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A Comparative Study of Mangrove Vegetation in Two Selected Areas of Ernakulam District, Kerala,India

Sofia S.* and Merlee Teresa M.V.
Department of Botany, St. Teresa's College, Ernakulam, Kerala, India
sraigil@gmail.com

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Abstract

Mangrove vegetation in two geographical regions of Ernakulam district was selected to study the phytosociological characteristics and diversity indices. Floristic analysis revealed that the flora consists of 7 mangrove species belonging to 5 families. In Phytosociological analysis, the highest density showed by Acanthus illicifolius (2.9 and 4.1) in Chirackal and Kattiparambu respectively. The highest IVI was recorded for A.illicifolius (8.85 and 16.07), and the lowest was recorded for Rhizophora apiculata (3.8 and 5.71) in Chirackal and Kattiparambu respectively. The other floristic elements were represented as Calophyllum inophyllum, Ipomoea purpurea, Eclipta alba, Eclipta prostrata, Alternanthera aquatica. Species abundance, density, frequency, Important Value Index (IVI), Maturity Index Values (MIV) and Similarity Index (SI) and Coefficient Difference (CD) of the mangrove species in the studied area were determined. In the present study Similarity Index, Dissimilarity Index and Coefficient Difference are reported as 70%, 30% and 30% respectively. In the present study Shannon Weiner index of diversity was ranged from 2.172 to 2.765 at two sites.

Keywords: Mangroves, Phytosociology, Similarity Index, Important Value Index, Diversity index.

Introduction

Mangroves are the most productive and natural renewable ecosystems. Mangrove habitat are a shield for marine ecosystem and a repository of biological diversity[1]. Their bulk growth modify the habitat and control the growth of other species of the community as these species are called dominants[2]. The development and structure of mangrove forests result from an interaction of many physical factors and environmental variables[3,4].

Mangroves of south coastal region of Kerala have indigenous characteristics compare to the mangrove ecosystem of other region. So, this investigation was carried out to identify the present status of mangroves forest in Ernakulam. It is mainly concerned with the phytosociological analysis of selected mangrove plants to understand floristic vegetation, to estimate the species richness and diversity which is existing in the study sites.

Materials and Methods

Study Area: Chirackal is situated between 9.927658° N and 76.255159° N and Kattiparambu between 9.8072100° N and 76.277427° N. Species area estimation and Quadrat analysis were used to study the different diversity indices and distribution patterns of mangroves in Chirackal and Kattipparambu. The analysis of plant diversity was to assess and compare the range and distribution of mangrove species in the two selected sites.

Phytosociological Analysis: Phytosociological studies were carried out using quadrat method by dividing the selected plots into smaller quadrats of 5m x 5m size. All the Plant specimens were collected for identification. Individual species were analyzed for Abundance, Relative Abundance, Density, Relative Density, Frequency, Relative Frequency, Importance Value Index (IVI), Mature Index Value (MIV) and Similarity Index (SI). Density, frequency, and abundance of selected mangrove trees, shrubs and herbs species were determined quantitatively[5]. Simpson's index and Shannon-wiener's index were also carried out as diversity indices[6,7].

Results and Discussion

Species composition: Distribution of true mangroves and associates at the selected two sites are shown in Table-1. Floristic studies reported that these areas showed the presence of total 26 plant species belonging to 17 families (Table-2). The relationship between the two selected areas of mangroves along the northern and western coasts stated the species composition and the agents causing maximum destruction differed with localities[8].

