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SOIL ORGANIC CARBON SEQUESTRATION POTENTIAL OF COASTAL HABITATS IN MANDVI TEHSIL

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ABSTRACT: Soil is the only way to survive any kind of life. If humans and plants want to survive they need healthy soil. Healthy soil makes healthy plants which makes healthy planet, but due to pollution earth's upper surface get polluted and face very critical problems. For knowing the effect of pollution on the element of soil we use physiochemical parameters .Physiochemical parameters are uses for knowing both physical and chemical properties, changes and reactions. These properties are easily influence by season and surrounding changes. How physiochemical parameters help to grow plants in coastal region, we decided to study on two sites of Mandvi Taluka's coastal village Tragadi and Modhva. From each site we collected samples of plant and soil of Suaeda nudiflora and Avicennia marina and analysis physicochemical parameters. pH, EC, Ash, TOC, Sodium, Potassium, Magnesium, Calcium, Chloride were analyzed in the laboratory.

KEYWORDS: Soil, Plant, Mangroves, *Suaeda nudiflora, Avicennia marina*

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1. INTRODUCTION

The word "Mangrove" is considered to be a two word the Portuguese word "Mangue" and the English word "grove". Mangroves are the sea-inter-phase, intertidal or tidal habitat tropical and sub-tropical woody plants; the community of these mangroves was defined by at The dominant mangrove ecosystems are generally found within 30°00'N - 30°00'S [1] as 'Mangal'. Mangroves

plants mostly grow within the sheltered intertidal flat deltaic lands, funnel-shaped bays, broad estuarine mouths, shallow or frequently tidal inundated coast lines. [2] The total mangrove cover of the world is about 1, 70, 75,600 sq.km. and occupy less than 1% of the world's surface [3] A total of 121 countries and areas were identified as containing one or more species of true mangroves [4]. 60% of these mangroves found in Indonesia, Brazil, Nigeria ,Australia, Bangladesh ,Malaysia , Cuba ,India ,Mexico ,Papua New Guinea countries. India have the fourth largest mangrove area in the world [5]. India covers about 7516.6 km long Coast line, including Island territories [6], This allows the seedlings to get a head-start before the seed falls into the water and disperses to new areas with the tides and waves. If the seed lodges in a proper place on a mud or sand bank, the seedling can quickly become grow. Mangrove wetland is a multiple use ecosystem. It is considered as a best form of coastal bio shield since it plays a critical role in reducing the impact of cyclonic storms, hurricanes and tsunami on human lives and properties [7]. *A. marina* is a common mangrove species on tropical and sub-tropical sea shores, swamps and stream banks. A marina is the species with the widest distribution, with phenological trends according to latitude [8].

(*Avicennia marina*)

The black mangrove genus A. marina consist of around 8 species of trees which grow in the intertidal zone of coastal. The genus *Suaeda* consists of 110 species all over the coastal tropics and sub-tropics of the world [9]. It consists mostly of halophytic leaf-succulents that grow in saline and alkaline wetlands and deserts. *Suaeda nudiflora*, a tropical halophytic grass that tolerates high temperature, generally found on the moist soil of river sea side ward fringe which always remain waterlogged with high and low tides [10]. *S.nudiflora* is a salt mangrove succulent herb that grows well in the highly saline, dry and extreme high tidal belt. It belongs to the chenopodiaceae family. *Suaeda nudiflora* having erected branches, immature twigs green but after maturity it become reddish. Tap roots well developed and deep suken tap roots exposed during land erosion. It has small, green, linear and succulent leaves and this succulence is a morphological adaptation [11].

(*Suaeda nudiflora*)

