PRELIMINARY STUDIES ON FLORA OF KOLE WETLANDS, THRISSUR, KERALA

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Introduction

Wetlands are ranked third among the most productive ecosystems on earth. They are valuable sources, sinks and transformers of a multitude of chemical, biological and genetic material and are considered the "Kidneys of the Earth" for the cleaning function they perform through biogeochemical cycles. They have been reported to prevent floods, trap sediments, serve as sources of water, recharge groundwater, protect the shoreline, regulate biogeochemical cycles, abate pollution, and are rich in biodiversity.

Wetlands are generally rich in their floristic and faunal diversity which is often much higher than that in many other ecosystems. Although the decreased availability of oxygen (hypoxia) or its total absence (anoxia) and the consequent chemical changes in the soil characteristics as a result of water logging make the environment unsuitable for the terrestrial plants, a large variety of aquatic plants are well adapted to wetland environment. Wetland flora includes representatives of all taxonomic groups. It should be stressed that a cursory look at a wetland is often misleading because generally one or two plant species may dominate the entire wetlands. Only a closer look would reveal the richness of plant and animal life. The people living in around the Kole wetlands are under four occupational categories such as agriculture, fisheries, poultry and husbandry. Agriculture is the major occupation of the people of Kole wetlands and ninety per cent people were practicing agriculture mostly paddy.

Competition from plants other than rice is the major constraints for higher productivity in rice. As many as 350 species in more than 150 genera and 60 plant families have been reported as weeds in rice (Smith, 1983). However the relative abundance, density and diversity of these weeds vary widely with agro-climatic regions, seasons and type of rice culture. A knowledge on major plant community and their relative importance in the Kole wetland is very much essential for evaluating ecologically sound and environmentally safe weed or plant community control measures in rice cultivation of Kole wetlands.

Material and Methods

The present study was conducted from November 1998 to October 2003. The floristic composition was noted by making visual observation and specimen samples were collected at different reproductive

stages to prepare herbarium specimens and substantiate their correct identity. The plants were identified with the help of available field keys, taxonomic revisions, monographs and floras like *Flora of Madras Presidency* (Gamble, 1915-36); *Flora of British India* (Hooker, 1875-97); *Flora of Tamil Nadu and Carnatic* (Mathew, 1981-84; 1991).

Study Area

The Kole wetland lies between 10° 20' and 10° 40' N latitudes and 75° 58' and between 76° 11' E longitudes. The Kole wetland with an extent of 13,632 ha and are spread over Thrissur and Malappuram districts in Kerala State. It extends from the northern banks of Chalakudy River in the South to the southern banks of Bharathapuzha River in the North. Eastern side of Kole wetlands is Thrissur town and western side extends up to Arabian Sea. The name "Kole" refers to the peculiar type of paddy cultivation carried out from December to May and this Malayalam word indicates bumper yield of high returns in case floods do not damage the crops (Johnkutty and Venugopal, 1993). The Kole wetlands are low lying tracts located 0.5 to 1 m below msl and remain submerged for about six months in a year. The River Keecheri and Karuvannur bring the floodwaters into the wetlands, which finally empty into the Arabian Sea. The average annual rainfall is 3,200 mm and the temperature varied from 28°C to 31.5°C. The Kole wetland is a part of the Vembanad-Kole wetland Ramsar site declared in the year 2002.

Results and Discussion

The study revealed that the Kole wetland vegetation is peculiar in that apart from the truly aquatic marshy forms like *Hydrilla, Eichhornia,* water ferns and algae, it also comprises of many bund species including small trees that can withstand inundation with water over long duration. Numerous herbaceous plants, submerged or free floating, rooted floating leaved or emergent, occupy different niches in wetlands. During the present study total of 140 species belonging to 23 families of Dicotyledons and 11 families of Monocotyledons and 5 families of Water fern were recorded from the Kole wetlands (Table 1). Prominently represented family is Cypreceae (27 genera) followed by Poaceae (25 genera) and other dominant families are Asteraceae, Fabaceae and Hydrocharitaceae.

Of the recorded species in the Kole wetlands, Monocotyledons (74) was the largest number of plant groups in the Kole wetlands followed by Dicotyledones (61). Nine genera have 2 congeneric species and ten genera have 3 congeneric species and *Eleocharis* have 5 congeneric species. *Cypreus* with eleven species is the largest genus in the Kole wetlands.

