Journal of
Plant Sciences

ISSN 1816-4951

Academic
Journals Inc.

www.academicjournals.com

OPEN ACCESS Journal of Plant Sciences

ISSN 1816-4951
DOI: 10.3923/jps.2022.161.165

Research Article
Riparian Grass Diversity of Pambar and Thalaiyar Freshwater Streams, Western Ghats, India

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Abstract

Background and Objective: Riparian system is unique, comprising specific vegetation aggregation, forms as the cover crop and being the major producer system, facilitates as the fostering of mountain forest regeneration. Incessant monitoring of the fragile wetland ecosystem would lead to evolving the proper management guidelines to protect the dynamic wetland ecosystem. Beta diversity analysis was investigated for the grass vegetation in two freshwater streams flowing over the South-Eastern Western Ghats Region, India. **Materials and Methods:** Pambar stream (10°11'17 N and 77°31'74 E) and Thalaiyar stream (10°13'25 N and 77°35'54 E), were the experimental streams to undertake the vegetation survey. A checklist of the grass vegetation was prepared through frequent field visits. **Results:** A total of 34 grass species belong to the Poaceae family from the riparian zones of the streams. The topography, climatic conditions, geography and biotic interference might be responsible for variation in floral diversity in the experimental sites, because of the biotic interaction and anthropogenic interventions. **Conclusion:** The present study revealed that the alteration of land-use pattern through intensive livestock grazing would have the significant impact on the community structure, eventually will be the cause for concern to wildlife managers and stake holders. Protection of the fragile ecosystem by keeping intact with the native phytodiversity is therefore emphasized through this study.

Key words: Freshwater streams, domestic livestock, riparian ecosystem, beta diversity, phytodiversity

Citation: Palsamy P. and K.D. Pandian, 2022. Riparian grass diversity of pambar and thalaiyar freshwater streams, Western Ghats, India. J. Plant Sci., 17: 161-165.

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Riparian plant habitats and communities are characterized by plants with specific adaptive features. Riparian vegetation consists of macrophytes, native grasses, sedges, climbers, shrubs and trees[1]. Riparian zones are considered to be ecologically important to retain the soil nutrients, restricts the velocity of flowing water, thereby preventing soil erosion, retaining the soil nutrients at the forest floor, besides fostering habitat biodiversity. Riparian vegetation composition is a heterogeneous mixture of floristic species, including grasses, woody species, aquatic and semi-aquatic floral communities. Buffer strips of riparian vegetation are effective in reducing sediment and nutrient loads[2]. Water current plays a decisive role in the dispersal of vegetative propagates and in influencing the marginal vegetation. More fertile vegetation communities emerge, comprising luxuriant herbaceous vegetation, providing niches to the aquatic animals for breeding and spawning[3] and hence, they form a habitat for a variety of aquatic macro-invertebrates and herbivores[4].

Grasses existing as terrestrial herbs are one among the best survivor terrestrial life forms on the earth found anywhere with great abundance. In wetland ecosystems, grasses are redundant elements due to their adaptability concerning the change in environmental factors. They possess huge functional roles in the purification of the soil quality and act as organizers of the macro-invertebrate communities[5]. These attributes of grass vegetation play a crucial role in the maintenance of biodiversity in any ecosytem[6], as they are the major primary producers in wetlands ecosystem[7]. Grasses have wide ecological amplitude and several adaptations in diverse habitats, including freshwater streams and river banks, as they adapt well to the lotic system. The floristic composition of the locality offers diversified and versatile functioning of ecosystems[7], however such ecosystems are severely affected due to biotic interferences[8]. Most of the natural habitats become under biological disturbances and anthropogenic pressure. Apart from the protected areas, most of the natural habitats in India have already been converted to human-dominated ecosystems[9].

Despite the utmost importance of grasses for the sustainable ecosystem, the study on vegetation community of wetlands is considerably available[10-13], however, these data are hardly reported, focusing on grass communities alone.

