A Taxonomic Account of Poaceae Subfamily Panicoideae in Andhra Pradesh and Telangana States, Southern India

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in
Botany

Submitted by

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CERTIFICATE

This is to certify that the Ph.D. thesis entitled "**A Taxonomic Account of Poaceae Subfamily Panicoideae in Andhra Pradesh and Telangana States, Southern India"** is the record of *bona fide* research work carried out by **Mr. Settipalle Gurappa,** M.Sc., under my supervision and guidance at the Department of Botany, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India. This is submitted for the award of the **DOCTOR OF PHILOSOPHY** in **BOTANY** to Bharathidasan University, Tiruchirappalli.

I further certify that the research work is original and the data presented in the thesis are based on his own observations and no portion thereof has been submitted elsewhere in part or full for any other Degree, Diploma, Associate-ship, Fellowship or other similar titles of this or any other University or Society.

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DECLARATION

I hereby declare that the Ph.D. thesis entitled **"A Taxonomic Account of Poaceae Subfamily Panicoideae in Andhra Pradesh and Telangana States, Southern India"**, submitted by me for the award of the degree of **Doctor of Philosophy** in **Botany**, is the result of my original and independent work carried out at the Department of Botany, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu under the supervision of **Dr. T. Senthil Kumar**, Professor, Department of Botany, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India. The thesis has not formed previously the basis for the award of any degree, diploma, associate-ship, fellowship or any other similar title.

(**Settipalle Gurappa**)

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1 I. INTRODUCTION 1.1 GENERAL The study of grasses, a branch of systematic botany, is called Agrostology (Greek: ἄγρωστις, agrōstis, "type of grass"; λογία –logia means a kind of grass + body of knowledge). It is the study, especially,of the identification, classification and evolution of grasses. On the other, the scientific study of grasses is called Graminology. All true grasses belong to the family Gramineae (nom. alt. Poaceae; type Poa L.); they represent the true Monocots among the flowering plants (Angiosperms). The grasses are distributed under the all climatic conditions, soil types and all over the globe. The grasses (as cereals) are very importantand provide us food, fodder, cellulose fiber (rayon), fuel, roof material, brooms, brushes, oil, jaggery and sugar,pulp for paper and help to conserve the soil besides being ornamental and the lawn grasses. The Poaceae represent a very successful divergence in the evolution of Angiosperms, having diversified throughout the Cenozoic to become the fifth most species-rich family of flowering plants, ranking only behind the Fabaceae (33,000 spp.), Orchidaceae (28,000 spp.), Asteraceae (23,000 spp.), and Rubiaceae (13,500 spp.) (Hodkinson & Parnell, 2007; Soreng et al., 2017). 1.2 EVOLUTION OF GRASSES A new worldwide phylogenetic classification of Poaceae was provided by Soreng et al.(2017). According to this system, 11,506 grass species in 768 genera, 12 subfamilies, seven supertribes, 52 tribes, five supersubtribes, and 90 subtribes were realized. The Poaceae are ecologically dominant ecosystems as grasslands, bamboo forests or savannahs; these are estimated to occupy 40% of the Earth's land surface (Gibson, 2009). It is much more and manifold when we consider the area of occupancy by cereals (crops) which provide the staple food to the people, feed and fodder to the domesticated animals.

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(**Settipalle Gurappa**)

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ABBREVIATIONS

1. DISTRICTS

(a) ANDHRA PRADESH

(i) Costal Andhra

EG	:	East Godavari
GNT	:	Guntur
KSN	:	Krishna
NLR	:	Nellore
PKM	:	Prakasam
SKLM	:	Srikakulam
VJN	:	Vizianagaram
VSKP	:	Visakhapatnam
WG	:	West Godavari

(ii) Rayalaseema

ATP	:	Ananthapur (Ananthapuram)
CDP	:	Cuddapah (Kadapa)
CTR	:	Chittoor
KNL	:	Kurnool

(b) TELANGANA

ADB	:	Adilabad
HYD	:	Hyderabad
KMM	:	Khammam
KNR	:	Karimnagar
MBNR	:	Mahabubnagar
MDK	:	Medak
NLG	:	Nalgonda
NZB	:	Nizamabad
RR	:	Rangareddy
WGL	:	Warangal

2. HERBARIA ACRONYMS

(i) INTERNATIONAL

K : Kew, Royal Botanic Gardens, UK

E : Edinburgh, Royal Botanic Garden, UK

G : Geneva, Conservatoire et Jardin botaniques de la Ville de Genève

L : Leiden, National Biodiversity Centre, Netherlands

P : Paris, Museum National d'Histoire Naturelle

(ii) INDIAN

AUV : Andhra University Herbarium, Visakhapatnam

CAL : Central National Herbarium, Kolkata

DD : Dehra Dun, Uttarakhand

DRC : Botanical Survey of India, Deccan Regional Center, Hyderabad

FRC : Fischer Herbarium, Institute of Forest Genetics and Tree Breeding, Coimbatore

KUW : Kakatiya University, Warangal, Telangana

MH : Madras Herbarium, Coimbatore, Tamil Nadu

RHT : Rapinat Herbarium, St. Joseph's College, Tiruchirappalli, Tamil Nadu

SKU : Sri Krishnadevaraya University Herbarium, Anantapuram, Andhra Pradesh

SVT : Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh

3. PLANT COLLECTORS

AMR : A. Madhusudana Reddy

ANH : A.N. Henry

BO : Bourne

BR : B. Ravi Prasad Rao

BSS : B. Sadasivaiah

CAB : C.A. Barber

CECF : C.E.C. Fischer

CPR : C. Prabhakar Raju

CSR : C.S. Reddy

DCSR : D.C.S. Raju

EKK : E.K. Krishnan

GO : G. Obulesu

GVS	:	G. V. Subba Rao
JLE	:	J.L. Ellis
JSG	:	J.S. Gamble
KCJ	:	K.C. Jacob
KMS	:	K.M. Sebastine
KS	:	K. Subramanian
KSM	:	K. Srirama Murthy
MCB	:	M. Chandrabose
MRS	:	M.R. Suxena
MSG	:	M.S. Gayathri
MSM	:	M. Silar Mohamed
NPBK	:	N.P. Balakrishnan
NRR	:	N. Rama Rao
NY	:	N. Yesoda
PVP	:	P.V. Prasanna
PVSK	:	P.V. Sreekumar
RR	:	R. Rajan
RVR	:	R.R. Venkata Raju
SKB	:	S. Khader Basha
SRS	:	S.R. Srinivasan
TAR	:	T. Ananda Rao
TP	:	T. Pullaiah
TRS	:	T. Ravi Shankar
VNS	:	V. Narayanaswami
VRK	:	V. Ramakrishnaiah
VSR	:	V.S. Raju

4. UNITS

AMSL	:	Above Mean Sea Level
cm	:	centimeter
ha	:	hectare
m	:	meter
mm	:	millimeter

I. INTRODUCTION

1.1 GENERAL

The study of grasses, a branch of systematic botany, is called *Agrostology* (Greek: ἄγρωστις, *agrōstis*, "type of grass"; λογία –*logia* means a kind of grass + body of knowledge). It is the study, especially, of the identification, classification and evolution of grasses. On the other, the scientific study of grasses is called *Graminology*. All true grasses belong to the family Gramineae (nom. alt. Poaceae; type *Poa* L.); they represent the true Monocots among the flowering plants (Angiosperms). The grasses are distributed under the all climatic conditions, soil types and all over the globe. The grasses (as cereals) are very important and provide us food, fodder, cellulose fiber (rayon), fuel, roof material, brooms, brushes, oil, j*aggery* and sugar, pulp for paper and help to conserve the soil besides being ornamental and the lawn grasses. The Poaceae represent a very successful divergence in the evolution of Angiosperms, having diversified throughout the Cenozoic to become the fifth most species-rich family of flowering plants, ranking only behind the Fabaceae (33,000 spp.), Orchidaceae (28,000 spp.), Asteraceae (23,000 spp.), and Rubiaceae (13,500 spp.) (Hodkinson & Parnell, 2007; Soreng *et al*., 2017).

1.2 EVOLUTION OF GRASSES

A new worldwide phylogenetic classification of Poaceae was provided by Soreng *et al*. (2017). According to this system, 11,506 grass species in 768 genera, 12 subfamilies, seven supertribes, 52 tribes, five supersubtribes, and 90 subtribes were realized. The Poaceae are ecologically dominant ecosystems as grasslands, bamboo forests or savannahs; these are estimated to occupy 40% of the Earth's land surface (Gibson, 2009). It is much more and manifold when we consider the area of occupancy

by cereals (crops) which provide the staple food to the people, feed and fodder to the domesticated animals.

1.2.1 Evolutionary History and Phylogenetic Tree

There has been considerable progress in the understanding of evolution of grasses. It is due to the advent of cheap and efficient DNA sequencing in the later part of the 20th century. Earlier, the Grass Systematists have used traditional morphological and anatomical traits to determine the evolutionary history of the group. Such study was difficult and required extensive morphogenetic and anatomical investigations to establish appropriate comparisons. In view of these difficulties, many Grass Systematists are now using DNA sequences to determine the phyletic relationships. Since a large numbers of DNA sequences are required for the studies, it has led to collaborative. Groups of scientists combine their data to attain a common goal. This is an unusual endeavour for systematists who traditionally have worked alone, each investigating a single group of organisms.

Now, we almost have a clear picture of the evolutionary history of the grass family. This stems from restriction site maps of the chloroplast genome (Soreng & Davis, 1998), sequences of chloroplast genes, including rps4 (Nadot *et al*., 1994), ndhF (Clark *et al*., 1995), rbcL (Barker *et al*., 1995), rpoC2 (Barker *et al*., 1999), matK (Hilu *et al*., 1999), and sequences of several nuclear genes, such as 18S rDNA (Hamby & Zimmer, 1988), GBSSI (Mason-Gamer *et al*., 1998), ITS (Hsiao *et al*., 1999) and phytochrome B (Mathews *et al*., 2000). Some of these studies were hampered by small sample sizes or insufficient numbers of variable bases. But all had reached similar conclusions about the order of events in the evolution of Poaceae. The data from seven of these sources have been combined by a consortium of 13 researchers, who called themselves the GPWG: *Grass*

Phylogeny Working Group (www.virtualherbarium.org/GPWG/), and produced a phylogeny tree (GPWG, 2000). This evolutionary history was strongly supported by bootstrap and decay analyses, and statistics that measure the extent to which the data support the tree topology.

The GPWG had chosen 59 representative species for study of the phylogeny of Poaceae. These were chosen to be ambassadors for all known major groups plus a set of species whose relationships were unknown. They took advantage of earlier investigations that had studied sets of morphological characters across hundreds of species. For example: (i) The Russian Cytogeneticist Avdulov (1931) reported on chromosome number and karyotype of many hundreds of grasses and found that a large group of temperate grasses had much larger chromosomes than the other grasses, with a base number (x) of 57. This group includes such familiar species as wheat (*Triticum*), barley (*Hordeum*), rye (*Secale*) and oats (*Avena*), as well as the most north temperate lawn and pasture grasses; and (ii) Prat (1932), the French anatomist, looked at the shape and structure of epidermal cells and found that the subsidiary cells of foliar stomata in Avdulov's x 57 Group have outer walls that are parallel rather than curved or sinuous. Besides, this group was found to represent a single lineage in every DNA study to-date (for summary, see Kellogg, 1998; GPWG, 2000). The GPWG (2000), therefore, resolved to represent it by only three genera, *Avena, Bromus* and *Triticum*, besides barley, rye, and all the temperate grasses commonly placed in the subfamily Pooideae.

The phylogeny correlates with information from mapping of the nuclear genome (Kellogg, 1998) in which the genes are in a similar order in all grasses (Gale & Devos, 1998). So, the whole chromosomes of rice can be lined up with chromosomes of wheat or maize. However, major re-arrangements have occurred, among blocks of linked genes,

and these correlate with the phylogeny. For example, in the panicoid grasses maize (*Zea*), sugar cane (*Saccharum*), sorghum (*Sorghum*), pearl millet (*Pennisetum*) and foxtail millet (*Setaria*), the linkage group corresponding to rice chromosome 10 which is inserted into the middle of what had been rice chromosome 3. The centromere of chromosome 3 was apparently replaced by the centromere of chromosome 10, which is now the centromere for the entire combined chromosome. Rice chromosome 9, similarly, has been inserted in rice 7. Other rearrangements have occurred in the subfamily Pooideae, correlating with the change in chromosome number to x 57 Group, with a marked increase in genome size (Bennetzen & Kellogg, 1997).

The GPW Group has produced a revised classification with the names of plants governed by the International Code of Nomenclature for Algae, Fungi and Plants, analogous to the standards developed for *Arabidopsis* or maize gene nomenclature (Meinke & Koornneef, 1997). For convenience, a large family may be divided into subfamilies, subfamilies into tribes, and tribes into subtribes, etc. All these intermediate ranks are used in Poaceae because it is so big. The subfamily names conventionally end in -*oideae*, tribes in -*eae*, and subtribes in -*inae.* Some taxonomists have suggested dropping a ranked classification as it may be cumbersome and confusing. But, this proposal has not received wide support and acceptance yet.

The earlier classifications were created using only characters that could be observed on pressed dried specimens. The molecular data have shown that some groups so delimited were accurate in reflecting evolutionary history; but some changes have been necessary. Each group with a name is required to represent only a single lineage. The subfamilies were named as similar as possible to those that previous workers had recognized. Therefore, for much of the family, the molecular classification is similar to

those presented by Clayton & Renvoize (1986) and Watson & Dallwitz (1999). To illustrate, the Pooideae includes Avdulov's x 57 Group but is expanded to include some genera whose relationships had only been guessed at by the previous workers. The Panicoideae (its members all have paired flowers with the upper one generally hermaphroditic and the lower one staminate or reduced), including maize, sorghum, common millet, and foxtail millet. This has been recognized since the time of Brown (1810, 1814) and remains largely unchanged.

The Chloridoideae, including finger millet and teff, was originally recognized by the structure of its micro-hairs and its C_4 anatomy. The Bambusoideae, including the woody and herbaceous bamboos, is characterized by asymmetrically lobed mesophyll cells (Zhang & Clark, 2000). In its new circumscription, the subfamily Bambusoideae now represents a much smaller group than it was in the past. These four subfamilies, together, account for nearly 90% of the species in Poaceae.

The major point of discussion in the recent literature has been the disposition of the large group of grasses known by the acronym PACC (Panicoids, Arundinoids, Chloridoids and Centothecoids). Although the entire group could have been designated a single large subfamily, the only morphological characteristic they share is a long internode in the embryo below the leaves around the point of attachment of the presumed cotyledon (mesocotyl), a character difficult to observe under most ordinary circumstances. The revised classification thus recognizes Chloridoideae and Panicoideae as distinct subfamilies while the remaining groups were either given names or left *incertae sedis*, i.e. "of uncertain placement".

1.3 DINOSAURS DID NOT EAT GRASS

Based on the grass pollen in the fossil records, their ancestors lived before 70–50 million years ago (Kellogg, 2001). The grass pollen grains are spherical and monoporate and the earliest records belong to 60–50 million years ago from Paleocene of South America and Africa (Jacobs *et al*., 1999). This timing was after the major extinction events that ended the Age of *Dinosaurs* and the Cretaceous period.

1.4 WHAT HAPPENED WHEN THE GRASSES ORIGINATED?

Right around the end of the Cretaceous or the beginning of the Tertiary period, changes happened in the divergence of monocots. A major change occurred in the embryo development. Most monocotyledonous plants have largely undifferentiated embryos. Seed maturation begins after the embryo has formed a shoot apical meristem. But the differentiation of cotyledon, leaves, root meristem and vasculature largely occurs after the seed is shed from the parent plant. However, in grasses, the embryo development is accelerated relative to seed maturation (Kellogg, 2000). Simultaneously, there was a notable change in the structure of the fruit. All the ancestors of the grasses had ovaries formed of three fused carpels (tricarpellay syncarpous, triolocular); each carpel forming one locule with one ovule (Kellogg & Linder, 1995). In many of the close grass relatives, it was presumed in the grass ancestors, two of those ovules abort and only one develops (Dahlgren *et al*., 1985; Linder, 1991). In the grasses, only one locule and one ovule ever form. As the ovule develops, the outer integument fuses with the inner ovary wall to form the distinctive fruit of the grasses, known as the *grain* or *caryopsis*, a unique structure among the flowering plants.

The grasses are wind-pollinated but so are all their relatives (Linder & Kellogg, 1995). We can infer that anemophily originated millions of years before the grasses

appeared on earth. Along with wind pollination happened, a reduction in perianth size and loss of pollen stickiness (Linder, 1998). All the relatives of the grasses similarly accumulate silica somewhere in the plant so this trait also must have originated well before the grasses themselves did. Besides, a large set of monocotyledonous plants, including not only the grasses but also the gingers, pineapples, and palms, have cell walls rich in ferulic acid which is yet another ancient characteristic preserved in the grasses.

Other "grass" characteristics originated long after the first grasses appeared (GPWG, 2000; Kellogg, 2000). The most notable of these is drought tolerance and the capacity to grow and thrive in dry open habitats. The original grasses were plants of forest margins or deep shade, characteristics that are retained today in some grasses. The phylogeny shows that the grasses persisted for many millions of years in such habitats. The major diversification of Poaceae in the mid-Miocene epoch was detected in the fossil record, by a marked increase in the amount of grass pollen (Jacobs *et al*., 1999).

1.5 ECONOMIC IMPORTANCE

The grasses are by far the most important plant group, providing our: (i) staple cereals such as *Eragrostis* (Teff: one of most important staple crops in Ethiopia and Eritrea)*, Hordeum, Oryza, Secale, Sorghum, Triticum* and *Zea*; (ii) sugar crops such as *Saccharum* and *Sorghum*; (iii) reeds such as *Arundo* and *Phragmites*; and (iv) bamboo for food, building, and amenity materials such as *Bambusa* and *Phyllostachys* (Clayton & Renvoize, 1986; Hodkinson *et al*., 2000). The Poaceae also provide many forage and lawn grasses as tropical species in *Cenchrus, Cynodon, Digitaria, Panicum, Paspalum, Stenotaphrum, Urochloa* and *Zoysia,* or temperate species in *Alopecurus, Cynosurus, Dactylis, Festuca, Lolium, Phleum* and *Poa* (Hodkinson *et al*., 2007a). Recently, *Arundo,*

Miscanthus and *Saccharum* have become important sources of raw material for the biomass and bioenergy industries (Hodkinson *et al*., 2015).

There are 65 wild crop relatives which belong to 18 genera of 24 cultivated grasses in combined Andhra Pradesh (Elangovan *et al*., 2012). The commercial grasses are to a maximum of 11 species with 23 wild relative species, followed by small millets with seven species (+ 22 wild relatives), millets with two crop species (+ 12 wild relatives), cereals with four cultivated crop species (+ 8 wild relatives). Among these, the genus *Panicum* is having a maximum of 10 wild relatives, followed by bamboo and *Cymbopogon* (9 spp. each), *Pennisetum* (7), *Oryza* (6), *Sorghum* and *Setaria* (5 each) and *Zea* (2) besides four crop species represented by one wild relative each.

Food: The cereals and millets are major food crops of Poaceae. *Oryza sativa* L. (rice) is the major food crop in India. *Triticum aestivum* L., (wheat) provides the staple food of hundreds of millions of people. *Cenchrus americanus* (L.) Morrone., (≡*Pennisetum typhoides*; Peral Millet), *Setaria italica* (L.) P. Beauv*., Sorghum bicolor* (L.) Moench., (Jowar, Great millet, broom corn), *Zea mays* L., (Maize) and *Panicum miliaceum* L., (common millet) are grown in areas suitable for their cultivation. *Eleusine coracana* (L.) Gaertn., (Ragi) is one of the main food sources in southern India and some primitive ethnic tribes in Araku Valley Agency Area (Visakhapatanam district, Andhra Pradesh) cultivate it through *Podu* (Solu). *Hordeum vulgare* L., (Barley) is cultivated in parts of higher altitude Himalaya, whereas *Avena sativa* L., (Oats) cultivated in very limited area in north-western Himalaya. *Saccharum officinarum* L., (Sugarcane) is cultivated on large scale throughout India.

Fodder: Cattle are happy to graze on most of the grasses. Bor (1960) classified the fodder grasses as of four categories based on habitations: (i) **Plains and moist habitats**: *Andropogon pumilus* Roxb.*, Bothriochloa pertusa* (L.) A. Camus.*, Cenchurus ciliaris* L.*, Cynodon dactylon* (L.) Pers.*, Echinochloa colona* (L.) Link., and *Panicum repens* L.; (ii) **Desert and Sea coast habitats:** *Aeluropus lagopoides* (L.) Trin. ex Thwaites.*, Desmostachya bipinnata* (L.) Stapf.*, Ischaemum afrum* (J.F. Gmel.) Dandy., and *Tragus monglorum* Ohwi.; (iii) **Hills and Dry habitats:** These are species of *Bromus*, *Digitaria*, and *Bothriochloa*; and (iv) **Exotic Fodder grasses:** *Cenchrus purpureus* (Schumach.) Morrone.*, Melinis minutiflora* P. Beauv.*, Megathyrus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs.*, Paspalum dilatatum* Poir.*, Sorghum halepense* (L.) Pers., and *Zea mays* L.

Essential oils: *Cymbopogon flexuosus* (Nees) Will*, C. nardus* (L.) Rendle and *C. citrates* (DC.) Stapf., are cultivated for extracting citronella oil used in soaps, disinfectants and polishes, whereas the lemon grass powder used for beverages (Tea). *Chrysopogon zizanioides* (L.) Roberty (*Vetiveria zizanioides*) is cultivated for Vetiver oil and fragrant mats used as curtains to reduce summer temperatures.

Ornamental grasses: *Cenchrus compressus* (R.Br.) Morrone (*Pennisetum villosum*) *Melinis repens* (Willd.) Zizka*, Miscanthus nepalensis* (Trin.) Hack., and *Setaria palmifolia* (J. Koenig) Stapf., are planted in gardens.

Lawn grasses: *Cynodon dactylon* (L.) Pers., and *Zoysia matrella* (L.) Merr., are used for making Lawns.

Soil binders: On the seashore, *Aeluropus lagopoides* (L.) Trin. ex Thwaites, *Halopyrum mucronatum* (L.) Stapf.*, Spinifex littoreus* (Burm.f.) Merr., and *Zoysia matrella* (L.) Merr., are the useful natural colonizers of coastal flats and sand stabilizers of their spread.

Grasses with Medicinal Properties: *Arundinella nepalensis* Trin. is used for healing wounds and *Pogonatherum crinatum* (Thunb.) Kunth., for skin diseases.

Paper industry: *Heteropogon contoruts* (L.) P. Beauv., and *Saccharum spontaneum* L., are used in paper industry.

Ornaments: The caryopses of *Coix* species are used for decoration, ear rings and necklaces by Naga tribes (Bor, 1960).

Musical instruments: The hollow culms of *Arundo donax* L., and *Phragmites karaka* (Retz.) Trin. ex Steud., are used for shepherds' pipes in north-west India.

Hindu rituals: *Cynodon dactylon* (L.) Pers., (*Garika gaddi*) and *Imperata cylindrica* (L.) P. Beauv., are used for worship and in religious ceremonies in India. According to Dymock (1885), *Desmostachya bipinnata* (L.) Stapf., has an important place in Hindu rituals.

Miscellaneous uses:

Brooms: The grass inflorescences of *Aristida setacea* Retz., *Arundinella setosa* Trin., and *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda., are used for making brooms.

Thatching: *Arundo donax* L., *Cymbopogon caesius* (Ness ex Hook. & Arn.) Stapf., *Imperata cylindrica* (L.) P. Beauv*., Themeda cymbaria* Hack. and *Phragmatis karka* (Retz.) Trin. ex Steud., are used for thatching by the tribal people.

Mats: The culms of species of *Arundo*, *Phragmates* and Bamboo are used for flooring and walling, whereas *Chrysopogon zizanioides* (L.) Roberty., is used for making "tatties".

Ropes: *Desmostachya bipinnata* (L.) Stapf., and *Eulaliopsis binata* (Retz.) C.E. Hubb., are used for making ropes (cordage), charpoys (light bedstead used in India) and tying.

1.6 POACEAE

The Poaceae are represented globally by 10,000 species in 600–700 genera (Watson & Dallwitz, 1992). In India, there are 1200 species from 268 genera (Karthikeyan *et al.*, 1989). However, the recent checklist of Indian grasses by Kellogg *et al.,* (2020) put the number of Poaceae as 266 genera and 1,506 species.

The subfamily Panicoideae of Poaceae in the world includes about 3270 species and 206 genera (GPWG, 2001). In India, the Panicoideae, according to the checklist of the grasses of India (Kellogg *et al*., 2020), has 6–8 tribes, 98 genera and 668 species present. So, it is one of the largest subfamilies in India contributing to 23% of genera and 44% grass species. In view of its ecological and economic importance, this subfamily Panicoideae was chosen for the present study to deal with its ecology, distribution and taxonomy. The study was to be limited to this subfamily because the Poaceae are a very large family and as well the study area, the combined state of Andhra Pradesh (Telugu-speaking land) though now segregated into two states, i.e., Andhra Pradesh and Telangana, geographically vast large area for the nature of work.

1.6.1 Poaceae Subfamily Panicoideae

These grasses generally have fibrous root system; in marshy areas, they form mats (*Chrysopogon zizanoides* (L.) Roberty*., Imperata* spp., *Saccharum sponataneum* L*.,* etc.); and stilt roots develop in some species (spp. of *Chinonachne*, *Rottboellia* and *Sorghum*). The roots of *Chrysopogon zizanoides* (L.) Roberty., are aromatic and of commercially importance (Vetiver oil). The grass stems, called culms, consist of a series of nodes and internodes. Culms are generally terete, smooth and ribbed, and in some species they are shallowly furrowed (*Andropogon polyptyches* Steud.). Ligule is usually present at the junction of sheath and blade, on the inner side. Ligule is absent in some

species (e.g. *Echinochloa colonum* (L.) Link, *E. crusgalli* P. Beauv.). Leaf blades are attached to the sheath, usually they are linear. The leaf blades may be elliptic, ovate or obovate-oblong (*Centotheca lapacea* (L.) Desv., *Oplismenus* spp.) The leaves may be glabrous, pubescent or sparsely tuberculate hairy (*Eulalia* spp.). The inflorescence is terminal or an axillary spike (spp. of *Andropogon*, *Apocopis*, *Digitaria*, *Dimeria* and *Paspalum*) or panicle (spp. of *Arundinella*, *Capillipedium* and *Panicum*), while in some species it is terminal and leaf-like (spp. of *Iseilema, Schizachyrium* and *Themeda*). The size, shape and texture of glumes are highly variable. Lemmas are well-developed in some species while reduced in others. The palea is a floral bract, directly facing the lemma. The presence or absence of palea in a spikelet is a variable character. The stamens are three or two. The fruit is caryopsis (a grain).

1.6.2 Important Publications on revision of tribes and genera of Panicoideae in India

The noted taxonomic accounts on Panicoideae were on *Dimeria* (Bor, 1952; Terawatananon *et al*., 2014; Kiran Raj *et al*., 2015), *Arundinella* (Bor, 1955), Panicoideae (Raizada *et al*., 1957; Raizada & Jain, 1964), *Arthraxon* (Jain, 1972; van Welzen, 1981), *Panicum* (Majumdar, 1973), tribe Garnotieae (Prakash & Jain, 1979), tribe Andropogoneae (Deshpande, 1984), *Heteropogon* (Deshpande, 1990) and Andropogoneae genera such as *Eulalia* (Sur, 1985a), *Pogonatherum* (Sur, 1985b) and *Sehima* (Sur, 1988).

1.7 REVIEW OF LITERATURE ON GRASSES OF INDIA

1.7.1 Important Floristic works on Grasses of India

Duthie (1883, 1886, 1888) surveyed the grasses of North-Western India while Symonds (1886) provided an account of Indian grasses. On the other, Coldstream (1889) illustrated to the grasses of South Punjab, whereas Lisboa (1896) dealt with Bombay

grasses, with illustrations. The *Flora of British India* (Hooker, 1897) made available a full account of the grasses of India. Gamble (1896) published the Bambuseae of British India. Cooke's (1903–1908) *Flora of the Presidency of Bombay* included a good account of grasses in the region. Again, the grasses of Bombay were illustrated and updated by Blatter & McCann (1935). Rangacharaiyar & Mudaliyar (1921) and Fischer (1934) described the South Indian grasses and the grasses of Madras Presidency, respectively. Bor studied the grasses of Assam in 1940, Uttar Pradesh in 1941, and finally the grasses of whole Indian subcontinent in 1960. Besides, several other workers contributed to the grass flora of India, the important works being Caius (1936), Kapadia (1945), Desai & Murty (1950), Tiwari (1954), Majumdar (1956), Chaudhary (1959, 1960), Singh *et al*. (1976), Sharma (1983) and Roy (1984).

A synoptic account and the phytogeography of grasses of India were furnished by Jain (1986) who reported 266 genera and 1200 species. Then, Karthikeyan *et al*. (1989) listed 1254 species belonging to 260 genera of Poaceae. Sreekumar & Nair (1991) reported 296 species of 103 genera for Kerala state. Sharma *et al.* (1996) listed 373 species of 104 grass genera for Maharashtra which was updated to 415 species and 125 genera by Potdar *et al*. (2012). Then, Moulik (1997) accounted for the grasses and bamboos of India. Then, Kabeer & Nair (2009) reported 447 species belonging to 136 genera for Tamil Nadu.

1.7.2 Floristic works on erstwhile Andhra Pradesh

In the study of the flora of different regions and districts of the erstwhile Andhra Pradesh: Rao (1977) reported 44 grass species for Visakhapatnam district; Venkaiah (1980) noted 58 grass species from Viziayanagaram district; Rao *et al*. (1981) recorded 89 grass species from Tirumala hills; Rao & Harasreeramulu (1986) listed 70 species of 50

genera from Srikakulam district; Krishnamohan (1987) collected 56 grass species from Prakasam district; Prasanna (1988) enumerated 176 grass species from Rayalaseema region. Rao (1989) gathered 35 grass species from Cuddapah district; Pullaiah & Yesoda (1989) found 82 grass species in Anantapuram district; Rangacharyulu (1991) enumerated 41 grass species from Chitoor district; Thammanna *et al.* (1994) recorded 82 grass species from Tirumala Hills of Chitoor district; Raju & Pullaiah (1995) listed 119 grass species from Kurnool district; Lakshminarayana *et al*. (1997) enumerated 95 grass species from Krishna district; Pullaiah (1997) listed 279 grass species in the *Flora of Andhra Pradesh*; Rao *et al*. (1999) recorded 33 genera with 40 species from west Godavari district; Pullaiah *et al*. (2000) listed 86 grass species from Guntur district; Suryanarayana & Rao (2001) explored the flora of Nellore district and recorded 48 grass species; and Chetty *et al*. (2008) enlisted 150 grass species for the district of Chittoor in Rayalaseema of Andhra Pradesh.

1.7.3 Floristic works on Grasses of Telangana

The district floras in Telangana region had the following accounts of grass species numbers listed district-wise: Adilabad: 90 (Pullaiah *et al*., 1992); Nizamabad: 59 (Pullaiah & Rao, 1995); Ranga Reddy: 69 (Pullaiah & Mohammad, 1998); Medak: 83 (Pullaiah *et al*., 1998); Nalgonda: 42 (Rao *et al*., 2001); Karimnagar: 92 (Naqvi, 2001); Warangal: 103 (Reddy, 2001); and Hyderabad: 118 (Ramana, 2010). For the flora of Telangana, Pullaiah (2015) listed 213 grasses and Reddy & Reddy (2016) recorded 194 species.

1.8 IMPORTANT EARLY PLANT COLLECTORS OF GRASSES FROM ANDHRA PRADESH AND TELANGANA

1.8.1 Andhra Pradesh

Dr. Williaim Roxburgh (1795–1819), the Scottish surgeon and botanist, who is called the 'Founding Father of Indian Botany' collected and several grass species with vernacular names from Godavari (East) district around Samarlkot and Rajahmundry Circar (e.g. *Andropogon tridentatus* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 261. 1820. Type: India: Native of Coromandel; *Roxburgh s.n.*). Later, Dr. Robert Wight (1834–1837) collected and described *Andropogon bellariensis* Hack., Flora 68: 123. 1885. Type: India: Anantapur district, on Gooty Fort Hill, Bellari; *Wight 2321* from Ghooty Fort Hill. Sir Walter Elliot (1859) worked on 'Flora Andhrica' of vernacular names including those of grasses in the region. Sir A.G. Bourne (1901–1902) collected species of *Chrysopogon*, *Dimeria* and *Sehima* from Godavari and Nellore districts. Gamble (1917) collected *Andropogon* spp. from Anantapuram and Cuddapah, whereas Fischer (1909–1918) gathered plants from Anantapuram, Chitoor, Cuddapah, Kurnool and Nellore districts. Barber (1902–1907) collected the species of *Chrysopogon*, *Imperata, Ischaemum*, *Sehima* and *Themeda* in Krishna district and *Andropogon* species from Basion hills and Samarlkot of Godavari district.

Of the Indian botanists, Jacob (1923–1938) collected *Ischaemum* species from Bavikonda RF in Vizagapatnam (Visakhapatnam), Samarlkot in Godavari, and *Lophopogon tridentatus* (Roxb.) Hack., from Madikonda in Chitoor districts. Narayanaswami (1930) collected the species of *Andropogon* from Maripilli, whereas Raju (1962–1965) gathered 12 grass species from Simhachalam Hill in Visakhapatnam district. Ellis (1987,1990) explored the grasses from Nallamalla Hills of Kurnool and Prakasam districts. Later, Subramanian (1965–1967) of Forest Ranger's College, Coimbatore, did botanize and

collect *Lophopogon tridentatus* (Roxb.) Hack., from Palakonda Hills of Kadapa district and *Cymbopogon* species from Nallamalais in Kurnool and Prakasam districts. Wagh (1960), in his study of the flora of Andhra for his doctoral degree, described the grasses of the state.

1.8.2 Telangana

Patridge (1911), Sayeeduddin (1935, 1938, 1941a,b), Saxena (1947) and Khan (1953) studied the grasses of the H.E.H. the Nizam's Dominions, Hyderabad, Deccan. In independent India, Sebastine *et al*. (1960) studied the flora of Narsapur forests in Medak district and Sebastine & Henry (1966) listed 33 grass species from Pakhal Wildlife Sanctuary. Subbarao & Kumari (1967) reported 34 grass species from parts of Karimnagar district.

1.9 JUSTIFICATION FOR THE PRESENT STUDY

There are only scattered reports but not a comprehensive work on the grasses and grasslands of Andhra Pradesh and Telangana states. The district and state floras are based on collections, compilations of various publications but the variations are not taken care and there were several changes in the nomenclature and revival or merging of several grass genera in the light of recent findings and molecular studies. Therefore, the present work was conceived to fill the gap in this regard, besides presenting the goods and services offered by grasslands to humans in states, the abiotic and biotic threats to grasslands, the invasions of grassland by exotic flora and the impacts, and to provide a comprehensive account of the subfamily Panicoideae of Poaceae. The present study was conceived to attain the following four objectives.

1.10 OBJECTIVES OF THE PRESENT STUDY

I. Survey of grasslands of Andhra Pradesh and Telangana states and collection of the PANICOID grasses.

II. Proper identification and preparation of grass herbarium of Poaceae subfamily PANICOIDEAE.

III. Reassessment of tribes, genera and species using morphological, ecological and geographic evidence in the light of recent molecular phylogenetic classifications of grasses; and

IV. The nomenclature and typification issues of PANICOID grasses found in the Andhra Pradesh and Telangana states.

II. STUDY AREA

2.1 GEOGRAPHY AND CLIMATE

The erstwhile Andhra Pradesh state was segregated on June 2, 2014 into of Andhra Pradesh proper and the new state of Telangana.

2.1.1 Andhra Pradesh

It is located in southern India in between $12^0$41'–19.07^0 N latitude and 77^0–$84^0$40' East longitudes (Fig. 2.1). It shares borders with Telangana, Chhattisgarh and Odisha states in the north, the Bay of Bengal in the east, Tamil Nadu to the south and Karnataka to the west. The normal annual rainfall is 940 mm, with the major portion (68.5%) received through south-west monsoon (June–Sept), followed by 22.3% through north-east monsoon (Oct–Dec). The rest (9.2%) of the rainfall is received during the winter and summer months. The state comprises 13 districts when it was constituted; recently, in April 2022, it was segregated into 26 districts.

2.1.2 Telangana

The newly constituted state of Telangana (the 29th state) of India is located in a part of the Deccan Plateau, a semi-arid zone with hot to dry climates. The state is located in between $15^0$50'–$19^0$55' N latitude and $77^0$14'– $78^0$50' East longitude (Fig. 2.1). It is bordered by the state of Maharashtra to the north and north-west, Karnataka to the west, Chhattisgarh to the north-east and Andhra Pradesh to the south-east. The average annual rainfall in the state is 900–1500 mm; 80% of it is received through south-west monsoon. Telangana state, when it was carved out had 11 districts but, presently, it comprises 31.

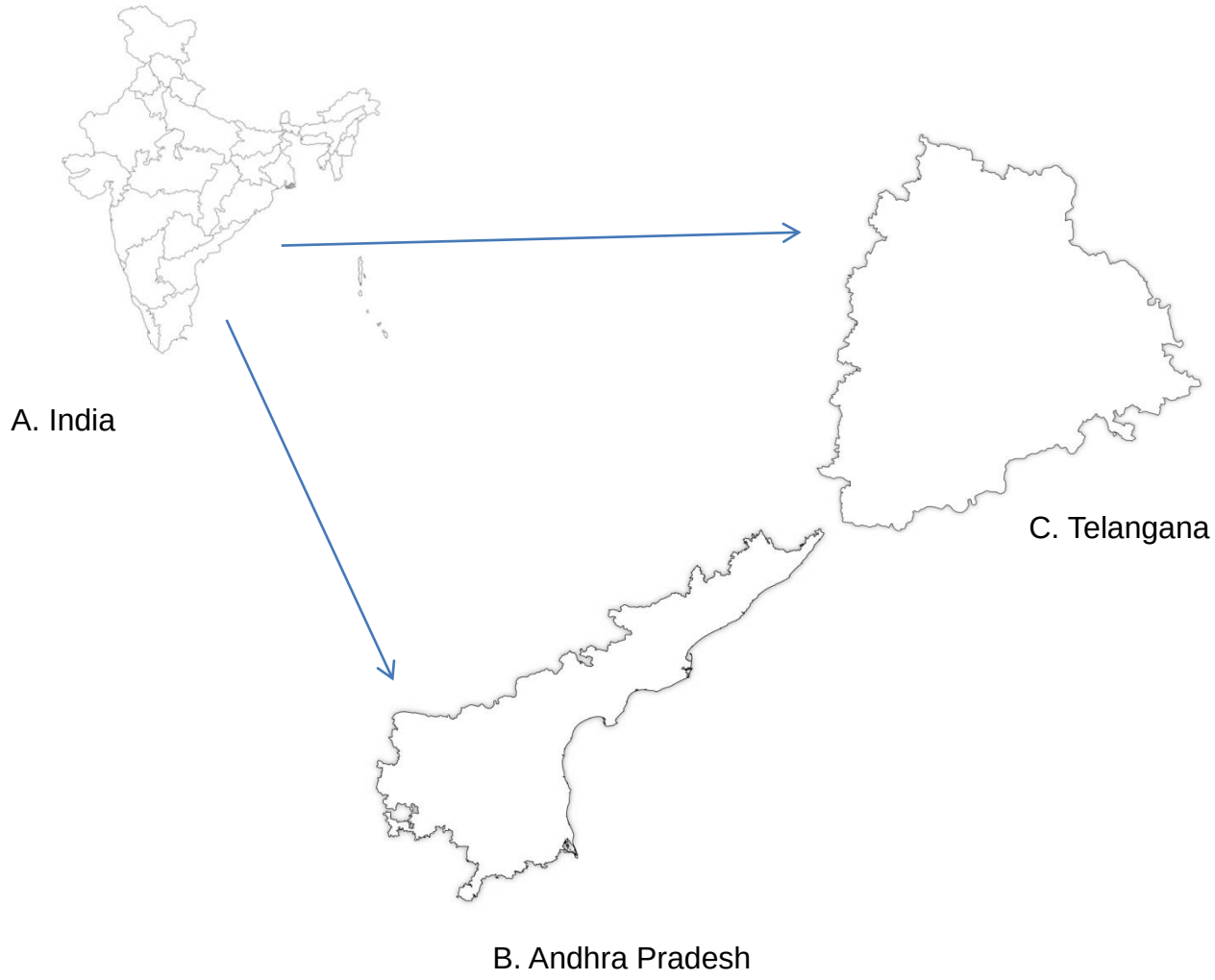

Fig. 2.1 Map showing outlines of the study area. A – India; **B, C** – State boundaries; **B** – Andhra Pradesh; **C** – Telangana. **(***Map not as per scale or latitude and longitudes*)

2.2 GEOLOGY AND SOILS

2.2.1 Geology

The Andhra Pradesh and Telangana states have a wide variety of geological formations, ranging from the oldest Dharwar schists to the recent alluvium. These rocks possess rich minerals, well distributed throughout these two states. The Dharwar formations extend into Anantapuram, Nellore, Prakasam and Guntur districts of Andhra Pradesh and Telangana district of Mahabubnagar. The Archaeans dominate the rock formations in Telangana and Rayalaseema of Andhra Pradesh. It is of granites, granodiorides and branded gneisses.

The Charnokites and Khondolites are found only in Costal Andhra (Srikakulam, Viziaynagaram, Visakhapatanam, East and West Godavari, Krishna, Guntur and Prakasam districts), whereas the *puranas,* which include limestones, sand stones, slates and shales, occur in from Kadapa and Kurnool districts of Andhra Pradesh and Adilabad, Mahabubnagar, Nalgonda and Ranga Reddy districts of Telangana.

The Pranahita and Godavari rivers of Telangana state (eastern margin) are occupied by the Gondwanas. The lower Gondwana contains coal seams among the sandstones and shales which are being exploited at Kothagudem and Yellandhu in former Khammam district, Bellampalli in Adilabad district and Godavari Khani in Karimnagar district. The Upper Gondwanas comprise mostly of shales and sandstones, extending along Godavari River in eastern Adilabad and Karimnagar districts. The laterite soils occur in Deccan traps of western Telangana in Vikarabad, Zaheerabad and Narayankhed, and Nellore and Visakhapatnam districts in coastal Andhra (Murty & Ramam, 1997).

2.2.2 Soils

Alluvium: A belt of alluvium is found deep inland along the valleys of Vamsadhara and Nagavalli Rivers of northern costal Andhra of sand, gravel, silt and clay, with silt predominating in the deltas. It also occurs extensively in the deltas of Krishna and Godavari rivers (Murty & Ramam, 1997).

Red Soils: The red soils occur in Telangana and Rayalaseema (Andhra Pradesh); but, they are highly restricted in occurrence to the districts of coastal Andhra such as Nellore, Guntur, West Godavari, Visakhapatnam and Srikakulam. Red soils are found in large area in Karimnagar district of Telangana state.

Black Soils: The black soils occur both in Telangana and Andhra Pradesh states. The deep black soils are found along the Pranahita, the Godavari and the Krishna rivers belts. They also occur in Telangana districts such as Adilabad, Mahabubnagar, Ranga Reddy, Medak and Nizamabaad. The mixed black and red soils are found in vast patches between the rivers Krishna and Pennar. Mixed red and black soils occur in Adilabad and Mahabubnagar districts of Telangana (Murty & Ramam, 1997).

Deltaic Alluvial Soils: These soils occur in the delta areas of Krishna and Godavari, and also the coast in Visakhapatnam and Srikakulam districts and in the valleys of Vamsadhara and Nagavalli rivers and in Pennar in Nellore district of Andhra Pradesh.

Costal Alluvial Soils: The costal alluvial soils occur in Visakhapatnam district of Andhra Pradesh. The Casuarina and Cashew plantations are raised extensively on this belt in Nellore, Guntur and Srikakulam districts, whereas in Krishna and East Godavari districts; large areas are covered by mangroves swamps.

Laterite Soils: The lateric soils occur in Hyderabad, Naryanakhed, Vikarabad and Zaheerabad areas in Telangana and East Godavari, Srikakulam and Visakhapatnam in Andhra Pradesh states.

Coastal Sandy Soils: These occur in the Bandar taluk of Krishna district, coastal margins of Bapatla taulk of Guntur district and Chirala taluk of Prakasam district in Andhra Pradesh.

Skeletal Soils: The skeletal soils are found in Nallamala slopes, Badvel of Kadapa district, Giddalur of Prakasam district, and Jammalamadugu of Kadapa district in Andhra Pradesh (Murthy, 2010).

2.3 RIVERS AND WATER BODIES

The Godavari:

The Godavari River is the largest river in southern India and the second largest in India. It had its birth in Triambakeshwar near Nasik in Maharastra state. It travels and enriches Maharashtra, Madhya Pradesh, Odisha, Telangana and Andhra Pradesh. It enters Telangana state near Basara village of Adilabad district and flows through Nizamabad, Karimnagar, Warangal, Khammam (Telangana), and passes through East and West Godavari districts of Andhra Pradesh. It gives out five branches: Vashista, Gautami, Tulya, Attrya and Bhardwaja before falling into the Bay of Bengal near Antaravedi in East Godavari district of Andhra Pradesh. The main tributaries of river Godavari are Kadam, Pranahita, Manjira, Penganga, Manair, Wardha, Wainganga, Sabari, Indravathi and Purana. The Kaleshwaram, Nizamsagar and Sriramsagar are the important projects in the river basin.

The Manjira:

It originates from Pathoda taluk of Bir district in Maharashtra. It enters Osmanabad and Bidar of Medak districts in Telangana and joints Godavari near Kandakurthy in Bodhan mandal of Nizamabad district. The Manjira is one of the major tributaries of River Godavari (Murthy, 2010).

The Krishna:

The Krishna River, being originated from Mahabaleshwar in Maharashtra, passes through both Telangana (enters near Tangadigi village) and Andhra Pradesh passes into the plains at Pulichintala in Krishna district, and falls into the Bay of Bengal between Hamsaladevi and Nachukunta in the district. Its tributaries are Bhima, Chandravanka, Dindi, Hundri, Moosi, Naguleru, Tammileru, Thungabhadra and Wyra.

The Thungabhadra:

It is the main tributary of River Krishna. It originates in Varaha Hills, Chikamangluru district, Karnataka state and passes through Kosagi and joins Krishna River near Moravakonda in Kurnool district, Andhra Pradesh.

The Pennar:

Its origin is in Nandi Hills, Kolar district, Karnataka. It enters near Chowluru in Anathapuram district and flows into Bay of Bengal near Utkuru, Nellore district, Andhra Pradesh. Its main tributaries are the Cheyyeru, Chitravathi, Jayamangali, Kumudvathi, Kunderu, Papaghni and Sagileru.

The Vamsadhara:

It originates from Eastern Ghats in Odisha and enters into Andhra Pradesh in Srikakulam district. It flows between Narasampet and Srikakulam taluks, and finally falls into the Bay of Bengal, near Kalingapatnam.

The Nagavalli:

Its origin is also from Eastern Ghats but in Odisha, and enters Andhra Pradesh near Parvathipuram taluk, and joins Bay of Bengal at Mofaz Bandar in Srikakulam district. It is the main tributary to Swarnamukhi.

The Gundlakamma:

Having borne in the Nallamalais, it flows through Prakasam district in Andhra Pradesh and falls into the sea near Devarampadu village of the district.

The Swarnamukhi:

Originating in the Chandragiri Hills of Chittoor district, it flows through Nellore district and falls into the sea near Siddavaram, Nellore district, Andhra Pradesh.

Other Rivers:

There are a few rivulets like the Sarada, the Varaha, the Thandava, the Gosthani, the Meghdrigadda, the Saragudu gedda and the Champavathi; all these rise in the Eastern Ghats and fall into the sea in Visakhapatnam district in Andhra Pradesh.

Tanks and Lakes:

Huge tanks and lakes, most of them fed by river channels, dot the countryside in the two states. To cite a few, Ananthasagaram tank in Nellore district, Anantharajasagar in Kadapa, Cumbam tank in Prakasam and Nandyal tank in Kurnool district of Andhra Pradesh, and Pakhal, Ramappa and Lakanavaram tanks in Mehbubabad and Mulugu districts of Telangana.

Water Falls:

The main water falls in Andhra Pradesh are Ethipothala in Guntur district, Kambakam, Talakona, Kailasakona and Papavinasanam in Chittoor district of Andhra Pradesh, Kunthala and Potchera in Adilabad and Bogatha in Mulugu district of Telangana state.

2.4 GENERAL VEGETATION OF FORESTS

The vegetation maps of residual Andhra Pradesh and Telangana are presented in Figs. 2.2 and 2.3.

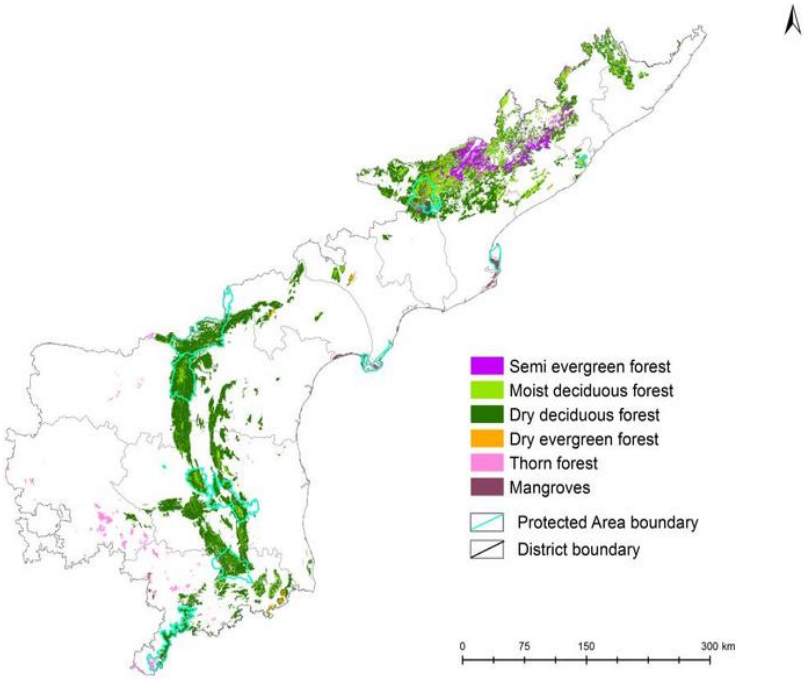

Fig. 2.2 Vegetation map of Andhra Pradesh

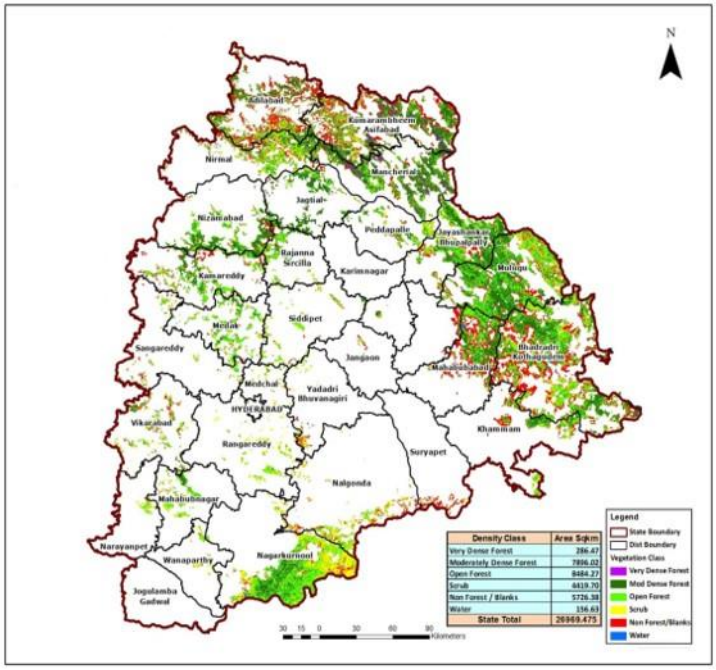

Fig. 2.3 Vegetation map of Telangana state

2.4.1 Forests

The forest areas are based on the classification of Champion & Seth (1968). They are: (i) Tropical semi-evergreen forests; (ii) Tropical moist deciduous forests; (iii) Southern dry deciduous forests; (iv) Northern mixed dry deciduous forests; (v) Dry savannah forests; (vi) Tropical dry evergreen forests; and (vii) Tropical dry evergreen scrub forests.

(i) Tropical semi-evergreen forests:

These forests occur in costal Andhra (Maredumilli, Gudem, Sileru, Sapparla, Chintapalli, Dharakonda, Galikonda, Minumuluru, Nulakamaddi, Padovalasa, Anatagiri, Tekkali and Pathapatnam). The typical elements of this forest type are *Bridelia tomentosa* Blume, *Dillenia pentagyna* Roxb., *Magnolia champaca* (L.) Baill. ex Paire., *Firmiana colorata* (Roxb.) R.Br., *Xylia xylocarpa* (Roxb.) Taub., with lianas such as *Entada rheedi* Spreng.

(ii) Tropical moist deciduous forests:

These forests can be divided into three categories: (a) Northern tropical moist deciduous forests (Sal forests); (b) South Indian tropical moist deciduous forests; and (c) Southern tropical moist deciduous and Riparian forests.

(a) ***Northern Tropical moist deciduous forests*** **(Sal forests):** This type of forests occurs in Srikakulam district of northern coastal Andhra. It is dominated by species *Shorea robusta* Gaertn., *Syzygium cumini* (L.) Skeels., *Xylia xylocarpa* (Roxb.) Taub., *Pterocarpus marsupium* Roxb., *Madhuca longifolia* (J. Koenig ex L.) J.F.Macbr., and *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guillem. & Perr.

(b) ***South Indian tropical moist deciduous forests*****:** This type of forest occurs in Coastal Andhra (Gudam and Rampa agencies) and the Rayalaseema regions (Rollapenta, Bairluty, Gundlabrameswaram) in Kurnool district and Talakona in Chittoor district. The dominant tree species are *Syzygium alternifolium* (Wight) Walp., *Pterocarpus marsupium* Roxb., *P. santalinus* L.f., *Dillenia pentagyna* Roxb., *Haldinia cordifolia* (Roxb.) Ridsdale, *Dalbergia latifolia* Roxb., and *Schleichera oleosa* (Lour.) Merr.; and

(c) ***Southern tropical moist deciduous riparian forests*****:** These forests are present along the banks of river Godavari and other hill streams in narrow strips in Andhra and Telangana states. The most common trees in these forests are *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn., *Syzygium cumini* (L.) Skeels., *Barringtonia acutangula* (L.) Gaertn., *Bombax ceiba* L., *Neolamarckia cadamba* (Roxb.) Bosser., and *Oroxylum indicum* (L.) Kurz.

(iii) Southern dry deciduous forests:

These forests are wide spread in all the districts of the Andhra Pradesh and Telangana. The typical tree elements are *Bosowelia serrata* Roxb. ex Colebr., *Diospyrous melanoxylon* Roxb., *Gardenia latifolia* Aiton., *Givotia moluccana* (L.) Sreem., and *Chloroxylon swietenia* DC. In Deccan plateau region, the dominant species are *Tectona grandis* L.f., and *Terminalia alata* Wall., whereas in the Eastern Ghats part of Khammam district have *Xylia xylocarpa* (Roxb.) Taub., with *Terminalia alata* Wall. and *Hardwickia binata* Roxb.

(iv) Northern mixed dry deciduous forests:

These forests are found in both the states. They are found in Kadapa, Chittoor and Kurnool districts of Andhra Pradesh and Cherukupalli of Nalgonda district and some areas of Medak and Ranga Reddy districts in Telangana.The common tree species are *Shorea tumbuggaia* Roxb., *Syzygium alternifolium* (Wight) Walp., *Lannea coromandelica* (Hout.) Merr., *Pterocarpus marsupium* Roxb., *P. santalinus* L.f., *Albizia amara* (Roxb.) B. Boivin., *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guillem. & Perr., *Hardwickia binata* Roxb., *Terminalia chebula* Retz., *T. tomentosa* Wight & Arn., *T. paniculata* Roth, *Firmiana simplex* (L.) W.Wight., *Bauhinia racemosa* Lam., and *Cassia fistula* L.

(v) Dry savannah forests:

These forests occur throughout the Eastern Ghats and parts of Telangana. The primary elements are *Phyllanthus emblica* L., *Pterocarpus marsupium* Roxb., *Terminalia chebula* Retz., and associated with grass species such as *Aristida setacea* Retz., *Bothriochloa pertusa* (L.) A. Camus., *Chrysopogon aciculatus* (Retz.) Trin., *Cymbopogon flexuosus* (Nees) Will., *Themeda triandra* Forssk., and *Urochloa ramos*a (L.) T.Q. Nguyen., interspersed with species of *Phoenix*.

(vi) Tropical dry evergreen forests:

These forests occur only in Pollabagah and Velgada (Vizianagaram), Madugula (Visakhapatnam), Tekkali and Pathapatanam (Srikakulam), Sirharikota island (Nellore) of Costal Andhra and Kadapa and Mamandur valley of Chittoor district of Rayalaseema. The forest elements are *Shorea tumbuggaia* Roxb., *Syzygium alternifolium* (Wight) Walp., *S. cumini* (L.) Skeels., *Lannnea coromandalica* (Houtt.) Merr., *Pterocarpus marsupium*

Roxb., *P. santalinus* L.f., *Manilkara hexandra* (Roxb.) Dubard., *Albizia amara* (Roxb.) B. Boivin., *Flacourtia indica* (Burm.f.) Merr., and *Wrightia tinctoria* R.Br.

(vii) Tropical dry evergreen scrub forests:

These forests are found all over the drier parts of Andhra Pradesh and Telangana. The prime tree species are *Acacia chundra* (Rottler) Willd., *Albizia amara* (Roxb.) B.Boivin., *Balanites roxburghii* Planch., *Erythroxylum monogynum* Roxb., *Premna tomentosa* Willd., *Euphorbia antiquorum* L., *Dichrostachyous cinerea* (L.) Wight & Arn. *Capparis bervispina* DC., *Gymnosporia emarginata* (Willd.) Thwaites., *Carissa spinarum* L. and *Grewia tenax* (Forssk.) Fiori.

