

Chapter 4

Diversity of Cyperaceae Members in South India

Abstract

South India is a peninsula in Asia having divergent ecosystems. The hot and moist climate, high rainfall and variety of microclimates support luxuriant growth of sedges in this biodiversity rich area. The sedge members show a wide variety of distribution pattern including low land, wet land, shallow open water bodies, forest margins and even high-altitude grasslands and rocky slopes. In south India, 274 taxa in 24 genera are distributed, among which, *Fimbristylis* (78 species) and *Cyperus* (58 species) are the dominant genera. The chapter deals with diversity and distribution of sedges in South India.

Introduction

The geography of South India is divergent and embraces floristically rich mountain ranges and varied ecosystems of wetlands and dry area. The region also has wide variation in the seasonal rainfall pattern, temperature and edaphic factors, and the species richness and endemism are not uniform. However, the general topography of south India is favourable for Cyperaceae members to thrive. In south India, the family Cyperaceae is represented by 274 taxa in 24 genera, among which *Fimbristylis* (78 species) and *Cyperus* (58 species) are the dominant genera, followed by *Carex* (28 species), *Pycnus* (21 species) and *Scleria* (20 species) (**Table 1**) (Nayar *et al.*, 2014; Nayar *et al.*, 2006; Prasad and Singh, 2002; Karthikeyan *et al.* 1989).

Table 1. Cyperaceae genera and species in South India

Sl. No.	Cyperaceae genus	Cyperaceae species
1.	<i>Actinoscirpus</i> (Ohwi) R. W. Haines & Lye	1. <i>A. grossus</i> (L.f.) Goetgh. & D.A. Simpson
2.	<i>Bulbostylis</i> Kunth.	1. <i>B. barbata</i> (Rottb.) Kunth ex Clarke in Hook. f. 2. <i>B. barbata</i> (Rottb.) Kunth ex Clarke ssp. <i>Pulchella</i> (Thw.) Koyama 3. <i>B. densa</i> (Wall. ex Roxb.) Hand.-Mazz. 4. <i>B. puberula</i> (Poir.) Clarke in Hook.f., 5. <i>B. Subspinescence</i> C.B. Clarke

3.	<i>Bolboschoenus</i> (Asch.) Palla.	<ol style="list-style-type: none"> 1. <i>B. maritimus</i> (L.) Palla. ssp. <i>maritimus</i> 2. <i>B. maritimus</i> ssp. <i>affinis</i> (Roth) T. Koyama
4.	<i>Carex</i> L.	<ol style="list-style-type: none"> 1. <i>C. baccans</i> Nees in Wight. 2. <i>C. breviculmis</i> R. BR. 3. <i>C. brunnea</i> Thunb. 4. <i>C. capillacea</i> Boott. 5. <i>C. christii</i> Boeck. 6. <i>C. filicina</i> Nees in Wight 7. <i>C. foliosa</i> D. Don. 8. <i>C. hebecarpa</i> ssp. <i>ligulata</i> (Nees) T.Koyama 9. <i>C. indica</i> L. 10. <i>C. jackiana</i> Boott. 11. <i>C. lateralis</i> Kuek. 12. <i>C. lenta</i> D.Don. 13. <i>C. leucantha</i> Arn. ex Boott. 14. <i>C. lindleyana</i> Nees in Wight 15. <i>C. longicuris</i> Nees in Wight 16. <i>C. longipes</i> D. Don. 17. <i>C. maculate</i> Boott 18. <i>C. myosurus</i> Nees in Wight 19. <i>C. nubigena</i> D.Don 20. <i>C. phacota</i> Spreng. 21. <i>C. pseudoaperta</i> Boeck. 22. <i>C. raphidocarpa</i> Nees. 23. <i>C. rara</i> Boott. 24. <i>C. speciosa</i> Kunth. 25. <i>C. stramentitia</i> Boott ex Boeck. 26. <i>C. vicinalis</i>Boott. 27. <i>C. walker</i> Arn. Ex Boott. 28. <i>C. wightiana</i> Nees in Wight
5.	<i>Courtoisiana</i> Sojak.	<ol style="list-style-type: none"> 1. <i>C. cyperoides</i> (Roxb.) SojÅjk
6.	<i>Cyperus</i> L.	<ol style="list-style-type: none"> 1. <i>C. alopecuroides</i>Rottb. 2. <i>C. alternifolius</i> L. 3. <i>C. alulatus</i> J. Kern. 4. <i>C. amabilis</i> Vahl. 5. <i>C. arenarius</i> Retz. 6. <i>C. articulatus</i> L. 7. <i>C. bulbosus</i> Vahl. 8. <i>C. castaneus</i> Willd. 9. <i>C. cephalotes</i> Vahl. 10. <i>C. clarkei</i> Cooke 11. <i>C. compressus</i> L. 12. <i>C. conglomerates</i> Rottb. 13. <i>C. conglomerates</i> Rottb. ssp. <i>pachyrrhizus</i> (Nees ex Boeck.) Koyama

