and *Urochloa* are each represented by 2 species. Furthermore, 27 genera namely.

**Table1. Statistical Analysis of the Grasses in Shivaram Wildlife Sanctuary**

S.No.	Sub family	Tribe	Genera	Species
1	Aristidoideae	Aristideae	<i>Aristida</i> (3)	3
2	Bambusoideae	Bambuseae	<i>Dendrocalamus</i> (1)	1
3	Chloridoideae	Cynodonteae	<i>Chloris</i> (1), <i>Cynodon</i> (1), <i>Dactyloctenium</i> (1), <i>Dinebra</i> (2), <i>Eragrostiella</i> (1), <i>Microchloa</i> (1), <i>Perotis</i> (1), <i>Schoenefeldia</i> (1)	9
		Eragrostideae	<i>Eragrostis</i> (6)	6
4	Panicoideae	Andropogoneae	<i>Apluda</i> (1), <i>Apocopsis</i> (1), <i>Arthraxon</i> (1), <i>Bothriochloa</i> (2), <i>Chrysopogon</i> (1), <i>Cymbopogon</i> (1), <i>Dichanthium</i> (3), <i>Dimeria</i> (1), <i>Heteropogon</i> (1), <i>Imperata</i> (1), <i>Ischaemum</i> (1), <i>Iseilema</i> (1), <i>Saccharum</i> (1), <i>Schizachyrium</i> (1), <i>Sorghum</i> (1)	18
		Paniceae	<i>Alloteropsis</i> (1), <i>Cenchrus</i> (1), <i>Digitaria</i> (2), <i>Echinochloa</i> (1), <i>Oplismenus</i> (1), <i>Panicum</i> (2), <i>Sacciolepis</i> (1), <i>Setaria</i> (1), <i>Urochloa</i> (2)	12
		Paspaleae	<i>Paspalum</i> (2)	2
<b>Total</b>	<b>04</b>	<b>07</b>	<b>36</b>	<b>51</b>





**Fig. 1: A-B. Dry deciduous forest; C. Grassland with *Heteropogon contortus* dominance; D. Grassland with *Chrysopogon fulvus* dominance; E. Grasslands with *Dimeria* spp. dominance; F. Grasslands with *Aristida* spp. dominance; G. Grasslands with *Eragrostis* spp. dominance**





**Fig. 2:** A. *Apluda mutica* L.; B. *Arthraxon lancifolius* (Trin.) Hochst.; C. *Chloris barbata* Sw.; D. *Chrysopogon fulvus* (Spreng.) Chiov.; E. *Dactyloctenium aegyptium* (L.) Willd.; F. *Eragrostis tremula* (Lam.) Hochst. ex Steud.; G. *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.; H. *Setaria pumila* (Poir.) Roem. & Schult.