To fill the gap in the knowledge, investigation of grasses in Pambar and Thalaiyar streams, flowing in Southern Palni Hills of Southern Western Ghats, Tamil Nadu, India was undertaken.

MATERIALS AND METHODS

Description of the study area: The present study was carried out in two different freshwater streams viz., Pambar stream (10°11'17 N and 77°31'74 E) and Thalaiyar stream (10°13'25 N and 77°35'54 E), both are originating and flowing through the Southern Palni Hills of Southern Western Ghats, situated, respectively in Theni and Dindigul Districts of Tamil Nadu, India. The experimental streams have been utilized by adjoining communities, for their domestic purpose and to perform cattle ranching and downstream, these streams are stored in Manjalar Reservoir and further utilized for farming activities and offering eco-tourism services.

Species enumeration: The extensive and intensive floristic study was made at monthly intervals from July, 2018-June, 2019. All the collected plant species were identified with various regional and national Flora's using standard keys and descriptions. The specimens were collected and preserved using the standard herbarium making methods. The Herbaria for the plant specimens, which have been prepared and deposited at the Department of Botany, Thiagarajar College, Madurai, Tamil Nadu.

RESULTS

The present grass floristic exploration comprises 34 Poaceae taxa, which were observed in both Pambar and Thalaiyar streams (Table 1). Among them, 23 grass species from Pambar and 28 types of grass from Thalaiyar streams were found occurred and a total of 17 species were encountered commonly from both of the experimental streams. Based on the species contribution, *Eragrostis* was dominantly present with 4 species with 11.76% (Fig. 1) relative

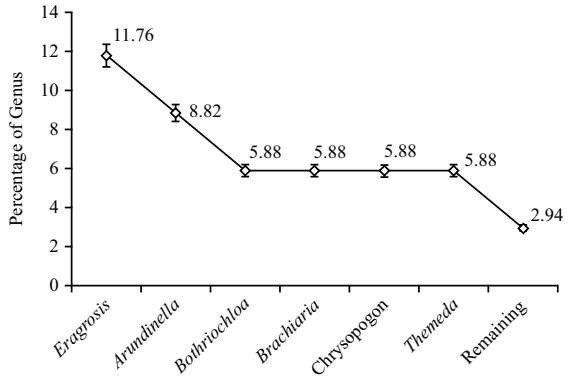

Fig. 1: Percentage distribution of grass genus, encountered in Pambar and Thalaiyar stream

Table 1: Checklist of riparian Poaceae taxa that occurred at the experimental streams, during the study periods

Binomial names	Pambar stream	Thalaiyar stream
Apluda mutica L.	✓	✓
Aristida hystrix L.f.	✓	✓
Arundinella ciliata (Roxb.) Nees ex Miq.	*	✓
Arundinella hirta (Thunb.) Tanaka	✓	✓
Arundinella leptochloa (Nees ex Steud.) Hoo k. f.	✓	*
Arundo donax L.	✓	*
Bambusa arundinacea (Retz.) Willd.	*	✓
Bothriochloa insculpta (Hochst. ex A. Rich.) A. Camus	✓	*
Bothriochloa ischaemum (L.) Keng	✓	*
Brachiaria mutica (Forssk.) Stapf	✓	✓
Brachiaria ramosa (L.) Stapf.	✓	✓
Chloris barbata Sw.	✓	✓
Chrysopogon aciculatus (Retz.) Trin.	*	✓
Chrysopogon fulvus (Spreng.) Chiov.	*	✓
Cymbopogon citratus (DC. ex Nees) Stapf.	✓	✓
Cynodon dactylon (L.) Pers.	✓	✓
Dichanthium annulatum (Forssk.) Stapf.	✓	✓
Digitaria ciliaris (Retz.) Koeler	*	✓
Eleusine indica (L.) Gaertn.	✓	*
Eragrostis minor Host.	✓	✓
Eragrostis pilosa (L.) P. Beauv.	✓	✓
Eragrostis unioloides (Retz.) Nees ex Steud.	✓	✓
Eragrostis viscosa (Retz.) Trin.	*	✓
Heteropogon contortus (L.) P. Beauv. ex Roem. and Schult.	*	✓
Imperata cylindrica (L.) P. Beauv.	*	✓
Isachne globosa (Thunb.) Kuntze	*	✓
Oplismenus compositus (L.) P. Beauv.	✓	✓
Panicum repens L.	✓	✓
Paspalidium flavidum (Retz.) A. Camus	*	✓
Saccharum spontaneum L.	✓	✓
Setaria pumila (Poir.) Roem. and Schult.	✓	*
Themeda cymbaria Hack.	✓	✓
Themeda tremula (Nees ex Steud.) Hack	*	✓
Urochloa panicoides P. Beauv.	✓	✓