The above summary account of forests is based on the present survey of the areas besides the accounts provided by Murthy (2010), Sangameshwar (2015), Pullaiah (2015) and Reddy & Reddy (2016).

Plate 2.1 **Study area and vegetation types. A** – Seshachalam Biosphere; **B** – Araku valley; **C** – Galikonda; **D** – Ananthagiri; **E, F** – Nallamalla Hills.

III. MATERIALS AND METHODS

3.1 MATERIALS

The present study intends to provide a complete inventory of the family Poaceae subfamily Panicoideae found in Andhra Pradesh and Telangana states, southern India. For the first time, these grasses will be presented in accordance with the latest inframailial and tribal classification (Soreng *et al*., 2015, 2017). It is in the light of the recent checklist of the grasses of India (Kellogg *et al*., 2020) *vis-à-vis* the present assessment.

The grasslands and savannahs of these Telugu-speaking states were explored along with other open and domesticated habitats to search and collect the Panicoid grasses; it was for their identification, descriptions, documentation, nomenclature assessment, and mentioning types and/or typifications.

3.2 METHODS

3.2.1 Filed Exploration

During the present taxonomical study of Panicoid grasses of Andhra Pradesh and Telangana states, intensive field surveys were under taken throughout the area the regions from October 2018 to December 2021. It was programmed to cover all grass habitats and the flowering and caryopsis (fruiting) seasons. The major natural vegetation areas in the districts of Andhra Pradesh and Telangana States are: (i) *Eastern Ghats of Andhra Pradesh*: Sri Lankamalleswara Wildlife Sanctuary, Vempally forest and Mallela ghat of Kadapa district, Seshachalam Biosphere Reserve spread in Kadapa and Chittoor districts, Nallamala Hills in Kurnool, Prakasam and Guntur districts, Batrepalli and Tadipatri forest areas; (ii) *Gooty Fort forest* area of Anantapuram district; (iii) *Erramalais* spread in the districts of Kadapa, Kurnool and Anantapuram districts; (iv) *Anantagiri Hills,*

Galikonda, Araku valley and Kambalakonda Wildlife Sanctuary in Vishakhapatnam districts of Costal Andhra; and (v) The Pakhal Wildlife Sanctuary and Laknavaram lake and Eturnagaram Wildlife Sanctuary in Warangal (Mulugu) district, Kinnerasani in Khammam district, Nalgonda, Hyderabad Outer Ring Road (ORR). Anantagiri, Sangareddy and Zaheerabad (Bilalpur) Grasslands, etc.

3.2.1.1 Grasses Collections from Diverse Habitats

The collections were made from a wide range of habitats, i.e. the forest hill tops, slopes and foothills, open scrubs, grassy vegetation along the streams and water bodies. The representative grass specimens collected along with roots/rhizomes/tubers while its habit and habitat were photographed. Essential information (ecological, ethnic or folk uses, etc.) for each species was documented in the field notebook; collection site latitude, longitude and altitude; collection date, including assigning a field number. All collections were placed in wooden plant press, sandwitched between the news/blotting papers and the bundle-tied tightly with help of a rope. The pressed specimens were poisoned and changed to new blotting papers every day or alternate days, until the specimen became perfectly dry.

3.2.1.2 Preparation of Voucher Specimens

The Panicoideae grass species so processed were pasted and/or stitched on herbarium sheets according to the methodology laid down by Lawrence (1951) and Fosberg & Sachet (1965). Before mounting, the specimens were poisoned by dipping them in a saturated solution of mercuric chloride in ethyl alcohol. The poisoned specimens were placed in blotting papers in wooden plant pressers. Then on, they were changed till the specimens were perfectly dry.

3.2.1.3 Mounting

The processed dry specimens were pasted on a standard herbarium sheets (42 x 28 cm), with animal glue. The lengthy specimens were stitched after arranged like V, N, I, J and W, on herbarium sheets.

3.2.1.4 Labeling

The specimen was mounted on the herbarium sheet with a label (6.5 × 10.5 cm) pasted on the lower right-hand corner bearing definite information about the specimen pasted, connected by the collection number. The label provides information about: the family/scientific/vernacular name; locality; latitude, longitude and altitude of the habitat; abundance/distribution; field description; ecological notes; uses known by the local people; name of the plant collector; collection number and date of collection.

3.2.1.5 Identification and Authentication

Once the grass specimens were segregated, every Panicoideae member specimen was critically examined in terms of its root system, ligule, inflorescence, rachis, spikelets, glumes, lemmas, paleas, stamens, lodicules, caryopsis, etc. The duplicate specimens were dissected under the Labomed binocular stereo-microscope for identifications.

The following standard Grass literatures (monographs/flora) were consulted in the identification: *The True Grasses* (Hackel, 1896), *A Handbook of Some South Indian Grasses* (Rangachariar & Mudaliyar, 1921), *The Grasses of Burma, Ceylon, India and Pakistan* (Bor, 1960), *The Flora of the Presidency of Madras* (Fischer, 1934) and grass generic revisions available from time to time, and the research articles. The specimens identified were compared with authentic specimens in MH, FRC, RHT, BSID, KUW and AUV apart from the images available in the digital herbaria at Kew, CAL, E, etc.

The above authenticated specimens were further scrutinized and confirmed by Dr. Vatsavaya S. Raju, Professor (Retd.), Plant Systematics Laboratory, Department of Botany, Kakatiya University, Warangal, Telangana, India. These sheets were deposited at KUW, a recognized herbarium (http://sweetgum.nybg.org/science/ih/herbarium-list/?NamOrganisationAcronym=KUW). Another set will be deposited in AUV (Andhra University Herbarium, Visakhapatnam, Andhra Pradesh, India).

Plate 3.1 **Field collection and herbarium preparation**. **A** – Collection of Grasses; **B** – Grass collection with the help of local tribal person; **C** – Pressing process; **D** – Pressing, to start with additional weight; **E** – Herbarium specimen mounted on a sheet; **F** – Herbarium label in close-up.

Plate 3.2 **Workout on grasses in herbarium consultation. A** – Examination of grass specimen under binocular dissection microscope at Kakatiya University, Warangal, KUW; **B** – Visit to Fischer Herbarium, Coimbatore; **C** – DRC herbaria, BSI, Hyderabad; **D** – Andhra University Herbarium, Visakhapatnam (AUV); **E, F** – Examination of herbarium specimens of grasses with hand lens and simple dissection microscope and noting down of diagnostic traits at Andhra University Herbarium.

IV. GRASSLANDS AND SAVANNAHS OF ANDHRA PRADESH AND TELANGANA

4.1 INTRODUCTION

This chapter on the grasses and savannahs in the study area attempts to provide a glimpse of the two productive ecosystems which were and are neglected for ecological studies and status assessment. A summary of the available information is provided to paint a picture of the same.

4.2 LAND USE

The following is the account of land use pattern in the study area. We need a real land use pattern which reflects the grassland and savannahs in these two states in the right perspective which is not forthcoming. However, the land use patterns in the two states are provided here are biased towards agricultural use versus arable land.

4.2.1 Andhra Pradesh

The Andhra Pradesh Reorganization Act, 2014 bifurcated the erstwhile State of Andhra Pradesh into two separate states namely, Andhra Pradesh and Telangana. Andhra Pradesh is now the 8th largest State of the country as per the geographical area of the country. Of the 13 districts in the State, five are tribal districts.

Table 4.1 Land use pattern in Andhra Pradesh (2014–15)

S.No.	Land use type	Area (in 000' ha)	Percentage
1	Geographical area	16,276	100
2	Forests	3,663	22.51
3	Land not available for cultivation	3,353	20.6
4	Permanent pastures and other grazing lands	214	1.32
5	Land under misc. tree crops and groves	159	0.98
6	Cultivable land	391	2.4
7	Fallow land other than current fallows	858	5.27
8	Current fallows	1,402	8.61
9	Net area sown	6,236	38.31

Source: Land Use Statistics*, Ministry of Agriculture*, GOI (2014–15)

Unfortunately, there is no realization of grasslands or savannahs in the above land use patterns. Even the FSI has no separate monitoring of grassland since they are not conceived as forests (as defined with dominant trees) though grasses only providing us the staple food fodder to the wild as well the domesticated animals which is again a resource for us.

4.2.2 Telangana

It is 12th largest State in India in terms of population. It has a geographical area of over 112.08 lakh ha, and constitutes 11th largest state in the country in the area. Of the total area, about 39% is under agriculture, 23% under forest cover, and 8% non-agriculture land. The region has a population of 350.04 lakh people, as per 2011 census.

Majority of this population is in rural areas, and primarily dependent on Agriculture for livelihoods.

Table 4.2 Land use pattern in Telangana (as per 2019–2020 record)

S. No.	Category	Area in Lakh acres	% to Total Geographical Area
1	Total Geographical area	276. 96	100.00
2	Forest	66. 67	24. 07
3	Barren and uncultivable land	15. 00	5. 42
4	Land put to non-agriculture uses	20.61	7.44
5	Cultivable waste	4.44	1.60
6	Permanent pastures and other grazing lands	7.39	2. 67
7	Land under misc. tree crops, groves not included in net area sown	2.77	1. 00
8	Other fallow lands	18.56	6. 71
9	Current fallow lands	26.37	9. 52
10	Net area sown	115. 15	41. 57
11	Gross area sown	142. 68	51. 52
12	Net irrigated area	54. 61	19. 72
13	Gross irrigated area	77. 37	27.93

Source: DES 2019–2020.

4.3 GRASSLANDS AND SAVANNAHS

4.3.1 Grasslands

The grasslands occupy about 20% of the earth's land surface (Moore, 1964). It is estimated that 3.9% of the total area of our country is occupied by grasslands. Based on elevation differences, the grasslands can be classified as low-level and high altitude grasslands. Today, the grassland ecosystems are threatened everywhere, more so in

India due to overgrazing, mining, fire, *podu* or *jhum* (shifting) cultivation, increased number of bore wells/irrigation facilities, alien grass invasions, etc.

The grasslands are essential to supply fodder to cattle and as well provide the diversity from which wild crops can continue to be domesticated into agriculturally suitable crops. The grasslands of India were classified as of Xerophilous, Mesophilous and Hygrophilous, based on the soil moisture. Whyte (1955) described the grassland cover of India. Later, Dabadghao & Shankarnarayana (1973) elaborated it. The grasslands are named after the dominant grass genus or genera against the soil types and environment. The grasslands in India are of eight types, namely: **Sehima/Dichanthium** (Black soils), **Dichanthium (**Sandy loams), **Phargmites/Saccharum** (Marshy areas), **Bothriochloa** (Paddy tracks), **Cymbopogon (**Low hills), **Arundinella** (High mountains), **Deyeuxia/Arundinella** (Mixed temperate environments) and **Deschenpsia/Deyeuxia** (Temperate/Alpine regions). To provide a brief account of these:

(i) **Sehima–Dichanthium type**: These grasslands are spread over the Deccan including Telangana and Chota Nagapur Plateaus and Aravallis, with the elevation range of 300–1200 m AMSL.

(ii) **Dichanthium–Cenchrus–Lasiurus type**: These grasslands are spread across the northern parts of India from Gujarat, Rajasthan (Aravalli ranges), Punjab, Delhi and south-western Uttar Pradesh, in an elevation range of 150–300 m AMSL.

(iii) **Phragmites–Saccharum–Imperata type**: These grasslands are found in the Gangetic plains, Brahmaputra valley and the plains of Punjab, with an elevation range of 300–500 m AMSL.

(iv) **Themeda–Arundinella type**: These grasslands spread over the foothills and lower hills of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, northern parts of West

Bengal, Assam, Manipur, Odisha and Andhra Pradesh, in the elevation range of 350–2000 m AMSL; and

(v) **Temperate–Alpine grasslands**: These grasslands are spread across the Himalayan states and the temperate high altitude areas of Nagaland, Manipur, and the Western Ghats of peninsular India, at an elevation of 2000 m AMSL.

The grasslands of the Eastern Ghats are comparatively drier due to lesser rainfall and lower elevation of the ground being around 700 m AMSL. They are highly discontinuous, patchy and small patches unlike those of the Western Ghats. The major grass community is dominated by *Arundinella setosa* Trin., in the higher elevations and *Aristida adscencionis* L., *Heteropogon contrortus* (L.) P. Beauv., species of *Chrysopogon, Sporobolus* and *Themeda* in lower elevations. The hills of Shevaroy of Yercaud, Javdi and Malkanagiri represent such grassland communities. Tropical short grass plain states are Rajasthan, Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh.

4.4 The Secondary formation of Grasses

I. *Wall grasses: Apluda mutica* L*., Aristida* spp., *Chloris* spp., *Dactylotenium aegyptium* (L.) Willd., *Digitaria stricta* Roth., *Eragrostis minor* Host. and *E. pilosa* (L.) P. Beauv.

II. *Grasses in the crevices of rocks*: *Arthraxon hispidus* (Thunb.) Makino., species of *Arundinella*, *Cymbopogon, Dimeria* and *Garnotia*, *Parahyparrhenia bellariensis* (Hack.) Clayton., and *Pogonatherum crinatum* (Thunb.) Kunth.

III. *Grasses of dripping hanging rocks and steep slopes*: The species of *Arundinella*, and *Chrysopogon*, *Parahyparrhenia bellariensis* (Hack.) Clayton., *Schizachyrium exile* (Hochst.) Pilg., and *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda.

IV. *Grasses along streams and river beads*: *Arundo donax* L., *Coix* spp., *Paspalum* spp. and *Saccharaum spontaneum* L.

V. *Wetland and Water logged areas: Chrysopogon lawsonii* (Hook. f.) Veldkamp, *Ischaemum rugosum* Salisb., *I. cilliare* Retz., *Oryza rufipogon* Griff., *Paspalum congugatum* P.J. Beargius., and *Sacciolepsis indica* (L.) Chase.

VI. *Grasses of sandy and sea-shores*: *Cenchrus biflorus* Roxb., *Desmostachya bipinnata* (L.) Stapf., and *Perotis indica* (L.) Kuntze, and seashores with dioecious *Spinifex littoreus* (Burm.f.) Merr.

VII. *Forest grasses*: *Centotheca lappacea* (L.) Desv., *Crytococum* spp., *Eulalia phaeothrix* (Hack.) Kuntze., and *Eulaliopsis binata* (Retz.) C.E. Hubb.

VIII. *Poor soils*: *Andropogon pumilus* Roxb., *Aristida redacta* Stapf, *Lophopogon tridentatus* (Roxb.) Hack., and *Tripogon* spp.

IX. *Wasteland grasses*: *Alloteropsis cimicina* (L.) Stapf., *Cenchrus ciliaris* L., *Eragrostis viscose* (Retz.) Trin., *Setaria pumila* (Poir.) Roem. & Schult., and *S. italica* (L.) P. Beauv.; and

X. *Weedy Grasses*: *Alloteropsis cimicinia* (L.) Stapf., *Cynodon dactylon* (L.) Pers., species of *Echinochloa, Eriochloa,* and *Panicum repens* L.

The drier and open areas in Andhra Pradesh and Telangana are commonly covered by grass species such as *Alloteropsis cimicina* (L.) Stapf., *Andropogon pumilus* Roxb., *Apluda mutica* L., *Axonopus compressus* (Sw.) P. Beauv., *Bothriochloa pertusa* (L.) A. Camus, *Chenchrus biflorus* Roxb., *Chyrsopogon fulvus* (Sperng.) Chiov., *Cymbopogon gidarba* (Buch.-Ham. ex Steud.) Haines., *Dichanthium* spp., *Digitaria ciliaris* (Retz.) Koeler., *Echinochloa* spp., *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.,

Imperata cylindrica (L.) P. Beauv., *Ischaemum rugosum* Salisb., *Melinis repens* (Willd.) Zizka, *Mnesithea laevis* (Retz.) Kunth., *Mnesithea granularis* (L.) L.f., *Rottboellia cochinchinensis* (Lour.) Clayton, *Sacciolepis* spp., *Setaria* spp., *Themeda triandra* Forssk.,*Trachys muricata* (L.) Pers. ex Trin., and *Urochloa* spp.

4.4.1 Andhra Pradesh

There are grasslands and savannahs in Sri Lankamalleswara Wildlife Sanctuary, Vempally Forest and Mallela Ghat of Cuddapah district, Seshachalam Biosphere Reserve (Cuddapah and Chittoor districts) and Nallamalais (Kurnool, Prakasam and Guntur districts). *Arundinella nepalenensis* Trin., *A. nervosa* (Roxb.) Nees ex Hook. & Arn., and *A. purpurea* Hochst. ex Steud. are the rare grasses found in Nallamala ranges, whereas *Apocopis mangalorensis* (Hochst. ex Steud.) Henrard., *Arthraxon prionodes* (Steud.) Dandy., and *Arundinella setosa* Trin., are the typical rare grasses in Seshachalam Hills. The species of *Dimeria, Eulalia*, *Garnotia* and *Ischaemum* are found growing well on hill tops and *Manisuris myurus* L. at foot hills. The grass associated forest elements are *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guillum. & Perr., *Boswellia ovalifoliolata* N.P. Balakr. & A.N.Henry., *Diospyros melanoxylon* Roxb., *Lannea coromandelica* (Houtt.) Merr., *Mallotus philippensis* (Lam.) Müll.Arg., *Pterocarpus santalinus* L.f., *Shorea tumbuggaia* Roxb., *Firmiana simplex* (L.) W.Wight, *Syzygium alternifolium* (Wight) Walp., *Terminalia alata* Wall., *T. bellarica* (Gaertn.) Roxb., *T. chebula* Retz., and *T. pallida* Brandis. The Gooty Fort forest area of Anantapuram district and Erramalais in the districts of Anantapuram, Kadapa and Kurnool districts have in common the grass species belonging to *Arundinella, Cymbopogon, Heteropogon, Lophopogon* and *Parahyparrheria*. The species of *Arthraxon* and *Parahyparrheria bellariensis* (Hack.) Clayton., inhabit the

rock cervices while *Lophopogon* species prefer sandy soils. *Arundinella ciliata* (Roxb.) Nees ex Miq., *Cymbopogon* spp. and *Themeda* species occupy open hill top (balds) and are associated with species of *Capparis, Carissa* and *Grewia*, *Dichrostachys cinerea* (L.) Wight & Arn., and *Euphorbia antiquorum* L. The Ananthagiri, Araku valley, Galikonda, and Kambalakonda Wildlife Sanctuary, located in Vishakhapatnam and Vizianagaram districts of Costal Andhra, have the grasses represented by the species of *Arundinella, Cappilipedium, Chrysopogon, Cymbopogon, Eulalia, Eulaliopsis, Heteropogon, Ischaemum, Panicum* and *Themeda* which dominate the open places and foot hills. The hill tops are covered by *Arundinella bengalensis* (Sperng.) Druce., *A. pumila* (Hochst. ex A. Rich.) Steud., *Eulalia villosa* (Sperng.) Nees., and *Thysanolaena* spp. The species of *Eulalia* are associated with *Phenix* spp. and forbs. Along the streams, *Pogonatherum* is present in rocky crevices. The associated tree/liana elements are *Bridelia tomentosa* Blume., *Entada rheedi* Sperng., *Firmiana colorata* (Roxb.) R.Br., *Pterocarpus marsupium* Roxb., *Magnolia champaca* (L.) Baill. ex Pierr., and *Xylia xylocarpa* (Roxb.) Taub.

4.4.2 Telangana

The Eturngaram and Pakkal Wildlife Sanctuaries and Laknavaram lake environs in Warangal (Mulugu) district, Nalgonda district, Hyderabad outer ring road, Sangareddy and Zaherabad (Bilalpur) grasslands are represented by *Diectomis fastigiata* (Sw.) P. Beauv., species of *Cymbopogon*, *Dimeria, Ischaemum, Iseilema, Lophopogon, Schizachyrum*, *Sehima* and *Thelepogon.* The associated forest elements are *Phoenix humilis* L.*, Phyllanthus emblica* L.*, Pterocarpus marsupium* Roxb and *Terminalia chebula* Retz. The openings of forests have the apparent grass species *Aristida setacea* Retz.,

Bothriochloa pertusa (L.) A. Camus, *Chrysopogon aciculatus* (Retz.)Trin., *Cymbopogon flexuosus* (Nees) Will., and *Themeda triandra* Forssk.

4.5 Threats to Grassland and Savannah Habitats

Podu cultivation is a major threat to grasslands in Andhra Pradesh along the Eastern Ghats, more so in the northern parts. In Vizianagaram and Visakhapatnam districts, the native tribes belong to the sect *Savars* who speak Savara language; their prime food source is "Solu" (*Eleusine coracana* (L.) Gaertn.) and also cultivate paddy (Ananthagiri Hills, Galikonda, Sunkarimetta and Araku Valley). To wean away the tribal people from this practice and to create economic avenues for them, the Andhra Pradesh Forest Department has started Coffee plantations to employ these people as labour. Besides, Girijan (i.e. Tribal) Co-operative Coffee Plantations have also been started.

In East Godavari district, the Savaras, Konda Reddi, Valmiki and Koya are the ethnic tribes who inhabit these hilly forest areas; they depend mostly on various non-timber forest products, including grasses. But, the methods of collection and utilization are uncontrolled and unscientific, thereby causing damage to the grassland or savannah ecosystems. For the last few centuries, these people are cultivating their food grains (millets, pulses and sometimes rice). They still continue deforest and indulge in *Podu* cultivation besides converting the wet grassy patches for paddy or millet cultivation. Once can see this activity still in Maredumilli, Kutravada, Konda modalu of Rampachodavaram Forest Range, Gurtedu, Nulakamaddi, Y. Ramavaram of Addateegala Range and Sudikonda, Mallavaram and Pidatamamidi of Sudikonda Range in East Godavari district. Local ethnic people indicated that neither their fore-fathers nor they themselves had gone to such hill tops anytime for indulging in *podu* cultivation. Besides,

they warned that, most of such hill-tops are very favourable abodes of Gaur and other wild animals. The undulating terrain has the altitude ranging from 200–1000 m AMSL. The lower canopy is with smaller trees, shrubs and climbers. With such set-up, enough light gets into the forest to permit reasonably good growth of grasses. In certain areas, human interference by way of clearance and burning encouraged dense growth of grasses, presenting a good grassland outlook within the forest which, however, it is termed as Savannah-like form (Champion & Seth, 1968) though the term 'Savannah' is not strictly applicable to the type of grass areas of these deciduous forests of India. Bamboo, to some extent, grows in this forest type though not luxuriantly. Removal of timber trees leaves the bamboo clumps alone for better growth and the density in some areas in Upper Godavari. In West Godavari district, due to over-exploitation, heavy grazing and annual burning, the grasslands and savannahs are in a degraded stage. The grasses of undergrowth are *Alloteropsis cimicina* (L.) Stapf., *Apluda mutica* L., *Cymbopogon nardus* (L.) Rendle, *Heteropogon contorutus* (L.) P. Beauv., *Imperata cylindrica* (L.) P. Beauv., *Panicum bervifolium* L., *Pogonatherum paniceum* (Lam.) Hack., *Setaria flavida* (Retz.) Veldkamp., *Themeda triandra* Forssk., and *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda.

4.6 Hill Top Grass Flora Evolution

The open grasslands with sparse, stunted tree and shrub growth exclusively on the hill tops above 1000 m AMSL along the Eastern Ghats are an interesting vegetation type due to the specific and unusual character; these form a part of the dry deciduous forest, the climatic climax type of vegetation of the Eastern Ghats. These stand out clearly as open bald hill-top with trees growing far apart or in small groups with

extremely stunted growth and heavy grass mixed with the characteristic bushy *Phoenix*, an indicator species. The trees and shrubs look unhealthy, with very short crooked stems.

It is rather interesting that no serious attention was paid as to why such characteristic bald hill-top vegetation developed uniformly on every-hill-tops of Eastern Ghats, above 1000 m AMSL. Similar bald hill-tops were also noted along the Eastern Ghats of Odisha and southern Bihar, Nallamalais of Andhra Pradesh and in Tamil Nadu. According to Champion & Seth (1968), the hill top bald vegetation is a Dry Savannah Forest (DS2). In these forests, the trees form few isolated stands or in groups amongst more or less heavy grass with fire resistant plants persisting. Bushy *Phoenix loureirioi* Kunth., is characteristic of these forests. The trees are often unarmed and hollow. *Anogeissus latifolia* (Roxb. ex Dc.) Wall. ex Guillum. & Perr., *Phyllanthus emblica* L.*, Pterocarpus marsupium* Roxb., *Terminalia chebula* Retz., *T. bellirica* (Gaertn.) Roxb., and *Syzygium cumini* (L.) Skeels are the associates. These grass formations were called 'Pats' (Haines, 1925). They consider such 'baldy' condition as human-made for *Jhum* or *Podu* cultivation since long and that they could not recover due to climatic factors with fire constantly promoting high erosion year after year. But, hardly there is evidence for such intensive biotic interference on the hill-tops. Moreover, it is uneconomical, let alone practicable to have *Podu* cultivation in such distant and difficult to reach hill-tops. Besides, these areas are frequented by herds of 'gaur' (*Bos gaurus*) and other herbivorous animals for grazing. Then, how the local people cultivate millets there? Such an explanation about the formation of 'Pats' needs verification reexamination of the

theory. It is more so in view of the heavy Bauxite deposits found in these entire 'Pats' regions, which could be a reason for the baldness.

No doubt, the climatic factors particularly the high velocity of wind coupled with intensive rain-fall produces considerable damage to the soil cover on such sloppy hill-tops, causing high erosion. The presence of heavy deposits of Bauxite, hardly two meters below the soil surface, could normally hinder vigorous root growth of various plant species. Besides, the floristic composition which is rather uniform and typical along such bald hill-tops of the Eastern Ghats of Andhra Pradesh and Odisha may prove to be an indicator to locate Bauxite deposits. The common grass found on these hill tops are *Arthaxon lancefolius* (Trin.) Hochst., *Arundinella nervosa* (Roxb.) Nees ex Hook. & Arn., *A. pumila* (Hochst. ex A. Rich.) Steud., *Capillipedium huegelii* (Hack.) A. Camus., *Chrysopogon fulvus* (Sperng.) Chiov., *Cymbopogon flexuosus* (Nees) Will., *C. martini* (Roxb.) Will., *Dimeria lawsonii* (Hook. f.) C.E.C. Fisch., *Eulalia phaeothrix* (Hack.) Kuntze., *Jansenella griffithiana* (Mull.Hal) Bor., *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda., *Themeda quadrivalvis* (L.) Kuntze., and *T. triandra* Forssk.

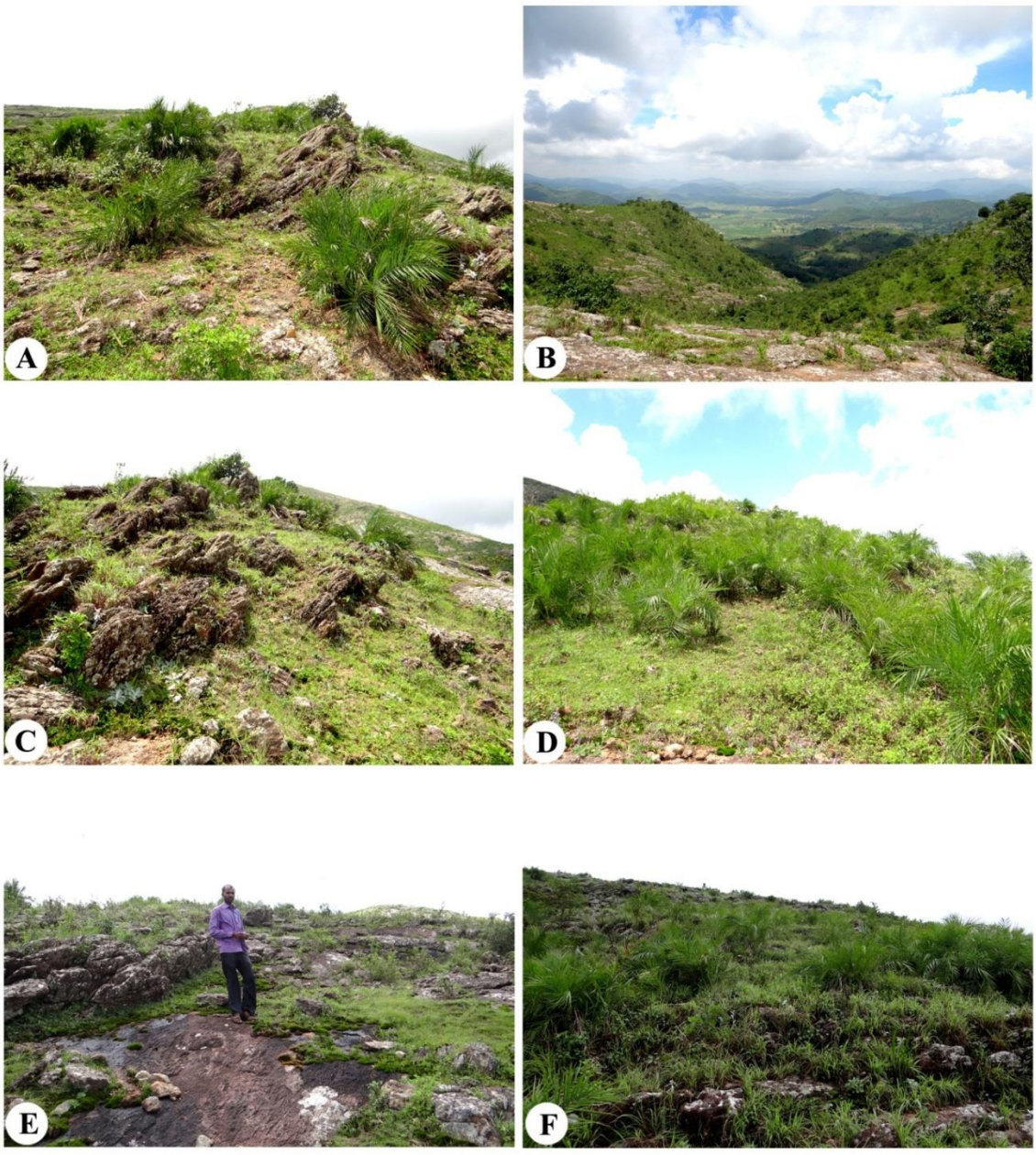

Plate 4.1 **Hill top vegetation in the study area. A** – Seshachalam Biosphere; **B** – Arakuvalley; **C** – Balapalli Kadapa Hill range; **D** – Nallamalla Hills; **E** – Galikonda; **F** – Ananthagiri.

Plate 4.2 **Podu (Solu) cultivation and habitat loss. A** – Solu cultivation in Araku agency area; **B** – Solu cultivation at Katika, Araku valley; **C, D** – Solu cultivation at Ananthagiri; **E** – Solu cultivation near Borra caves, Araku valley; **F** – Over grazing at Galikonda.

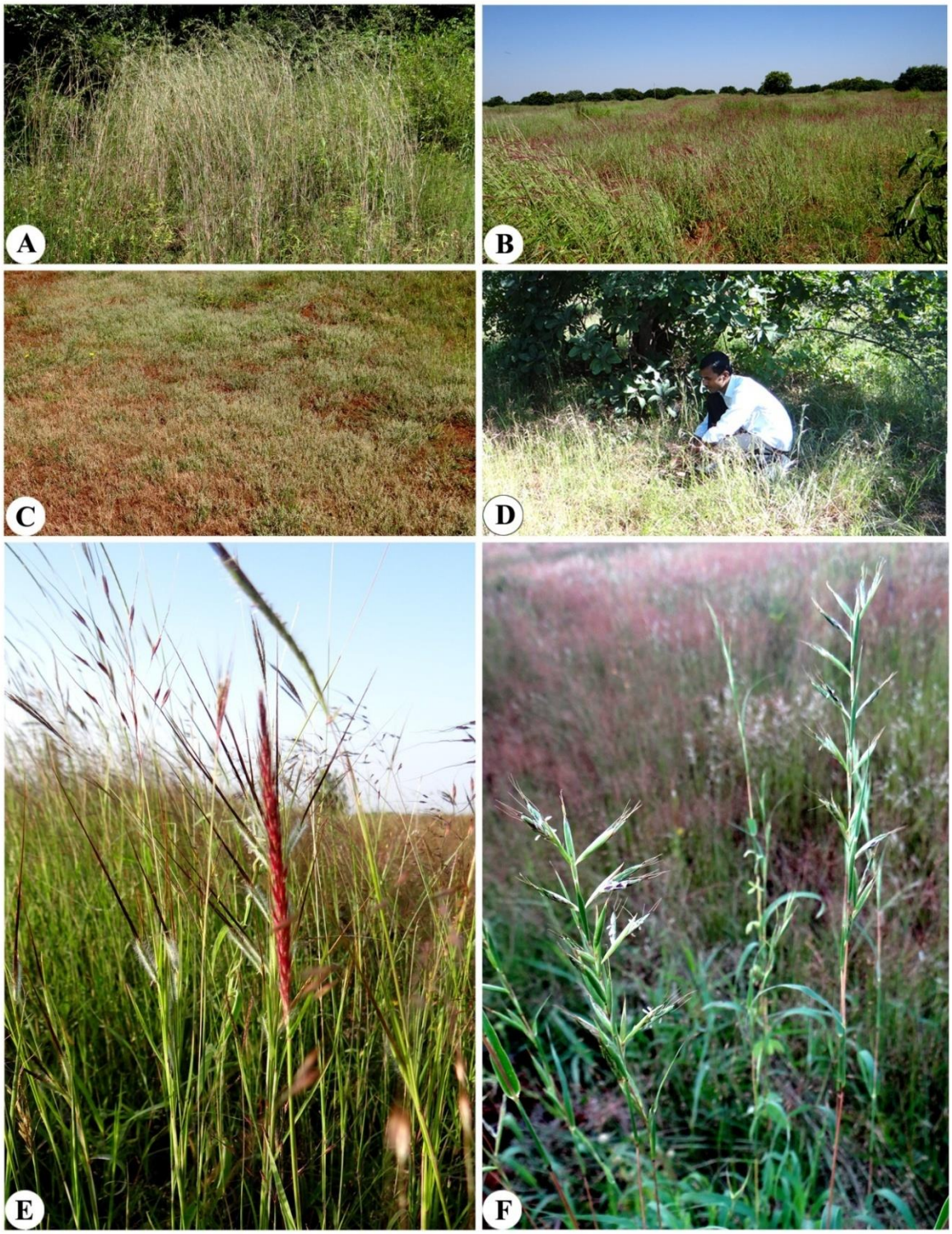

Plate 4.3 **Grasslands and savannahs in the study area. A** – Cymbopogon grassland type; **B** – Cenchrus grassland type; **C** – open areas; **D** – Grass collections at field; **E** – Cenchrus- Heteropogon–Chrysopogon dominated grassland; **F** – Cymbopogon species dominant grassland.

Plate 4.4 **Grassland types in the study area. A** – Heteropogon grassland type (in bloom); **B** – Chrysopogon grassland type (in bloom); **C** – Cenchrus grassland type; **D** – Heteropogon species dominant grassland; **E, F** – Grassland collection of the researcher along with Prof. Vatsavaya S. Raju in Sangareddy district, Telangana.

V. RESULTS

The POACEAE subfamily PANICOIDEAE presented here are those presently collected and/or reported from the states of Andhra Pradesh and Telangana. They are enumerated with a key to the subfamily, tribes, genera and species, alphabetically. The author citations of the currently accepted tribes, genera and species are up-to-date based on the latest professional webpages and by personal research. For every species and infra-specific taxa, the basionym and more popular synonyms, when present, are all cited. The species are provided with the type, brief description, phenology, specimens examined, distribution, and remarks if any on the identity or nomenclatural history or distribution or new information besides the flowering and caryopis time.

5.1 POACEAE SUBFAMILY PANICOIDEAE: ENUMERATION

5.1.1 Key to the Tribes

Spikelets bisexual; bisexual spikelets mixed with staminate or sterile spikelets in the same inflorescence ..... ……**PANICOIDEAE**

1a. Spikelets two-flowered; dorsally compressed with the lower floret staminate or sterile 2

1b. Spikelets many flowered; laterally compressed with the lower floret staminate or sterile ..... ……Centotheceae

2a. Spikelets in pairs (clusters); fertile spikelets pedicelled…… .....Jansenelleae

2b. Spikelets paired or solitary; bisexual spikelets mixed with staminate or sterile spikelets in the same inflorescence 3

3a. Spikelets often paired; one sessile and the other pedicelled; glumes aslong as spikelets and enclosing the florets; upper lemma usually awned ... Andropogoneae

3b. Spikelets solitary or paired, more or less similar; upper lemma usually without awns 4

4a. Inflorescence a panicle; spikelets not plano-convex .....Paniceae

4b. Inflorescence unilateral raceme-like; spikelets plano-convex .....Paspaleae

5.1.2 Taxonomic Treatment of Tribes in Panicoideae

5.1.2.1 Tribe Centotheceae Ridl., 1907

Key to the genera:

1a. Glumes longer than the lemmas, 1-nerved or obscurely; lemmas 1–3-nerved with no tubercle-based bristles present on the margins; caryopsis free between the lemma and palea; paleas abscent .....Thysolaena

1b. Glumes shorter than the lemmas, 3–7-nerved; lemmas 3–9-nerved with refiexed tubercle-based bristles present on the margins; caryopsis loosely held between the lemma and palea; paleas keeled .....Centotheca

Centotheca Desv.

(Nouv. Bull. Sci. Soc. Philom. Paris 2: 189. 1810 ("Centosteca"), nom. & orth. cons.)

Type: *Centotheca lappacea* (L.) Desv. (*Cenchrus lappaceus* L.).

Centotheca lappacea (L.) Desv., Nouv. Bull. Sci. Soc. Philom. Paris. 2: 189. 1810; FBI 332. 1896; FPM 3: 1848. 1934; Bor, Grass. India 457. 1960; FAP 3. 1146. 1997; FTS 687. 2016. *Cenchrus lappaceus* L., Sp. Pl., ed. 2. 2: 1488. 1763. var. **lappacea**

Neotype: Herb. Linn. No. 1212.15 (LINN). LT designated by Monod de Froideville in Blumea 19: 59. 1971.

Perennial tufted grass; culms 70 cm, ligule membranous. Leaves flat, obovate, apex acute. Inflorescence panicle, 12 cm, lax. Spikelets 0.4–0.5 cm, compressed; glumes unequal, lanceolate, perisistent; lemmas oblong, upper lemma with reflexed bristles on the margins; palea keeled, stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: November–January.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 165 (KUW).

Specimens examined: Andhra Pradesh, Chitoor distr., Tirumala hills, *PVP* 3687; East Godavari distr., Basion Hill, *CAB* 5083 (MH).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

*Note***:** The genus was not reported in Flora of Telangana by Pullaiah (2015), whereas Reddy & Reddy (2016) have reported it without a specimen.

Excluded

Centotheca lappacea (L.) Desv. var. **longilamina (**Ohwi) Bor, Grasses Burma, Ceylon, India & Pakistan 459. 1960. *Centotheca longilamina* Ohwi, Bull. Tokyo Sci. Mus. 18: 10. 1947.

Type: Indonesia: Java, Pasir Kiara Djongkang in Res. Batavia; June 8, 1924; Bakhuizen van der Brink 3312 (BO).

Distribution : (I) GLOBAL: China, China, Myanmar and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands (Naithani), Assam, Goa, Kerala, Maharashtra, Manipur, Meghalaya, Rajasthan, Sikkim, Tamil Nadu and West Bengal.

Remarks: It was record from Andaman and Nicobar Islands (Naithani, 1990) but its presence in Andhra Pradesh is erroneous since no authentic collection is available.

2. Thysanolaena Nees

(Edinburgh New. Philos. J. 18: 180. 1835)

Type: *Thysanolaena agrostis* Nees, nom. illeg. (*Agrostis maxima* Roxb., *Thysanolaena maxima* (Roxb.) Kuntze).

Thysanolaena latifolia (Roxb. ex Hornem.) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 312. 1930. *Melica latifolia* Roxb. ex Hornem., Suppl. Hort. Bot. Hafn. 117. 1819. *Thysanolaena maxima* (Roxb.) Kuntze, Revis. Gen. Pl. 2: 784, 1891; FPM 3: 1797. 1934; Bor, Grass. India 650. 1960; FAP 3. 1266. 1997; FTS 755. 2016. *Agrostis maxima* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 319. 1820.

Type: A native of hedges, amongst the Mountains, India, 1900–4000 ft.: *W. Roxburgh s.n.*

Neotype: *J.O. Voigt* s.n. (C/BC: C-10017246) [vide www.thetropicos.org].

Tall, tufted, perennial; culms 70 cm, ligule ciliate. Leaves lanceolate, base semi amplexicaual, margin scaberulous, apex acuminate. Panicle 55 cm, drooping. Spikelets 0.2 cm, lanceolate. Upper lemma long hairy. Stamens 2. Caryopsis oblong.

Flowering and Caryopsis time: February–August.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 219 (KUW).

Specimens examined: Andhra Pradesh, East Godavari distr., Maripakala, *GVS* 27422 (CAL); Maredumilli, *MM* 100708 (MH!); Yarlagadda, *VNS* 155 (CAL).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Tamil Nadu, Tripura, Uttarakhand and West Bengal.

Note: The report was from Telangana and based on Naqvi (2001); Reddy & Reddy (2016) cited no specimen of it.

5.1.2.2 Tribe Paspaleae J. Presl, 1830

Key to the Genera:

1a. Spikelets arranged in more or less in open panicles, or with panicles contracted and spike like 2

1b. Spikelets arranged in one sided spikes or spike like racemes; spikes or racemes digitate or scattered, rarely solitary 3

2a. Panicle contracted, 15 cm long; spikelets 0.4–0.5 cm long; glumes not aristate, not keeled ..... *Hildaea*

2b. Panicle cylindrical, 35 cm long; spikelets 0.6 cm long; glumes aristate, keeled ..... *Hymenachne*

3a. Lower glume turned towards the rachis; back of the upper lemma turned away from it (i.e., spikelets adaxial); lower glume absent ..... *Axonopus*

3b. Lower glume (when present) turned away from the rachis; the back of the upper lemma facing it (i.e., spikelets adaxial); lower lemma present ..... *Paspalum*

Axonopus P. Beauv.

(Ess. Agrostogr. 12, 154. 1812)

Lectotype: *Axonopus compressus* (Sw.) P. Beauv. (*Milium compressum* Sw.). LT designated by Hitchcock in Contr. U.S. Natl. Herb. 12: 142. 1908; Chase, Proc. Biol. Soc. Wash. 24: 129. 1911.

Axonopus compressus (Sw.) P. Beauv., Ess. Agrostogr. 154, 167. 1812; FAP 1138. 1997. *Milium compressum* Sw., Prodr. 24. 1788. LT designated by Hitchcock in Contr. U.S. Natl. Herb. 12: 142. 1908.

Type: Jamaica; *O.P.Swartz* s.n. India orientalis

Perennial; culms 10–40 cm long, decumbent, nodes pubescent; ligule membranous. Leaf blade; lanceolate, apex abtuse or acute, 5–15 x 0.2–1.0 cm. Inflorescence a raceme, digitate, 2–5 paired; spikelets solitary, appressed, hairy, ovoid, 0.2–0.3 cm. Lower glumes abscent, upper ovate, membranaceous, 0.2 cm long, apex obtuse, dorsal surface hairy, margin inflexed, 3-nerved. Lemmas: lower membranous, ovate, 0.2 cm long, apex acute, dorsal surface covered hairy, margin inflexed, 2-nerved, palea absent. Lodicules 2. Stamens 3. Caryopsis ellipsoidal to ovoid.

Flowering and Caryopsis time: Throughout year.

Exsiccata: Andhra Pradesh, Kadapa distr., *S. Gurappa* 170 (KUW).

Specimens examined: Andhra Pradesh, Chittorr distr., Tirumala Hills, *MSG* 12168; East Godavari distr., Maredumilli, *TP* & *MSG* 12264 (SKU).

Distribution: (I) GLOBAL: China and Pakistan; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Meghalaya, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Note: For Telangana state, both Pullaiah (2015) and Reddy & Reddy (2016) have not cited the genus.

Excluded

Hildaea C. Silva & R.P. Oliveira

(Molec. Phylog. Evol. 93: 229. 2015)

Type: *Hildaea pallens* (Sw.) C. Silva & R.P. Oliveira (*Panicum pallens* Sw.).

Hildaea pallens (Sw.) C. Silva & R.P. Oliveira, Molec. Phylog. Evol. 93: 229. 2015. *Panicum pallens* Sw., Prodr. 23. 1788.

Lectotype: *O.P. Swartz* s.n.; Jamaica; designated by Stieber, Syst. Bot. 12: 203. 1987.

Distribution: (I) GLOBAL: Pantropical; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Assam, Delhi, Kerala, Nagaland, Odisha and Tamil Nadu.

Remarks: Chorge *et al*. (2013) are of the opinion that *Hildaea pallens* var. *majus* (Nees) Stieber (*Ichnanthus pallens*) is widely distributed in India and synonymous with *I. vicinus*. On the other, *Hildaea pallens* var. *pallens* is only recorded from the Andaman Islands; this variety is primarily neotropical with sporadic records from Southeast Asia. The present study agrees with this observation and accordingly this taxon is excluded from the list.

Hymenachne P. Beauv.

(Ess. Agrostogr. 48, 165. 1812)

Lectotype: *Hymenachne myuros* (Lam.) P. Beauv. (*Panicum myuros* Lam. ("myruos")) LT designated by L.K.G. Pfeiffer, Nom. 1: 1702. 1873.

Hymenachne amplexicaulis (Rudge) Nees, Fl. Bras. Enum. Pl. 2 (1): 276. 1829. *Panicum amplexicaule* Rudge, Pl. Guian. 1: 21. t. 27. 1805.

Type: Guianas; *Rudge* s.n. French Guiana; *Martin* s.n.

Tall perennial, tall, culms decumbent, nodes glabrous; leaf sheath glabrous, ligule membranaceous. Leaf blade lancolate, acuminate, glabrous, margin scabrous, base amplexicaul, 10–30 cm x 1.0–1.5 cm. Panicle, 15–35 cm long, spiciform; spikelets solitary, upper pedicelled, lower sessile to subsessile. Glumes 2, unequal; lower ovate, cuspidate,

3-nerved, hylanie; upper membranaceous, lanceolate, 0.2–0.4 mm long, caudate, 5-nerved, awn 0.5 mm long. Lemma: Lower lemma sterile, membranaceous, caudate, 5-nerved; upper acuminate, involute. Palea longer than the upper lemma, acuminate, 2-nerved 2. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: October–January.

Specimens examined: Andhra Pradesh, East Godavari distr., D. Mallapuram, *TP* & *MSG* 12281 (SKU). Telangana, Karimnagar distr., Mukunuru, *NRR* & *TRS* 86599 (MH).

Distribution: (I) GLOBAL: Pantropical, China and Myanmar; (II) INDIA: Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Meghalaya, Odisha, Rajasthan, Telangana, Tripura, Uttar Pradesh and West Bengal.

Paspalum L.

(Syst. Nat., ed. 10. 2: 855, 1359. 1759)

Lectotype: *Paspalum dimidiatum* L., nom. illeg. (*Panicum dissectum* L. *Paspalum dissectum* (L.) L.), designated by Nash in N. Amer. Fl. 17: 165. 1912; affirmed by Hitchcock, Bull. U.S.D.A. 772.225.1920.

Key to the species:

1a. Racemes 2, paired ..... *P. conjugatum*

1b. Racemes more than 2; usually spread on an axis 2

2a. Racemes 2–5; upper lemma elliptic ..... *P. scrobiculatum*

2b. Racemes 4–10; upper lemma ovate ..... *P. canarae*

Paspalum canarae (Steud.) Veldkamp, Blumea 21 (1): 72. 1973. *Panicum canarae* Steud., Syn. Pl. Glumac. 1: 58. 1853; FAP 1234. 1997.

Type: India: Canara Province; *R.F. Hohenacker* 635.

Annuals, prostate or decumbent; culms 10–25 cm above, nodes bearded. Leaf sheath tubercle-based hairy; ligule membranous. Leaf blade lanceolate to elliptic, acute, hairy.

Racemes 4–10 cm long, digtate; spikeletes 0.2 cm long, solitary. Glumes: lower absent; upper glume obovate, acute, margin tuberculate-hairy, 3–5 nerved. Lemmas: two; lower sterile, upper ovate, gibbous, indurate, 3–5-nerved. Palea involvute, indurate. Stamens 3. Caryopsis reddish brown, plano-convex, granulate.

Flowering and Caryopsis time: August–November.

Exsiccata: Andhra Pradesh. VSKP distr., Araku, *S. Gurappa* 191 (KUW).

Specimens examined: Andhra Pradesh. Visakhapatnam distr., On the way to Tajavi, *GVS* 42626 (MH!).

Distribution: (I) GLOBAL: Asia–tropical: India and Indo-China; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu.

Paspalum conjugatum P.J. Bergius, Acta Helv. Phys.–Math. 7: 129, t. 8. 1762; Bor, Grass. India 336. 1960; FEG 7: 265. 2020.

Type: “Habitat in Surinamo.” France: Surinam; Rolander in Herb. *Bergius* 36 (SBT). LT designated by de Koning & Sosef, Blumea 30: 290. 1985.

Perennial; culms 25–50 cm; ligule membrane. Leaf blade lanceolate, 5–20 x 0.5–1 cm. Racemes, 5–15 cm long, two paried; spikelets solitary. Glumes: lower absent, upper membranaceous, margin ciliate, apex obtuse. Lemmas: lower sterile; upper 1.5 mm, orbicular, gibbous, indurate, 3-nerved, striate, margin involute, apex acute. Palea involute and indurate.

Flowering and Caryopsis time: July–November.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 193 (KUW).

Specimens examined: Andhra Pradesh, Visakhapatnam distr., Chintapalli, *BR* & *AMR* 24576 (SKU).

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Karnataka, Kerala, Maharashtra, Meghalaya, Odisha, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Paspalum distichum L., Syst. Nat., ed. 10, 2: 855. 1759; FBI 7: 12. 1896; Bor, Grass. India 338. 1960; FAP 1234. 1997; FEG 7: 266. 2020.

Type: "Habitat [in Jamaica.]" LT: *P. Browne* s.n.; Jamaica (LINN–75.9, second fertile culm from the left) LT designated by Guedes, Taxon 25: 513. 1976; earlier discussed by Jovet & Guedes, Taxon 21: 546. 1972; formally ruled on by Nom. Comm., Taxon 32: 281. 1983.

Perennial; culms 10–50 cm long, decumbent. Ligule membranaceous. Leaf blade 3–10 cm x 0.3–0.5 cm, flat–convolute. Racemes 2 or 3 paired spikelets, solitary. Glumes: lower absent; upper elliptic, coriaceous, acute, 3-nerved, puberulous. Lemmas: lower sterile; upper 0.2-0.5 mm, ovate, indurate, gibbous, involute, acute. Palea indurate.

Flowering and Caryopsis time: August–November.

Exsiccata: Andhra Pradesh, Kurnool distr., *S. Gurappa* 196 (KUW).

Specimens examined: Andhra Pradesh, Kurnool distr., *RVR* 1645; Vaddemanu, *PVP* & *RVR* 2529, 2527 (SKU). Telangana, Hyderabad, Kachiguda, *MRS* 107 (DD).

Distribution: (I) GLOBAL: Pantropical; (II) INDIA: Throughout.

Remarks: It is often confused with *Paspalum vaginatum*. Bor (1960) cited *P. distichum* in India and Pakistan and correctly differentiated *P. distichum* from *P. vaginatum* by a hairy upper glume in the former species.

Paspalum scrobiculatum L., Mant. Pl. 29. 1767; FBI 7: 10. 1890; FMP 3: 1772.; 1934; FEG 7: 268. 2020; FAP 1235. 1997; FTS 737. 2016. var**. scrobiculatum. [Plate 5.1: F]**

Lectotype: Herb. Linn. No. 79.4 (LINN). LT designated by Clayton in Kew Bull. 30: 101. 1975.

Perennial; culms 1 m above; geniculate. Leaf blade 7–30 x 0.3–1 cm, attenuate, filiform. Racemes 3–10 cm long, many, digitate; spikelets solitary. Glumes: lower glume absent; upper elliptic, chartaceous, 5–7-nerved, obtuse. Lemmas: lower absent; upper elliptic, gibbous, indurate, 5-nerved, striate, involute, obtuse. Palea indurate.

Flowering and Caryopsis time: Throughout the year.

Exsiccata: Telangana, Warangal distr., *S. Gurappa* 188 (KUW).

Specimens examined: Andhra Pradesh, Chittoor distr., Papavinasanam, *PVP* 3680; Kurnool distr., Cement Nagar Valley, *TP* & *RVR* 1817 (SKU). Telangana, Adilabad distr., Bellampalli, *PVP* 9443; MDK distr., Pocharam tank, *TP* & *MSG* 12037 (SKU).

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu and Telangana.

Excluded

Paspalum scrobiculatum L. var. **auriculatum** (J. Presl) Merr., Philipp. J. Sci. 1 (Suppl. 5): 345. 1906. *Paspalum auriculatum* J. Presl in C. Presl, Reliq. Haenk. 1 (4–5): 217. 1830.

Lectotype: Philippines: Luzon, Sorzogon; *Haenke* s.n. (the 3 right–hand side specimens) (PR). (vide de Koning & Sosef, Blumea 30: 304. 1985).

Distribution: (I) GLOBAL: Philippines; (II) INDIA: Andhra Pradesh, Karnataka and Tamil Nadu.

Remarks: Zuloaga (1987) noted that this taxon is native in other parts of Asia but might be naturalized or only cultivated in parts of India. It is excluded here in view of not finding any specimen.

Paspalum scrobiculatum L. var.**horneri** (Henrard) de Konnig & Sosef, Blumea 30 (2): 307. f. 7B. 1985. *Paspalum horneri* Henrard, Blumea 1 (2): 306. f. 2. 1935.

Type: Sumatra: Prairien, *Horner* s.n. (L).

Distribution: (I) GLOBAL: Indonesia; (II) INDIA: Andhra Pradesh and Assam.

Remarks: It was based on the record of Kellogg *et al*. (2020) but no specimen could be traced from the present study area.

5.1.2.3 Tribe Paniceae R. Br., 1814

Key to the genera:

1a. Plants dioecious; inflorescence terminal, globose; glumes chartaceous; caryopsis clavate, tipped with rigid style-base.....*Spinifex*

1b. PIants monoecious; inflorescence axillary or terminal; glumes otherwise; caryopsis not tipped with rigid style-base..... 2

2a. Spikelets with an involucre of bristles or subtended by a solitary bristle and falling with or without the bristles at maturity..... 3

2b. Spikelets falling singly, not subtended by involucres of bristles..... 4

3a. Spikelets arranged in more or less open panicles or with the panicles contracted and spike-like 6

3b. Spikelets arranged in one-sided spikes or spike-like racemes; spikes or racemes digitate or scattered, rarely solitary 8

4a. Upper lemma smooth; bristles caducous 5

4b. Upper lemma transversely rugose; bristles persistent .....*Setaria*

5a. Bristles numerous; involucres of bristles free or cup-like .....*Cenchrus*

5b. Bristles solitary, formed of prolongation of branch beyond the spikelets ..... *Pseudoraphis*

6a. Spikelets arranged in open or contracted panicles 8

6b. Spikelets usually arranged in cylindrical spike-like panicles 9

7a. Spikelets distinctly gibbous ..... *Cyrtococcum*

7b. Spikelets not or slightly gibbous ..... *Panicum*

8a. Lemma of the upper floret crustaceous or coriaceous usually with narrowin-rolled margins, exposing palea 10

9a. Lemma of the upper floret thinks cartilaginous usually with flat hyaline margins 16

9a. Lemma of the upper floret otherwise with no hyaline margins 17

10a. Spikelets laterally compressed, obliquely ovoid ..... *Pseudechinolaena*

10b. Spikelets dorsally compressed or almost terete 11

11a. Lower glume and lowest internode of the rhachilla forming a swollen callus at the base of the spikelet ..... *Eriochloa*

11b. Lower glume and lowest internode of the rhachilla not forming a swollen callus at the base of the spikelets..... 12

12a. Lower glume present 13

12b. Lower glume absent ..... *Paspalum*

13a. Glumes acuminate or awned, upper lemma not mucronate 14

13a. Glumes awnless, if acuminate, then upper lemma mucronate 15

14a. Leaf blades linear; culms erect or sub-erect .....*Echinochloa*

14b. Leaf blades ovate-lanceolate; culms creeping and ascending .....*Oplismenus*

15a. Upper lemma acute .....*Urochloa*

15b. Upper lemma not acute 16

16a. Spikelets awnless ..... *Digitaria*

16b. Spikelets awned ..... *Alloteropsis*

17a. Inflorescence of 1–3 racemes, each with disarticulating rachis, bearing abaxial shortly peduncled clusters of 1–6 at each joint .....*Trachys*

17b. Inflorescence in panicles, heads or racemes; disarticulating spikelets not in groups 18

18a. Lower glume a minute scale; upper lemma crustaceous .....*Moorochloa*

18b. Lower glume linear; finely awned at the notch of lower lemma .....*Melinis*

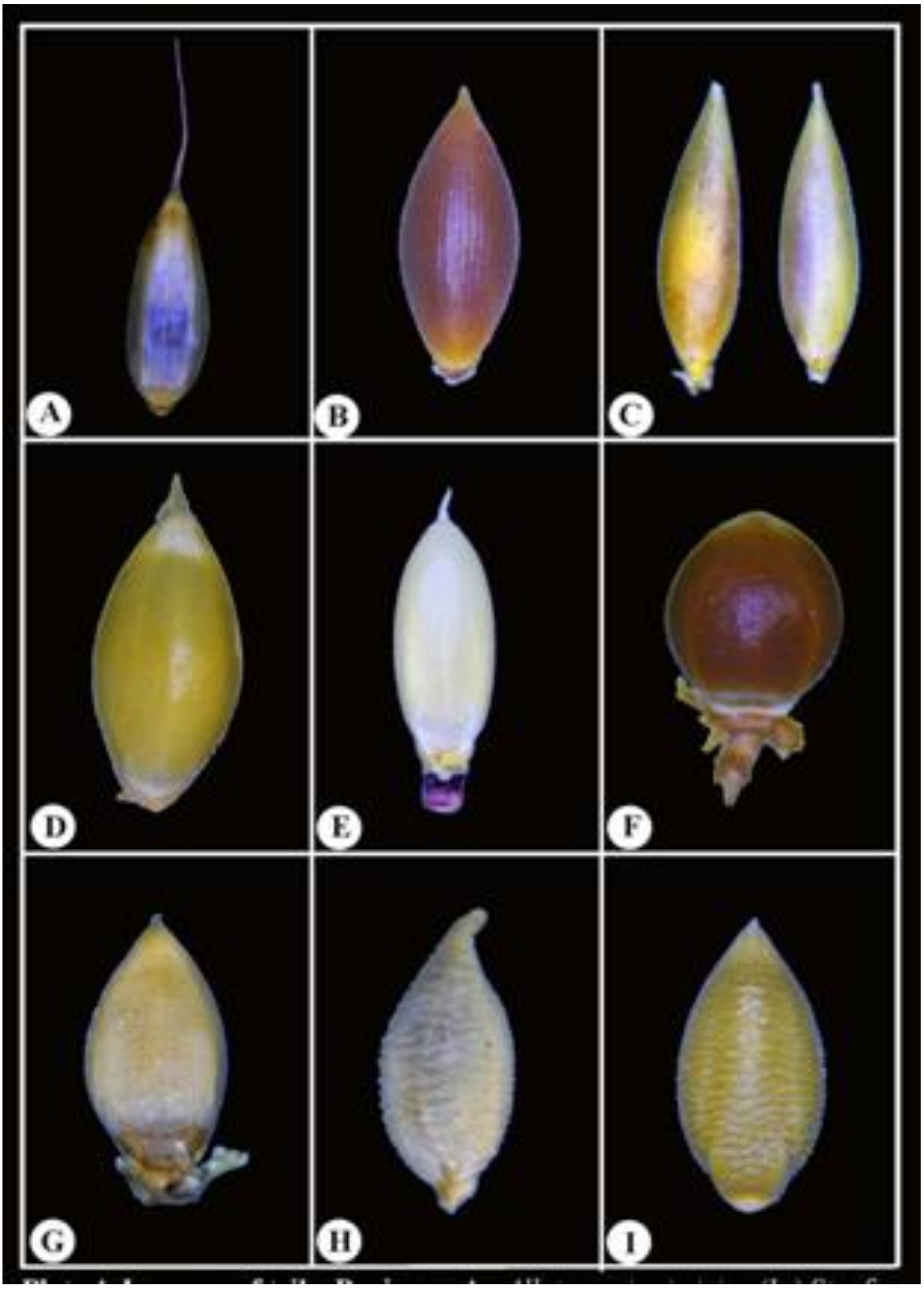

Plate 5.1. **Lemmas of Tribe Paniceae and Paspaledeae, Panicoideae, Poaceae.** **A** – *Alloteropsis cimicina*; **B** – *Digitaria abludens*; **C** – *Digitaria longiflora*; **D** – *Echinochloa crus-galli*; **E** – *Eriochloa procera*; **F** – *Paspalum scrobiculatum*; **G** – *Setaria geminta*; **H** – *Setaria plicata*; **I**– *Setaria pumila*.

