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EVALUATION OF SOIL-SITE SUITABILITY OF DIFFERENT MANGROVES IN COASTAL SALINE AREA OF INDIAN SUNDARBANS

AMAL KUMAR SARKAR

Department of Botany, Krishnath College, Berhampore -742101, Murshidabad, West Bengal.

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Abstract: Mangroves are the nature's own choice, naturally these are spreading over in the intertidal silted up deltaic regions of estuarine mouths, shallow coasts, edges of the islands and saline mudflats in the tropical and sub-tropical regions of the world. The varying salinity of the water and soil is the most important factor but the tidal water interacts with the mangroves in many ways for their natural succession. So different mangroves species grow in different intertidal zones according to their suitability of existing factors in the Sundarbans ecosystem.

Keywords: Mangroves, intertidal, estuarine, salinity, tidal water, succession, ecosystem.



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Corresponding Author: MR. AMAL KUMAR SARKAR

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INTRODUCTION

The Sundarbans is the largest prograding delta situated at the estuarine phase of the Ganga-Brahmaputra river system, both in India and Bangladesh (Chaudhuri and Chowdhury, 1994; Naskar,1985). This is the only mangrove tiger land on the globe, where the world famous "Royal Bengal Tiger" still lives (Anonymous,1987). Mangroves are the nature's own choice, naturally spreading over in the intertidal silted up deltaic areas of estuarine mouth, shallow coast, edges of the islands and saline mudflats in the tropical and subtropical regions of the world (Mac Nae,1968; Chapman,1976; Untawale,1985). The rise and fall of tidal wave create an environment of dynamic nature. The various degrees of salinity of soil and water are the most important factors but the tidal water interacts with mangroves in different ways. This coastal area is characterised by low flat alluvial plains covered with nature's unique gift, mangrove plants. Mangrove ecosystem is significantly important for its multiple uses. In spite of this importance, research works on mangrove soil of Sundarbans are meagre, except few works of Sah et al (1985,1987), Adhikari et al (1987), Bandopadhyay et al (1987,1995), Sarkar et al (1987), Das et al (1995). Different mangrove species have different tolerance limit in respect of soil and water salinity and they grow in different habitats and in their respective preferred zones. The present investigation is aimed at evaluating the characteristics of some typical mangrove soil of Sundarbans ecosystem in order to recommend the particular species suitable for afforestation at particular spot, as each and every species has specific requirements for their growth in this dynamic ecosystem.

MATERIALS AND METHODS:

Soil samples were collected from the root zone depth of different species (> 15 cm) covering the three zones *i.e.* eastern part (zone-I), central part (zone-II), western part (zone-III) throughout all the seasons of the year. The collected soil samples were air dried, ground to pass through fine mesh sieve and the physico-chemical parameters were analysed following the standard methods (Black,1965). The observed results of different parameters are presented in table-1 and table-2.

RESULTS & DISCUSSIONS:

Soils of these areas are generally silty-clay to clay-loam texture, pH of the soil is generally slightly acidic to alkaline in reaction. Organic carbon status is low to medium, available nitrogen status is somehow high (Sah, *et al*,1987). The chemical properties of soil, collected from different parts of Sundarbans, covering all seasons are presented in table-1.

Table -1:-Chemical Properties of the Soil of different parts of IndianSundarbans.

Parameters	Zone – I (Eastern)			Zone – II (Central)			Zone – II (Western)		
	Winter	Summer	Monsoon	Winter	Summer	Monsoon	Winter	Summer	Monsoon
Salinity (ppt)	10.65	14.8	7.12	5.5	16.65	5.5	11.95	29.98	6.7
pH	8.7	8.1	7.98	7.3	7.65	7.9	7.2	8.52	7.65
Ec (mmhos/cm)	2.2	2.9	1.6	1.4	4.2	0.79	6.3	2.02	0.9
Organic Carbon (%)	0.62	0.55	0.40	0.9	1.3	0.85	1.35	1.4	1.25
Available N (mg/100g soil)	10.45	14.08	8.2	5.7	5.05	6.05	31.1	16.65	9.4

In Sundarbans, each and every island is dominated particularly with some specific plant species or communities. The species distribution and diversity depends the soil character and tidal inundation of different islands.

Table-2: Ideal soil parameters for different mangrove species of Indian Sundarbans

Sl. No	Name of the plant	pH	EC (mmhos/cm)	N (mg/100 gm soil)	P (mg/100 gm soil)	K (%)
1	<i>Avicennia alba</i>	8.36	1.85	12.90	15.92	.034
2	<i>Avicennia marina</i>	8.50	10.50	17.92	12.90	.134
3	<i>Avicennia officinalis</i>	8.37	2.50	9.25	13.90	.089
4	<i>Lumnitzera racemosa</i>	7.64	0.35	13.40	12.10	.002
5	<i>Sonneratia caseolaris</i>	8.03	0.60	4.90	7.30	.019
5	<i>Sonneratia apetala</i>	8.26	4.35	15.70	15.00	.037
6	<i>Sonneratia griffithii</i>	8.43	2.65	15.80	16.76	.080
7	<i>Heritiera fomes</i>	8.03	1.15	6.90	11.20	.190
8	<i>Porteresia coarctata</i>	8.40	1.20	15.80	14.30	.190
9	<i>Bruguiera cylindrica</i>	8.36	1.35	5.80	12.20	.030
10	<i>Bruguiera gymnorhiza</i>	8.31	2.75	18.90	17.10	.021
11	<i>Rhizophora apiculata</i>	8.30	2.10	6.80	13.30	.021
12	<i>Rhizophora mucronata</i>	8.32	2.80	17.50	17.40	.017
13	<i>Phoenix paludosa</i>	6.63	6.50	13.44	15.10	.040
14	<i>Nypa fruticans</i>	7.93	8.40	50.28	13.60	.030

From Table-2, it is shown that *Avicennia marina* tolerates the highest saline condition in compare to *A. alba* and *A. officinalis*. *Lumnitzera racemosa* and *Sonneratia caseolaris* survive in the lowest saline regime; whereas *Sonneratia apetala* and *S. griffithii* grow in such area with more saline soil. Nitrogen status of the soil is high, but availability of potassium to these plants is low. This is because of higher value of sodium present in soil decreases the availability of potassium to the plants. *Heritiera fomes* occurs on slightly saline to moderately saline soil. However, the growth of this species is found much better in slightly saline soil (Naskar, et al., 1997). *Porteresia coarctata* grows well on newly deposited silted up river flats and regularly inundated with saline water. *Avicennia marina* grows almost everywhere and did not depend upon on a particular set of soil character; similar observation was also reported by Chatterjee, et al. (1995). *Bruguiera cylindrica*, *B.gymnorhiza*, *Rhizophora apiculata*, *R.mucronata* grow well on sandy soil with more salinity. However, *Phoenix paludosa* grows well on more mature soil having slightly acidic in nature, particularly in the climax stage, whereas grows in the soil having alkaline in nature with moderate salinity regime. This present *Nypa fruticans* study is a holistic approach to find out as well as assess the site-suitability of different mangrove species in the coastal areas of Sundarbans. Obviously, these findings are helpful for proper future planning, strict conservation and management practices for this important but threatened ecosystem of the Indian Sundarbans.

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