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ANALYSIS OF CHLOROPHYLL PIGMENTS IN THE PICHAVARAM MANGROVE LEAVES

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Abstract

The variation of Chlorophyll 'a' Chlorophyll 'b' and carotenoid. Have been investigated to the Mangrove plant leaves such as *Acanthus ilicifolius, Aegiceras cornicularum, Avicennia marina, Avicennia officinalis, Ceriops decandra, Excoecaria agallocha, Lumnitzera racemosa, Rizophora apiculata, Rhizophora mucronata* and *Salvadora persica* these are the important Mangrove plants. Hence a Comparative account of the chlorophyll 'a', Chlorophyll 'b' and carotenoid content of the leaves on Mangrove plants revealed that the highest amount of chlorophyll 'a' and chlorophyll 'b' in the leaves of *Rhizophora apiculata* (Chl a)14.40µg/ml Fr. Wt., (Chl b) 22.74µg/ml Fr.Wt and highest amount in Carotenoid content was highest in *Aegiceras corniculatum* 1.43µg/g Fr.Wt in Summer seasons Comparative lower amount of chlorophyll 'a' chlorophyll 'b' leaves of *Aegiceras corniculatum* (Chl a 3.61 µg/ml Fr.Wt) (Chl b 4.91 µg/ml Fr.Wt) and carotenoid content was lowest amount in the leaves of *Rhizophora apiculata* (0.21 µg/ml Fr.Wt) in summer seasons.

Key words: Mangrove plants, Biochemical, Chlorophyll, Carotenoid.

Introduction

The pigments which are involved in the process of photosynthesis are called photosynthetic pigments. These pigments are the coloured organic compounds that have capacity to absorb certain wavelength of light and reflect to others chlorophyll is a green pigment found in cyanobacteria and the chloroplasts of algae and plants. Chlorophyll is an extremely important biomolecule, critical in photosynthesis, which allows plants to absorb

ISSN: 2278-4632
Vol-10 Issue-6 No. 16 June 2020

energy from light. Chlorophyll absorbs light most strongly in the blue portion of the electromagnetic spectrum, followed by the red portion.

However, it is a poor absorber of green and near- green portions of the spectrum, followed by the red portion. However there is a poor absorber of green and near-green portions of the spectrum, Hence it is a poor absorber of green and near green portions of the spectrum hence the green colour of chlorophyll- containing tissues chlorophyll was first isolated by Joseph Bienaime Cavetou and Pierre Joseph Pelletier in 1817. Several kinds of chlorophyll have been discovered in plants. (**V.B Kadam et al. (2013).**

The formation of chlorophyll is physiological process that occurs only in living cells. The essential conditions for chlorophyll formation is the presence of genetic factors **(Anonymous, 1986).**

Excoecaria agalocha L. of the family Euphorbiaceae is small tree mangrove that grows in sandy soil or in drier, harder sandy mud near terrestrial fringes of mangrove vegetation. In India it is distributed in most of the mangrove pockets of east coast, of pichavaram (Tamil Nadu). *Excoecaria agalocha* L. Plants are dioeciously and produce small Non-viviparous seeds having air space in the seed coat which help to keep them afloat and enable to disperse over long distance through ocean currents thereby forming different population in various islands of different mangrove regions of India. Hence it plays an important role in shaping population genetic structure of mangrove species through their effect on plant distribution and level of gene flow among the populations. **(Pawar umesh ramchandra. (2012).**

(Francisco Flores- de Santiago et al 2012) For mangroves, the concentrations of leaf pigments can be associated with environmental factors such as ambient temperature/sunlight **(Saenger 2002),** water availability **(Lacerda 2002),** and salinity **(Steinke et al. 1993).** Thus, in a sub-tropical mangrove forest where fresh water availability is seasonal, precipitation patterns could affect the physiological development of the mangrove trees, resulting in an increase or decrease of ground salinity **(Field 1995).** As a consequence, in sub-tropical regions there could be a seasonal decrease in net primary productivity a seasonal decrease in net primary productivity and growth **(Saenger 2002)** (**Raven et al 1992).** Each species of mangrove has a particular range of tolerance to the environmental factors such as water salinity. For example, some species are relatively intolerant to hypersaline conditions (e.g. Rhizophora mangle), whereas others are quite capable of tolerating very high salinities of over 60 (e.g. Avicennia germinans; **Moroyoqui-Rojo &Flores- verdugo 2005)**

ISSN: 2278-4632
Vol-10 Issue-6 No. 16 June 2020

Mangrove are halophytic woody plants that serve as protection against cyclone Tsunami and are a source of energy for coastal inhabitants it is also used for drugs dyes, tannins and also for medicine. Mangroves are derived from eight families of trees and sherbs growing on the shoreline and estuaries. In tropical and subtropical coastal regions **(Arumugam et al 2012**) and (**M.A. A1-Bahrany, 2003**)

however mangrove habitats are ecologically important, as they function as natural nutrient filters and recyclers, aid in flood water mitigation and help protect coastal areas from seawater intrusion **(Arumugam et al 2012**) **(V. Selvam 2002)** Excoecaria agalocha L. (Euphorbiaceae a mangrove tree also called milky mangrove highly tolerant to adverse environmental conditions **(Arumugam et al 2012**) (**K. Tenji, Y. Kiyonori, K. Masahira et al. (2003)**

Materials and Methods

The following mangrove species were used for the present investigation:

Acanthus ilicifolius L.	-	Acanthaceae
Aegiceras corniculatum Blanco.	-	Myrsinaceae
Avicennia marina, (Forsk.) Vierch.	-	Avicenniaceae
Avicennia officinalis, L.	-	Avicenniaceae
Ceriops decandra Griff.	-	Rhizophoraceae
Excoecaria agallocha, L.	-	Euphorbiaceae
Lumnitzera recemosa, Willd.	-	Combretaceae
Rhizophora apiculata, Bl.	-	Rhizophoraceae
Rhizophora mucronata, Poir.	-	Rhizophoraceae
Salvadora persica, L.	-	Salvadoraceae

The above species were naturally growing in abundance in the mangrove belt of pichavaram, on the east coast of Tamil Nadu, India ($11^0$24'N and $79^0$44'E) about 13km east of Annamalai University Campus.