Phytosociological analysis: This study comprises the phytosociological analysis of selected mangroves of Ernakulam District. The results revealed the highest density in *Acanthus illicifolius* (2.9 and 4.1) of Chirackal and Kattiparambu respectively, followed by *Avicennia officinalis* (2.1 and 2.8). *A.illicifolius* showed maximum relative density (5.45) in Kattiparambu and (3.07) in Chirackal. Minimum was shown by

Rhizophora apiculata (1.86) and (0.953) in Kattiparambu and Chirackal in order. Relative abundance was recorded highest for *A.illicifolius* at Chirackal (2.71) and (5.17) at Kattiparambu (Figures-1and 2). Relative density, relative frequency and relative abundance of the plant species were used to determined the Importance Value Index. Maximum IVI was recorded for *A.illicifolius* (8.85 and 16.07) and minimum for *Rhizophora apiculata* (3.8 and 5.71) in Chirackal and Kattiparambu (Figures-3 & 4). From the two locations studied,, the species with maximum density was observed in *A.illicifolius.* Species dominance was influenced by salinity tolerance level, Soil organic contents, morphological adaptations of plants, resistance towards physical pressure exerted by the turbulent water, duration of fresh water inundation etc[9].

In the present study Similarity Index, Dissimilarity Index and Coefficient Difference are reported as 70%, 30% and 30% respectively (Figure-5). Mature Value Index of the two sites are shown in Figure-6. Diversity indices of mangroves at different sites showed that Chirackal constituted highest Shannon Weiner index (2.765). Kattiparambu registered highest Simpson's index (14.49) and lowest Shannon Weiner index (2.172). Simpson index of diversity (0.144) for mangroves in Puduvyppu, Kerala was reported very less value [10]. In the present study Shannon Weiner index of diversity was ranged from 2.172 to 2.765 at two studied sites. In Puduvyppu, Kerala, value changed from 3.8 to 4.3 in the mangrove species. Shannon Weiner index showed the range between 2.0-3.2 in Honkong[11], 1.4 in China[12], 1.0 to 2.27 in Maharashtra[13] in different studies.

Table-1
Floristic composition of mangroves at Chirackal and Kattiparambu, Ernakulam

Sl.No	Plant Species	Family	Habit	Chirackal	Kattipparambu
1	*Caesalpinia pulcherima,*L.	Fabaceae	Tree	-	✓
2	*Acrostichum aureum,*L.	Pteridaceae	Fern	✓	✓
3	*Avicennia officinalis,*L.	Verbenaceae	Tree	✓	✓
4	*Calophyllum inophyllum,*L.	Calophyllaceae	Tree	-	✓
5	*Rhizophora mucranata,*Lam.	Rhizophoraceae	Tree	✓	✓
6	*Sonneratia alba,*Sm.	Lythraceae	Tree	✓	✓
7	*Acanthus ilicifolius,*L.	Accanthaceae	Shrub	✓	✓
8	*Ipomoea purpurea,*(L.)Roth.	Convolvulaceae	Herb	-	✓
9	*Clerodendron inerme,*(L.)Gaertn.	Verbenaceae	Shrub	-	✓
10	*Excoecaria agallocha,*L.	Euphorbiaceae	Tree	✓	✓
11	*Rhizophora apiculata,*Blume.	Rhizophoraceae	Tree	✓	✓
12	*Cerbera odollam,*Gaertn.	Apocynaceae	Tree	-	✓
13	*Thespesia populnea,* (L.) Sol. ex Correa.	Malvaceae	Tree	-	✓
14	*Scoparia dulcis,*L.	Scrophulariaceae	Herb	✓	✓
15	*Eclipta alba,* (L.)Hassk.	Asteraceae	Herb	✓	✓
16	*Diodia teres*,Walt	Rubiaceae	Herb	✓	✓
17	*Derris trifoliate,*Lour	Fabaceae	Climber	✓	✓
18	*Alternanthera aquatic,* (Parodi.) Chodat.	Amaranthaceae	Herb	✓	-
19	*Eclipta prostrate,*L.	Asteraceae	Herb	✓	✓
20	*Phaseolus atropupureus,*L.	Fabaceae	Herb	✓	-
21	*Setaria faberi,*Herrm.	Poaceae	Herb	✓	-
22	*Hygrophila costata,*Sinning.	Accanthaceae	Herb	✓	-
23	*Melochia corchorifolia,*L.	Malvaceae	Herb	✓	-
24	*Alternanthera phyloxeroides,* Griseb.	Amaranthaceae	Herb	✓	-
25	*Cayratia trifolia,*(L.)Domin.	Vitaceae	Twainer	✓	-
26	*Avicennia alba,*Blume.	Verbenaceae	Tree	✓	-