Table2. Annotated checklist of Grasses in Shivaram Wildlife Sanctuary

S. No.	Sub family	Tribe	Genera	Scientific name	IUCN status
1	Aristidoideae	Aristideae	<i>Aristida</i>	<i>Aristida funiculata</i> Trin. & Rupr.	-
2	Aristidoideae	Aristideae	<i>Aristida</i>	<i>Aristida hystrix</i> L.f.	-
3	Aristidoideae	Aristideae	<i>Aristida</i>	<i>Aristida setacea</i> Retz.	-
4	Bambusoideae	Bambuseae	<i>Dendrocalamus</i>	<i>Dendrocalamus strictus</i> (Roxb.) Nees	-
5	Chloridoideae	Cynodonteae	<i>Chloris</i>	<i>Chloris barbata</i> Sw.	-
6	Chloridoideae	Cynodonteae	<i>Cynodon</i>	<i>Cynodon dactylon</i> (L.) Pers.	-
7	Chloridoideae	Cynodonteae	<i>Dactyloctenium</i>	<i>Dactyloctenium aegyptium</i> (L.) Willd.	-
8	Chloridoideae	Cynodonteae	<i>Dinebra</i>	<i>Dinebra chinensis</i> (L.) P.M.Peterson & N.Snow	-
9	Chloridoideae	Cynodonteae	<i>Dinebra</i>	<i>Dinebra retroflexa</i> (Vahl) Panz.	-
10	Chloridoideae	Cynodonteae	<i>Eragrostiella</i>	<i>Eragrostiella bifaria</i> (Vahl) Bor	-
11	Chloridoideae	Cynodonteae	<i>Microchloa</i>	<i>Microchloa indica</i> (L.f.) P.Beauv.	-
12	Chloridoideae	Cynodonteae	<i>Perotis</i>	<i>Perotis indica</i> (L.) Kuntze	-
13	Chloridoideae	Cynodonteae	<i>Schoenefeldia</i>	<i>Schoenefeldia gracilis</i> Kunth	-
14	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis atrovirens</i> (Desf.) Trin. ex Steud.	LC (2020)
15	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis gangetica</i> (Roxb.) Steud.	LC (2020)
16	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis japonica</i> (Thumb.) Trin.	LC (2020)
17	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis tremula</i> (Lam.) Hochst. ex Steud.	-
18	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis uniolooides</i> (Retz.) Nees ex Steud.	LC (2011)
19	Chloridoideae	Eragrostideae	<i>Eragrostis</i>	<i>Eragrostis viscosa</i> (Retz.) Trin.	-
20	Panicoideae	Andropogoneae	<i>Apluda</i>	<i>Apluda mutica</i> L.	-
21	Panicoideae	Andropogoneae	<i>Apocopis</i>	<i>Apocopis mangalorensis</i> (Hochst. ex Steud.) Henrard	-
22	Panicoideae	Andropogoneae	<i>Arthraxon</i>	<i>Arthraxon lancifolius</i> (Trin.) Hochst.	-
23	Panicoideae	Andropogoneae	<i>Bothriochloa</i>	<i>Bothriochloa kuntzeana</i> (Hack.) Henrard	-
24	Panicoideae	Andropogoneae	<i>Bothriochloa</i>	<i>Bothriochloa pertusa</i> (L.) A.Camus	-
25	Panicoideae	Andropogoneae	<i>Chrysopogon</i>	<i>Chrysopogon fulvus</i> (Spreng.) Chiov.	-
26	Panicoideae	Andropogoneae	<i>Cymbopogon</i>	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) Will. Watson	-
27	Panicoideae	Andropogoneae	<i>Dichanthium</i>	<i>Dichanthium annulatum</i> (Forssk.) Stapf	-
28	Panicoideae	Andropogoneae	<i>Dichanthium</i>	<i>Dichanthium caricosum</i> (L.) A.Camus	-
29	Panicoideae	Andropogoneae	<i>Dichanthium</i>	<i>Dichanthium foveolatum</i> (Delile) Robery	-
30	Panicoideae	Andropogoneae	<i>Dimeria</i>	<i>Dimeria ornithopoda</i> Trin.	LC (2011)
31	Panicoideae	Andropogoneae	<i>Heteropogon</i>	<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	-
32	Panicoideae	Andropogoneae	<i>Imperata</i>	<i>Imperata cylindrica</i> (L.) Raeusch.	LC (2010)
33	Panicoideae	Andropogoneae	<i>Ischaemum</i>	<i>Ischaemum rugosum</i> Salisb.	LC (2020)
34	Panicoideae	Andropogoneae	<i>Iseilema</i>	<i>Iseilema prostratum</i> (L.) Anderson	-
35	Panicoideae	Andropogoneae	<i>Saccharum</i>	<i>Saccharum spontaneum</i> L.	LC (2020)
36	Panicoideae	Andropogoneae	<i>Schizachyrium</i>	<i>Schizachyrium exile</i> (Hochst.) Pilg.	-
37	Panicoideae	Andropogoneae	<i>Sorghum</i>	<i>Sorghum halepense</i> (L.) Pers.	-
38	Panicoideae	Paniceae	<i>Alloteropsis</i>	<i>Alloteropsis cimicina</i> (L.) Stapf	-
39	Panicoideae	Paniceae	<i>Cenchrus</i>	<i>Cenchrus pedicellatus</i> (Trin.) Morrone	LC (2018)
40	Panicoideae	Paniceae	<i>Digitaria</i>	<i>Digitaria ciliaris</i> (Retz.) Koeler	-
41	Panicoideae	Paniceae	<i>Digitaria</i>	<i>Digitaria longiflora</i> (Retz.) Pers.	-
42	Panicoideae	Paniceae	<i>Echinochloa</i>	<i>Echinochloa colona</i> (L.) Link	LC (2020)
43	Panicoideae	Paniceae	<i>Oplismenus</i>	<i>Oplismenus burmanni</i> (Retz.) P.Beauv.	-
44	Panicoideae	Paniceae	<i>Panicum</i>	<i>Panicum curviflorum</i> Hornem.	-
45	Panicoideae	Paniceae	<i>Panicum</i>	<i>Panicum repens</i> L.	LC (2020)
46	Panicoideae	Paniceae	<i>Sacciolepis</i>	<i>Sacciolepis indica</i> (L.) Chase	LC (2020)
47	Panicoideae	Paniceae	<i>Setaria</i>	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	-
48	Panicoideae	Paniceae	<i>Urochloa</i>	<i>Urochloa distachyos</i> (L.) T.Q.Nguyen	-
49	Panicoideae	Paniceae	<i>Urochloa</i>	<i>Urochloa mutica</i> (Forssk.) T.Q.Nguyen	LC (2020)
50	Panicoideae	Paspaleae	<i>Paspalum</i>	<i>Paspalum distichum</i> L.	LC (2016)
51	Panicoideae	Paspaleae	<i>Paspalum</i>	<i>Paspalum scrobiculatum</i> L.	LC (2019)