Alloteropsis J. Presl

(Reliq. Haenk. 1: 343. 1830)

Type: *Alloteropsis distachya* J.Presl.

Key to the species:

1a. Racems 4–11 digitate; upper lemma arista 2–5 mm long .....*A. cimicina*

1b. Racems 2–4 digitate; upper lemma arista 1–3 mm long ..... *A. semilata*

Alloteropsis cimicina (L.) Stapf., Fl. Trop. Afr. [Oliver *et al*.] 9: 487. 1919; FPM 3: 1766. 1934; Bor, Grass. India 276. 1960; FAP 1126. 1997; FTS 677. 2016. *Milium cimicinum* L., Mant. Pl. Altera 184. 1771. **[Plate 5.1: A]**

Neotype: Herb. Linn. No. 83.2 (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 617. 1982.

Annual; culms 35–70 cm long, geniculate; nodes glabrous or bearded. Leaf sheath loose; ligule hairy; leaf blade 3–10 cm x 0.5–1.5 cm, lanceolate, acute, ciliate, glabrous; base amplexicaul. Racemes 5–20 cm long, 4–11 digitate, peduncle filiforum, hairy. Glumes two, unequal. Lower glume ovate, 3-nerved, acuminate. Upper glume ovate, 5-nerved, margin ciliate, acuminate. Lemmas two, lower lemma 5-nerved, acuminate; upper lemma long arista, 0.2–0.5 cm long, 5-nerved, involute, acuminate. Palea chartaceous, surface papillose or glabrous. Stamens 3. Caryopsis ovoid, compressed.

Flowering and Caryopsis time: July–February.

Exsiccata: Andhra Pradesh, ATP distr., *S. Gurappa* 150 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalli RF, *PVP* 3453 (SKU); Duggmakonda, *KSM* 6359 (MH, CAL). Telangana, MDK distr., Pocharam tank, *TP* & *MSG* 12049 (SKU).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Throughout.

Alloteropsis semialata (R. Br.) Hitchc., Contr. U.S. Natl. Herb. 12: 210. 1909; Bor, Grass. India 276. 1960; Moulik, Grass. Bamb. India 1: 70. 1997. *Panicum semialatum* R. Br., Prodr. Fl. Nov. Holland. 1: 192. 1810.

Type: Australia: “Littora Novae Hollandiae intra tropicum”; *R. Brown* 6101 (BM).

Annual; culms 100 cm long; geniculate, nodes glabrous. Leaf sheath loose; ligule ciliate membranous. Leaf blade 10–40 x 0.5–1.0 cm, acuminate, margin tuberculate hairy; surfaces rough. Racemose 5–20 cm long, 2–4 digitate; spikelets solitary. Glumes two, unequal. Lower glume ovate, 3-nerved, acuminate. Upper glume ovate, 5-nerved, ciliate, acuminate. Lemmas two; lower lemma 5-nerved, truncate; upperl lemma shortly arista, 0.1–0.3 cm, involute, acuminate. Palea smooth. Stamens 2. Caryopsis ovoid, compressed.

Flowering and Caryopsis time: June–March.

Specimens examined: Andhra Pradesh: Chittoor distr.: Talakona, *BR & BSS* 30621 (SKU). Telangana, MBNR distr., Appapur, *BR* & *AMR* 26802 (SKU).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Tamil Nadu, Telangana and Uttar Pradesh.

Cenchrus L.

(Sp. Pl. 2: 1049. 1753)

Lectotype: *Cenchrus echinatus* L. LT designated by Green in Prop. Brit. Bot. 193. 1929.

Key to the species:

1a. Spikelets of involcural bristles antrosely 2

1b. Spikelets of involcural bristles retrosely..... *C. biflorus*

2a. Caryopsis dorsiventrally compressed, oblong..... *C. setigerus*

2b. Caryopsis not dorsiventrally compressed, not oblong..... 3

3a. Panicles oblong; inner bristles longer than outer ..... *C. ciliaris*

3a. Panicles otherwise; inner bristles not longer than outer..... 4

4a. Anther cells bearded at the apex 5

4b. Anther cells not bearded at the apex..... 6

5a. Bristles 10–18 mm long; wild ..... *C. purpureus*

5b. Bristles below 7 mm long; cultivated .....*C. americanus*

6a. Palea not toothed..... 7

6b. Palea toothed 8

7a. Upper lemma 8–12-nerved ..... *C. clandestinus*

7b. Upper lemma 5–7-nerved ..... *C. hohenackeri*

8a. Bristles wooly.....*C. pedicellatus*

8b. Bristles plumose ..... *C. polystachios*

Cenchrus americanus (L.) Morrone, Ann. Bot. (Oxford), n.s. 106: 127. 2010. *Panicum americanum* L., Sp. Pl. 1: 56. 1753.

Lectotype: "Panicum Americanum" in Clusius, Rar. Pl. Hist., 2: 215, 215, 1601. LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 672. 1982.

Pennisetum americanum (L.) K. Schum., Pflanzenw. Ost-Afrikas B: 51. T. 4. 1895.

Annual tufted grass; cultivated, running wild. Panicle up to 20 cm long, involucural bristles below 0.7 cm long. Lower glume absent; upper glume minute. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: August–November.

Specimens examined: Andhra Pradesh. VSKP distr., *NPBK* 585 (CAL).

Distribution: (I) GLOBAL: China; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

Note: Widely cultivated and running wild in the region.

Cenchrus biflorus Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 238–239. 1820; FBI 7: 89. 1896; Bor, Grass. India 287. 1960; FAP 3. 1155. 1997; FTS 686. 2016; FEG 7: 64. 2020.

Type: India: dry elevated parts of the Coromandel coast; *Roxburgh* s.n. (BM).

Cenchrus barbatus Schumach., Beskr. Guin. Pl. 43. 1827. Type: Ghana: Guinea; *P. Thonning s.n.*; FMP 3: 1749. 1934.

Tufted annual; culms 50 cm long; leaf sheath loose, surface glabrous. Leaf blade linear or lanceolate, 5–10 x 3–5 cm, margin scabrous, acuminate. Panicle linear, 10 cm long; spikelets ovoid, 0.3–0.5 cm, dorsally compressed; involucral bristles retrorsely scaberulous. Lower glume lanceolate, obtuse. Upper glume ovate, 0.2–0.3 cm, 1–nerved, apex obtuse. Lower glume absent. Lower lemma ovate, 3–nerved, apex muticous. Upper lemma ovate, 0.5 cm, coriaceous, 5-nerved, acute. Palea coriaceous, empty or bear a staminate flower. Stamens 3. Caryopsis oblong or orbicular.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Kadapa distr., *S. Gurappa* 184 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Muchukota RF, *PVP* 2560; KNL distr., Gazulapalle, *KCJ* 83138 (MH!). Telangana, NLG distr., Vijayapuri, *KM* 9851 (CAL).

Distribution: (I) GLOBAL: Native range is Africa to NW India; (II) INDIA: Andhra Pradesh, Bihar, Daman and Diu, Delhi, Goa, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh.

Cenchrus ciliaris L., Mant. Pl. Altera 302. 1771; FPM 3: 1749. 1934; Bor, Grass. India 287. 1960; FAP 1146. 1997; FTS 687. 2016; FEG 7: 66. 2020.

Lectotype: Koenig s.n., Herb. Linn. No. 1217.9 (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 691. 1982.

Pennisetum ciliare (L.) Link, Hort. Berol. [Link] 1: 213. 1827.

Tufted perennial; culms 60 cm long. Leaf sheath loose; ligule hairy, 0.2 cm. Leaf blade 5–10 x 3–7 cm, hairy, acuminate. Panicle oblong, 10 cm long; spikelets lanceolate, 0.6 cm, spikelets subtended by involucre bristle; inner bristles longer than outer, bristle 0.5–1.5 cm, antrorsely scaerulous. Lower glume acute. Upper glume ovate, 3-nerved, acute. Lower lemma ovate, membranaceous, 5-nerved, mucronate. Upper lemma ovate, dorsally compressed, 0.5 cm, mucronate. Palea ovate, 2-nerved. Stamens 3. Caryopsis obovoid, 0.1 cm long.

Flowering and Caryopsis time: July–January.

Exsiccata: Andhra Pradesh, ATP distr., Gooty, *S. Gurappa* 159 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Gooty Fort, *PVP* 3670; Gooty, *JSG* 800 (MH) & 20824 (DD). Telangana, Warangal distr., Hasanparthi, *CSR* 538 (KUW).

Distribution: (I) GLOBAL: Native range is Sicilia, S. Greece, Africa, Arabian Peninsula to Indian Subcontinent; (II) INDIA: Throughout.

Note: Pullaiah (2015) cited no specimen of it for Telangana. The grass is good animal feed, a poison and a medicine.

Cenchrus clandestinus (Hochst. ex Chiov.) Morrone, Ann. Bot. (Oxford) n.s., 106: 127. 2010. *Pennisetum clandestinum* Hochst. ex Chiov., Annuario Reale Ist. Bot. Roma 8 (1): 41, t. 5, f. 2. 1903; FPM 3: 1793. 1934; Bor, Grass. India 344. 1960; FAP 3. 1236. 1997; FTS 739. 2016.

Type: "In Abyssinia legit W. Schimper no. 2084." Ethiopia; *Schimper* 2084 (FI).

Tufted perennial; culms 40 cm long; ligule hairy. Leaf blade 5–10 x 2–5 cm, conduplicate, apex obtuse. Spikelets subtended involucres bristles, spikelets lanceolate, 0.7–2.0 cm, compressed, bristle 0.5–1.5 cm. Lower and Upper glumes obscure. Lower lemma oblong, membranous, 7–12-nerved. Upper lemma lanceolate, 1.0–2.0 cm, membranaceous, 8–12-nerved, acute. Palea 2–4-nerved. Stamens 3, 4–5 mm long.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, SKLM distr., Palasa, *BDM* 183 (CAL).

Distribution: (I) GLOBAL: Native range is Eritrea to S. Tropical Africa; (II) INDIA: Andhra Pradesh, Assam, Sikkim, Tamil Nadu and Uttarakhand.

Note: It is an Introduced fodder grass; at times invasive.

Cenchrus hohenackeri (Hochst. ex Steud.) Morrone, Ann. Bot. (Oxford) n.s., 106: 128. 2010. *Pennisetum hohenackeri* Steud., Syn. Pl. Glumac. 1: 103. 1854; FAP 3. 1237. 1997; FTS 739. 2016.

Type: India: Tamil Nadu, Nilgherry Mountains; 1851, *R.F. Hohenacker* 930.

A perennial tuftedgrass. Panicle up to 12 cm long; spikelets 0.8 cm long, narrowly lanceolate. Lower glume acute, rotund or truncate; upper glume half as long as the spikelet, emarginated. Lemmas similar, 5–7-nerved; lower *staminate* or sterile, upper firmer. Stamens 3, anther-tips with or without a minute tuft of hairs. Caryopsis narrowly oblong.

Flowering and Caryopsis time: September–October.

Specimens examined: Andhra Pradesh, VSKP distr., Gudem, *VNS* 632 (CAL).

Distribution: (I) GLOBAL: Native range is E. Tropical Africa, Madagascar, Indian Subcontinent; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Tamil Nadu.

Cenchrus pedicellatus (Trin.) Morrone, Ann. Bot. (Oxford) n.s., 106: 128. 2010. *Pennisetum pedicellatum* Trin., Mém. Acad. Imp. Sci. Saint–Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 3, 1 (2–3): 184. 1834; FBI 7: 86. 1896; FPM 3: 1792. 1934; Bor, Grass. India 346. 1960; FAP 3. 1237. 1997; FTS 740. 2016; FEG 7: 272. 2020.

Type: Cape Verde Islands, St. Lago; *D. Peters* s.n. (LE–TRIN–1101.01).

Tufted annual grass of 1 m high. Leaf sheath glabrous, ligule puberulous; leaf blades linear, flat. Racemes 12 cm long, spikelets closely packed, 0.4 cm long, subsessile. Involcural bristles plumose. Upper glume truncate, lower glume small. Upper lemma ovate, apex fimbriate. Palea toothed. Staments 3, anther tips hairy.

Flowering and Caryopsis time: November–January.

Specimens examined: Andhra Pradesh, EG distr., *CAB* 4976 (MH).

Distribution: (I) GLOBAL: Native range is Cape Verde, Tropical Africa, Madagascar, Indian Subcontinent to Indo-China; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

Cenchrus polystachios (L.) Morrone, Ann. Bot. (Oxford) n.s., 106: 129. 2010. *Pennisetum polystachyon* (L.) Schult. Mant. 2: 146. 1824; FPM 3: 1792 (1241). 1934; FAP 3: 1238. 1997; FTS 740. 2016. *Panicum polystachion* L., Syst. Nat., ed. 10. 2: 870. 1759.

Lectotype: Herb. Linn. No. 80.4 (LINN). LT designated by van der Zon in Wageningen Agric. Univ. Pap. 92–1: 335. 1992.

Tufted perennial. Racemes 10 cm long, involcural bristles densely plumose. Spikelets 0.4 cm long, lower glume minute, palea toothed.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, WG distr., Sirivaka, *CAB* 5272 (MH).

Distribution: (I) GLOBAL: Native range is Africa, Arabian Peninsula, India to Indo-China; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal.

Cenchrus purpureus (Schumach.) Morrone, Ann. Bot. (Oxford) n.s., 196: 129. 2010. *Pennisetum purpureum* Schumach., Beskr. Guin. Pl. 44. 1827; Bor, Grass. India 348. 1960; FAP 3: 1238. 1997; FTS 740. 2016; FEG 7: 274. 2020.

Type: Ghana: Guinea.*Thonning* 355 (C).

Tufted perennial; ligule hairy, 0.1–2 mm. Leaf blade 7–15 x 2–5 cm, rough. Panicles 3–6 cm long, spiciforum; spikelets subtended by involucre bristles; spikelets 2.5 mm, compressed dorsally. Lower glume ovate, obtuse. Upper glume ovate, 1-nerved, obtuse. Lower lemma oblong, membranous, 5-nerved, rough. Upper lemma lanceolate, 0.2 cm, chartaceous, acute. Palea chartaceous. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: August–November.

Exsiccata: Telangana, Warangal distr., *S. Gurappa* 172 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Anantagiri, *GVS* 21558 (MH).

Distribution: (I) GLOBAL: Native range is Sahara to Tropical Africa, Aldabra, Arabian Peninsula; (II) INDIA: Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Himachal Pradesh,

Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and West Bengal.

Note: Introduced; cultivated as fodder grass locally.

Cenchrus setigerus Vahl, Enum. Pl. (Vahl) 2: 395. 1805; FPM 3: 1794. 1934; Bor, Grass. India 290. 1960; FEF 7: 66. 2020.

Type: "Habitat in Arabia. Forskal." Saudi Arabia; Forsskal s.n. (C).

Cenchrus biflorus Hook. f., Fl. Brit. India 7: 89. 1896, non Roxb. 1820.

Tufted perennial, culms 60 cm long; ligule hairy. Leaf blade 5–10 x 2–5 cm. Panicles 10 cm long, linear, spiciform; spikelets 0.5 mm, dorsally compressed, subtended by involucres bristle, inner longer than outer bristles, long bristle 0.4 cm, antrosely scaberulous. Lower glume ovate, 0.1–0. 2 cm, puberulous, apex obtuse or acute. Upper glume ovate, 0.2 cm, puberulous, obtuse. Lower lemma oblong, 5-nerved, puberulous, emarginate. Upper lemma ovate, 0.3–0.5 cm, 5–nerved, truncate. Palea chartaceous. Stamens 3. Caryopsis 0.1 cm long, oblong, dorsally compressed.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, ATP distr., BT Dam, *BR* & *KVS* 29179 (SKU).

Distribution: (I) GLOBAL: Native range is Sahara to W. Indo-China and Tanzania; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Daman and Diu, Goa, Gujarat, Haryana, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh.

Cyrtococcum Stapf

(Fl. Trop. Afr. [Oliver *et al*.] 9: 15. 1917, 9: 745. 1920)

Lectotype: *Cyrtococcum setigerum* (P. Beauv.) Stapf (*Panicum setigerum* P. Beauv.) LT designated by F.W. Gould in R.A. Howard, Fl. Lesser Antilles 3: 121. 1979.

Key to the species:

1a. Pedicels shorter than spikelets..... 2

1b. Pedicels longer than spikelets 3

2a. Spikelets glabrous; panicle branches pilose ..... *C. oxyphyllum*

2b. Spikelets hispidulous; panicle branches glabrous ..... *C. trigonum*

3a. Panicle above 20 cm long ..... *C. longipes*

3b. Panicle below 20 cm long 4

4a. Panicle not contracted ..... *C. deccanense*

4b. Panicle contracted ..... *C. patens*

Cyrtococcum deccanense Bor, Kew Bull. 1956: 255–256. 1956; Bor, Grass. India 291. 1960; FEG 7; 107. 2020.

Type: Sri Lanka: Hakgala, gully near Botanical Garden; 6000 ft., December 30, 1950: *F. Ballard* 1341 (K).

Tufted perennial. Leaves lanceolate, acuminate. Panicle 10–18 cm, lax. Spikelets ovoid. Palea 0.1 cm. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, VSKPP distr., Chintapalli, *BR* & *AMR* 24590 (SKU).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Cyrtococcum longipes (Wight & Arn. ex Hook. f.) A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 118. 1921; FPM 3: 1786. 1934; Bor, Grass. India 291. 1960; FAP 3. 1165. 1997. *Panicum longipes* Wight & Arn. ex Hook. f., Fl. Brit. India. 7 (21): 58. 1896.

Syntypes: India: Nilghiri and Pulney Hills; *Heyne* (Numer. List [Wallich] no. 8741). *Wight & Arn* (Wight Cat. no. 1638); Karkun Ghar, alt. 2000 ft.: *Lawson* s.n.

Perennial, culms 1 m above, geniculate, ascendining, nodes glabrous or bearded. Leaf sheath glabrous or hairy, ligule membranaceous. Leaf blade 5–20 × 0.5–1.0 cm, lanceolate, acuminate. Panicle 5 cm long, obovoid; primary branches drooping. Spikelets solitary. Glumes 2, nearby, similar. Lower glume lanceolate, 0.1–0.2 cm long, 3-nerved, acuminate. Upper gulme oblong, 0.1–0.2 cm long, 5–7-nerved, cuspidate. Lemmas 2,

lower and upper as long as upper gulme. Lower lemma oblong, 5-nerved, ciliolate, cuspidate. Upper lemma compressed, obovate, 5–7-nerved, margin involute, apex crested. Palea involute, indurate, apex reflexed, 2-nerved. Stamens 3. Caryopsis obovoid.

*Flowering and Caryopsis ti*me: April–August.

Specimens examined: Andhra Pradesh, EG distr., Bhupatipalem, *TP* & *MSG* 12248 (SKU); Bison hills, *CAB* 5094 (MH).

Distribution: (I) GLOBAL: India and Myanmar; (II) INDIA: Andhra Pradesh, Assam, Karnataka, Kerala, Sikkim and Tamil Nadu.

Cyrtococcum oxyphyllum (Hochst. ex Steud.) Stapf., Hooker's Icon. Pl. 31: sub t. 3096. 1922; FPM 3: 1786. 1934; Bor, Grass. India 291. 1960; FAP 3: 1166. 1997 *Panicum oxyphyllum* Hochst. ex Steud., Syn. Pl. Glumac. 1: 65. 1853.

Type: India: Canara: *R.F. Hohenacker* 627.

Annual, culms 25–50 cm, nodes glabrous. Leaf sheath glabrous, ligule membranous. Leaf blade lanceolate, 5–15 x 0.5–0.9 cm, glabrous, acuminate. Panicle, 5–20 cm long, contracted, lanceolate, branches asending. Spikelets solitary. Glumes 2, nearby similar. Lower glume ovate, 1–1.5 mm long, 3-nerved, acute. Upper glume oblong, 1–2 mm long, gibbous, 3-nerved, acute. Lower lemma oblong, 5-nerved, acute. Upper lemma compressed, gibbous, 5-nerved, apex crested. Palea apex reflexed, indurate, 2-nerved. Stamens 3. Caryopsis globose.

Flowering and Caryopsis time: April–August.

Exscicata: Andhra Pradesh, VSKP distr., Araku. *S. Gurappa* 194 (KUW).

Specimens examined: Andhra Pradesh, East Godavari, Dumakonda, *VNS* 195 (CAL); Basion hill, *CAB* 5055 (MH!).

Distribution: (I) GLOBAL: Bhutan, China and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura and West Bengal.

Cyrtococcum patens (L.) A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 118. 1921; FPM 3: 1786. 1934; Bor, Grass. India 292. 1960. *Panicum patens* L., Sp. Pl. 1: 58. 1753.

Lectotype: Herb. Linn. No. 80.63 (LINN). LT designated by Mitra & Jain in Manilal (ed.), Bot. Hist. Hort. Malabaricus 151. 1980.

Tufted perennial. Leaves very narrow. Panicles 7–10 cm long, lax. Spikelets obovoid. Lemmas unequal. Caryopsis obovoid.

Flowering and Caryopsis time: July–May.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley. *S. Gurappa* 197 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Lambasingi Ghat, *BR* 52962 (SKU).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, Myanmar, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Andaman and Nicobar Islands, Assam, Bihar, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Odisha, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

Cyrtococcum trigonum (Retz.) A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 118. 1921; FPM 3: 1785. 1934; Bor, Grass. India 292. 1960; FAP 3. 1166. 1997; FTS 696. 2016. *Panicum trigonum* Retz., Observ. Bot. 3: 9. 1783.

Type: India: *Koenig* s.n. (LD). “Specimina javanica melius conceniunt cum Rumph. quam cum Rheed. figura cujus folia longiora.”

Perennial, nodes glabrous. Leaves lanceolate. Panicles 5 cm long. Spikelets 13 cm long. Lemmas oblong. Stamens 3. Caryopsis sub-globose.

Flowering and Caryopsis time: July–March.

Exscicata: Andhra Pradesh, CTR distr., Tirumala. *S. Gurappa* 164 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Horsely hills, *PVP* 4664; Papanasanam, *KS* 6593 (MH); EG distr., Gokavaram, *CAB* 8260 (MH).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Goa, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu and West Bengal.

Note: Pullaiah (2015) reported the genus while Reddy & Reddy (2016) have not cited any specimen.

Digitaria Haller f.

(Hist. Stirp. Helv. 2: 244. 1768, nom. cons.)

Type: *Digitaria sanguinalis* (L.) Scopoli (*Panicum sanguinale* L.) (type cons.).

Key to the species:

1. Spikelets binate or ternate; pedicels stout 2

1b. Spikelets solitary; pedicels capillary ..... *D. tomentosa*

2a. Spikelets binate 3

2b. Spikelets ternate 9

3a. Rachis margin glabrous ..... *D. radicosa*

3b. Rachis margin serrate 4

4a. Spikelets homomorphous 5

4b. Spikelets heteromorphous 8

5a. Lower glume abscent ..... *D. setigera*

5b. Lower glume present 6

6a. Lower lemma reduced, not minute; triangular spines on nerves ..... *D. ciliaris*

6b. Lower lemma developed, minute; triangular spines on nerves 7

7a. Upper glume 3-nerved; caryopsis ovoid ..... *D. compacta*

7b. Upper glume 5-nerved; caryopsis oblong ..... *D. sanguinalis*

8a. Culms not thickend ..... *D. bicornis*

8b. Culms thickend ..... *D. nodosa*

9a. Caryopsis flattened ..... *D. ternata*

9b. Caryopsis not flattened 10

10a. Tips of the pedicels cupuliforum ..... *D. ternata*

10b. Tips of the pedicels not cupuliforum 11

11a. Rachis flat, broadly winged ..... *D. longiflora*

11b. Rachis filiform, not winged ..... *D. stricta*

Digitaria abludens (Roem. & Schult.) Veldkamp, Blumea 21 (1): 53–55 f. 11d. 12. 1973; FAP 3. 1176. 1997; FTS 703. 2016. *Panicum abludens* Roem. & Schult., Syst. Veg., ed. 15 bis 2: 457. 1817. **[Plate 5.1: B]**

Type: India: *Heyne* s.n. (B). "*Pancium paradoxum* Roth, Nov. Plant. Spec. MS."

Tufted annual, culms 50 cm long, nodes glabrous. Leaf sheath tubercle hairy, ligule eciliate, membranous. Leaf blade lanceolate, 3–7 x 1–3 cm, rough, scaberulous, apex attenuate. Racemes up to 2–5 cm long, 5-digtate. Spikelets 0.1–1.5 cm long, ellipsoid, dorsally compressed. Lower glume absent. Upper glume lanceolate, 3–nerved, hairy, acute. Lower lemma elliptic, capitate hairy. Upper lemma ovate, 0.1 cm long, margin thin, apiculate. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–October.

Exscicata: Andhra Pradesh, Kadapa distr., Mallela Ghat, *S. Gurappa* 151 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Balugram, *RVR* 2744; CTR distr., Nagalapuram, *MCB* 54234 (MH). Telangana, ADB distr., Rebbana, *GO* & *PVP* 4892 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal and Pakistan; (II) INDIA: Throughout.

Digitaria bicornis (Lam.) Roem. & Schult., Syst. Veg., ed. 15 bis 2: 470. 1817; Bor, Grass. India 299. 1960; FAP 3. 1177. 1997; FTS 704. 2016. *Paspalum bicorne* Lam., Tabl. Encycl. 1: 176. 1791.

Type: "Lieu nat. l'Inde." India: *Sonnerat* in Herb. Lamarck (P–LAM).

Tufted annual, culms 20–35 cm long, rooting from lower nodes. Leaf sheath hairy, ligule eciliate, leaf blade elliptic, 3–7 x 2–5 cm, rough, acute. Racemes 5–10 cm long, digitate or paired. Spikelets 0.3 cm long, ellipsoid. Lower glume ovate, 0.2 cm, obtuse. Upper glume lanceolate, 3-nerved, ciliate, acute. Lower lemma elliptic, 5-nerved, ribbed, ciliate, acute. Upper lemma elliptic, 0.2 cm, glabrous, acute. Palea cartilaginous. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–November.

Exscicata: Andhra Pradesh, Kurnool distr., Ahobilum, *S. Gurappa 182* (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Muchukota RF, *PVP* 2568; KNL distr., Lower Ahobilam, *RVR & GO* 2582 (SKU); Telangana, NLG distr., Nagarjuna Konda valley, *KT* 9684 (CAL).

Distribution: (I) GLOBAL: China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Digitaria ciliaris (Retz.) Koeler, Descr. Gram. 27. 1802; Matthew, Fl. Tamilnadu Carnatic 3: 1837. 1983; FAP 3:. 1177. 1997; FTS 704. 2016. *Panicum ciliare* Retz., Observ. Bot. 4: 16. 1786–1787.

Type: "E Java et China adtulit honor. Wennerberg." China: Guangdong, Guangzhou: *Wennerberg* s.n. (LD).

Annual tufted, 50 cm long. Leaf sheath glabrous, ligule eciliate, blade lanceolate, 3–10 x 0.2–0.6 cm. Racemes 10 cm long, digitate. Spikelets dorasally compressed, ellipsoid, 0.3 cm. Lower glume ovate, 0.2 cm, 3-nerved. Upper glume linear, hairy, acute. Lower lemma elliptic, 7-nerved, hairy, ciliate, acute. Upper lemma 0.3 cm long, 3-nerved. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–October.

Exscicata: Telangana, Warangal distr. *S. Gurappa* 195 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Tadipatri, *JSG* 21306 (DD); KDP distr., Guvvalacheruvu, *PVP* 3422. Telangana, ADB distr., Sattenapalle beat, *TP* & *PVP* 4084 (SKU).

Distribution: (I) GLOBAL: China, Myanmar, Nepal and, Pakistan; (II) INDIA: Throughout.

Digitaria compacta (Roth) Veldkamp, Blumea 21 (1): 71. 1973; FEG 7. 126. 2020. *Paspalum compactum* Roth, Syst. Veg., ed. 15 bis [Roemer & Schultes] 2: 316. 1817; FBI 7: 12. 1896; FPM 3: 1772. 1934; Bor, Grass. India 336. 1960.

Type: India orientalis: *Heyne* s.n. (B).

Tufted annual, culms 25 cm, ligule membranaceous. Leaves lanceolate. Racemes 5–15 cm. Spikelets 0.1–0.2 cm. Upper glume 0.2 cm, ovate. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, VSKP distr., on the way to Tanjavanam, *GVS* 42626 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Meghalaya and Uttar Pradesh.

Digitaria longiflora (Retz.) Pers., Syn. Pl. 1: 85. 1805; FPM 3: 1765. 1934; Bor, Grass. India 302. 1960; FAP 3. 1178. 1997; FTS 705. 2016. *Paspalum longiflorum* Retz., Observ. Bot. 4: 15. 1786–1787; FBI 7: 17. 1896. **[Plate 5.1: C]**

Type: "E Malabaria, ubi ad margines agrorum crescit, misit hon. *Koenig*."

Tufted annual. Leaf sheath hairy, ligule eciliate, blade lancolate, 5–9 x 0.2–0.5 cm, hairy. Racemes 10 cm, digitate. Spikelets dorsally compressed, elliptic, 0.2 cm long. Lower glume absent. Upper glume elliptic, 5-nerved, hairy, acute. Lower lemma elliptic, 7-nerved. Upper lemma 0.1 cm long, acute. Palea cartilaginous. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–October.

Exscicata: Telangana, Zaherabad distr., *S. Gurappa* 186 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalle RF, *PVP* 3472; KNL distr., Way to Balugram, *JLE* 25538 (CAL, MH); Gazulapalle, *KCJ* 83135 (MH). Telangana, Hyderabad, *MRS* 236 (DD).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Digitaria nodosa Parl., Pl. Nov. 39. 1842; Bor, Grass. India 303. 1960; Moulik, Grass. Bamb. India 1: 94. 1997; FEG 7: 128. 2020. *Syntherisma nodosa* (Parl.) Newbold, Torreya 24: 9. 1924.

Type: "Habitat in arvis insulae Canariae."

Tall tufted perennial, ligule membranaceous. Leaves lanceolate, acuminate. Racemes 2–3-digitate. Spikelets 0.3 cm, ellipsoid. Upper glume 0.3 cm, lanceolate. Stamens 3. Lodicules 2.

Flowering and Caryopsis time: July–October.

Specimens examined: Andhra Pradesh, KNL distr., Peccheruvu, *AMR* & *BR* 24507 (SKU).

Distribution: (I) GLOBAL: Afghanistan, India and Pakistan; (II) INDIA: Andhra Pradesh and Punjab.

Digitaria radicosa (J. Presl) Miq., Fl. Ind. Bat. 3: 437. 1857; Matthew, Fl. Tamilnadu Carnatic 3: 1838. 1983; FAP 3. 1179. 1997; FTS 705. 2016. *Panicum radicosum* J. Presl in C. Presl, Reliq. Haenk. 1 (4–5): 297. 1830.

Type: "Habitat ad Sorzogon Luzoniae." Philippine Islands: Luzon, Sorsogon Province; *Haenke* s.n. (PR?).

Tufted annual, culms 35 cm long, ligule eciliate. Leaf blade lanceolate, 2–5 x 0.2–0.4 cm long. Racemes 9 cm long, digitate. Spikelets dorsally compressed, elliptic, 0.2–0.3 cm. Lower glume ovate, 0.1 cm, obtuse. Upper glume lanceolate, pubescent, acute. Lower lemma elliptic, 5-nerved, pubescent. Upper lemma lanceolate, 0.2 cm, acute, margin covering palea, acute. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–December.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 155 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Mangapuram, *RVR* & *GO* 2449. Telangana, ADB distr., Sattenapalle RF, *TP* & *PVP* 4098 (SKU).

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Pakistan; (II) INDIA: Throughout.

Remarks: Kellogg *et al*. (2020) placed *Digitaria timorensis* (Kunth) Balansa in synonymy despite the uncertainity of its status.

Digitaria sanguinalis (L.) Scop., Fl. Carniol., ed. 2. 1: 52. 1771; Bor, Grass. India 304. 1960; T.A. Cope in Nasir & Ali, Fl. Pak. 143. 231. 1982; FAP 3. 1179. 1997. *Panicum sanguinale* L., Sp. Pl. 1: 57. 1753.

Lectotype: Herb. Linn. No. 80.31 (LINN). LT designated by Henrard in Monogr. Digitaria 649. 1950.

Tufted annual, culms 25 cm, nodes glabrous. Leaf sheath pilose, ligule membrane. Leaf blade 3–6 x 0.2–0.5 cm, linear. Racemes 8 cm long, digitate. Spikelets ellipsoid, dorsally compressed, 0.2–0.3 cm, acute. Lower glume absent. Upper glume lancelate, 3-nerved, pubescent, obtuse. Lower lemma elliptic, 7-nerved, rough. Upper lemma elliptic, 0.2 cm, acute. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: September–November.

Distribution: (I) GLOBAL: Mediterranian to Central Asia and Malaysia; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Jharkhand, Jammu and Kashmir, Karnataka, Kerala, Punjab, Rajasthan and Uttar Pradesh.

Note: Naturalized weed.

Digitaria setigera Roth, Syst. Veg., ed. 15 bis 2: 474. 1817; Bor, Grass. India 305. 1960; FAP 3: 1179. 1997; FTS 705. 2016.

Type: India: *Heyne* s.n.

Tufted annual, culms 50 cm long. Leaf sheath loose, ligule membrane, blade lanceolate, 3–10 x 0.3–0.5 cm. Racemes 8 cm long. Spikelets lanceolate, 0.3 cm long, dorsally compressed. Lower glume absent. Upper glume oblong, 3-nerved, pubescent, acute. Lower palea elliptic, 0.2 cm, acute. Palea cartilaginous. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–October.

*Exscicat*a: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 161 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Choutkoor, *TP & MSG* 11917; Horsely hills, *MSG* & *AA* 11212; Tirumala hills, *RVR* & *GO* 2415. Telangana, MDK distr., *TP* &*MSG* 11917 (SKU).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar, Nepal and Pakistan; (II) INDIA: Throughout.

Digitaria stricta Roth, Syst. Veg., ed. 15 bis [Roemer & Schultes] 2: 474. 1817.

Type: India: *B. Heyne* s.n.

Tufted annual, culms 30 cm long. Leaf sheath hairy, ligule eciliate, blade 5–10 x 0.3–0.5 cm, hairy, acuminate. Racemes 10 cm long, digitate. Spikelets dorsally comprseed, 0.3 cm, ellipsoid. Lower glume obscure. Upper glume elliptic, 3-nerved, glabrous, acute. Lower lemma elliptic, 3–5-nerved, capitate hairy. Upper lemma 0.1 cm long, 3-nerved, apiculate. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, KNL distr., Gundlabrahmeswaram RF, *JLE* 22183 (MH).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Goa, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and Uttarakhand.

Digitaria ternata (Hochst. ex A. Rich.) Stapf., Fl. Cap. 7: 376–377. 1898; Bor, Grass. India 305. 1960; Moulik, Grass. Bamb. India 1: 97. 1997; FEG 7: 130. 2020. *Cynodon ternatus* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 405. 1850–1851.

Type: “Crescit in arvis Poae Abyssinicae cultis, prope Adoua (Quartin Dillon, Schimper)”; Ethiopia: Tigray; September 23, 1837; *Schimper* 76 (P). LT designated (as “type”) by Henrard, Monogr. Digitaria 738. 1950.

Tall tufted annual, ligule membrane. Leaf blade 5–10 x 0.3–0.5 cm. Racemes digitate. Spikelets compressed, 0.1–0.3 cm long. Lower glume abscure. Upper glume elliptic, membranous 3-nerved, clavate hairy, acute. Lower lemma elliptic, 5-nerved, hairy. Upper lemma elliptic, 0.2 cm, acute. Palea cartilaginous. Caryopsis flattened.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, KNL distr., Srisailam *AMR* 26802. Telangana, MBNR distr., Appapur, *BR* & *AMR* 25677 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar and Nepal; (II) INDIA: Throughout.

Digitaria tomentosa (J. Koenig ex Rottler) Henrard, Blumea 1 (1): 100. 1934; Bor, Grass. India 306. 1960; FAP 3: 1180. 1997; FTS 706. 2016; Matthew, Fl. Tamilnadu Carnatic 3: 1840. 1983. *Milium tomentosum* J. Koenig ex Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 220. 1803.

Type: "Intra fissures rupium in monte Wandiwash."

Tufted perennial, culms 40 cm long. Leaf sheath hirsute, ligule eciliate, blade oblong, 5–10 x 0.3–0.7 cm, flaccid, hairy, margin scabrous, acuminate. Panicle 20 cm long, effuse. Spikelets solitary, 0.2–2.5 cm long, compressed. Glumes lower, upper obscure. Lower lemma elliptic, 7-nerved, hairy. Upper lemma 0.2 cm long, elliptic, striate, apiculate. Palea cartilaginous. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–October.

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *KMS* 6837 (CAL, MH); ATP distr., Bugga, *TP* 453 (MH, SKU); KNL distr., Modugumisila, *JLE* 42200 (MH). Telangana, WGL distr., Thupakulagudem, *PVS & NRR* 76999 (BSID).

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Tamil Nadu and Telangana.

Echinochloa P. Beauv.

(Essai Agrostogr. 53. 1812, nom. cons.)

Type: *Echinochloa crus–galli* (L.) P. Beauv. (*Panicum crus–galli* L.)

Key to the species:

1a. Ligule present 2

1b. Ligule absent..... 3

2a. Lower lemma with awn 2 mm long..... *E. picta*

2b. Lower lemma with awn 4 mm long..... *E. stagnina*

3a. Spikelets awned..... 4

3a. Spikelets unawned..... 5

4a. Spikelets awned; upper glume 5 mm long, spikelets 6 mm long..... *E. oryzoides*

4b. Spikelets awned; upper glume 4 mm long; spikelets 4 mm long.....*E. crus-galli*

5a. Species cultivated .....*E. frumentacea*

5b. Species not cultivated.....*E. colona*

Echinochloa colona (L.) Link, Hort. Berol2: 209. 1833; FPM 3: 1776. 1934; Bor, Grass. India 308. 1960; Matthew, Fl. Tamilnadu Carnatic 3: 1845. 1983; FAP 3: 1184. 1997; FTS 709. 2016. *Panicum colonum* L., Syst. Nat., ed. 10. 2: 870. 1759.

Lectotype: Browne, Herb. Linn. No. 80.23 (LINN). LT designated by Hitchcock in Contr. U. S. Natl. Herb. 12: 119. 1908.

Annual tufted, culms 50 cm, nodes glabrous. Leaf sheath glabrous, ligule obsolete, blades 5–10 x 0.3–0.6 cm, lancolate, acute. Racemes up to 10 cm long. Spikelets ovoid, 0.2–0.3 cm long, crowded, dorsally compressed. Lower glume ovate, scabrous, acuminate. Upper glume ovate, pubescent, cuspidate. Lower lemma ovate, acute. Upper lemma ovate, 0.2 cm long, indurate, acute. Palea indurate. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: Throughout year.

Exscicata: Telangana, Warangal distr., Pakala, *S. Gurappa* 157 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balarachepalli, *PVP* 3443 (SKU); KNL distr., Chelama, *JLE* 16797 (CAL). Telangana, NLG distr., Nagarjunakonda valley, *KT* 9834 (CAL).

Distribution: (I) GLOBAL: China and Pakistan; (II) INDIA: Throughout.

Echinochloa crus–galli (L.) P. Beauv., Ess. Agrostogr. 161, 169. 1812; FPM 3: 1777. 1934; Bor, Grass. India 310. 1960; FAP 3. 1184. 1997; FTS 709. 2016. *Panicum crus-galli* L., Sp. Pl. 1: 56. 1753. **[Plate 5.1: D]**

Lectotype: *Kalm,* Herb. Linn. No. 80.18 (LINN). LT designated by Hitchcock in Contr. U.S. Natl. Herb. 12: 117. 1908.

Tall tufted annual. Leaf sheath glabrous, ligule absent, blade 10–20 x 0.5–1.0 cm. Racemes up to 20 cm long. Spikelets 0.3–0.5 cm long, ellipsoid, dorsally compressed. Lower glume broadly ovate, cuspidate. Upper glume ovate, hairy, cuspidate. Lower lemma ovate, hispid, awned. Upper lemma ovate, 0.3 cm long, acute. Palea indurate. Stamens 3. Caryopsis broadly ellipsoid.

Flowering and Caryopsis time: Throughout year.

Exscicata: Telangana, Warangal distr., Pakala, *S. Gurappa* 169 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalle, *PVP* 3451. Telangana, NZB distr., Mandora, *TP* & *BR* 6226 (SKU).

Distribution: (I) GLOBAL: China, Nepal and Sri Lanka; (II) INDIA: Throughout.

Echinochloa frumentacea Link, Hort. Berol. 1: 204. 1827; Bor, Grass. India 308. 1960; FAP 3: 1185. 1997.

Type: India; cultivated.

Tall tufted cultivated annual. Leaf sheath glabrous, ligule absent, blade 10–25 x 0.5–1.0 cm. Racemes 5–20 cm long, lanceolate. Spikelets 0.2–3.5 cm long, ellipsoid, compressed dorsally. Lower glume ovate, hispid, acute. Upper glume ovate, hispid, cuspidate. Lower lemma membranceous, pubescent, acute. Upper lemma 0.2–0.3 cm long, shiny, margin involute, acute. Palea indurate. Stamens 3.

Flowering and Caryopsis time: Throughtout the year.

Specimens examined: Andhra Pradesh, NLR distr., Chinthaladevi, *VNS* 82179 (MH); Telangana, WGL distr., Thupakulagudem, *PVS & NRR* 76971 (BSID).

Distribution: (I) GLOBAL: Asia, Africa and America; (II) INDIA: Throughout.

Echinochloa oryzoides (Ard.) Fritsch, Verh. K.K. Zool.-Bot. Ges. Wien 41: 742. 1891. *Panicum oryzoides* Ard., Animadv. Bot. Spec. Alt. 16. t. 5. 1764.

Type: “Semina hujus Panici inventa a me fuere inter Oryzam.”

Tufted annual. Spikelets 0.3–0.4 cm long. Lower glume shorter than upper glume, mucronate. Upper glume 4.5 cm long, awn 1.5 mm long.

Flowering and Caryopsis time: October–November.

Specimens examined: Telangana, KRN distr., Laxmipur, *A. Naqvi* 930104 (KUW).

Distribution: (I) GLOBAL: Native range Caucasus to Japan and Philippines; (II) INDIA: Telangana and several states as a weed.

Echinochloa picta (J. Koenig) P.W.Michael, Philipp. Weed J. Sci. 5: 18. 1978. *Panicum pictum* J. Koenig, Naturforscher (Halle) 23: 204. 1788.

Type: India: Calcutta: *J. Koenig* s.n.

Tufted annual grass, panicle 6–10 cm long, spikelets paried. Upper glume broadly ovate. Caryopsis ellipsoid.

Flowering and Caryopsis time: September–January.

Exscicata: Telangana, Warangal distr., Pakala, *S. Gurappa* 183 (KUW).

Specimens examined: Telangana, NLG distr., Krishna river bank, *KMS* 9823 (CAL).

Distribution: (I) GLOBAL: China; (II) INDIA: Karnataka, Tamil Nadu and Telangana.

Echinochloa stagnina (Retz.) P. Beauv., Ess. Agrostogr. 161, 171. 1812; FPM 3: 1777. 1934; Bor, Grass. India 311. 1960; FAP 3. 1185. 1997; FTS 709. 2016. *Panicum stagninum* Retz., Observ. Bot. 5: 17. 1788.

Type: 'Habitat in stagnis Indiae Orientalis, D.Koenig." India: *Koenig* s.n. (LD).

Tall tufted perennial, culms decumbent, nodes glabrous. Leaf sheath surface glabrous or hairy, ligulle hairy, leaf blade 15–20 x 0.5–1.0 cm. Raceme up to 20 cm long. Spikelets ellipsoid, compressed, 0.3–0.6 cm long, gibbous. Lower glume ovate, 3–nerved, hispidulous, cuspidate. Upper glume awned, ovate, surface hairy 0.1 mm long, acuminate, awn 0.4 cm long. Lower lemma ovate, surface hairy, acuminate, awned. Upper lemma ovate, gibbous, 0.3–0.5 cm long, acute. Palea indurate, reflexed at apex. Stamens 3.

Flowering and Caryopsis time: Throughout the year.

Specimens examined: Andhra Pradesh, ATP distr., Kalasamudram RF, NY 1172 (MH, SKU); KNL distr., Somayajulapalli, RVR 1872 (SKU).

Distribution: (I) GLOBAL: Pakistan and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Gujarat, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Rajasthan, Tamil Nadu and Tripura.

Eriochloa Kunth

(Nov. Gen. Sp. [H.B.K.] 1: 94 (ed. qto.). t. 30. 31. 1816)

Lectotype: *Eriochloa distachya* Kunth. LT designated by G.V. Nash in N. Amer. Fl. 17: 157. 1912; affirmed by Hitchcock, Bull. U.S.D.A. 772: 220. 1920.

Eriochloa procera (Retz.) C.E. Hubb., Bull. Misc. Inform. Kew 1930: 256. 1930; FPM 3: 1767. 1934; Bor, Grass. India 312. 1960; FAP 3. 1202. 1997. *Agrostis procera* Retz., Observ. Bot. 4: 19. 1786–1787. **[Plate 5.1: E]**

Type: "In graminosis subhumidis Malabariae frequens: *Koenig*."

Tufted annual, culms 50 cm long, nodes glabrous. Leaf sheath loose, ligule hairy, blade 5–15 cm x 0.2–0.5 cm, linear, base rounded, apex acuminate. Panicles, 5–10 cm long. Spikelets 0.3 cm long. Lower glume absent. Upper gulme elliptic, 0.3 cm long, acute or muticous. Lower lemma as long as spikelet, lancolate, acute. Upper lemma ovate, 2 mm long, obtuse or mucronate, arista 0.2–5 cm long. Palea ovate. Stamens 3. Caryopsis oblong or ellipsoid, compressed.

Flowering and Caryopsis time: August–October.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 204 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *KS* 6430 (MH); KNL distr., Chelama, *JLE* 18013 (MH). Telangana, MDK distr., Pupple vagu, *TP* & *MSG* 12089 (SKU).

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Throughout.

Megathyrsus (Pilg.) B.K. Simon & S.W.L. Jacobs

(Austrobaileya 6 (3):572. 2003)

Panicum subgen. *Megathyrsus* Pilg., Notizbl. Bot. Gart. Berlin–Dahlem 11: 242. 1931

Lectotype: *Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs (*Panicum maximum* Jacq.), designated by Zuloaga, Grass Syst. Evol. 296. 1987.

Megathyrsus maximus (Jacq.) B.K. Simon & S.W.L. Jacobs, Austrobaileya 6 (3): 572. 2003. *Panicum maximum* Jacq., Ic. Pl. Rar. 1: 2. t. 13. 1781; FAP 3. 1227. 1997; FTS 732. 2016.

Type: West Indies, Lesser Antilles: Leeward Islands, Guadeloupe: Herb. *Jacquin* s.n. (W).

A tufted perennial. Panicles up to 25 cm long. Spikelets 4 mm long. Upper lemma ovate, transversely rugose. Stamens 3. Caryopsis narrowly ellipsoid.

Flowering and Caryopsis time: June–September.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 168 (KUW).

Specimens examined: Telangana, NZB distr., Kamareddy, *BR* 9627 (SKU).

Distribution: (I) GLOBAL: China and India; (II) INDIA: Throughout.

Melinis P. Beauv.

(Ess. Agrostogr. 54. 1812)

Type: *Melinis minutiflora* P. Beauv.

Melinis repens (Willd.) Zizka, Biblioth. Bot. 138: 55. 1988. *Saccharum repens* Willd., Sp. Pl., ed. 4, 1 (1): 322. 1797. *Rhynchelytrum repens* (Willd.) C.E. Hubb., Kew Bull. 1934. 110. 1934; Bor, Grass. India 355. 1960; FAP 5: 2261. 2018; FTS 744. 2016.

Type: “Habitat in Guinea.” Africa: Ghana, *Isert* s.n. (BW–1499).

Annual, culms 50 cm, nodes pubescent. Leaf sheath teberculately hairy, ligule hairy. Leaf blade 3–8 x 0.3–0.5 cm, lanceolate, acuminate. Panicle 4–10 cm long, open, panicle branches filiform. Spikelets 0.5 cm long, solitary, bearded at base. Lower glume linear, hairy, white or purpule. Upper glume ovate, gibbous, acuminate, bifid, arista 0.4–0.7 cm

long. Lower lemma oblong, acuminate, 3–5-nerved, densely pilose, awned. Palea linear. Upper lemma retuse. Stamaens 3. Caryopsis obovoid.

Flowering and Caryopsis time: September–December.

Exscicata: Telangana, Hyderabad outer ring road, *S. Gurappa* 210 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Kekati RF, *TP* & *NY* 783 (SKU). Telangana, HYD distr., Upperpalli, *MRS* 318 (DD).

Distribution: (I) GLOBAL: China and Pakistan; (II) INDIA: Andhra Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh.

Moorochloa Veldkamp (2004)

(Reinwardtia 12 (2): 138–139)

Type: *Moorochloa eruciformis* (Sm.) Veldkamp (*Panicum eruciforme* Sm.).

Moorochloa eruciformis (Sm.) Veldkamp, Reinwardtia 12 (2): 139. 2004. *Panicum eruciforme* Sm., Fl. Graec. (Sibthorp) 1: 44, t. 59. 1806.

Type: Greece: Samos “in arvis circa Junonis templum”, *Sibthorp* s.n. (OXF).

Tufted annual. Panicle 5 cm long. Spikelets 2 mm. Glumes not equal, lower minute, upper broadly ovate. Upper lemma crustaceous. Caryopsis ovoid.

Flowering and Caryopsis time: September–December.

Exscicata: Telangana, Warangal distr., Laknavaram Lake, *S. Gurappa* 154 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., *JSG* 21305 (DD, MH); KSN distr., Kondapalli, *CAB* 7973 (MH!).

Distribution: (I) GLOBAL: Africa, Australia, Europe, Malaysia, Papua New Guinea and South America; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and West Bengal.

Excluded

Moorochloa eruciformis (Sm.) Veldkamp var. **divaricata** (Basappa & Muniy.) E.A. Kellogg, Phytokeys 163: 252. 2020. *Brachiaria eruciformis* (Sm.) Veldkamp var. *divaricata* Basappa & Muniy., Proc. Indian Natl. Sci. Acad., B, 49 (4): 379. 1983.

Type: India: Karnataka, Mysore, 3 km west of Mysore, 12 Aug 1979.

Distribution: (I) GLOBAL: Africa and Europe; (II) INDIA: Andhra Pradesh, Goa, Gujarat, Jammu and Kashmir, Karnataka (Naithani), Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu.

Oplismenus P. Beauv.

(Fl. Oware 2: 14. 1810 ("1807"), nom. cons.)

Type: *Oplismenus africanus* P. Beauv.

Key to the species:

1a. Lower glume awn below 1 cm longl annuals ..... *O. compositus*

1b. Lower glume awn above 1 cm; perennials ..... *O. burmannii*

Oplismenus burmanni (Retz.) P. Beauv., Ess. Agrostogr. 168, 169. 1812; FBI 7: 68. 1896; FPM 3: 1778. 1934; Bor, Grass. India 317. 1960. FAP 3. 1222. 1997; FTS 729. 2016. *Panicum burmanni* Retz., Observ. Bot. 3: 10. 1783.

Type: India: Madras, *Koenig* s.n. (LD).

Tufted perennials, culms up to 50 cm long. Leaf sheath 10 cm long, margin ciliate, ligiule hairy. Leaf blade lanceolate, 5–7 x 0.3–1.0 cm, ventral and dorsal surface hairy, acute. Racemes spiciform. Spikelets solitary, awned, elliptic to ovate, 0.3 cm long. Glumes 2, shorter than the spikelet. Lower glume ovate, keeled, 5-nerved, awn 0.2–1.8 cm long. Upper glume ovate, keeled, 5–nerved 7, apex muticous, 0.4 mm long. Lower lemma ovate, margin hairy, apex aristate. Upper lemma ovate, 0.2–0.3 mm long, acute, not keeled. Palea involute, Stamens 3.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, KNL distr., Chelama, *JLE* 22025 (CAL, MH); Upper Ahobilum, *TP* & *RVR* 2600 (SKU). Telangana, NZB distr., Manchippa RF, *BR* 6043 (SKU).

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Throughout.

Oplismenus compositus (L.) P. Beauv., Ess. Agrostogr. 168, 169. 1812. FBI 7: 66. 1896; FPM 3: 1778. 1934; Bor, Grass. India 317. 1960; FAP 3. 1223. 1997; FTS 729. 2016. *Panicum compositum* L., Sp. Pl. 1: 57. 1753.

Lectotype: *Herb. Hermann 3: 45, No. 42* (BM–000621970). LT designated by Davey & Clayton in Kew Bull. 33: 156. 1978.

Perennial, culms up to 80 cm long, nodes glabrous. Leaf sheath hairy, ligule membranaceous. Leaf blade lanceolate, 5–7 x 0.2–0.3 cm, acuminate, pubescent. Racemes 16 cm long. Spikelets 0.4 cm long, speciform, awned. Lower glume ovate, acute, awned, awn 4–10 mm long, viscid. Upper glume ovate, muticous, awn 0.2–0.4 cm long. Lower lemma ovate, membranaceous, mucronate. Upper lemma oblong, dorsally compressed, acute. Palea involute, Stamens 3. Caryopsis linear.

Flowering and Caryopsis time: November–January.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 153 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Thalakona RF, *PVP* 2317; KNL distr., Paladara Panchadara, *JLE* 22150 (MH). Telangana, MDK distr., Gangapur, *TP & MSG* 12096 (SKU).

Distribution: (I) GLOBAL: China, Sri Lanka and Pantropical; (II) INDIA: Throughout.

Panicum L.

(Sp. Pl. 1: 55. 1753)

Lectotype: *Panicum miliaceum* L. LT designated by Nash in N.L. Britton & A. Brown, Ill. Fl. N.U.S. ed. 2. 1: 134. 1913; affirmed by Hitchcock, Bull. U.S.D.A. 772: 229. 1920.

Key to the species:

1a. Spikelets gibbous; leaves ovate-lanceolate.....*P. brevifolium*

1a. Spikelets not gibbous; leaves linear 2

2a. Spikelets acute, 0.4–0.5 cm.....*P. fischeri*

2b. Spikelets not acute, 0.3–0.4 cm 3

3a. Spikelets lanceolate..... 4

3b. Spikelets oblong, ovate-oblong..... 5

4a. Culms spongy, lower glume nerveless ..... *P. paludosum*

4b. Culms not spongy, lower glume nerved..... *P. repens*

5a. Lower glume ¼ to ¾ to the length of spikelet..... 6

5b. Lower glume length otherwise..... 7

6a. Lower glume ¼ to ½ length of spikelet.....*P. psilopodium*

6b. Lower glume ½ to ¾ length of spikelets or more ..... *P. notatum*

7a. Spikelets gaping at maturity; wild.....*P. curviflorum*

7b. Spikelets not gaping at maturity 8

8a. Plants cultivated .....*P. miliaceum*

8b. Plants wild or naturalized..... 9

9a. Panicle effuse; caryopsis ellipsoid..... *P. sumatrense*

9b. Panicle contracted; caryopsis ovoid.....*P. antidotale*

Panicum antidotale Retz., Observ. Bot. 4: 17. 1786–1787. FEG 7. 250. 2020. *P. miliare* Lam., Tabl. Encycl. 1: 173. 1791; FBI 7: 46. 1896; Fischer 3: 1782. 1934; Bor, Grass. India 329. 1960.

