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Floristic Diversity of Grasses (Poaceae) in Selected Wetlands of Tirunelveli District, Tamil Nadu

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Abstract

The present study evaluates the diversity and distribution of grasses (Poaceae) in selected wetland habitats of Tirunelveli district, Tamil Nadu, South India. Field surveys were conducted from July 2022 to March 2023 across marshes, paddy fields, pond margins, and riverine ecosystems. A total of 88 grass taxa belonging to 48 genera and six subfamilies were recorded, including five taxa endemic to Tamil Nadu. Among the subfamilies, Panicoideae was the most dominant in diversity with 53 species, followed by Chloridoideae (28), while Aristidoideae (3), Micrairoideae (2), Arundinoideae (1), and Oryzoideae (1) were lesser represented. The results emphasize the floristic richness and conservation significance of wetlands in the Tirunelveli district and provide baseline information for wetland biodiversity management and conservation planning.

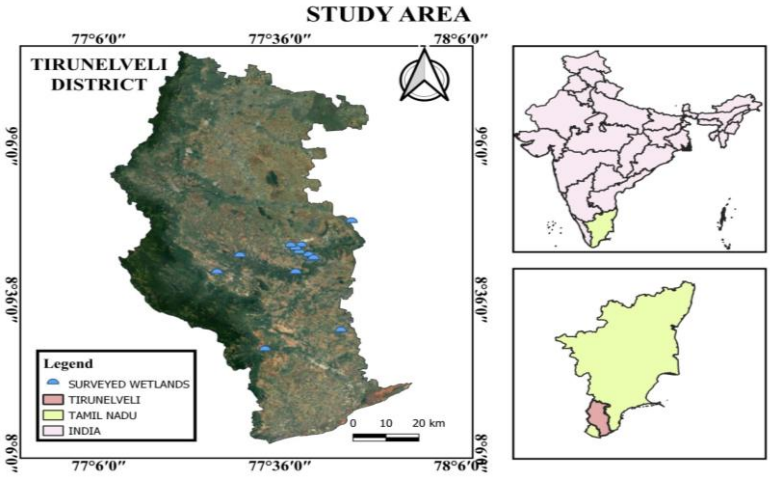
Key words: Endemic grasses, Floristic survey, Grass flora, Marshes, Paddy fields, Poaceae, Ponds, Submerged plains, Tirunelveli and Wetlands.

Introduction

Wetlands are among the most productive ecosystems globally, functioning as dynamic transition zones between terrestrial and aquatic environments and providing a wide range of ecological services such as groundwater recharge, flood mitigation, control of soil erosion nutrient cycling, and habitat provision for diverse biota (Satheesh et al., 2018). In India, wetlands are of immense ecological and socio-economic importance, supporting fisheries, irrigation, tourism, water purification, and local livelihoods. Wetland ecosystems support a wide array of aquatic and semi-aquatic vegetation, including free-floating, submerged, emergent, amphibious, and marsh plants.The hydrological regime of wetlands strongly influences soil properties and vegetation structure, enabling the establishment of specialized hydrophytic plant communities adapted to waterlogged and anaerobic conditions (Rejmankova et al., 2006). Despite pronounced seasonal fluctuations in water availability, these ecosystems sustain high levels of biological productivity and ecological complexity.The Ramsar Convention has designated 75 wetlands in India as sites of international importance, of which 20 are located in Tamil Nadu (Tamil Nadu Wetland Mission, 2020). These wetlands are recognized based on criteria such as ecological uniqueness, support for threatened species, significance for water bird populations, and fisheries productivity, highlighting their conservation value at both national and global scales.Tamil Nadu is floristically rich, harboring about 6,723 plant taxa, among which Poaceae is one of the most diverse families with 479 recorded species (Narasimhan & Irwin, 2021). Grasses form a fundamental structural and functional component of wetland vegetation, contributing to primary productivity, sediment stabilization, nutrient cycling, and water filtration (Ban et al., 2017). Globally, Poaceae comprises approximately 780 genera and 12,000 species, making it one of the largest and most ecologically significant plant families (Packiaraj et al., 2019). In wetlands, grasses exhibit high ecological plasticity, occupy varied niches, and often dominate plant communities, along with other families such as Cyperaceae and Commelinaceae (Lakshmanan & Saravana, 2018).Despite their importance, wetlands worldwide are increasingly threatened by anthropogenic pressures and climate change. Agricultural expansion, urbanization, hydrological modifications, pollution, and biological invasions have led to widespread degradation and loss of wetland habitats. In India, invasive species such as *Eichhornia crassipes, Salvinia molesta, Pistia stratiotes,* and *Prosopis juliflora* have severely altered wetland structure and function, negatively impacting native biodiversity and water quality (Sarkar et al., 2021). In addition to ecological consequences, wetland degradation affects the economic and cultural services these ecosystems provide, including livelihoods, freshwater availability, carbon sequestration, and climate regulation (Bassi et al., 2014; Kingsford et al., 2016).In this context, the present study aims to document the diversity, distribution, and ecological characteristics of grass species occurring in selected wetlands of Tirunelveli district, thereby contributing baseline data essential for effective wetland management and conservation strategies.

