

## Occurrence of East Himalayan floral elements in the Eastern Ghats of Andhra Pradesh: I. Grasses

Ravi Prasad Rao<sup>2</sup>, B., B. Sadasivaiah, S. Sunitha and A. Madhusudhana Reddy<sup>1</sup>

Conservation Ecology Division, Department of Botany

Sri Krishnadevaraya University, Anantapur, 515003, Andhra Pradesh, India

<sup>1</sup>Department of Botany, Yogi Vemana University, Kadapa, 516003, Andhra Pradesh, India

<sup>2</sup>Corresponding author E-mail: [rao\\_rp@rediffmail.com](mailto:rao_rp@rediffmail.com)

### Abstract

A total of 92 wild and naturalized grass taxa from the flora of Eastern Himalaya are found in the Eastern Ghats of Andhra Pradesh. Of these, 54 are perennials and 32 are annuals. A total of 49 taxa are common throughout the Ghat area and 17 taxa have restricted distribution confining to single district. *Cymbopogon pendulus*, *Isachne albens*, *Paspalum conjugatum*, *Pseudechinolaena polystachya* and *Themeda villosa* are significant grasses.

**Key words:** Eastern Himalaya, Grasses, Eastern Ghats, Distribution

### INTRODUCTION

The Eastern Ghats are an assemblage of discontinuous hill ranges, distributed in four states, Orissa, Andhra Pradesh, Karnataka and Tamilnadu. In Andhra Pradesh the Ghats lies between 13°32' – 18° 20' N latitude and 78° 30' – 84°08' E longitude. Most of the Ghat forests are distributed in the districts of Srikakulam, Vizayanagaram, Visakhapatnam, East Godavari, West Godavari (Northern Eastern Ghats), Prakasam, Nellore, Chittoor, Kadapa and Kurnool (Southern Eastern Ghats). The altitude ranges from 150 – 1680 m above MSL. The highest elevation peaks over 1000 m are Armakonda (1680 m), Galikonda (1643 m), Mahendragiri (1501 m), Horsley hills (1234 m) and Tirumala (1155 m). Mean annual rainfall is 1000 – 1500 mm. The mean annual minimum temperature is 20°C, and maximum temperature is 36°C. Red and black soils dominate the study area. Godavari and Krishna are the major rivers that flow through the terrain. About 30,000 sq km forest area of the state is covered in the Eastern Ghats. Six forest types viz. Tropical semi-evergreen, moist deciduous, dry deciduous, dry savannahs, dry evergreen and scrub are found in the ghat area. A Centre of Plant Diversity, Nallamalais (WWF& IUCN 1995) and nine wildlife sanctuaries including Gundla Brahmeswaram and Sri Venkateswara are located in the Eastern Ghats of the state.

The Eastern Himalayas Region includes Bhutan, northeastern India, and southern, central, and eastern Nepal. Previously classified as a region within the Indo-Burma biodiversity hotspot, the Eastern Himalayas Region now stretches across the Indo-Burma Hotspot and Himalaya Hotspot, with the latter being identified as a new hotspot in 2005 by Conservation International. The Eastern Himalayan region of India lies between the latitudes 26° 40' - 29° 30' N and longitudes 88° 5' – 97° 5' E and covers a total area of 93,988km<sup>2</sup> comprising Arunachal Pradesh, Sikkim and Darjeeling hills of West Bengal; North-East Indian hills are categorized as purvanchal Himalaya (Singh 1971). The climate of Eastern Himalaya is characterized by cool summer and chilly winter. In most of the places rainfall is quite high and snowfall is quite regular in high altitude areas (> 3000 m).

Grasses is one of the largest natural homogenous group of plant kingdom included in a single family Gramineae (*nom alt.* Poaceae). The family comprises about 10,000 species belonging to 650 genera shows remarkable diversity and is vital for survival of other biodiversity elements on the planet. All the cereal crops and most of the forages are grasses. India harbor 1291 species of grasses (Nair & Sharmila 2001), of which about 300 are encountered in the state of Andhra Pradesh and 252 in the Eastern Ghats region of the state (Reddy 2002).

A perusal of literature (Bor 1960; Karthikeyan *et al.* 1989; Shukla 1996; Moulik 1997) has revealed that over 35% of grasses encountered in the Eastern Himalayas of India are found in the

Eastern Ghats of Andhra Pradesh. The present study provides the information of the grass taxa and their distribution pattern in the Eastern Ghats of the state.

