

## Distribution of *Salicornia brachiata* in Relation to Physico-Chemical and Soil Characteristics in Godavari Estuary, AP, India

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**Abstract:** *Salicornia brachiata* is a halophyte occurs in estuarine habitats of mangrove regions. Plants popularly known as Sea asparagus are cooked and eaten or pickled. It is also a good fodder for cattle, sheep and goat. Plant material is also used as raw material in paper and board factories. Its seeds yield high quality edible oil which is highly poly unsaturated and similar to safflower oil in fatty acid. Six study sites were selected in different parts of the estuary for collection of data on distribution of *Salicornia brachiata* populations in relation to Physico-chemical and soil characteristics. Transects were made to get the data on density of the *Salicornia* populations and soil samples were collected from different stations along the transect line to collect the information on soil salinity, soil pH and ratios of silt, clay and silt content in the sediments. Soil salinity varied from 24 to 34 ppt in all study sites, pH of the soil samples varied from 7.6 to 7.9. Soil analysis shows the sand content varies from 9.0 to 18.0, silt 46.0 to 61.0 and clay 23 to 38. In the Godavari estuary maximum density (3242 plants/hectare) was reported for *Salicornia* populations in the station 1(Chollangi) followed by station-4 ( Masanitippa; 1678 plants/hectare). Minimum density (564 plants/ hectare) of the *Salicornia* populations were recorded in the station-5 (Pandi) of the Godavari estuary.

**Key words:** Distribution, density, soil characteristics, *Salicornia brachiata*, Godavari estuary.

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### I. Introduction

Halophytes are transitional plants which occur in between terrestrial and aquatic ecosystems. *Salicornia brachiata* is a halophyte occurs in estuarine and saline areas of the tropical and subtropical regions of the Globe. In India species of *Salicornia* grows along the estuarine regions of the east and west coasts. Several authors studied the ecological and cultural investigations on species of *Salicornia* Satish et al, 1991; Narasimha Rao et al, 2012; Narasimha Rao and Reddi, 2013, Narasimha Rao and Murty, 2013) [1,2,3,4,5,6]. In the present investigation an attempt was made to study the distribution of *Salicornia brachiata* in relation to soil salinity and sediment characteristics at different regions in the Godavari estuary.

### II. Study sites and Methods

Mangroves of Godavari estuary distributed from Chollangi near Kakinada to Anthervedi near Narasapur, mangroves, associated mangroves and halophytes are distributed along the estuarine habitats of the Godavari estuary. Six study sites were selected in different areas of the Gautami and Vashista branches of the Godavari estuary (Fig.1). At each station two transects were placed from waterfront to barren zone where no plant populations occur. Quadrates of 4M X 4M were made along the transect line at 5M interval from water edge to a distance of about 50-60 M. The plant populations present in the quadrates were noted and sediment samples were collected from water edge to every 10 M region up to end of the forest or up to 60 M of the transect line to know the sediment features in relation to distribution of *Salicornia* and other halophytes. Sediment analysis was done by the pipette method (Craver, 1971) [7 ]

### III. Results and Discussion

Information collected on *Salicornia* and other halophytes present in different parts of the Godavari estuary were presented in the Table.1. Density of the *Salicornia* species and other mangroves of this estuary varied from station to station. Maximum density of the *Salicornia* was reported in station-1 and minimum density was reported in the station-3. In all six study sites 12 plants such as *Acanthus ilicifolius*, *Clerodendron inerme*, *Derris trifoliata*, *Dalbergia spinosa*, *Excoecaria agallocha*, *Ipomoea tuba*, *Myriostachya wightiana*, *Salicornia brachiata*, *Sesuvium portulacastrum*, *Suaeda maritime*, *Suaeda monoica*, *Suaeda nudiflora* including halophytes and associates mangrove species were reported.