Materials and Methods

Study Area: The study was carried out in selected wetland ecosystems of Tirunelveli district, Tamil Nadu, India, to document grass species diversity and distribution (Table 2). The district is situated between 77°09′–77°59′ E longitude and 8°08′–9°25′ N latitude, encompassing an area of 5,597.55 km² and comprising nine taluks within three revenue divisions. It is bordered by Virudhunagar district to the north, Kanyakumari district and the Gulf of Mannar to the south, Thoothukudi district to the east, and Kanyakumari district and the state of Kerala to the west. The physiography is largely plain with slight undulations in the western and northwestern regions, and soils range from alluvial and black to red and lateritic types. The drainage system is dominated by the Thamirabarani River and its associated tributaries, while the climate is semi-arid tropical with distinct cool (December–March), hot (April–June), and monsoonal seasons, receiving most rainfall from the northeast monsoon. Temperatures peak above 35 °C during April–May and drop to around 22.9 °C in November–December, conditions that strongly influence wetland vegetation dynamics. The selected wetlands were chosen based on their ecological significance, extent of anthropogenic pressure, and representation of major wetland types in the Tirunelveli district. Several sites experience intensive grazing, agricultural encroachment, and hydrological modification, making them suitable for assessing the response of grass communities to disturbance. The selection of these sites allowed for a comprehensive evaluation of grass diversity across both relatively undisturbed and human-influenced wetland habitats. Several of the surveyed wetlands are subjected to seasonal grazing, shoreline encroachments for agriculture, and sediment deposition, while also supporting fishing activities and serving as feeding and nesting grounds for migratory and resident water birds.