Table-2
Families of the selected flora

Sl.No	Family	Number
1	Fabaceae	3
2	Verbenaceae	3
3	Rhizophoraceae	2
4	Accanthaceae	2
5	Malvaceae	2
6	Asteraceae	2
7	Amaranthaceae	2
8	Pteridaceae	1
9	Calophyllaceae	1
10	Lythraceae	1
11	Convolvulaceae	1
12	Euphorbiaceae	1
13	Apocynaceae	1
14	Scrophulariaceae	1
15	Rubiaceae	1
16	Poaceae	1
17	Vitaceae	1

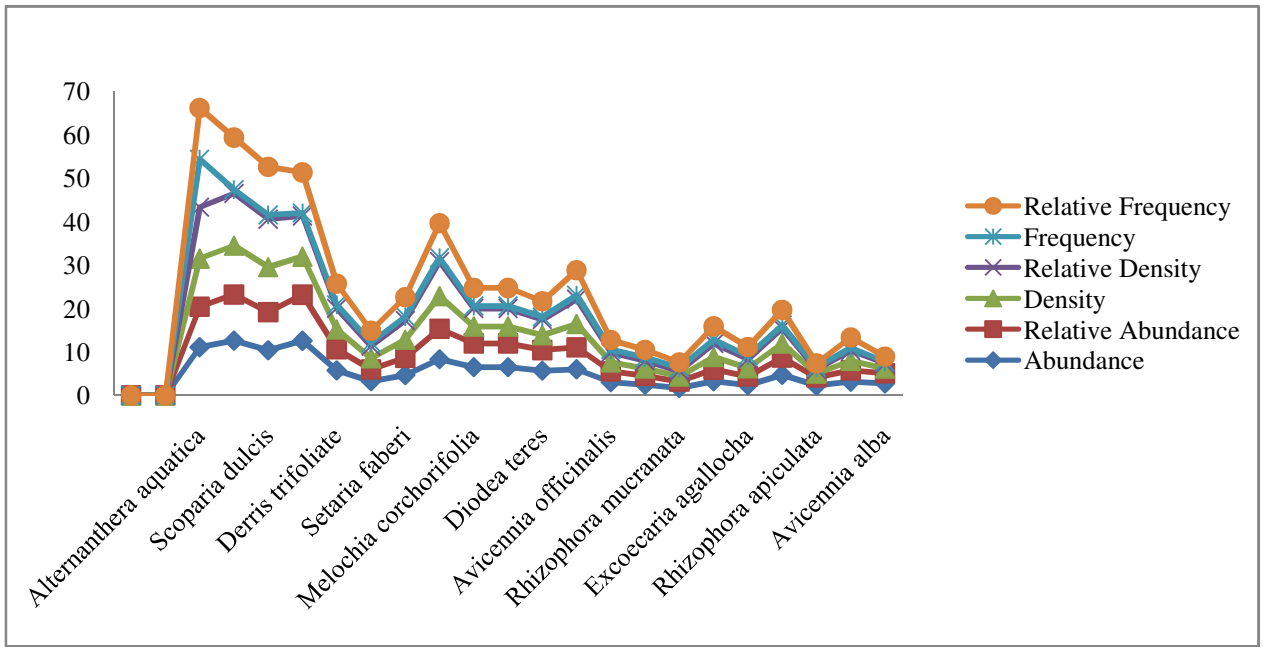

Figure-1
Showing the Phytosociological analysis at Chirackal area