[12] carried study on Vishwanath and Ukil published a soil map of India by placing the soils in different climatic zones, Integrating the effects of climate, vegetation and topography. [13], studied on Incorporating the areas of the rocky Kimberley Coast, flanked by the deltaic gulfs of Cambridge Gulf and King Sound, as well as the Dampier Peninsula, the Kimberley host a difficult coastal zone with a plethora of coastal habitats. The smallest scale of habitat includes rocky cliff, scree slopes, gravelly/bouldery shore, sandy beaches, spits, dunes, tidal mud flats, alluvial fans, and the contact between some of these habitats and freshwater. The main vegetation units include mangroves, shrubby chenopods (which include succulent halophytic shrubs), saline marsh, sedgelands, rushlands, dune scrub, dune grasslands, and tea tree thickets. [14] carried out study on the influence of biotic factors on the distribution and establishment of halophytes. Physicochemical factors, such as salinity and flooding, often are considered to be the determining factors controlling the establishment and conational patterns of species in salt marsh and salt desert environments. This study also found that some species of halophytes that are salt accumulators have the ability to change soil chemistry. [15], This study carried out the describe soil properties and to investigate how these parameters, including soil salinity, are related to zone wise and distributional patterns of halophytic plants occurring at edges of the Djendli Sabkha (northeastern Algeria). [16] studied on diversity of plants in Caiçara communities from the Atlantic Forest coast, Brazil. They conducted an ethno-botanical study and 227 plants founded which is used mainly for food, medicine, handicraft and construction of houses and canoes. [17], in this paper they described pattern of diversity across major habitat types in a relatively well preserved coastal dune system in central Italy. They carried stud on different habitats defined on the base of a land cover map support similar levels of biodiversity in terms of vascular flora richness and number of rare and endangered species, and how each habitat contributes to the total species diversity of the coastal environment. [18] carried study with Brazilian mangroves for the degradation and conservation. They estimated that more than 50,000 ha destroyed over the past three decades because of conversions to aquaculture, industrial and urban development and the only way to protect ecologically degradation is planting of

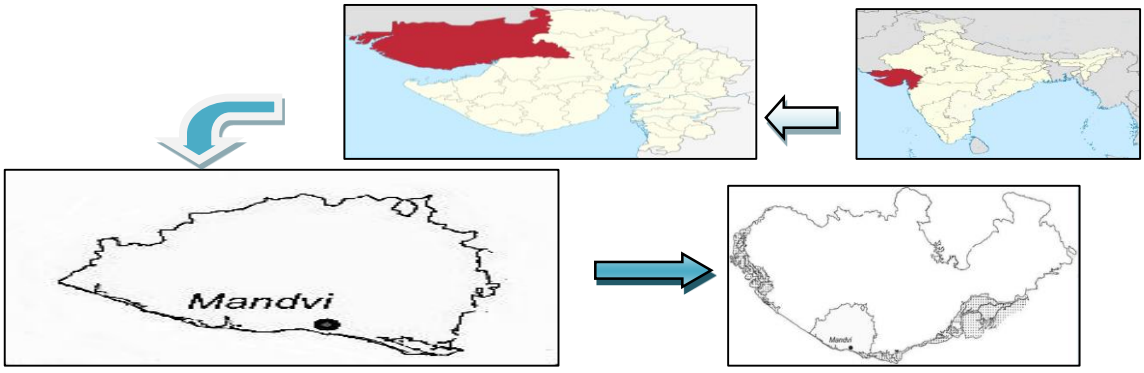
Rhizophora mangle. [19], studied on Vegetation structure of Kachchh mangroves, Gujarat, northwest coast of India. Investigation was carried out in the Kachchh region mangroves of Gujarat to delineate its structure in a coastal stretch of three hundred km. Study shows a clear trend of salinity increase from Mundra to Kori creek could be observed respectively predominated in all stations. Among 5 major stations both maximum (491666/ha) and minimum (4545/ha) regeneration density were recorded at Jakhau. Density of recruitment class was fairly. [20], studied on spatial and seasonal fluxes of nitrous oxide (N2O) and carbon dioxide (CO2) from soil in Mai Po mangrove swamp in Hong Kong, South China and their relationships with soil characteristics were investigated. [21], carried study on the mangrove swamp and salt marsh communities of the Sydney district: I. vegetation, soils and climate. They investigated on soil profile characteristics, particle size distribution, loss on ignition, field moisture content, and bulk density, infiltration by water, caution exchange capacity and pH. [22], Studied on effects soil Physicochemical Patterns on Mangrove Species Distribution. They found mangrove zones dominated by Rhizophora mangle L. alone or in combination with Avicennia germinans (L.) L.The distributions of two dominant mangrove species in a neotropical forest were associated with spatial variation in soil redox potentials (Eh) and interstitial water sulphide concentrations. [23], carried study on relationship between characteristics of soil and halophytic vegetation in coastal area of North China. Plant-soil relationship of saline coastal plain of north China was studied. Principle component analysis (PCA) and cluster analysis were used to create a hypothesis that the distribution pattern of halophytic vegetation was influenced by the variation in soil properties. The hypothesis was tested by canonical correlation analysis (CCA). Principle component analysis results showed that salinity, potential of Hydrogen, moisture contain and available nitrogen were the major soil factors responsible for variations in the pattern of vegetation. [24], Study on Physiological Ecology of Psammophytic species and Halophytic Species from Coastal area in Northern South America. Coastal area of all tropical and subtropical latitudes are the habitat for a number of plants able to establish in a range of sandy to clayey soil, submitted to periodical flooding from rainfall and high tides from the sea, tolerant to large variations of high or low salinity of soils interstitial water, with standing coastal winds and sea-salt spray, and submitted to yearlong high solar irradiation and day temperatures. The soil and plant nutritional interaction of a number of commonly occurring coastal species allowed the characterization of psammophytes and halophytes, based on the Na/K, and Ca/Mg ratios, and their preferential absorption of K over Na. [25] studied on mineral concentrations in leaves of mangrove trees. The concentration of Na, K, Ca and Mg in measured in species of Avicennia , Rahizophora and Langunculira. [26] Carried study on nutrient partitioning and storage in the mangroves Rhizophora stylosa and Avicennia marina. Study carried out R.stylosa trees preferentially accumulated more Mg, S, Cl, Na, Si, Fe, Mn, B and Mo than A.marina trees. Proportionally greater

