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Research Article

Studies on Grass Flora in the Wetland of Birbhum District, West Bengal, India

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Abstract

Background and Objective: Grasses are diverse in taxonomic diversity and exhibit wide range of tolerance against the environmental factors qualifying as a pioneer species of an ecological community. In wetland ecosystems, grasses are redundant elements with huge functional roles in purification of the soil quality and acting as organizers of the macro-invertebrate communities. Keeping in view the role of the grasses in the wetland ecosystems, the present study was aimed at recording the diversity of the grasses in wetlands of Birbhum, West Bengal, India. The purpose of the study was to document the taxonomic diversity of the grass species, its functional role and prospective use in the restoration of the ecosystems. **Materials and Methods:** The investigation was carried out during 2012-2016 covering 65 wetland areas of Birbhum. Plant specimens were collected and processed for preservation and identification following standard taxonomic methods. **Results:** The present taxonomic study revealed the occurrence of 28 species belonging to 18 genera of the family *Poaceae* in 65 wetlands of Birbhum district. Most of the species occur in the moist fringe areas of wetlands. The distribution of *Poaceae* in wetland scenario of the district indicates a later stage (sedge-meadow) of ecological succession (hydrosere) which proceeds from the periphery towards centre. **Conclusion:** It was apparent that the grasses (*Poaceae*) contribute considerably to the wetland producers and play crucial role in developing the seral stages of the ecosystem development in the study area. Assuming equally diverse functional role of the grasses in the concerned wetlands, the present document may be used to gain preliminary information about the grasses and biological significance in the wetlands of the concerned regions of India.

Key words: Wetland, *Poaceae*, taxonomic study, grass species, vegetation scenario

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INTRODUCTION

Grasses not only provide ecosystem services such as water and climate regulation in support of agriculture, biogeochemical cycling, carbon storage but also they form a habitat for variety of aquatic macro-invertebrates and herbivores¹. Grasses have wide ecological amplitude and several adaptations in diverse habitat. They are one of the primary producers in wetlands ecosystem². Need for assessment of grass flora in fresh water wetlands habitat of Birbhum district was felt integrated long term research to bringing updated information on aquatic grass flora from the taxonomic and ecological perspectives.

Grasses a natural homogenous group of family *Graminae* (*Poaceae*) undoubtedly forms one of the most fascinating families of flowering plants with a wide range of diversity and is playing a significant role in the ecology as well as primary producers of the wetland ecosystem. The members of this group are present in all suitable habitats for the growth of plant communities in wetlands ecosystem. The grass family undoubtedly the most important plant family to mankind agriculturally, economically and ecologically. They are enabling to adopt wide range of habitat and to spread widely. Grasses have much wider ecological amplitude than sedges and are aptly considered one of the most ecologically successful taxa due to their extensive diversification, adaptability and tolerance. The grasses are very close to sedges but are distinguishable from them by round and mostly fistular stem, 2-ranked leaves, open rather than closed leaf sheathes and caryopsis fruit. Grasses are good soil binders which entangle soil by roots, shoots and tillers forming a close cushion like cover over ground and prevent erosion by rain and wind. Grasses have also proved their worth in reclamation of wastelands even those resulting from mining³. As grasses form an exceedingly natural family, it is very difficult for the beginners to readily distinguish them from one another⁴. Grass dominated communities cover no less than 24% of the Earth's vegetation⁵. So far economic potential is concerned, this taxon is well ahead of others for having contributed the global staple food informed of rice and wheat and several types of cereals having multifarious uses and high nutritive value.