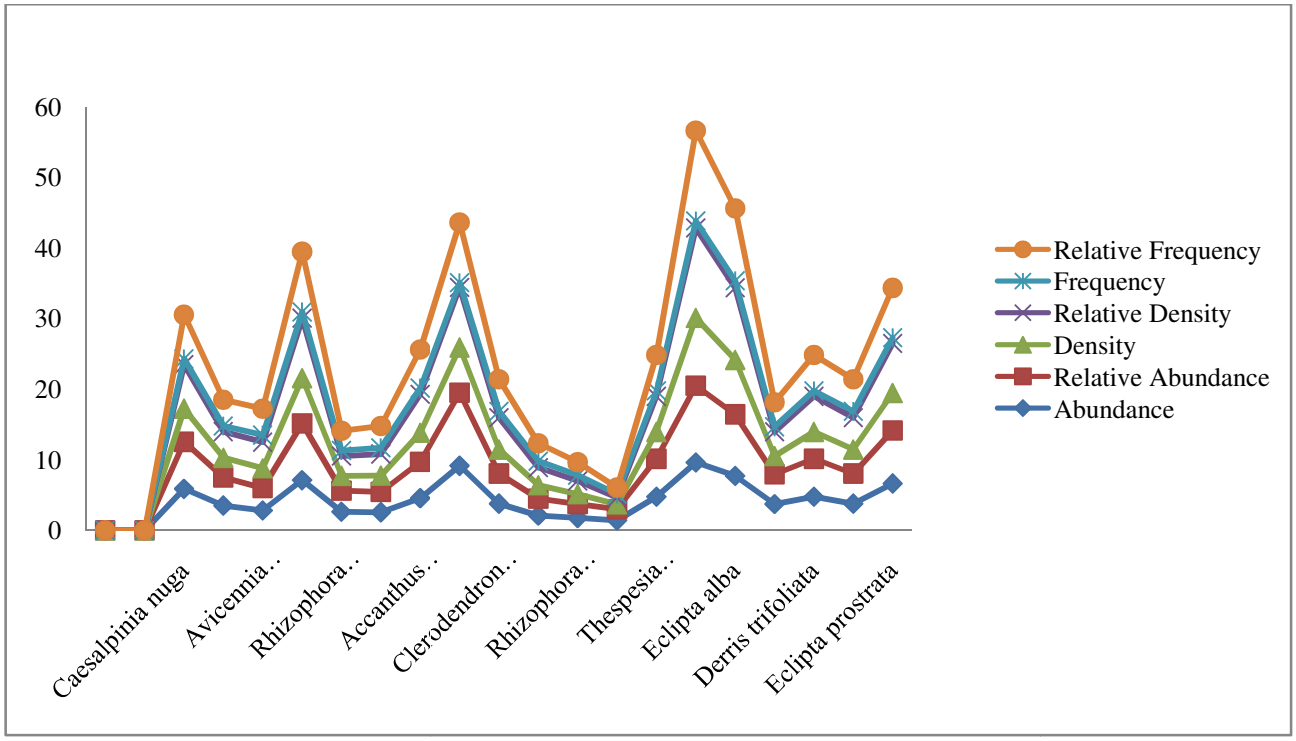

Figure-2
Showing the Phytosociological analysis at Kattiparambu area

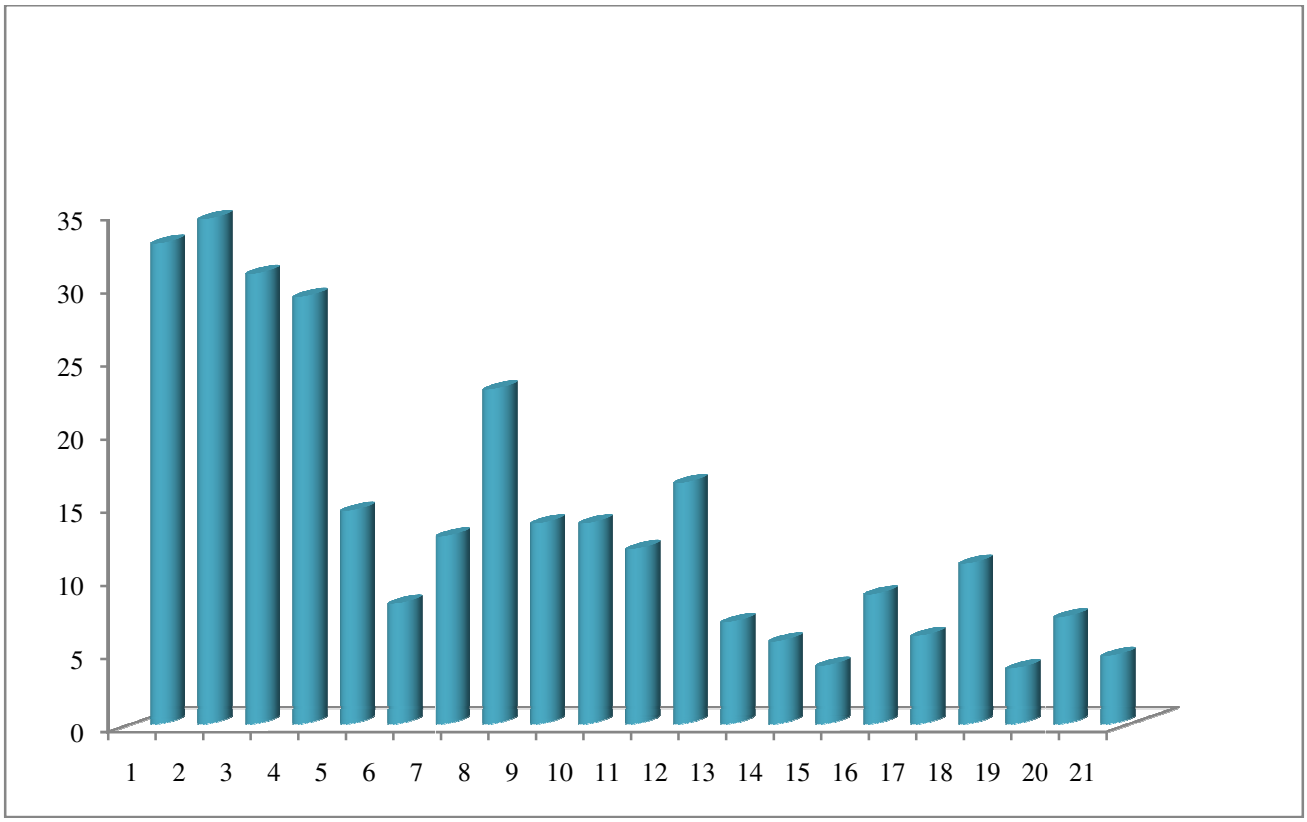

Figure-3
Showing the Important Value Index of the species at Chirackal