storage of P, N, Ca, K, Cu and Zn occurred in two of the three marina forests. [27] carried study on mineral composition in leaves of some halophytic species of Bhal. In this study. Mineral analysis of 48 plant samples of 3 dicot(Suaeda nudiflora, Salvadora persica, Prosopis chilensis) and 3 monocot (Schoenoplectus maritimus, Sporobolus coromandellianus, Aeluropus lagopoides)species indicated that Na+ and Cl- mainly contributed to the salt content in species, followed by Ca2+, Mg2+ and K+. [28] present study is to focus about the current arsenic contamination in soil and drinking water of Uttar Pradesh, India in order to make public aware about the health hazards of arsenic contaminated water and understand the need for immediate action. Agricultural soil and ground water samples of arsenic affected areas of district Lakhimpur Kheri and Unnao (Uttar Pradesh, India) were analyzed for presence of arsenic (As). [29] carried study on chemical composition of Salicornia Herbacea L.They investigated chemical compostion of its leaves, stem and roots and conclude that mineral components of Salicornia Herbcea L. rich in Na (1,003.4 ~1,333.8 mg/100 g), Ca (22.1 ~237.5 mg/100 g), K (650.1 ~741.1 mg/100 g). [30] carried study on effects of neutral salts and alkalis on ions distributions in the roots, shoots, and leaves of two alfalfa cultivars with differing degrees of salt tolerance. [31], carried study on Salt tolerance in the halophyte Suaeda nudiflora Moq.: effect of NaCl on growth, ion accumulation and oxidative enzymes. The accumulation of cations was greater in leaves than in shoots or roots. The result shows Na+ and Cl- contributed substantially to dry mass. Salinity treatments decreased the concentration of K+ in leaves. The Ca2+ content and Na+/K+ ratio increased steadily with salinity.

2. MATERIALS AND METHODS

Description of Study Area

Site-1: Modhava is a village of Mandvi tehsil. It is approximately 8 km away from Mandvi. The location of the study area of modhva sea coast is lies between 22°46 N and 69°26 E. **Site-2:** Tragadi is a village of Mandvi tehsil. It is approximately 13 km away from Mandvi. The location of the study area of Tragadi sea coast is lies between 22°46 N and 69°29 E.



Location of study area

Soil Sampling and processing

Avicennia marina and Suaeda nudiflora samples Soil were collected around 1kg of 0-15 cm deep depth. The collected samples were packed in pre-cleaned air tight plastic bags, labeled and transferred to the K.S.K.V. University for further analysis. The field collected samples were air dried at normal room temperature [32] and homogenized using an agate mortar and pestle. The homogenized samples were passed through a sieve of 2 mm mesh size [33] and stored in pre-cleaned plastic containers till further analysis. Take 100gm sieved soil sample and add 200ml distilled water into it. Keep that sample in shaker for 24hrs. After 24hrs filter the samples and using for an analyzing the physico-chemical characterization.

Plant Sampling

Leaves, roots and branches of *Suaeda nudiflora* and mangroves spp. *Avicennia marina* were collected from natural habitats in December. The material was thoroughly washed to remove dust, mud and salts and blotted to dryness. It was dried in the oven at 75-80 °C to a constant weight. Dry material so obtained, was ground to fine powder and preserved. The material was once more dried in oven, before using for analysis of mineral ions [27].