		<p>14. <i>C. coonoorensis</i> Viji, Pandur., Deepu & G.C. Tucker</p> <p>15. <i>C. corymbosus</i> Rottb.,</p> <p>16. <i>C. cuspidatus</i> Kunth.</p> <p>17. <i>C. cyperinus</i> (Retz.) Sur.</p> <p>18. <i>C. cyperoides</i> (L.) Kuntze</p> <p>19. <i>C. difformis</i> L.</p> <p>20. <i>C. diffusus</i> Vahl.</p> <p>21. <i>C. digitatus</i> Roxb.</p> <p>22. <i>C. distans</i> L. f.</p> <p>23. <i>C. dubius</i> Rottb.</p> <p>24. <i>C. elatus</i> L.,</p> <p>25. <i>C. esculentus</i> L.</p> <p>26. <i>C. exaltatus</i> Retz.</p> <p>27. <i>C. haspan</i> L.</p> <p>28. <i>C. imbricatus</i> Retz.</p> <p>29. <i>C. iria</i> L.</p> <p>30. <i>C. javanicus</i> Houtt.</p> <p>31. <i>C. karthikeyanii</i> Wad. Khan & Lakshmin.</p> <p>32. <i>C. laevigatus</i> L.</p> <p>33. <i>C. macer</i> C. B. Clarke.</p> <p>34. <i>C. longus</i> L.</p> <p>35. <i>C. maderaspatanus</i> Willd.</p> <p>36. <i>C. malaccensis</i> Lam.</p> <p>37. <i>C. mollipes</i> C.B. Carke.</p> <p>38. <i>C. niveus</i> Retz.</p> <p>39. <i>C. nutans</i> Vahl ssp. <i>eleusinoides</i> (Kunth) Koyama</p> <p>40. <i>C. nutans</i> Vahl ssp. <i>nutans</i> Koyama in Dassan. & Fosb.</p> <p>41. <i>C. papyrus</i> L.</p> <p>42. <i>C. pangorei</i> Rottb.</p> <p>43. <i>C. paniceus</i> (Rottb.) Boeck.</p> <p>44. <i>C. pilosus</i> Vahl.</p> <p>45. <i>C. platystylis</i> R. Br.</p> <p>46. <i>C. procerus</i> Rottb.</p> <p>47. <i>C. prolifer</i> Lam.</p> <p>48. <i>C. pseudokyllingioides</i> Kuek.</p> <p>49. <i>C. pulchellus</i> R. Br.</p> <p>50. <i>C. pulcherrimus</i> Willd. ex Kunth.</p> <p>51. <i>C. rotundus</i> L.</p> <p>52. <i>C. rubicundus</i> Vahl.</p> <p>53. <i>C. sphacelatus</i> Rottb.</p> <p>54. <i>C. stoloniferous</i> Retz.</p> <p>55. <i>C. squarrosus</i> L.</p> <p>56. <i>C. tenuiculmis</i> Boeck.</p> <p>57. <i>C. tenuispica</i> Steud.</p>
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		58. <i>C. zollingeri</i> Steud.
7.	<i>Diplacrum</i> R. Br.	1. <i>D. africanus</i> (Benth.) C. B. Clarke. 2. <i>D. caricinum</i> R. Br.
8.	<i>Eleocharis</i> R. Br.	1. <i>E. acutangula</i> (Roxb.) Schult. 2. <i>E. atropurpurea</i> (Retz.) Presl. 3. <i>E. congesta</i> D. Don. 4. <i>E. dulcis</i> (Burm. f.) Trimen ex Hensch. 5. <i>E. geniculata</i> (L.) Roem. & Schult. 6. <i>E. lankana</i> Koyama 7. <i>E. ochrostachys</i> Steud. 8. <i>E. ranganathensis</i> Viji, G.C.Tucker, Deepu & Pandur. 9. <i>E. pellucid</i> C.Presl. 10. <i>E. retroflexa</i> (Poir.) Urban ssp. <i>Chaetaria</i> (Roem. & Schult.) Koyama 11. <i>E. Sphacelata</i> R. Br. 12. <i>E. spiralis</i> (Rottb.) Roem. & Schult. 13. <i>E. Swamyi</i> Govind. 14. <i>E. tetraquetra</i> Nees
9.	<i>Eriophorum</i> L.	1. <i>E. comosum</i> (Wall.) Palla
10.	<i>Fimbristylis</i> Vahl.	1. <i>F. acuminata</i> Vahl. 2. <i>F. aestivalis</i> Vahl. 3. <i>F. agasthyamalaensis</i> Viji & Preetha. 4. <i>F. aggregata</i> C. E.C. Fisch. 5. <i>F. alboviridis</i> Clarke in Hook.f. 6. <i>F. angamoozhiensis</i> Ravi & Anil Kumar 7. <i>F. aphylla</i> Steud. 8. <i>F. argentea</i> (Rottb.) Vahl. 9. <i>F. arnottiana</i> Boeck. 10. <i>F. bispicula</i> Govind. 11. <i>F. bisumbellata</i> (Forssk.) Bubani 12. <i>F. carpopoda</i> Govind. 13. <i>F. cinnamometorum</i> (Vahl) Kunth. 14. <i>F. complanata</i> (Retz.) Link 15. <i>F. consanguinea</i> Kunth. 16. <i>F. contorta</i> C. E.C. Fisch. 17. <i>F. crystallina</i> Govind. 18. <i>F. cymosa</i> R.Br. 19. <i>F. dauciformis</i> Govind. 20. <i>F. dichotoma</i> (L.) Vahl. 21. <i>F. dichotoma</i> (L.) Vahl ssp. <i>glauca</i> (Vahl) Koyama 22. <i>F. dichotoma</i> (L.) Vahl ssp. <i>podocarpa</i> (Nees & Meyen) Koyama 23. <i>F. dimorphonucifera</i> Govind. 24. <i>F. dipsacea</i> (Rottb.) Clarke in Hook. f. 25. <i>F. dura</i> (Zoll. & Moritz.) Merr.