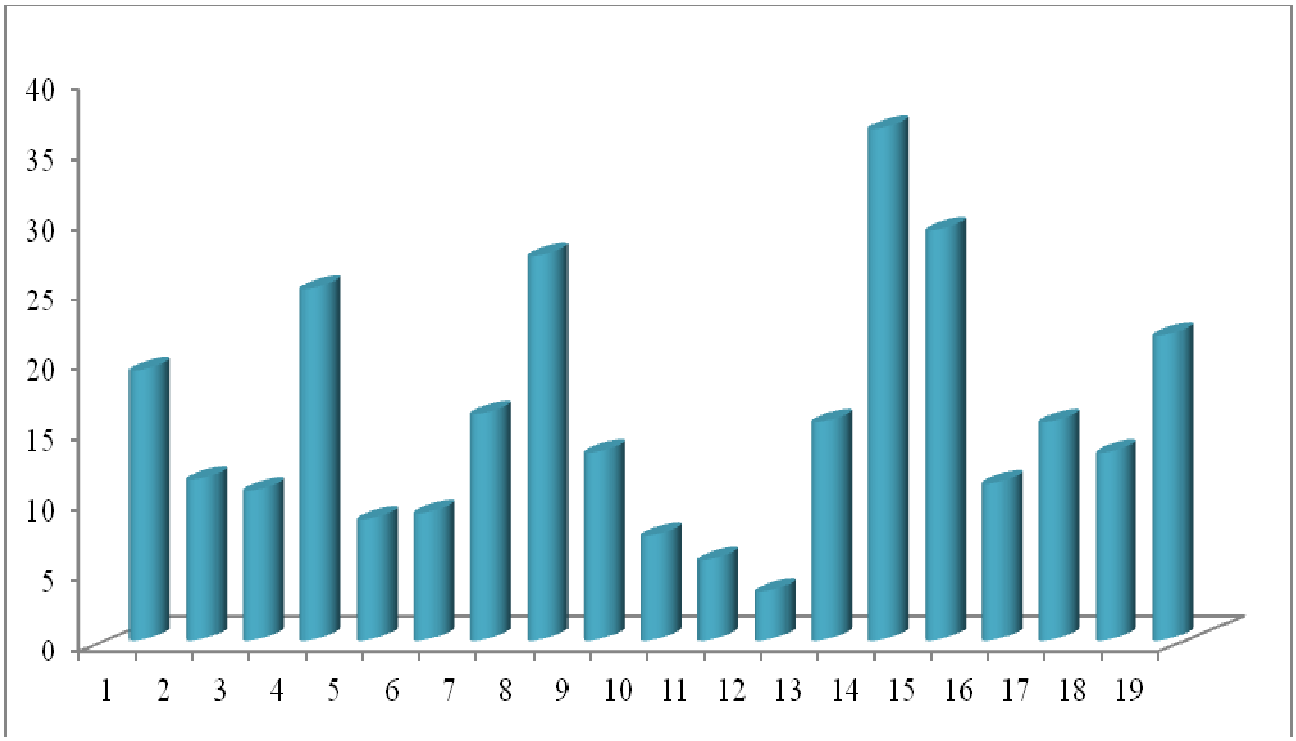

Figure-4
Showing the Important Value Index of the species at Kattiparambu

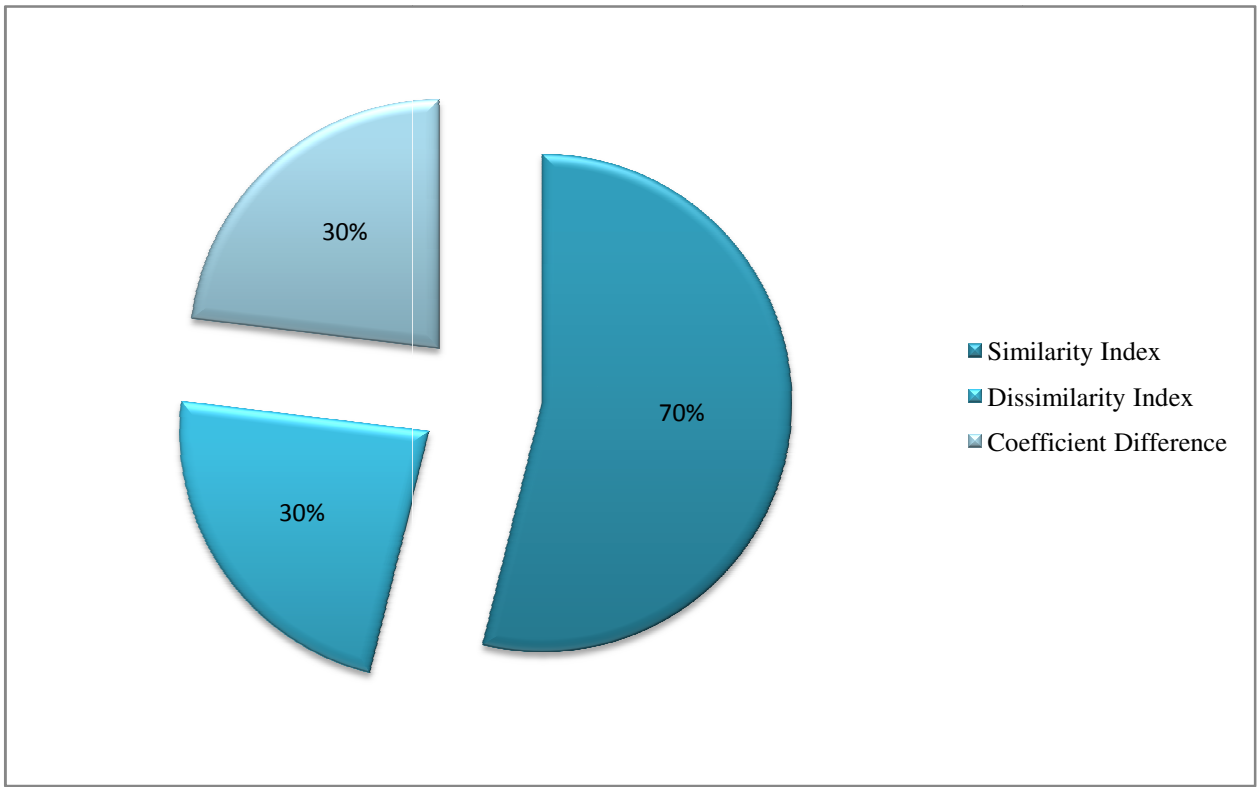

Figure-5
Showing the Similarity index, Dissimilarity Index and Coefficient Difference