Plant processing

About 1 g plant material was taken into a silica crucible, incinerated and ash in a muffle furnace at a temperature of 450-480:C. To achieve complete oxidation of the organic matter, about 0.5 - 1 ml of concentrated nitric acid was added to the crucibles after cooling them to room temperature. The acid was evaporated on a water bath and the crucibles were again placed in the furnace for complete washing. After cooling at room temperature, 10 ml of 1:1 hydrochloric acid was added to the crucibles containing the ash and was evaporated on water bath. This was followed by addition of 20 ml distilled water and the extract was filtered through Whatman filter paper No. 44 with repeated washing and final volume of 250 ml was made by adding de-ionized water. The aqueous extract was further used for the estimation of sodium (Na+) and potassium (K+) by flame photometry, calcium (Ca 2+) and magnesium (Mg2+) by EDTA titration and chloride (Cl-) by argentometric method. About 1 g dry material was boiled in 100 ml of deionised water on water bath for 30 minutes. After cooling, the extract was filtered, made up to 100 ml in volumetric flask and the filtrate was used for estimation of chloride by Argentometric method.

Physico-chemical Characteristics

The following methods were adopted to completely characterize the soil and Plant samples.

pH:- Prepared 1:2 soil solution was agitated thoroughly for 30 minutes to stabilizer the pH. the same procedure was adopted for each sample. **Total organic carbon** TOC was estimated by Walkley and Rapid Titration method. **Chloride:-** Chloride in the water extract of the soil can be determined by titrating against AgNO3. **Sodium** was estimated by flame photometer method, **Potassium** was

estimated by flame photometer method, **Calcium** EDTA titration method, **Magnesium** EDTA titration method

3. RESULTS AND DISCUSSION

Sr. no.	Location	Habitat	GPS location	Plant species
1	Tragadi	Marshy	22 46 46.65 N 69 29 16.29 E	*Suaeda nudiflora, Aleuropus lagopoides, Prosopis juliflora, Salicornia brachiata Avicennia marina*
2	Modhava	Sandy	22 46 50.47 N 69 26 45.80 E	*Avicennia marina, Salicornia brachiata, Suaeda nudiflora,Salvadora persica, Aleuropus lagopoides,*

Table No. 1: Location detail

The table shows the height, breadth and remark of plants species.

Sr.No	Location	Plant name	Height	Breadth	Remark
1	Modhva	Avicennia marina	45 c.m.	509 c.m.	Covered by Send
		Sueada nudiflora	18 c.m.	278 c.m.	Near terrestrial grass
2	Tragadi	Avicennia marina	74 c.m.	555 c.m.	Bridge's outside near selicornia branchiate and suaeda nudiflora
		Sueada nudiflora	17 c.m.	196 c.m.	Near avicennia marina and Salicornia branchiate

Table No. 2: Observation Table of Species

1. Potential Hydrogen (pH)

Sr.no	Species name	Modhva			Tragadi		
		Sample-1	Sample-2	Sample-3	Sample-1	Sample-2	Sample-3
1	Suaeda nudiflora	8.1	7.7	7.9	7.7	7.4	7.5
2	Avicennia marina	7.9	7.4	7.6	8.3	7.5	7.9

Table No.-3 variation in pH of different coastal flora's soil

pH is not indicator of fertility but it affects on nutrients level and absorption of plants. Generally pH in between 5 to 7 is best range for growing healthy plant, but some plants have some special adaptation so they can grow in high alkaline soil. The areas of Mandvi (Modhva, Tragadi) have shoreline and analysis of the shoreline shows that the soil nature is alkaline. Measuring pH of soil near species of *Suaeda nudiflora* in Modhva respectively 8.1,7.7 ,7.9 and the pH recorded in Tragadi respectively 7.7, 7.4, 7.5. In Modhva, the spp. of *Avicennia marina* pH were recorded respectively 7.9,7.4,7.6 and in Tragadi the pH were recorded 8.3, 7.5, 7.9. The highest pH was recorded in spp. Of *Avicennia marina* which was 8.3.

2. Electric Conductivity (EC)

Sr.no.	Species name	Modhva			Tragadi		
		Sample-1	Sample-2	Sample-3	Sample-1	Sample-2	Sample-3
1	Suaeda nudiflora	18.14	10.63	14.38	19.21	9.87	14.54
2	Avicennia marina	23.16	18.23	20.69	16.38	12.14	14.26

Table No.- 4 variation of EC ($dS.m^{-1}$) in different coastal flora's soil

EC is very important in plants for create an osmotic pressure around root. It helps in absorption of water and nutrients. Measuring Electric Conductivity in water it means measuring a salinity of soil. EC of soil near spp. of *Suaeda nudiflora* in Modhva ranged between 10.63-18.14 $dS.m^{-1}$ and in Tragadi ranged between 9.87-19.21 $dS.m^{-1}$. A soil near spp. of *Avicennia marina* EC recorded in Modhva were between 18.23-23.16 $dS.m^{-1}$ and in Tragadi ranged between 12.14-16.38 $dS.m^{-1}$. The high number of EC, more chances to stimulate the growth of any plant and The result shows that the highest electrical conductivity recorded in spp. Of *Avicennia marina* which is 23.16 $dS.m^{-1}$