		<p>26. <i>F. eragrostis</i> (Nees & Meyen) Hance 27. <i>F. falcata</i> (Vahl) Kunth. 28. <i>F. ferruginea</i> (L.) Vahl. 29. <i>F. hirsutifolia</i> Govind. 30. <i>F. hookeriana</i> Boeck. 31. <i>F. humerosa</i> Govind. 32. <i>F. hyalina</i> Govind. & Sasidh. 33. <i>F. insignis</i> Thw. 34. <i>F. kingie</i> Gamble ex Boeck. 35. <i>F. latinucifera</i> Govind. 36. <i>F. latiglumifera</i> Govind. 37. <i>F. lawiana</i> (Boeck.) J. Kern. 38. <i>F. littoralis</i> Gaudich 39. <i>F. longistigmata</i> Govind. 40. <i>F. manilaliana</i> Govind. 41. <i>F. matthewii</i> Murug., V. Balas. & Nagarajan 42. <i>F. merrilli</i> Kern. 43. <i>F. microcarya</i> Muller 44. <i>F. monospicula</i> Govind. 45. <i>F. monticola</i> Hochst. ex Steud. 46. <i>F. narayanii</i> C.E.C. Fisch. 47. <i>F. obtusata</i> (Clarke) Ridley 48. <i>F. ovata</i> (Burn. f.) Kern 49. <i>F. pandurata</i> Govind. 50. <i>F. paupercula</i> Boeck. 51. <i>F. perspicua</i> Govind. & Sasidh. 52. <i>F. polytrichoides</i> (Retz.) Vahl. 53. <i>F. pseudomicrocarya</i> Govind. 54. <i>F. pseudonarayanii</i> Ravi & Anil Kumar 55. <i>F. pubisquama</i> Kern. 56. <i>F. pustulosa</i> Govind. 57. <i>F. quinquangularis</i> (Vahl) Kunth. 58. <i>F. rigidiuscula</i> Govind. 59. <i>F. rugosa</i> Govind. 60. <i>F. salbundia</i> (Nees) Kunth ssp. <i>pentaptera</i> (Nees) Koyama 61. <i>F. schoenoides</i> (Retz.) Vahl. 62. <i>F. semidisticha</i> Govind. 63. <i>F. sieberiana</i> Kunth. 64. <i>F. simpsonii</i> Kunth. 65. <i>F. squarrosa</i> Vahl. 66. <i>F. stigmatotecta</i> Govind. 67. <i>F. swamyii</i> Govind. 68. <i>F. tenera</i> Schult. 69. <i>F. tetragona</i> R. Br. 70. <i>F. tortifolia</i> Govind.</p>
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		<p>71. <i>F. tristachya</i> R. Br. 72. <i>F. tuckeri</i> Viji, Pandur. & Deepu 73. <i>F. tumida</i> Govind. 74. <i>F. uliginosa</i> Hochst. ex Steud. 75. <i>F. umbellaris</i> (Lam.) Vahl. 76. <i>F. velliangiriensis</i> Murug., V. Balas. & Nagarajan 77. <i>F. woodrowii</i> C. B. Clarke. 78. <i>F. zatei</i> Wad. Khan & D. P. Chavan</p>