The Kole wetland is one of the largest and highly productive wetlands and it is also one of the most threatened wetlands in Kerala State (Jayson and Sivaperuman, 2005). Reclamation of land and changes in land use pattern are the most serious problems. The Kole wetlands are being converted to coconut, areca nut, banana plantations and other cash crops at an alarming rate. Various species of grasses and sedges form the floristic spectrum of Kole wetlands and have great value of ecological and economic important. The vegetation plays an important role in the wetland ecology by removing water through evapo-transpiration, altering

Table 1

Flora recorded from the Kole wetlands, Thrissur

Sl. No.	Group	Family	Species Name
1	2	3	4
1.	Dicots	Nymphaceae	*Nymphaea lotus* Hk. f. & T.
2.	Polypetalae		*Nymphaea pubescens* Willd.
3.			*Nymphaea stellata* Willd.
4.		Capparidaceae	*Cleome viscosa* L.
5.		Caryophyllaceae	*Drymaria cordata* (L.) Willd. Ex Roem& Schult
6.		Portulacaceae	*Trianthema portulacastrum* L.
7.		Elatinaceae	*Bergia ammannioides* Roxb.
8.			*Bergia capensis* L.
9.		Sapindaceae	*Cardiospermum halicacabum* L.
10.		Fabaceae	*Cassia tora* L.
11.			*Cassia occidentalis* L.
12.			*Crotalaria juncea* L.
13.			*Mimosa rubicaulis* Lam
14.			*Mimosa pudica* L.
15.			*Smithia geminiflora* Roth.
16.		Lythraceae	*Ammania baccifera* L.
17.			*Ammania multiflora* L.
18.		Onagraceae	*Ludwigia repens* Roxb.
19.			*Ludwigia parviflora* Roxb.
20.			*Trapa bispinosa* Roxb.
21.		Cucurbitaceae	*Mukia scabrella* Arn.
22.		Molluginaceae	*Glinus lotoides* Linn.
23.			*Mollugo pentaphylla* L.
24.	Gamopetalae	Rubiaceae	*Borreria articularis* (L.F.) F.N. Williams
25.			*Hedyotis leschenaultiana* W. & A.
26.			*Oldenlandia corymbosa* L.
27.		Asteraceae	*Acanthospermum hispidum* DC.
28.			*Ageratum conyzoides* L.
29.			*Eclipta alba* Hassk.
30.			*Emilia sonchifolia* DC.
31.			*Sphaeranthus indicus* L.

Contd...

1	2	3	4
32.			*Spilanthus calva* DC.
33.			*Synedrella nodiflora* (L.) Gaertn.
34.			*Tridax procumbens* L.
35.			*Vernonia cinerea* Less.
36.		Lobeliaceae	*Lobelia dichotoma* L.
37.		Menyanthaceae	*Nymphoides cristatum* Gmel.
38.			*Nymphoides indicum* Thw.
39.		Convolvulaceae	*Convolvulus arvensis* L.
40.			*Ipomea aquatica* Forsk.
41.			*Merrimia tridentata* Hall. F.
42.			*Merremia umbellata* Hall. F.
43.			*Merremia vitifolia* Hall. F.
44.			*Monochoria vaginalis* (Burm. F.) Presl. ex Kunth.
45.		Scrophulariaceae	*Limnophila hetrophylla* Benth.
46.			*Scoparia dulcis* L.
47.		Lentibulariaceae	*Utricularia aurea* Lour.
48.			*Utricularia flexuosa* Vahl.
49.			*Utricularia stellaris* L.
50.		Acanthaceae	*Hygrophila auriculata* (K. Schum.) Heine
51.			*Justicia japonica* L.
52.		Lamiaceae	*Leucas aspera* Spr.
53.			*Leucas cephalotes* Spr.
54.	Monochlamydeae	Amarantaceae	*Achyranthus aspera* L.
55.			*Aerva lanata* (L.) Juss.ex Schult.
56.			*Alternanthera sessilis* R.Br.
57.			*Digera muricata* (L.) Mart.
58.		Polygonaceae	*Polygonum barbatum* L.
59.		Euphorbiaceae	*Phyllanthus maderaspatensis* L.
60.			*Phyllanthus* sp. L.
61.			*Phyllanthus urinaria* L.
62.	Monocots	Hydrocharitaceae	*Hydrilla verticillata* Royle
63.			*Hydrolea zeylanica* Vahl.
64.			*Largarosiphon alternifolia* Druce
65.			*Limnocharis flava* Linn.
66.			*Vallisneria spiralis* Linn.
67.		Pontederiaceae	*Eichhornea crassipes* Solms.

Contd...