3. Sodium (Na^+)

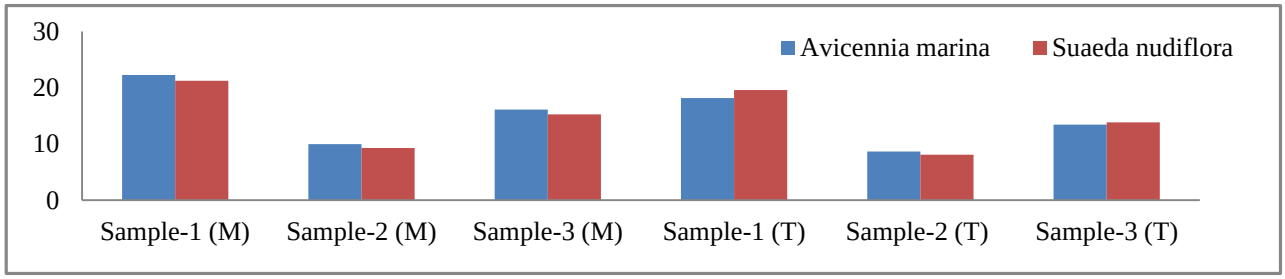


Fig. 1 Sodium (Na^+) of soil supporting coastal flora ($meq.g^{-100}$)

Halophytic plants are grow under high pressure of salts, and those halophytic plants which grows near sea faces a concentration of NaCl. Sodium helps in synthesis of chlorophyll as well as regulate and balance water inside the plant by opening and closing stomata. Sodium recorded near spp. *Suaeda nudiflora* is between 9.31-21.26 $meq.g^{-100}$ in Modhava. and near Tragadi. The founded range between 8.1-19.6 meq. g^{-100}. Modhva soils maximum content 22.28 meq. g^{-100} and minimum content 9.98 $meq.g^{100}$ near *Avicennia marina*. Tragadi soils ranges between 8.68–18.18 $meq.g^{-100}$. The highest amount of sodium recorded in soil near A*vicennia* spp. This is 22.28 meq. g^{-100}.

4. Chloride (Cl^-)

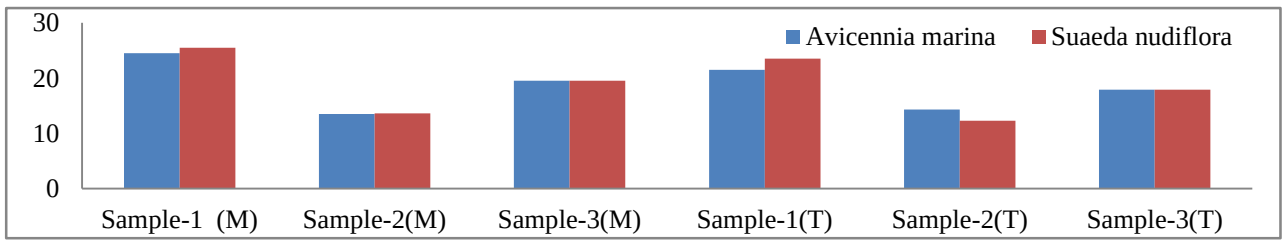


Fig. 2 Chloride (Cl^-)of soil supporting coastal flora ($meq.g^{-100}$)

Chloride works as a micronutrient in plants. Chloride is important for metabolism, photosynthesis, osmos and ionic balance within the cell of plant. For growing of healthy plant chloride must minimum contain minimum 2 ppm. Cl^- of soil near spp. of *Suaeda nudiflora* in Modhva ranged between 13.6-25.5 meq.g^{100} and in tragadi ranged between 12.29-23.5 meq.g^{-100}. The soil near spp Of *Avicennia marina* Cl^- recorded in Modhva were between 13.5-24.5 meq.g^{-100} and in Tragadi ranged between 14.3-21.5 meq.g^{-100}. The result shows that the highest Chloride recorded in spp. Of *Avicennia marina* which is 21.5 meq. g^{-100}.