Tall tufted annual Leaves flat. Panicles 23 cm. Spikelets 0.5 cm. Stamens 3. Caryopsis ovoid.

Type: “Colitur in hortis Malabarorum. Honor. Koening.” India, *Koenig* s.n. (LD).

Flowering and Caryopsis time: October–December.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 214 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Mandasamenudu, *VNS* 4626 (MH).

Distribution: (I) GLOBAL: Afghanistan, China, Myanmar and Pakistan; (II) INDIA: Andhra Pradesh, Bihar, Delhi, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh.

Note: A cultivated grass. Telugu vernaculars: *Gangasamulu, Konda samalu*.

Panicum brevifolium L., Sp. Pl. 1: 59. 1753; Fischer 3: 1783. 1934; Bor, Grass. India 324. 1960; FAP 3. 1227. 1997; FTS 732. 2016.

Lectotype: *Herb. Linn. No. 80.64* (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 496. 1982.

Tall tufted annual. Leaf sheath hairy, ligule membrane, blade ovate, 5–9 x 0.7–1.5 cm, base amplexicaul, pilose, acute. Panicles 16 cm, ovoid. Spikelets solitary, 0.15 cm, ovoid. Lower glume oblong, acute. Upper glume ovate, 5-nerved, pilose, acute. Lower lemma oblong, 0.1 cm, indurate, obtuse. Palea indurate.

Flowering and Caryopsis time: November–February.

Specimens examined: Andhra Pradesh, CTR distr., Tirumala hills, *MSG* 12172; EG distr., Bison hills, *CAB* 5093 (MH!).

Distribution: (I) GLOBAL: China; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu and Tripura.

Panicum curviflorum Hornem., Hort. Bot. Hafn. 116. 1819; FEG 7. 251. 2020. *Panicum trypheron* Schult., Syst. Veg. 2. Mant. 244. 1824; FBI 7: 47. 1896; Fischer 3: 1783. 1934; Bor, Grass. India 331. 1960.

Neotype: India: Herb. Roxburgh, cultivated in Copenhagen in 1818, from seed obtained from Wallich as *Panicum tenellum* Roxb. which in turn were collected from plants

cultivated in the Calcutta Bot. Gardens (BM). NT designated by Veldkamp in Blumea 34 (1): 79. 1989.

Tufted annual, clums 70 cm. Leaf sheath hairy, ligule hairy, leaf blade lanceolate, 8–15 x 0.3–0.5 cm, acute. Panicle 15 cm long, effuse. Spikelets ellipsoid, 0.2–0.3 cm, dorsally compressed. Lower glume ovate, 0.1 cm, cuspidate. Upper glume lanceolate, 7-nerved, acuminate. Lower lemma elliptic, 7-nerved. Upper lemma oblong, 0.2 cm, 7–9-nerved, obtuse. Palea indurate. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: October–March.

Specimens examined: Andhra Pradesh, KNL distr., Diguvametta, *CAB* 8114 (MH); Gajulapalle, *KCJ* 83136 (MH). Telangana, HYD distr., Hyderabad, *MRS* 238 (DD).

Distribution: (I) GLOBAL: China, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Panicum fischeri Bor, Kew Bull. 1956: 257–258. 1956; Bor, Grass. India 324. 1960; FAP 3. 1227. 1997.

Type: India: Madras State, Nilgiris, Kullar, alt. 2500 ft. October, 1889, *J.S. Gamble* 21338 (K).

Tall tufted perennial, ligule hairy, leaf blade lanceolate, 5–15 x 0.3–0.6 cm, attenuate. Panicle open, 30 cm long. Spikelets elliptic, 0.5 cm, dorsally compressed. Lower glume ovate, acute. Upper glume elliptic, acute. Lower lemma elliptic, acute. Upper lemma elliptic, 0.3 cm, obtuse. Palea coriaceous. Stamens 3.

Flowering and Caryopsis time: August–October.

Specimens examined: Andhra Pradesh, CTR distr., Near Papavinasanam Falls, *KS* 6962 (MH); Kambakam Hills, *MCB* 45084 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Kerala and Tamil Nadu.

Panicum humile Nees, Syn. Pl. Glumac. 1: 84. 1854; FEG 7. 255. 2020.

Type: Sri Lanka: Thwaites Ceylon Plant 3243 (P).

Tufted annual, clums 60 cm long, leaf sheath hairy, ligule membranaceous, blade acute. Panicle, 20 cm. Spikelets ovoid, 0.1–0.2 cm, dorsally compressed. Lower glume ovate, muticous. Upper glume ovate, acuminate. Lower lemma ovate, acuminate. Upper lemma oblong, 0.1 cm, indurate, obtuse. Palea indurate.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, SKLM distr., Palasa mandal, *VNS* 46290 (MH). Telangana, HYD distr., Hyderabad, *MRS* 252 (DD).

Distribution: (I) GLOBAL: China, Myanmar, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Panicum miliaceum L., Sp. Pl. 1: 58. 1753; FBI 7: 45. 1896; FMP 3: 1782. 1934; Bor, Grass. India 327. 1960; FAP 3. 1228. 1997; FTS 732. 2016.

Lectotype: Herb. Linn. No. 80.49 (LINN). LT designated by Sherif & Siddiqi in El-Gadi (ed.), Fl. Libya 145: 282. 1988.

Tall tufted annual. Leaf sheath hispid, ligule membrane, 0.1–0.3 cm, blade 5–10 x 0.5–0.9 cm, lanceolate, hispid. Panicle, 15 cm. Spikelets 0.4–0.5 cm, ellipsoid, compressed dorsally. Lower glume ovate, acute. Upper glume ovate, acute. Lower lemma ovate, acuminate. Upper lemma oblong, 0.3 cm, indurate, obtuse. Palea indurate. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, KNL distr., Wuragi, *JSG* 18610 (MH). Telangana, MBNR distr., Kollapur, *BSS* & *SKB* 32915 (BSID).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Pakistan and Sri Lanka; (II) India: Throughout.

Remarks: It is widely cultivated globally.

Panicum notatum Retz., Observ. Bot. 4: 18. 1786–1787; Bor, Grass. India 701. 1960; FAP 3: 1228. 1997; FTS 733. 2016.

Type: “In Sumatra lectum dedit nuper nominatus D. Wennerberg.” Indonesia: Sumatra, *Wennerberg* (LD).

Tall, tufted perenneial, Legule membrane. Leaf blade 5–10 x 0.9–1.5 cm, hirsute, margin ciliate. Panicle, 20–40 cm long. Spikelets 0.2–0.3 cm, ellipsoid, compressed. Lower glume ovate, pubescent, acute. Upper glume ovate, acute. Lower lemma 0.1–0.2 cm, elliptic, indurate, obtuse. Palea indurate. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: September–February.

Exscicata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 158 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Rollapenta, *PVP* & *RVR* 2336 (SKU); VSKP distr., Donubai, *KCJ* 55047 (MH). Telangana, Warangal, *CSR* 831 (KUW).

Distribution: (I) GLOBAL: China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Telangana.

Panicum paludosum Roxb., Fl. Ind. 1: 310. 1820; FMP 3: 1783. 1934; Bor, Grass. India 329. 1960; FAP 3: 1229. 1997; FTS 733. 2016.

Type: India: Circar Mountains; *Roxburgh* 806 (BM).

Tall tufted perennial. Leaf sheaths loose, ligule hairy, blade base broadly ronded, 7–15 x 0.5–1.0 cm, lanceolate, acute. Panicle 25 cm. Spikelets 0.3–0.4 cm, lanceolate, compressed dorsally. Lower glume orbicular, 0.1 cm, obtuse. Upper glume ovate, acute. Lower lemma acute. Upper lemma oblong, 0.2 cm, indurate. Palea indurate. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: September–March.

Exscicata: Andhra Pradesh, Kadapa distr., Guvalacheruvu, *S. Gurappa* 176 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Cuddapah, *JSG* 21217 (DD, MH). Telangana, MDK dt, Rusthampet, *KMS* 6800 (MH).

Distribution: (I) GLOBAL: China, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Panicum repens L., Sp. Pl., ed. 2. 1: 87. 1762; FMP 3: 1783. 1934; Bor, Grass. India 330. 1960. FAP 3: 1230. 1997; FTS 734. 2016.

Lectotype: *Alstroemer 2a,* Herb. Linn. No. 80.47 (LINN). LT designated by Hitchcock & Chase in Contr. U. S. Natl. Herb. 15: 85. 1910.

Tufted perennial, ligule membrane. Leaf blade flat, 7–15 x 3–6 cm, coriaceous, acuminate. Panicle, open, 7–20 cm, oblong. Spikelets ovoid, 0.2–0.3 cm, compressed. Lower glume obscure. Upper glume ovate, acute, 7-nerved. Lower lemma acute, 7–9-nerved, acute. Upper lemma oblong, 0.2 cm, obtuse. Palea indurate. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: March–December.

Specimens examined: Andhra Pradesh, CDP distr., Adavulapalle, *JSG* 21250 (MH); ATP distr., Gurugudu Kona, *TP* 946. Telangana, ADB distr., Sone, *TP* & *PVP* 4032 (SKU).

Distribution: (I) GLOBAL: China; (II) INDIA: Throughout.

Panicum sumatrense Roth, Syst. Veg., ed. 15 bis 2: 434. 1817; Bor, Grass. India 701. 1960. FAP 3: 1230. 1997; FTS 734. 2016.

Type: Indonesia: Sumatra, Heyne in Hb. *Heyne s.n.* (B). LT designated by Veldkamp in Blumea 41 (1): 205. 1996.

Tall tufted annual. Leaf sheath glabrous, ligule membranaceous, blade 10–20 x 0.5–1.0 cm, glabrous, acuminate. Panicle up to 20 cm long, contracted, oblong. Spikelets solitary, 0.2–3.5 cm, ellipsoid, dorsally compressed. Lower glume ovate, 0.7 cm, nerved 3, acute. Upper glume ovate, 15- nerved, acute. Lower lemma acute, 0.2 cm, membranaceous, 10-nerved, indurate, acute. Stamens 3. Caryopsis ovoid, 1.9 cm long.

Flowering and Caryopsis time: October–December.

Specimens examined: Andhra Pradesh, ATP distr., Bhukkapatnam RF, *JSG* 20947 (DD); CTR distr., Horsley Konda, *JSG* 20990 (DD). Telangana, RR distr., Mohmmadabad, *MSM* 10552 & 10555 (SKU).

Distribution: (I) GLOBAL: Tropical to subtropical Asia; (II) INDIA: Throughout.

Excluded

Panicum flexuosum Retz., Observ. Bot. 3: 9. 1783

Type: “In Agris Oryzaceis passim obvenientem habui ab amiosiss”, *Koenig* s.n.

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Himachal Pradesh, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh and Uttarakhand.

Remarks: This species is excluded since no specimens could be traced but reported by Kellogg *et al*. (2020).

Excluded

Pseudechinolaena Stapf

(Fl. Trop. Afr. [Oliver *et al.*] 9: 494. 1919)

Type: *Pseudechinolaena polystachya* (Kunth) Stapf (*Echinolaena polystachya* Kunth)

Pseudechinolaena polystachya (Kunth) Stapf., Fl. Trop. Afr. 9: 495. 1919; FPM 3: 1766. 1934; Bor, Grass. India 352. 1960. *Echinolaena polystachya* Kunth, Nov. Gen. Sp. [H.B.K.] 1: 119 (ed. qto.). 1816.

Type: Colombia; *Humboldt & Bonpland s.n.* (P). “Crescit in ripa fluminis Magdalenae inter Tenerife et Zambrano.”

Annual, culms 10–30 cm, ligule membranaceous. Leaf blade lanceolate, acuminate, base cuneate. Racemes, spikelets solitary. Lower glume lanceolate, 3-nerved, acute or acuminate. Upper glume ovate, gibbous, 7-nerved, setose. Lower lemma oblong, chartaceous. Upper lemma oblong, compressed, gibbous, coriaceous, 5-nerved, margin convolute. Palea coriaceous, involute.

Distribution: (I) GLOBAL: China and Pakistan; (II) INDIA: Assam, Andhra Pradesh, Arunachal Pradesh, Bihar, Karnataka, Kerala, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Telangana and West Bengal.

Remarks: The report from study area was based on Kellogg *et al.* (2020) but no specimen could be traced.

Pseudoraphis Griff. ex Pilg.

(Notizbl. Bot. Gart. Berlin–Dahlem 10 (93): 210. 1928)

Lectotype: *Pseudoraphis brunoniana* (Wall. & Griff.) Griff. ex Pilg. (*Panicum brunonianum* Wall. & Griff.) LT Designated by Ohwi, Acta Phytotax. Geobot. 10: 272. 1941.

Pseudoraphis squarrosa (L.f.) Chase, J. Arnold Arbor. 20 (3): 313. 1939. *Andropogon squarrosus* L.f., Suppl. Pl. 433. 1782 ("1781"). *Panicum spinescens* R. Br., Prodr. Fl. Nov. Holland. 1: 193. 1810. FAP 3. 1244. 1997; FTS 743. 2016. *Chamaeraphis spinescens* (R. Br.) Poir., Encycl. (Lamarck) Suppl. 2: 189. 1811; FBI 7: 62. 1896.

Type: "Habitat circa Zeylonam natans supra stagna profundiora rarior."

Tufted perennial. Leaves linear, acuminate. Panicles 12 cm. Spikelets 0.6 cm. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: October–March.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 220 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Horsley Konda, *JSG* 21172 (MH); KSN distr., Kotapalli, *CAB* 8270 (MH). Telangana, MDK distr., Ooracheru lake, *KMS* 6755 (CAL).

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Throughout.

Remarks: It is not clear whether *Pseudoraphis squarrosa* was based on *Andropogon squarrosus* or *Pseudoraphis spinescens* (R.Br.) Vickery. Bor (1960) suggested that *A. squarrosus* may be a *nomen confusum*. In such a case, the basionym *Panicum spinescens* R.Br. (Prodr. Fl. Nov. Holland. 193. 1810) has priority.

Sacciolepis Nash, Man.

(Fl. N. States (Britton) 89. 1901)

Type: *Sacciolepis gibba* (Elliott) Nash (*Panicum gibbum* Elliott).

Key to the species:

1a. Caryopsis ellipsoid 2

1b. Caryopsis other wise linear to ovoid 3

2a. Panicles dense; spikelets blunt..... *S. myosuroides*

2b. Panicles effuse; spikelets not blunt..... *S. curvata*

3a. Spikelets 0.4–0.5 cm long..... *S. interrupta*

3b. Spikelets 0.2–3.5 cm long..... *S. indica*

Sacciolepis indica (L.) Chase, Proc. Biol. Soc. Wash. 21: 8. 1908; FPM 3: 1787. 1934; Bor, Grass. India 357. 1960; FAP 3: 1248. 1997; FTS 745. 2016. *Aira indica* L., Sp. Pl. 1: 63. 1753.

Neotype: Sri Lanka: Sabaragamuwa Province, Ratnagsura District; October 22, 1974; *Davidse 7871* (K). NT designated by Renvoize in Cafferty et al. (ed.), Taxon 49: 244.2000.

Tall tufted annual, culms 70 cm, nodes glabrous, leaf sheath 0.3 cm long, ligule cilolate. Leaf blade 5–10 x 0.3–0.5 cm, linear, scaberulos, acute. Panicle spiciform, 10 cm long. Spikelets 0.3 cm long, solitary. Lower glume ovate, 3–5-nerved, acute. Upper glume elliptic, 5–7-nerved, acute. Lower lemma elliptic, 7-nerved, ribbed, membranaceous, acute. Upper lemma elliptic, compressed, 0.1–0.2 cm long. Palea coriaceous. Stamens 3. Caryopsis linear.

Flowering and Caryopsis time: August–October.

Exscicata: Andhra Pradesh, CTR distr., Sheshachalam Biosphere, *S. Gurappa* 174 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Araku, *GVS* 21564 (CAL, MH!).; Telangana, MDK distr., Pocharam tank, *TP* & *MSG* 12040 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar and Nepal; (II) INDIA: Througout.

Sacciolepis interrupta (Willd.) Stapf., Fl. Trop. Afr. 9 (4): 757. 1920. FPM 3: 1787. 1934; Bor, Grass. India 358. 1960; FAP 3. 1249. 1997; FTS 746. 2016. *Panicum interruptum* Willd., Sp. Pl., ed. 41 (1): 341. 1797; FBI 7: 40. 1896.

Type: “Habitat in Indiae stagnis.”

Tufted perennial, culms tall, lower nodes glabrous, rooting, nodes. Leaf sheath loose, glabrous, ligule membranaceous, blade lanceolate, scaberulous, acuminate. Panicle

spiciform, 20 cm long. Spikelets 0.6 cm long, ellipsoid. Lower glume ovate, hyaline, 5-nerved, obtuse. Upper glume elliptic, 0.4–0.5 cm long, gibbous, 9-nerved, ribbed, acute. Lower lemma equal to upper glume, 9-nerved, ribbed, acute. Upper lemma elliptic, compressed, 0.3 cm long, acute. Palea involute Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: June–December.

Exscicata: Andhra Pradesh, Kadapa distr., Balapalli, *S. Gurappa* 201 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Satyavedu, Neelithotiikandriga, *MCB* 45250 (MH); VSKP distr., Kilagada, *GVS* 21531 (MH). Telangana, WRL distr., Pakhal lake, *ANH* 15916 (CAL, MH).

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Throughout.

Sacciolepis myosuroides (R.Br.) Chase ex E.G.Camus, Fl. Indo–Chine 7: 460. 1922; FPM 3: 1787. 1934; Bor, Grass. India 358. 1960; FAP 3: 1249. 1997; FTS 746. 2016. *Panicum myosuroides* R. Br., Prodr. Fl. Nov. Holland. 189. 1810.

Type: “Littora novae Hollandiae intra tropicum.”

Tufted annual, clums 70 cm. Leaf sheath 3–7 cm long, ligule ciliolate, blade lanceolate, 5–7 x 0.2–0.5 cm, glabrous, margin scaberulos. Panicle 20 cm long, spiciforum. Spikelets 0.2–0.5 cm long. Lower glume ovate, below 0.1 cm long, 5-nerved, acute. Upper glume elliptic, 0.15 cm long, 9-nerved, ribbed, obtuse. Lower lemma longer than upper glume, elliptic, 7-nerved, ribbed. Upper lemma elliptic, 0.1 cm long, compressed, shiny, acute. Palea coriaceous. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: October–January.

Specimens examined: Andhra Pradesh, VSKP disrt., Paderu fields, *BR* 52840 (SKU).

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Excluded

Sacciolepis curvata (L.) Chase, Proc. Biol. Soc. Wash. 21: 8. 1908; FPM 3: 1787. 1934; Bor, Grass. India 357. 1960. *Panicum curvatum* L., Syst. Nat., ed. 12. 2: 732. 1767; FBI 7: 42. 1896.

Lectotype: Herb. Linn. No. 80.60 (LINN). LT designated by Simon in Kew Bull. 27: 390. 1972.

Tufted perennial, culms 50 cm long decumbent, lower nodes rooting, leaf sheath keeled. Leaf balade lancelate, 5–10 x 0.3–0.7 cm. Panicles 10 cm long, open or contracted, branches sinuous. Spikelets solitary, 0.2–0.3 cm long. Lower glume ovate, obtuse. Upper glume ovate, glabrous or puberulous, acute. Lower lemma longer over upper glume, membranaceous, ribbed, acute. Upper lemma elliptic, compressed, obtuse. Palea indurate. Stamens 3. Caryopsis plano-convex, ellipsoid.

Flowering and Caryopsis time: October–January.

Distribution: (I) GLOBAL: Sri Lanka: (II) INDIA: Andhra Pradesh, Kerala, Tamil Nadu and West Bengal.

Remarks: Although the species was reported from Andhra Pradesh in literature but no spcemens could be found.

Setaria P. Beauv.

(Ess. Agrostogr. 51, 178. 1812, nom. cons.)

Type: *Setaria viridis* (L.) P. Beauv. (Panicum viride L.), type cons.

Key to the species:

1a. Inflorescence lax or congested panicle; leaf blades plicate ..... *S. palmifolia*

1a. Inflorescence spike-like, cylindrical, dense; leaf blades flat, not plicate 2

2a. Bristles barbed retrorsely ..... *S. verticillata*

2b. Bristles barbed antrorsely 3

3a. Plants cultivated .....*S. italica*

3b Plants wild..... 4

4a. Upper glume as long as upper lemma.....*S. geminata*

4b. Upper glumes shorter than upper lemma..... 5

5a. Inflorescence spicate or false spike..... 6

5b. Inflorescence a panicle..... 7

6a. Inflorescence cylindrical false spike ..... *S. pumila*

6b. Inflorescence spicate.....*S. sphacelata*

7a. Inflorescence a panicle..... 8

8a. Upper lemma rugulose.....*S. punctata*

8b. Upper lemma granular 9

9a. Panicle narrow, often lobed below .....S. *intermedia*

9b. Panicle narrow, not lobed below 10

10a. Palea elliptic, crustaceous, rugose, keeled.....*S. barbata*

10b. Palea otherwise 11

11a. Spikelets solitary, deflexed, bristled, crowded, 2-rowed.....*S. flavida*

11b. Spikelets otherwise 12

12a. Caryoposis ovoid .....*S. parviflora*

12b. Caryopsis ellipsoid .....*S. pilicata*

Setaria barbata (Lam.) Kunth, Révis. Gramin. 1: 47. 1829; Bor, Grass. India 360. 1960; FEG 7. 305. 2020. *Panicum barbatum* Lam., Tabl. Encycl. 1: 171. 1791.

Type: “Ex Insula Franciae.” Mauritius: *P. Commerson* s.n. (P).

Tufted annual, nodes bearded. Panicles 5–12 cm long, not spicate, bristles 0.3–0.8 cm long. Palea elliptic, crustaceous, rugose, keeled. Stamens 3.

Flowering and Caryopsis time: December–April.

Specimens examined: Andhra Pradesh, EG dstr., Valamuru, *MM* 105056 (BSID,MH).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Andaman and Nicobar Islands, Assam, Bihar, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Rajasthan, Tamil Nadu and West Bengal.

Setaria flavida (Retz.) Veldkamp, Blumea 39 (1–2): 376. 1994. *Panicum flavidum* Retz., Observ. Bot. 4: 15. 1786–1787. *Paspalidium flavidum* (Retz.) A. Camus in Lecomate, Fl. Indo-Chine 7: 419. 1922; FAP 3: 1232. 1997; FTS 735. 2016.

Type: "E Zeylona misit honor Koenig." Sri Lanka: *Koenig s.n.* (LD).

Tall tufted perennial; culmes geniculate, nodes glabrous, ligule hairy. Leaf blade 5–15 x 0.1–0.8 cm, smooth or scabrous, acuminate. Raceme up to 25 cm long. Spikelets solitary, deflexed, bristled, crowded, 2-rowed, pedicels reduced, tip discoid. Lower glume ovate, obtuse–acute. Upper glume elliptic, membranaceous, 5–9-nerved, obtuse. Lower lemma elliptic, membranaceous, 5-nerved, acute. Upper lemma ovate, compressed, gibbous, 0.1–0.3 cm long, granulose, rugose, margin involute, acute. Palea indurate, apex reflexed. Stamens 3. Caryopsis not seen.

Flowering and Caryopsis time: September–November.

Exscicata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 187 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Rollapenta, *PVP* & *RVR* 2343 (SKU); Telangana, WGL distr., Pakhal, *ANH* 13158 (MH).

Distribution: (I) GLOBAL: Bhutan, China and Sri Lanka; (II) INDIA: Throughout.

Setaria geminata (Forssk.) Veldkamp, Blumea 39 (1–2): 377. 1994. *Panicum geminatum* Forssk., Fl. Aegypt.–Arab. 18. 1775. *Paspalidium geminatum* (Forssk.) Stapf in Paris, Fl. Trop. Afr. 9. 583. 1920; Bor 333. 1960; FAP 3: 1233. 1997; FTS 736. 2016. **[Plate 5.1: G]**

Type: "Rofettae in pratis ad littoral Nili". Egypt: Rashid, November 2–6, 1761, *Forrskal s.n.* (C).

Tall tufted perennial, ligule hairy. Leaf blade conduplicate, acuminate, 5–20 x 0.3–1.0 cm. Racemes up to 30 cm long. Spikelets appressed, solitary, crowded, 0.2–0.4 cm long. Lower glume orbicular, 0.5 cm long. Upper glume 0.7 cm long, elliptic, membranaceous,

5-nerved, obtuse. Lower lemma as long as the upper glume, membranaceous, 5-nerved, obtuse or acute. Upper lemma obtuse–acute, rugulose, margin involute. Palea indurate, apex reflexed.

Flowering and Caryopsis time: November–February.

Exscicata: Telangana, Warangal distr., Pakala, *S. Gurappa* 152 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Tirumala hills, *MSG* 12157; Telangana, ADB distr., Kadam dam, *TP* & *PVP* 4139 (SKU).

Distribution: (I) GLOBAL: Pakistan; (II) INDIA: Andhra Pradesh, Bihar, Delhi, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Uttar Pradesh.

Setaria intermedia Roem. & Schult., Syst. Veg., ed. 15 bis 2: 489. 1817; FBI 7: 79. 1896; FPM 3: 1789. 1934; FAP 3: 1252. 1997; FTS 748. 2016. *Panicum intermedium* (Roem. & Schult.) Roth, Nov. Pl. Sp. 47–48. 1821, non Vahl, 1813.

Type: "In India orientali: *B. Heyne* s.n."

Tall tufted annual, culms weak, nodes glabrous. Leaf sheath loose, ligule hairy, blade lanceolate, 7–15 x 0.5–1.0 cm, glabrous or pilose. Panicle, contracted, up to 3–10 cm long, axis hispidulous. Spikelets ellipsoid, 1.5–0.2 cm long, subtended by involucre, bristles antrosely barbed. Lower glume ovate, 0.5 cm long, membranaceous, 3–5-nerved, obtuse. Upper glume elliptic, 0.6 cm long, 5-nerved, acute. Lower lemma elliptic, membranaceous, 5-nerved, acute. Upper lemma compressed, 1.5–0.2 cm long, rugose, involute. Palea indurate, rugose. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, CTR distr., Tirumala hills, *MSG* 12159; ATP distr., Yellutla, *PVP* 2642 (SKU).Telangana, NLG distr., Nagarjunakonda, *KT* 9830 (CAL).

Distribution: (I) GLOBAL: Eritrea to Tanzania, Arabian Peninsula, Indian Subcontinent to China (Yunnan) and Indo-China; (II) INDIA: Almost throughout.

Setaria italica (L.) P. Beauv., Ess. Agrostogr. 51, 170, 178. 1812; FBI 7: 78. 1896; FPM 3: 1789. 1934; Bor, Grass. India 362. 1960; FAP 3: 1253. 1997; FTS 748. 2016. *Panicum italicum* L., Sp. Pl. 1: 56. 1753.

Lectotype: Herb. A. van Royen No. 912.356–242 (L). LT designated by Veldkamp in Cafferty *et al*. (ed.), Taxon 49: 253. 2000.

Tall tufted cultivated annual, nodes glabrous, ligule membranaceous. Leaf blade linear, acuminate. Panicle up to 10 cm long, contracted, involcural bristles antrosely barbed. Spikelets 0.2–0.3 cm long. Lower glume 0.3 cm long, ovate, acute, 1–3-nerved. Upper glume 0.6 cm long, obtuse, 5–7-nerved. Lower lemma ovate, palea empty. Upper lemma ovate, rugose. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: September–November.

*Exscicata:*Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 160 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Peapully, *PVP* 2690 (SKU).

Note: The grass is cultivated in Rayalaseema, Andhra Pradesh.

Distribution: (I) GLOBAL: China; (II) INDIA: Andhra Pradesh, Bihar, Goa, Karnataka, Kerala, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and Uttarakhand.

Setaria palmifolia (J. Koenig) Stapf., J. Linn. Soc., Bot. 42: 186. 1914; FPM 3: 1789. 1934; Bor, Grass. India 363. 1960; FAP 3: 1253. 1997. *Panicum palmifolium* J. Koenig, Naturforscher (Halle) 23: 208. 1788.

Type: Thailand: *J. Koenig* s.n. (US–978043 (fragm. ex FI)). (as" palmaefolium") holotype, K!; isotypes, C, FI, US–978043! fragment ex FI).

Flowering and Caryopsis time: August–November.

Specimens examined: Andhra Pradesh, VSKP distr., Cherukonda, *GVS* 28150 (CAL, MH).

Distribution: (I) GLOBAL: Bhutan, China, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala,

Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Remarks: Zuloaga (in Kellogg *et al*., 2020) noted that the citations of *Setaria paniculifera* (Steud.) E.Fourn. ex Hemsley from India are erroneous. It is because, the species is not present in the Old World. The material cited under this name should correspond to *S. palmifolia* (J. Koenig) Stapf (cf. Morrone *et al*., 2012).

Setaria pumila (Poir.) Roem. & Schult., Syst. Veg., ed. 15 bis 2: 891. 1817; FAP 3: 1254. 1997; FTS 749. 2016. *Panicum pumilum* Poir., Encycl. Suppl. 4: 273. 1816. **[Plate 5.1]**

Type: "J'ignore le lieu natal de cette plante. (V.s. in herb. Desfont)." locality unknown but probably France or North Africa; *Desfontaines* s.n. (FI, P).

Tufted annual, above 50 cm long, culms geniculate, nodes glabrous. Leaf sheath glabrous, ligule hairy, blade 5–10 x 0.3–0.7 cm. Panicle 20 cm long, spiciform, axis pubescent. Spikelets 0.2–0.3 cm long, bristles antrosely barbed. Lower glume orbicular, 0.2 cm long, acute. Upper glume ovate, acute. Lower lemma ovate, membranaceous, acute. Upper lemma 0.2 cm long, gibbous, rugose. Palea indurate.Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, CTR distr., Mamandur valley, *KSM* 6911 (CAL); KNL distr., Upper Ahobilam, *JLE* 25567 (CAL). Telangana, ADB distr., Jannaram, *TP* & *PVP* 4198 (SKU).

Distribution: (I) GLOBAL: Burma, China and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh and West Bengal.

Setaria verticillata (L.) P. Beauv., Ess. Agrostogr. 51, 171, 178. 1812; FBI 7: 80. 1896; FPM 3: 1789. 1934; Bor, Grass. India 365. 1960; FAP 3: 1255. 1997; FTS 749. 2016. *Panicum verticillatum* L., Sp. Pl., ed. 2. 1: 82. 1762.

Lectotype: Herb. Linn. No. 80.7 (LINN). LT designated by Sherif & Siddiqi in El–Gadi (ed.), Fl. Libya 145: 296. 1988.

Tall rufted annual, nodes glabrous. Leaf sheaths glabrous to hairy, ligule hairy, blade 7–15 x 0.5–1.0 cm, pilose. Panicles 7–15 cm long, axis hispidulous. Spikelets oblong–ellipsoid, 0.2 cm long, bristles retrosely scaberulous, persistent. Lower glume ovate, acute. Upper glume ovate, acute. Lower lemma membranaceous, 5–7-nerved, acute. Upper lemma ovate, 0.1 cm long, compressed, gibbous, indurate, rugose. Palea indurate. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–January.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 178 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *KS* 6936 (CAL, MH); KNL distr., Modugamamisala, *JLE* 42201 (MH). Telangana, KRN distr., Aklaspur, *GVS* 25652 (CAL).

Distribution: (I) GLOBAL: China and Pakistan; (II) INDIA: Throughout.

Excluded

Setaria parviflora (Poir.) Kerguélen, Lejeunia, n.s. 120: 161. 1987. *Cenchrus parviflorus* Poir., Encycl. 6: 52. 1804.

Distribution: (I) GLOBAL: North and South Americas; (II) INDIA: Andhra Pradesh, Rajasthan, Uttar Pradesh and Uttarakhand.

Remarks: It is likely to be native to the New World or Africa (cf. Kellogg *et al*.,2009). But it is widespread as well weedy in tropics.

Setaria plicata (Lam.) T.Cooke, Fl. Bombay 2: 919. 1908. *Panicum plicatum* Lam., Tabl. Encycl. 1: 171. no. 892. 1791. **[Plate 5.1: H]**

Type: *Anon.* in Herb. Lamarck ('cult. in horto Reg. parisiensis') (holotype, P, IDC microfiche 6207, fiche 689/19; isotype, B, *Herb. Willdenow* 18734/3, IDC microfiche 7440; US, fragm.).

Tall tufted perennial, nodes pubescent. Leaf sheath keeled, pilose, ligule hairy, blade lanceolate, 10–35 x 2–5 cm, plicate, hairy–rough. Panicle up to 10–30 cm long. Spikelets

compressed, oblong, 0.2–0.4 cm long. Lower glume ovate, 0.3 cm long, membranaceous, nerved 3, margin very thin. Upper glume oblong, 0.6 cm, 5–7-nerved, obtuse. Lower lemma membranaceous, 5-nerved. Upper lemma elliptic, compressed, rugose, apiculate. Stamens 3. Caryopsis ellipsoid.

Distribution: (I) GLOBAL: China, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar,Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

Remarks: Although it was reported from Andhra Pradesh, no authentic specimens could be traced.

Setaria punctata (Burm.f.) Veldkamp, Blumea 39 (1–2): 381. 1994. *Panicum punctatum* Burm.f., Fl. Ind. 26. 1768.

Lectotype: India: *Plukenet* s.n. (BM). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 672. 1982.

Tall tufted perennial, ligule hairy, leaf blade flat, 5–15 x 0.3–0.6 cm, acuminate. Racemes up to 30 cm long. Spikelets ovoid, compressed, 0.2–0.3 cm long, crowded. Lower glume orbicular, truncate. Upper glume elliptic, 0.1 cm long, obtuse. Lower lemma elliptic, 5-nerved, obtuse. Upper lemma elliptic, 0.2 cm long, indurate, rugose. Palea apex reflexed, indurate.

Distribution: (I) GLOBAL: Bangladesh, China and Myanmar; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Remarks: Excluded this species from the list of study area for want of specimen.

Spinifex L.

(Mant. Pl. Altera 163, 300. 1771)

Type: *Spinifex squarrosus* L.

Spinifex littoreus (Burm.f.) Merr., Philipp. J. Sci., C 7: 229. 1912; FPM 3: 1706. 1934; Bor, Grass. India 366. 1960; FAP 3. 1257. 1997. *Stipa littorea* Burm.f., Fl. Ind. 29. 1768.

Type: "Rompot laut Javanis" Rheed. Hort. Malab. 12. P. 143. t. 75.

Perennial, dioecious, stoloniferous, culmes thick, nodes glabrous, lower rooting. Leaf sheath 3–7 cm long, glabrous, ligule hairy, blade 5–15 x 0.2–0.5 cm, oblong, involute. Racemes spike-like. Staminate 20 cm long. Spikelets lanceolate–ovate. lower glume ovate, coriaceous. Upper glume lanceolate, coriaceous, margin scabrid. Lower lemma oblong. Palea oblong, keeled, winged, ciliate. Upper lemma linear, scabrid, Stamens 3. Pistillate spiklets solitary, lanceolate. Lower/upper glumes oblong, coriaceous. Lower lemma oblong, acute. Upper lemma oblong, margin scabrid. Palea ovate. Stigma plumose.

Flowering and Caryopsis time: March–June.

Exscicata: Andhra Pradesh, Guntur distr, *S. Gurappa* 202 (KUW).

Specimens examined: Andhra Pradesh, GNT distr., Nizamapatanam Coast, *VRK* 6805; NLR distr., Dugarajapatnam, *JSG* 26379 (DD); VSKP distr., Bhimlipatnam, *TAR* 7225 (CAL).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Lakshadweep, Maharashtra, Odisha, Tamil Nadu and West Bengal.

Trachys Pers.

(Syn. Pl. (Persoon) 1: 85. 1805)

Type: *Trachys mucronata* Pers., nom. illeg. (*Cenchrus muricatus* L., *Trachys muricata* (L.) Trin.)

Key to the species:

1a. Rachis internodes with 2 or 3 spikelet clusters .....*T. muricata*

1b. Rachis internodes with single spikelet cluster .....*T. deccanensis*

Trachys deccanensis M.Anil Kumar & B.R.P.Rao, Rheedea 27 (2): 79. 2017; FEG 7: 338, 2020.

Type: India, Andhra Pradesh, Kurnool district, Kadivella near Yemmiganur, 16 November 2016, *B.Ravi Prasad Rao, K.V.Subbaiah & M.Anil Kumar* 52099 (holotype: SKU; isotype: CAL).

Tufted perennial. Leaves lanceolate, acuminate. Raceme 6–9 cm, digitate. Spikelets 0.5 cm, lanceolate. Lodicules 2. Stamens 3.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh (Endemic).

Remarks: It is based on type and author of thesis could not collect or examine any specimen other than type.

Trachys muricata (L.) Pers., Syn. Pl. 1: 85. 1805; FPM 3: 1813. 1934; Bor, Grass. India 369. 1960; FAP 3: 1267. 1997; FTS 756. 2016. *Cenchrus muricatus* L., Mant. Pl. Altera 302. 1771.

Neotype: India: Tamil Nadu, Madras, South Arcot, Chidambarum, Kille, Anuvampattu: *Venugopal* in RHT No. 21360 (K). Neotype designated by Renvoize in Cafferty *et al*. (ed.), Taxon 49: 249. 2000.

Annuals, culms 25 cm, geniculate, nodes hairy. Leaf sheath loose, ligule hairy. Leaf blade 3–7 x 0.3–0.6 cm, lanceolate, hairy. Raceme 3–5 cm long, paired or digitate. Spikelets 5–6 mm long, sunk in cavity of rachis. Glumes 2, unequal. Lower glume coriaceous. Upper

glume lanceolate, hyaline, acute. Lower lemma ovate, coriaceous, many veined, cuspidate. Upper lemma ovate, 5-nerved, acute. Palea cartilaginous. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: August–December.

Exscicata: Andhra Pradesh, Kadapa distr., Muddhanur, *S. Gurappa* 166 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Palamaneru, *KCJ* 466 (MH). Telangana, NLG distr., Nagarjunasagar, *KMS* 9732 (CAL).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Gujarat, Karnataka, Kerala, Odisha, Tamil Nadu and Telangana.

Remarks: Persoon (*l.c.*) misspelled the Linnaean epithet “muricata” as “mucronata”; he used the latter epithet in his combination which is a correctable error.

Urochloa P. Beauv.

(Ess. Agrostogr. 52. 1812)

Type: *Urochloa panicoides* P. Beauv.

Key to the species:

1a. Racemes 3 –5 cm long 2

1b. Racemes above 6 cm long 3

2a. Racemes 4 cm long; spikelets ovoid ..... *U. semiundulata*

2b. Racemes 8 cm long; spikelets ellipsoid ..... *U. deflexa*

3a. Inflorescence rachis flat; palea not keeled 4

3b. Inflorescence rachis trigonous; palea keeled ..... *U. brizantha*

4a. Caryopsis ellipsoid 5

4b. Caryopsis otherwise 7

5a. Upper glume ovate, mucronate ..... *U. mutica*

5b. Upper glume otherwise 6

6a. Spikelets 5 mm long; lower glume broadly ovate ..... *U. remota*

6b. Spikelets 3 mm long; lower glume elliptic..... *U. kurzii*

7a. Upper glume broadly oblong..... *U. reptans*

7b. Upper glume otherwise..... 8

8a. Upper lemma keeled ..... *U. mosambicensis*

8b. Upper lemma not keeled..... 9

9a. Racemes 8-10 cm long.....*U. setigera*

9b. Racemes less than 10-20 cm long 10

10a. Upper glume broadly ovate.....*U. panicoides*

10b. Upper glume otherwise..... 11

11a. Upper glume oblong.....*U. distachyos*

11b. Upper glume ovate..... 12

12a. Caryopsis ovoid.....*U. ramosa*

12b. Caryopsis broadly ovoid .....*U. munae*

Urochloa brizantha (Hochst. ex A. Rich.) R.D.Webster, The Australian Paniceae (Poaceae) 223. 1987; FEG 7: 49. 2020. *Panicum brizanathum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 363. 1850–1851. *Bracharia brizanatha* (Hochst. ex A. Rich) Stapf in Prain, Fl. Trop. Afr. 9: 531. 1919; Bor, Grass. India 281. 1980; FEG 7: 49. 2020.

Type: Ethiopia: Tigre: "In declivibus meridionalis partis mediae et superioris monte Sellenda prope Adouba". October 3, 1837, *Schimper* 89 (P). LT designated by Veldkamp in Blumea 41 (2): 417. 1996.

Tufted perennial, nodes glabrous. Leaf sheath densely hairy, glabrous, blade lancolate. Racemes 13 cm long. Spikelets solitary. Lower lemma ovate. Palea 2-keeled. Stamens 3.

Flowering and Caryopsis time: August–January.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 180 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Chintapalli, *BR* 24586 (SKU).

Distribution: (I) GLOBAL: Papua New Guinea, Africa, North America and South America; (II) INDIA: Andhra Pradesh and Kerala.

Urochloa deflexa (Schumach.) H. Scholz, Bull. Mus. Natl. Hist. Nat., B, Adansonia sér. 4, 11 (4): 443. 1990; FEG 7. 50. 2020. *Panicum deflexum* Schumach., Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. 3: 83–84. 1827.

Tufted annual, nodes glabrous. Leaf sheath base rounded, blade lancolate. Racemes 6 cm long. Spikelets 0.3 cm long.

Flowering and Caryopsis time: June–November.

Specimens examined: Andhra Pradesh, KSN distr., Elur, *CAB* 7905 (MH).

Distribution: (I) GLOBAL: Africa, Saudi Arabia; (II) INDIA: Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh.

Urochloa kurzii (Hook. f.) T.Q. Nguyen, Novosti Sist. Vyssh. Rast. 1966: 13. 1966. *Panicum kurzii* Hook. f., Fl. Brit. India (J.D.Hooker). 7 (21): 38. 1896. *Bracharia kurzii* (Hook. f.) A. Camus in Lecomte, Fl. Indo-Chine 7: 438. 1992. FEG 7: 52. 2020.

Type: Seebpore: *Kurz* s.n. (K). LT designated by Veldkamp in Blumea 41 (2): 422. 1996.

Tufted annual, nodes glabrous. Leaf blade lancolate. Spikelets 3 mm long. Lower/Upper glumes elliptic. Palea keeled. Stamens 3. Caryopsis elliptic.

Flowering and Caryopsis time: September–December.

Specimens examined: Andhra Pradesh, EG distr., *DCSR* 362 (CAL).

Distribution: (I) GLOBAL: Australia and Indonesia; (II) INDIA: Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

Urochloa mosambicensis (Hack.) Dandy, J. Bot. 69 (2): 54. 1931; Bor, Grass. India 372. 1960. *Panicum mosambicense* Hack., Bol. Soc. Brot. 6: 140. 1888.

Type: “Prope Moçambique.” Mozambique. 1886; *M.R. de Carvalho* 19 (W).

Tufted perennial. Leaves linear, acute. Racemes 3–4 cm. Spikelets 0.5 cm, ovoid. Palea keeled, rugose. Stamens 3.

Flowering and Caryopsis time: November–January.

Specimens examined: Andhra Pradesh, KNL distr., Nallamalais, Chelama forest, BR, *BSS* & *SKB* 32945 (SKU).

Distribution: (I) GLOBAL: Africa and Myanmar; (II) INDIA: Andhra Pradesh, Rajasthan and Tamil Nadu.

Urochloa mutica (Forssk.) T.Q. Nguyen, Novosti Sist. Vyssh. Rast. 3: 13. 1966. *Panicum muticum* Forssk., Fl. Aegypt.–Arab. 20. 1775. *Bracharia mutica* (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9. 526. 1919; FBI 7: 34. 1896; FAP 3: 1143. 1997.

Type: Egypt: "Rosettae" (Rashid), November 2–6, 1761, *Forsskal* 86 (C).

Tufted perennial. Leaf blade linear. Racemes 15 cm long, rachis winged. Lemma broadly ovate, 7-nerved. Palea 2-nerved. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–January.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 162 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Anantapur, *PVP* 2493 (SKU).

Distribution: (I) GLOBAL: Africa, Australia, Indonesia, North America and South America; (II) INDIA: Andhra Pradesh, Assam, Bihar, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal.

Urochloa panicoides P. Beauv., Ess. Agrostogr. 53. t. 11. f. 1. 1812; FPM 3: 1775. 1934; Bor, Grass. India 372. 1960; FAP 3: 1270. 1997; FTS 758. 2016.

Neotype: P. Beauv., Ess. Agrost. pl. 11. f. 1. 1812. NT designated by Veldkamp in Blumea 41: 433. 1996.

Tall tufted annua, culms geniculate, nodes pubescent. Leaf sheath loose, glabrous, ligule hairy, blade lancolate, 5–15 x 0.3–0.7 cm, glabrous or pubescent, margin tuberculate hairy Raceme 3–10 cm long. Spikelets solitary, 0.4–0.5 cm long, dorsally compressed.

Lower glume acute. Upper glume elliptic, 7–10-nerved, acuminate. Lower lemma elliptic, 5–7-nerved. Upper lemma orbicular, compressed, 0.2 cm long, rugulose, mucronate, arista 0.1–0.3 cm. Palea indurate. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: August–October.

Exscicata: Andhra Pradesh, Kadapa distr., Guvvalacheruvu, *S. Gurappa* 175 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *PVP* 3417 (SKU); KSN distr., Kondapalli, *CAB* 8139 (MH). Telangana, ADB distr., Kowtal, *GO* & *PVP* 4832 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Urochloa ramosa (L.) T.Q. Nguyen, Novosti Sist. Vyssh. Rast. 1966: 13. 1966. *Panicum ramosum* L., Mant. Pl. 29. 1767. *Bracharia ramosa* (L.) Stapf in Oliver, Fl. Trop. Afr. 9: 542. 1919; FAP 3: 1143. 1997; FTS 685. 2016.

Lectotype: Herb. Linn. No. 80.44 (LINN). LT designated by Cope in Nasir and Ali (ed.), Fl. Pakistan 143: 207. 1982.

Tufted perennial up to 50 cm long, nodes hairy. Leaf sheaths reflexed hairy, ligule hairy,leaf blade 15–30 x 0.2–0.5 cm, convolute. Panicle up to 7–20 cm long. Spikelets solitary, ovoid, 5–8 cm long, dorsally compressed. Lower glume obovate, acute, villous. Upper glume ovate, villous, obtuse. Lower lemma ovate, hairy, obtuse. Upper Lemma as long as the spikelet, oblong, idurate, margin pilose, obtuse. Palea indurate.

Flowering and Caryopsis time: June–November.

Exscicata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 179 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvalacheruvu, *PVP & GO* 3433. Telangana, MDK distr., Gangapur RF, *TP* & *MSG* 12072 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Daman and Diu, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

Urochloa remota (Retz.) Ashalatha & V.J.Nair, Bull. Bot. Surv. India 35 (1–4): 29. 1997. *Panicum remotum* Retz., Observ. Bot. 4: 17. 1786–1787. *Brachiaria remota* (Retz.) Haines, Bot. Bih. Orissa 1005. 1924; FAP 3: 1144. 1997; FTS 685. 2016.

Type: "E Tranquebaria misit Opt. *Koenig*."

Tufted annual, nodes glabrous. Leaf blade lancolate. Spikelets 5 cm long. Glumes membranaceous, acuminate. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: August–November.

Exscicata: Andhra Pradesh, VSKP distr., Ananthagiri, *S. Gurappa 173* (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Tirumala Hills, *MSG* 12183. Telangana, ADB distr., Sirpur, *GO* & *PVP* 4912 (SKU).

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu and Uttar Pradesh.

Urochloa reptans (L.) Stapf., Fl. Trop. Afr. 9: 601. 1920. *Panicum reptans* L., Syst. Nat., ed 10. 2: 870. 1759. *Brachiaria reptans* (L.) C. Gardenar & C.E. Hubb. in Hook., Icon. Pl. Sub. t. 3363. 1938; FAP 3: 1144. 1997; FTS 686. 2016.

Lectotype: *Browne*, Herb. Linn. No. 80.52, upper specimen (LINN). LT designated by Veldkamp. Blumea 41 (2): 427. 1996.

Annual, nodes glabrous. Leaf blade lancolate, base amplexicaul. Spikelets 2 cm long. Upper glume 7-nerved. Upper lemma indurated, 3-nerved. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–September.

Exscicata: Andhra Pradesh, VSKP distr., Ananthagiri, *S. Gurappa* 167 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balarachapalli, *PVP* 3446. Telangana, ADB distr., Jaipur RF., *GO* & *PVP* 4949 (SKU).

Distribution: (I) GLOBAL: Malaysia, Oceanic Islands, Africa, Australia and China; (II) INDIA: Throughout.

Urochloa setigera (Retz.) Stapf., Fl. Trop. Afr. 9: 598. 1920; FPM 3: 1775. 1934. *Brachiaria setigera* (Retz.) C.E Hubb. in Hook. f., Ic. Pl. 34, 2. 1938; Bor, Grass. India 286. 1960. FAP 3: 1145. 1997. *Panicum setigerum* Retz., Observ. Bot. 4: 15. 1786–1787.

Type: "E China misit Cel. Bladh." China: Guangdong, Guangzhou, *Bladh* s.n. (LD).

Tall tufted anuual, nodes bearded. Leaf sheath. ligule hairy, blade lanceolate, 7–13 x 1.5–2.0 cm, hairy, margin ciliate, cordate. Racemes up to 13 cm long, rachis ciliate. Spikelets 0.4–0.5 cm long, ellipsoid, compressed. Lower glume ovate, obtuse, membranaceous. Upper glume ovate, pubescent, acute. Lower lemma elliptic, 0.2 cm, indurate, rugose, margin involute, apex mucronate, arista 0.1 cm. Palea indurate.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, KSN distr., Kondapalli, *CAB* 7993 (MH); VSKP distr., Anantagiri, *GVS* 19476 (CAL).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Kerala, Maharashtra, Rajasthan, Tamil Nadu and West Bengal.

Excluded

Urochloa distachyos (L.) T.Q. Nguyen, Novosti Sist. Vyssh. Rast. 1966: 13. 1966. *Panicum distr.achyon* L., Mant. Pl. Altera 183–184. 1771.

Lectotype: Herb. Linn. No. 80.41 (LINN). LT designated by Henrard in Monogr. Digitaria 191. 1950.

Distribution: (I) GLOBAL: China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Almost throughout.

Urochloa munae (Basappa) Ashalatha & V.J.Nair, Bull. Bot. Surv. India 35 (1–4): 29. 1997 ("1993"). *Brachiaria munae* Basappa, Proc. Indian Acad. Sci. Pl. Sci. 93 (1): 53. f. 1. 1984.

Type: India: Tamil Nadu, Madurai Kamaraj University Campus; December 20, 1979; *Basappa* 3001 (CAL).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh and Tamil Nadu.

Remarks: No specimen of it could be traced from the study area.

Urochloa semiundulata (Hochst. ex A. Rich.) Ashalatha & V.J.Nair, Bull. Bot. Surv. India 35 (1–4): 30. 1997 ("1993"). *Panicum semiundulatum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 364. 1850–1851.

Syntypes: Ethiopia: Schire, October 10, 1840: *Schimper* 1833; Ethiopia: Adoam; September 25, 1837, *Schimper* 289.

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Throughout.

Remarks: No specimen of this taxon was found in herbaria nor could collected.

Urochloa setigera (Retz.) Stapf var. **albistyla** (Basappa & Muniy.) S.Karthikeyan in S. Karthikeyan *et al*., Fl. Ind. Enumerat. - Monocot. 273. 1989. *Brachiaria setigera* (Retz.) C.E. Hubb. var. *albistyla* Basappa & Muniy., Proc. Indian Acad. Sci., B. 49: 380. 1983.

Type: India.

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Maharashtra, Tamil Nadu and West Bengal.

Remarks: It is considered as a synonym of *U. setigera* and no specimen was found to decide either way, for its report form Andhra Pradesh.

5.1.2.4 Tribe Jansenelleae Voronts., 2020

Jansenella Bor

(Kew Bull. 1955: 96. 1955)

Type: *Jansenella griffithiana* (Müll.Hal.) Bor (*Danthonia griffithiana* Müll.Hal.).

Jansenella griffithiana (Müll.Hal.) Bor, Kew Bull. 1955: 98. 1955. *Danthonia griffithiana* Müll.Hal., Bot. Zeitung 14 (20): 347. 1856.

Type: India: Assam, Khasiya; *Griffith* 36 (B).

Annual grass, culms 10–30 cm, lower nodes rooting, ligule membrane. Leaf blade lanceolate, 2–6 x 3–10, flaccid, baase amplexicaul. Inflorescence panicle 2–6 cm long, branches pilose, spikelets pedicelled, 0.4–0.7 cm, lanceolate, laterally compressed.

Glumes persistent and awned. Lower glume ovate, 0.3 cm, 3-nerved, glabrous to pilose, acute, awn 0.1 cm. Upper glume oblong, 0.5 cm, 5-nerved, scabrous, acute, awn 0.1–0.2 cm. Lower lemma oblong 0.5 cm, membranous, 3–5-nerved, apex obtuse, awn 0.1–0.2 cm, lower palea narrowly keeled. Upper lemma oblong, 0.6 cm, coriaceous, not keeled, 3-nerved, glabrous or pilose, bear two tufts of hair, involute, 2–fid, awn sinus, 1.0–1.5 cm. Palea lanceolate, keeled, winged, apex dentate 2–fid. Lodicules cuneate. Stamens 3; stigmas 2. Caryopsis 0.1–1.5 cm, oblong, dorsally compressed, palno–convex.

Flowering and Caryopsis time: October–February.

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Arunachal Pradesh, Assam, Chhattisgarh, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu.

Remarks: It is reported on the authority Andhra University Herbarium speciemen of 5610 (AUV!).

5.1.2.5 Tribe Andropogoneae Dumort., 1824

Key to the generas

1a. Spikelets (staminate and pistillate) in separate inflorescences on the same plant .....Group-I

1b. Staminate and pistillate inflorescences on the same plant .....Group-II

1c. Spikelets not two flowered; mature spikelets falling not entire from their pedicels .....Group-III

GROUP I (Staminate and pistillatespikelets in separate inflorescences on the same plant)

1a. Staminate and pistillate spikelets present on the same inflorescence, pistillate spikelets not fused, natural 2

1b. Staminate and pistillate spikelets not present on the same inflorescence, female spikelets fused, cultivated ..... *Zea*

2a. Caryopsis sub-globose or ellipsoid, not compressed, not ventrally channeled .....*Coix*

2b. Caryopsis otherwise 3

3a. Racemes with staminate spikelets at the apex; pistillate imbedded in each joint of the rachis, so that the smooth cartilaginous axis and the lower glume form a nearly cylindric mass .....*Tripsacum*

3b. Racemes entirely staminate or with 1 or more pistillate at base; lower glume of pistillate thickly coriaceous, embracing the rachis and enclosing the upper glume and floret ..... *Chionachne*

GROUP II (Staminate and pistillate inflorescences on the same plant)

1a. Spikelets solitary .....*Dimeria*

1b. Spikelets not solitary 2

2a. Spikelets in each pair similar, sessile and pedicelled spikelets hermaphroditic..... 3

2b. Spikelets arranged in panicle, and enclosed in long, white, silky hairs 4

3a. Inflorescence terminal, spiciform or thrysiform panicles; spikelets all pedicelled; glumes sub-equall; lodicules absent; caryopsis oblong ..... *Imperata*

3b. Inflorescence terminal panicles, spikelets, one sessile and other pedicelled; lodicules present; caryopsis oblong to sub-lobose ..... *Saccharum*

4a. Spikelets arranged in several pairs of racemes, and not enclosed in silky hairs 5

5a. Racemes supported by spathes..... 6

5b. Racemes not supported by spathes 7

6a Basal sheaths wooly ..... *Eulaliopsis*

6b. Basal sheaths glabrous ..... *Eulalia*

7a. Sessile spikelets with a short callus, dorsally compressed; glumes chartaceous; palea quardate .....*Lophopogon*

7b. Sessile spikeletsnot as above, so also glumes and palea .....*Pogonatherum*

8a. Racemes spiciform; pedicelled spikelets well- developed; caryopsis oblong or obovoid.....*Microstegium*

8b. Racemes terminal, solitary; pedicelled spikelets reduced, caryopsis linear or fusiform .....*Apocopis*

9a. Inflorescence of not solitary racemes 10

9b. Infloresence of solitary raceme 18

10a. Racemes supported by the spathes 11

10b. Racemes not supported by spathes 12

11a. Caryopsis linear-obovoid, subterete; grooved on the front ..... *Themeda*

11b. Caryopsis dorsally compressed; not grooved on the front ..... *Iseilema*

12a. Inflorescence of panicles compound leafly, spikelets 3-nate, one sessile and two pedicelled, caryopsis oblong, slightly laterally compressed ..... *Apluda*

12b. Inflorescence paired, rarely solitary or corymbose, spikelets 2-nate, one sessile another one pedicelled, caryopsis subulate to oblong, subterete or plano-convex ..... *Andropogon*

13a. Sessile spikelets of lower glume not winged or no broadly chanalled on the back ..... *Pseudanthistiria*

13b. Sessile spikelets of lower glume narrowly winged or broadly chanalled on the back ..... *Cymbopogon*

14a. Inflorescence a panicle 15

14b. Inflorescence not panicle 17

15a. Inflorescence of spikelets arranged in whorls; lodicules glabrous 16

15b. Inflorescence of spikelets arranged in the panicle; lodicules hairy ..... *Sorghum*

16a. Spikelets in threes at the end of the branches, spikelets 3-nate, one sessile two pedicelled ..... *Chrysopogon*

16b. Spikelets not threes at the end of the branches, spikelets 2-nate, one sessile and one pedicelled ..... *Pseudosorghum*

17a. Inflorescence corymbose; caryopsis narrowly oblong ..... *Theleopogon*

17b. Inflorescence not corymbose; caryopsis narrowly linear or fusiform ..... *Arthraxon*

18a. Sessile spikelets of upper lemmas well developed, caryopsis oblong or lanceolate, dorsally compressed ..... *Ischaemum*

18b. Sessile spikelets of upper lemmas reduced, caryopsis oblong, slightly dorsally compressed ..... *Capillipedium*

19a. Pedicels and rachis internodes without a translucent median line .....*Dichanthium*

19b. Pedicels and rachis internodes with a translucent median line .....*Bothriochloa*

20a. Spikelets unawned ..... *Eremochloa*

20b. Spikelets awned..... 21

21a. Sessile spikelets of lower glumes not winged .....*Hemarthria*

21b. Sessile spikelet of lower glumes broadly winged ..... *Manisuris*

22a. Sessile spikelet ovoid, keeled, pedicelled spikelet well developed 23

22b. Sessile spikelet oblong, not keeled, pedicelled spikelet rudimentary .....*Ophiuros*

23a. Joints and spikelets reduced towards the apex of the raceme and appendaged, caryopsis compressed, oblong or ellipsoid .....*Rottboellia*

23b. All joints and spikelets uniformly developed, apex not appendaged, caryopsis compressed, narrowly oblong ..... *Mnesitheia*

24a. Joints and pedicels clavate, 2-toothed, sessile spikelets not pitted,pedicelled spikelets lemmas present ..... *Schizachyrium*

24b. Joints and pedicels not clavate and toothed, sessile spikelets pitted, pedicelled spikelet lemmas usually absent .....*Eremopogon*

25a. Inflorescence a panicle ..... *Diectomis*

25b. Inflorescence terminal raceme ..... *Sehima*

26a. Sessile spikelet of lower glume with a deep groove on the dorsal surface ..... *Parahyparrhenia*

26b. Sessile spikelet of lower glume with no deep groove on the dorsal surface .....*Heteropogon*

GROUP III (Spikelets not two flowered; mature spikelets falling not entire from their pedicles)

1a. Spikelets 2-flowered (rarely 3); palea 2-keeled with wide inflexed flaps; caryopsis oblong or ellipsoid .....*Arundinella*

1b. Spikelets 1-flowered; palea not keeled and inflexed flaps;caryopsis linear or oblong .....*Garnotia*

Andropogon L.