Floristics Survey for Grasses

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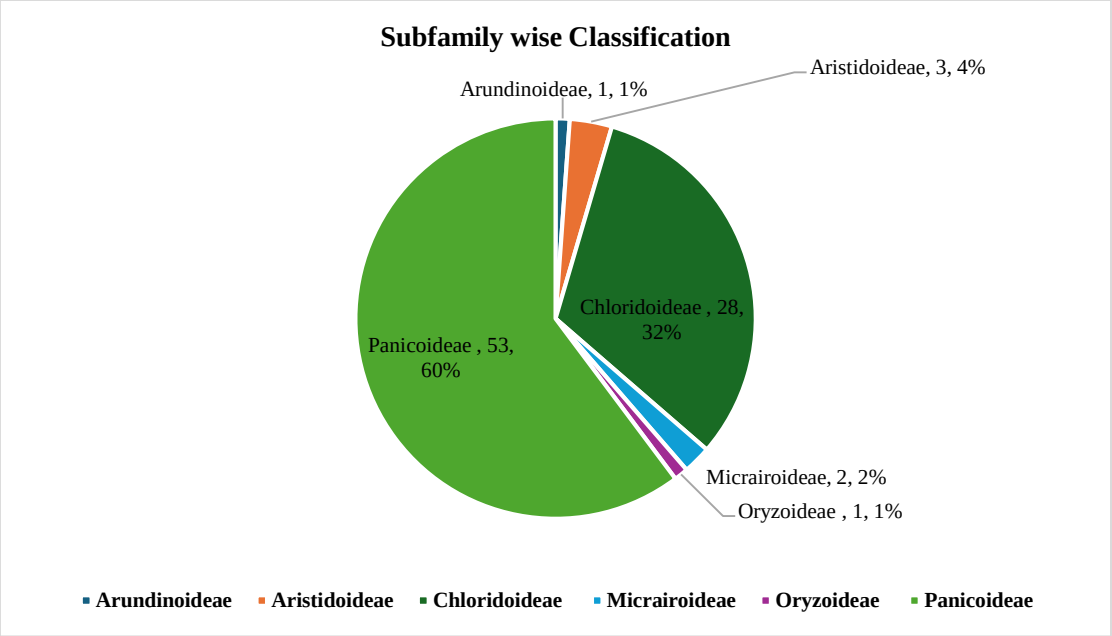
Floristic surveys were conducted between July 2022 and March 2023 across diverse hydrophytic and marshy habitats, including rice fields, ponds, tanks, rivers, canals, ditches, seasonal puddles, and other waterlogged areas, particularly following monsoonal rainfall. During field visits, observations on habit, habitat, inflorescence characters, phenology, and associated species were recorded, and specimens were photographed in situ. Collected grass specimens were processed using standard herbarium techniques, and detailed morphological characters were examined under a stereomicroscope. Species identification was carried out using regional floras, taxonomic literature, authenticated herbarium specimens, and online databases such as World Flora Online and Plants of the World Online. Voucher specimens were deposited in the Sundaranar Herbarium (SH). The collected data were analyzed for phenology, habitat preference, distribution, and morphological variation; nomenclature was verified, classification followed the APG IV system, taxa were arranged alphabetically, artificial identification keys were prepared where applicable, and information on endemic status, vernacular names, and uses was documented.