5. Calcium (Ca^{2+})

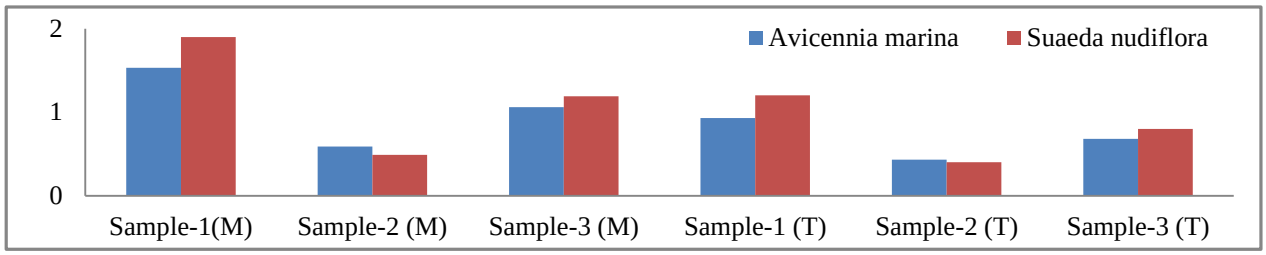


Fig. 3 Ca^{2+} of soil supporting coastal flora (meq.g^{-100})

Calcium is responsible for holding the cell walls and activating certain enzymes in plants. When calcium is deficient, plant's new tissue such as root tips, young leaves, and shoot starting to distorted. Calcuim must be present minimum between 40-60 ppm in plant.Calcium recorded in soil near spp. *Suaeda nudiflora* is between 0.49-1.19 meq.g^{-100} in Modhava and near Tragadi the founded range between 0.4-1.2 meq.g^{-100} Modhva soils maximum content 1.53 meq.g^{-100} and minimum content 0.59 meq.g^{-100} near *Avicennia marina*. Tragadi soils ranged between 0.43 – 0.93 meq.g^{-100}. The highest amount of calcium recorded in soil near *Avicennia marina* spp. Which was 1.53 meq. g^{-100}.

6. Potassium (K^+)

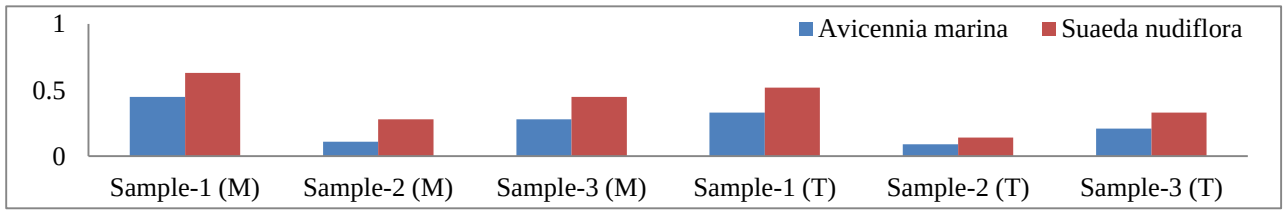


Fig. 4 potassium K^+ of soil supporting coastal flora (meq.g^{-100})

A plant needs potassium in high amount so potassium consider as a macronutrient for plant. Potassium is absorbed in ionic foam of K^+. It is responsible for plant's shape, taste, size and color. Potassium regulates the opening and closing of stomata, activation of enzymes and essential for production of Adenosine Triphosphate (ATP). Potassium is ideal between 81-120 ppm. In modhva Potassium founded between 0.28-0.63 meq.g^{-100} and 0.14-0.52 meq.g^{-100} in Tragadi. *Avicennia marina* of Modhva content maximum 0.45 meq.g^{-100} and minimum 0.11 meq.g^{-100}. Tragadi had maximum and minimum respectively 0.09 meq.g^{-100} and 0.33 meq.g^{-100}. *Suaeda nudiflora* content high potassium concentration then *Avicennia marina spp.*

7. Magnesium (Mg^{2+})

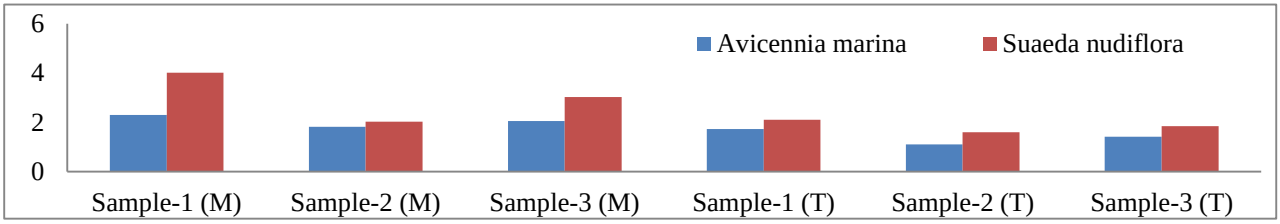


Fig. 5 magnesium(Mg^{2+}) of soil supporting coastal flora (meq.g^{-100})