(Sp. Pl. 2: 1045. 1753, nom. cons.)

Type. *Andropogon distachyos* L. (as "distachyon") (typ. cons.)

Key to the species:

1a. Spikelets in pairs; lower glume (sessile) slighty concave ..... *A. pumilus*

1b. Spikelets binate; lower glume (sessile) strongly concave .....*A. lividus*

Andropogon lividus Thwaites, Enum. Pl. Zeyl. 367. 1864; FBI 7:209. 1806; Bor, Grass. India 91. 1960. *Cymbopogon lividus* (Thwaites) Willis, Revis. Cat. Fl. Pl. Ceylon 110. 1911; FEG 7: 16. 2020.

Type: Sri Lanka: Central Province, Newera Ellia and other of more elevated parts; *Thwaites Ceylon Plant* 953.

Tufted perennial, culms 80 cm above. Leaves lanceolate. Raceme 2–3 cm. Spikelets sessile, pedicelled, awned, keeled. Sessile spikelets 0.4 cm, lanceolate, awn 1.5 cm, bisexual. Pedielled spikelets 0.4 cm, elliptic, keeled. Stamens 3.

Flowering and Caryopsis time: October–January.

Specimens examined: Andhra Pradesh, ATP distr., Samrajyam Konda, *BR* 29194 (SKU).

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Andhra Paradesh, Kerala and Tamil Nadu.

Andropogon pumilus Roxb., Fl. Ind. 1: 277. 1820; FBI 7: 170, 1896; FPM 3: 1753. 1934; Bor, Grass. India 93. 1960; FAP 3: 1128. 1997; FTS 678. 2016; FEG 7: 18. 2020.

Type: India: "A native of Coromandel."

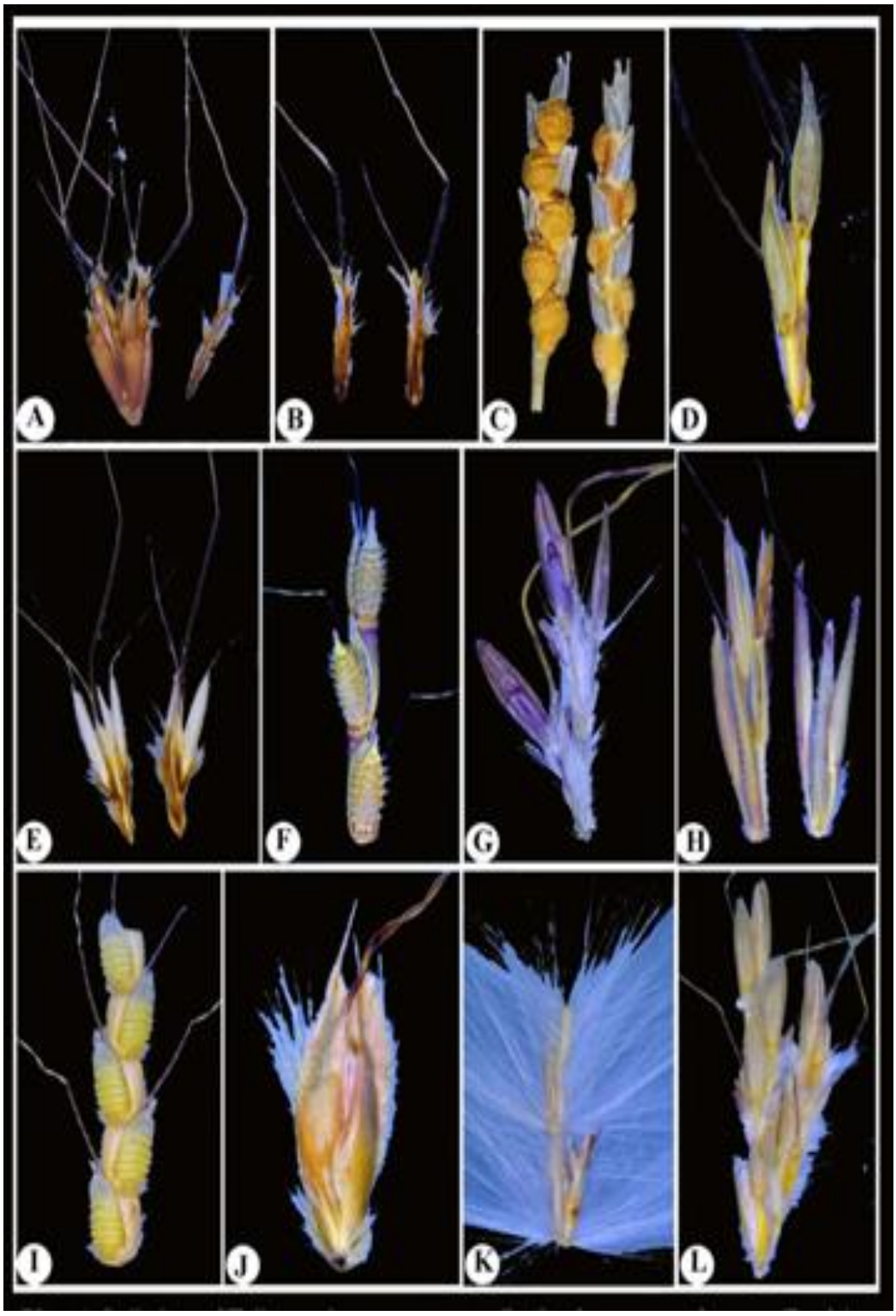

Plate 5.2. **Spikelets of Tribe Andropogoneae. Panicoideae, Poaceae.**
A, B – *Lophopogon tridentatus*; **C** – *Mnesithea granularis*; **D** – *Sehima nervosa*; **E** – *Chrysopogon fulvus*; **F** – *Thelepogon elegans*; **G** – *Eremopogon foveolatus*; **H** – *Arthraxon lanceolatus*; **I** – *Ischaemum rugosum*; **J** – *Ischaemum ciliare*; **K** – *Saccharum spontaneum*; **L** – *Cymbopogon gidarba*.

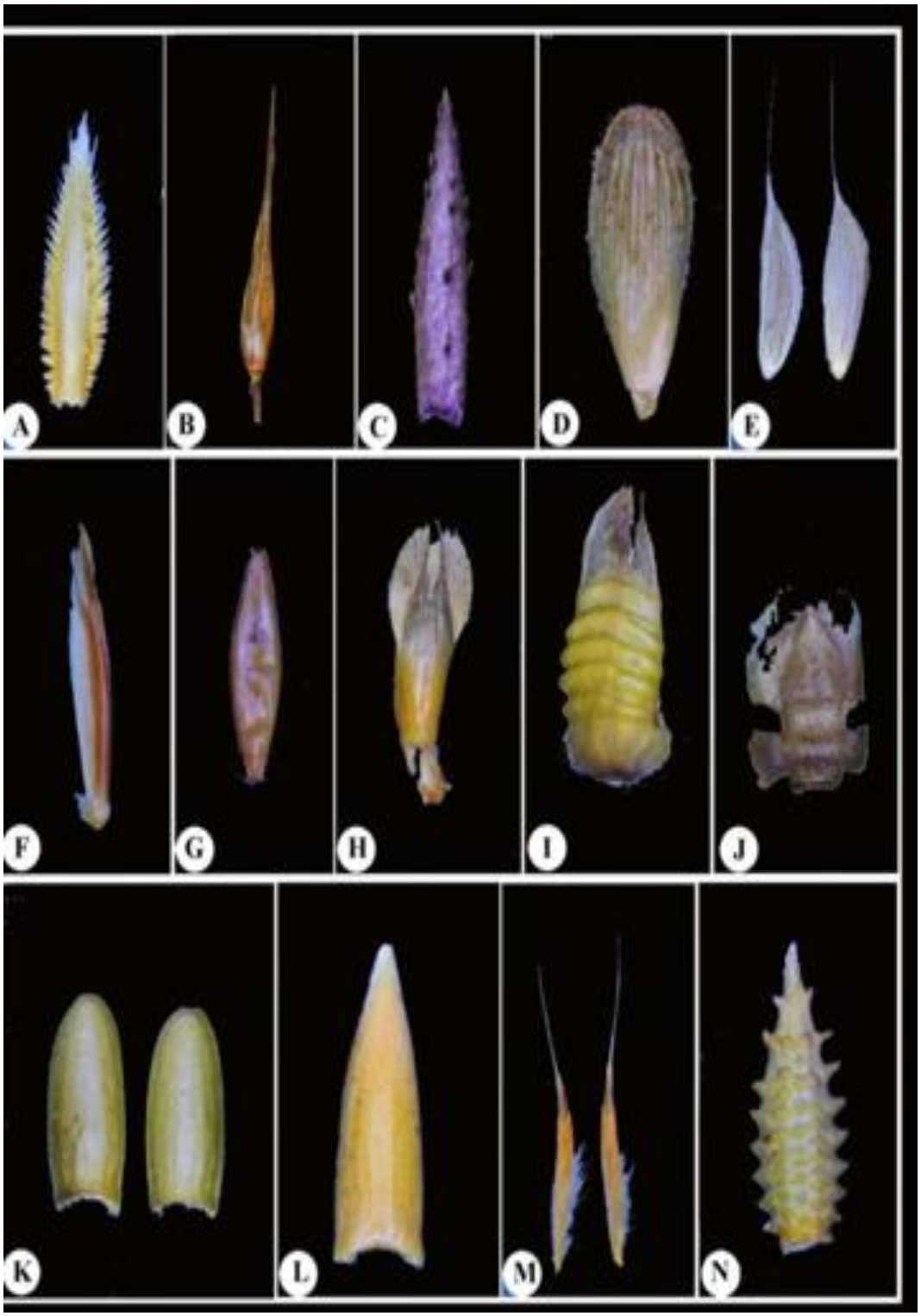

Plate 5.3. Glumes of Tribe Andropogoneae, Panicoideae, Poaceae.
A – *Arthraxon lanceolatus var. echinatus*; **B** – *Arundinella ciliata*; **C** – *Chrysopogon verticillatus*; **D** – *Dichanthium annulatum*; **E** – *Diectomis fastigita*; **F** – *Dimeria connivens*; **G** – *Eremopogon foveolatus*; **H** – *Ischaemum ciliare*; **I** – *Ischaemum rugosum*; **J** – *Manisuris myurus*; **K** – *Ophiurous exlatus.*

Plate 5.4. **Caryopsis of Tribe Andropogoneae. Panicoideae, Poaceae.**
A – *Dichanthium annulatum;* **B** – *Dimeria connviens;* **C** – *Eremopogon foveolatus;* **D** – *Eulalia phaeothrix;* ***E*** – *Ischaemum ciliare*; **F** – *Ischaemum rugosum*; **G** – *Schizachyrium brevifolium*; **H** – *Sehima nervosa*; **I** – *Thelepogon elegans.*

Tufted annual, culms 30 cm long, nodes glabrous, leaf sheath glabrous; ligule membrane. Leaf blade acuminate, 5–10 x 2–5 cm, glabrous. Paniculate, 5–10 cm long, subtended by sapthole, linear, 2–5 cm; racemes paired, deflexed. Spikelets sessile, pedicelled, awned. Lower glume linear, coriaceous, 2-keeled dorsally, dentate, bifid. Upper glume lanceolate, chartaceous, 1-keeled, mucronate. Sesile spikelets (sterile) 0.3 cm long, lanceolate, dorsally compressed. Lemma 0.3 cm, hyliane, 2-nerved. Stamens 3, 0.2 cm long. Peddicelled spikelets (fertile) 0.4–0.5 cm, linear, dorsally compressed, bearded at base, pedicel oblong, 0.2 cm, ciliate. Lemma linear, hyline, not keeled, bifid, dentate, awn sinus 0.9–1.5 cm, geniculate. Palea hyaline, not keeled. Stamens 3.

Flowering and Caryopsis time: August–December.

Exsiccata: Telangana, Zaherabad distr., *S. Gurappa* & *V.S.Raju* 4868 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Muchukota RF, *PVP* 2569; KNL distr., Kammavaripalli, *TP & PVP* 3378. Telangana, Hyderabad, *MRS* 197 (DD).

Distribution: (I) GLOBAL: Myanmar and Nepal; (II) INDIA: Throughout.

Apluda L., Sp. Pl. 1: 82. 1753

Type: *Apluda mutica* L., Sp. Pl. 1: 82. 1753.

Apluda mutica L., Sp. Pl. 1: 82. 1753; FPM 3: 1750. 1934; Bor, Grass. India 93. 1960; FAP 3: 1128. 1997; FTS 678. 2016; FEG 7: 18. 2020.

Type: “Habitat in India.” Lectotype: *Herb. Linn. No.* 1213.1 (LINN). LT designated by Cope in Jarvis *et al*. (ed.), Regnum Veg. 127: 20. 1993.

Tall tufted perennial, ligule membrane. Leaf blade lanceolate. Panicle 20–30 cm, spikeletes sessile (fertile), pedicelled (sterile). Sessile spikeletes: 3–6 m, oblong, laterally compressed. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets 0.3 cm.

Flowering and Caryopsis time: November–December.

Exsiccata: Telangana, Zaherabad distr., *S. Gurappa* & *V.S.Raju* 4824 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balepalle, *JLE* 15704 (CAL). Telangana, NGL distr., Nagarjunakonda valley, *KT* 9686 (CAL).

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Apocopis Nees

(Proc. Linn. Soc. London 1: 93. 1841)

Type: *Apocopis royleanus* Nees, Proc. Linn. Soc. London 1 (11): 94.1841 (*Apocopis paleaceus* (Trin.) Hochr.)

Key to the species:

1a. Lower glume not 4–5 cm long (sessile), not obcordate; annuals..... 2

1b. Lower glume 4–5 cm long (sessile), obcordate; perennial ..... *A. courtallumensis*

2a. Racemes single .....*A. vaginata*

2b. Racemes two ..... A. *manglorensis*

Apocopis courtallumensis (Steud.) Henrard, Blumea 4 (3): 524. 1941; Bor, Grass. India 95. 1960; FEG 7: 21. 2020. *Andropogon courtallumensis* Steud., Syn. Pl. Glumac. 1: 377. 1854. FAP 3: 1129. 1997; FTS 679. 2016.

Type: India: Courtallum,*Wight* s.n.

Perennial. Leaves lanceolate. Raceme 1–4 cm. Sessile spikelets 0.3 cm, obovoid, awned. Stamens 2. Ovary oblong.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 222 (KUW).

Specimens examined: Andhra Pradesh, EG distr., Chinalldasakaru, *VNS* 51 (CAL).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Note: For Telangana state, both Pullaiah (2015) and Reddy & Reddy (2016) have not cited any specimens for its presence.

Apocopis mangalorensis (Hochst. ex. Steud.) Henrard, Blumea 4 (3): 523. 1941; Bor, Grass. India 96. 1960; FEG 7: 21. 2020. *Amblyachyrum mangalorense* Hochst. ex Steud., Syn. Pl. Glumac. 1: 413. 1854.

Type: India: 1847, *R.F. Hohenacker* 231 (P).

Tufted annual. Leaves lanceolate, acuminate. Racemes 2, digitate. Spikelets sessile and pedicelled, awned, bisexual. Stamens 2. Caryopsis oblong.

Flowering and Caryopsis time: August–February.

Exsiccata: Andhra Pradesh, Chittoor distr., Talakona, *S. Gurappa* 250 (KUW).

Specimens examined: Andhra Pradesh, Kadapa distr., way to Rudragal from Talakona, *BSS & P.P* 32932 (SKU).

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Apocopis vaginatus Hack., Oesterr. Bot. Z. 41: 8. 1891; Bor, Grass. India 96. 1960; FAP 3: 1130. 1997; FEG 7: 22. 2020.

Type: India: Hazaribagh, *C.B. Clarke* 33849 (W).

Annual. Leaves linear. Racemes 1–2 cm. Sessile spikelets 0.5 cm, oblong, awned, bisexual. Stamens 2. Caryopsis fusiform. Pedicelled spikelets reduced.

Flowering and Caryopsis time: November–January.

Specimens examined: Andhra Pradesh, EG distr., Basion Hills, *CAB* 5086 (MH!).

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Daman and Diu, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, West Bengal, Uttarakhand and Uttar Pradesh.

Arthraxon P. Beauv.

(Ess. Agrostogr. 111. 1812)

Type: *Arthraxon ciliare* P. Beauv.

Key to the species:

1a. Pedicelled spikelets not developed; spikelets up to 5 mm long 2

1b. Pedicelled spikelets developed; spikelets up to 3 mm long .....*A. lancifolius*

2a. Stamens 2 .....*A. hispidus*

2a. Stamens 3 3

3a. Caryopsis cylindrical ..... *A. nudus*

3b. Caryopsis otherwise 4

4a. Lower glume (sessile), pectinately spinulose .....*A. lanceolatus*

4b. Lower glume (sessile), faintly spinulose.....*A. prionodes*

Arthraxon hispidus (Thunb.) Makino, Bot. Mag. 26: 214. 1912; FPM 3: 1728. 1934; Bor, Grass. India 99. 1960; FEG 7: 29. 2020. *Phalaris hispida* Thunb. in J.A. Murray, Syst. Veg. ed. 14: 104. 1784.

Type: Japan: *C.P. Thunberg* 1776 (UPS).

Tufted annual grass. Leaves hairy. Raceme 1–5 cm; sessile spikelets 0.4 cm, ovoid, awned, bisexual; pedicelled spikelets reduced; palea absent. Stamens 2. Caryopsis linear.

Flowering and Caryopsis time: August–November.

Exsiccata: Andhra Pradesh, VSKP distr., Galikonda, *S. Gurappa* 211 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Near Sileru, *GVS* 42717 (MH!); Chintapalli, *JLE* 37149 (MH!); East Godavari distr., *CAB* 5086 (MH).

Distribution : (I) GLOBAL: Bhutan, China, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Sikkim, Uttar Pradesh and West Bengal.

Note: No specimens were not cited for Telangana either by Pullaiah (2015) or Reddy & Reddy (2016).

Arthraxon lanceolatus (Roxb.) Hochst., Flora 39: 188. 1856 var. **lanceolatus**; FBI 7: 143. 1896; Bor, Grass. India 100. 1960. *Andropogon lanceolatus* Roxb., Fl. Ind. 1: 262. 1820.

[Plate 5.2: H.]

Type: India: "A native of Coromandel." Lectotype: India; Roxburgh Icon. Ined. 2019 (K, copy in L). LT designated by P.C. van Welzen in Blumea 27 (1): 283. 1981.

Tufted annual; ligule membranous. Leaves elliptic. Racemes 3–6 cm. Sessile spikelets 0.6 cm, awned, bisexual. Stamens 3.Lodicules 2. Pedicelled spikelets 0.5 cm, elliptic. *Distribution* : (I) GLOBAL. China and Pakistan; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Daman and Diu, Gujarat, Jharkhad, Karnataka, Kerala, Maharashtra, Odisha, Punjab and Tamil Nadu.

Note: No specimens were cited for this species in Flora of Telangana (Pullaiah, 2015; Reddy & Reddy, 2016). This taxon has close resemblance to *Arthraxon prionodes* but it can be easily distinguished by its flattened lower glume of sessile spikelets besides the key characters mentioned.

Arthraxon lanceolatus (Roxb.) Hochst. var. **echinatus** (Nees) Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 348. 1889; FEG 7: 31. 2020. *Arthraxon echinatus* (Nees) Hochst., Flora 39: 188. 1856; FPM 3: 1728. 1934; Bor, Grass. India 99. 1960. *Batratherum echinatum* Nees, Edinburgh New Philos. J. 18: 181. 1835. **[Plate 5.3: A.]**

Lectotype: India: *Wight* KD 1684 (K). LT designated by P.C. van Welzen in Blumea 27 (1): 285. 1981.

Tufted annual. Leaves ovate. Racemes 2–5 cm. Sessile spikelets 0.6 cm, ovoid, glumes keeled, bisexual. Stamens 3. Pedicelled spikelets 0.5 m, ovoid.

Flowering and Caryopsis time: September–February.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 217 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Alurkona near stream, *PVP* 3491; Kurnool distr., Rangapuram RF, *RVR* 1702; Cuddapah distr., Tangelakunta, *JSG* 21230 (MH). Telangana, MDK distr., Pullavagu, *TP & MSG* 12088 (SKU).

Distribution: (I) GLOBAL: Nepal; (II) INDIA: Andhra Pradesh, Assam, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana and Uttar Pradesh.

Arthraxon lancifolius (Trin.) Hochst., Flora 39: 188. 1856; FPM 3: 1729. 1934; Bor, Grass. India 100. 1960; FEG 7: 33. 2020. *Andropogon lancifolius* Trin., Mém. Acad. Imp. Sci. St.–Pétersbourg, sér. 6, Sci. Math. 2 (4): 271. 1832.

Type: Nepal: Numer. List [Wallich] no. 8828B (LE).

Tufted annual, decumbent. Leaves lanceolate, base amplexicaul. Raceme 1–2 cm. Sessile spikelets 0.4 cm, lanceolate, awned, bisexual. Stamens 2. Caryopsis linear. Pedicelled spikelets 0.2 cm, ovoid.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, PKS distr., Way to Diguvametta, *JLE* 22165 (CAL). Telangana, ADB distr., Sathenapalle beat, *TP & PVP* 4079 (SUV).

Distribution : (I) GLOBAL: China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Arthraxon nudus (Steud.) Hochst., Flora 39: 188. 1856; Bor, Grass. India 101. 1960; Moulik, Grass. Bamb. India 1: 261. 1967. *Andropogon nudus* Steud., Syn. Pl. Glumac. 1: 383. 1854.

Type: India: Tavoy, Numer. List [Wallich] no. 8834A.

Tufted annual, nodes bearded, ligule 0.2 cm. Leaves lanceolate, cordate. Sessile spikelets 0.3 cm, dorsally compressed, bisexual, awned, keeled. Stamens 3. Pedicelled spikelets reduced.

Flowering and Caryopsis time: August–February.

Specimens examined: Andhra Pradesh, VSKP distr., Near Sileru, *GVS* 42717 (MH); Chintapalli, *AMR* 25616 (SKU); EG distr., Devarapalli, Maredumilli, *MM* 100793 (MH).

Distribution : (I) GLOBAL; China and Myanmar; (II) INDIA: Andhra Pradesh, Assam, Kerala, Uttarakhand and Uttar Pradesh.

Arthraxon prionodes (Steud.) Dandy. in F.W. Andrews, Fl. Pl. Sudan 3: 399. 1956; Bor, Grass. India 101. 1960; FEG 7: 34. 2020. *Andropogon prionodes* Steud., Syn. Pl. Glumac. 1: 383. 1854.

Type: Ethiopia: *Schimper* 1117 (P). LT designated by P.C. van Welzen in Blumea 27: 283. 1981.

Tufted perennial grass. Leaves lanceolate, base cordate, acuminate. Raceme 0.5–7 cm, spikelets 0.5 cm, lanceolate, keeled, awned, bisexual. Stamens 3.

Flowering and Caryopsis time: September–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Ahobilum, *S. Gurappa* 215 (KUW).

Specimens examined: Andhra Pradesh PKS distr., Diguvametta, Bairanifalls, *JLE* 32469 (CAL). Telangana, Warangal distr., Hanamakonda, *CSR* 669 (KUW).

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Chhattisgarh, Himachal Pradesh, Gujarat, Karnataka, Madhya Pradesh, Telangana and Uttarakhand.

Arundinella Raddi

(Agrostogr. Bras. [Raddi] 36. t. 1. f. 3. 1823)

Type: *Arundinella brasiliensis* Raddi.

Key to the species:

1a. Upper lemma with two setae, one on each side of the awn 2

1b. Upper lemma with a single awn or the awn absent 5

2a. Plants not covered with tubercle based hairs 3

2b. Plants not covered with tubercle based hairs 4

3a. Spikelets crowded .....*A. mesophylla*

3b. Spikelets loose .....*A. setosa*

4a. Plants not covered with tubercle based hairs ..... *A. nervosa*

4b. Spikelets below 2 mm long..... 6

5a. Spikelets above 2 mm long..... 7

5b. Panicle cylindric; perennials ..... *A. bengalensis*

6a. Panicle effuse; annual ..... *A. pumila*

6b. Panicle 2 – 10 cm long ..... *A. purpurea*

7a. Panicle above 15 cm long 8

7b. Panicle 20 cm long, contracted ..... *A. ciliata*

8a. Panicle 35 cm long, not contracted ..... *A. nepalensis*

Arundinella bengalensis (Spreng.) Druce, Rep. Bot. Exch. Club Soc. Brit. Isles 4: 605. 1917; Bor, Grass. India 421. 1960; FEG 7: 35. 2020. *Panicum bengalense* Spreng., Syst. Veg. 1: 311. 1824 ("1825").

Type: India: Native of Bengal, where it is found, though rarely, on dry barren spots.

Perennial tufted grass. Leaves lanceolate, acuminate. Panicle 28 cm. Spikelets 0.4 cm, ovoid.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 223 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Araku valley, *NPBK* 10810 (CAL, MH); Araku, *GVS* 21568 (CAL, MH!).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Madhya Pradesh, Meghalaya, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Arundinella ciliata (Roxb.) Nees ex Miq., Nieuwe Verh. Eerste Kl. Kon. Ned. Inst. Wetensch. Amsterdam 4: 30. 1851; Bor, Grass. India 421. 1960; FEG 7: 35. 2020. *Holcus ciliatus* Roxb., Fl. Ind. 1: 321. 1820. **[Plate 5.3: B.]**

Type: India: "A native of Coromandel."

Tufted annual grass. Leaves linear. Panicle 20 cm, contracted. Spikelets 2 mm, glumes pilose. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, VSKP distr., Ananthagiri Hills, *S. Gurappa* 560 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Horsely hills, *PVP* 3497 (SKU); Horsely konda, *CECF* 55422 (MH! & CAL); VSKP distr., Cherukonda, *GVS* 42745 (MH!).

Distribution: (I) GLOBAL: Native range Central & S. India and W. Indo-China; (II) INDIA: Andhra Pradesh, Chhattisgarh, Dadra and Nagar Haveli, Karnataka, Kerala, Madhya Pradesh, Maharashtra and Tamil Nadu.

Note: Pullaiah (2015) reported this species based on Ramana (2010), without citing a specimen.

Arundinella mesophylla Nees ex Steud., Syn. Pl. Glum. 1, 115. 1854; FBI 7: 69, 1896; FPM 3: 1801. 1934; Bor, Grass. India 423. 1960.

Type: India: Courtallum; Numer. List [Wallich] no. 8663.

Perenials, decumbent. Leaf sheath tubercle hairy, leaf blade lanceolate. Inflorescence 4 cm. Spikelets 0.3–5 mm long, lanceolate. Upper lemmas with 2 equal setae, setae as long as the upper lemma, base bearded. Stamens 3. Caryopsis oblong to elliptic.

Flowering and caryopsis time: October–January.

Exsiccata: Andhra Pradesh,Chittoor district, Tirumala, *S. Gurappa* 261052 (KUW).

Specimens examined: Andhra Pradesh, Chittoor distr.,Tirumala, Papanasanam, *S.Gurappa* 261052 (KUU) [same as above].

Note: A new record for Andhra Pradesh (Gurappa & Kumar, 2022a).

Arundinella nepalensis Trin., Gram. Panic. 62. 1826; Bor, Grass. India 423. 1960; FPM 3: 1801. 1934; FEG 7: 36. 2020.

Type: Nepal; *Wallich* s.n. in Herb. Lindley (LE).

Tufted perennial. Leaves linear. Panicle 35 cm, lax. Spikelets 0.7 cm, lanceolate; glumes acuminate. Upper lemma awned. Stamens 3.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 224 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Chalama, *MPG* 106 (CAL).

Distribution: (I*)* GLOBAL: Bhutan, China, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Arundinella nervosa (Roxb.) Nees ex Hook. & Arn., Bot. Beechey Voy. 5: 237. 1837; FPM 3: 1801. 1934; Bor, Grass. India 424. 1960. *Holcus nervosus* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 320. 1820.

Type: India: A native of Coromandel.

Tufted annual. Leaves lanceolate, acute. Panicle 4–10 cm. Spikelets 0.4 cm, lanceolate, Stamens 3. Lodicules 2.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Anantapuram distr., on the way from Tadipatri to Anatapuram, *S. Gurappa* 249 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Gounivaripalli, *BR & P.Priyadarsini* 37199*,* 37309 (SKU, BSID); Kalasamudram, *KRKS* 40454 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Goa, Himachal Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Arundinella pumila (Hochst. ex A. Rich.) Steud., Syn. Pl. Glumac. 1: 114. 1854; FPM 3: 1801. 1934; Bor, Grass. India 423. 1960; FEG 7: 37. 2020. *Acratherum pumilum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 414. t. 100. 1850–1851.

Lectotype: Ethiopia: “in vallibus prope Adde Arbati”; October, 1839; *Schimper* 642 (B). LT designated by van der Zon, Gram. Cameroun 2: 361. 1992.

Tufted slender annual. Leaves lanceolate, acuminate. Panicle effuse. Spikeletes 0.2 cm, glumes lanceolate, membranaceous. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: July–November.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 226 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Way to Ramanapenta, *JLE* 22202 (MH, CAL); EG distr., Basion hills, *CAB* 5037, 5056 (MH!); VSKP distr., Gudem valley, *VNS* 497 (CAL); Sapparalagedda, *GVS* 42772 (MH!).

Distribution: (I) GLOBAL: Myanmar, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Dadra and Nagar Haveli, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Note: Pullaiah (2015) cited no specimen of this species for Flora of Telangana.

Arundinella purpurea Hochst. ex Steud., Syn. Pl. Glumac. 1: 115. 1854; Bor, Grass. India 42. 1960; FEG 7: 37. 2020.

Type: India: Tamil Nadu, Nilagiri Mountain, *Hohenacker* 928 (P).

Tufted perennial. Panicle 5 cm, contracted. Spikelets 0.4–0.8 cm. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Ahobilum, *S. Gurappa* 241 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Nallamalais, *V.S.Raman* 94235 (MH, CAL).

Distribution: (I) GLOBAL: W. Himalaya to India and Myanmar; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Arundinella setosa Trin., Gram. Panic. 63. 1826 var. **setosa**; FBI 7: 70. 1896; FPM 3: 1801. 1934; Bor, Grass. India 424. 1960.

Type: Nepal: *Lindley* s.n. (LE).

Perennial tufted, nodes glabrous, ligule membranous, apex acuminate. Panicle 18 cm, effuse. Spikelets 0.3 cm. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 261071 (KUW).

Specimens examined: Andhra Pradesh, Kadapa distr., Mogilikuppa, *JSG* 21307; KNL distr., Chealema, *JLE* 18057 (CAL). Telangana, MDK distr., Narsapur RF, *TP & MSG* 11970 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) India: Throughout.

Arundinella setosa Trin. var. **esetosa** Bor, Grasses Burma, Ceylon, India & Pakistan 425. 1960.

Syntypes: India: Bihar, *T. Thomson* s.n. Nepal: Western part; *Stainton, Sykes & Williams* 4255, 4461.

Tufted perennial. Leaves lanceolate. Panicle 35 cm, effuse. Spikelets 0.7 cm. Lower lemma sub-coriaceous. Upper lemma awned.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, VSKP distr., Northern Circar, Waltair, Acc. no. 26294 (CAL).

Distribution: (I) GLOBAL: China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Bihar, Tamil Nadu and Uttar Pradesh.

Arundinella setosa Trin. var. **lanifera** C.E.C. Fisch., Fl. Madras 3 (10): 1801. 1934.

Type: India: Cuddapa dist., Mogili Kuppa, alt. 6000 ft., *Meebold* s.n.

Tufted perennial. Panicle 20 cm. Spikelets 0.5 cm, glumes setose. Stamens 2.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, CDP distr., Mogalikuppa, *JSG* 21307 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Uttar Pradesh.

Arundinella tuberculata Munro ex Lisboa, J. Bombay Nat. Hist. Soc. 5: 344. 1890; FBI 7: 69. 1896; Bor, Grass. India 425. 1960; FEG 7: 38. 2020.

Type: India: Poona and Konkan, *Munro* s.n. (Herbarium of Poona College of Science).

Tufted annual. Panicle 33 cm. Spikelets 0.1–1.2 mm, ovoid, apex acute. Glumes and lemmas awned. Sstamens 3. Lodicules 2.

Flowering and Caryopsis time: November–February.

Specimens examined: Andhra Pradesh, ATP distr., Batrepalle, *BR & KVS* 29193; *BR & P. Priyadarsini* 37062 (SKU, BSID). Telangana, MBNR distr., Vatavarlapalli, *BSS & SKB* 30573 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Bihar, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu and Telangana.

Note: Reddy & Reddy (2016) have not reported this specices from Telangana state.

Excluded

Arundinella setosa Trin. var. **nilagiriana** Subba Rao & Kumari, J. Bombay Nat. Hist. Soc. 72: 827. 1976.

Type: India, Tamil Nadu, Nilgiri distr., Koilbetta; September 11, 1970, *G.V. Subba Rao* & *G.R. Kumari* 19795A (CAL).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Uttar Pradesh.

Remarks: The report from the study area was based on Kellogg *et al.* (2020) but no specimen could be traced.

Bothriochloa Kuntze,

(Revis. Gen. Pl. 2: 762. 1891)

Type: *Bothriochloa anamitica* Kuntze

Key to the species:

1a. Lower racemes longer than the rachis 2

1b. Lower racemes shorter than the rachis ..... *B. bladhii*

2a. Lower glume (sessile) hairy below the middle with 1 or 2 rarely pits 3

2b. Lower glume (sessile) glabrous; sessile spikelets pitted .....*B. insculpta*

3a. Recemes not flexuous, up to 6 cm long .....*B. pseudoischaemum*

3b. Recemes flexuous, above 7 cm long 4

4a. Leaves mostly basal; racemes 2–8 .....*B. pertusa*

4b. Leaves mostly cauline; racemes 9 – 15 ..... *B. kuntzeana*

Bothriochloa bladhii (Retz.) S.T.Blake, Proc. Roy. Soc. Queensland 80: 62. 1969; FEG 7: 45. 2020. *Andropogon bladhii* Retz., Observ. Bot. 2: 27. 1781. *Amphilophis glabra* (Roxb.) Stapf in Fl. Trop. Afr. 9: 172. 1917; FPM 3: 1732. 1934.

Type: “In China lectum cum aliis mislit bonorat, D. Bladh.” China, *Bladh* s.n. (LD).

Tall tufted perennial, nodes bearded. Leaves linear, acuminate. Panicle 13 cm. Spikelets 0.6 cm. Sessile spikelets 0.3 cm, oblong, bisexual, awned, keeled. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.3 cm.

Flowering and Caryopsis time: July–November.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 223 (KUW).

Specimens examined: Andhra Pradesh, PKM distr., Diguvametta, *JLE* 42179 (MH). Telangana, ADB distr., Alampalli, *TP & PVP* 4169 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh,

Maharashtra, Manipur, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Bothriochloa insculpta (Hochst. ex A. Rich.) A. Camus, Ann. Soc. Linn. Lyon sér. 2, 76: 165. 1931; Bor, Grass. India 107. 1960. *Andropogon insculptus Hochst*. ex A. Rich., Tent. Fl. Abyss. 2: 458. 1850–1851. *Amphilophis insculpta* (Hochst. ex A. Rich.) Stapf in Prain, Fl. Trop. Africa 9: 176. 1917; FPM 3: 1732. 1934.

Lectotype: Ethiopia: Tigray, Scholoda; September 22, 1837; Schimper 80 (US–76201 (fragm)). LT designated (as "holotype") by Marchi & Longhi–Wagner in Bol. Inst. Bioci. Univ. Fed. Rio Grande do Sul 57: 38. 1998.

Tall tufted perennial. Leaves lanceolate. Sessile spikelets 0.4 cm, lanceolate, awned. Stamens 3. Pedicelled spikelets 0.2–0.3 cm, unawned. Lower glume pitted. Stamens 3.

Flowering and Caryopsis time: November–March.

Specimens examined: Andhra Pradesh, CTR distr., Horsley hills*, BR* 51982 (SKU).

Distribution: (I) GLOBAL: Africa and South America; (II) INDIA: Andhra Pradesh, Bihar, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Bothriochloa kuntzeana (Hack.) Henr., Blumea 3: 456. 1940; Bor, Grass. India 108. 1960; Moulik, Grass. Bamb. India 1: 266. 1977. *Andropogon kuntzeanus* Hack., Monogr. Phan. [A. DC. & C. DC.] 6: 478. 1889.

Type: Peninsular Indiae orientalis: Assirgar, *Kuntze* s.n. (NY).

Tufted perennial. Leaves liner. Racemes digitate, 7 cm long. Sessile spikelets 0.5 cm, lanceolates. Lower glume 1–pitted. Stamens 3. Pedicelled spikelets 0.4 cm.

Flowering and Caryopsis time: August–February.

Specimens examined: Andhra Pradesh, CTR distr., Bhupathyyakona, *BR* 37323 (SKU,BSID). Telangana, Hyderabad, *MRS* 111 (DD).

Distribution: (I) GLOBAL: Pakistan; (II) INDIA: Andhra Pradesh, Bihar, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Telangana, Uttarakhandand Uttar Pradesh.

Bothriochloa pertusa (L.) A. Camus, Ann. Soc. Linn. Lyon sér. 2, 76: 164. 1931; Bor, Grass. India 109. 1960; Moulik, Grass. Bamb. India 1: 267. 1977; FEG 7: 46. 2020. *Holcus pertusus* L., Mant. Pl. Altera 301–302. 1771.

Type: "Habitat in India orientali." Lectotype: *Herb. Linn. No.* 1212.16 (LINN). LT designated by Clayton in Kew Bull. 32: 4. 1977.

Tufted perennial. Leaves lanceolate. Raceme sub-digitate, 8 cm long. Sessile spikelets 0.3 cm, linear, awned. Stamens 3. Pedicelled spikelets 0.4 cm, oblong. Stamens 3.

Flowering and Caryopsis time: September–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 227 (KUW).

Specimens examined: Andhra Pradesh, GNT distr., Kondaveedu Fort, *CAB* 4700 (MH!); KSN distr., Kondapalli, *CAB* 8179 (MH!); Telangana, NLG distr., Nagarjunakonda valley, *KT* 9767 (CAL).

Distribution: (I) GLOBAL: Afghanistan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Bothriochloa pseudoischaemum (Nees) Henr., Blumea 3 (3): 457. 1940; Bor, Grass. India 109. 1960; FEG 7: 48. 2020. *Andropogon pseudoischaemum* Nees, Syn. Pl. Glumac. 1: 380. 1854; FBI 7: 172. 1896. *Amphilophis pseudoischaemum* (Nees ex Steud.) Fischer, FPM 3: 1731. 1934.

Type: India orientalis: *Heyne* s.n. (Numer. List [Wallich] no. 8815).

Tufted perennial. Leaves oblong, raceme digitate, Sessile spikelets 0.5 cm long, awned. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets 0.4 cm, lanceolates. Stamens 3.

Flowering and Caryopsis time: September–February.

Exsiccata: Telangana, *S. Gurappa* & *V.S.Raju* 4737 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Kothakota, *JSG* 21157 (DD); CTR distr., Papavinasanam, *PVP* 3695.Telangana, Hyderabad, *MRS* 247 (DD).

Distribution: (I) GLOBAL: Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Telangana.

Capillipedium Stapf

(Fl. Trop. Afr. [Oliver *et al*.] 9: 11, 169. 1917)

Lectotype: *Capillipedium parviflorum* (R.Br.) Stapf (*Holcus parviflorus* R. Br.). LT designated by G. Roberty, Boissiera 9: 1–455. 1960.

Key to the species:

1a. Culms decumbent and trailing .....*C. filiculme*

1b. Culms erect..... 2

2a. Panicles 10–25 cm long ..... *C. parviflorum*

2a. Panicles 5–10 cm long 3

3a. Nodes glabrous; panicles effuse..... *C. assimile*

3b. Nodes bearded; panicles contracted.....*C. huegelii*

Capillipedium assimile (Steud.) A. Camus, Fl. Indoch. 7: 314. 1922; Bor, Grass. India 110. 1960. FEG 7: 60. 2020. *Andropogon assimilis* Steud., Syn. Pl. Glumac. 1: 397. 1854.

Type: Java: *Zollinger Herb.* 859 (P).

Tufted perennial. Leaves lanceolate. Panicles lax. Sessile spikelets 0.3 cm, awned. Stamens 3, bisexual. Pedicelled spikelets 0.4 cm. Stamens 3.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Yerramalla Hills, *S. Gurappa* 229 (KUW).

Specimens examined: Andhra Pradesh, EG distr., Basion hills, *CAB* 5090 (MH!); VSKP distr., Ananthagiri, *GVS* 19576 (CAL).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Capillipedium filiculme (Hook. f.) Stapf., Hooker's Icon. Pl. 31: sub tab. 3085. 1922; FPM 3: 1730. 1934; Bor, Grass. India 111. 1960; FEG 7: 61. 2020. *Andropogon filiculmis* Hook. f., Fl. Brit. India. 7 (21): 181. 1896.

Syntypes: India: Deccan, Poonah, in rocky places; *Jacquemont* 310. Mawar, Dhomsha: *Woodrow* 26 (K).

Tufted perennial, nodes bearded. Leaves lanceolate. Panicle 10 cm. Sessile spikelets 0.3 cm, oblong, awned. Stamens 3. Pedicelled spikelets 0.4 cm, lanceolate.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh; KNL distr., Ahobilum, *TP & GNVF* 7059 (SKU). Telangana, ADB distr., Sathenapalli beat, *TP & PVP* 4282 (SKU).

Distribution: (I) GLOBAL: Western India; (II) INDIA: Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu and Telangana.

Capillipedium huegelii (Hack.) A. Camus, Rev. Bot. Appl. Agric. Colon. 1 (4): 306. 1921; FPM 3: 1730. 1935; Bor, Grass. India 111. 1960; FEG 7: 63. 2020. *Andropogon huegelii* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 492. 1889.

Type: Asia: *Hügel* 2243 "in h. Vind. verisimiliter, ut ex num. cit. patet in India ad pedes Himalayae lectus."

Tufted perennial, ligule membranaceous. Leaves linear. Panicle 10 cm. Sessile spikelets 0.3 cm, oblong, awned, bisexual. Stamens 3. Caryopsis ovoid, compressed. Pedicelled spikelets 0.3 cm.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 15289 (KUW).

Specimens examined: Andhra Pradesh. KNL distr., Peddacheruvu, *PVP & RVR* 2177; Chelama, *JLE* 17949 (CAL, MH).

Distribution: (I) INDIA: Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Sikkim, Tamil Nadu and Uttar Pradesh.

Note: No specimen of it was cited for Telanaga state (Pullaiah, 2015; Reddy & Reddy, 2016).

Excluded

Capillipedium parviflorum (R.Br.) Stapf., Fl. Trop. Afr. 9: 169. 1917; FPM 3: 1893. 1935; Bor, Grass. India 112. 1960; FEG 7: 63. 2020. *Holcus parviflorus* R.Br., Prodr. Fl. Nov. Holland. 1: 199. 1810.

Type: Australia: *R. Brown* s.n. (BM).

Tufted perennial, ligule membrane. Leaf blades 7–25 cm. Panicle 10–25 cm, open, oblong. Sessile spikelets 0.3–0.4 cm, oblong, dorsally compressed, bisexual, awned, keeled. Stamens 3. Pedicelled spikelets 0.2–0.3 cm, lanceolate.

Flowering and Caryopsis time: September–January.

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Sikkim, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal.

Remarks: No specimen of it could be found from the study area.

Chionachne R.Br.

(Pl. Jav. Rar. (Bennett) 15, 18. 1838)

Type: *Chionachne barbata* (Roxb.) R.Br. ex Aitch (*Coix barbata* Roxb.).

Chionachne gigantea (J. Koenig) Veldkamp, Blumea 47 (3): 559. 2002. *Coix gigantea* J. Koenig, Naturforscher (Halle) 23: 211. 1788. *Coix gigantea* Koen. ex. Roxb., Fl. Ind. 3: 570. 1832; Bor 264. 1960; FAP 3: 1158. 1997; FTS 692. 2016.

Type: India: Andhra Pradesh, Circars: *Koenig* s.n. (BM, K, UPS, Herb. Thunberg 21727; IDC microfiche 1036).

Tufted perennial. Leaves lanceolate. Racemes terminal. Spikelets 7 cm long. Female spikelets dorsiventralley compressed. Caryopsis orbicular.

Flowering and Caryopsis time: September–November.

Exsiccata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 190 (KUW).

Specimens examined: Andhra Pradesh. KNL distr., Gundlabrahmeswaram, *JLE* 16918 (MH); Telangana, HYD distr., Adikmet, *MRS* 88012 (DD).

Distribution: (I) GLOBAL: Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Tripura and West Bengal.

Remarks: *Chionachne* is at times maintained as distinct from *Polytoca* (Jannink & Veldkamp 2002). Kellogg (2015b) considered them as sister genera and combined them on molecular and morphological evidences.

Excluded

Chionachne punctata (R.Br.) Jannink, Blumea 47 (3): 566–567, f. 8. 2002. *Sclerachne punctata* R. Br., Pl. Jav. Rar. 15. t. 4. 1838.

Type: Indonesia: Java, near Surakarta, Jebus village. *Horsfield* s.n. (BM).

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andhra Pradesh, Karnataka and Maharashtra.

Remarks: The distribution was based on Kellogg *et al.* (2020) but no specimen available.

Chionachne semiteres (Benth. ex Hook. f.) Henrard, Meded. Rijks–Herb. 67: 16. 1931. *Polytoca semiteres* Benth. ex Hook. f., Fl. Brit. India. 7 (21): 101. 1896.

Syntypes: Deccan Peninsula, Palamcotta: *Wight* s.n.; Burma: Taong–dong Hills; *Wallich* s.n.

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andhra Pradesh, Bihar, Maharashtra and Tamil Nadu (Kellogg *et al*., 2020).

Remarks: The distribution was based on Kellogg *et al.* (2020) but no specimen available.

Chrysopogon Trin.

(Fund. Agrost. 187. 1820, nom. cons.)

Type: *Chrysopogon gryllus* (L.) Trin. (*Andropogon gryllus* L.) (typ. cons.).

Key to the species:

1a. Inflorescence whorled at nodes; spikelets largely spinulose or muricate 2

1b. Inflorescence not whorled at nodes; spikelets not spinulose or muricate 3

2a. Pedicel of joints glabrous; lower glume muriculate ..... *C. zizanioides*

2b. Pedicel of joints hairy; lower glume with a row of tubercles ..... *C. lawsonii*

3a. Pedicels half the length of the sessile spikelets or longer 4

3b. Pedicles shorter than half the length of the sessile spikelet 5

4a. Pedicels glabrous ..... *C. aciculatus*

4b. Pedicels villous 6

5a. Pedicelled spikelets of lower glume long-awned; upper glume not or short-awned 7

5b. Pedicels half the length of the sessile spikelets or longer 8

6a. Pedicels shorter than half the length of the sessile spikelet 10

6b. Leaves distichous ..... *C. asper*

7a. Leaves not distichous 9

7b. Leaf blades to 50 cm long, 15 mm wide ..... *C. verticillatus*

8a. Leaf blades to 25 cm long, 10 mm wide ..... *C. lancearius*

8b. Leaves glabrous 11

9a. Leaves puberulous 14

9b. Leaves distichous ..... C. *polyphyllus*

10a. Leaves otherwise 12

10b. Lower glume of the pedicelled spikelet awned 13

11a. Lower glume of the pedicelled spikelet not awned. ..... *C. hackelli*

11b. Upper glume of sessile spikelet hairy on lower three quarters of length.....*C. fulvus*

12a. Upper glume of sessile spikelet glabrous or ciliate in the upper quarter only ..... C. *serrulatus*

12b. Pedicelled spikelets of lower and upper glumes awned ..... *C. orientalis*

13a. Pedicelled spikelets of lower and upper glumes not or shortly awned 14

13b. Sessile spikelets laterally compressed; panicles 10-25 cm .....*C. hamiltonii*

14a. Sessile spikelets not laterally compressed; panicles 5-8 cm .....*C. velutinus*

Chrysopogon aciculatus (Retz.) Trin., Fund. Agrost. 188. 1820; FPM 3: 1738. 1934; Bor, Grass, India 115. 1960. *Andropogon aciculatus* Retz., Observ. Bot. 5: 22. 1789; FBI 7: 188. 1896.

Lectotype: India: *Koenig* s.n. in herb. Retzius (LD). LT designated by Veldkamp in Austrobaileya 5 (3): 509. 1999.

Tufted perennial, ligule membranous. Leaves lanceolate, apex acute. Panicles 4–10 cm. Spikelets sessile, pedicelled, awned, bearded at base. Sessile spikelets 0.4 cm, lanceolate. Lodicules 2. Stamens 3. Caryopsis oblong. Pedicelled spikelets 2, 0.5 cm, lanceolate.

Flowering and Caryopsis time: July–October.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 216 (KUW).

Specimens examined: Andhra Pradesh, WG distr., Bhimavaram, *CAB* 4383 (MH!). EG distr., Ethakonda, *VNS* 543 (CAL). Telangana, WGL distr., Hanamakonda, *CSR* 986 (KUW).

Distribution: (I) GLOBAL: Afghanistan, Bangladesh, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andaman and Nicobar Islands and throughout India.

Chrysopogon asper Heyne ex Blatter & McCann, Sci. Monogr. Imp. Council Agric. Res. India 5: 68. 1935; FPM 3: 1738. 1934; Bor, Grass. India 116. 1960. *Andropogon asper* Heyne ex Hook. f., Fl. Brit. India. 7 (21): 189. 1896, non (Thunb.) Kunth, 1829, nom. illeg.

Type: India: Madras, Pulicat Hills; *Heyne* s.n.

Tufted perennial, ligule 0.2 cm, membranous. Leaves linear, apex acute. Panicle, 12 cm. Spikelets sessile and pedicelled, awned, keeled, bearded at base. Sessile spikelets 1, 0.6 cm, lanceolate, acuminate, rufous hairy. Lodicules 2. Stamens 3. Pedicelled spikelets 2, 0.7 cm, oblong.

Flowering and Caryopsis time: August–November.

Exsiccata: Andhra Pradesh, VSKP distr., Ananthagiri, *S. Gurappa* 230 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *RV Reddy* 8041; Balapalle, *JSG* 11193, Cuddapah, *EKK* 79518 (DD); CTR distr., Thalakona RF, *PVP* 2325 (SKU); NLR distr., Kannapenta, *JSG* 21737 (DD).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Chrysopogon fulvus (Spreng.) Chiov., Fl. Somala 1: 327. 1929; Bor, Grass. India 166. 1960. *Pollinia fulva* Spreng., Pl. Min. Cogn. Pug. 2: 10. 1815. *Chrysopogon montanus* Trin. ex Sperng., Entadeck. 2: 93. 1821; FPM 3: 1739. 1934. **[Plate.5.2: E]**

Type: "Habitat in Bengalia": *Roxburgh* s.n.

Tufted perennial, ligule 0.4 cm, hairy. Leaves linear, acute. Panicle 7 cm. Spikelets 1 sessile, 2 pedicelled, awned, keeled, bearded at base. Sessile spikelets 0.3 cm, ovoid, laterally compressed, acute, yellow pubescent. Lodicules 2. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.4 cm, oblong. Stamens 3.

Flowering and Caryopsis time: July–November.

Exsiccata: Telangana, Zaherabad distr., *S. Gurappa & V.S.Raju* 4834 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Kamalapuram, *JSG* 11206 (MH); KNL distr., Chelema, *JLE* 22083 (MH!). Telangana, MDK distr., Choutkoor fields, *TP & MSG* 11934 (SKU).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Daman and Diu, Delhi, Goa, Gujarat, Jammu and Kashmir, Himachal

Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttarakhand and Uttar Pradesh.

Chrysopogon hackelii (Hook. f.) C.E.C. Fisch., Fl. Madras 3 (10): 1739. 1934; Bor, Grass. India 117. 1960. *Andropogon hackelii* Hook. f., Fl. Brit. India. 7 (21): 194. 1896.

Syntypes: India: Travancore, Nilghiri Hills; Wight *1030* (K). Gondaloo Ghat, alt. 4500 ft.; *Lawson* s.n., Numer. List [Wallich] no. 8783.

Tufted perennial, ligule 0.4 cm. Leaves lancelate. Panicles 10–22 cm long. Spikelets 1 sessile, 2 pedicelled, awned, bearded. Sessile spikelets 0.6 cm, lanceolate, acute. Stamens 3. Peddicelled spikelets 0.5 cm, lanceolate.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu *KS* 6428 (MH, CAL); WG distr., Godavari Gorge, *BO* 3467 (MH, CAL).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh.

Chrysopogon hamiltonii (Hook. f.) Haines, Bot. Bihar Orissa 5: 1036. 1924; Bor, Grass. India 117. 1960; Moulik, Grass & Bamb. India 1: 241. 1997. *Andropogon hamiltonii* Hook. f., Fl. Brit. India. 7 (21): 190. 1896.

Type: India: Behar, Monghir, *Buchanan–Hamilton* s.n.

Tufted perennial, ligule hairy. Leaf surface glabrous or scabrulous, acuminate, margin scabrous. Panicle, 10–25 cm, lanceolate, contracted. Sessile spikelets 0.6–0.7 cm, oblong, laterally compressed, bisexual, awned. Pedicelled spikelets 1–2 cm, awned.

Flowering and Caryopsis time: October–December.

Specimens examined: Andhra Pradesh, ATP distr., Gounivaripalli-Samrajyamkonda, *BR & KVS* 28188 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu and West Bengal.

Chrysopogon lancearius (Hook. f.) Haines, Bot. Bihar Orissa 5: 1036. 1924; Bor, Grass. India 118. 1960; FEG 7: 86. 1920. *Andropogon lancearius* Hook. f., Fl. Brit. India. 7 (21): 190. 1896.

Syntypes: India: Sikkim Himalaya, Punkabaree, *Kurz* s.n. Chota Nagpore: Ramghur, Ghat, 1750 ft.; *C.B.Clarke* s.n.

Tufted perrinial, ligule 0.2 cm, membranaceous. Leaves linear, rough, serrulate. Panicle 21 cm long. Spikelets 1 sessile, 2 pedicelled, awned. Sessile spikelets 0.8 cm, oblong, bisexual. Stamens 2. Pedicelled spikelets 0.7 cm, lanceolate.

Flowering and Caryopsis time: July–February.

Exsiccata: Andhra Pradesh. Kurnool distr., Yerramalla Hills, *S. Gurappa* 15252 (KUW).

Specimens examined: Andhra Pradesh, GNT distr., Kondagorulapenta, *MPG* 119 (MH); EG distr., Bison hills, *CAB* 5112 (MH).

Distribution: (I) GLOBAL: India to E. Himalaya; (II) INDIA: Andhra Pradesh, Bihar, Jharkhand, Maharashtra, Odisha, Sikkim and West Bengal.

Chrysopogon lawsonii (Hook. f.) Veldkamp, Austrobaileya 5 (3): 515. 1999. *Veteveria lawsonii* (Hook. f.) Blatt. & MaCann, J. Bombay Nat. Hist. Soc. 32: 409, 1928; FPM 3: 1733. 1934; Bor, Grass. India 258. 1960. *Andropogon lawsonii* Hook. f., Fl. Brit. India. 7 (21): 187. 1896.

Type: India: Mysore, Bandypore, in moist ground, alt. 3000 ft., *Lawson* s.n.

Tall tufted, perennial, cultivated. Leaf sheath glabrous, ligule membrane. Leaves liner, acuminate. Panicle 18 cm long, branches whorled. Sessile spikelets 0.5 cm, bisexual, spinulose, keeled, awned. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.6 cm.

Flowering and Caryopsis time: September–February.