The monocotyledonous family *Poaceae*, alternatively *Graminae* and commonly grasses, is represented globally by about 780 genera and 12000 species⁶ for which it is placed in the fifth position of dominance after *Asteraceae*. In India *Poaceae* is represented by about 263 genera and 1291 species⁷. The grassland ecosystem covers about 39% of the total geographical area of India. There are 18 genera⁸ and 350 species⁹ of grasses which are endemic in India. As many as

120 endemic species are very rare¹⁰. Some of such communities are Steppes of Eurasia, Veldt of Africa, Pampas of South America and Prairie of North America. 19 species of grasses was revealed in the river Damodar in Burdwan District, West Bengal¹¹. In a separate study, 16 taxa of grasses in West Dinajpur with its ethnobotanical uses is highlighted¹², supporting the significance of the wetland grasses. In Indian context, the taxonomic and functional appraisal of the wetland grass (*Poaceae*) flora of valley districts of Manipur, with records of new species¹³⁻¹⁷, indicate the relevance in ecological management and restoration. Considering the vast array of the ecosystem services attributable to the wetland grasses, a document on the taxonomic features of the constituent species of the assemblage is essential. In order to enhance the sustainability of the grasses and integrate in the ecological restoration and varied ecosystem processes for the sustenance of the environmental quality, the records of the species assemblages of the grasses is essential. The present commentary is an effort to present the diverse variety of the grass species encountered in the wetlands of the concerned geographical area.

MATERIALS AND METHODS

Study site: While studying the macrophyte diversity in the wetlands of Birbhum district, special attention was given on *Poaceae* (*Graminae*) because of its intimate wetland-association. Adequate numbers of plant specimens were collected from 65 wetlands in the period from 2012-2016, some of which were processed for herbarium preservation and the rest were taxonomically worked out.

Methods: Standard taxonomic methods were applied for description and identification using authentic literature¹⁸⁻²¹. The taxonomic account, thus prepared, includes comprehensive key to identification of genera, citations, popular synonyms and basionym wherever necessary, flowering and fruiting periods, field notes, growth-form, status, distribution and specimens examined. The genera and species under each genus are arranged alphabetically.

RESULTS

The present investigation revealed the occurrence of 28 species belonging to 18 genera of the family *Poaceae* in 65 wetlands of Birbhum district. The most common species were of the genera *Brachiaria*, *Eragrostis*, *Echinochola*, *Digitaria*, *Panicum*, *Setaria*, etc. *Eragrostis* was the most dominant

genus with four species, followed by *Panicum* and *Digitaria*, having three species each. *Brachiaria*, *Echinochloa* and *Setaria* occur in the wetlands in Birbhum with two species each. Remaining 12 genera contain single species each. From the field notes it clearly appears that most of the species occur in the moist fringe area of wetlands and spreads in their vicinity. However, some of them like *Eragrostis coarctata*, *Panicum repens* and *Phragmites karka* stretch themselves to somewhat shallow water regimes and *Oryza rufipogon* sometimes forming floating mats in seasonally inundated places, also along water courses. Most of the species were common in wetlands but few species like *Echinochloa colona*, *Paspalum conjugatum* and *Sacharum spontaneum* were not only confined to wetlands but also found in their surroundings. The distribution of *Poaceae* in wetland scenario of the district indicates a later stage (sedge-meadow) of ecological succession (hydrosere) which proceeds from the periphery towards centre.

SYSTEMATIC DISCOURSE

Key to the genera:

1. Spikelets male or female..... **Coix**
1. Spikelets bisexual
2. Spikelets strictly 1-flowered
3. Glumes solitary..... **Leersia**
3. Glumes 3 or more
4. Glumes 4..... **Digitaria**
4. Glumes 3
5. Spikelets secund..... **Paspalum**
5. Spikelets not secund
6. Spikelets in digitate spikes..... **Cynodon**
6. Spikelets not in digitate spikes
7. Inflorescence spiciform raceme..... **Perotis**
7. Inflorescence not spiciform raceme
8. Spikelets often paired
9. Panicles large, silky and densely branched, joints of the rachis, pedicels swollen..... **Saccharum**
9. Panicles not silky and as large and densely branched, joints of the rachis and pedicels not swollen..... **Vetiveria**
8. Spikelets not often paired
10. Spikelets loosely arranged on the branches of an elongate panicle, articulate below glume..... **Oryza**
10. Spikelets in effuse or contracted panicle, articulate on the pedicel..... **Sporobolus**
2. Spikelets not consistently 1-flowered or many flowered