Magnesium is very essential nutrient for plant growth. The magnesium's well-known role is a building block of the Chlorophyll, which are responsible for appearing leaves green. Magnesium is also important to activation of many enzymes in plant cells. Magnesium must be range between 11 to 33 lb./A. In Modhva soil near *Suaeda nudiflora* conatant magnesium respectively 4.01,2.03,3.02 meq.$g^{-100}$and near *Avicennia marina* respectively 2.3,1.82,2.06 meq.g^{-100}.Soil in Tragadi conatant 2.1,1.6,1.85 meq.$g^{-100}$and 1.73,1.11 , 1.42 meq.g^{-100} respectively in spp. of *Suaeda nudiflora* and *Avicennia marina*. Highest concentration of magnesium recorded in *Sueada nudiflora* in Modhva which is 4.01 meq.$g^{-100}$and the lowest concentration is also recorded from *Suaeda nudilflora* in Tragadi which is 1.6 meq.g^{-100}.

8. Total Organic Carbon (TOC)

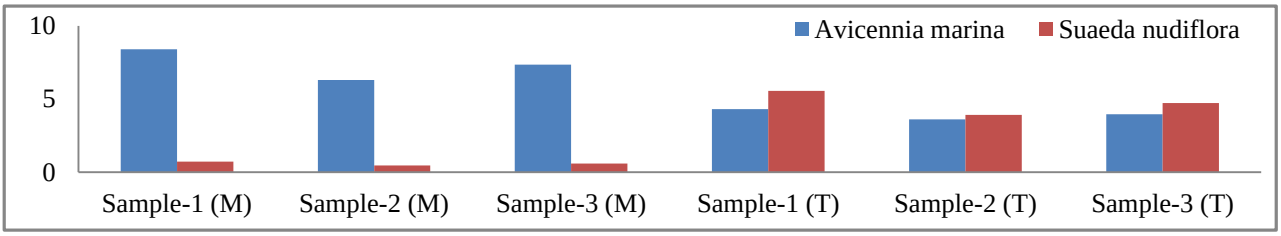


Fig. 6 TOC of soil supporting coastal flora (g.Kg^{-1})

TOC shows the bioactivity of soil. The amount of TOC is increased the fertility of Soil is also increased. In Modhva *Suaeda spp*. Content o.73, 0.45, 0.59 g.Kg^{-1} and *Avicennia Spp*. Content 8.42, 6.31, 7.36 g.Kg^{-1}. In Tragadi *Avicennia spp*. Content 4.32, 3.61, 3.96 g.Kg^{-1} and in spp. of *Suaeda* recorded respectively 5.56,3.91,4.72 g.Kg^{-1}. The result shows that *Avicennia marina*has high concentration then *Suaeda nudiflora*. Modhva's soil near *Avicennia* is high fertile compaire *Suaeda nudiflora*'s. Tragadi's soil shows high TOC near *Suaeda spp*. Compare to *Avicennia Spp*.

9. Minerals contain in Halophytic plants

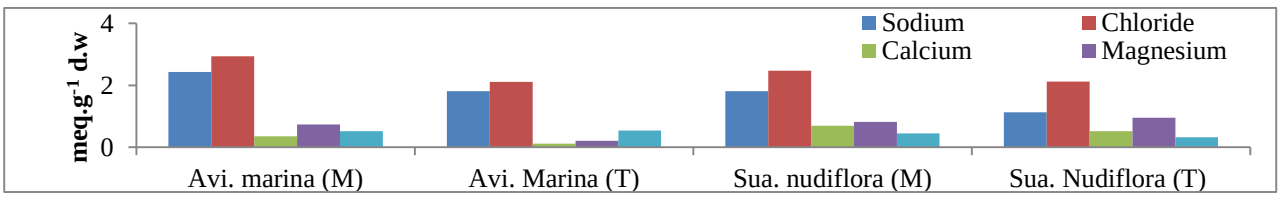


Fig. 7 - Mineral content in leaves of from marshy and inland saline habitats:

In modhva ,leaves of *Avicennia marina* content 2.43,2.94, 0.35, 0.74, 0.52 and *Suaeda spp*. Content 1.81, 2.47, 0.7, 0.82, 0.45 ; Na^+, Cl^-,Ca^{2+},Mg^{2+},K^+ respectively in unit of meq.g^{-1} d. wt. A second study area of Tragadi's *Avicennia marina* leaves content 1.81, 2.11, 0.12, 0.21, 0.54 and *Suaeda spp*. Content 1.13, 2.12, 0.52, 0.95, 0.32; Na^+, Cl^-, Ca^{2+}, Mg^{2+}, K^+ respectively in unit of meq.g^{-1} d. wt. The result shows that chloride concentration was highest recorded and calcium concentration recorded lowest in these halophytic species.