11.	<i>Fuirena</i> Rottb.	<p>1. <i>F. ciliaris</i> (L.) Roxb. 2. <i>F. cuspidate</i> (Roth) Kunth 3. <i>F. ponmudiensis</i> Ravi & Anil Kumar 4. <i>F. simpsonii</i> Ravi 5. <i>F. trilobites</i> C. B. Clarke. 6. <i>F. umbellate</i> Rottb. 7. <i>F. uncinata</i> (Willd.) Kunth</p>
12.	<i>Hypolytrum</i> Rich. ex. Pers.	<p>1. <i>H. nemorum</i> (Vahl) Spreng</p>
13.	<i>Isolepis</i> R. Br.	<p>1. <i>I. fluitans</i> (L.) R.Br.</p>
14.	<i>Kyllinga</i> Rottb.	<p>1. <i>K. brevifolia</i> Rottb. 2. <i>K. brevifolia</i> Rottb. var. <i>stellulata</i> (Sur.) Hooper 3. <i>K. bulbosa</i> P. Beauv. 4. <i>K. eglanulosa</i> Govind. 5. <i>K. melanosperma</i> ssp. <i>bifolia</i> (Miq.) Karthik. 6. <i>K. melanosperma</i> Nees, <i>K. nemoralis</i> (J. R & G. Forst.) Dandy ex Hutch. & Dalz. 7. <i>K. odorata</i> Vahl ssp. <i>cylindrica</i> (Nees ex Wight) Koyama 8. <i>K. polyphylla</i> Willd. ex Kunth. 9. <i>K. pumila</i> Michx. 10. <i>K. squamulata</i> Vahl.</p>
15.	<i>Lepironia</i> Pers.	<p>1. <i>L. articulata</i> (Retz.) Domin</p>
16.	<i>Lipocarpha</i> R. Br.	<p>1. <i>L. chinensis</i> (Osbeck) Kern 2. <i>L. gracilis</i> (Rich. ex Pers.) Nees 3. <i>L. hemispherica</i> (Roth) Goetgh. 4. <i>L. kernii</i> (Reymond) Goetgh. 5. <i>L. squarrosa</i> (L.) Goetgh.</p>
17.	<i>Pycreus</i> P. Beauv.	<p>1. <i>P. diaphanous</i> (Schrud. Ex Roem. & Schult.) S.S. Hooper & T. Koyama. 2. <i>P. flavescens</i> (L.) Rchb.f. 3. <i>P. flavidus</i> (Retz.) Koyama 4. <i>P. intactus</i> (Vahl) J.Raynal 5. <i>P. kanarensis</i> V. P. Prasad & N.P Singh. 6. <i>P. macrostachyos</i> (Lam.) Raynal 7. <i>P. mahadevanii</i> Govind. 8. <i>P. malabaricus</i> Clarke 9. <i>P. membranaceus</i> (Vahl) Govind.</p>