11. Spikelets 1-2 flowered in the same plant
12. Spikelets subtended by bristles
13. Bristles usually barbed, forming unilateral involucrel, spikelets in spiciform panicle..... **Setaria**
13. Bristles long, neither barbed nor forming unilateral involucrel, spikelets in racemes forming panicles..... **Brachiaria**
12. Spikelets not subtended by bristles
14. Inflorescence racemose of simple spikes bearing second spikelets
15. Glumes awned, spikes longer than internodes..... **Echinochloa**
15. Glumes awnless, spikes shorter than internodes-- **Paspalidium**
14. Inflorescence open or contracted panicles of spikelets... **Panicum**
11. Spikelets many flowered
16. Spikelets unilateral..... **Leptochloa**
16. Spikelets not unilateral
17. Spikelets in decomposed panicles, 3-7 flowered... **Phragmites**
17. Spikelets in spiciform panicles, many flowered... **Eragrostis**

1. *Brachiaria* (Trin.) Griseb

Key to the species:

1. Spikelets less than 3 mm long **B. reptans**
 1. Spikelets more than 3 mm long..... **B. ramosa**
- ***Brachiaria ramosa* (L.)** Stapf in Prain, Fl. Trop. Africa 9: 542. 1919
Fl. and Fr.: April-October.
Field notes: Grows in wet places such as ditches, ponds and in marshes. Growth-form: Graminid
Status: Common.
Distributions: Throughout India; Pakistan and Afghanistan. Tropical Asia and Africa. Specimen examined: Paboipara dighi, D. Palit 769.
 - ***Brachiaria reptans* (L.)** Gardner & Hubbard in Hook. Icon. Pl. 34: t. 3363. 1938
Vernacular name: Chhotajalgati.
Field notes: In the fringe areas of wetlands. Growth-form: Graminids.
Status: Common.
Distributions: Naturalized throughout India; Tropical Old and New world.
Specimens examined: Panchpara dighi, D. Palit 681, Mahindrapur dighi, D. Palit 752.

2. Coix L.

- **Coix lachryma-jobi** L., Sp. Pl. 972. 1753

Vernacular name: Gurgar.

Fl. and Fr.: September-March.

Field notes: Found in a wide variety of wetlands. Growth-form: Graminids.

Status: Common.

Distributions: Wild or cultivated throughout the hotter and damper parts of India. Native of Tropical Asia and now widely distributed in the Tropic in Africa and America. Specimen examined: Joysagar dighi, D. Palit 709.

3. Cynodon L. C. Richard *nom. cons.*

- *Cynodon dactylon* (L.) Pers., Syn. Pl. 1: 85. 1805

Vernacular name: Durba.

Fl. and Fr.: All round the year.

Field notes: Gregariously grows along the margins of water bodies and spreads in the vicinity. Growth-form: Graminids.

Status: Common.

Distributions: Throughout India; Pantropic. Specimen examined: Paboipara dighi, D. Palit 770.

4. Digitaria Haller *nom. cons.*

Key to the species:

1. Hairs on the spikelets always verrucose..... **D. longiflora**

1. Hairs on the spikelets never verrucose

2. Spikelets of each pair heteromorphic..... **D. bicornis**

2. Spikelets of each pair not heteromorphic..... **D. ciliaris**

- *Digitaria bicornis* (Lam.) Roem. et Schult., Syst. Veg. 2: 470. 1817

Fl. and Fr.: Rainy season.

Field notes: Found on the margins of wetlands. Growth-form: Helophyte/Hyperhydate.

Status: Not very Common.

Distributions: Throughout India; Tropical Asia. Specimen examined: Mahindrapur dighi, D. Palit 756.

- *Digitaria ciliaris* (Retz.) Koeler, Descr. Gram. Gallia et Germania 27. 1802

Fl. and Fr.: May-November.