Specimens examined: Andhra Pradesh, KNL distr., Peccheruvu, *TRS & PVS* 79525 (BSID). Telangana, MDK distr., Gangapur fields, *TP & MSG* 12093 (SKU).

Distribution: (I) GLOBAL: India, Nepal and Indo-China; (II) INDIA: Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Telangana.

Chrysopogon orientalis (Desv.) A. Camus, Fl. Indo–Chine 7: 332. 1922; FPM 3: 1739. 1934; Bor, Grass. India 118. 1960. *Rhaphis orientalis* Desv., Opusc. Sci. Phys. Nat. 69. 1831.

Type: "India orientalis." India, Klein 392 (B–W–18636 [sheet 4]).

Tufted perennial. Leaves oblong. Panicle 13 cm. Spikelets 1 sessile, 2 pedicelled, awned. Sessile spikelet 0.7 cm, lanceolate, apex acute, base bearded. Stamens 3. Caryopsis 0.4 cm, ellipsoid. Pedicelled spikelets 0.8 cm.

Flowering and Caryopsis time: October–December.

Exsiccata: Andhra Pradesh, Chitoor distr., Thirumala Hills, *S. Gurappa* 241 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalle, *JSG* 11193 (MH), NLR distr., Penchalakonda, *CECF* 12791 (MH); Kanuparti, *JSG* 21737 (CAL).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu.

Note:Pullaiah (2015) record it for Telangana State after Naqvi (2001).

Chrysopogon polyphyllus (Hack. ex Hook. f.) Blatt. & McCann, J. Bombay Nat. Hist. Soc. 32: 416. 1928; FPM 3: 1739, 1934; Bor, Grass. India 118. 1960. *Andropogon polyphyllus* Hack. ex Hook. f., Fl. Brit. India. 7 (21): 194–195. 1896.

Type: India: Madhya Pradesh, Khandua, Chanda and Jubbulpore districts, by the Nerbudda and Indravati Rivers, *J.C. Duthie* 8491 (K).

Tufted perennial, ligule membrane. Leaves linear, acuminate. Panicle 8–12 cm, open. Spikelets 1 sessile, 2 pedicelled, awned, keeled. Sessile spikelets 0.4 cm, oblong, awn 0.4–0.7 cm. Pedicelled spikelets 0.4 cm.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, WG distr., Devyapatnam, *JSG* 15781 (MH).

Distribution: (I) GLOBAL: Malaysia and North America; (II) INDIA: Andhra Pradesh, Bihar, Dadra and Nagar Haveli, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttar Pradesh.

Chrysopogon serrulatus Trin., Mém. Acad. Imp. Sci. St.–Pétersbourg, sér. 6, Sci. Math. 2 (3): 318. 1832; Bor, Grass. India 118. 1960; FEG 7: 89. 1920.

Type: Nepal: 1821; Wallich (Numer. List [Wallich] no. 8791).

Tufted perennial, ligule ciliate. Panicle 3–10 cm. Spikelets 1 sessile, 2 pedicelled, awned, keeled. Sessile spikelets 0.6 cm. Pedicelled spikelets 0.7 cm.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, EG distr., Balabutharapuram, *BO* 3226 (CAL).

Distribution: (I) GLOBAL: Afghanistan, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Uttarakhand and Uttar Pradesh.

Chrysopogon velutinus (Hook. f.) Bor, Grasses Burma, Ceylon, India & Pakistan 119. 1960. *Andropogon velutinus* Hook. f., Fl. Brit. India 7: 194. 1896.

Type: India: Mysore, Chuddapah, *Wight* 2314.

Tufted perennial, ligule ciliate. eaves linear, apex acuminate. Panicle 5–8 cm. Spikelets 1 sessile, 2 pedicelled, awned, winged. Sessile spikelets 0.6 cm, base beared. Pedicelled spikelets 0.5 cm, oblong.

Specimens examined: Andhra Pradesh, CDP distr., *Wight* 2314 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Chrysopogon verticillatus (Roxb.) Trin. ex Steud., Nomencl. Bot., ed. 21: 360. 1840; FPM 3: 1739. 1934; Bor, Grass. India 119. 1960. *Andropogon verticillatus* Roxb., Fl. Ind. 1: 267. 1820; FBI 7: 189. 1896. **[Plate.5.3: C]**

Type: India: “A native of Mountains.”

Tufted perennial, ligule 0.4 cm, membrananous. Leaves anceolate, acute. Panicle 15 cm, compact. Spikelets 1 sessile, 2 pedicelled, awned, winged. Sessile spikelets 0.6 cm, acute, oblanceolate. Stamens 3. Caryopsis lanceolate. Pedicelled spikelets 0.9 cm, oblong.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, EG distr., Srivaka, *BO* 3420 (MH); Bison Hills, *CAB* 5112 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Odisha and Tamil Nadu.

Chrysopogon zizanioides (L.) Roberty, Bull. Inst. Franç. Afrique Noire 22: 106. 1960. *Phalaris zizanioides* L., Mant. Pl. Altera 183. 1771. *Vetiveria zizaniodes* (L.) Nash, Fl. South–East U.S. 67. 1903; FPM 3: 1733. 1934; Bor, Grass. India 258. 1960.

Lectotype: Herb. Linn. No. 78.12 (LINN). LT designated by van der Zon in Wageningen Agric. Univ. Pap. 92–1: 409. 1992.

Tufted perennial, leaf sheath glabrous. Leaves liner, acuminate. Panicle 20 cm long, panicle branches whorled. Sessile spikelets 0.4 cm, bisexual, spinulose, keeled, winged. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.4 cm.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, CDP distr., Rajampet, *JSG* 11233 (CAL, DD). Palakonda, *PVP* 3436 (SKU); Nellore, *CECF* 4179 (CAL). Telangana, WRL distr., Pakhal RF, *KMS* 13148, 11683 (CAL).

Distribution: (I) GLOBAL: China, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Jharkhand, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Uttarakhand, Uttar Pradesh, Tamil Nadu and West Bengal.

Remarks: It is a widely cultivated grass for its scented roots (vettiver).

Excluded

Chrysopogon tadulingamii Sreek., V.J.Nair & N.C.Nair, J. Bombay Nat. Hist. Soc. 80: 198. f. 15. 1983

Type: India: Kerala, Cannanore district, Periye, alt. 200 ft., October 18, 1981, *P.V. Sreekumar* 71758 (CAL).

Tufted perennial, ligule membrane. Leaves linear. Panicle 5–15 cm. Sessile spikelets 0.6 cm, oblanceolate, bisexual, awned, base bearded (brown hairy). Stamens 3. Pedicelled spikelets 8–10 cm, awned. Stamens 3.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh and Kerala.

Coix L.

(Sp. Pl. 2: 972. 1753)

Lectotype: *Coix lacryma–jobi* L. LT designated by G.V.Nash, N. Amer. Fl. 17: 82. 1909; affirmed by Hitchcock, Amer. J. Bot. 5: 250. 1918.

Key to the species:

1a. Leaf blade spinulosely serrate, glabrous ..... *C. lacryma-jobi*

1b. Leaf blade hispid, surface pubescent ..... *C. aquatica*

Coix aquatica Roxb., Fl. Ind. (Roxburgh) 3: 571–572. 1832; Bor 264. 1960; FAP 3: 1158. 1997; FTS 691. 2016.

Type: India: Lower parts of Bengal, generally found floating on lakes; *Roxburgh* s.n.

Tall tufted aquatic perennial. Leaf blade linear, acute. Spikes terminal, drooping, spikelets 3-seriate.

Flowering and Caryopsis time: November–January.

Specimens examined: Andhra Pradesh. EG distr., Biccavol, *BO* 3221 (CAL). Telangana, KRN distr., Rachapalli, *GVS* 25696 (MH).

Distribution : (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

Coix lacryma–**jobi** L., Sp. Pl. 2: 972. 1753; FBI 7: 100. 1896; FAP 3: 1159. 1997; FTS 692. 2016.

Lectotype: Herb. Linn. No. 1098.1 (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 857. 1982.

Tall tufted aquatic perennial. Leaf blade linear. Racemes terminal. Pistillate spikelets 8 cm long. Staminate spikelets 9 cm long. Caryopsis ovoid.

Flowering and Caryopsis time: November–January.

Exsiccata: Telangana, Zaherabad distr., Kohir, *S. Gurappa & V.S.Raju* 4865 (KUW).

Specimens examined: Andhra Pradesh, NLR distr., Ramayapatnam, *KCJ* 18360 (MH). Telangana, MDK distr., Gangapur, TP & MSG 12087 (SKU).

Distribution: (I) GLOBAL: Indian Subcontinet to Taiwan to Malaysia; (II) INDIA: Throughout and Andaman and Nicobar Islands.

Excluded

Coix lacryma–jobi L. var. ***stenocarpa*** Oliv., Hooker's Icon. Pl. 18: t. 1764. 1888. *Coix stenocarpa* (Oliv.) Balansa, J. Bot. (Morot) 4 (4): 77–78. 1890.

Syntypes: Burma: *G. Watt* s.n.; India: Mergui, *Griffith* s.n.

Distribution: (I) GLOBAL: China and Myanmar; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Karnataka, Manipur, Meghalaya, Mizoran, Nagaland, Rajasthan, Tripura, and Uttarakhand.

Remarks: No specimen could be traced nor collected during the present study.

Cymbopogon Spreng.

(Pl. Min. Cogn. Pug. 2: 14. 1815)

Lectotype: *Cymbopogon schoenanthus* (L.) Spreng. (*Andropogon schoenanthus* L.). LT designated by N.L. Britton & P. Wilson in Bot. Porto Rico 1: 27. 1923.

Key to the species:

1a. Awn reduced (sessile spikelets)..... 2

1b. Awn developed (sessile) 3

2a. Spikelets (sessile) oblong-oblanceolate; wild..... *C. nardus*

2b. Spikelets (sessile) linear-lanceolate; cultivated ..... *C. citratus*

3a. Joints, pedicels covered by hairs ..... *C. jwarancusa*

3b. Joints, pedicels not covered by hairs..... 4

4a. Lower glume (sessile) with a deep slot .....*C. gidarba*

4b. Lower glume (sessile) without a deep slot..... 5

5a. Lower glume (sessile) with a narrow silt like groove 6

5b. Lower glume (sessile) without narrow silt like groove..... 7

6a. Upper glume (sessile) narrow .....*C. caesius*

6b. Upper glume (sessile) boat shaped .....*C. martinii*

7a. Pedicel of lowest pedicelled spikelet much swollen 8

7b. Pedicel of the lowest pedicelled spikelet not swollen ..... *C. coloratus*

8a. Lower glume grooved (sessile) from base to apex.....*pendulus*

8b. Lower glume without grooved (sessile) ..... *C. flexuosus*

Cymbopogon caesius (Nees ex Hook. & Arn.) Stapf., Bull. Misc. Inform. Kew 1906: 360–361. 1906; FPM 3: 1757. 1934; Bor, Grass. India 125. 1960. *Andropogon caesius* Nees ex Hook. & Arn., Bot. Beechey Voy. 6: 244. 1838.

Syntypes: India: *Wight* 1700b (K). “N. ab E. in Wight Cat. n. 1700”. [China]: “Hab. a et b, in vicinia urbis Macao, et in insulis adjecti,. Millett, *G.H. Vachell*, n. 41. a.”

Tufted perennial. Leaf blade lanceolate. Panicle 27 cm with 2 racemes. Sessile spikelets 0.4 cm, oblong, awned. Stamens 3. Caryopsis oblong. Lower glume deeply grooved. Pedicelled spikelets 0.4 cm, lanceolate.

Flowering and Caryopsis time: August–March.

Exsiccata: Andhra Pradesh, Kadapa distr., Guvalacheruvu, *S. Gurappa* 225 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Near Bapanakonda falls, Guvvalacheruvu, *KS* 6821 (MH). Telangana, Hyderabad, *MRS* 236 (DD).

Distribution: (I) GLOBAL: China, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Odisha, Tamil Nadu, Telangana, Uttarakhand and Uttar Pradesh.

Cymbopogon citratus (DC.) Stapf., Bull. Misc. Inform. Kew 1906: 322, 357. 1906; FPM 3: 1756. 1934; Bor, Grass. India 126. 1960. *Andropogon citratus* DC., Cat. Pl. Horti Monsp. 78. 1813; FBI 7: 210. 1896.

Type: "Cult. at Montpellier, France, from seed collected in Asia" Rumphius, Herb. Amboin. 5. p. 181. under *Schoenanthum amboinicum*, Specimen from Lambert's Garden (BM).

Tufted perennial. Leaf sheath loose, surface rough. Panicle with sessile spikelets 0.6 cm, lanceolate. Lower glume lanceolate.

Flowering and Caryopsis time: August–December.

Specimens examined: Telangana, Warangal distr., Hanumakonda, *CSR* 914 (KUW).

Distribution: (I) GLOBAL: China; (II) INDIA: Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra,Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh.

Note: Pullaiah (2015) has not cited specimens for Telangana and Eastern Ghats of Andhra Pradesh, respectively.

Remarks: It is a widely cultivated grass.

Cymbopogon coloratus (Hook. f.) Stapf., Bull. Misc. Inform. Kew 1906: 321, 356. 1906; FPM 3: 1756. 1934; Bor, Grass. India 126. 1960; Mathew, Fl. Tamilnadu Carnatic 3: 1828. 1983.

Tufted perennial, nodes bearded, ligule membrane. Leaves lanceolate. Panicle 7 cm, dense, with 2 recemes. Sessile spikelets 0.5 cm, oblong, awned. Stamens 3. Pedicelled spikelets 0.5 cm, glumes keeled.

Flowering and Caryopsis time: August – December.

Exsiccata: Andhra Pradesh, Chittoor distr., Tirumala Hills, *S. Gurappa* 234 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalle, *JSG* 11195 (CAL), *JLE* 1493 (MH, CAL); CTR distr., Tirumala hills, *KS* 6876 (CAL). Telangana, Hyderabad, *MRS* 119 (DD).

Distribution: (I) GLOBAL: China and Myanmar; (II) INDIA: Andhra Pradesh, Karnataka and Tamil Nadu.

Cymbopogon flexuosus (Nees) Will. Watson in Atkins., Bot. Himalayan distr. N.W. Prov. 392. 1882. var. **flexuosus:** FPM 3: 1756. 1934;Bor, Grass. India 127. 1960. *Andropogon flexuosus* Nees ex Steud., Syn. Pl. Glumac. 1: 388. 1854.

Type: India: *Wight* 1704 (P). "A. nardus Klein herb. Ind. or."

Tufted perennial, ligule membranous. Leaves lanceolate, acuminate. Panicle 27 cm, lax. Sessile spikelets 0.3 cm, oblong, bisexual, awned. Stamens 3. Pedicelled spkelets oblong.

Flowering and Caryopsis time: July–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 249 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Arakuvalley, *GVS* 32884 (CAL). Telangana NLG distr., Nagarjunakonda valley, *KT* 9800 (CAL).

Distribution: (I) GLOBAL: Indian Subcontinent to Indo-China; (II) INDIA: Andhra Pradesh, Bihar, Karnataka, Kerala, Maharashtra, Odisha, Sikkim, Tamil Nadu, Telangana and West Bengal.

Cymbopogon gidarba (Buch.–Ham. ex Steud.) Haines, Bot. Bihar Orissa 5: 1048. 1924; FPM 3: 1757. 1934; Bor, Grass. India 128. 1960. *Andropogon gidarba* Buch.–Ham. ex Steud., Syn. Pl. Glumac. 1: 387. 1854; FBI 7: 208. 1896. **[Plate.5.2: L]**

Type: India: Numer. List [Wallich] no. 8797.

Tufted perennial. Leaves linear, acuminate. Panicle 5–9 cm. Sessile spikelets 0.3 cm, ovoid, awned. Lodicules 2. Stamens 3. Pedicelled spikelets 0.4 cm, ovoid.

Flowering and Caryopsis time: July–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 239 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Palamaner RF, *KCJ* 457 (MH); KSN distr., Jaggayapeta, *CAB* 8213 (MH); NLR distr., Kanigiri, *CAB* 6619 (MH); VSKP distr., Maripalli, *VNS* 4607 (MH).

Distribution: (I) GLOBAL: China; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana and West Bengal.

Note: Pullaiah (2015) and Reddy & Reddy (2016) have cited no specimens from Telanagana.

Cymbopogon jwarancusa (Jones) Schult., Mant. 2 . 458. 1824; Bor, Grass. India 128. 1960. *Andropogon jwarancusa* Jones, Asiat. Res. 4: 109. 1795; FBI 7: 203. 1896.

Type: India: Lucnow: *Blane* s.n.

Perennial tufted, ligule membrane. Leaves convolute. Panicle with sessile spikelets 0.4 cm, lanceolate, keeled. Stamens 3.

Flowering and Caryopsis time: August – January.

Specimens examined: Andhra Pradesh, PKS distr., Diguvametta, *MPG* 117 (CAL).

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Jammu and Kashmir, Rajasthan, Tamil Nadu, Telangana, Uttarakhand and Uttar Pradesh.

Cymbopogon martini (Roxb.) Will. Watson in Atkins., Bot. Himalayan distr. N.W. Prov. 392. 1882; FPM 3: 1756. 1934; Bor, Grass. India 129. 1960. *Andropogon martini* Roxb., Fl. Ind. 1: 280–281. 1820.

Type: "A native of the high lands of Balla–ghat, General Martin collected the seeds while there with the army, during the last war with Tippoo Sultan, and has reared abundance of it at Lucknow."

Tall, tufted perennial. Blades lanceolate. Panicle 22 cm. Sessile spikelets 0.4 cm, oblong, awned, bisexual.

Flowering and Caryopsis time: July–December.

Specimens examined: Andhra Pradesh. CDP distr., Yerrabalem, *BDP* 160 (CAL); KNL distr., Chelama, *MPG* 105 (CAL). Telangana, Hyderabad, *MRS* 212 (DD).

Distribution: (I) GLOBAL: China, Myanmar, Nepal and Pakistan; (II) INDIA:Throughout.

Cymbopogon nardus (L.) Rendle, Cat. Afr. Pl. 2 (1): 155. 1899 *var*. **nardus**; FPM 3. 1756. 1934; Bor, Grass. India 130. 1960. *Andropogon nardus* L., Sp. Pl. 2: 1046. 1753; FBI 7: 205. 1896.

Lectotype: Herb. Hermann 2: 66, No. 45 (BM–000594628). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 764. 1982.

Tufted perennial. Leaves linear. Panicle with sessile spikelets 0.5 cm long, lanceolate, keeled.

Distribution: (I) GLOBAL: Bhutan, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Maharashtra, Karnataka, Kerala, Tamil Nadu and Tripura.

Note: Pulliah (2015) and Reddy & Reddy (2016) have not cited any specimen for Telangana while it was reported to be cultivated (Flora of Andhra Pradesh 7: 1164. 1997).

Cymbopogon nardus (L.) Rendle *var*. **confertiflorus** (Steud.) Stapf ex Bor, J. Bombay Nat. Hist. Soc. 51: 905. 1953. *Andropogon confertiflorus* Steud., Syn. Pl. Glumac. 1: 385. 1854.

Type: India: Tamil Nadu, Nilagiri Mountains, 1851: *R.F. Hohenacker* 932 (K).

Tufted perennial, ligule coriaceous. Panicle 28 cm with sessile spikelets 0.5 cm, awned.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, VSKP distr., Araku valley, *GVS* 32884 (MH); KNL distr., *PVSK* 79526 (MH).

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka and Tamil Nadu.

Note: The report of Pullaiah (2015) was based on Naqvi (2001), whereas Reddy & Reddy (2016) have not cited any specimen for Telangana.

Cymbopogon pendulus (Nees) Will. Watson in Atkins., Bot. Himalayan distr. N.W. Prov. 392. 1882; Bor, Grass. India 131. 1960; Moulik, Grass. & Bamb. India 1: 217. 1996; FEG 7: 104. 2020. *Andropogon pendulus* Nees, Syn. Pl. Glumac. 1: 388. 1854.

Type: Nepal.

Tufted perennials. Leaves lanceolate, acute. Racemes 2, paired. Sessile spikelets 4 cm long, lower glume Keeled. Pedicelled spikelets lanceolate. Lower glume 7-nerved.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, ATP distr., Gounivaripalli–Samrajyam Konda, *BR & KVS* 29719 (SKU).

Distribution: (I) GLOBAL: Bhutan, China and Nepal; (II) INDIA: Andhra Pradesh and Assam.

Dichanthium Willemet

(Ann. Bot. (Usteri) 18: 11. 1796)

Type: *Dichanthium nodosum* Willemet, nom. illeg. (*Andropogon annulatus* Forssk. (as "annulatum"), *Dichanthium annulatum* (Forssk.) Stapf.

Key to the species:

1a. Racemes single ..... *D. tuberculatum*

1b. Racemes more than one..... 2

2a. Ligule shortly ciliate..... 3

2b. Ligule with long hairs..... *D. annulatum*

3a. Upper glume elliptic, sessile; awn present in pedicelled spikelets..... *D. caricosum*

3b. Upper glume lanceolate; awn absent in pedicelled spikelets.....*D. foulkesii*

Dichanthium annulatum (Forssk.) Stapf., Fl. Trop. Afr. 9: 178. 1917; FPM 3: 1741. 1934; Bor, Grass. India 133. 1960. FAP 3. 1170. 1997; FTS 698. 2016. *Andropogon annulatus* Forssk., Fl. Aegypt.–Arab. 173. 1775; FBI 7: 196. 1896. **[Plate.5.3: D; Plate.5.4: A]**

Type: "Passim ad ripas Nili." Egypt: Rashid, banks of Nile River; June, 1762, *Forsskal* 127 (C).

Perennial; nodes bearded. Leaves linear. Raceme 5–6 cm, sub-digitate. Sessile spikelets 0.4 cm, elliptic, bisexual, awned. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: Throught the year.

Exsiccata: Andhra Pradesh, Kadapa distr., Poddutur, *S. Gurappa* 198 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Gani RF, *RVR* 1539,1527; Vaddemanu, *PVP* 2532 (SKU); WG distr., Ischonum, *JSG* 15779 (CAL). Telangana, MDK distr., Narsapur RF, *TP & MSG* 1193 (SKU).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Dichanthium aristatum (Poir.) C.E. Hubb., Bull. Misc. Inform. Kew 1939 (10): 654. 1939; Bor, Grass. India 134. 1960; FAP 3. 1170. 1997; FTS 698. 2016. *Andropogon aristatus* Poir., Encycl. Suppl. 1: 585. 1811.

Type: "Cette plante a été observée a l'lle de–France par Commerson. (Herb. Desfont.)"

Perennial grass; nodes bearded, ligule membranous. Leaves linear. Raceme 7 cm long, fasciled. Sessile spikelets 0.4 cm, obovate, bisexual, awned. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: August–November.

Specimens examined: Andhra Pradesh, EG distr., Devarapudi, *CAB* 4303 (MH!); VSKP distr., Palakonda, *KCJ* 17261 (MH); WG distr., Kovvur, *CAB* 4344 (MH). Telangana, MDK distr., Patancheruvu, *BR* 11317 (SKU).

Distribution: (I) GLOBAL: India to China (Yunnan) and Malaysia; (II) INDIA: Andhra Pradesh, Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Telangana.

Dichanthium caricosum (L.) A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 549. 1921, nom. cons. FPM 3: 1741. 1934; Bor, Grass. India 134. 1960; FAP 3: 1171. 1997; FTS 699. 2016. *Andropogon caricosus* L., Sp. Pl., ed. 2. 2: 1480. 1763; FBI 7: 196. 1896.

Type: "Habitat in India."

Perennial tall tufted; nodes bearded, ligule membranous. Leaves linear. Racemes 8 cm long, terminal. Sessile spikelets 0.2 cm, obovate, bisexual, awned. Stamens 3. Caryopsis compressed, obtuse. Pedicelled spikelets 0.2 cm long.

Flowering and Caryopsis time: July–December.

Exsiccata: Andhra Pradesh, Kurnool distr., Ahobilum, *S. Gurappa* 167 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Veldurthi RF, *RVR* 1726, 1744 (SKU). Telangana, Hyderabad, *MRS* 243 (DD).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Throughout.

Dichanthium foulkesii (Hook. f.) S.K.Jain & Deshp., Bull. Bot. Surv. India 20 (1–4): 134. 1979 ("1978"); FTS 699. 2016. *Andropogon foulkesii* Hook. f., Fl. Brit. India 7 (21): 174. 1896. *Amphilopsis foulkesii* (Hook. f.) C.E.C. Fischer, Fl. Madras Pres. 3: 1732. 1934. *Bothriochloa foulkesii* (Hook. f.) Henr., Blumea 3: 457. 1940; Bor, Grass. India 107. 1960.

Syntypes: India: Nilghiri Hills; *Wight* s.n.; Kaity: *Foulkes* s.n. (K).

Tufted perennial. Leaves linear, acuminate. Racemes 9 cm. Sessile spikelets 0.5 cm, awned. Stamens 3. Pedicelled spikelets 0.5 cm, unawned.

Flowering and Caryopsis time: September–March.

Specimens examined: Andhra Pradesh, EG distr., *MM* 100867A (MH).

Distribution: (I) GLOBAL: Indian Subcontinet and Nicobar Islands; (II) INDIA: Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Excluded

Dichanthium tuberculatum (Hack.) Cope, Kew Bull. 35 (3): 703. 1980; Moulik, Grass. Bomb. India 1: 274. 1997. *Andropogon tuberculatus* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 404. 1889; FBI 7: 168. 1896.

Type: India: Assirgar,*O. Kuntze* s.n. (W).

Perennial tufted; ligule membrane. Leaf blade 15–30 x 2–5 cm, rough, margin scabrous. Racemes 20–35 cm long. Sessile spikelets 0.5 cm, lanceolate, dorsally compressed, lemmas awned. Stamens 2.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Madhya Pradesh and Maharashtra.

RemarKs: A specimen of the report could not found in the present study.

Diectomis Kunth

(Mém. Mus. Hist. Nat. 2: 69. 1815, nom. cons.)

Type: *Diectomis fastigiata* (Sw.) P. Beauv. (*Andropogon fastigiatus* Sw. (as "fastigiatum")).

Diectomis fastigiata (Sw.) P. Beauv., Ess. Agrostogr. 132, 150, 160. 1812; Bor, Grass. India 135. 1960; FAP 3. 1175. 1997; FTS 702. 2016. *Andropogon fastigiatus* Sw., Prodr. 26. 1788; FBI 7: 167. 1896. **[Plate.5.3: E]**

Type: Jamaica: *Swatrz* s.n.

Tuffted annual. Leaves linear. Raceme single. Sessile spikelets lanceolate 0.4 cm, bisexual, awned. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets 0.6 cm, ovoid, awned.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh. VSKP distr., Galikonda, *S. Gurappa* 279 (KUW).

Specimens examined: Andhra Pradesh. VSKP distr., on the way to Cherukonda, *GVS* 42751 (BSID). Telagana. MDK distr., Pocharam tank, *TP & MSG* 12052 (SKU).

Distribution: (I) GLOBAL: Tropics and subtropics; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Telangana and West Bengal.

Dimeria R. Br.

(Prodr. Fl. Nov. Holland. 204. 1810)

Type: *Dimeria acinaciformis* R.Br., Prodr. Fl. Nov. Holland. 204. 1810

Key to the species:

1a. Upper glume awned ..... *D. avenacea*

1b. Upper glume awnless 2

2a. Upper glume winged 3

2b. Upper glume not winged 4

3a. Upper glume with broad papery wing; perennials ..... *D. lehamanni*

3b. Upper glume with corky wing; annuals ..... *D. bilata*

4a. Upper glume winged all along the keel..... *D. fischeri*

4b. Upper glume not winged all along the keel 5

5a. Caryopsis lanceolate to linear 6

5b. Caryopsis ellipsoid to linear..... 7

6a. Upper glume narrowly winged; racemes not divergent .....*D. connivens*

6b. Upper glume winged below the tip; racemes slightly divergent .....*D. orissae*

7a. Rachis angular or trigonous; caryopsis ellipsoid .....*D.ornithopoda*

7b. Rachis flat or zig-zag; caryopsis linear .....*D. kanjirapalliana*

Dimeria avenacea (Retz.) C.E.C. Fisch., Bull. Misc. Inform. Kew 1932: 72. 1932; Bor, Grass. India 139. 1960; FAP 3. 1181. 1997; FEG 7: 134. 2020. *Anthoxanthum avenaceum* Retz., Observ. Bot. 3: 8. 1783. *Dimeria pusilla* Thwaites, Enum. Pl. Zeyl. 369. 1864; FBI 7: 103. 1896.

Type: "E. Tranquebaria misit cel. *Koeni*g."

Tufted annual. Leaves linear, acuminate. Raceme 2–5 cm. Spikeletes 0.4–0.7 cm, oblong, crowded, solitary, keeled, bisexual. Stamens 2.

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Kerala, Odisha, Tamil Nadu.

Note: Pullaiah (1997, 2015) record it for Andhra Pradesh based on collection of Bourne from Nellore and for Telangana it was after Ramana (2010).

Dimeria bialata C.E.C. Fisch., Bull. Misc. Inform. Kew 1933: 351. 1933; Bor, Grass. India 140. 1960; FEG 7: 134. 2020.

Type: India: Kanara distr., Siradi, November, *A. Meebold* 10548.

Flowering and Caryopsis time: September–December.

Tufted annual, culms 20–40 cm, nodes bearded. Leaves lanceolate. Racemes 2, 4–8 cm cm long. Spikelets 0.3 cm, oblong, winged, awn 0.7–1.1 cm. Stamens 2.

Specimens examined: Andhra Pradesh. EG distr., Sivakasipuram near Y. Ramavaram, *BR & M. Anil Kumar* 49203 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Dimeria connivens Hack., Monogr. Phan. 6: 689, in add. 1889; FBI 7: 104. 1896; Bor, Grass. India 140. 1960; FEG 7: 135. 2020. **[Plate.5.3: F; Plate. 5.4: B]**

Type: India orientalis, loco speciali collectoreque ignoto, *T. Anderson* s.n.

Tufted annual. Leaves linear. Racemes 2–3, divergent. Spikelets 0.2–0.4 cm, awn 0.7–1.0 cm. Stamens 2. Caryopsis lanceolate.

Flowering and Caryopsis time: September–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 258 (KUW).

Specimens examined: Andhra Pradesh, EG distr., Way to Y. Ramavaram, *TP & MSG* 12286 (SKU); Maredumilli, near Tiger camp, *MM* 102585 (BSID).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Odisha and Rajasthan.

Dimeria fischeri Bor, Kew Bull. 1952: 564. 1952; Bor, Grass. India 140. 1960; Fl. Tamil. Grasses 413. 2009.

Type: India: Madras state, Mahendragiri, *C.E.C. Fischer* 133 (K).

Tufted annual, nodes bearded. Leaves lanceolate. Racemes 1–3 cm. Spikeletes 0.4 cm, oblong, crowded, bearded at base, solitary, keeled, winged, bisexual. Stamens 2. Caryopsis oblong. Basal florets barren.

Flowering and Caryopsis time: November–March.

Distribution : (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Kerala, Tamil Nadu.

Dimeria kanjirapallilana Jacob, J. Bombay Nat. Hist. Soc. 47: 48. 1947; FAP 3: 1181. 1997; FTS 706. 2016; FEG 7: 137. 2020.

Type: South India, Travancore, Peermade, alt. 3200 ft., December, 1941, *K.C. Jacob* s.n. (MH–86320).

Tufted annual, culms 20 cm above, nodes bearded. Leaves linear. Spikeletes 0.4 cm, oblong, bisexual. Stamens 2. Caryopsis linear.

Flowering and Caryopsis time: November–March.

Specimens examined: Telangana, MDK distr., Pocharam, *TP & MSG* 12024 (SKU).

Distribution: India. Andhra Pradesh, Kerala, Tamil Nadu and Telangana.

Note: Reddy & Reddy (2016) have not cited any specimen for Telangana though included it in the flora.

Dimeria lehmannii (Nees) Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 82. 1889; FBI 7: 104. 1896; FPM 3: 1713. 1934; Bor, Grass. India 142. 1960. *Pterygostachyum lehmannii* Nees, Syn. Pl. Glumac. 1: 413. 1855.

Type: India.

Tufted perennial grass, culms 25–60 cm, geniculate, ligule membrane, leaf surface glabrous or pilose. Racemes digitate. Spikelets 0.2–3.5 m, oblong, laterally compressed, winged, keeled, awned, bisexual. Stamens 2.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, EG distr., Rampa hills, *K.N. Reddy & CSR 2255* (FRLHT).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh and Tamil Nadu.

Dimeria orissae Bor, Kew Bull. 1952: 579. 1952.

Type: India: Orissa, Pipokhuri, Keonjhar state, alt. 3200 ft., October 1, 1946, *H.F. Mooney* 2758 (K: K000245787, Image!).

Tufted annual, nodes hariy. Leaves linear-lanceolate; ligule truncate. Racemes 2–3. Spikelets elliptic-oblong, callus beared. Lower and upper glumes linear-lanceolate. Florets 2, lower sterile, upper bisexual. Stamens 2. Cayopsis linear.

Flowering and Caryopsis time: October–January.

Specimens examined: Telangana, ADB distr., Kawal Tiger Reserve, Indanpalli Range, *Alock Chorge, Chandamohan & P.S. Annamma* 3933 (BSID); *Thadalapet Range, Alock Chorge, Chandamohan & P.S. Annamma* 3962 (BSID).

Distribution: (I) GLOBAL: India; (II) INDIA: Odisha, Karnataka, Tamil Nadu and Telangana.

Dimeria ornithopoda Trin., Fund. Agrost.167. t. 14. 1820; FBI 7: 104. 1896; FPM 3: 1713. 1934; Bor, Grass. India 142. 1960; FAP 3: 1182. 1997; FTS 707. 2016. var. **ornithopoda**

Type: India orientali.

Tufted annual, decumbent, nodes bearded. Leaves lanceolate, acuminate, hairy. Racemes 1–4 cm, digitate. Spikeletes 0.2 cm, oblong, acute, bearded at base, keeled, awned. Stamens 2. Caryopsis oblong.

Flowering and Caryopsis time: October–January.

Specimens examined: Andhra Pradesh, KNL distr., *BSS, SKB & BR* 30691. Telangana, MBNR distr., Irlapenta, *BR & BSS* 32290 (BSID).

Distribution: (I) GLOBAL: Tropical and Subtropical Asia and N. & NE. Australia; (II) INDIA: Throughout.

Excluded

Dimeria ornithopoda Trin. *var*. **gracillima** Bor, Kew Bull. 1952: 576. 1952

Syntypes: India: Bihar, Parasnath, alt. 4000 ft. October 1, 1873, *C.B. Clarke* 21084B. Ibidem, alt. 4500 ft. October 1, 1833, *C.B. Clarke* 33719A &C.

Distribution: (I) GLOBAL: INDIA; (II) INDIA: Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra and Tamil Nadu.

Remarks: A specimen of this report by Kellogg *et al.* (2020) could not found in the present study.

Dimeria ornithopoda Trin. *var*. **megalantha** Bor, Kew Bull. 1952: 576. 1952

Type: India: Maharashtra, Bombay, Belgaum; May 25, 1914, Anonymous no. 14.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka (Naithani), Madhya Pradesh, Maharashtra and Tamil Nadu.

Remarks: A specimen of this earlier report could not found in the present study.

Eremochloa Buse

(Gram. (Buse) 17. 1854)

Type: *Eremochloa horneri* Buse

Key to the species:

1a. Pedicels cuneate.....*E. muricata*

1b. Pedicels narrowly elliptic.....*E. zeylanica*

Eremochloa muricata (Retz.) Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 262. 1889; FBI 7: 142. 1896; FPM 3: 1726. 1934; Bor, Grass. India 146. 1960. *Aegilops muricata* Retz., Observ. Bot. 2: 27. 1781.

Type: "Ex India Orientali diu habui pro exaltata, donec illam benevoletia Cl. D. Konig accepi." India: *Koenig* s.n. (LD).

Tufted perennial. Leaves lanceolate. Sessile spikelets 0.6 cm, elliptic, dorasally compressed, spines comb-like. Pedicelled spikelets reduced, spathe-like.

Flowering and Caryopsis time: September–February.

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Gujarat, Maharashtra, Meghalaya, Odisha and Tamil Nadu.

Eremochloa zeylanica Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 263. 1889.

Type: Sri Lanka:*Thwaites* 3322 (K).

Tufted perennial, ligule membranaceous. Leaves lanceolate, acute. Racemes 4–7 cm. Sessile spikelets 0.5 cm, compressed, keeled. Stamens 3. Pedicelled spikelets rudimentary.

Distribution: (I) GLOBAL: Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka and Maharashtra.

Note: The representative specimens of both the species of this genus were not found in any herbaria and therefore the genus record is excluded from the list till they were found.

Eremopogon Stapf

(Fl. Trop. Afr. [Oliver *et al*.] 9: 182–183. 1917)

Lectotype: *Eremopogon foveolatus* (Delile) Stapf., Fl. Trop. Afr. [Oliver *et al*.] 9: 183. 1917 (*Andropogon foveolatus* Delile). LT designated by Maire, Fl. Afrique Nord 1: 275. 1952.

Eremopogon foveolatus (Delile) Stapf., Fl. Trop. Afr. [Oliver *et al*.] 9: 183. 1917; FPM 3: 1751. 1934; Bor, Grass. India 148. 1960; FAP 3: 1200. 1997; FTS 719. 2016. *Andropogon foveolatus* Delile, Descr. Egypte, Hist. Nat. 2: 16, t. 8, f. 2. 1813; FBI 7: 168. 1896.

[Plate. 5.2: G; Plate.5.3: G; Plate. 5.4: C]

Type: “Fleurit en hiver dans les vallees sablonneuses de l’isthme de Soneys.” Egypt: l’isthe de Soneys; no date; *A.R. Delile* s.n. (P).

Tufted annual, culms 55 cm long, ligule 0.3 cm, membranous. Leaf blade lanceolate, 5–10 x 2–3 cm. Panicle 13 cm, subtendd by saptheole, 3–5 cm. spikelets sessile (fertile), pedicelled (sterile), awned. Sessile ellipsoid, 0.2–0.4 cm, dorsally compressed. Lower glume ovate, 2.5 cm, 2-keleed, 1-pitted. Upper glume elliptic, 0.3 cm, acuminate. Lower lemma oblong, 1.6 cm, bilobed, geniculate. Lodicules 2, truncate. Stamens 3. Caryopsis oblong. Pedicelled ovoid, 0.3 cm, obtuse. Lower glume 0.3 cm, 2-keeled, pitted. Upper glume 2.5 cm. Lower lemma 1.5 cm, upper lemma reduced.

Flowering and Caryopsis time: September–January.

Exsiccata: Telangana, Zaherabad distr., Bilalpur, *S. Gurappa* & *V.S.Raju* 4786 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Badvel, *JSG* 11207 (MH!). Telangana, NLG distr., Nagarjunakonda valley, *KT* 9688 (CAL).

Distribution: (I) GLOBAL: Pakistan and Sri Lanka; (II) INDIA: Throughout.

Eulalia Kunth

(Rév. Gram. 1: 160. 1829)

Type: *Eulalia aurea* (Bory) Kunth (*Andropogon aureus* Bory ("aureum")).

Key to the species:

1a. Basal sheaths wooly (brown, coffee, golden or white) 2

1b. Basal sheaths glabrous 3

2a. Basal sheaths brownshish wooly; racemes 2−10 ..... *E. phaeothrix*

2b. Basal sheaths white wooly; racemes 3–6..... *E. quadrinervis*

3a. Lower glume concave ..... *E. villosa*

3b. Lower glume narrow 4

4a. Lower glume not truncate ..... *E. trispicata*

4b. Lower glume truncate ..... *E. contorta*

Eulalia contorta (Brongn.) Kuntze, Revis. Gen. Pl. 2: 775. 1891; FEG 7: 182. 2020. *Pogonatherum contortum* Brongn., Voy. Monde, Phan. 2 (2): 90, t. 17. 1831. *PseudoPogonatherum contortum* (Brongn.) A. Camus in Lecomte, Gen. de Indochine 7: 255. 1922; Fischer 3: 1716. 1934; Bor, Grass. India 204. 1960.

Type: "Bourou, dans les iles Moluques."

Tufted annual. Leaves linear, acuminate, scabrous. Racemes 4–6 cm, digitate. Sessile spikelets 0.1–2.5 cm, lanceolate, dorsally compressed. Lemmas awned, awn geniculate. Stamens 3.

Flowering and Caryopsis time: November–January.

Specimens examined: Andhra Pradesh, VSKP distr., Kodagundi RF, *KCJ* 17282 (MH).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Madhya Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal.

Eulalia phaeothrix (Hack.) Kuntze., Revis. Gen. Pl. 2: 775. 1891; FPM 3: 1715. 1934; Bor, Grass. India 156. 1960; FAP 3. 1202. 1997; *Pollinia phaeothrix* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 168. 1889; FBI 7: 112. 1896. **[Plate. 5.4: D]**

Syntypes: Sri Lanka: Newara Ellia,*Thwaites* 959. India: *Wight* s.n.; Nilgiri Mountains: *Perrotet* 1317, 1333. Kunur: *JS Gamble* s.n.

Tufted prennial, base brownish wooly. Leaves lanceolate. Racemes digitate. Sessile spikelets 0.5 cm, oblong, bisexual, awned. Stamens 3. Caryopsis ovoid.

Flowering and Caryopsis time: Spetember–December.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 252 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Tirumala hills, *MSG* 12150; KNL distr., Gundlabrameswaram, *PVP* & *RVR* 2400 (SKU).

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Meghalaya and Tamil Nadu.

Eulalia trispicata (Schult.) Henrard., Blumea 3 (3): 453. 1940; Bor, Grass. India 157. 1960; FAP 3. 1203. 1997; FTS 720. 2016. *Andropogon trispicatus* Schult., Mant. 2. 452. 1824. *Andropogon tristachyos* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 261. 1820, *nom. illeg*. hom., non Kunth, 1816.

Type: India: “found on newly laid down pasture ground in the vicinity of Calcutta.”

Tufted annual. Leaves linear. Racemes digitate. Sessile spikelets 0.5 cm long, lanceolate, bisexual, awned. Stamens 3.

Flowering and Caryopsis time: September–December.

Exsiccata: Andhra Pradesh,Kurnool distr., Nallamalla Hills, *S. Gurappa* 264 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., *JLE* 16857 (CAL). Telangana, WGL distr., Cherial, *CSR* 381 (KUW).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Througout.

Eulalia villosa (Spreng.) Nees, Fl. Afr. Austral. III. 91. 1841. *Pollinia villosa* Spreng., Syst. Veg. 1: 288. 1824. *Eulalia wightii* (Hook. f.) Bor, Grass. India 158. 1960. *Pollinia villosa* Spreng., Syst. Veg. [Sprengel] 1: 288. 1824 ("1825"). Replaced name. *Andropogon villosus* Thunb., Prodr. Pl. Cap. 20. 1794, nom. illeg. hom., non Lam. 1779.

Type: South Africa: Hab. Bonae Spei Africaes, *Thunberg* s.n.

Tufted perennial. Leaf blade 5–20 cm, pubescent, acute. Racemes 5–15 cm, digitate. Spikelets 0.5–0.7 cm, lanceolate, dorsally compressed, keeled, awned, awn 0.1–2 cm. Stamens 3.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, Rampa hills at 1400 m, *VNS* 1742 (CAL)

Distribution: (I) GLOBAL: Sri Lanka; (II) INDIA: Andhra Pradesh, Daman and Diu, Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu and Uttar Pradesh.

Excluded

Eulalia quadrinervis (Hack.) Kuntze., Revis. Gen. Pl. 2: 775. 1891. FEG 7: 185. 2020. *Pollinia quadrinervis* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 158–159. 1889. var. **quadrinervis**

Syntypes: China: Canton, *Sampson* s.n. Macao: *Vachell* s.n. Cap Syng Moon, *Meyen* s.n. Nepal: Numer. List [Wallich] no. 8808. India: Sikkim, Rinchingpong, *Anderson* 1365.

Perennial tufted, leaf blade 10–20 x 2–3 cm, hairy, acuminate. Racemes 6–12 cm, digitate. Sessile spikelets 0.5 cm, dorsally compressed, keeled, lemma apex bifid, awned. Stamens 3.

Distribution: (I) GLOBAL: China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Assam, Madhya Pradesh, Manipur, Meghalaya, Nagpur, Sikkim, Tamil Nadu and Uttarakhand.

Remarks: The earlier report of from the study area could not substantiated with a authentic specimen either by collection or at herbaria.

Eulaliopsis Honda

(Bot. Mag. (Tokyo) 37: 124. 1923)

Type: *Eulaliopsis angustifolia* Honda (*Spodiopogon angustifolius* Trin.).

Eulaliopsis binata (Retz.) C.E. Hubb., Hooker's Icon. Pl. 33: sub t. 3262. 1935; Bor, Grass. India 158. 1960. FAP 3: 1204. 1997. *Andropogon binatus* Retz., Observ. Bot. [Retzius] 5: 21. 1788. *Pollinidium binatum* (Retz.) C.E. Hubb., Kew Bull. 1932. 72. 1932; FPM 3: 1717. 1934.

Type: "Tschandranconae lectum dedit amiciff. Koening." India: Travancore, *Koenig* s.n. (LD).

Tall tufted perinneal. Leaf blade flat. Inflorescence axillary, digitate. Sessile spikelets, 0.4 cm, oblong, awned. Lodiculs 2. Stamens 3. Pedicelled spikelets almost sessile.

Flowering and Caryopsis time: May–July.

Specimens examined: Andhra Pradesh, VSKP distr., Barnakonda RF, *KCJ* 17119 (MH).

Distribution: (I) GLOBAL: Afghanistan, China, Myanmar, Nepal and Pakistan; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Uttarakhand and Uttar Pradesh.

Remarks: Repotred on authority of Andhra University Herbarium specimen 6162 (AUV!), collected from West Godavari district.

Garnotia Brongn.

(Voy. Monde, Phan. 2 (pt. 10): 133. t. 21. 1832)

Type: *Garnotia stricta* Brongn.

Key to the species:

1a. Paleas not winged..... 2

1b. Paleas winged .....*G. stricta*

2a. Panicle up to 15 cm long .....*G. elata*

2b. Panicle 40–70 cm long.....*G. tenella*

Garnotia elata (Arn. ex Miq.) Janowski, Repert. Spec. Nov. Regni Veg. 17: 86. 1921; Bor, Grass. Inda 567. 1960; FAP 3. 1204. 1997. *Berghausia elata* Arn. ex Miq., Nieuwe Verh. Eerste Kl. Kon. Ned. Inst. Wetensch. Amsterdam ser. 3, 4: 32. 1851. *Garnotia scoparia* Stapf ex Hook. f., Fl. Brit. India 7: 242. 1896 non Thw. 1864; FMP 3: 1812. 1934.

Type: India: *Wight cat*. no. 2600.

Tufted perennial. Leaves linear. Panicle 25–55 cm long. Spikeletes 0.3 cm, lanceolate, awn, 0.3 cm. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: July–December.

Specimens examined: Andhra Pradesh, CTR distr., Horsley hills, *JSG* 21308 (MH!).

Distribution: (I) GLOBAL: India and Andaman and Nicobar Islands; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Uttar Pradesh.

Garnotia tenella (Arn. ex Miq.) Janowski, Repert. Spec. Nov. Regni Veg. 17: 86. 1921; FAP 3. 1204. 1997; FTS 721. 2016. *Berghausia tenella* Arn. ex Miq., Nieuwe Verh. Eerste Kl. Kon. Ned. Inst. Wetensch. Amsterdam ser. 3, 4: 34. 1851. *Garnotia stricta* sensu Hook. f., FBI 7: 243. 1896; FPM 3: 1812. 1934; Bor, Grass. India 569. 1960.

Type: India: Wight cat. no. 2599.

Tufted annual. Leaves lanceolate. Panicles 5–20 cm long, contracted. Spikeletes 0.2 cm, loblong, awned, awn 0.8 cm. Lodicules 2. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: September–January.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 260 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Rollapenta, *PVP & RVR* 2342. Telangana, WGL distr., Regonda, *CSR* 1088 (KUW).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Bihar, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal.

Excluded

Garnotia stricta Brongn., Voy. Monde, Phan. 2 (pt. 10): 133, t. 21. 1832; Bor, Grass. India 569. 1960.

Type: "Ile de taiti"

Tufted perennial, culms 10–60 cm, decumbent. Leaf blade 10–40 x 0.5–1.5 cm. Panicle 5–40 cm, linear, contracted. Spikelets 0.2–5 cm, laterally compressed. Paleas wingled.

Distribution: (I) GLOBAL: China and Myanmar; (II) INDIA: Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Meghalaya, Sikkim, Uttarakhand and Uttar Pradesh.

Remarks: No specimen of this report of Kellogg *et al*. (2020) could not be substantiated.

Hemarthria R. Br.

(Prodr. Fl. Nov. Holland. 207. 1810)

Lectotype: *Hemarthria compressa* (L.f.) R.Br. (*Rottboellia compressa* L.f.). LT designated by Nash, N. Amer. Fl. 17: 87. 30 1909; affirmed by Hitchcock, Bull. U.S.D.A. 772: 278. 1920.

Hemarthria compressa (L.f.) R.Br., Prodr. Fl. Nov. Holland. 1: 207. 1810; FPM 3: 1762. 1934; Bor, Grass. India 161. 1960; FAP 3: 1205. 1997. *Rottboellia compressa* L.f., Suppl. Pl. 114. 1782; FBI 7: 153. 1896.

Neotype: Numer. List [Wallich] no. 8871–E (L). Neotype designated by E. van den Heuvel & J.F. Veldkamp in Blumea 45 (2): 455. 2000.

Perennial, culms terete, ligule ciliate. Racemes solitary, 3–6 cm. Sessile spikelets ovoid, 0.3–0.5 cm. Lower glume ovoid, 0.4 cm, sub-coriaceous, keels winged. Upper glume 0.3 cm. Lower lemma 0.3 cm, obtuse. Upper lemma oblong, 0.2 cm. Palea 0.2 cm. Lodicules 2. Stamens 3. Caryopsis oblong. Pedicelled spikelets ovoid, 0.4–0.5 cm. Lower glume ovate, 0.4 cm. Upper glume ovate, 4.5 cm, boat-shaped, keels winged. Lower lemma empty. Upper lemma 3.5 cm. Palea ovate. Lower palea absent in sessile and pedicelled spikelets.

Flowering and Caryopsis time: July–November.

Specimens examined: Andhra Pradesh, NLR distr., Thummalapenta, *JSG* 12788 (DD); KSN distr., Kankipadu, *CAB* 8228 (MH).

Distribution: (I) GLOBAL: Afghanistan, Bangladesh, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Chhattisgarh, Dehli, Gujarat, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttarakhand and Uttar Pradesh.

Heteropogon Pers.

(Syn. Pl. (Persoon) 2: 533. 1807)

Lectotype: *Heteropogon glaber* Pers., nom. illeg. (*Andropogon allioni* DC., *Heteropogon allionii* (DC.) Roem. & Schult.). LT designated by Nash in N. Amer. Fl. 17: 127. 1912; affirmed by Hitchcock, Bull. U.S.D.A. 772: 273. 1920.

Key to the species:

1a. Gulmes grooved; leaves distichous .....*H. fischerianus*

1b. Gulmes not grooved, leaves not distichous ..... *H. contortus*

Heteropogon contortus (L.) P. Beauv., Syst. Veg., ed. 15 bis 2: 836. 1817; FAP 3: 1206. 1997; FTS 721. 2016. *Andropogon contortus* L., Sp. Pl. 2: 1045. 1753.

Type: “Habitat in India.”

Tufted perennial. Leaf blade flat. Racemes 3–9 cm. Sessile spikelets oblong, 0.3–0.6 cm. Lowe glume oblong, 0.4 cm. Upper glume 0.4 cm, coriaceous, grooved dorsally. Lower lemma linear, 0.2 cm. Upper lemma hyaline, awned. Caryopsis cylindric. Pedicelled

spikelets 0.6–0.9 mm, elliptic. Spikelets bearded at base, brown hairy; palea absent in both kinds of spikelets.

Flowering and Caryopsis time: July–November.

Exsiccata: Telangana, Zaherabad distr., Bilalpur, *S. Gurappa & V.S.Raju* 4814 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Kamalapuram, *JSG* 11179 (CAL); Balapalle, *JSG 11167* (MH); KNL distr., Chelama, *JLE* 22036 (MH). Telangana: ADB distr., Sone, *TP & PVP* 4056 (SKU).

Distribution: (I) GLOBAL: China, Myanmar and Pakistan; (II) INDIA: Throughout.

Heteropogon fischerianus Bor, Kew Bull. 1951: 170–171. 1951 & in Grass. India 165. 1960; Moulik, Grass, Bamb. India 1: 227. 1997; FEG 7; 194. 2020.

Type: India: Madras, Kodaikanal, Pulneys, Jesmond Hill, July 1, 1901, *Ibid.,* 2025 (K).

Tufted perennial. Racemes solitary, 2–5 cm. Sessile spikelet 0.5 cm. Stamens 3. Pedicelled spikelet 0.7 cm, awn 5 cm. Lodicules 2.

Flowering and Caryopsis time: July–December.

Specimens examined: Andhra Pradesh, ATP distr., Batrepalli, *KRKS* 40333; Samarajyamkonda, *KVS & MSB* 29196, *BR & P.Priyadarsini* 37354 (SKU); KDP distr., Bhumaiahgaripalli, *BSS & KRKS* 37610; KNL distr., Pecheruvu, *BR & AMR* 24505 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Kerala and Tamil Nadu.

Imperata Cirillo

(Pl. Rar. Neapol. 2: 26. 1792)

Type:*Imperata arundinacea* Cirillo, nom. illeg. (*Lagurus cylindricus* L., *Imperata cylindrica* (L.) P. Beauv.

Imperata cylindrica (L.) P. Beauv., Ess. Agrostogr. 165, 166. 1812 *var*. **cylindrical**. Bor, Grass. India 169, 1960; FAP 3. 1208. 1997; FTS 722. 2016. *Lagurus cylindricus* L., Syst. Nat., ed. 10. 2: 878. 1759.

Lectotype: Herb. Linn. No. 96.2 (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 700. 1982.

Tufted perennial. Leaves linear. Panicles 4–10 cm, cylindrical. Spikelets 0.4 cm, ovoid, bearded. Lodicules absent. Stamens 2. Caryopsis oblong.

Flowering and Caryopsis time: July–November.

Exsiccata: Andhra Pradesh, Kurnool distr., Ahobilum, *S. Gurappa* 230 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Balapalle, *JLE* 14909 (CAL), Orampadu, *PVP* 3484; EG distr., Kutravada, *GVS* 27284. Telangana, Hyderabad, Moosi River, *MRS* 309 (DD).

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Excluded

Imperata cylindrica (L.) P. Beauv. *var*. **latifolia** (Hook. f.) C.E. Hubb., Joint Publ. Imp. Agric. Bur. 7: 12. 1944; Bor, Grass. India 170. 1960. *Imperata latifolia* (Hook. f.) L. Liou, Vasc. Pl. Hengduan Mountains 2: 2299. 1994.

Distribution: (I) GLOBAL: India and Nepal; (II) INDIA: Andhra Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Tripura and Uttar Pradesh.

Imperata cylindrica (L.) P. Beauv. *var*. **major** (Nees) C.E. Hubb., Grasses Mauritius 96. 1940; Bor, Grass. India 170, 1960.

Distribution: (I) GLOBAL: Afghanistan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Tripura and Uttar Pradesh.

Remarks: The earlier reports of these two varieties of the species could not be substantiated by the present study and hence excluded.

Ischaemum L.

(Sp. Pl. 2: 1049. 1753)

Lectotype: *Ischaemum muticum* L. LT designated by Nash, N. Amer. Fl. 17: 94. 30 Jun 1909; affirmed by M.L. Green, Prop. Brit. Bot. 193. 1929.

Key to the species:

1a. Lower glume (sessile) margins expanded below the middle 2

1b. Lower glume (sessile) margins narrowly inflexed from base to apex..... 3

2a. Callus longer; upper glume- (sessile) boat-shaped .....*I. polystachyum*

2b. Callus shorter; upper glume (sessile) lanceolate .....*I. ciliare*

3a. Lower glume (pedicelled) margin broadly winged.....*I. fischeri*

3a. Lower glume (pedicelled) margin not so winged..... 4

4a. Lower glume (sessile) ovoid; nodes glabrous.....*I. semisagittatum*

4b. Lower glume (sessile) lanceolate–elliptic to elliptic; nodes hairy..... 5

5a. Nodes bearded .....*I. rugosum*

5b. Nodes not beared..... 6

6a. Caryopsis ellipsoid ..... *I. commutatum*

6b. Caryopsis lanceolate.....*I. afrum*

Ischaemum afrum (J.F. Gmel.) Dandy, Fl. Pl. Anglo–Egyptian Sudan 3: 476. f. 120. 1956. *Andropogon afer* J.F. Gmel., Syst. Nat. 2: 166. 1791. *Ischaemum pilosum* (Klein ex Willd.) Wight, Madras Lit. Sci. J. 3: 138. 1835; FBI 7: 130. 1896; FPM 3: 1723. 1934; Bor, Grass. India 183. 1960; FAP 5: 2208. 2018.

Lectotype: dessins in Bruce, Travels 5: 47. 1790.

Tall tufted perennial. Leaf blade 10–50 cm, apex filiform. Racemes 6–20 cm, digitate. Sessile spikelets 0.5–0.8 cm, lanceolate, dorsally compressed, awned. Pedicelled spikelets 0.6 cm, dorsally compressed.

Flowering and Caryopsis time: November–February.

Exsiccata: Telangana,Zaherabad distr., Kohir, *S. Gurappa & V.S.Raju* 4828 (KUW).

Specimens examined: Andhra Pradesh, GNT distr., Narasaraopet, *CAB* 4717 (MH); KSN distr., Mylavaram, *CAB* 8143 (MH). Telangana, ADB distr., Keslapur, *GO & PVP* 4558 (SKU).

Distribution: (I) GLOBAL: China and Myanmar; (II) INDIA: Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Telangana.