		<ol style="list-style-type: none"> 10. <i>P. opulentus</i> Govind. 11. <i>P. palghatensis</i> Govind. 12. <i>P. plurinodosus</i> (Govind.) P. Singh & V. Singh 13. <i>P. plicatus</i> Govind. 14. <i>P. polystachyos</i> (Rottb.) P. Beauv. 15. <i>P. pumilus</i> (L.) Nees 16. <i>P. puncticulatus</i> (Vahl) Nees in Mart. 17. <i>P. sanguinolentus</i> (Vahl) Nees ex Clarke in Hook. f. 18. <i>P. similinervulosus</i> Govind. 19. <i>P. stramineus</i> Clarke in Hook. f. 20. <i>P. sulcinux</i> (Clarke) Clarke 21. <i>P. uniolooides</i> (R. Br.) Urb. var. <i>angulatus</i> (Nees) Domin
18.	<i>Queenslandiella</i> Domin.	<ol style="list-style-type: none"> 1. <i>Q. hyalina</i> (Vahl) Ballard in Hook.
19.	<i>Remirea</i> Aubl.	<ol style="list-style-type: none"> 1. <i>R. maritime</i> Aubl.
20.	<i>Rhynchospora</i> Vahl.	<ol style="list-style-type: none"> 1. <i>R. corymbosa</i> (L.) Brit. 2. <i>R. graciliima</i> Thwaites & Hook. 3. <i>R. rubra</i> (Lour) Makino. 4. <i>R. rugosa</i> (Vahl) Gale ssp. <i>brownii</i> (Roem. & Schult.) Koyama 5. <i>R. panduranganii</i> Viji, Shaju & Geetha Kum. 6. <i>R. submarginata</i> Kuk. 7. <i>R. wightiana</i> (Nees) Steud.
21.	<i>Schoenoplectiella</i> (L.) Lye.	<ol style="list-style-type: none"> 1. <i>S. articulata</i> (L.) Lye 2. <i>S. juncooides</i> (Roxb.) Lye 3. <i>S. lateriflora</i> (Gmel.) Lye 4. <i>S. litoralis</i> (Schrad.) Palla ssp. <i>thermalis</i> (Trab.) S.S.Hooper in C.J.Saldanha & D.H. Nicolson 5. <i>S. mucronatus</i> (L.) Palla in Engl. 6. <i>S. senegalensis</i> (Hochest. Ex Steud.) Lye.
22.	<i>Schoenoplectus</i> (Rchb.) Palla.	<ol style="list-style-type: none"> 1. <i>S. corymbosus</i> (Roth ex Roem. & Schult.) J. Raynal. 2. <i>S. subulatus</i> (Vahl.) Lye.
23.	<i>Scleria</i> L.	<ol style="list-style-type: none"> 1. <i>S. annularis</i> Nees ex Steud. 2. <i>S. biflora</i> Roxb. 3. <i>S. corymbosa</i> Roxb. 4. <i>S. laevis</i> Retz. 5. <i>S. lithosperma</i> (L.) Sw. var. <i>linearis</i> Benth. 6. <i>S. lithosperma</i> (L.) Sw. 7. <i>S. neesii</i> Kunth 8. <i>S. mikawana</i> Makino. 9. <i>S. multilacunosa</i> T. Koyama. 10. <i>S. oblata</i> Blake 11. <i>S. parvula</i> Steud.