Field notes: Gregariously grown near the edges of ponds.

Growth-form: Hyperhydate/Helophyte. Status: Common.

Distributions: Almost throughout India; warmer parts of the world. Specimen examined: Mahindrapur dighi, D. Palit 757.

- *Digitaria longiflora* (Retz.) Pers., Syn. pl. 1: 85.1805. Vernacular name: Kanka Juriya.

Fl. and Fr.: April-September.

Field notes: Widely creeping grass which rapidly occupies the embankments of wetlands. Growth-form: Helophyte/Hyperhydate.

Status: Common.

Distributions: Throughout India; Tropical and sub-tropical zones. Specimen examined: Panchpara dighi, D. Palit 687.

5. Echinochloa Beauv.

Key to the species:

1. Stem slender, decumbent, leaves narrow..... **E. colona**

1. Stem stout, erect, leaves broad..... **E. crus-galli**

- *Echinochloa colona* (L.) Link, Hort. Berol 2: 209. 1833

Vernacular name: Shama.

Fl. and Fr.: June-December.

Field notes: Not confined to wetlands only, sometimes in their dry surroundings. Growth-form: Graminids.

Status: Common.

Distributions: Throughout India. All warmer countries of the world, widespread in the tropics of Asia and Africa.

Specimen examined: Lambadharpur sayar, D. Palit 509.

- *Echinochloa crus-galli* (L.) P. Beauv., Ess. Agrost. 161. 1812. Vernacular Name: Barashama.

Fl. and Fr.: July-December.

Field notes: Grows near the margins of the ponds and ditches. Growth-form: Graminids.

Status: Common.

Distributions: Throughout India. All warmer countries of the world.

Specimens examined: Lambadharpur sayar, D. Palit 510; Dwarka barrage, D. Palit 615.

6. Eragrostis Wolf.

Key to the species:

1. Rachis fragile, spikelets breaking up from above downwards:

2. Lemmas ciliolate on the margins **E. coartata**

2. Lemmas not ciliolate on the margins..... **E. tenella**

1. Rachis tough; spikelets breaking up from below upwards

3. Annuals..... **E. gangetica**

3. Perennials..... **E. nutans**

- *Eragrostis coartata* (Roxb.) Steud., Syn. Pl. Glum. 1:266. 1854. Fl. and Fr.: October-April.

Field notes: Often found in shallow wetlands. Growth-form: Graminids.

Status: Very Common.

Distributions: Major parts of India and Burma.

Specimens examined: Tilpara barrage, D. Palit 583; Panchpara dighi, D. Palit 688; Mahindrapur dighi, D. Palit 758.

- *Eragrostis gangetica* (Roxb.) Steud., Syn. Pl. Glum. 1:266. 1854. Fl. and Fr.: March-August.

Field notes: Found in moist places near the margin of ponds and other wetlands. Growth-form: Graminids.

Status: Very Common.

Distributions: Throughout India, Burma, Sri Lanka, Tropical Asia and Africa. Specimens examined: Lalbandh, D. Palit, 647; Mahindrapur dighi, D. Palit 759.

- *Eragrostis nutans* (Retz.) Nees ex Steud., Nom. Bot. Ed. 2.: 563. 1840. Fl. and Fr.: September-December.

Field notes: Found in margins of wetlands. Growth-form: Graminids.

Status: Not very Common.

Distributions: Throughout India, Burma, Sri Lanka, Tropical Asia and Africa. Specimen examined: Tilpara barrage, D. Palit 584.

- *Eragrostis tenella* (L) P. Beauv. ex Roem. & Schult., Syst. Veg. 2: 576. 1817. Vernacular name: Sursuri ghas.

Fl. and Fr.: June-October.

Field notes: Grows in the moist places along the ditches and ponds. Growth-form: Graminids.

Status: Common.

Distributions: Throughout the plains of India. Widely spread in the Tropics of the old world. Specimen examined: Datindighi, D. Palit 548.