1	2	3	4
68.			*Lindernia hyspoides* Thw.
69.		Commelinaceae	*Commelina benghalensis* L.
70.			*Cyanotis axillaris* R.& S.
71.		Pandanaceae	*Pandanus furcatus* Roxb.
72.		Typhaceae	*Typha angustata* B. & Ch.
73.			*Typha bispinosa* Hk.f.
74.			*Typha elephantiana* L.
75.		Araceae	*Pistia stratiotes* L.
76.		Lemnaceae	*Lemna gibba* Linn.
77.			*Lemna polyrrhiza* Linn.
78.		Potamogetonaceae	*Potamogeton crispus* Roxb.
79.			*Potamogeton indicus* Roxb.
80.			*Potamogeton pectinatus* Linn.
81.			*Ruppia maritime* Linn.
82.			*Zanichella palustris* Linn.
83.		Najadaceae	*Najas indica* (Willd.) Cham.
84.		Cyperaceae	*Blyxa talboti* Hook. f.
85.			*Bulbostylis barbata* (Rottb.) Kunth ex Clarke
86.			*Cyperus bifax* Clarke, Bull.
87.			*Cyperus compressus* L.
88.			*Cyperus difformis* Linn.
89.			*Cyperus haspan* Linn.
90.			*Cyperus iria* Linn.
91.			*Cyperus malaccensis* Lam.
92.			*Cyperus papyrus* Rottb.
93.			*Cyperus pangorei* Rottb.
94.			*Cyperus procerus* Rottb.
95.			*Cyperus rotundus* Linn.
96.			*Cyperus tenuispica* Steud.
97.			*Eleocharis capitata* R. br.
98.			*Eleocharis chaetaria* Roem & Sch.
99.			*Eleocharis geniculata* (L.) R.& S.
100.			*Eleocharis plantaginea* R. br.
101.			*Eleocharis spiralis* R. br.
102.			*Kyllinga brevifolia* Rottb.
103.			*Lipocarpha chinensis* R. Br.
104.			*Mariscus cyperinus* Vahl.

Contd...

1	2	3	4
105.			*Pycreus odoratus* Urb.
106.			*Rhynchospora corymbosa* Vahl.
107.			*Scirpus articulatus* Linn.
108.			*Scirpus grossus* Linn.
109.			*Scirpus supinus* Linn.
110.			*Zizania aquatica* Linn.
111.		Poaceae	*Arundo donax* L.
112.			*Brachiera mutica* Stapf.
113.			*Coix lachryma-Jobi* L.
114.			*Cynodon dactylon* Pers.
115.			*Dactyloctenium aegypticum* (L.) Beauv.
116.			*Dimeria pubescens* Hack.
117.			*Dimeria hohenackeri* Hochst
118.			*Dimeria thwaitesii* Hack.
119.			*Echinochloa colona* Link.
120.			*Echinochloa crusgali* Beauv.
121.			*Echinochloa stagnina* Beauv.
122.			*Eleusine indica* Gaertn.
123.			*Glyceria flutans* R. Br.
124.			*Heteropogon contortus* Beauv.
125.			*Hygrorhiza aristata* Nees.
126.			*Imperata cylindrica* Cyr.
127.			*Ischaemum muticum* L.
128.			*Leersia hexandra* Sw.
129.			*Paspalum dilatatum* Poir.
130.			*Paspalum scrobiculatum* L.
131.			*Paspalum vaginatum* Sw.
132.			*Phragmites karka* Retz.
133.			*Saccolepis indica* Chase
134.			*Saccolepis curvata* Chase
135.			*Saccharum spontaneum* L.
136.	Water Ferns	Azollaceae	*Azolla pinnata* R. Br.
137.		Marsileaceae	*Marsilea quandrifolia* Linn.
138.		Parkeriaceae	*Ceratopteris thalictroides* (L.) Brogn.
139.		Pteridaceae	*Pteris multifida* Poir.
140.		Salviniaceae	*Salvinia natans* L.

water and soil chemistry, providing habitat for various species and reducing erosion. The species composition of wetland species in cultivated and uncultivated area of Kole wetland is same but difference is seen only in their number and some of these plants are herbicide resistant and more suitable to this particular ecosystem. The estimates of annual production of some common wetland like *Cyperus* and water hyacinth are indeed more productive than the crop plants under intensive cultivation. Like primary production, the secondary production is also fairly high. The secondary production depends upon the pathway and efficiency of utilization of energy in primary production. Plants other than the cultivated rice varieties are broadly considered as weeds through neglecting its great ecological value and remove these plant communities from cultivating fields and its surroundings. Still these plants are a main part of a sound ecosystem they cause important social problems like more money and man days spent for weeding operations.