10. Ash contain in halophytic plant

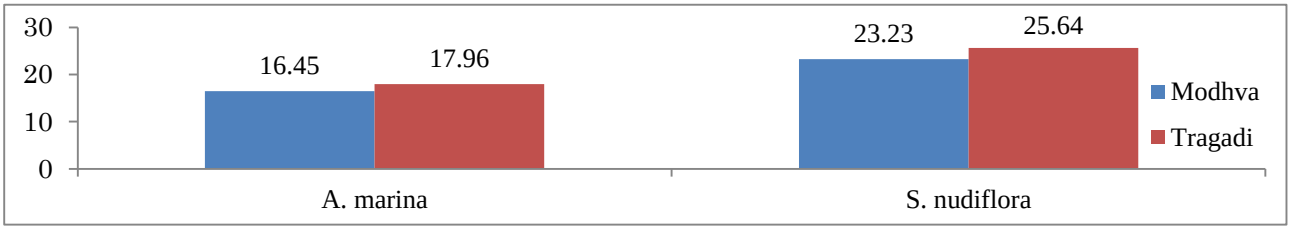


Fig.8- Ash contain in halophytic plants (%)

4. CONCLUSION

Soil is the only way to survive any kind of life. If humans and plants want to survive they need healthy soil. Healthy soil makes healthy plants which makes healthy planet, but due to pollution earth's upper surface get polluted and face very critical problems. For knowing the effect of pollution on the element of soil we use physiochemical parameters .Physiochemical parameters are uses for knowing both physical and chemical properties, changes and reactions. These properties are easily influence by season and surrounding changes. How physiochemical parameters help to grow plants in coastal region, we decided to study on two sites of Mandvi Taluka's coastal village Tragadi and Modhva. From each site we collected samples of plant and soil of *Suaeda nudiflora* and *Avicennia marina* and analysis physicochemical parameters. pH, EC, Ash, TOC, Sodium, Potassium, Magnesium, Calcium, Chloride were analyzed in the lab.

❖ **Soil :**

- In Modhva, *Suaeda nudiflora* had higher pH compare to *Avicennia marina*, but Tragadi's analysis shows the opposite result.
- Electric conductivity was recorded minimum in soil supporting plant *Suaeda nudilfora* near Tragadi village while it was higher in soil of *Avicennia marina* near Modhva village.
- Lowest sodium recorded in soil supporting spp. *Suaeda nudiflora* near Tragadi and the highest sodium concentration recorded in spp. *Avicennia marina* near Modhva.
- In Modhva *Suaeda nudiflora* recorded lowest and *Avicennia marina* founded highest. Tragadi had highest concentration in *Suaeda nudiflora* and lowest recorded in spp. of *Avicennia marina* .

- Magnesium founded averagely low in spp. *Avicennia marina* and high spp. *Suaeda nudiflora* of Modhva. Magnesium was found averagely low in spp. *Avicennia marina* and high spp. *Suaeda nudiflora* of Tragadi.
- Chloride average adsorption ratio were same in *Avicennia marina* and *Suaeda nudiflora* of site Modhava and Tragadi.
- TOC was found higher in soil supporting *spp. Suaeda nudiflora* while it was miximum in *spp. Avicennia marina*'s soil of ,Modhva. Sodium adsorptionratio was higher in *Avicennia marina* and minimum in *Spp. Suaeda nudiflora* ,Tragadi.

❖ **Plants:**

- Ash recorded maximum in *Suaeda nudiflora*and minimum in *Avicennia marina* from both site.
- Sodium noted to be higher in *Avicennia marina* while it was Minimum in soil of *Sueda nudiflora* in both site.
- Chloride recorded highest in *Avicennia marina* near Modhava and lowest also in *Avicennia marina* near Tragadi.
- Calcium recorded lowest in All spp. In spp. of *Avicennia marina* Modhva content high calcium compare to Tragadi. The difference was same in *Suaeda nudiflora spp*.
- Magnesium noted minimum in *Avicennia marina* and maximum in *Suaeda nudiflora* from both sites.
- Potassium founded higest in *Avicennia marina* and minimum in *Suaeda nudifora* from from both study area.

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6. CONFLICT OF INTEREST

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