7. *Leersia nom. cons.* Swartz.

- *Leersia hexandra* Sw., Prodr. Veg. India. Occ. 21. 1778. Fl. and Fr.: August-January.

Field notes: Found with floating tops as well as in the fringe areas of wetlands. Growth-form: Helophyte/Pleustophyte/Ephydate.

Status: Common.

Distributions: Pantropic distributions. Specimen examined: Ramsayar, D. Palit 678.

8. *Leptochloa* P. Beauv.

- *Leptochloa chinensis* (L.) Nees in Syll. Ratisb. 1: 4. 1824. Vernacular name: Barapininati.

Fl. and Fr.: April-August.

Field notes: Aquatic grass growing profusely along the margins of the beels and marshy lands. Growth-form: Helophyte/ Pleustophyte/ Ephydate.

Status: Common.

Distributions: Throughout India, Burma, Sri Lanka, Malaya, Australia, China and Japan. Specimen examined: Gopalnagar bandh, D. Palit 533.

9. *Oryza* L.

- *Oryza rufipogon* Griff., Notul. 3: 5. PL. 144. f. 2. 1851. Vernacular name: Bhunodhan.

Fl. and Fr.: October-December.

Field notes: In water as an emergent grass or sometimes forming floating mats in marshes or seasonally inundated places, also along water courses.

Growth-form: Hyperhydate/Ephydate/Helophyte /Pleustophyte. Status: Common.

Distributions: Rajputana, the Khasi Hills, Central India, in Bengal everywhere; Burma, Siam, Malaya, Cochin and Malayasia.

Specimens examined: Gopalnagar bandh, D. Palit 534; Lalbandh, D. Palit 660; Baidhara barrage, D. Palit 730.

10. *Panicum* L.

Key to the species:

1. Lower glumes cuspidate..... ***P. trypheron***
1. Lower glumes not cuspidate
2. Leaf blades broad, flat, culms spongy..... ***P. paludosum***
2. Leaf blades narrow, involute, culms tough ***P. repens***

- *Panicum paludosum* Roxb., F1. Indica 1: 310. 1820. Vernacular name: Borati, Kalas-nar.

Fl. and Fr.: June-December.

Field notes: Gregariously growing in ponds, beels and other wetlands. Growth-form: Graminids.

Status: Common.

Distributions: India to South-East Asia.

Specimen examined: Gopalnagar bandh, D. Palit 535.

- *Panicum repens* L. Sp. Pl. 87. 1762. Vernacular name: Baranda.

Fl. and Fr.: Almost throughout the year.

Field notes: This grass has extensively creeping stolons and is abundant on the banks and shallow portions of wetlands.

Growth-form: Graminids. Status: Common.

Distributions: Throughout India; Sri Lanka, South Europe, Asia, Africa and America. Specimens examined: Tilpara barrage, D. Palit 602; Mahulah dighi, D. Palit 704.

- *Panicum typheron* Schult., Mant. 2: 244. 1824. Vernacular name: Fupi Kanka.

Fl. and Fr.: September-November.

Field notes: Found along the margins of wetlands. Growth-form: Graminids.

Status: Not Very Common.

Distributions: India to China and Malaysia.

Specimen examined: Baidhara barrage, D. Palit 731.

11. *Paspalidium* Stapf

- *Paspalidium flavidum* (Retz.) Camus in Lecomte, F1. Gen. Indo-Chine 7: 419. 1922. Fl. and Fr.: April to October.

Field notes: It is not only confined to wetlands, but also frequent in the vicinity.

Growth-form: Ephydate/ /Pleustophyte/Helophyte. Status: Common.

Distributions: Plains of India, Nepal, Sri Lanka; throughout Tropical Asia. Specimen examined: Baidhara barrage, D. Palit 732.

12. Paspalum L.

- *Paspalum conjugatum* Betgins in Act. Helv. Phys. Math. 7:129. t. 8. 1772. Fl. and Fr.: June-September.