Results and Discussion

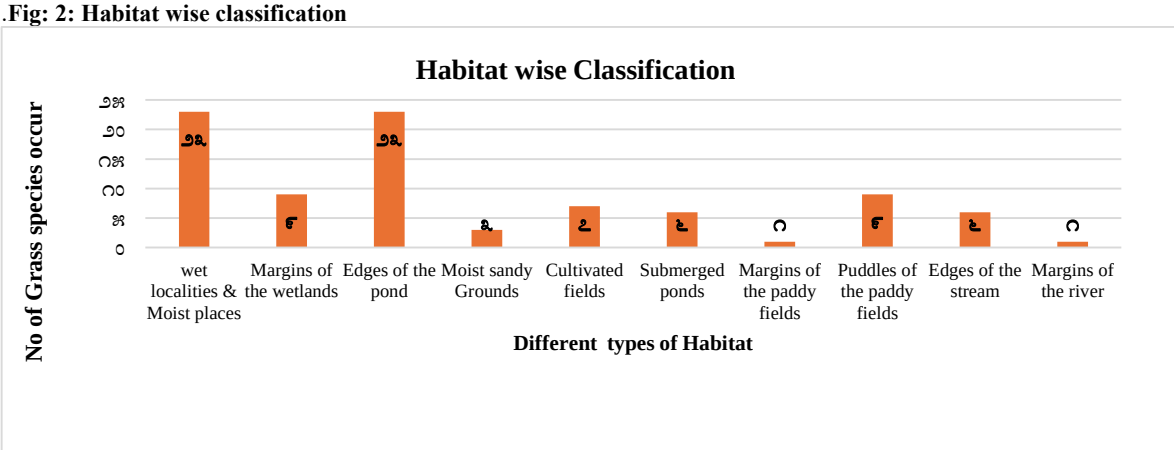
Floristic Composition and Diversity

The present investigation documents the floristic composition and diversity of grasses occurring in selected wetlands of Tirunelveli district, Tamil Nadu. A total of fifteen wetlands—Abishekapatti (Ab), Alaangamaraikulam (AK), Gangaikondan Periyakulam (GP), Gandhinagarkulam (GK), Gopalasamudram (GS), Ilanthaikulam (IK), Kammalankulam (KK), Kandiyaperi Kulam (KP), Koonthankulam (KTK), Nainarkulam (NK), Thirukkurungudi Kulam (TKK), Thalarkulam (TK), Thernakulam (TRK), Thulukkarkulam (TLK), and Vellalankulam (VK) were surveyed, collectively representing the major wetland types distributed across the district.Floristic analysis revealed a total of 88 grass taxa belonging to 48 genera and six subfamilies of Poaceae (Table 1 & Fig 1). These taxa were distributed across a wide range of habitats, including wet localities and moist places, wetland margins, pond edges, submerged ponds, moist sandy grounds, cultivated fields, paddy field margins, and stream and river edges, indicating considerable ecological adaptability. The highest species richness was recorded in wet localities and pond edges, each supporting 23 taxa, highlighting the strong influence of hydrological conditions on grass distribution.Based on habitat preference, the 88 taxa were categorized into distinct ecological niches:(Table 1 & Fig 2) wet localities and moist places (23 taxa), pond edges (23), wetland margins (9), submerged ponds (6), stream edges (6), cultivated fields (7), moist sandy grounds (3), paddy field margins (1), and river margins (1). This pattern reflects the ability of wetland grasses to occupy both permanently inundated and seasonally moist habitats, as well as moderately disturbed agricultural landscapes.Among the recorded subfamilies, Panicoideae was the most dominant, contributing 53 taxa, followed by Chloridoideae with 28 taxa, while Aristidoideae (3 taxa), Micraioideae (2 taxa), Arundinoideae (1 taxon), and Oryzoideae (1 taxon) were sparsely represented. This dominance is consistent with earlier studies from South Indian wetlands and reflects the adaptability of these groups to tropical climates and fluctuating moisture regimes.Notably, five taxa endemic to Tamil Nadu - *Iseilema jainianum, Ischaemum timorense, Dimeria ornithopoda, Arundinella ciliata,* and *Arundinella nervosa* were recorded from the surveyed wetlands. The occurrence of these endemic grasses underscores the role of wetlands as important refugia for regionally significant taxa and highlights the need for focused conservation of wetland habitats in the Tirunelveli district.

Fig: 1 Sub family wise classification



.Fig: 2: Habitat wise classification



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Discussion

The present study recorded a comparatively higher diversity of grasses, with 88 taxa belonging to 48 genera, from selected wetlands of Tirunelveli district, when compared with earlier wetland studies from other regions. Sukumaran and Jeeva (2011) reported 39 Poaceae species from wetlands of Kanyakumari district, emphasizing the ecological and economic importance of grasses such as Oryza, Cynodon, and Saccharum, a trend that is also evident in the present investigation where grasses occupy a wide range of wetland and agro wetland habitats. Likewise, Palit et al. (2017) documented 28 grass species representing 18 genera from the wetlands of Birbhum district, West Bengal, noting the dominance of certain genera in maintaining wetland health, although species richness there was lower than that observed in Tirunelveli, possibly due to regional differences in climate and hydrology. Within Tirunelveli district, Lakshmanan and Saravana Ganthi (2018) recorded 28 Poaceae species from the Nambineri wetland, further confirming the dominance of grasses among monocots. The higher number of taxa documented in the present study can be attributed to extensive spatial coverage, inclusion of multiple wetland types, and detailed habitat-wise sampling, highlighting the role of wetland heterogeneity in supporting rich grass diversity and reinforcing the need for their conservation and sustainable management. The presence of grazing, encroachment, and fishing activities in many of the wetlands may influence grass species composition by favoring disturbance-tolerant taxa, while potentially reducing the abundance of sensitive and endemic species. At the same time, the use of these wetlands by water birds and local fishing communities highlights their multifunctional ecological and socio-economic value.

Summary and Conclusion: The present study documents the diversity of grasses (Poaceae) in selected wetlands of Tirunelveli district, Tamil Nadu, recording 88 taxa belonging to 48 genera and six subfamilies, including five endemic taxa. Species richness was highest in wet localities and pond edges, highlighting the influence of hydrological conditions and habitat heterogeneity on grass distribution, with Panicoideae emerging as the dominant subfamily followed by Chloridoideae. Comparisons with earlier studies indicate relatively higher grass diversity in the Tirunelveli wetlands, likely due to extensive sampling across diverse wetland types. The occurrence of endemic and ecologically important species underscores the role of wetlands as biodiversity refugia, while the presence of grasses in agro-wetland habitats reflects their ecological adaptability and increasing human influence. Overall, the study provides baseline information essential for wetland conservation and sustainable management in the region.