Ischaemum ciliare Retz., Observ. Bot. 6: 36. 1791; FBI 7: 133. 1896; V.S.Raju & Kumar, J. Threat. Taxa 10 (7): 11969. 2018. **[Plate.5.2: J; Plate.5.3: H; Plate. 5.4: E]**

Type: "E. China accepi."

Tufted perennial, culms 20–60 cm, prostrate. Racemes 2–10 cm, paired. Sessile spikelets 0.5–0.6 cm, dorsally compressed, oblong, lemmas awned. Pedicelled spikelets 0.4 cm, lanceolate, laterally compressed. Stamens 3.

Flowering and Caryopsis time: August–January.

Exsiccata: Telangana, Warangal distr., *S. Gurappa* & *V.S. Raju* 4761 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., *PVP & RVR* 2377; CTR distr., Tirumala hills, *PVP* 3495 (SKU). Telangana, Warangal distr., Pakhal RF, *KMS* 11661 (CAL, MH).

Distribution: (I) GLOBAL: China and Sri Lanka; (II) INDIA: Throughout.

Remarks:Ischaemum ciliare Retz. was often treated as a synonym *of I. indicum* (Houtt.) Merr. However, the type of *I. indicum* (Houtt.) Merr. is *Polytrias indica*, and thus the epithet "indicum" is misapplied to *I. ciliare*.

Ischaemum commutatum Hack. ex Trimen, Syst. Cat. Fl. Pl. Ceylon 107. 1885; FBI 7: 131. 1896; FPM 3: 1722. 1934; Bor, Grass. India 178. 1960.

Type: Sri Lanka; Thwaites 2625.

Tufted perennial. Racemes 2. Sessile spikelets 0.7 cm. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.4 cm, ellipsoid.

Flowering and Caryopsis time: June–April.

Specimens examined: Andhra Pradesh, VSKP distr., Galikonda, *BR & AMR* 25640 (SKU).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Ischaemum fischeri Ravi & KiranRaj, Bot. Bull. Acad. Sin. 42: 227. 2001; FEG 7: 211. 2020

Type: India: Kerala, Thiruvananthapuram distr, Palode-TBGRI campus, 500 ft., February 12, 1998, *Ravi 36706* (TBGT).

Tufted perennials. Inflorescence solitary. Sessile spikelets 5–7cm long, ellipsoid. Pedicelled spikelets 4–6 cm long.

Flowering and Caryopsis time: October–April.

Specimens examined: Andhra Pradesh, Godavari distr., Rampa Agency, *VNS* 1743 (CAL).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Kerala, Maharashtra and Tamil Nadu.

Ischaemum rugosum Salisb., Icon. Stirp. Rar. 1, t. 1. 1791; FPM 3: 1722. 1934; Bor, Grass. India 185. 1960. FAP 3: 1211. 1997; FTS 723. 2016. **[Plate.5.2: I; Plate.5.3: I; Plate. 5.4: F]**

Type: "Sponte nascentem in Orissa ad margines agrorum oryzaceorum", India: Orissa, *J. Koenig* s.n. (BM).

Tufted annual. Leaves lanceolate. Raceme digitate. Sessile spikelets 0.5 cm, awned, bisexual. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh. VSKP distr., Araku valley, *S. Gurappa* 256 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Pennahobilam, *TP* 1273; GNT distr., Vinukonda RF, *VRK* 6861 (SKU). Telangana, WGL distr., Pakhal RF, *KMS* 11663 (CAL, MH).

Distribution: (I) GLOBAL: China, Myanmar, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Ischaemum semisagittatum Roxb., Fl. Ind. 1: 322–323. 1820; FBI 7: 130. 1896; Bor, Grass. India 185. 1960. FAP 3: 1212. 1997; FTS 723. 2016.

Type: India: "A native of newly formed pasture land in Bengal."

Tufted annual. Leaves lanceolate, Racemes 3–6 cm. Sessile spikelets 0.5 cm, bearded, awned, upper lemma awned, apex bilobed. Pedicelled spikelets close to sessile spikelets, awned.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, WG distr., cultivated fields, *KS* 5110 (CAL). Telangana, MDK distr., Rusthempet, *KMS* 6797 (CAL, MH).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Dadra and Nagar Haveli, Daman and Diu, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Telangana and West Bengal.

Excluded

Ischaemum polystachyum J. Presl, Reliq. Haenk. 1 (4–5): 328. 1830. *I. nilagiricum* Hack, Oesterr. Bot. Z. 51: 150. 1901; FPM 3: 1722. 1934; Bor, Grass. India 183. 1960.

Type: Mariana Islands, *Haenke* s.n.

Tufted perennial, culms 20–100 cm, prostrate or decumbnent, nodes pubescent. Racemes 3–15 cm, digitate. Sessile spikelets 0.4–0.7 cm, lanceolate, bearded at base, dorsally compressed, oblong. Lemma bifid, awned. Pedicelled spikelets 0.4–0.7 cm, elliptic, laterally compressed. Stamens 3.

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Assam, Andhra Pradesh, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Tamil Nadu and West Bengal.

Remarks: The earlier report of Kellogg *et al*. (2020) cannot be supported without any available authentic specimen.

Iseilema Andersson

(Nova Acta Regiae Soc. Sci. Upsal. ser. 3. 2: 250. 1856)

Type: *Iseilema prostratum* (L.) Andersson (*Andropogon prostratus* L. (as “prostratum”).

Key to the species:

1a. Pedicelled spikelets shorter; hidden by the involcural spikelets .....*I. venkateswarlui*

1b. Pedicelled spikelets projecting beyond the tips of the involcural spikelets 2

2a. Keels of the saptheoles with glandular tubercules ..... *I. prostratum*

2b. Keels of the saptheoles with no glandular tubercular ..... *I. anthephoroides*

Iseilema anthephoroides Hack., Monogr. Phan. 6: 683. 1889; FBI 7: 219. 1896; FPM 3: 1748. 1934; Bor, Grass. India 187. 1960; FAP 3: 1213. 1997; FTS 724. 2016.

Typ: India orientalis. Numer. List [Wallich] no. 8767A., Peninsula: *Wight* 2335 "leg. ?: via in h. Nees, ad Appiahpilly in ditione Cuddapah". "d na Stead in h. m., pr. Scholapur."

Tufted annual, decumbent, ligule membranous. Leves linear. Panicle 9 cm, involucural spikelets 0.4 cm. Sessile spikelets 0.3 cm, bisexual, awned. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets 0.4 cm long.

Flowering and Caryopsis time: June–October.

Exsiccata: Andhra Pradesh, Kurnool distr., Yerramalla Hills, *S. Gurappa* 15272 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Yerrabalem, *MPG* 163 (CAL), Cuddapah, *EKK* 78578 (DD). Telangana, NLG distr., Krishna River bank, *KMS* 9858 (CAL).

Distribution: (I) GLOBAL: India; (II) INDIA: Throughout.

Iseilema prostratum (L.) Andersson, Nova Acta Regiae Soc. Sci. Upsal. ser. 3. 2: 251. 1856; FPM 3: 1747. 1934; Bor, Grass. India 188. 1960; FAP 3. 1214. 1997; FTS 725. 2016. *Andropogon prostratus* L., Mant. Pl. Altera 304. 1771.

Type: "Habitat in India orientali. Koenig." Lectotype: Herb. Linn. No. 1211.8 (LINN). LT designated by Renvoize in Cafferty et al. (ed.), Taxon 49: 246. 2000.

Tufted perennial. Leves linear. Panicle 15 cm. Involucural spikelets 0.4 cm. Sessile spikelets 0.5 cm, bisexual, awned. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.4 cm long.

Flowering and Caryopsis time: November–June.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 259 (KUW).

Specimens examined: Andhra Pradesh, Kadapa distr., Balapalli, *JLE* 15025 (MH); VJN distr., Salur, *NPBK* 1153 (CAL). Telangana, NLG distr., Krishna River bank, *KMS* 9821 (CAL).

Distribution: (I) GLOBAL: Myanmar, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh.

Iseilema venkateswarlui Satyavathi, J. Bombay Nat. Hist. Soc. 65: 666–667. 1969; FAP 3. 1214. 1997.

Type: India: Andhra Pradesh, Guntur, Lam Farm, September 26, 1966, *Satyavathi* s.n. (K).

Tufted annual. Leaves linear. Sessile spikelets 0.5 cm, awned, bisexual. Stamens 3. Pedicelled spikelets 0.5 cm.

Flowering and Caryopsis time: December–January.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh.

Remarks: Reported on authority of *Satyavathi* s.n. (K) from Lam Farm, Guntur district. Andhra Pradesh, India. It was not collected later (Pullaiah, 1997).

Lophopogon Hack.

(Nat. Pflanzenfam., ed. 2 [Engler & Prantl] 2 (2): 26. 1887)

Type: *Lophopogon tridentatus* (Roxb.) Hack. (*Andropogon tridentatus* Roxb.).

Lophopogon tridentatus (Roxb.) Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 254. 1889; FBI 7: 149. 1896; FPM 3: 1724. 1934; Bor, Grass. India 190. 1960; FAP 3. 1216. 1997; FTS 726. 2016. *Andropogon tridentatus* Roxb., Fl. Ind. 1: 261. 1820. **[Plate.5.2: A,B]**

Type: India: Native of Coromandel, *Roxburgh* s.n.

Tufted annual, ligule cilate. Leaf blade linear. Racemes 1–3 cm. Sessile/pedicelled spikelets fertile. Sessile spikelets obovoid, 0.4–0.5 cm. Lower glume sub-coriaceous, 0.3 cm, 5-nerved. Upper glume elliptic, 0.4 cm. Lower lemma linear, 0.3 cm. Upper lemma linear, 0.3 cm. Pedicelled spikelets 0.4–0.5 cm. Lower glume 0.4 cm, 5-nerved, tuft of ferruginous hairs present. Upper glume linear, 0.5 cm, awned, awn 0.1–1.6 cm. Lower lemma linear, 0.3 cm. Palea linear, 0.3 cm. Caryopsis oblong.

Flowering and Caryopsis time: July–October.

Exsiccata: Telangana, Zaherabzd distr., Bilalpur, *S. Gurappa* & *V.S.Raju* 4912 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Gooty fort, *MSG* 12240, *PVP* 3672; KNL distr., Rangapuram RF, *RVR* 1704 (SKU); CTR distr., Madinikonda, *KCJ* 469 (MH). Telangan,. NLG distr., Krishna River bank, *KMS* 9828 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Telangana.

Note: Spikelets bearded at base, brown callus, and lodicules absent in fertile spikelets. Sterile spikelets present in lower racemes.

Manisuris L.

(Mant. Pl. Altera 164, 300. 1771)

Type: *Manisuris myurus* L.

Manisuris myurus L., Mant. Pl. Altera 300. 1771; FPM 3: 1760. 1934; Bor, Grass. India 192. 1960; FAP 3. 1217. 1997. **[Plate.5.3: J]**

Lectotype: Herb. Linn. No. 1215.2 (LINN). LT designated by Clayton in Cafferty *et al*. (ed.), Taxon 49: 252. 2000.

Tufted perennial. Leaf blade lanceolate. Racemes 3–6 cm, cylindrical. Sessile spikelets 0.2–0.3 cm, ovoid, winged. Lower glume 0.3 cm, ovate. Upper glume 0.2 cm, oblong. Lemma lanceolate. Palea ovate. Stamens 3. Caryopsis ovoid. Pedicelled spikelets lanceolate.

Flowering and Caryopsis time: August–February.

Exsiccata: Andhra Pradesh, Chitoor distr., Thalakona, *S. Gurappa* 266 (KUW).

Specimens examined: Andhra Pradesh, NLR distr., *JSG* 12785 (MH).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Karnataka, Manipur and Tamil Nadu.

Remarks: Although *Manisuris* L. was rejected against *Rottboellia* L.f. (1782), the recent studies recognize them as distinct genera.

Microstegium Nees

(Nat. Syst. Bot., ed. 2 447. 1836)

Type: *Microstegium willdenovianum* Nees

Microstegium ciliatum (Trin.) A. Camus, Ann. Soc. Linn. Lyon ser. 2, 68: 201. 1921; FPM 3: 1716. 1934; Bor, Grass. India 193. 1960. FAP 3. 1219. 1997. *Pollinia ciliata* Trin., Mém. Acad. Imp. Sci. St.–Pétersbourg, Sér. 6, Sci. Math. 2: 306. 1832.

Type: Nepal: Wallich ex hb. Hornem. (LE).

Tufted perennial. Leaf blade lanceolate. Racemes 3–7 cm, sub-digitate. Sessile spikelets 0.3 cm, oblong, awned. Stamens 3. Caryopsis oblong. Pedicelled spikelets, 0.2–0.3 cm long, awn 0.3 cm.

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Odisha, Sikim, Tamil Nadu, Uttar Pradesh and West Bengal.

Remarks: Reported on authority of *V. Naryanaswamy* 592 (CAL) from Gudem camp, VSKP distr., Andhra Pradesh, India.

Mnesithea Kunth

(Rév. Gram. 1: 153. 1829)

Type: *Mnesithea laevis* (Retz.) Kunth (*Rottboellia laevis* Retz.).

Key to the species:

1a. Plants annual; non-rhizomatous; culms up to 30 cm high; pedicelled spikelet 1.5–2.5 mm... ..... *M. granularis*

1b. Perennial, minutely rhizomatous; culms up to 1.2 m high; pedicelled spikelets reduced to a minute glume .....*M. laevis*

Mnesithea granularis (L.) de Koning & Sosef, Blumea 31 (2): 295. 1986. *Cenchrus granularis* L., Mant. Pl. Altera 575. 1771; FAP 3. 1220. 1997; FTS 728. 2016. **[Plate.5.2: C]**

Lectotype: Herb. Linn. No. 1217.12 (LINN). LT designated by Clayton & Renvoize in Polhill (ed.), Fl. Trop. E. Africa, Gramineae 3: 849. 1982.

Erect annual, up to 30 cm high; nodes hairy. Leaf blades linear-lanceolate, acuminate; margins hairy; ligules short, membranous. Racemes 0.5–2.5 cm long, solitary, joints terete. Spikelets paired. Sessile spikelet 1–1.5 cm, lower glume hemispherical, coarsely reticulate-rugose, pits shallow and separated by broad rounded ribs, the whole surface finely granular. Upper glume hyaline below, thickening upward toward the crested apex. Lower and upper lemmas hyaline. Pedicelled spikelet 1.5–2.5 mm. Glumes with whitish wings.

Flowering and Caryopsis time: July–September.

Exsiccata: Andhra Pradesh, Kadapa distr., Vempalli, *S. Gurappa* 207 (KUW).

Specimens examined: Andhra Pradesh, CDP distr., Guvvalacheruvu, *PVP* 3241, *RVR* 8013 (SKU). Telangana, RR distr., Vikarabad, *MRS* 323 (DD).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Throughout.

Mnesithea laevis (Retz.) Kunth, Révis. Gramin. 1: 154. 1829; FPM 3: 1761. 1934; Bor, Grass. India 197. 1960. FAP 3. 1220. 1997. *Rottboellia laevis* Retz., Observ. Bot. [Retzius] 3: 11. 1783.

Type: “Misit e Tranquebaria Cl. Koening.”

Perennial. Culms erect, tufted, erect, 15–70 cm high, usually unbranched. Leaf blades linear, apex abruptly acute, glabrous. Racemes solitary, terminal and axillary. Sessile spikelets paired at each joint and separated by a pedicel; rachis internodes clavate. Sessile spikelet 0.3–0.5 cm. Lower glume oblong, smooth. Upper glume boat-shaped, equal to lower glume. Palea absent. Pedicelled spikelet minute or absent.

Flowering and Caryopsis time: September–November.

Specimens examined: Andhra Pradesh, CDP distr., Balapalle, *JLE* 14916 (CAL, MH); CTR distr., Palamaneru, *KCJ* 443 (MH); WG distr., Bhimavaram, *CAB* 4369 (CAL).

Distribution: (I) GLOBAL: Afghanistan, China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh,

Maharashtra, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Excluded

Mnesithea laevis (Retz.) Kunth var. **cochinchinensis** (Lour.) de Koning & Sosef, Blumea 31 (2): 286. 1986. *Phleum cochinchinense* Lour., Fl. Cochinch. 1: 48. 1790.

Type: "Habitat spontaneum in Cochinchina." Vietnam: *Loureiro* s.n. (BM).

Distribution: (I) GLOBAL: Indo-China to Nansei-shoto and NW. Pacific; (II) INDIA: Andhra Pradesh, Bihar (Naithani*et al*., 1997), Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh.

Note: It was based on Naithani *et al*. (1997) for Kellogg *et al.* (2020), but no specimen could be traced and hence excluded.

Ophiuros C.F. Gaertn.

(Suppl. Carp. 3. 1805)

Lectotype: *Ophiuros corymbosus* C.F.Gaertn. ("corymbosa"), nom. illeg. (*Aegilops exaltata* L., *Ophiuros exaltatus* (L.) Kuntze); designated by Clayton [cf., Revis. Handb. Fl. Ceylon [Dassanayake] 2: 321. 1994].

Ophiuros exaltatus (L.) Kuntze, Revis. Gen. Pl. 2: 780. 1891; FPM 3: 1758. 1934; Bor, Grass. India 199. 1960; FAP 3. 1221. 1997; FTS 728. 2016. *Aegilops exaltata* L., Mant. Pl. Altera 575. 1771. **[Plate.5.3: K]**

Neotype: Herb. Linn. No. 1218.15 (LINN).

Tall tufted robust Leaf sheth hairy, ligule membrane. Leaf blade elliptic. Racemes, 7–25 cm, subtended by saptheole. Sessile spikelets (fertile) ovoid, 0.2–0.3 cm, obtuse. Lower glume oblong, 0.2 cm, margin inflexed. Upper glume 0.3 cm, boat-shaped. Lower lemma 0.2 cm, ovate. Palea 0.2 cm Lodicules 2. Stamens 3. Upper lemma 0.2 cm. Caryopsis oblong.

Flowering and Caryopsis time: July–November.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 242 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Kammavaripalle, *TP* & *PVP* 3363 (SKU). Telangana, WGL distr., Pakhal, *KMS* 11574 (MH).

Distribution: (I) GLOBAL: China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Daman and Diu, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh and Uttarakhand.

Parahyparrhenia A. Camus

(Bull. Mus. Natl. Hist. Nat. Ser. 2, 22: 404. 1950)

Type: *Parahyparrhenia jaergeriana* A. Camus.

Parahyparrhenia bellariensis (Hack.) Clayton, Kew Bull. 27 (3): 448. 1972. *Andropogon bellariensis* Hack., Flora 68: 123. 1885; FBI 7: 201. 1896. *Heteropogon bellariensis* (Hack.) C.E.C. Fischer, Fl. Pres. Madras 3: 1744. 1934; Bor, Grass. India 163. 1960.

Type: India: Anantapur district, on Gooty Fort Hill, Bellari, *Wight* 2321 (K).

Perennial tufted. Racemes solitary, 4–8 cm. Sessile spikelets 0.3–0.7 cm. Upper glume with deep central groove dorsally. Caryopsis ovoid. Pedicelled spikelets oblong.

Flowering and Caryopsis time: January–March.

Exsiccata: Andhra Pradesh, Kurnool distr., Yerramalla Hills, *S. Gurappa* 15372 (KUW).

Distribution: (I) GLOBAL; (II) INDIA: Andhra Pradesh and Karnataka.

Pogonatherum P. Beauv.

(Ess. Agrostogr. 56, 176. 1812)

Type: *Pogonatherum saccharoideum* P. Beauv., nom. illeg. (*Saccharum paniceum* Lam., *Pogonatherum paniceum* (Lam.) Hack.).

Key to the species:

1a. Racemes 2–3 cm long; nodes beard; spikelets not more than 3 mm long; hairy on the mouth 2

1b. Racemes 4–7 cm long; nodes bearded; spikelets 4–5 mm long; not hairy on the mouth ..... *P. rufobarbatum*

2a. Spikelets 2.5–0.3 cm long; Stamens 2 ..... *P. paniceum*

2b. Spikelets not more than 0.3 cm long; Stamens 1 .....*P. crinitum*

Pogonatherum crinitum (Thunb.) Kunth, Enum. Pl. 1: 478. 1833; FBI 7: 141; 1896; Bor, Grass. India 200. 1960; FAP 3. 1241. 1997. *Andropogon crinitus* Thunb., Fl. Jap. 40. t. 7. 1784.

Type: Japan.

Annual grass. Leaves linear. Racemes, 2–4 cm, terminal. Sessile spikelets 0.2 cm long, lanceolate, awn 0.15–0.20 cm. Stamens 1. Caryopsis oblong.

Flowering and Caryopsis time: August–January.

Exsiccata: Andhra Pradesh. VSKP distr., Araku valley, *S. Gurappa* 267 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Anthagiri, *GVS* 19532 (MH!).

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Pogonatherum paniceum (Lam.) Hack., Allg. Bot. Z. Syst. 12: 178. 1906; FPM 3: 1714; 1934; Bor, Grass. India 202. 1960; FAP 3. 1242. 1997; FTS 742. 2016. *Saccharum paniceum* Lam., Encycl. 1: 595. 40. f. 1. 1785.

Type: “Cette plante croit dans les Indes orientales, & nous a été communiqué par *M. Sonnerat*.” East Indies: *Sonerat* s.n . (P).

Perennial. Leaves elliptic. Racemes 1–3 cm long, solitary, terminal. Sessile spikelets 0.3 cm, awned. Stamens 2. Caryopsis obovoid.

Flowering and Caryopsis time: September–January.

Specimens examined: Andhra Pradesh, Andhra Pradesh, VSKP distr., Araku valley, *NPBK* 592 (CAL). Telangana, MBNR distr., Mallelatheertham, *SRS* 110703 (BSID).

Note: Cultivated in gardens as ornamental.

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Myanmar, Nepal, Pakistan and Sri Lanka; (II) INDIA: Througout.

Excluded

Pogonatherum rufobarbatum Griff., Not. Pl. Asiat. 3: 81. 1851.

Type: India: Assam, in aquois, Moosmai; October 18, 1835; It. Ass. 159.

Tufted perennial, culms 25–60 cm. Leaves lanceolate. Racemes 2–6 cm, single, straight. Spikelets 0.3–0.5 cm, oblong, laterally compressed. Lemma bifid, awned, awn 0.2 cm, geniculate. Lodicules absent. Stamens 2.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Odisha, Tamil Nadu, Uttarakhand and West Bengal.

Remarks: It is based on Kellogg *et al*. (2020) but no specimen could be traced.

Pseudanthistiria (Hack.)

(Hook. f., Fl. Brit. India (J.D. Hooker). 7 (pt. 21): 219. 1896)

Lectotype: *Pseudanthistiria heteroclita* (Roxb.) Hook. f. (*Anthistiria heteroclita* Roxb.). LT designated by B.P. Uniyal in Taxon 33: 501. 1984.

Key to the species:

1a. Leaf blade base cordate or rounded; panicles loose .....*P. heterocliata*

1b. Leaf blade base narrowly acute; panicles fasle .....*P. umbellat*a

Pseudanthistiria umbellata (Hack.) Hook. f., Fl. Brit. India. 7 (21): 220. 1896; FPM 3: 1749. 1934; Bor, Grass. India 204. 1960; FAP 3. 1243. 1997. *Andropogon umbellatus* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 401. 1889.

Type: Sri Lanka; Thwaites 963 (W).

Tufted annual. Leaf sheath hairy. Inflorescence panicle 20 cm long. Sessile spikelets 3 cm long, lower glume dorsally concave. Pedicelled spikelets linear.

Flowering and Caryopsis time: November–December.

Specimens examined: Andhra Pradesh. EG distr., Basion hills, *CAB* 5097 (MH).

Distribution: (I) GLOBAL: S. India, Sri Lanka, S. Myanmar to Thailand; (II) INDIA: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Odisha and Tamil Nadu.

Excluded

Pseudanthistiria heteroclita (Roxb.) Hook. f., Fl. Brit. India 7 (21): 219. 1896. *Anthistiria heteroclita* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 253–254. 1820.

Type: India: "A native of newly made pasture land in the vicinity of Calcutta."

Distribution : (I) GLOBAL: India to Bangladesh; (II) INDIA: Andhra Pradesh, Bihar, Daman and Diu, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu and West Bengal.

Remarks: No authentic specimen of it could be in the herbaria nor it could be collected by the author of this thesis in his survey.

Pseudosorghum A. Camus

(Bull. Mus. Natl. Hist. Nat. 26 (7): 662. 1920–1921)

Lectotype: *Pseudosorghum fasciculare* (Roxb.) A. Camus (*Andropogon fascicularis* Roxb.).

Pseudosorghum fasciculare (Roxb.) A. Camus, Bull. Mus. Natl. Hist. Nat. 26 (7): 662. 1920–1921; FPM 3: 1734. 1934; Bor, Grass. India 205. 1960; FAP 3. 1245. 1997; FTS 743. 2016. *Andropogon fascicularis* Roxb., Fl. Ind. (Carey & Wallich ed.) 1: 269. 1820.

Type: India: "A native of Mountains."

Tall tufted. Leaf blades linear. Panicles 5–10 cm. Spikelets sessile, pedicelled. Sessile spikelets (fertile) 0.4–0.5 cm, ovoid, bearded at base. Lower glume 0.3 cm, ovate. Upper glume 0.4 cm. Lower lemma 0.3 cm, ovate. Upper lemma awned, awn 0.15 cm. Palea ovate. Pedicelled spikelets ovoid 0.3–0.4 cm.

Flowering and Caryopsis time: October–January.

Specimens examined: Andhra Pradesh, EG distr., Bison Hills, *CAB* 5179 (MH!). Telangana, WGL distr., Pakhal, *KMS* 11264 (MH).

Distribution: (I) GLOBAL: Indian Subcontinent to S. Central China and Philippines; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Nagaland, Odisha, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal.

Rottboellia L. f. (Suppl. Pl. 13 (Rottböllia), 114 ("Rottbölla"). 1782 ("1781"), nom. cons.)

Type: *Rottboellia exaltata* L.f., nom. illeg. (non (L.) Naezen, 1779) (typ. cons.).

Rottboellia cochinchinensis (Lour.) Clayton, Kew Bull. 35 (4): 817. 1981; FAP 3. 1246. 1997; FTS 744. 2016. *Stegosia cochinchinensis* Lour., Fl. Cochinch. 1: 51. 1790. *Rottboellia exaltata* L.f., Suppl. Pl. 114. 1781, non (L.) L.f. 1779; FBI 7: 156. 1896; FPM 3: 1759. 1934; Bor, Grass. India 206. 1966.

Type: Vietnam: "Nullibi eam vidi praeterquam in Cochinchina."

Tall tufted. Leaf blade flat. Racemes 4–10 cm. Spikelets sessile, pedicelled. Sessile spikelets 0.4–0.5 cm, ovoid. Lower glume 0.4 cm, ovate, 2-keeled. Upper glume coriaceous, 0.4 cm. Lower lemma 0.4 cm, ovate, palea 0.3 cm. Lodicules 2. Stamens 3. Upper lemma 0.3 cm. Palea hyaline. Pedicelled spikelets 04–0.5 cm. Lower glume 0.3 cm, elliptic. Upper glume 0.3 cm, acute.

Flowering and Caryopsis time: August–December.

Exsiccata: Telangana, Zaherabad distr., Bilalpur, *S. Gurappa* & *V.S.Raju* 4830 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Kammavaripalli, *TP* & *PVP* 3382; Ramanapenta, Nallamalais, *JLE* 2621 (CAL & MH!). Telangana, KNR distr., Kodimial, *GVS* 25665 (CAL).

Distribution : (I) GLOBAL: Tropical and Subtropical Old World to N. and NE. Australia; (II) INDIA: Throughout.

Saccharum L.

(Sp. Pl. 1: 54. 1753)

Lectotype: *Saccharum officinarum* L. ("officinaram") LT designated by Nash, N. Amer. Fl. 17: 89. 30 Jun 1909; affirmed by Hitchcock, Bull. U.S.D.A. 772: 255. 1920.

Key to the species:

1a. Peduncle hairy; rachis very fragile; wild ..... *S. spontaneum*

1b. Penduncle not hairy; rachis firm; cultivated .....*S. officinarum*

Saccharum officinarum L., Sp. Pl. 1: 54. 1753; FBI 7: 118. 1896; FPM 3: 1709. 1934; Bor, Grass. India 212. 1960. FAP 3. 1247. 1997; FTS 744. 2016.

Lectotype: "*Arundo saccharifera* C.B." in Sloane, Voy. Jamaica, 1: 108, t. 66, 1707. Typotype: Herb. Sloane 2: 14 (BM–SL). LT designated by Reveal *et al*. in Taxon 38: 96. 1989.

Tall perennial cultivated crop. Leaf blade lanceolate. Panicle very large, terminal. Caryopsis oblong.

Distribution: (I) GLOBAL: Native to New Guinea; but introduced globally; (II) INDIA: Cultivated throughout the country.

Saccharum spontaneum L., Mant. Pl. Altera 183. 1771; FBI 7: 118. 1896; FPM 3: 1709. 1934; Bor, Grass. India 214. 1960; FAP 3. 1247. 1997; FTS 745. 2016. **[Plate.5.2: K]**

Lectotype: Herb. Linn. No. 77.1 (LINN). LT designated by Cope in Nasir & Ali (ed.), Fl. Pakistan 143: 263. 1982.

Tall perennial. Panicles 10–35 cm. Spikelet; sessile, pedicelled. Sessile spikelets 0.3 cm, Lodicules 2. Stamens 3. Caryopsis oblong.

Flowering and Caryopsis time: October–February.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 269 (KUW).

Specimens examined: Andhra Pradesh, VSKP distr., Anthagiri, *GVS* 21562 (CAL); PKM distr., Diguvametta, Nallamalais, *JLE* 32465 (CAL). Telangana, ADB distr., Sone, *TP* & *PVP* 4041 (SKU).

Distribution: (I) GLOBAL: Afghanistan, Bhutan, China, Myanmar, Pakistan and Sri Lanka; (II) INDIA: Throughout.

Schizachyrium Nees

(Fl. Bras. Enum. Pl. 331. 1829)

Lectotype: *Schizachyrium condensatum* (Kunth) Nees (*Andropogon condensatus* Kunth). LT designated by Pfeiffer, Nomencl. Bot. 2: 1077. 1874.

Key to the species:

1a. Leves oblong, mucronate; caryopsis oblong ..... *S. bervifolium*

1b. Leves linear, acuminate; caryopsis linear..... *S. exile*

Schizachyrium brevifolium (Sw.) Nees ex Buse, Pl. Jungh. 359. 1854; FPM 3: 1752. 1934; Bor, Grass. India 215. 1960; FAP 3: 1250. 1997. *Andropogon brevifolius* Sw., Prodr. 26. 1788; FBI 7: 165. 1896. **[Plate.5.4: G]**

Lectotype: West Indies: Jamaica: *O.P. Swartz* s.n. (M). LT designated by Hitchcock in Contr. U.S. Natl. Herb. 12: 143. 1908.

Tufted annual, ligule 0.1 cm. Leaves short, oblong. Raceme spath 2 cm. Spikelets sessile, pedicelled, awned. Sessile spikelets 0.3 cm, awn 0.6 cm. Stamens 3. Caryopsis cylindric–oblong. Pedicelled spikelets reduced to aristate like the glume. Glumes 0.3 cm, scabrid, arista 0.3 cm.

Flowering and Caryopsis time: September–December.

Specimens examined: Andhra Pradesh, EG distr., Bision hills, *CAB* 5021 (MH); Near Vedurupalli, *GVS* 42763 (BSID, MH); Maredumilli, *TP* & *MSG* 12265 (MH).

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar and Nepal; (II) INDIA: Throughout.

Schizachyrium exile (Hochst.) Pilg., Bot. Jahrb. Syst. 54: 284. 1917; FPM 3: 1752. 1934; Bor, Grass. India 216. 1960; FAP 3: 1250. 1997; FTS 747. 2016. *Andropogon exilis* Hochst., Flora 27: 241. 1844; FBI 7: 166. 1896.

Syntypes: Sudan: “Ad latus, orientale montis Cordofani Arasch–Cool locis humidis habitat”; *Kotschyi* 370 (K). Ethiopia: ad latus orientale montis Cordofani Arasch–Cool locis humidis habitat, 1837– 1838, *Kotschyi* 19 (L).

Tufted annual. Leaves linear. Racemes 2–4 cm, solitary. Spikelets sessile, pedicelled. Sessile spikelets 0.5–0.6 cm, ovoid. Lodicules 2. Caryopsis linear. Pedicelled spikelets 0.5 –0.6 cm.

Flowering and Caryopsis time: August–December.

Exsiccata: Andhra Pradesh, Kadapa distr., Vempalli, *S. Gurappa* 300 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Thalaricheruvu, *TP* 905. Telangana, MDK distr., Pocharam tank, *TP* & *MSG* 12053 (SKU).

Distribution: (I) GLOBAL: Tropical and S. Africa, Indian Subcontinent to Myanmar; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal.

Sehima Forssk.

(Fl. Aegypt.–Arab. 178. 1775)

Type: *Sehima ischaemiides* Forssk.

Key to the species:

1a. Lower glume (sessile) with groove deep, longitudinal, slit-like .....*S. sulcata*

1b. Lower glume (sessile) with groove shallow or deep, not slit-like .....*S. nervosa*

Sehima nervosa (Rottler) Stapf., Fl. Trop. Afr. [Oliver et al.] 9 (1): 36. 1917; Bor, Grass. India 218. 1960; FAP 3. 1250. 1997; FTS 747. 2016. *Andropogon nervosus* Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 218. 1803. **[Plate.5.2: D; Plate.5.4: H]**

Type: India: Madras, *Rottler* s.n. (K).

Tufted perennial. Leaf blade linear. Racemes 8–20 cm, solitary. Spikelets sessile, pedicelled, bearded, awned. Sessile spikelets 0.8–1.1 cm, ovoid. Lodicules 2. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets 0.9–1.3 cm, linear. Stamens 3.

Flowering and Caryopsis time: August–January.

Exsiccata: Andhra Pradesh, Kurnool distr., Nallamalla Hills, *S. Gurappa* 272 (KUW).

Specimens examined: Andhra Pradesh, ATP distr., Muchukota RF, *PVP* 2564; KNL distr., Gundlabrameswarm, *JLE* 32674 (MH); Mandalakatta, *JSG 18699* (DD). Telangana, NLG distr., Nagarjunakonda valley, *KT* 9669 (CAL).

Distribution: (I) GLOBAL: China, Myanmar, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Deccan, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan and Tamil Nadu.

Excluded

Sehima sulcata (Hack.) A. Camus, Bull. Mus. Hist. Nat. 27: 373. 1921; FPM 3: 1724. 1934; Bor, Grass. India 219. 1960. FAP 3. 1251. 1997. *Ischaemum sulcatum* Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 248. 1889; FBI 7: 137. 1896.

Syntypes: "India orientalis, prope Narsingpur province, Centralis alt. 1000 ft."; *O. Kuntze* in h. prop. s.n. Sholapur province, Bombay Stead in h. m."

Tufted annual. Leaf blade linear. Racemes 4–9 cm long, solitary. Spikelets sessile, pedicelled, awned. Sessile spikelets 0.9–1.1 cm, ovoid. Lodicules 2. Stamens 3. Caryopsis oblong. Pedicelled spikelets 0.7–0.9 cm, linear. Lodicules 2. Stamens 3.

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu.

Remarks: The report of this taxon from the study area could not be endored for want of an authentic specimen.

Sorghum Moench

(Methodus (Moench) 207. 1794, nom. cons.)

Type: *Sorghum bicolor* (L.) Moench (*Holcus bicolor* L.).

Key to the species:

1a. Awn short; panicle branches divided 2

1b. Awn long; panicle branches simple ..... *S. nitidum*

2a. Sessile spikelet acuminate-acute ..... *S. controversum*

2b. Sessile spikelet otherwise..... 3

3a. Sessile spikelet obovoid.....*S. bicolor*

3b. Sessile spikelet linear-lanceolate.....*S. halepense*

Sorghum bicolor (L.) Moench, Methodus 207. 1794; Bor, Grass. India 228. 1960; FAP 3. 1255. 1997; FTS 750. 2016. *Holcus bicolor* L., Mant. Pl. Altera 301. 1771.

Lectotype: Herb. Clifford: 468, Holcus 1 (BM–000647533). LT designated by Davidse in Cafferty *et al.* (ed.), Taxon 49: 251. 2000.

Tall cultivated. Leaf blades lanceolate. Inflorescence a panicle. Caryopsis obovoid.

Distribution: (I) GLOBAL: Bangladesh, Myanmar, Pakistan and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand, West Bengal.

Note: Cultivated; native to Africa.

Remarks: *Sorghum bicolor* was divided into many infraspecific taxa (Snowden, 1935) but Harlan & deWet (1972) provided a much simpler classification, reducing most of Snowden's taxa to synonymy.

Sorghum controversum (Steud.) Snowden, J. Linn. Soc., Bot. 55: 210. 1955. *Andropogon controversus* Steud., Syn. Pl. Glumac. 1: 391. 1854.

Type: "*A. laxus* Roxb. Fl. Ind. 275 vix Thunberg. Ind. or."

Type: Not designated. Until Roxburgh's type specimen has been located. A specimen at K, *Bourne* 3270, from Tapeswarani, Godavery district, Madras Province, dated December 1907, has been selected as characteristic of the awned state of this species.

Tall perinneal. Leaf blade linear. Panicles 10–35 cm. Sessile spikelets 0.5 cm, ovoid, awned. Stamens 3. Caryopsis ellipsoid. Pedicelled spikelets un-awned.

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu and West Bengal.

Remarks: It is based on Roxburgh's type specimen from East Godavari district, Andhra Pradesh.

Sorghum halepense (L.) Pers., Syn. Pl. (Persoon) 1: 101. 1805; FPM 3: 1735. 1934; Bor, Grass. India 222. 1960; FAP 3: 1256. 1997; FTS 750. 2016. *Holcus halepensis* L., Sp. Pl. 2: 1047. 1753.

Lectotype: Herb. Linn. No. 1212.7 (LINN). LT designated by Meikle in Fl. Cyprus 2: 1869. 1985.

Tall perinneal. Leaf blade ovate. Panicles 15–30 cm. Sessile spikelets 0.5 cm, ellipsoid. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: Throghout the year.

Specimens examined: Andhra Pradesh, EG distr., Mandapeta, *CAB* 4269 (MH); VSKP distr., Aditavalasa, *GVS* 21613 (MH). Telangana, KRN distr., Rechapalli, *GVS* 22244 (MH).

Distribution: (I) GLOBAL: Macaronesia to Central Asia and Indo-China; (II) INDIA: Throughout.

Sorghum nitidum (Vahl) Pers., Syn. Pl. (Persoon) 1: 101. 1805; FAP 3. 1256. 1997; FTS 750. 2016. *Holcus nitidus* Vahl, Symb. Bot. (Vahl) 2: 102. 1791; FPM 3: 1735. 1934; Bor, Grass. India 245. 1960.

Type: "Habitat in India Orientali."

Tall perinneal. Leaf blade ovate. Panicles 10–25 cm. Sessile spikelets 0.4 cm, awned. Stamens 3. Caryopsis ellipsoid.

Flowering and Caryopsis time: October–March.

Specimens examined: Andhra Pradesh, VSKP distr., Araku, *NPBK* 10755 (CAL, MH).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar and Sri Lanka; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Odisha, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Thelepogon Roth

(Syst. Veg. Syst. Veg., ed. 15 bis [Roemer & Schultes]. 2: 46. 1817)

Type: *Thelepogon elegans* Roth.

Thelepogon elegans Roth, Syst. Veg., ed. 15 bis. 2: 788. 1817; FPM 3: 1892. 1934; Bor, Grass. India 247. 1960; FAP 3: 1262. 1997; FTS 754. 2016. **[Plate.5.2: F; Plate.5.4: I]**

Type: "In India Orientali: *Heyne* s.n."

Tall tufted, nodes hairy. Leaf blade linear, ovate, hispid. Racemes 5–10 cm, digitate. Spikeletes sessile, pedicelled. Sessile spikelets 0.4–0.6 cm, ovoid. Lower glume 0.5m, surface rugose. Upper glume 0.6 cm, ovate, surface rugose. Lower lemma 0.5 cm, hyaline. Palea 0.4 cm, ovate. Lodicules 2. Stamens 3. Upper lemma 0.4 cm, oblong, apex bifid very deep, awned, awn 0.1 cm. Pedicelled spikelets reduced to pedicel. Pedicel 0.5–0.8 cm. *Flowering and Caryopsis time*: August–October.

Exsiccata: Telangana, Zaherabad distr., Bilalpur, *S. Gurappa* & *V.S.Raju* 4903 (KUW).

Specimens examined: Andhra Pradesh, KNL distr., Malayala fields, *PVP* & *RVR* 2545. Telangana, NZB distr., Gandhari, *BR* & *CPR* 7231 (SKU).

Distribution: (I) GLOBAL: Tropical Africa to Namibia, India to W. Indo-China, S. Malaysia; (II) INDIA: Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu.

Themeda Forssk.

(Fl. Aegypt.–Arab 178. 1775)

Type: *Themeda triandra* Forssk.

Key to the species:

1a. Involucral spikelets all inserted at same level 2

1b. Involucral spikelets inserted at different levels 5

2a. Spikelets clusters few; inflorescence branch effuse ..... *T. laxa*

2b. Spikelets clusters numerous; inflorescence branch short 3

3a. Clusters globose or fan-shaped 4

3b. Clusters narrow ..... *T. triandra*

4a. Fertile spikelets hispid on tip; robust grass ..... *T. quadrivalvis*

4b. Fertile spikelets hispid only dorsally; short grass ..... *T. helferi*

5a. Involcural spikelets entirely glabrous..... *T. cymbaria*

5b. Involcural spikelets hairy (lower glume) 6

6a. Awn sout; robust grass ..... *T. arundinacea*

6b. Awn slender; weak grass 7

7a. Sessile spikelet of lower glume deeply channeled..... *T. tremula*

7b. Sessile spikelet of lower glume not deeply channeled ..... *T. mooneyi*

Themeda cymbaria Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 668. 1889; FPM 3: 1746. 1934; Bor, Grass. India 251. 1960. *Anthistiria cymbaria* Roxb., Hort. Beng. 6. 1814, p.p. (excl. basionym)

Syntypes: "India or. in montosis (Roxb.) Peninsula (*Wight* 1707, 175 [h. prop.] Maisur et Carnatic (Hook. f. Thoms.); Ceylon (*Thwaites* 3257, 3803)."

Tufted perennial. Leaves lanceolate. Panicle 45 cm long. Spikelets bisexual. Caryopsis grooved.

Flowering and Caryopsis time: August–January.

Specimens examined: Andhra Pradesh, Kadapa distr., Mallelamma temple, *BR & BSS 30527*; EG distr., Thotamamidi near Devarapalli, *NRR* 76819 (BSID, MH).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu.

Themeda laxa (Andersson) A. Camus, Bull. Mus. Hist. Nat. 26: 423. 1920; FPM 3: 1746. 1934; Bor, Grass. India 251. 1960; FAP 3. 1264. 1997. *Anthistiria laxa* Andersson, Nov. Act. Nat. Soc. Sc. Upsal. ser. 3. 2: 243. 1856; FBI 7: 213. 1896.

Type: "Hab. in Nepalia." Numer. List [*Wallich*] no. 8775 (S).

Tufted perennial. Leaves filiform, acuminate. Panicle 9 cm. Involucural spikelets 4, 0.4 cm. Sessile spikelets 0.4 cm, awned, bisexual.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, KNL distr., Upper Ahobilam, *TP* & *GNVF* 7062. Telangana, MDK distr., Medak, *RG* 104106 (BSID).

Distribution: (I) GLOBAL: Bhutan and Nepal; (II) INDIA: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tamil Nadu and Telangana.

Themeda mooneyi Bor, Kew Bull. 1951: 451. 1952; Bor, Grass. India 252. 1960; Moulik, Grass. Bamb. India. 1: 231. 1997; FEG 7. 332. 2020.

Type: India: Orissa, near Pottangi, Koraput district, alt. 4100 ft, October 1950: *H.F. Mooney* 4064 (K).

Tufted perennials. Leaf sheath keeled. Racemes solitary. Sessile spikelets 7 cm long, oblong. Pedicelled spikelets lanceolate. Upper glume 3-nerved. Stamens 3.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, VSKP distr., Galikonda, *AMR & BR* 25650 (SKU).

Distribution: (I) GLOBAL: India; (II) INDIA: Andhra Pradesh and Odisha.

Themeda quadrivalvis (L.) Kuntze, Revis. Gen. Pl. 2: 794. 1891; FPM 3: 1746. 1934; Bor, Grass. India 252. 1960;. FAP 3: 1264. 1997; FTS 754. 2016. *Andropogon quadrivalvis* L., Syst. Veg., ed. 13. 1: 758. 1774.

Lectotype: Herb. Linn. No. 1211.5 (LINN). LT designated by Cope in Cafferty *et al*. (ed.), Taxon 49: 246. 2000.

Tall tufted slender annual. Leaves lanceolate, acuminate, base cordate. Panicle 15 cm long. Involucral spikelets 0.4 cm. Sessile spikelets 0.6 cm long, awned, bisexusl. Stamens 3. Caryopsis linear. Pedicelled spikelets 0.7 cm, lanceolate.

Flowering and Caryopsis time: August–December.

Specimens examined: Andhra Pradesh, PKM distr., Diguvametta, *CAB* 8094 (MH); KSN distr., Kondapalle, *CAB* 4599 (MH); VSKP distr., Karaka, *CAB* 1702 (MH!). Telangana, ADB distr., Sone, *TP* & *PVP* 4052 (SKU).

Distribution: (I) GLOBAL: Africa, China, Myanmarand Nepal; (II) INDIA: Throughout.

Themeda tremula (Nees) Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 667. 1889; FPM 3: 1746. 1934; Bor, Grass. India 254. 1960; FAP 3: 1265. 1997. *Anthistiria tremula* Nees, Syn. Pl. Glumac. 1: 401. 1855; FBI 7: 214. 1896.

Type: Sri Lanka; *Heyne* s.n. (Numer. List [*Wallich*] no. 8765).

Tall tufted perennial. Panicle 35 cm. Involcural spikelets four, 0.7–0.8 cm. Sessile spikelets 0.4 cm, oblong, bearded, awned, bisexual.

Flowering and Caryopsis time: November–January.

Exsiccata: Andhra Pradesh, VSKP distr., Araku valley, *S. Gurappa* 296 (KUW).

Specimens examined: Andhra Pradesh, EG distr., Chinnaudasakarru, *VNS* 29 (CAL).

Distribution: (I) GLOBAL: India and Sri Lanka; (II) INDIA: Andhra Pradesh, Bihar, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Meghalaya, Rajasthan, Tamil Nadu and Uttar Pradesh.

Themeda triandra Forssk., Fl. Aegypt.–Arab. 178. 1775; FPM 3: 1746. 1934; Bor, Grass. India 254. 1960; FAP 3. 1265. 1997; FTS 755. 2016.

Type: “Yemen in montibus ad Hadiyah”; 1763, *Forsskål* s.n. (C [destroyed]).

Tall tufted perennial. Leaves linear, base rounded. Panicle 20 cm long. Involcural spikelets 0.4 cm. Sessile spikelets 0.6 cm, linear. Upper lemma stipiform, awned, hispid, bisexual. Stamens 3. Caryopsis linear, grooved. Pedicelled spikelts 0.7 cm, lanceolate.

Flowering and Caryopsis time: August–December.

Exsiccata: Telangana, Zaherabad distr., Koira, *S. Gurappa & V.S.Raju* 4819 (KUW).

Specimens examined: Andhra Pradesh, CTR distr., Talakona RF, *PVP* 2320 (SKU); Palamaneru, *KCJ* 438 (MH!). Telangana, MBNR distr., Mallelatheertham, *SRS* 108857, 111412 (BSID).

Distribution: (I) GLOBAL: Bhutan, China, Myanmar, Nepal and Sri Lanka; (II) INDIA: Throughout.

Excluded

Themeda arundinacea (Roxb.) Ridley, Trans. Linn. Soc. London, Bot. ser. 2. 3: 401. 1893; Bor, Grass. India 250. 1960; FAP 3: 1264. 1997. *Anthistiria arundinacea* Roxb., Fl. Ind. 1: 256. 1820.

Type: "A native of Bengal."

Perennial tufted robust. Leaves narrow. Panicle lax. Sessile spikelets 0.2–0.3 cm, lanceolate, awned, bisexual. Caryopsis obovoid.

Distribution: (I) GLOBAL: Bangladesh, Bhutan, China, Myanmar and Nepal; (II) INDIA: Andhra Pradesh, Assam, Bihar, Jharkhand, Manipur, Meghalaya, Nagaland, Odisha, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

Themeda helferi Hack., Monogr. Phan. [A.DC. & C.DC.] 6: 665. 1889.

Type: Burma: Andaman Islands (Bay of Bengal), Tenasserim; March 1862; *J.W.Helfer* 6809.

Tufted annua. Leaves flat. Panicle 15–30 cm long. Sessile spikelets 0.4 cm, elliptic. Lemma linear, awned, awn 0.3–0.5 cm, geniculate. Pedicelled spikelets 0.4–0.5 cm, lanceolate.

Distribution: (I) GLOBAL: Myanmar; (II) INDIA: Andaman and Nicobar Islands, Andhra Pradesh, Madhya Pradesh and Uttar Pradesh.

Remarks: The report of the above two species of *Themeda* from the study area could not be substantiated by spcecimens at hand or herbaria.

Tripsacum L.

(Syst. Nat., ed. 10. 2: 1261. 1759)

Lectotype: *Tripsacum dactyloides* (L). L. (*Coix dactyloides* L.). LT designated by Hitchcock in Contr. U.S. Natl. Herb. 12: 124. 1908.

Tripsacum laxum Nash, N. Amer. Fl. 17: 81. 1909; FAP 3: 1269. 1997.

Type: Southern Mexico: 'Hacienda de la Laguna, Mexico'.

Tufted perennial. Leaves linear. Spikes 3, monoecious. The lower glume of staminate spikelets keeled. Upper glume of pistillate spikelets convex.

Flowering and Caryopsis time: August–December.

Distribution: (I) GLOBAL: Central and S. Mexico to Honduras; (II) INDIA: Andhra Pradesh, Bihar, Kerala and Tamil Nadu.

Remarks: Reported on authority of *G.V. Subba Rao* 32886 (MH) from Araku valley, Andhra Pradesh.

Zea L.

(Sp. Pl. 2: 971. 1753)

Type: *Zea mays* L.

Zea mays L., Sp. Pl. 2: 971. 1753; FPM 3: 1704. 1934; Bor, Grass. India 482. 1960; FAP 3. 1272. 1997; FTS 759. 2016.

Lectotype: Herb. Linn. No. 1096.1 (LINN). LT designated by Iltis & Doebley in Amer. J. Bot. 67: 1001. 1980.

Tall annual; cultivated. Leaf blade lanceolate. Staminate spikelets 0.8 cm, ovoid. Pistillate spikelets in many rows. Caryopsis sublobose. Stamiante and pistillate spikelets in separate (terminal and axillary) inflorescences.

Specimens examined: Andhra Pradesh, ATP distr., SKU campus, *PVP* 3673. Telangana, ADB distr., Bellampalli, *PVP* 9442 (SKU).

Distribution: (I) GLOBAL: Central and SW. Mexico to W. Guatemala; (II) INDIA: Cultivated throughout.

VI. DISCUSSION

The Panicoideae are the second largest subfamily in Poaceae; it comprises over 212 genera and about 3,316 species (Burke *et al.,* 2016). This subfamily offers many plants of economic interest: most importantly as crops (corn/maize: *Zea mays*; sugarcane: *Saccharum officinarum* L.; jowar/sorghum/sajjalu: *Sorghum bicolor* (L.) Moench.), lawn grasses (*Eremochloa ophiuroides, Paspalum notatum* Fluegge*, Stenotaphrum secundatum*), bio-fuel stocks (*Miscanthus × giganteus, Panicum virgatum* L.), a source of antitumor bioactive compounds (*Coix lacryma-jobi* L.). The importance of *Zea mays* L., is overwhelming as it accounts for 94% of all cereal consumption with over 717 million metric tons produced globally each year for products such as starch, sweeteners, beverages, industrial alcohol, fuel ethanol and oil (Ranum *et al*., 2014). The Panicoid grasses are also a major component of C_4 grasslands. There is great interest to understand the phylogenetic relationships among Panicoideae due to its economic and ecological importance.

6.1 GRASSLANDS AND SAVANNAHS

The grasslands occupy about 20% of the earth's land surface (Moore, 1964). It is estimated that 3.9% of the total area of our country is occupied by grasslands. Based on elevation differences, the grasslands can be classified as low-level and high altitude grasslands. Today, the grassland ecosystems are threatened everywhere, more so in India due to overgrazing, mining, fire, *podu* or *jhum* (shifting; slash and burn technique) cultivation, increased number of bore wells/irrigation facilities, alien grass invasions, etc.

The grasslands are essential to supply fodder to cattle and provide the diversity from which wild crops can continue to be domesticated into agriculturally suitable crops. The

grasslands of India were classified as of Xerophilous, Mesophilous and Hygrophilous. The grasslands in India are of eight types, namely: **Sehima/Dichanthium** (Black soils), **Dichanthium (**Sandy loams), **Phargmites/Saccharum** (Marshy areas), **Bothriochloa (Paddy** tracks), **Cymbopogon (**Low hills), **Arundinella** (High mountains), **Deyeuxia/Arundinella** (Mixed temperate environments) and **Deschenpsia/Deyeuxia** (Temperate/ Alpine regions).

The drier and open areas in Andhra Pradesh and Telangana are commonly covered by grass species such as *Alloteropsis cimicina* (L.) Stapf., *Andropogon pumilus* Roxb., *Apluda mutica* L., *Axonopus compressus* (Sw.) P. Beauv., *Bothriochloa pertusa* (L.) A. Camus., *Cenchrus biflorus* Roxb., *Chrysopogon fulvus* (Sperng.) Chiov., *Cymbopogon gidarba* (Buch.-Ham. ex Steud.) *Dichanthium* spp., *Digitaria ciliaris* (Retz.) Koeler., *Echinochloa* spp., *Heteropogon contortus* (L.) P. Beauv., *Imperata cylindrica* (L.) P. Beauv., *Ischaemum rugosum* Salisb., *Melinis repens*, *Mnesithea laevis* (Retz.) Kunth, *M. granularis* (L.) de Koning & Sosef., *Rottboellia cochinchinensis* (Lour.) Clayton, *Sacciolepis* spp., *Setaria* spp., *Themeda triandra* Forssk., *Trachys muricata* (L.) Pers., and *Urochloa* spp.

The open exclusive grasslands with sparse, stunted tree and shrub growth on the hill tops along the Eastern Ghats above 1000 m AMSL are an interesting vegetation type due to their specific and unusual character. These form part of the dry deciduous forest, the climatic climax type of vegetation, of the Eastern Ghats. These stand out clearly as open bald hill-top with trees growing far apart or in small groups with extremely stunted growth and heavy grass mixed with the characteristic bushy *Phoenix*, an indicator species. The trees and shrubs look unhealthy, with very short crooked stems.

There is characteristic bald hill-top vegetation developed uniformly on hill-tops of Eastern Ghats, above 1000 m AMSL. Such bald hill-tops were reported along the Eastern

Ghats of Odisha and southern Bihar, Nallamalais of Andhra Pradesh and in Tamil Nadu. According to Champion & Seth (1968), the hill top bald vegetation is a Dry Savannah Forest (DS2). In these forests, the trees form few isolated stands or in groups amongst more or less heavy grass with fire resistant plants persisting. The bushy *Phoenix loureiroi* Kunth., is characteristic of these forests. The trees are often unarmed and hollow. *Anogeissus latifolia* (Roxb. ex Dc.) Wall. ex Guillem., *Phyllanthus emblica* L., *Pterocarpus marsupium* Roxb., *Terminalia chebula* Retz., *T. bellirica* (Gaertn.) Roxb., and *Syzygium cumini* (L.) Skeels., are the associates.

6.2 TAXONOMY OF PANICOIDEAE

DNA sequencing has transformed traditional taxonomy of Angiosperms in general and Poaceae in particular which has led to a robust new classification for the family (GPWG, 2001). The most recent phylogeny of the entire grass family (GPWG, 2001) was based on morphology and seven molecular data sets. It helped to divide Poaceae into two major clades of nine subfamilies: BEP (Bambusoideae, Ehrhartoideae and Pooideae) and PACMAD (Panicoideae, Arundinoideae, Chloridoideae, Micrairoideae, Aristidoideae and Danthonioideae). So, Panicoideae are the first subfamily of the second clade; it has been consistently and highly supported as monophyletic (GPWG, 2001).

There are different opinions about the origin of Panicoideae. One recent hypothesis suggested that Panicoideae occupied a sister position to the remaining subfamilies and this result was retrieved despite the composition of out groups (Cotton *et al*., 2015).

6.2.1 Classification 6.2.1.1 Taxonomic History

Bentham (1881) recognized the Series Poaceae and Panicaceae (cf. Brown, 1814) with genera in which the spikelets disarticulate from the pedicel below the glumes was used to segregate. He divided the Series into six tribes, viz. Paniceae, Maydeae, Oryzeae, Tristegineae, Zoysieae and Andropogoneae. Hackel (1887), following Bentham (1881), provided a similar classification. He recognized 12 tribes in the Poaceae, six of which were equivalent to those proposed by Bentham for the Series Panicaceae. However, Hackle's descriptions were more detailed, and included as diagnostic characters, novel micro-characters of the caryopsis such as hilum and starch grain types.

Within the subfamily Panicoideae, Pilger (1940) recognized four tribes. Of them, the tribe Paniceae had six subtribes, namely Anthephorinae, Boivinellinae, Lecomtellinae, Melinidinae, Panicinae and Trachidinae. The tribe Andropogoneae was with six subtribes, viz., Andropogoninae, Dimeriinae, Ischaeminae, Rottboelliinae, Saccharinae and Sorghinae. The other two tribes were Arthropogoneae and Maydeae. Later, Pilger (1954) erected the subfamily Andropogonoideae to include these two tribes Arthropogoneae and Maydeae. Following, in part, the classification of Pilger (1954), Clayton & Renvoize (1986) recognized seven tribes in Panicoideae primarily on spikelet morphology, upper floret texture and leaf anatomical type. Renvoize & Claytonlater (1992) treated six tribes in the Panicoideae: Andropogoneae, Arundinelleae, Isachneae, Maydeae, Neurachneae and Paniceae.