Field notes: It is not only confined to wetlands but also found on their banks. Growth-form: Graminids.

Status: Common.

Distributions: A native of Tropical America, now pantropic. Specimen examined: Lambadharpur sayar, D. Palit 519.

13. Perotis Ait.

- *Perotis indica* (L.) O. Kuntz, Rev. Gen. Pl. 2: 787. 1891. Fl. and Fr.: July-November.

Field notes: In the fringe areas of ponds, ditches and other wetlands. Growth-form: Graminids.

Status: Common.

Distributions: Lower Himalayas and the plains of India. Widely distributed in Sri Lanka, Burma and Tropical Africa.

Specimen examined: Lambadharpur sayar, D. Palit 520.

14. Phragmites Trin

- *Phragmites karka* (Retz.) Trinex. Steud., Nom. (ed. 2) 2: 324. 1814. Vernacular name: : Nalor Dharma.

Fl. and Fr.: December-March.

Field notes: In shallow water bodies at the margin so flakes, ponds, ditches. Growth-form: Hyperhydate.

Status: Common.

Distributions: Throughout India; South East Asia, Tropical Africa and North Australia. Specimen examined: Datin dighi, D. Palit 559.

15. Saccharum L.

- *Saccharum spontaneum* L., Mant. Pl. 2: 183.1771. Vernacular name: Kash.

Fl. and Fr.: September-December.

Field notes: It is not confined to wetlands only but often found in seasonally inundated places, along streams, rivers and ditches.

Growth-form: Graminids. Status: Common.

Distributions: Throughout the warmer parts of India, Sri Lanka, South Europe and warmer regions of the world, East Australia. Specimen examined: Lalbandh, D. Palit 668.

16. Setaria P. Beauv

Key to the species:

1. Bristles retrose barbed, inflorescence as piciform panicle-----*S. verticillata*

1. Bristles antrose barbed, inflorescence a cylindrical false spike----- *S. pumila*

- *Setaria pumila* (Poir.) Roem. & Schult., Syst.Veg. 2: 891. 1817. Fl. and Fr.: Almost all-round the year.

Field notes: Grows on riverbanks, ponds and other wetlands.

Growth-form: Helophyte/ Ephydate.

Status: Common.

Distributions: Throughout India; Pantropic.

Specimens examined: Mahindrapur dighi, D. Palit 767.

- *Setaria verticillata* (L.) P. Beauv., Ess. Agrost.5: 178.1812. Fl. and Fr.: Almost throughout the year.

Field notes: Along the margins of ditches, ponds and other water bodies. Growth-form: Helophyte/ Ephydate.

Status: Common.

Distributions: Throughout India; generally in temperate and tropical regions.

Specimens examined: Lambadharpur sayar, D. Palit 522; Dwarka barrage, D. Palit 632.

17. Sporobolus R. Brown

- *Sporobolus diander* (Retz.) P. Beauv., Agrost.26, 147, 178.1812 (as *S. diandrus*). Vernacular name: Benajoni.

Fl. and Fr.: All round the year generally; but mainly in the rainy season.

Field notes: Along the riverbanks, ditches, other wetlands and often in their vicinity. Growth-form: Helophyte/ Ephydate.

Status: Very Common.

Distributions: Throughout India; Pantropic.

Specimens examined: Gopalnagar bandh, D. Palit 538; Sayer, D. Palit 571.

18. Vetiveria Bory-de-St-Vincent

- *Vetiveria zizanioides* (L.) Nashin Small, Fl. South East United States 67.1903. Vernacular name: Khas Khas.

Fl. and Fr.: Almost throughout the year.

Field notes: Mostly near ponds, ditches, banks of rivers and other water bodies. Growth-form: Graminids.

Status: Not very Common.