The mangrove species were collected from the forest area of pichavaram and brought to the laboratory during the period March 2017- May 2017. The fully matured leaves were detached from the twigs and surface dust was washed with distilled water and the mid-ribs were removed and laminae were used for various studies during the season on summer. chlorophyll 'a' chlorophyll 'b' and carotenoid were extracted from the freshly plucked third leaf from the top using 80% acetone optical densities were recorded at 480, 645, 663 nm.

The amount of chl. a, chl. b, were calculated in the terms of µg/g Fr.Wt and carotenoid were calculated in the terms of µg/ml Fr.Wt

ISSN: 2278-4632
Vol-10 Issue-6 No. 16 June 2020

Extraction of Chlorophyll (Arnon, 1949)

One gram of finely cut fresh leaves were taken and ground with 20-40ml of 80% acetone. It was then centrifuged at 5000-10000rpm for 5mins. The supernatant was transferred and the procedure was repeated till the residue becomes colourless. The absorbance of the solution was red at 645 nm and 663nm against the solvent (acetone) as a blank.

Estimation of Chlorophyll Content

The concentration of chlorophyll a chlorophyll b and total chlorophyll were calculated using the following equation:

Total chlorophyll : $20.2(A_{645}) + 8.02\ (A_{663})$

Chlorophyll a : $12.7\ (A_{663}) - 2.69\ (A_{645})$

Chlorophyll b : $22.9(A_{645}) - 4.68\ (A_{663})$

Result and Discussion

Table 1. Showing the estimation of chlorophyll in mangrove plants

S.No	Name of the plant species	Chl a (µg/ml)	Chl b (µg/ml)	Total Chl (µg/ml)	Carotenoid (µg/ml. fr.wt)
1.	*Acanthus ilicifolius*	11.41	6.86	18.26	1.15
2.	*Aegiceras corniculatum*	3.61	4.91	8.52	1.43
3.	*Avicennia marina*	4.84	11.54	16.37	0.70
4.	*Avicennia officinalis*	6.63	12.35	18.97	0.87
5.	*Ceriops decandra*	6.81	16.00	22.80	1.40
6.	*Excoecaria agallocha*	4.03	9.14	13.17	0.53
7.	*Lumnitzera littorals*	3.60	8.69	12.28	1.50
8.	*Rhizophora mucronata*	4.14	8.33	12.47	1.22
9.	*Rhizophora apiculata*	14.40	22.74	37.12	0.21
10.	*Salvadora persica*	10.36	13.16	23.51	0.83

Greens are important sources of protective food which are highly beneficial for the maintenance of good health and prevention of diseases. In this study commonly available plant leaves were used to estimate the chlorophyll content a total of ten plants were selected for this study these include *Rhizophora mucronata, Rhizophora apiculate, Salvadora persica Acanthus ilicifolius, Lumnitzera racemosa, Avicennia marina Avicennia officinalis, Aegiceras corniculatum, Excoecaria agallocha* and *Ceriops decandra* chlorophyll estimation was done

ISSN: 2278-4632
Vol-10 Issue-6 No. 16 June 2020

in the fresh green leaf samples extracted with the acetone solvent the absorbency readings of chlorophylls extracts were measured in two different wavelengths 645nm and 663nm respectively. Based on the absorbency value calculations were made using (**Arnon's (1949)** equation and the amount of chlorophyll a, chlorophyll 'b' and total chlorophyll were estimated and tabulated the highest total chlorophyll content (a+b) was detected *Rhizophora apiculata* (37.12 µg/g Fr.Wt) Followed Salvadora persica 23.51 µg/g Fr.Wt *Excoecaria agallocha* 22.80 µg/g Fr.Wt. **Khaleghi (2012)** showed that amount of leaf chlorophyll a and total chlorophyll (chl a+b) were reduced by increasing water deficit and the amount of total chlorophyll and chlorophyll a were higher in plants were received 100% ET crop than 65 and 45% ET crop (**Jose Francisco et al., (2008)** determined chlorophyll concentrations in tropical tree species by portable chlorophyll meter with provides convenient and non-destructive way to estimate the chlorophyll concentrations. The amount of chlorophyll a and chlorophyll 'b' in normal leaf was loss when compared to the regenerated leaf

Conclusion

I have concluded certain characters chlorophyll and carotenoid content from the mangrove plants leaves such as 1. *Rhizophora mucronata 2. Rhizophora apiculata 3.Salvadora persica 4.Acanthus ilicifolius, 5.Lumnitzera racemosa 6.Avicennia marina 7.Avicennia officinalis 8.Aegiceras corniculatum 9.Excoecaria agallocha 10. Ceriops decandra* Estimated for considering the results obtained from this work, among these Ten Mangrove plants the chlorophyll content in *Rhizophora mucronata* leaves was higher followed by *Salvadora persica*, *Excoecaria agalocha* the concentration of chlorophyll may vary in different season's evaluation. Carotenoid content in *Lumnitzera racemosa* leaves was higher followed by *Aegiceras corniculatum*, *Rhizophora mucronata* the concentration of the carotenoid content may vary in different seasons and salinity.

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Vol-10 Issue-6 No. 16 June 2020

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