## RESULTS AND DISCUSSION

During our studies in the Eastern Ghats of Andhra Pradesh for the past 15 years and intensive explorations in the ongoing research project on Eastern Ghat plant resources quantification sponsored by Department of Biotechnology, GOI as well a perusal of literature (Fischer 1928; Pullaiah 1997; Pullaiah & Karuppusamy 2008; Reddy 2002; Subbaiah 2008,) have revealed the presence of 260 grass taxa in the Eastern Ghats of Andhra Pradesh. Of the 260, we could identify 92 wild and naturalized taxa are found common to Eastern Himalayan region of India and the Eastern Ghats region of Andhra Pradesh. The list of 92 grass taxa along with its distribution pattern in the Eastern Ghat area of Andhra Pradesh is presented in Table 1.

**Table 1:** Eastern Himalayan grass elements in Eastern Ghats of Aandhra Pradesh

Name of the Taxon	Life span	Distribution in Eastern Ghats (districts)
<i>Apluda mutica</i> L.	P	Common throughout
<i>Arthraxon hispidus</i> (Thunberg) Makino	A	Visakhapatnam
<i>Arthraxon quartinianus</i> var. <i>quartinianus</i> (A. Richard) Nash	A	East Godavari and Visakhapatnam
<i>Arundinella bengalensis</i> (Sprengel) Druce	P	Visakhapatnam
<i>Arundinella nepalensis</i> Trinius	P	East Godavari and Kurnool
<i>Arundo donax</i> L. var. <i>donax</i>	P	Common throughout
<i>Axonopus compressus</i> (Swartz) P. Beauvois	A	Chittoor, East Godavari and Visakhapatnam .
<i>Bambusa arundinacea</i> (Retzius) Willdenow	P	Common throughout
<i>Brachiaria distachya</i> (L.) Stapf	A	Common throughout
<i>Brachiaria ramosa</i> (L.) Stapf	A	Common throughout
<i>Capillipedium assimile</i> (Steudel) A. Camus	P	East Godavari and Visakhapatnam
<i>Centotheca lappacea</i> (L.) Desvaux	P	Common throughout
<i>Chrysopogon aciculatus</i> (Retzius) Trinius	P	Chittoor, Godavari, Krishna and Visakhapatnam
<i>Chrysopogon lancearius</i> (Hook.f.) Haines	P	Prakasam .
<i>Chrysopogon serrulatus</i> Trinius	P	East Godavari
<i>Coelachne simpliciuscula</i> (Wight & Arnott ex Steudel) Munro & Bentham	A	Visakhapatnam
<i>Coix lacryma-jobi</i> L.	P	East Godavari, Nellore and Visakhapatnam
<i>Cymbopogon jwarancusa</i> (Jones) Schultes	P	Common throughout var. <i>jwarancusa</i>
<i>Cymbopogon martinii</i> (Roxburgh) W. Watson	P	Common throughout
<i>Cymbopogon pendulus</i> (Nees ex Steudel) W. Watson	P	Anantapur
<i>Cynodon dactylon</i> (L.) Persoon	P	Common throughout
<i>Cyrtococcum accrescens</i> (Trinius) Stapf	P	East Godavari
<i>Cyrtococcum oxyphyllum</i> (Steudel) Stapf	P	Common throughout
<i>Dendrocalamus strictus</i> Nees	P	Common throughout
<i>Dichanthium glabrum</i> (Roxburgh) Jain et Deshpande var. <i>glabrum</i>	P	Kurnool and Northern Eastern Ghats
<i>Digitaria abludens</i> (Roemer &Schultes)Veldkamp	A	Common throughout
<i>Digitaria ciliaris</i> (Retzius) Koeler	A	Common throughout
<i>Digitaria longiflora</i> (Retzius) Persoon	A	Common throughout
<i>Digitaria setigera</i> Roth ex Roemer &	A	Common in Chittoor Mahaboobnagar