Information collected on physicochemical features and sediment analysis from six study sites in three different seasons of the Godavari estuary was presented in Tables- 2 to 7. Salinity of the sediment samples varied seasonally from 24 to 34 ppt, pH of sediment samples varied from 7.7 to 7.9 in different regions of the Godavari estuary. (Table 2 to 7). Soil analysis shows the there was gradual increase in the sand percentage from water front to barren zone or end of the forest (10 to 17), likewise silt and clay percentages were varied from '0' M to 60 M length of the transect in different study sites of the Godavari estuary (Table-2 to 7). Bhaskara Rao et

al (1992) [8] reported that high density of mangrove populations were reported where silt was high and sand content were minimum in the sediments. Narasimha Rao and Dora (2009) [9] studied the distribution of mangroves in relation to salinity and pH of the soil samples along the transect lines and reported that true mangroves occurs very near to the water front region where salinity was in between 25 to 26.5 ppt while halophytes grow near to the barren zone where salinity was 40ppt. In the present study also salinity varied from 24 to 34 ppt ( water front to halophytic zone) which agrees the earlier observations of Bhaskara Rao et al(1992), [8] Narasimha Rao and Dora (2009). [9]

Salicornia brachiata prefer to grow in the saline zones of the mangroves habitats where other mangrove and associated mangroves unable to grow and develop normally. In general Mangroves and associated mangroves prefer to grow in the salinity fluctuations of 5 to 25 PPT, besides sediment characters such as proportions of silt, clay and sand contents play an important role in the formation and development of mangroves and halophytes.

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**Table 1. Density of the halophytes and associated mangroves including Salicornia brachiata in six study sites**

S.No	Name of the species	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6
1	Acanthus ilicifolius	346	424	348	868	678	568
2	Clerodendron inerme	78	84	124	42	86	68
3	Derris trifoliata	42	38	52	28	36	22
4	Dalbergia spinosa	24	48	38	46	52	34
5	Excoecaria agallocha	326	288	278	342	262	184
6	Ipomoea tuab	32	26	36	42	24	38
7	Myriostachya wightiana	242	128	184	142	282	312
8	Salicornia brachiata	3242	1292	942	1678	564	1456
9	Sesuvium portulacastrum	842	676	584	624	772	812
10	Suaeda maritima	1452	1262	1424	1574	2172	1642
11	Suaeda monoica	1822	1624	1386	1678	1898	1724
12	Suaeda nudiflora	846	1026	964	1214	758	926

**Table-2: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Chollangi**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand(grams)	Silt (grams)	Clay (grams)
1	0	27	7.7	12	52	36
2	10	30	7.8	16	46	38
3	20	31	7.7	14	48	38
4	30	34	7.9	9.0	61	30

**Table-3: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Matlapalem**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand(grams)	Silt (grams)	Clay (grams)
1	0	25	7.6	14	51	35
2	10	28	7.8	17	47	36
3	20	29	7.7	16	49	35
4	30	31	7.9	12	61	37
5	50	28	7.8	18	58	34

**Table-4: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Gaderu**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand(grams)	Silt (grams)	Clay (grams)
1	0	28	7.7	12	61	27
2	10	27	7.7	14	57	29
3	20	30	7.8	17	51	32
4	30	31	7.9	14	58	28
5	50	29	7.8	16	56	28
6	60	30	7.8	18	57	25

**Table-5: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Masanitippa**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand(grams)	Silt (grams)	Clay (grams)
1	0	25	7.6	14	59	27
2	10	27	7.6	12	58	30
3	20	31	7.8	18	56	26
4	30	31	7.7	15	57	28
5	50	29	7.8	14	56	30
6	60	31	7.9	17	60	23

**Table-6: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Pandi**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand(grams)	Silt (grams)	Clay (grams)
1	0	24	7.6	10	61	29
2	10	30	7.7	14	61	25
3	20	29	7.7	16	58	26
4	30	31	7.9	14	59	27
5	40	31	7.8	16	58	26
6	50	32	7.9	16	59	25
7	60	31	7.7	15	54	31

**Table-7: Percentage of various soil particles , soil salinity and pH in the mangrove habitats of the Vashista**

S.No	Distance from creek (in meters)	Soil salinity (‰)	Soil pH	Sand (grams)	Silt (grams)	Clay (grams)
1	0	29	7.7	14	55	31
2	10	30	7.6	17	51	32
3	20	32	7.8	16	49	35
4	30	33	7.8	11	61	28

Fig. 1 showing the study sites in different parts of the Godavari estuary