*Alloteropsis*, *Apluda*, *Apocopis*, *Arthraxon*, *Isachemum*, *Iseilema*, *Microchloa*,  
*Cenchrus*, *Chloris*, *Chrysopogon*, *Oplismenus*, *Perotis*, *Saccharum*,  
*Cymbopogon*, *Cynodon*, *Dactyloctenium*, *Sacciolepis*, *Schizachyrium*, *Schoenefeldia*,  
*Dendrocalamus*, *Dimeria*, *Echinochloa*, *Setaria* and *Sorghum* are represented by a  
*Eragrostiella*, *Heteropogon*, *Imperata*,

single species each, indicating a diverse range of grass types within the sanctuary.

Regarding conservation status, 15 species are classified under the Least Concern (LC) category according to the IUCN Red List. This comprehensive overview underscores the rich grass diversity within the Shivaram Wildlife Sanctuary, highlighting the varied representation across different taxa and providing valuable insights into conservation priorities. Detailed list of species and IUCN red list status are given in Table 2.

### CONCLUSION

The study conducted on the grass diversity within the Shivaram Wildlife Sanctuary in Telangana State has provided valuable insights into the richness and composition of grass species in the region. With 51 species identified across 36 genera and 7 tribes, the sanctuary exhibits a significant variety of grasses, contributing to the overall biodiversity of the area. Furthermore, the results of this study provide a foundation for informed wildlife management and habitat restoration efforts within the Shivaram Wildlife Sanctuary. By understanding the diversity and distribution of grass species, conservation strategies can be developed to ensure the long-term sustainability of the sanctuary's ecosystem. Overall, the systematic cataloguing and preservation of grass species within the Shivaram Wildlife Sanctuary are essential for ecological and cultural reasons and for bolstering resilience, biodiversity, and sustainability in the face of ongoing environmental challenges. This study underscores the importance of prioritizing conservation efforts to safeguard the diverse grasslands of the sanctuary for future generations.

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### Conflict of Interest:

There is no such evidence of conflict of interest.

### Author Contribution

All authors have participated in critically revising of the entire manuscript and approval of the final manuscript.

### REFERENCES

- Bor, N. L. (1960). *The grasses of Burma, Ceylon, India, and Pakistan(excluding Bambuseae)*. Pergamon Press, London. Pp.
- Gamble, J. S., & Fischer, C. E. C. (1915–1935). *Flora of the Presidency of Madras*. Allard & Sons, London.
- Jalander, V., Swamy, J., & Appaiah, A. (2021). *Grasses of Nizamabad District*, Telangana State Forest Department.
- Jalander, V., & Swamy, J. (2023). Taxonomic Studies of the Genus *Eragrostis* Wolf (Poaceae: Chloridoideae) in Telangana-with New Additions. *Journal of Experimental Agriculture International* 45(12), 102-139. DOI: [10.9734/JEAI/2023/v45i122271](https://doi.org/10.9734/JEAI/2023/v45i122271)
- Jalander, V., & Swamy, J. (2024). Expanding the Grass Diversity Atlas: 35 New Additions to the Grasses of Nizamabad District, Telangana. In: Balkhande (ed.), *Interdisciplinary Research in Life Sciences: A Path Towards Sustainability*. Advent Publishing, Mumbai, pp. 149-174. DOI: [10.5281/zenodo.10682951](https://doi.org/10.5281/zenodo.10682951)
- IUCN (2023). The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>> accessed on 12.11.2023.
- Jain, S. K., & Rao, R. R. (1977). *A Handbook of Field and Herbarium Methods*. Today and Tomorrow Printers and Publishers, New Delhi, pp.1- 157.

- Pullaiah, T. (2015). *Flora of Telangana- the 29<sup>th</sup> state of India*. Vol.3. Regency Publications, New Delhi.
- Reddy, K. N., & Reddy, C. S. (2016). *Flora of Telangana State*, India. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Swamy. J., Sailu, G., & Bhadraiah, B. (2019). *Floral Diversity of Pocharam Wildlife Sanctuary, Telangana, India*. Telangana State Forest Department, Hyderabad, Telangana.
- Swamy, J., Prabhakar, B., & Appaiah, A. (2020). *Grasses of Adilabad (Erstwhile District)*. J. Swamy, Hyderabad, Telangana.