Zuloaga *et al*. (2007), in one of the recent treatments of the American Panicoids, recognized eight tribes based on morphology and molecular data. They are: Andropogoneae, Arundinelleae, Centotheceae, Gynerieae, Isachneae, Paniceae, Steyermarkochloeae and Thysanolaeneae. Within the Paniceae, a total of seven subtribes

were accepted: Arthropogoninae, Cenchrinae, Digitariinae, Melinidinae, Panicinae and Setariinae. The present morphological study of the two major tribes Andropogoneae and Paniceae indicates that they are monophyletic. It is supported by plastome phylogenomic studies (Burke *et al.*, 2016).

The five smaller tribes, viz. Centotheceae, Chasmanthieae, Thysanolaeneae, Tristachyideae, and Zeugiteae, diverge as one clade with subsequent within-group divergences, which is not consistent with Morrone *et al.* (2012); this is followed in general by the serial divergence of Paniceae, Paspaleae, Arundinelleae and Andropogoneae (Burke *et al*., 2016). The present study has the opportunity to study Centotheceae only and therefore it is not possible to comment on this treatment.

6.2.1.2 Current System

For the present study, the classification of grasses adopted by Kellogg *et al.* (2020) was used. Under this head, the following is the presentation of the diversity of Panicoid grasses in the study area followed by a comparison of the systems of classifications by classical workers of Poaceae versus the present system in vogue. It indicates how the systematic treatments improve with new frontiers of knowledge arrived at time to time.

Initially, it was all morphological evidence that used to classify the grasses. It was followed by better understanding the grass spikelet analogy and homology, systematic anatomy of leaf and embryo, palynology, cytology and cytogenetic studies, phytochemical, photosynthetic pathways (C_3, C_4, etc.), molecular evidence and phylogenomics.

The Panicoid grass floristic diversity in the study area is presented in Tables 6.2 and 6.3. These provide the names of genera and the species richness along with the

varieties found in the study area. Although there were reported cases of grass species of the tribes mentioned above by authors in respective floristic accounts, some of them were not really found represented by authentic specimens in the standard herbaria searched. Nor they could be collected during thepresent survey. Therefore, they are excluded from the census awaiting their report with authentic specimens and made available for examination.

In the study area, among the five tribes found, Andropogoneae dominated the subfamily Panicoideae of Poaceae with 40 genera and 103 species. It is followed by Paniceae with 17 genera and 60 species. Third in position was Paspaleae with three genera and six species. Then, Centotheceae stands fourth with two genera and a species each. It was followed by Jansenelleae with a genus and species (Table 6.3). In the above statistics, the species number included the infraspecific taxa as well. For details of these categories, refer to Table 6.2.

Table 6.1 Classification of Poaceae subfamily Panicoideae in four different classifications

S.no	Kellogg *et al*. (2020)	N.L. Bor (1960)	J.D. Hooker (1897)	E. Hackel (1896)
	Subfamily Panicoideae	**Group II— Pooideae**	**Order CLXIII Gramineae**	**Tribe I – Maydeae**
	Tribe Centotheceae			
1	*Centotheca*	Centotheceae	Tribe IX— Festucaeae	Tribe XI – Festuceae
			Subtribe VI— Centothecae	Subtribe. F – Centotheceae
2	*Thysanolaena*	Thysanolaeneae	Tribe I —Paniceae	Tribe IV –Tristegineae
	Tribe Paspaleae			
3	*Axonopus*	Tribe: Paniceae	Tribe I —Paniceae	
4	*Hymenachne*	Tribe: Paniceae		Tribe V – Paniceae
				Sect. VII – Hymenachne
5	*Paspalum*	Tribe: Paniceae	Tribe I —Paniceae	Tribe V – Paniceae
	Tribe Paniceae			
6	*Alloteropsis*	Tribe: Paniceae		Tribe V – Paniceae
				Sect. II – Trichachne
7	*Cenchrus*	Tribe: Paniceae	Tribe I — Paniceae	Tribe V – Paniceae
8	*Crytococcum*	Tribe: Paniceae		
9	*Digitaria*	Tribe: Paniceae		Tribe V – Paniceae
				Panicum Sect. I – Digitaria
10	*Echinochloa*	Tribe: Paniceae		Tribe V – Paniceae
				Sect. VI – Echinochloa
11	*Eriochloa*	Tribe: Paniceae	Tribe I — Paniceae	
12	*Megathyrus*		As *Panicum* sect. Effusae	

13	*Melinis*	Tribe: Paniceae		Tribe IV – Tristegineae
14	*Moorochloa*			
15	*Oplismenus*	Tribe: Paniceae	Tribe I — Paniceae	Tribe V – Paniceae
16	*Panicum*	Tribe: Paniceae	Tribe I — Paniceae	Tribe V – Paniceae
17	*Pseudoraphis*	Tribe: Paniceae		
18	*Sacciolepis*	Tribe: Paniceae		
19	*Setaria*	Tribe: Paniceae	Tribe I — Paniceae	Tribe V – Paniceae
20	*Spinifex*	Tribe: Paniceae	Tribe I — Paniceae	Tribe V – Paniceae
21	*Urochloa*	Tribe: Paniceae		Tribe V – Paniceae
				Sect. II – Trichachne
	Tribe Jansenelleae			
22	*Jansenella*	Tribe: Arundinelleae		
	Tribe Andropogoneae			
23	*Andropogon*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe V. Euandropogoneae	Subtribe V. Euandropogoneae
24	*Apluda*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe V – Apludeae	
25	*Apocopis*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe IV – Ischaemeae	
26	*Arthraxon*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe IV – Ischaemeae	
27	*Arundinella*	Tribe: Arundinelleae	Tribe I— Paniceae	Tribe IV – Tristegineae
28	*Bothriochloa*	Tribe: Andropogoneae		
29	*Capillipedium*	Tribe: Andropogoneae		

30	*Chrysopogon*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Series. A. Isozygi, Subg. IX.
31	*Coix*	Tribe: Maydeae	Tribe IV — Andropogoneae	Tribe I – Maydeae
			Subtribe I – Maydeae	
32	*Cymbopogon*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Series. B. Heterozygi, Subg. XI.
33	*Dichanthium*	Tribe: Andropogoneae		Tribe II — Andropogoneae
				Series B. Heterozygi, Subg. X.
34	*Diectomis*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Series A. Isozygi, Subg. II.
35	*Dimeria*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe II – Dimerieae	Subtribe I – Dimerieae
36	*Eremopogon*	Tribe: Andropogoneae		
37	*Eulalia*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Subtribe I – Saccharreae
				Sec. I – Pollinia
38	*Eulaliopsis*	Tribe: Andropogoneae		
39	*Garnotia*	Tribe: Garnotieae	Tribe IV — Andropogoneae	Tribe VIII – Agrostideae
			Subtribe IV – Agrostideae	
			Subtribe III– Euagrosteae	
40	*Hemarthia*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Subtribe III – Rottbollieae
				Subg. III
41	*Heteropogon*	Tribe: Andropogoneae		Tribe II – Andropogoneae

				Subtribe V– Euandropogoneae
				Series B. Heterozygi
				Subg. XII.
42	*Ischaemum*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe IV – Ischaemeae	Subtribe IV – Ischaemeae
43	*Iseilema*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe VIII – Euandropogoneae	Series B. Heterozygi
44	*Imperata*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe III – Sacchareae	Subtribe III – Sacchareae
45	*Lophopogon*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe IV – Ischaemeae	Subtribe IV– Ischaemeae
46	*Manisuris*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe VI – Rottbollieae	Subtribe III – Rottbollieae
47	*Microstegium*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Sect. II – Lepatherum
48	*Mnesithea*	Tribe: Andropogoneae		
49	*Ophiurous*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe VI — Rottbollieae	Subtribe III – Rottbollieae
50	*Parahyparrhenia*			
51	*Pseudanthistria*	Tribe: Andropogoneae		
52	*Pseudosorghum*	Tribe: Andropogoneae		
53	*Rottboellia*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe VI — Rottbollieae	Subtribe III –Rottbollieae
54	*Saccharum*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae

			Subtribe III — Sacchareae	
55	*Schizachyrium*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Subtribe V– Euandropogoneae
				Series A. Isozygi, Subg. I
56	*Sehima*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Subtribe IV– Ischaemeae, Sect. II
57	*Sorghum*	Tribe: Andropogoneae		Tribe II – Andropogoneae
				Subtribe V–Euandropogoneae
				Subg. VII
58	*Thelepogon*	Tribe: Andropogoneae	Tribe IV — Andropogoneae	Tribe II – Andropogoneae
			Subtribe IV — Ischaemeae	Subtribe IV – Ischaemeae
59	*Themeda*	Tribe: Andropogoneae		Tribe II – Andropogoneae
60	*Zea*	Tribe: Maydeae	Tribe IV — Andropogoneae	Tribe I –Maydeae
			Subtribe I — Maydeae	

Note: *Hildaea, Eremochloa* and *Tripsacum* are the three genera excluded in view of their non-representation in the study area though some reports mentioned their presence.

Table 6.2 Numerical enumeration of Panicoid grasses in the study area

Tribe	Genus	Species	Excluded	Total
Centotheceae				
	1. *Centotheca*	1	1 var.	1
	2. *Thysanolaena*	1		1
Paspaleae	1. *Axonopus*	1		
	**Hildaea*		1 gen.	
	2. *Hymenachne*	1		
	3. *Paspalum*	4	2 var.	
Paniceae	1. *Alloteropsis*	2		
	2. *Cenchurus*	8	1 sp.	
	3. *Crytococum*	5		
	4. *Digitaria*	11+ 1 var.		
	5. *Echinochloa*	6		
	6. *Eriochloa*	1		
	7. *Megathyrus*	1		
	8. *Melinus*	1		
	9. *Moorochloa*	1		
	10. *Oplismenus*	2		
	11. *Panicum*	11	1 sp.	
	12. *Pseudoraphis*	1		
	13. *Sacciolepsis*	3	1 sp.	
	14. *Setaria*	9	2 spp.	
	15. *Spinifex*	1		
	16. *Trachys*	2		
	17. *Urochloaa*	4	7 spp.	
Jansenelleae	1. *Jansenella*	1		
Andropogoneae	1. *Andropogon*	2	1 sp.	
	2. *Apluda*	1		
	3. *Apocopsis*	3		
	4. *Arthraxon*	5+ 1 var.		
	5. *Arundinella*	10+ 2 var.	1 var.	

	6. *Bothriochloa*	4		
	7. *Capillipedium*	3	1 sp.	
	8. *Chionachne*	1		
	9. *Chrysopogon*	13	1 sp.	
	10. *Coix*	2		
	11. *Cymbopogon*	9+1 var.		
	12. *Dichanthium*	3	1	
	13. *Diectomis*	1		
	14. *Dimeria*	5	3 var.	
	** Eremochloa*			
	15. *Eremopogon*	1		
	16. *Eulalia*	5		
	17. *Eulaliopsis*	1		
	18. *Garnotia*	2	1	
	19. *Hemarthia*	1		
	20. *Heteropogon*	2		
	21. *Imperta*	1	var. 2	
	22. *Ischaemum*	5	2	
	23. *Iseilema*	3		
	24. *Lophopogon*	1		
	25. *Manisuris*	1		
	26. *Microstegium*	1		
	27. *Mnesithea*	2	var. 1	
	28. *Ophiurous*	1		
	29. *Parahyparrhenia*	1		
	30. *Pogonantherum*	2	1	
	31. *Pseudanthistria*	1	1	
	32. *Pseudosorghum*	1		
	33. *Rottboellia*	1		
	34. *Saccharum*	2		
	35. *Schizachyrium*	2		
	36. *Sehima*	2		
	37. *Sorghum*	2		
	38. *Thelepogon*	1		
	39. *Themeda*	6	2	
	**Tripsaeum*			
	40. *Zea*	1		

Table 6.3 Numerical synopsis of tribes of Panicoideae in the study area

S.no.	Tribe	Genera	Species
1	Centotheceae	2	2
2	Paspaleae	3	6
3	Paniceae	17	60
4	Jansenelleae	1	1
5	Andropogoneae	40	103
Total taxa		**63**	**172**

The Panicoideae of the present day treatment (e.g. Kellogg *et al.*, 2020) was Group I Panicoideae by Bor (1960). It was under the order Gramineae as per Hooker f. (1897).

1. Tribe Centotheceae

There were two genera, namely *Centotheca* and *Thysanolaena*, found in the tribe in the study area were earlier kept under the subfamily Pooideae tribes Centotheceae and Thysanolaeneae respectively by Bor (1960), in the tribe Festucaeae subtribe Centothecae and tribe Paniceae by Hookder f. Along with them were placed *Coix* and *Zea* in the subtribe Maydeae (Table 6.1) which now they are better placed in the tribe Andropogoneae. Hackel (1896) kept these two genera in the tribe Festucaeae subtribe Centothecae and tribe Tristegineae, respectively. These two genera are represented by a species each in the natural habitats.

2. Tribe Paspaleae

The tribe **Paspaleae** of Kellogg *et al*. (2020) has three genera *Axonopus, Hymenachne* and *Paspalum* represent in the study area while the genus *Hildaea* though reported is not found. The genus *Axonopus* was kept in the tribe Paniceae by Bor and

Hooker f. These three genera were kept under the tribe Paniceae by Bor, Hooker f. and Hackel. However, *Hymenachn*e was placed in the sect. Hymenachne.

3. Tribe Paniceae:

Brown (1814) recognized two tribes within Panaceae: Poeae and Paniceae. His concept of ‘‘Paniceae’’ included the genus *Panicum* among other genera now considered belong to the tribe Andropogoneae. Brown’s concept was later followed by several authors to circumscribe the subfamily Panicoideae while the name Paniceae was restricted to the actual tribe (Brown, 1814).

The tribe Paniceae s.l. is one of the largest tribes of the subfamily Panicoideae, with more than 2000 species. It exhibits great morphological, cytological and physiological diversity in inflorescence types, several basic chromosome numbers, and at least in four major photosynthetic pathways. The x = 10 **Paniceae clade** is sister to the **Andropogoneae–Arundinelleae** s.s. **clade** (x = 10), while the combined x = 10 clade is sister to the x = 9 clade that contains the remaining genera of Paniceae. The tribe comprises the cereal and forage grasses *Cenchrus americanus* (L.) Morrone*., Panicum miliaceum* L., *Paspalum dilatatum* Poir., and *Setaria italic* (L.) P. Beauv., and turf and ornamental species *Axonopus compressus* (Sw.) P. Beauv., and *Cenchrus purpureus* Schumach., besides a species used for bio-fuel (*Panicum virgatum* L.). So, these members make the tribe Paniceae important in the economy of the human community.

Brown (1977) divided tribe Paniceae into four subtribes according to the phylogenetic concept based on leaf anatomy and photosynthetic pathways. He proposed evolutionary hypotheses among taxa and related the photosynthetic syndrome to environmental adaptations.

The Paniceae of present study had 15 genera (with two excluded) found in the study area (Table 6.2) which are represented by 58 (2 excluded) species. The current/modern classification agrees with the divisions of Bor and Hooker f. who kept these genera in the tribe Paniceae. However, *Megathyrus* was recognized later which has *Panicum maximus* Jacq., (**Guinea grass** and **green panic grass)** that was kept in sect. Effusae of *Panicum* by Hooker f. Earlier, Hackel also kept (Table 6.1) these genera under the tribe Paniceae. However, *Alleteropsis* and *Urochloa* were kept under sect. II Trichachne, *Digitaria* in sect. I *Digitaria*, and *Echinochloa* in sect. VI *Echinochola*. Besides, the major difference was the placement of *Melinus* (*Rhynchelytrum*) in the tribe Tristegineae. The genus has troublesome invasive species such as *M. repens* (Willd.) Zizka., (Natal redtop) and *M. multiflora* P. Beauv. The former is naturalized invasive along the highways in Telangana state.

4. Tribe Jansenelleae

Jansenella Bor is wide-spread in India, Myanmar and Sri Lanka. The anatomy of *Jansenella* is typical of C_3 grasses, with a large distance between consecutive veins, a double bundle sheath, and no minor veins or distinctive cells. Furthermore, the genes encoding C_4-related enzymes from *Jansenella* and *Chandrasekharania* are similar to those of other C_3 grasses. Therefore, these two generaform the sister group of Andropogoneae, based on evidence from both plastomes and on markers spread (Bianconi *et al.,* 2020). Based on photosynthetic system (anatomical adaptation), etc. it is considered primitive to Andropogoneae.

5. Tribe Andropogoneae:

The tribe is represented by 40 genera (excl. *Tripsacum*) and 103 species. According to Bor, all these genera were treated in the tribe Andropogoneae except *Arundinella* (Arundinelleae), *Coix* and *Zea* (Maydeae) and *Garnotia* (Garnotieae). Hooker f. also placed them in the Tribe Andropogoneae but in the subtribes **Euandropogoneae** (*Andropogon* and *Iseilema*), *Ischaemeae* (*Lophopogon* and *Thelepogon*), **Sachhareae** (*Imperata* and *Saccharum*), **Maydeae** (*Coix* and *Zea*) and **Rottbollieae (***Manisuris, Ophiurous* and *Rottboellia*).

The genus *Imperata* (subtribe Sacchareae of Andropogoneae of Hooker f. and Hackel) was classified as *incertae sedis* (of uncertain position) within Andropogoneae by Soreng *et al*. (2015). The placement *of Imperata cylindrica* (L.) P. Beauv., as sister to a clade of *Saccharum officinarum* L., and two species of *Sorghum* based on plastome phylogenomics (Burke *et al*., 2016) is in agreement that of the relationship visualized by Hooker f. and Hackel. This is in disagreement with previous studies of Panicoideae that suggested a sister relationship for *I. cylindrica* (L.) P. Beauv., with the subtribe Germainiinae (GPWG II, 2012). The present study supports the treatment of Soreng *et al*. (2015).

6.3 ECONOMIC AND ECOLOGICAL POTENTIAL

The grasses are by far the most important plant group, providing our: (i) staple cereals such as *Eragrostis* (Teff: one of most important staple crops in Ethiopia and Eritrea)*, Hordeum Oryza, Secale, Sorghum, Triticum* and *Zea*; (ii) sugar crops such as *Saccharum* and *Sorghum*; (iii) reeds such as *Arundo* and *Phragmites*; and (iv) bamboo for food, building, and amenity materials such as *Bambusa* and *Phyllostachys*.

The Poaceae also provide many forage and lawn grasses as tropical species in *Cenchrus, Cynodon, Digitaria, Panicum, Paspalum, Stenotaphrum, Urochloa* and *Zoysia,* or temperate species in *Alopecurus, Cynosurus, Dactylis, Festuca, Lolium, Phleum* and *Poa* (Hodkinson *et al*., 2007a). Recently, *Arundo, Miscanthus* and *Saccharum* have become important sources of raw material for the biomass and bioenergy industries (Hodkinson *et al*., 2015).

There are 65 wild crop relatives which belong to 18 genera of 24 cultivated grasses in combined Andhra Pradesh (Elangovan *et al*., 2012). The commercial grasses are to a maximum of 11 species with 23 wild relative species, followed by small millets with seven species (+ 22 wild relatives), millets with two crop species (+ 12 wild relatives), cereals with four cultivated crop species (+ 8 wild relatives). Among these, the genus *Panicum* is having a maximum of 10 wild relatives, followed by bamboo and *Cymbopogon* (9 spp. each), *Pennisetum* (7), *Oryza* (6), *Sorghum* and *Setaria* (5 each) and *Zea* (2) besides four crop species represented by one wild relative each.

Food: The cereals and millets are major food crops of Poaceae. *Oryza sativa* L. is the major food crop in India. *Triticum aestivum* L. (wheat) provides the staple food of hundreds of millions of people. *Cenchrus americanus* (L.) Morrone (≡ *Pennisetum typhoides*; Peral Millet), *Setaria italika* (L.) P. Beauv*., Sorghum bicolor* (L.) Moench (Jowar, Great millet, broom corn), *Zea mays* L. (Maize) and *Panicum miliaceum* L. (common millet) are grown in areas suitable for their cultivation. *Eleusine coracana* (L.) Gaertn. (Ragi) is one of the main food sources in southern India and some primitive ethnic tribes in Araku Valley Agency Area (Visakhapatnam district, Andhra Pradesh) cultivate it through *Podu* (Solu). *Hordeum vulgare* L. (Barley) is cultivated in parts of higher altitude Himalaya, whereas *Avena sativa* L. (Oats)

cultivated in very limited area in north-western Himalaya. *Saccharum officinarum* L. (Sugarcane) is cultivated on a large scale throughout India.

Fodder: Cattle are happy to graze on most of the grasses. Bor (1960) classified the fodder grasses as of four categories based on habitations: (i) **Plains and moist habitats**: *Andropogon pumilus* Roxb., *Bothriochloa pertusa* (L.) A. Camus., *Cenchurus ciliaris* L., *Cynodon dactylon* (L.) Pers., *Echinochloa colona* (L.) Link., and *Panicum repens* L.; (ii) **Desert and Sea coast habitats:** *Desmostachya bipinnata* (L.) Stapf., *Ischaemum afrum* (J.F. Gmel.) Dandy., and *Tragus monglorum* Ohwi.; (iii) **Hills and Dry habitats:** These are species of *Bromus*, *Digitaria*, and *Bothriochloa*; and (iv) **Exotic Fodder grasses:** *Cenchrus purpureus* (Schumach.) Morrone., *Melinis minutiflora* P. Beauv., *Megathyrus maximus* (Jacq.) B.K. Simon., *Paspalum dilatatum* Poir., *Sorghum halepense* (L.) Pers., and *Zea mays* L.

Essential oils: *Cymbopogon flexuosus* (Ness) Will. Watson., *C. nardus* (L.) Rendle., and *C. citrates* (DC.) Stapf., are cultivated for extracting citronella oil which is used in soaps, disinfectants and polishes, whereas the lemon grass powder used for beverages (Tea). *Chrysopogon zizanioides* (L.) Robertty., (*Vetiveria zizanioides*) is cultivated for Vetiver oil and fragrant mats used as curtains to reduce summer temperatures.

Ornamental grasses: *Cenchrus compressus* (R. Br.) Morrone., (*Pennisetum villosum* R. Br. ex Fresen.) *Melinis repens* (Willd.) Zizka., *Miscanthus nepalensis* (Trin) Hack., and *Setaria palmifolia* (J. Koening) Stapf., are planted in gardens.

Lawn grasses: *Cynodon dactylon* (L.) Perss., and *Zoysia matrella* (L.) Merr., are used for making Lawns.

Soil binders: On the seahore, *Aeluropus lagopoides* (L.) Thwaites, *Halopyrum mucronatum* (L.) Stapf., *Spinifex littoreus* (Burm.f.) Merr., and *Zoysia matrella* (L.) Merr., are the useful natural colonizers of coastal flats and sand stabilizers of their spread.

Grasses with Medicinal Properties: *Arundinella nepalensis* Trin., is used for healing wounds and *Pogonatherum crinatum* (Thunb.) Kunth, for skin diseases.

Paper industry: *Heteropogon contoruts* (L.) P. Beauv., and *Saccharum spontaneum* L., are used in paper industry.

Ornaments: The caryopsesof *Coix* species are used for decoration, earrings and necklaces by Naga tribes (Bor, 1960).

Musical instruments: The hollow culms of *Arundo donax* and *Phragmites karaka* are used for shepherds' pipes in north-west India.

Hindu rituals: *Cynodon dactylon* (L.) (*Garika gaddi*) and *Imperata cylindrica* (L.) P. Beauv., are used for worship and in religious ceremonies in India. *Desmostachya bipinnata* (L.) Stapf., has an important place in Hindu rituals (Dymock *et al*., 1885).

Miscellaneous uses:

Brooms: The grass inflorescences of *Aristida setacea* Retz., *Arundinella setosa* Trin., and *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda, are used for making brooms.

Thatching: *Arundo donax* L., *Cymbopogon caesius* (Ness ex Hook. & Arn.) Stapf., *Imperata cylindrica* (L.) P. Beauv., *Themeda cymbaria* Forssk., and *Phragmatis karka* (Retz.) Trin. ex Steud., are used for thatching by the tribal people.

Mats: The culms of species of *Arundo*, *Phragmates* and Bamboo are used for flooring and walling, whereas *Chrysopogon zizanioides* (L.) Roberty., is used for making “tatties”.

Ropes: *Desmostachya bipinnata* (L.) Stapf., and *Eulaliopsis binata* (Retz.) C.E. Hubb., are used for making ropes (cordage), charpoys (light bedstead used in India) and tying.

Soil conservation: Grasses are excellent conservers of soil and its biomass enrichment.

Biodiversity value: The importance of grasses is well-known from the origin and evolution of mammals and herbivores. The grasses support the food chain, milk and meat production; serve as hiding, nesting, breeding and resting grounds besides the above uses enlisted. Above all, India is land for native and endemic genera of Poaceae such as *Chandrasekharania* V.J. Nair *et al*., *Cyathopus* Stapf., *Danthonidium* C.E. Hubb., *Glyphochloa* Clayton., *Hubbardia* Bor, *Indopoa* Bor, *Lophopogon* Hack., *Pogonachne* Bor, *Pseudodichanthium* Bor, *Trilobachne* Schenck ex Henrard., and *Triplopogon* Bor (Irwin & Narasimhan, 2011).

VII. SUMMARY AND CONCLUSIONS

The POACEAE (Gramineae), the members of the family called grasses, are ecologically dominant as grasslands, bamboo forests or savannahs. They are estimated to occupy 40% of the Earth's land surface, more than one third of the productive terrestrial substratum which sustains most of the life on the planet. The members of the family, particulars the cereals provide the staple food to all global people and fodder to the domesticated as well as the wild animals (herbivores). The grass members provide us the starch, sugar, pulp, thatching material, brooms to building material.

The Poaceae are known as Monocots treated either as primitive to Dicots or *vice-versa.* Now, based on molecular phylogeny, it is accepted that Monocots occupy a position in between the basal Angiosperms (Primitive Dicots) and the Eudicots (Advanced). The family belongs to the order Poales Small. The Monocot clade starts with order Acorales and ends with Poales. The order Poales starts with 91 [the assigned number is as per LAPG and APG IV, in the sequence of phyletic advancement] Typhaceae and ends with 106 Poaceae.

Although there are a number of studies on Indian grasses, there is no comprehensive work on the entire family after J.D. Hooker (1897) gave us the baseline information about the kinds of grass the Indian subcontinent harbours in general and the grasses of erstwhile Andhra Pradesh in particular, when there is shortage of fodder on one hand and the area under cereal crops is on serious decline. The grasses are a neglected group for research against the economic contribution they make.

The reports and the accounts of Poaceae in the flora of Andhra Pradesh and Telangana (Pullaiah, 2015; Reddy & Reddy, 2016) are more scattered or of compilations but not in the light of current molecular phylogenetic classification or with updated nomenclature. Therefore, the present study of grasses, the subfamily Panicoideae, was undertaken in view of the greater area and the size of the family. The study had in its objective, the survey, study the grasses of the subfamily for their true identification and critical taxonomic assessment and throw light and have a bird's eye view of the ecological scenario of grasslands and savannahs in Andhra Pradesh and Telangana states.

The subfamily PANICOIDEAE of Poaceae in world includes *ca.* 3270 species, 206 genera (GPWG, 2001). In India, the Panicoideae members, according to the latest checklist of the grasses of India (Kellogg *et al*., 2020), has six of the eight tribes, 98 genera, 668 species. So, it is one of the largest subfamilies constituting 23% of genera and 44% of grass species found in India.

The standard methods of field exploration, collection, processing and mounting of grass specimens were followed, and the latest literature on the grasses was consulted and expert opinion on key issues regarding typifications was sought.

The present study has revealed the presence of five tribes of Panicoideae, namely Centotheceae, Paspaleae, Paniceae, Jansenellae and Andropogoneae. As per the species turnover, the tribe Andorpogoneae dominates the subfamily in the study area with as many as 103 species, followed by Paniceae (60), Paspaleae (6), Centotheceae (2) and Jansenelleae (1). The species represent to 63 genera: Andropogoneae (40), Paniceae (17), Paspleae (3), Centocheceae (2) and Jansenellae (1).

The total number of the taxa found in the subfamily Panicoideae was 172. These taxa (diversity) were unevenly present in the five tribes as per the genera and species turn over. Counting the number of species, the genus *Chrysopogon* is the richest with 13 species, followed by *Digitaria* and *Panicum* (11 spp. each), *Setaria* (9 spp.), *Cenchurus* (8 spp.), *Arthraxon, Crytococum* and *Eulalia* (5 spp. each), *Bothriochloa, Pasplalum* and *Urochloa* (4 spp. each), five genera (*Apocopis, Capillipidium, Dicanthium, Iseilema* and *Saccolepis*) are with three species each. Besides, there are 16 genera with two species each. There are 31 genera represented with a single species.

The 172 grass taxa found are largely perennials (102; 59.3%). The rest (70; 40.7%) are annuals (Therophytes). The perennation is largely by rhizomes, root stocks, etc. These grasses quickly regenerate after rains from the dried or burnt out stocks. The grass roots systems (adventurous type) provide good hold to soil from erosion on hill slopes besides providing the ground abode to rodents with the moisture and hiding opportunities. The roots are the greatest biomass providers for grassland productivity and carbon stocks.

On morphology/habit and habitat, we have (i) Tall grasses (e.g.: *Apluda mutica* L.; (ii) Hill top grasses (e.g. *Arundinella mesophylla* Nees ex Steud.); (iii) Foothills (e.g. *Themeda triandra* Forssk.); (iv) Open areas (e.g. *Heteropogon contortus* (L.) P. Beauv.); (v) Poor soils (e.g. *Eremopogon foveolatus* (Delile) Stapf; (vi) Wetland areas (e.g. *Imperata cylindrica* (L.) P. Beauv.; (vii) Riparin grasses (e.g. *Paspalum scrobiculatum* (L.) Mant.; and (viii) Rocky crevices (e.g. *Pogonatherum crinitum* (Thunb.) Kunth).

The *Podu* cultivation and regular fires are the major threat to grasslands along the Eastern Ghats, more so in the northern parts of Andhra Pradesh and Nallamalais. In East Godavari, Visakhapatnam and Vizianagaram districts, the ethnic peoples Savarahs, Konda

Reddis, Valmikis and Koyas inhabit these hilly upland (agency) areas and depend mostly on various non-timber forest products, including grasses.

The following are the important and potential grasses for the forage of domesticated animals. *Digitaria abludens* (Roem. & Schult.) Veldkamp., *Digitaria abludens* (Roem. & Schult.) Veldkamp., *Oplismenus compositus* (L.) P. Beauv., *Eriochloa procera* (Retz.) C.E. Hubb., *Setaria plicata* (Lam.) T. Cooke and *Trachys muricata* (L.) Pers.

The *endemic* grasses to India present in Andhra Pradesh are *Arundinella mesophylla* Nees ex Steud., *Chrysopogon asper* Heyne ex Blatter & McCann, *Dimeria connivens* Hack., *Heteropogon fischerianus* Bor, *Lophopogon tridentatus* (Roxb.) Hack., and *Parahyparrhenia bellariensis* (Hack.) Clayton. On the other, *Dimeria connivens* Hack., *Dimeria orissae* Bor and *Heteropogon fischerianus* Bor found in Telangana state need further ecological assessment for their conservation.

The *invasive* grasses found in the study area, as serious threat to native grasses, are *Cenchrus americanus* (L.) Morrone, *Cenchrus purpureus* (Schumach.) Morrone, and *Melinis repens* (Willd.) Zizka; they were noted spreading into open habitats, bunds of agricultural fields, fallow lands and in abandoned *podu* cultivated areas, including forest fringes. The invasive grasses are creating greater frequency and extent of fires in grasslands and savannahs of the study area, more so on hill slopes of Eastern Ghats.

As part of the present study, the presence of *Arundinella mesophylla* (Poaceae: Panicoideae: Andropogoneae) was reported from Eastern Ghats which is known from the Western Ghats (Gurappa & Kumar, 2022a). Another publication was the Lectotypification of the grass *Ischamemum thomosianum* Stapf ex C.E.C. Fisch. (Gurappa & Kumar, 2022b).

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Annexure - I

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WHOM-SO-EVER CONCERNED

This is to certify that **Mr. Settipalle Gurappa,** Research Scholar, Department of Botany, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India,, who has been working in the Systematics Laboratory under Dr. Vatsasvaya S Raju (Retd. Professor) has submitted his grasses in our Herbarium (KUW), on 08th July, 2022.

Md Mustafa

(Dr. Md. MUSTAFA)

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APPENDIX-I (Publications)

PAPERS PUBLISHED:

1. **Settipalle Gurappa** & Thiruppathi Senthil Kumar, 2022. Lectotypification of *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. (Poaceae: Panicoideae: Andropogoneae**).** Adansonia, 44(20):211-214 (ISSN/eISSN: 1280-8571/1639-4798) Web of Science.

2. **Settipalle Gurappa** & Thiruppathi Senthil Kumar, 2022. Presence of *Arundinella mesophylla* (Poaceae: Panicoideae-Andropogoneae) in Eastern Ghats of India. Journal of Economic and Taxonomic Botany, 46 (1 & 2): 19-21. (ISSN:0250-9768) Web of Science.

3. **Settipalle Gurappa**, Thiruppathi Senthil Kumar & Vastavaya S. Raju, 2020. Occurrence of *Dimeria borii* (Poaceae: Andropogoneae – Ischaeminae) in Eastern Ghats and its Taxonomic Rank as a species. Journal of Economic and Taxonomic Botany, 44 (1-4):10-13. (ISSN:0250-9768) Web of Science.

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Lectotypification of *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. (Poaceae: Panicoideae: Andropogoneae)

Settipalle GURAPPA &
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Lectotypification of *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. (Poaceae: Panicoideae: Andropogoneae)

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KEY WORDS
India,
Presidency of Madras,
Gideon Thomson,
grass,
lectotypification.

ABSTRACT
In the systematic study of Panicoid grasses of southern India and in the process of taxonomic validation of grasses described from India, *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. is lectotypified with taxonomic notes.

MOTS CLÉS
Inde,
Province de Madras,
Gideon Thomson,
graminée,
lectotypification.

RÉSUMÉ
Lectotypification de Ischaemum thomsonianum *Stapf ex C.E.C.Fisch. (Poaceae: Panicoideae: Andropogoneae).*
Dans l'étude systématique des graminées panicoïdes du sud de l'Inde et dans le processus de validation taxonomique des graminées décrites de l'Inde, *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. est lectotypifiée avec des notes taxonomiques.

INTRODUCTION

Ischaemum L. (Linnaeus 1753: 1049), a tropical grass genus of 82 species, is distributed worldwide (Clayton *et al.* 2006). It is represented in India by 62 species, two varieties and three sub-varieties (Prasanna pers. comm. 2021). The genus is currently treated in the tribe Andropogoneae subfamily Panicoideae of Poaceae (Kellogg *et al.* 2020). *Ischaemum thomsonianum* Stapf ex C.E.C.Fisch. was described by Fischer (1934: 1722) from Peninsular India based on the specimens collected by G. Thomson from "Mysore; Cochin; Travancore; up to 3,000 ft." Native range: India to China (Yunnan) and Indo-China: India, Bangladesh, Myanmar, Andaman & Nicobar islands, South-central China and Vietnam. In India, it is reported from Maharashtra, Karnataka and Kerala (Kellogg *et al.* 2020; POWO 2021).

During the taxonomic study of Panicoideae, the authors found that the species name *I. thomsonianum* Stapf ex C.E.C. Fisch. requires lectotypification. While searching for the original material from the habitat India on which the species was based, four specimens of Gideon Thomson, Esq. (brother of Thomas Thomson (1817-1878; Superintendent of Botanical Garden, Calcutta: 1854-1861) were located. There are two sheets at Kew (K: Circular Ink/hand stamp 'Herbarium Hookerianum 1867': Madras collection number 99), one in Royal Botanic Garden, Edinburgh (E) and another at Central National Herbarium (CAL): 1) Maisor & Carnatic, Madras, *G. Thomson s.n.* (K000245701), labeled as the type material with no date of collection but with scattered illustrations drawn on the sheet; 2) Maisor and Carnatic, 1899, *G. Thomson s.n.* (K000245702), with pencil illustrations on a pasted paper; 1899, the year of collection mentioned in the Kew data sheet (K000245702) is an obvious error for C.B.Clarke's workout date on the sheet in September 1899; 3) Maisor & Carnatic, *G. Thomson s.n.* (E00393557) which was again of original material from 'Herbarium Hookerianum 1867' presented by the Herbarium, Royal Gardens, Kew, with isotype label; and 4) Madras & Concan, 1852, *G. Thomson s.n.* (CAL0000002287); P.R. Sur (*det.*; *s.d.*); isotype as per Srivastava & Nair (2010: 89) and Singh & Rao (2008: 824). The last-specimen mentioned (CAL0000002287) is a different collection and not from the type locality. Obviously, it is not an isotype as labeled or cited in the literature. Furthermore, this specimen was not cited either by Hooker filius or Fischer in the species accounts concerned. Moreover, the first three (K, E) are the specimens (sheets) authenticated by Fischer in 1932.

TYPIFICATION

Family POACEAE Barnh.
Genus *Ischaemum* L.

Ischaemum thomsonianum Stapf ex C.E.C. Fisch.
(Fig. 1)

Flora of the Presidency of Madras 3: 1722 (Fischer 1934).

TYPE CITATION. — " Mysore; Cochin; Travancore; up to 3,000 ft.".

LECTOTYPE (here designated). — **India**. Maisor & Carnatic, *G. Thomson s.n.* (lecto-, K[K000245702, image]!; isolecto-, K[K000245701, image]!; E[E00393557, image]!).

DISTRIBUTION. — **India**. Karnataka, Kerala, Maharashtra and Tamil Nadu.

REMARKS

Hooker filius (1897: 135) identified the grass specimens of G. Thomson from "Mysore or the Carnatic" as *Ischaemum murinum* Forst. in September 1889, C.B. Clarke dissected the type material, illustrated it (as can be seen from the original material of two sheets at Kew, cited in the 'Introduction') and identified it to be the species of Forster (Forster 1780: 185). But, later, on examination, O. Stapf found it different from the New Caledonian species *I. murinum* Forst. (Native range from New Guinea to SW Pacific) and assigned the name *I. nonum* Stapf (*det.*; *s.d.*).

Having confirmed of its distinct identity, Fischer (1934: 1722) provided a new replacement name "*Ischaemum thomsonianum*, Stapf MS., n. nom. differently from *I. murinum* Hook.f. non Forst.; FBI. vii. 135", as suggested by Stapf in preference (cf. determinavit slip on the original material by C.E.C. Fischer; 14.IX.1932 at K and 20.XII.1932 at E.

No later homonym situation arise in the present case but misapplication of a validly published name.

While proposing the new name in *Flora of Madras,* Fischer (1934: 1722) proposed the name in the species list of *Ischaemum* with its distribution as "Mysore; Cochin; Travancore; up to 3,000 ft.'. The name has a diagnostic key (Fischer 1934: 1719) but no description following the name, as per the format of *Flora of Madras*. The description was provided earlier by Hooker filius (1896 ["1897"]). Moreover, Fischer (1934: 1722) proposed a new name but not a new species, which was an error. However, having mentioned "non G. Forst." he excluded its type. Conversely, *I. thomsonianum* is an accepted name (Bor 1960; Karthikeyan *et al.* 1989; Sur 2001; Srivastava & Nair 2010; Kellogg *et al.* 2020) but needs lectotypification according to ICN for Algae, Fungi, and Plants (Turland *et al.* 2018).

Finally, of the original material housed at Kew, the specimen K000245702 is the most suitable having pencil sketches (drawings of dissected floral parts pasted at one place) by C.B. Clarke, and the sheet matches well with the key provided by Fischer in *Flora of Madras* (Fischer 1934: 1719). Therefore, it was chosen and designated here as lectotype for *I. thomsonianum* Stapf ex C.E.C. Fisch.

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The authors are grateful to Dr Kanchi N. Gandhi (Nomenclature Registrar, Harvard Herbaria), Professor Dr Vatsavaya S. Raju (Kakatiya University, Warangal, India) and Dr P. V. Prasanna (Botanical Survey of India, Deccan Regional Centre, Hyderabad) for their constructive criticism on the manuscript, Dr Alok R. Chorghe (Rajiv Gandhi Regional

Fig. 1. — Lectotype of *Ischaemum thomsonianum* Stapf ex C.E.C. Fisch. (K000245702). © The Board of Trustees of the Royal Botanic Gardens, Kew.

Museum of Natural History, Sawai Madhopur, Rajasthan) for academic help, and the Keeper, Kew Herbarium, for making available the digital images of type specimens for examination while the copy rights of their use rests with the Kew. Thanks are due to the Director, Botanical Survey of India and Dr R. K. Gupta (HoO, CNH), Kolkata for providing the digital image of type specimen, Dr A. Lakshmi Prabha, Professor and Head, Department of Botany, Bharathidasan University, Tiruchirappalli for facilities and Dr M. V. Rao, retired Professor, Department of Botany, for encouragement, and DST-PURSE (Grant No.SR/PURSE Phase 2/16) and UGC-SAP DRS-II (No.F.5-13/2018/DRS-II (SAP-II), for financial support.

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PRESENCE OF *ARUNDINELLA MESOPHYLLA* (POACEAE: PANICOIDEAE–ANDROPOGONEAE) IN EASTERN GHATS OF INDIA

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Introduction

The genus *Arundinella* Raddi (Poaceae) is a pan-sub-tropical genus with about 50 species (Veldkamp, 2015). It is distributed primarily in Asia (Clayton & Renvoize, 1986) with 29 species occurring in India (Kellogg *et al*., 2020). During the botanical exploration in Seshachalam Biosphere Reserve (Tirumala), Eastern Ghats, India, interesting specimens of *Arundinella* were collected in October, 2019. After examination and perusal of relevant literature (Fischer, 1934; Bor, 1960), the specimens were identified as *Arundinella mesophylla* Nees ex Steud. (Panicoideae: Andropogoneae), an endemic grass distributed at high altitude Western Ghats (Karnataka, Kerala and Tamil Nadu) of Peninsular India. The occurrence of this species was not recorded for Andhra Pradesh (Benjamin & Murthy, 2013; Pullaiah, 2018), southern Eastern Ghats of Tamil Nadu (Britto, 2019) or the entire Eastern Ghats (Pullaiah & Karuppusamy, 2020). The voucher specimens of *Arundinella mesophylla* is deposited at Kakatiya University herbarium, Warangal (KUW).

Taxonomic treatment

Arundinella mesophylla Ness ex Steud., Syn. Pl. Glum. 1: 115. 1854; Hook.f., Fl. Brit. India 7: 69. 1896; C.E.C. Fischer in Gamble, Fl. Madras 3: 1801. 1934; Bor, Grasses Burma, Ceylon, India & Pakistan 423. 1960; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 2: 367. 1987; V.J. Nair in A.N. Henry *et al*., Fl. Tamil Nadu Anal. 3: 92.1989; Bhattacharya (Sunanda Moulik), Grasses Bamboos India 1: 58. 1997: Kabeer & V.J. Nair, Fl. Tamil Nadu Grasses 338.2009.

Type: INDIA. Tamil Nadu, Courtallum, Numer. List [Wallich] 8663B.

Perennial (so far described as annual/therophyte), whole plant tubercular hirsute; culms 30–50 cm high, creeping, decumbent to erect; nodes glabrous. Leaf blade 4 cm × 0.3 mm, distichous, linear-lanceolate, apex acuminate, hairy on both surfaces. Ligules membranous, fimbricate. Leaf sheath not strongly compressed, tubercle based-hairy. *Racemes* up to 4 cm long, axis hairy, branches 2 cm long. *Spikelets* 0.3–5 mm long, lanceolate, pedicelled, pedicel 0.1 mm long, bisexual, awned. *Glumes* unequal, 0.5 mm long, chartaceous, tubercled-hairy on nerves. *Lower lemma* 0.3 mm long, lanceolate, glabrous, membranous, obtuse, 3-nerved, margins folded, keeled. *Upper lemmas* 0.2 mm long, apex with 2 setae, setae equal and as long as lemma, awn 0.5 mm long, keeled, base bearded. *Lower paleas* elliptic-oblong, hyaline, obtuse, margins ciliate, keeled. *Upper paleas* elliptic-lanceolate, hyaline, apex acute, 2-nerved, keeled. *Stamens* 3; anthers, 0.1 mm long; stigmas 0.1–2 mm long, pink. *Caryopsis* oblong to ellipsoid (Plate 1).

Flowering and Fruiting: October-January.

Illus.: Kabeer & Nair, Fl. Tamil Nadu – Grasses, Fig. 65. 2009.

Chromosome number: n = 8 (Basappa & Muniyamma, 1981).

Specimens examined: INDIA: **Andhra Pradesh**: Chittoor distr., Tirumala, Papanasanam, 26.10.2019, *S. Gurappa* 261052 (KUW). **Kerala:** Mannarghat Range, 20.12.1972, *K.N. Subramaniyam* 4623 (FRC)!. **Tamil Nadu:** Kodaikanal, Shembaganu-Periculam Path, 1800m: 2.6.1984, *S.J. Britto* 40266 (RHT)!; Vembadi Peak, 2400m, 7.8.1984, *K.M. Matthew* 40707 (RHT)!; Vellimalai-Anamalai Hills, 3500 m, 25.10.193, *C.E.C. Fischer* 3650! (FRC)!; Upper Palanis, 7200 m, 19.8.1911, *C.E.C. Fischer* 2878 (FRC)!.

Native Range: INDIA: Endemic to Southern India (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu – Bor, 1960; Sreekumar & Nair, 1991; Kabeer & Nair, 2009; Kellogg *et al.,* 2020).

Plate 1. *Arundinella mesophylla*. **A –** Herbarium specimen; **B –** Inflorescence.

Habitat and Ecology: The Seshachalam Biosphere Reserve in Andhra Pradesh is very rich in biodiversity with dry deciduous forest having several endemic species such as *Boswellia ovalifoliolata* N.P. Balakr. & A.N. Henry, *Cycas beddomei* Dyer, *Pimpinella tirupatiensis* N.P. Balakr. & Subram., *Pterocarpus santalinus* L.f., *Shorea tumbuggaia* Roxb, *Sophora interrupta* Bedd., *Syzygium alternifolium* (Wight) Walp. and *Terminalia pallida* Brandis, with the hill top and openings of forests filled with individuals of species of *Arundinella* and *Phoenix.* The present collection is obviously an extended distribution of *A. mesophylla* to the southern Eastern Ghats. Higher elevations and top grassy open areas and rocky slopes are with *Arundinella setosa* and *A. pumila,* and species of *Allmania, Chrysopogon, Crotalaria, Eulalia, Habenaria, Heteropogon, Microchloa, Phyllanthus* and *Tripogon*. *Arundinella mesophylla*is a good fodder for Nilgir tahr (*Nilgiritrgus hylocrius* Ogilby, 1833), a mountain ungulate endemic to the Western Ghats and parts of southern Eastern Ghats (Rice & Edblom, 1986), the State Animal of Tamil Nadu.

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rappalli), Tamil Nadu, for herbarium consultations, Professor Dr Vatsavaya S. Raju (Kakatiya University, Warangal) and Dr P.V. Prasanna (Botanical Survey of India, Deccan Regional Centre, Hyderabad) for their constructive criticism. Thanks are due to the Dr A. Lakshmi Prabha, Professor and Head, and Dr M.V. Rao, Retd. Professor, Department of Botany, Bharathidasan University, Tiruchirappalli, for facilities and encouragement. The financial support extended through DST-PURSE (Grant No. SR/PURSE Phase 2/16) and UGC-SAP DRS-II (No. F.5-13/2018/DRS-II (SAP-II) is gratefully acknowledged.

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OCCURRENCE OF *DIMERIA BORII* (POACEAE: ANDROPOGONEAE – ISCHAEMINAE) IN EASTERN GHATS AND ITS TAXONOMIC RANK AS A SPECIES

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Introduction

During the floristic study of Bharathidasan University campus, Tiruchirappalli, Tamil Nadu, India, an interesting species of *Dimeria* R.Br. was collected in February 2019. On examination, the specimens were identified to be of *Dimeria borii* Sreek., V.J. Nair & N.C. Nair, a grass species thus far believed to be endemic to Kerala, southern Western Ghats. In the recent past, KiranRaj *et al.* (2015) reduced it to the status of subspecies under *D. mooneyi* Raizada ex Mooney, which was described on the specimens collected by Dr H.F. Mooney in 1949 from northern Eastern Ghats, southwest of Sambalpur district, Odisha, India. The WCSP (2020), Tropicos.org and other important websites on plant names are maintaining *Dimeria borii* as an accepted species.

Dimeria is represented by 65 species (Teerawatananon *et al*., 2014) which are distributed from Madagascar, India, Sri Lanka, China, Korea, Indonesia, Micronesia and Australia (Bor, 1952; KiranRaj *et al.,* 2015). Majority of these (62%) are endemic to Peninsular India (KiranRaj, 2008). But, as per WCSP (2020), there are 56 species of *Dimeria* found globally. Amongst them, 40 (71.43%) species are known from India. As per the latest checklist (Kellogg *et al*., 2020), 50 taxa of *Dimeria* occur in India.

From Eastern Ghats, Krishnamurthy *et al*. (2014) enlisted 12 species of *Dimeria* but two of them are considered synonyms: *D. acutipes* Bor with *D. avenacea* (Retz.) C.E.C. Fisch. and *D. trimenii* Hook.f. with *D. pubescens* Hack. Recently, Pullaiah & Karuppusamy (2020) reported 11 species of *Dimeria* from Eastern Ghats. The difference between their species lists is *D. fischeri* Bor by the former authors and *D. bialata* C.E.C. Fisch. by the latter. But, both the works have not reported *D. borii* form the region of Eastern Ghats. So also, this species has not been reported for Tamil Nadu (Kabeer & Nair, 2009). It is not found in the recent flora of northern and central Tamil Nadu (Britto, 2019) which region does include Tiruchirappalli where from the present report is made.

According to Bor (1952: 570), *D. mooneyi* is very close to *D. bialata*; he reported the former species from Odisha in the north and Mysore (Shimoga: Karnataka) in the south. Later, Bhat & Nagendra (2001: 272) reported *D. mooneyi* from three localities in Udipi district of Karnataka; there seems to be difference between the descriptions therein and those of the specimens from type locality (Chandramohan, pers. com. 2020). KiranRaj *et al.* (2015: 49) reduced *D. borii* as subspecies of *D. mooneyi*, without any comment or key to distinguish the subspecies. More recently, Kellogg *et al.* (2020) reduced *D. borii* as a synonym of *D. mooneyi.* So, there exists a dispute as regards the standing of *D. borii* as a species. The present discovery of this taxon in Tiruchirapalli district, Tamil Nadu, extends its native range from southern Western Ghats to southern Indian peninsula. Besides, the present study makes an assessment of its taxonomic rank.

Taxonomic treatment

KiranRaj *et al*. (2015) relegated *D. borii* Sreek., V.J. Nair & N.C. Nair to the status of subspecies under another endemic species, *D. mooneyi* Raizada ex Mooney, known so far from Karnataka (doubtfully in Kerala) on the west and Odisha on the eastern peninsula. *Dimeria mooneyi* is diagnosed by narrowly winged rachis, 5 mm long lower glume, keel winged below, upper glume with acute apex, wings of even texture, anthers about 1.7 mm long (Mooney, 1950). According to Bor (1952), the wings to glumes are the most important diagnostic character in the genus *Dimeria.* The lower glume is rarely winged all along the keel; but, such a wing is present in *D. bialata* and *D. mooneyi*. Most often, the lower glume is furnished

with a wing only at the tip and becomes very compressed. However, the upper glume is often strongly winged all along the keel. This is a very constant and diagnostic character for those species where it exists. The wing texture is papery in *D. fischeri* Bor but it is very thick and corky in *D. mooneyi*. Where the wing is confined to a small area below the tip, it is usually very conspicuously marked with green nerves. However, the spikelet is 4 mm or more and the upper glume acuminate in *D. mooneyi* whereas the spikelet less than 4 mm long and the upper glume acute in *D. bialata*.

Table 1. Differences between *Dimeria mooneyi* and *D. borii*.

Character	Dimeria mooneyi	Dimeria borii
1. Culm length	10–20 cm	15 cm
2. Nodes	3–6 geniculate, beared	1–3 geniculate, glabrous or hairy
3. Racemes	Usually binate, rarely even 1 or 3; 5.8 cm long, 1.5 mm wide	Solitary; 2–4 cm long
4. Rachis	Linear, flat, narrowly winged, 1.5 mm wide, zig-zag, falcate	Flattened, not winged, straight
5. Spikelets	8 mm long; callus densely beared	4–6 mm long; callus cuneate, golden hairy
6. Lower Glume	Oblong, 4 or 5 mm long, acuminate, 1–keeled, winged thickly in its lower two-thirds; awned	Broadly lanceolate, 2–3 mm long, shortly acuminate, wing elliptic, corky; not keeled
7. Upper Glume	Oblong, 4–6 mm long, apex acute, 1-keeled, broadly winged	Elliptic lanceolate, 4–5 mm long, acuminate, broadly winged, not keeled but corky in the lower 2/3, papery towards apex
8. Awn	10 mm long	10–16 mm long
9. Anther	*ca*. 1.8 mm	*ca*. 1 mm
10. Distribution	Northern Eastern Ghats (Odisha); Central Western Ghats (Karnataka)	Southern Peninsular India (Kerala, Tamil Nadu)

After Mooney (1950), Bor (1952, 1960), Sreekumar *et al.* (1982), Sreekumar & Nair (1991), Chandramohan (2017) and present study.

Dimeria Sect. **Loriformes** Bor is mostly confined to Peninsular India constituting *D. bialata, D. borii* and *D. mooneyi* alliance. Its members are therophytes with racemes 1 or 2 (or very rarely 3: Chandramohan, pers. com. 2020); raceme internodes 0.5–1 mm; rachis straight, compressed, dorsally flattened and winged; spikelets overlapping, early disarticulating from 0.3–0.5 long; and distinctly compressed pedicles appressed to the wing of the rachis axis.

Sreekumar *et al.* (1982) described *D. borii* and allied it with *D. mooneyi* with contrasting characters such as glabrous nodes, raceme rachis 4 × 1 mm, etc. These traits according to KiranRaj (2008) are variable and the only difference is one mm long callus. Therefore, KiranRaj *et al.* (2015) reduced *D. borii* to a subspecies under *D. mooneyi*. However, a critical examination of the fresh specimens of *Dimeria borii* and a comparison of the protologues and the descriptions of *D. mooneyi* (Mooney, 1950) revealed certain differences between them (Table 1). In view of the difference, *D. borii* cannot be reduced to the synonymy of *D. mooneyi* (Kellogg *et al.,* 2020) or can be treated as an intraspecific taxon (KiranRaj *et al*., 2015). Therefore, *D. borii* is better maintained as a species of its standing till we receive conflicting molecular or other evidence.

Key to distinguish *Dimeria borii* from *D. mooneyi*

1a. Racemes paired predominantly, rarely 1 or 3; glumes oblong; lower glume 1-keeled, winged below the keel; upper glume winged one side all along the keel ..... *D. mooneyi*

1b. Racemes solitary; glumes lanceolate; lower glume not keeled, wing elliptic and corky; upper glumes not keeled, broadly winged ..... *D. borii*

Dimeria borii Sreek., V.J. Nair & N.C. Nair, J. Econ. Taxon. Bot. 3(2): 657. f.1. 1982.

Type: INDIA, Kerala, Calicut distr., Kanjirakkadavu, near Kakkayam (alt. 3000 ft): 26.11.1981, *P.V. Sreekumar* 71855 (Holo – CAL; Iso: K, MH!)

Therophyte; culms erect, [5] –7–15 cm, branched, geniculate, nodes 2 or 3, glabrous or hairy. Leaf sheath not strongly compressed, keeled from top to below. *Ligule* membranous, 2–3 mm. *Leaf blade* 3–5 cm long, 2–3 mm wide, base rounded, lanceolate, margin tubercle-based hairy. *Inflorescence* (racemes) solitary, 2–4 cm long, 1–3 per plant; rachis capillary, not winged, straight to falcate, margin shortly ciliate. *Spikelets* 4–6 mm, hermaphroditic, obovate, base beard, florets two. *Glumes* two, unequal; shorter (*lower*) glumes 2–3 mm, lanceolate, apex shortly acute to acuminate, coriaceous; longer (*upper*) glumes 4–5 mm, lanceolate, apex acuminate, winged, coriaceous, margin shortly ciliate. *Lower floret*: 3 mm long, barren, lemma oblanceolate, acute, hyaline, 1-nerved and margins ciliate in the distal half. *Upper floret*: 4–5 mm long, hermaphroditic; lemma 3–5 mm, two lobed and awned, lobes apex acuminate, very delicate, one-nerved, glabrous, awn, 10–16 mm long, column 4 mm, twisted, brown, bristle pale, scabrid;

stamens two, anthers 1 mm, stigmas 1 mm. *Caryopsis* 3–4 mm long, ellipsoidal (**Plate 1**).

Plate 1. **Specimen of *Dimeria borii* from** Tamil Nadu, India. **A–C.** Variation in number of racemes (1–3) per plant.

Flowering and Caryopsis time: December–February.

Illustration: Sreekumar *et al*., Fl. Kerala Grasses, Pl. 14. 1991.

Specimen examined: INDIA, Tamil Nadu, Tiruchirapalli distr., Bharathidasan Univ. campus: 27.02.2019, *S. Gurappa & T. Senthil Kumar* 0027 (KUW).

Range: INDIA (Endemic to Southern India: Kerala and Tamil Nadu).

Ecology: Sandy and rocky areas, associated with *Alloteroposis cimcinia* (L.) Stapf, *Apocopis mangalorensis* (Hochst. ex Steud.) Henrad., *Cyprus* sp., *Drosera burmanni* Vahl, *D. indica* L., *Eriocaulon* spp., *Fimbristylis* spp., *Perotis indica* (L.) Kuntze, *Utricularia* sp. and *Xyris indica* L.

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