Besides all floating vegetation, grasses and sedges act as microhabitat for fauna of Kole wetlands. The faunal diversity is nearly always greater. There are two major factors responsible for it. First, the variety of growth forms of macrophytes that inhabit a wetland results in greater niche diversification. This is coupled with the fact that large water level changes allow for a more dynamic and diverse community of both plants and animals, and that the detritus based food chain enhances the availability of food energy for a greater variety of animals. According to Jayson and Sivaperuman (2005), the Kole wetlands act as feeding, roosting and breeding ground for many species of migratory and resident birds and they were reported 182 species of birds, 13 species of fishes from the Kole wetlands. Sustainable development and conservation are important for the very survival of the Kole lands and for the maintenance of the delicate balance of life that exists within these special ecosystems.

SUMMARY

The study was conducted from November 1998 through October 2003. The Kole wetland is one of the largest and highly productive wetlands and it is also one of the most threatened wetland in the State. Etymology of "Kole" refers to the peculiar type of paddy cultivation carried out from December to May and this Malayalam word indicates bumper yield of high returns if in case floods do not damage the crops. Agriculture is the major occupation of the people of Kole wetlands and ninety per cent people were practicing agriculture mostly paddy. Total of 140 species belonging to 23 Ffamilies of Dicotyledons and 11 families of Monocotyledons and 5 water fern families were recorded from the Kole wetlands. Prominently represented family is Cyperaceae (27 genera) followed by Poaceae (25). The other dominant families are Asteraceae, Fabaceae and Hydrocharitaceae. Reclamation of land and changes in land use pattern are the most serious problems. The Kole lands are being converted to coconut, areca nut, banana plantations and other cash crops at an alarming rate. Various species of grasses and sedges comprises the floristic spectrum of Kole wetlands and have great value of ecological and economic importance.

Key words **: Flora, Kole wetlands, Thrissur, Kerala.**

कोले जलभूमि, थ्रिश्शूर, केरल के पेड़-पौधों का प्रारम्भिक अध्ययन

के०ए० सुजाना व सी० शिवपेरुमन

सारांश

यह अध्ययन नवम्बर 1998 से अक्टूबर 2003 तक के दौरान किया गया। कोले जलभूमि इस राज्य की सबसे बड़ी और अति उत्पादक जलभूमियों में आती है तथा यह उसकी सबसे ज्यादा संकटापन्न जलभूमियों में से भी है। कोले का व्युत्पत्तिपरक सम्बन्ध एक विशेष प्रकार की धान खेती से है जिसे यहां दिसम्बर से मई तक किया जाता है और मलयालम शब्द अधिक मात्रा में भारी उपज प्राप्ति देने का सूचक है यदि बाढ़ आकर फसलों को नष्ट ही न कर डाले। खेती बाड़ी कोले जलभूमि के लोगबागों का मुख्य व्यवसाय है और नब्बे प्रतिशत लोग खेती-बाड़ी, विशेषतः धान की, करते हैं। कोले जलभूमि से द्विबीजपत्रों के 23 कुलों की कुल 140 जातियां एकबीजपत्रों के 11 कुल तथा जल पर्णागों के 5 कुल अभिलिखित हुए। अधिक प्रतिनिधि करते कुल ह*– मुस्ता कुल (27 प्रजातियां) और उसके बाद घासकुल (25 प्रजातियां), अन्य अधिरोही कुल हैं तारक कुल, पृथुशिम्बि कुल और जलश्री कुल। भूमि की पुनप्राप्ति तथा भूमि उपयोग सज्जा में किए गए परिवर्तन यहां की सर्वाधिक गम्भीर समस्याएं हैं। कोले भूमियां नारियल, सुपारी और केला और अन्य नकदी फसल बागानों में चिन्ता खड़ी करती तेजी से परिवर्तित होती जा रही है। घासों और वलीकों की विविध जातियां कोले जलभूमि के पेड़ पौधों के पटचित्र का अंग है और उनका बहुत अधिक परिस्थिकीय और आर्थिक मूल्य भी है।

References

Gamble, J.S. (1915-1936). *Flora of the Presidency of Madras*, Vol. 1-3. Adlard and Son Ltd., London.

Hooker, J.D. (1875-1897). *The Flora of British India*, L. Reeve and Co., London.

Johnkutty, I. and V.K. Venugopal (1993). *Kole wetlands of Kerala*. Kerala Agricultural University, Thrissur. 68 p.

Mathew, K.M. (1981-1984). *The flora of Tamil Nadu and Carnatic*. Part 1-3. The Rapinat Herbarium, Thiruchirappalli, Tamil Nadu.

Mathew, K.M. (1991). *An excursion flora of Tamil Nadu*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Jayson, E.A. and C. Sivaperuman (2005). Avifauna of Thrissur district, Kerala, India. *Zoos' Print J.*, **20** (2): 1774-1783.

Smith, R.J. (1983). Weeds of major economic importance in rice and yield losses due to weed competition. *Proc. Conf. on Weed control in Rice*, IRRI, Philippines. pp. 19-36.