Name of the Taxon	Life span	Distribution in Eastern Ghats (districts)
<i>Digitaria ternata</i> (A. Richard) Stapf ex Dyer Schultes var. <i>setigera</i>	A	Kurnool, Mahaboobnagar and Prakasam
<i>Echinochloa colona</i> (L.) Link	A	Common throughout
<i>Echinochloa frumentacea</i> Link	A	Nellore and Vizayanagaram
<i>Echinochloa stagnina</i> (Retzius) P. Beauvois	P	Common throughout
<i>Eleusine indica</i> (L.) Gaertner	A/P	Common throughout
<i>Eragrostis atrovirens</i> (Desfontaines) Trinius ex Steudel	P	Common throughout
<i>Eragrostis coarctata</i> Stapf	P	Common throughout
<i>Eragrostis diarrhena</i> (Schultes) Steudel	P	Common throughout
<i>Eragrostis japonica</i> (Thunberg) Trinius	P	Common throughout
<i>Eragrostis nigra</i> Nees ex Steudel	P	Chittoor and Visakhapatnam
<i>Eragrostis pilosa</i> (L.) P. Beauvois	A	Common throughout
<i>Eragrostis riparia</i> (Willdenow) Nees	P	Common throughout
<i>Eragrostis tenella</i> (L.) P. Beauvois var. <i>tenella</i>	A	Common throughout
<i>Eragrostis unioides</i> (Retzius) Nees ex Steudel	A/P	Common throughout
<i>Garnotia tenella</i> (Arnott ex Miquel) Janowski	A/P	Kurnool, Chittoor and Visakhapatnam
<i>Hackelochloa granularis</i> (L.) O. Kuntze	A	Common throughout
<i>Heteropogon contortus</i> (L.) P. Beauvois ex Roemer et Schultes	P	Common throughout
<i>Ichnanthus pallens</i> (Swartz) Munro ex Bentham	P	Visakhapatnam
<i>Imperata cylindrica</i> (L.) P. Beauvois var. <i>cylindrica</i>	P	Common throughout
<i>Isachne albens</i> Trinius	P	Visakhapatnam
<i>Isachne globosa</i> (Thunberg) O. Kuntze	A	East Godavari and Visakhapatnam
<i>Ischaemum rugosum</i> Salisbury	A/P	Common throughout
<i>Leersia hexandra</i> Swartz	A/P	Chittoor, Nellore, Guntur, Krishna, West Godavari and Visakhapatnam
<i>Leptochloa panicea</i> (Retzius) Ohwi	A	Visakhapatnam
<i>Microstegium ciliatum</i> (Trin.) A. Camus	P	Visakhapatnam
<i>Oplismenus burmanii</i> (Retzius) P. Beauvois	A	Common throughout
<i>Oplismenus compositus</i> (L.) P. Beauvois	P	Common throughout
<i>Oryza meyeriana</i> (Zollinger & Moritzi) Baillon ssp. <i>granulata</i> (Nees & Arnott ex Watt) Tateoka	P	Chittoor, Kurnool and Visakhapatnam
<i>Panicum brevifolium</i> L.	A	Chittoor, East Godavari and Visakhapatnam
<i>Panicum miliaceum</i> L.	A	Kurnool, Krishna and Prakasam
<i>Panicum notatum</i> Retzius	P	Common throughout
<i>Panicum psilopodium</i> Trinius	P	Common throughout
<i>Panicum repens</i> L.	P	Common throughout
<i>Paspalidium flavidum</i> (Retzius) A. Camus	A	Common throughout
<i>Paspalidium punctatum</i> (Burman f.) A. Camus	P	Rayalaseema and Godavari
<i>Paspalum conjugatum</i> O. Berg	P	Visakhapatnam
<i>Paspalum scrobiculatum</i> L.	A/P	Common throughout
<i>Pennisetum clandestinum</i> Hochst. ex Chiov.	P	Srikakulam
<i>Pennisetum purpureum</i> Schumacher	P	Chittoor, Guntur, Kurnool and Visakhapatnam
<i>Phargmites karka</i> (Retz.) Trinius ex Steudel var. <i>karka</i>	P	Common throughout