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Plate 1: Common grasses found in Surveyed area:

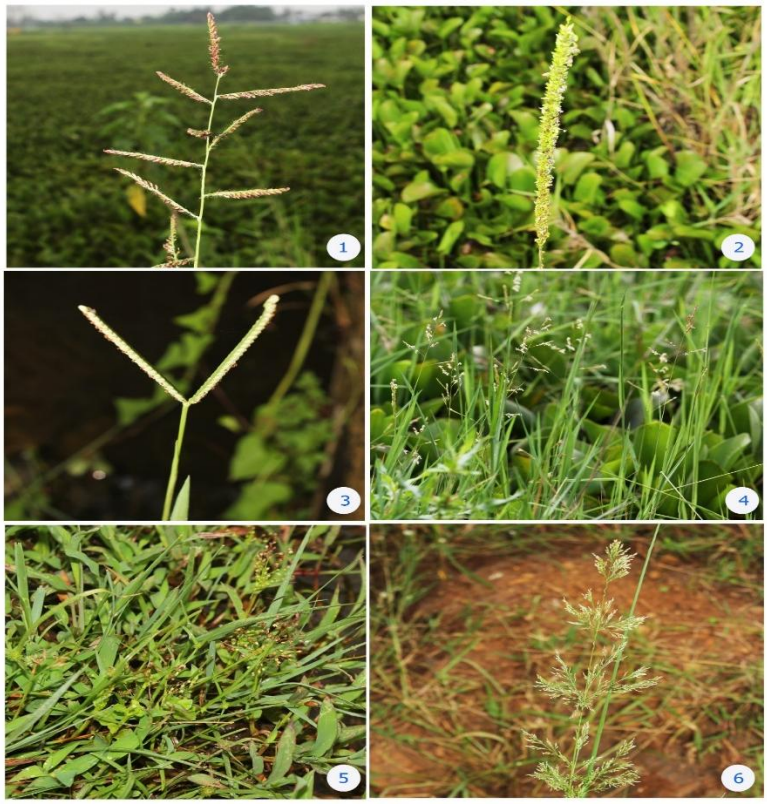

Fig 1. ***Urochloa mutica*, 2. *Sacciolepis indica* 3. *Paspalum scrobiculatum* 4. *Leersia hexandra*, 5. *Isachne gracilis*, 6. *Eragrostis japonica***

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Table 1. A checklist of grasses recorded in the Wetlands of Tirunelveli