(*-absent and √-present)

dominance, followed by *Arundinella in* 3 spp (each 8.82%), *Bothriochloa*, *Brachiaria*, *Chrysopogon* and *Themeda* with every 2 species (each 5.88%) and remaining were monospecific genera (each 2.94%). In comparison with the Pambar stream, the Thalaiyar stream has the highest number of grass vegetation. This phenomenon could be attributed due to structural differences that exist between the experimental streams. Thalaiyar stream passed with a higher number of grass vegetation and sorenson's similarity index calculated using the data was 0.42.

DISCUSSION

Floristic study of any given area helps to evaluate the plant wealth and its potential values[14]. Grass species aggregation and its variation at the species level explains the phenomenon due to the existing structural differences among the two experimental streams. The present study revealed that the experimental site strongly favours the occurrence of the diversity of the grass, facilitating the secondary forest and climax. The life form is the indicator of micro and macroclimate and it is described by plant adaptation to certain environmental factors[15]. The data shown in the preceding part indicated that the floristic richness of an area depends upon the type, quality and stratification of its vegetations. It gives the nature and functioning of the natural communities and also provides a complete understanding of the pattern and process of their structure[15]. Similarity index value, an essential diversity index indicates the wealth of the ecosystems, including the riparian systems[16].

The present study result corroborates with the works of Matthew[17] as Poaceae are dominantly present in the habitat. Grass species ideally colonize which forms the fostering biodiversity by providing the niche and producer system to the next trophic level organisms and therefore the secondary forest complex develops. The giant spear grass is an important food source for many granivores, especially the avian population. Faunal communities, therefore have the

proliferation, by the supporting mechanism of the grasses, rendered as the role of producers, corroborates with the previous reports[18-20]. Plant hydrochory is an important biological means of maintaining the riparian ecosystem health through their allochthonous inputs contained in the detritus collected by the floods adding nutrients to the forest floor[21]. This holds particularly true for the patchy hill complexes of southern Western Ghats. Presently, many forest sites of southern Western Ghats are subjected to various anthropogenic pressures[21]. Data concerning plant diversity, such as that presented in the current study on floristic analysis will help to emphasize the importance of these forests for species conservation and forest management. The protection of the fragile ecosystem is, therefore, to be considered and ecological monitoring is essentially emphasized. Owing to the biological interactions and the anthropogenic pressures, the shifting of vegetation communities in these ecosystems has to be analyzed for the proper management of the ecosystem.

CONCLUSION

Pambar and Thalaiyar streams were observed with rich grass diversity, at their riparian zones, offering eloquent ecological services and benefits to communities. This work, further has the scope of continuous monitoring of the ecosystem, to understand the ecosystem dynamics, to the biotic pressures and anthropogenic pressures, prevalent to the fragile ecosystems.

SIGNIFICANCE STATEMENT

In an ecologically healthy landscape, stream corridor encompassing riparian vegetation thereby making the ecosystem intact and further facilitating the biodiversity aggregation. The assemblages of riparian plant communities and wildlife depend upon the natural hydrologic regimes representative of a particular landscape. In the absence of human alteration, riparian plant communities support numerous functions. This work offers a database to researchers and wildlife managers, who have the least opportunity to access this experimental site.

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