Name of the Taxon	Life span	Distribution in Eastern Ghats (districts)
<i>Pogonatherum crinitum</i> (Thunberg) Kunth	A	Chittoor, East Godavari, Kurnool, Nellore, Prakasam, Visakhapatnam
<i>Pseudechinolaena polystachya</i> (HBK) Stapf	A	Visakhapatnam
<i>Pseudopogonatherum contortum</i> (Brongh.) A. Camus	P	Visakhapatnam
<i>Rottboellia cochinchinensis</i> (Loureiro) W. D. Clayton	P	Common throughout
<i>Saccharum spontaneum</i> L.	P	Common throughout
<i>Sacciolepis indica</i> (L.) A. Chase	A	Common throughout
<i>Sacciolepis interrupta</i> (Willdenow) Stapf	A	Common throughout
<i>Sacciolepis myosuroides</i> (R. Br.) A. Camus	A	Chittoor and Srikakulam
<i>Setaria glauca</i> (L.) P. Beauvois	P	Common throughout
<i>Setaria palmifolia</i> (Koenig) Stapf	P	Chittoor, Nellore and North circars
<i>Setaria pumila</i> (Poiret) Roemer & Schultes	A	Common throughout
<i>Setaria verticillata</i> (L.) P. Beauvois	A	Common throughout
<i>Sporobolus diander</i> (Retzius) P. Beauvois	A	Common throughout
<i>Sporobolus fertilis</i> (Steudel) W. D. Clayton	A	Common throughout
<i>Sporobolus piliferus</i> (Trinius) Kunth	A	Guntur, Nellore and Visakhapatnam
<i>Themeda arundinacea</i> (Roxburgh) Ridley	P	Srikakulam
<i>Themeda laxa</i> (Anderss.) A. Camus	P	Visakhapatnam and Kurnool
<i>Themeda quadrivalvis</i> (L.) O. Kuntze var. <i>quadrivalvis</i> Fischer	P	Common throughout
<i>Themeda triandra</i> Forsskål	P	Common throughout
<i>Themeda villosa</i> (Poiret) A. Camus	P	Visakhapatnam
<i>Thysanolaena maxima</i> (Roxburgh) O. Kuntze	P	Northern Eastern Ghats .
<i>Tripogon trifidus</i> Munro ex Stapf	P	Kadapa and Chittoor
<i>Vetiveria zizanioides</i> (L.) Nash	P	Common throughout

Of the 92 taxa, 54 are perennials (59%), 32 are annuals (35%) and 6 are annual-perennials. A total of 49 taxa are common throughout the Eastern Ghats and 17 taxa have restricted distribution and are located in one district and 11 of them are located in Visakhapatnam district. *Cymbopogon pendulus*, *Isachne albens* and *Paspalum conjugatum*, *Pseudechinolaena polystachya*, *Themeda villosa*, *Tripogon trifidus* recently collected by our team forms are the new distributional records for peninsular India and Andhra Pradesh.

### Acknowledgements

The authors are grateful to Department of Science & technology (SP/SO/A-40/98) and Department of Biotechnology (BT/PR6603/NDV/51/089/2005), Government of India, New Delhi for financial support.

### LITERATURE CITED

- Bor, N.L. 1960. *The Grasses of Burma, Ceylon, India and Pakistan*. Pergamon Press, Oxford.
- Fischer, C.E.C. 1928. In J.S. Gamble's. *The Flora of presidency of Madras*. Vol.3. Adlard & Son, Limited, W.C., London.
- Karthikeyan, S., S.K.Jain, M.P. Nayar and M.Sanjappa 1989. *Florae Indicae Enumeration : Monocotyledons*. Botanical survey of India.
- Reddy, Madhusudhana A. 2002. *Grasses of Eastern Ghats of Andhra Pradesh, India*. Ph.D., Thesis, Sri Krishnadevaraya University, Anantapur.

- Moulik, S. 1997. *The Grasses and Bamboos of India*. 2 Vols. Scientific Publishers, Jodhpur.
- Nair, V. J. and Sharmila, Thomas. 2001. Poaceae. In V. Mudgal & P.K. Hazra (ed.) *Floristic Diversity and Conservation strategies in India*. Vol.4. Botanical Survey of India, Calcutta.
- Pullaiah, T. 1997. *Flora of Andhra Pradesh (India)*, Vol.3. Scientific Publishers, Jodhpur.
- Pullaiah, T. and S. Karuppusamy. 2008. *Flora of Andhra Pradesh (India)*, Vol.5. Scientific Publishers, Jodhpur.
- Shukla, V. 1996. *The Grasses of North-Eastern India*. Scientific Publishers, Jodhpur.
- Singh, R.L. (ed.). 1971. *India - A Regional Geography*. National Geographical Society of India, Varanasi.
- Subbaiah, K.V. 2008. *Grasses of Arid zone of peninsular India*. Ph.D, thesis submitted to Sri Krishnadevaraya University, Anantapur.