S/No	Binomial Name	Locality	Phenology	Habitat
1	*Acrachne racemosa* (B.Heyne ex Roth) Ohwi	AB,GK	Mar - Dec	Wet localities
2	*Alloteropsis cimicina* (L.) Stapf	GK	Mar - Aug	Margins of the wetlands
3	*Apluda mutica* L.	AK,TRK	Throughout the year	Edges of ponds, ditches
4	*Aristida adscensionis* (L.)	GK	Throughout the year	Edges of ponds, ditches
5	*Aristida funiculata* Trin. & Rupr.	Gk	Nov - May	Moist sandy grounds
6	*Aristida hystrix* L.f.	Gk	June – March	Margins of the wetland
7	*Arundinella ciliata* Nees ex Miq.	Ak,TRK	Oct – Mar	Edges of ponds, ditches
8	*Arundinella nervosa* (Roxb.) Nees ex Hook. & Arn.	TRK	June – Aug	Edges of ponds, ditches
9	*Bothriochloa pertusa* (L.) A.Camus	GP,GK	Sep - June	Edges of ponds, ditches
10	*Cenchrus ciliaris* L.	AB,GK	Throughout the year	Wet localities
11	*Cenchrus pedicellatus* (Trin.) Morrone	GP,GK,KK	July – Feb	Wet localities
12	*Chionachne koenigii* (Spreng.) Thwaites	KK	July – Mar	Margins of paddy field
13	*Chloris barbata* Sw.	TK,VK	Throughout the year	Edges of ponds, ditches
14	*Chloris gayana* Kunth	AB	June - Nov	Moist sandy grounds
15	*Chloris montana* Roxb.	KTK	Throughout the year	Edges of ponds, ditches
16	*Chloris virgata* Sw.	KK	Oct – Feb	Edges of ponds
17	*Chloris wightiana* Nees ex Steud.	AB,GK	Throughout the year	Wet localities
18	*Chrysopogon aciculatus* (Retz.) Trin.	TRK	Apr - Nov	Wet localities
19	*Chrysopogon zizanioides* (L.) Roberty	AB	Aug - March	Margins of the pond
20	*Cynodon dactylon* (L.) Pers.	KP,TK,TRK,VK,GK	Throughout the year	Edges of streams
21	*Cyrtococcum longipes* (Wight & Arn. ex Hook.f.)	TRK	July – Mar	Margins of the paddy field
22	*Cyrtococcum trigonum* (Retz.) A.Camus	AK,TRK	July – April	Wet localities
23	*Dactyloctenium aegyptium* (L.) Willd.	AB,GK,KP,KTK	Throughout the year	Edges of ponds, ditches
24	*Dichanthium caricosum* (L.) A.Camus	AK	Sep – Mar	Cultivated lands
25	*Digitaria bicornis* (Lam.) Roem. & Schult.	TK	Aug – Feb	Edges of the stream
26	*Digitaria ciliaris* (Retz.) Koeler	AB,	Throughout the year	Cultivated fields
27	*Digitaria longiflora* (Retz.) Pers.	AK, TLK	June – Feb	Edges of ponds, ditches
28	*Digitaria sanguinalis* (L.) Scop.	AK,TRK		Wet localities
29	*Dimeria ornithopoda* Trin.	TRK	Nov - Jan	Edges of ponds, ditches
30	*Dimeria thwaitesii* Hack.	AK	Mar - Apr	Edges of ponds, ditches
31	*Dinebra retroflexa* (Vahl) Panz.	Kk,GS	Throughout the year	Cultivated fields
32	*Echinochloa colonum* (L.) Link	IK,KK,NK,TLK,TRK	Throughout the year	Puddles and paddy fields
33	*Echinochloa crus-galli* (L.) P.Beauv.	TK	Throughout the year	Puddles and paddy fields
34	*Eragrostiella bifaria* (Vahl) Bor	AK,TRK	Aug - May	Margins of the wetland
35	*Eragrostis aspera* (Jacq.) Nees	AK,TRK	Nov – Feb	Submerged of ponds
36	*Eragrostis atrovirens* (Desf.) Trin. ex Steud.	AK,TRK	July – Feb	Submerged of ponds
37	*Eragrostis gangetica* (Roxb.) Steud.	GK,GS,AK	Throughout the year	Cultivated fields
38	*Eragrostis japonica* (Thunb.) Trin.	AB,KK	Throughout the year	Moist places
39	*Eragrostis pilosa* (L.) P.Beauv.	AK,TRK	May – Mar	Moist places
40	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	KK,GK	Throughout the year	Wet localities
41	*Eragrostis unioloides* (Retz.) Nees ex Steud.	AK,TRK	Throughout the year	Edges of ponds, ditches
42	*Eragrostis viscosa* (Retz.) Trin.	AB,KK,GK	May – Mar	Edges of ponds, ditches
43	*Eriochloa procera* (Retz.) C.E.Hubb.	AB,KK,GK,TLK,VK	Throughout the year	Edges of ponds, ditches
44	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	AK,TRK	Throughout the year	Margins of the wetland
45	*Imperata cylindrica* (L.) Raeusch.	VK	Throughout the year	Wet localities
46	*Isachne globosa* (Thunb.) Kuntze	AK,TRK	May – Feb	Edges of ponds, ditches
47	*Isachne gracilis* C.E.Hubb.	AK,TRK	Aug – Mar	Puddles and paddy fields
48	*Ischaemum rugosum* Salisb.	TK	Nov- Feb	Puddles and paddy fields
49	*Ischaemum timorense* Kunth	AK,TRK,IK,KP.	Nov- Mar	Puddles and paddy fields
50	*Iseilema jainianum* P.Umam. &P.Daniel	AB,GK	Dec – Jan	Margins of the wetland
51	*Iseilema laxum* Hack.	AK,GK	July – May	Puddles and paddy fields