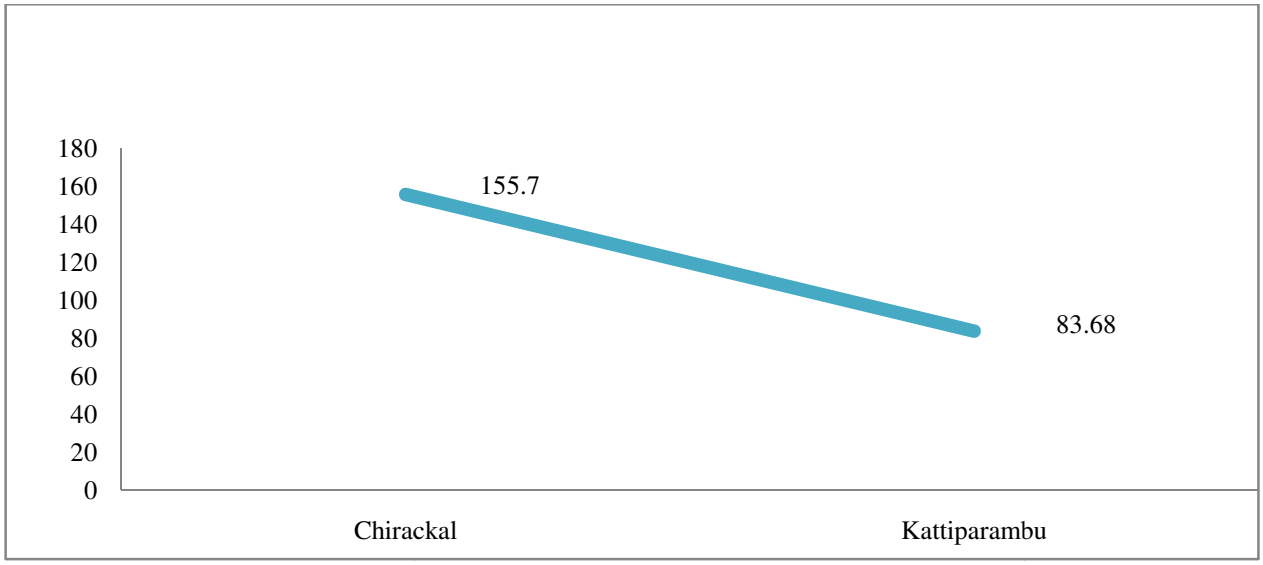

Figure-6
Showing the Mature Index value of the two studied areas

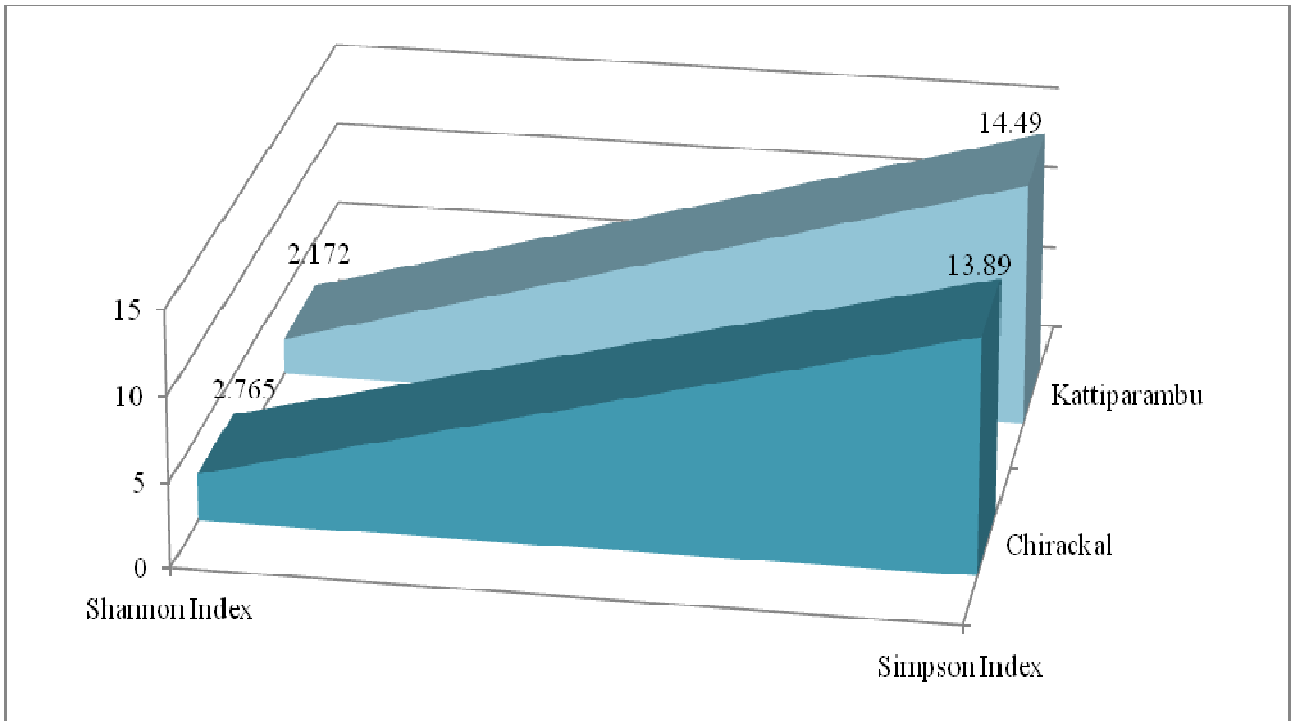

Figure-7
Showing the Shannon and Simpson Indices of plants in two studied sites

Conclusion

A study was carried out on mangrove distribution and diversity of Ernakulam district to investigate the present status of mangrove vegetation. It revealed that mangroves of Ernakulam district are threatened by the population pressure. Phytosociological characters like frequency, density and abundance were highly influenced by the biotic stresses at the present study sites. The quantitative characters and their relative values well act as indicators of anthropogenic disturbances and such studies help in understanding the threats that are being faced by the tropical areas and help in deriving conservation policies. As a result, an urgent step to be taken to recognize these natural systems in all levels and a holistic attempt for the better management to conserve their biodiversity.

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