		12. <i>S. pergracilis</i> (Nees) Kunth. 13. <i>S. Poiformis</i> Retz. 14. <i>S. psilorrhiza</i> C. B. Clarke. 15. <i>S. rugosa</i> R. Br. 16. <i>S. sumatrensis</i> Retz. 17. <i>S. stocksiana</i> Boeck. 18. <i>S. terrestris</i> (L.) Fassett. 19. <i>S. swamyi</i> Govind. 20. <i>S. tessellata</i> Willd.
24.	<i>Trichophorum</i> Pers.	1. <i>T. subcapitatum</i> (Thw. & Hook.) D. A. Simpson

***Fimbristylis* Vahl.**

Fimbristylis Vahl is the fourth largest genus within the family Cyperaceae, and includes several homogenous subunits (Bruhl and Wilson 2007). The genus shows worldwide distribution, especially in the tropics and subtropics, a few species are found in the warmer parts of the temperate region also. About 320 species have been reported from all over the world, and majority are distributed in tropical Asia. More than 128 taxa have been reported from India (Prasad *et al.*, 2020), of which 37 are endemic, and peninsular India has maximum number of endemic species (Prasad and Singh, 1997). In south India, 78 *Fimbristylis* species are reported.



Figure 1. Common *Fimbristylis* species in south India; *F. aestivalis*, *F. dichotoma*, *F. dipsacea* and *F. miliaceae*

The genera *Fimbristylis* accommodate sedges with spirally imbricated glumes, each subtending a bisexual floret, with a biconvex or trigonous achene carrying a basally expanded, usually fimbriate margined, 2-3 branched style and with sub-distichous basal glumes and a trigonous, persistent style base in the latter. Indian species extend to south and south-east Asian countries, and many species found in India have worldwide distribution; *F. dichotoma* (L.) Vahl, *F. complanata* (Retz.) Link, *F. ferruginea* (L.) Vahl and *F. cymosa* R. Br. are a few examples. *Fimbristylis aestivalis*, *F. dichotoma*, *F. dipsacea* and *F. miliaceae* are the common species in South India (**Figure 1**).

***Cyperus* L.**

In India the genus *Cyperus* is represented by about 118 taxa (Govaerts *et al.*, 2021) of which 58 species are from south India. Several State floras have variably recorded the diversity of this genus, of which Tamil Nadu is the most diverse in terms of species richness. Even though this diversity is not reflected in the endemism status of the genus, as only a few species are reported as endemic. *C. haspan* L, *C. distans* L., *C. pilosus* Vahl, *C. compressus* L., *C. difformis* L. and *C. iria* L. are the most common species under the genus, widely distributed in South India (**Figure 2**).



Figure 2. Common *Cyperus* species in South India; *C. haspan*, *C. distans*, *C. pilosus*, *C. compressus*, *C. difformis* and *C. iria*

Distribution pattern of sedges in south India

Most of the sedges are found in the low-lying wetland areas and certain species are usually found partly submerged in shallow open water bodies like lakes, reservoirs and ponds (**Figure 3**). Species under the genera *Eleocharis*, *Schoenoplectus*, *Cyperus*, *Rhynchospora* and *Actinoscirpus* are often form large patches in open water areas by means of vegetative propagation. *Carex*, *Scleria* and *Hypolytrum* are confined to forest margins. Many *Cyperus* and *Fimbristylis* species grow in grassland along with grasses and forms an important constituent of herbage. Some sedges prefer high altitude grasslands and rocky slopes. Most of Cyperaceae species possess well developed root systems or highly developed rhizomatous stolons to grow in sandy soil.



Figure 3. Sedges in different habitats in south India

Conclusions

Around 274 taxa of sedges in 24 genera were identified from South India through extensive field study and literature review. The members are occurring in various habitats, with dominance in wetlands. Except the common species, most of the Cyperaceae species are competitively inferior, restricted to vulnerable habitats, and thus rare and endangered. With the support of diverse adaptive characters, Cyperaceae members are widely seen in

south India, ranging from sea level to high mountains. Most of the species of this family are used traditionally in south India as medicines, food, fodder, thatching materials and ornamentals, however only a few are scientifically investigated. Proper identification, documentation and conservation of the Cyperaceae species in south India for the sustainable utilisation of the plant wealth.

References

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