Distributions: Throughout India; Burma Sri Lanka, South-east Asia and Tropical Africa. Specimens examined: Tilpara barrage, D. Palit 610, Dwarka barrage, D. Palit 63

DISCUSSION

In the current study, 28 species belonging to 18 genera of the family *Poaceae* in 65 wetlands of Birbhum district were

encountered. The diversity of the grass species observed in the concerned geographical area remained similar to other places of India. Taxonomic study of grass species with their ethno-botanical use are documented from West Dinajpur, West Bengal, India²². Medicinal uses of grass species were surveyed by the tribal people in West Bengal²³. Similar study were found related to grass species in Kajiranga National Park with special reference to their habitat characterization and palatability²⁴, composition, structure and their conservation significance of grassland in Jaldapara²⁵, composition of grass species in West Bengal and diversity of it in Gujjars relocated site of the Rajaji National Park in Uttarakhand, Northern India²⁶, conservation strategy of grass species in Saurashtra and Kutch region of Gujarat²⁷. Several studies of grass distribution and abundance were investigated in different area²⁸.

The assemblage of the grasses in the wetlands varies in accordance with the availability of suitable soil and light conditions evident through several studies. The photosynthetic activity of the grasses is influenced by the flooding condition²⁹ and consequently the growth is affected. Increased salinity³⁰ also affects the growth of the grass adapted to wetland conditions. As observed in the growth of the wetland grasses under controlled conditions, the length of the stems and the stomata regulations vary among the grass species exposed to differential levels of the water height and the drought conditions. In many instances, the wetland grasses are able to utilize both the ammonium and the nitrate forms as a nitrogen source for the growth, indicating generalist nature in terms of resource requirements³¹. Experimental evidences suggest that the N:K ratio of the wetland soil is a crucial factor in the growth and physiology of the wetland grasses³². While the amount of N is linked to the growth of the plants, the amount of K determined the leaf senescence and the biomass allocation to the root³³. Many species exhibit wide range of tolerance to the variations in the N:K conditions but the effects on the growth and the physiology of the grasses are observed³⁴, indicating that the variations in the habitat conditions can affect the assemblage characteristics of the grasses of wetlands. In wetland conditions, different grass species are crucial in facilitating the colonization and growth of arbuscular mycorrhiza, essential in the soil nutrient cycling and symbiotic relationships with other plants^{35,36}. Invasion of wetland grass species may also induce changes in the habitat conditions and thereby alteration in the community species composition³⁷. A comparative account of the wetland grass species assemblages indicates variations in the richness and the abundance is linked with the land use pattern³⁸. Thus the extent of diversity in the agricultural and urban wetlands is considerably higher than that of forested wetlands observed in Ethiopia, with significant contribution of

the representatives of *Poaceae* in the plant assemblages. Thus the pattern of the grass species assemblages in the wetlands depends on the water regime, soil nutrient content and land use observed in varied geographical locations. Extending the observations to the present context, continuous monitoring of the wetlands should be continued to retrieve the variations in the distribution of the grass species and associated changes in the community structure. In the present instance, the taxonomic studies of all the grass species observed from the wetlands of Birbhum, West Bengal, are compiled with nomenclature, vernacular name, flowering and fruiting time, growth forms, status, distribution of species. Work exclusively on grasses especially in the context of wetlands is rather rare. Since no publication on the subject is available in Birbhum district, the present study can be ascertained as a work new of its kind. The outcome of this research work can well be used in preparing district flora and in substantiating ecological studies. The wetlands need to be more thoroughly studied with precision regarding species composition with special reference to the spatial and temporal resource partitioning.

CONCLUSION

The present study based on 65 wetlands is purely a taxonomic approach with notes on location, growth form, flowering and fruiting time etc. This kind of study always sets the ground for launching in-depth ecological projects for working out the present ecological characteristics and status of the wetlands and their restoration and conservation.

SIGNIFICANCE STATEMENTS

This study concerns the grass species in the wetland communities, their taxonomy that can be beneficial for understanding the community characteristics of wetland habitats of Birbhum. It may also be helpful in revealing the succession pattern of the area. This study may be helpful to researchers to understand the critical perspectives of community dynamics with the help of grasses.

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