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52	*Leersia hexandra* Sw.	AK,TRK	June – Mar	submerged of ponds
53	*Leptochloa chinensis* (L.) Nees	AB,GK	Throughout the year	Puddles and paddy fields
54	*Leptochloa neesii* (Thwaites) Benth.	AK	Nov – Feb	Cultivated fields
55	*Leptochloa uniflora* Hochst. ex A. Rich.	AK,TRK	Oct – Feb	Cultivated fields
56	*Megathyrsus maximus* (Jacq.) B.K.Simon& S.W.L.Jacobs	KK,GK,AK,TRK	June – Apr	Wet localities
57	*Melinis repens* (Willd.) Zizka	AK,TRK	Throughout the year	Wet localities
58	*Mnesithea laevis* (Retz.) Kunth	AK	May - June	Edges of ponds, ditches
59	*Panicum curviflorum* Hornem.	AK	Mar – Dec	Cultivated fields
60	*Panicum paludosum* Roxb.	AK,TRK	Aug – Dec	submerged of ponds
61	*Panicum psilopodium* Trin.	KK,AK,TRK	July – Mar	Edges of ponds, ditches
62	*Panicum repens* L.	TK	Throughout the year	Margins of the wetland
63	*Paspalum scrobiculatum* L.	AK,TRK,IK,KP,KP	Throughout the year	Edges of ponds, diches
64	*Perotis indica* (L.) Kuntze	GK,KK,AB,GP	Throughout the year	Edges of the stream
65	*Phragmites karka* (Retz.) Trin. ex Steud.	AK	June - Mar	Margins of the river
66	*Pommereulla cornucopiae* L.f.	GK,AB	Oct – Feb	Wet localities
67	*Pseudosorghum fasciculare* (Roxb.) A.Camus	AK	Oct – Dec	Edges of the stream
68	*Sacciolepis indica* (L.) Chase	AK,TRK	Aug – Apr	Submerged of ponds
69	*Sacciolepis myosuroides* (R.Br.) Chase ex	AK,TRK	May – Dec	Edges of ponds, ditches
70	*Setaria flavida* (Retz.) Veldkamp	AK	May – Mar	Puddles and paddy fields
71	*Setaria geminata* (Forssk.) Veldkamp	TRK	May – Mar	Puddles and paddy fields
72	*Setaria homonyma* (Steud.) Chiov.	AK	Sep	Sandy areas near streams
73	*Setaria punctata* (Burm.f.) Veldkamp	TRK,GS	Sep - Mar	Moist localities of paddy fields
74	*Setaria verticillata* (L.) P.Beauv.	AB,AK,KK,IK	June – Apr	Edges of ponds, ditches
75	*Sorghum nitidum* (Vahl) Pers.	AK	Aug – Dec	Edges of the stream
76	*Sporobolus coromandelianus* (Retz.) Kunth	AB,KK,GK	June – Mar	Wet localities
77	*Sporobolus diandrus* (Retz.) P.Beauv.	TRK	May – Mar	Wet localities
78	*Sporobolus indicus* (L.) R.Br.	TRK,AK	Throughout the year	Puddles and paddy fields
79	*Sporobolus virginicus* (L.) Kunth	Gk	July – Jan	Margin of the wetland
80	*Themeda triandra* Forssk.	AK	Throughout the year	Edges of ponds, ditches
81	*Trachys muricata* (L.) Pers. ex Trin.	AB,GK,KK,I	Mar - Dec	Edges of the stream
82	*Urochloa brizantha* (A.Rich.) R.D.Webster	TRK	June - Mar	The margins of the wetland
83	*Urochloa distachyos* (L.) T.Q.Nguyen	GS,AK	June – Mar	Cultivated fields
84	*Urochloa mutica* (Forssk.) T.Q.Nguyen	GS,AK,TRK,KP	Nov - June	Submerged of ponds
85	*Urochloa ramosa* (L.) T.Q.Nguyen	Gk,kp	June – Mar	The margins of the wetland
86	*Urochloa reptans* (L.) C.A.Gardner& C.E.Hubb.	KTK	July - Mar	Wet localities
87	*Urochloa setigera* (Retz.) C.E.Hubb.	AB	Aug - Feb	Wet localities
88	*Zoysia matrella* (L.) Merr.	GK,KK,TK,VK	Mar - Oct	Wet localities