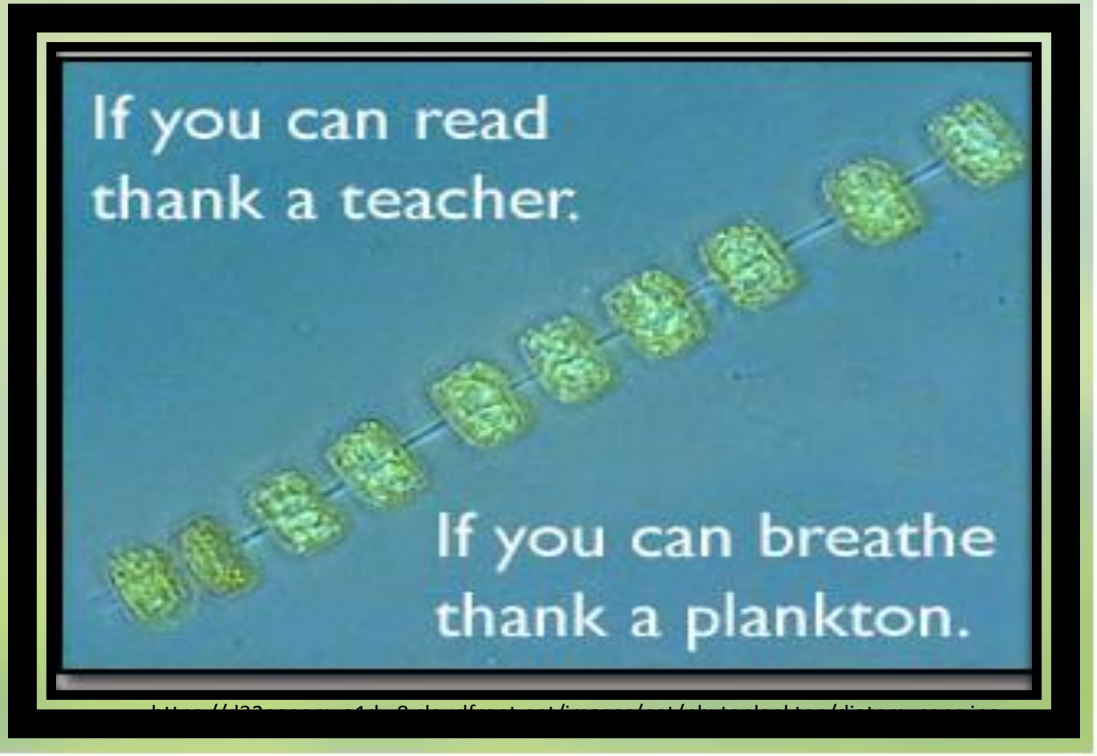
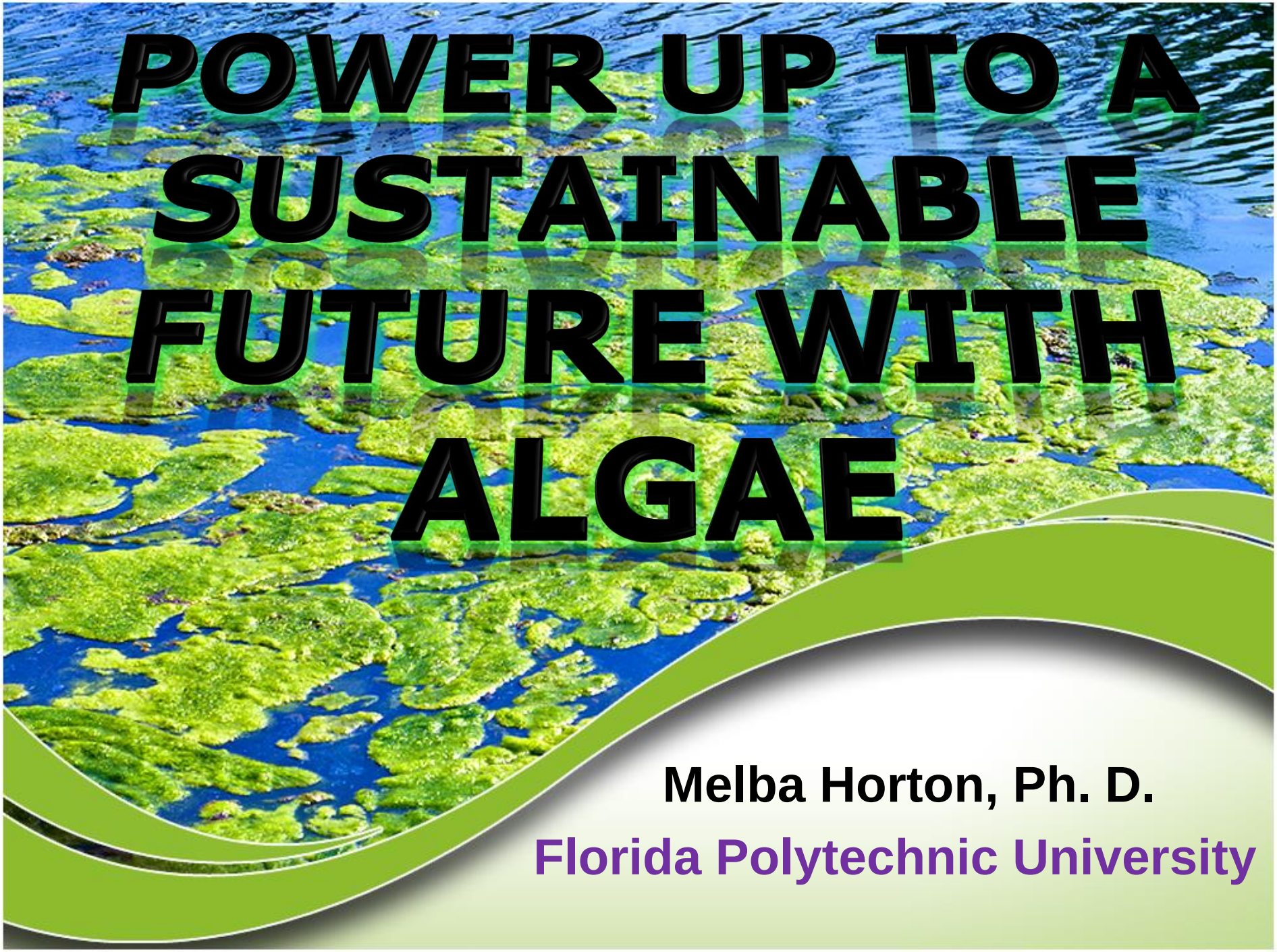
Which of the following do you consider the most important organism on earth?

- A) Bacteria
- B) Algae
- C) Plants
- D) Animals
- E) Humans




POWER UP TO A SUSTAINABLE FUTURE WITH ALGAE
Melba Horton, Ph. D.
Florida Polytechnic University

ALGAE

- Photosynthetic micro/macroscopic protists
- Food & shelter for aquatic organisms

http://en.wikipedia.org/wiki/Plant#/media/File:Haeckel_Siphoneae.jpg

http://russgeorge.net/wp-content/uploads/2015/03/silly-plankton-24821841-470x260.jpg

SPECIES DIVERSITY

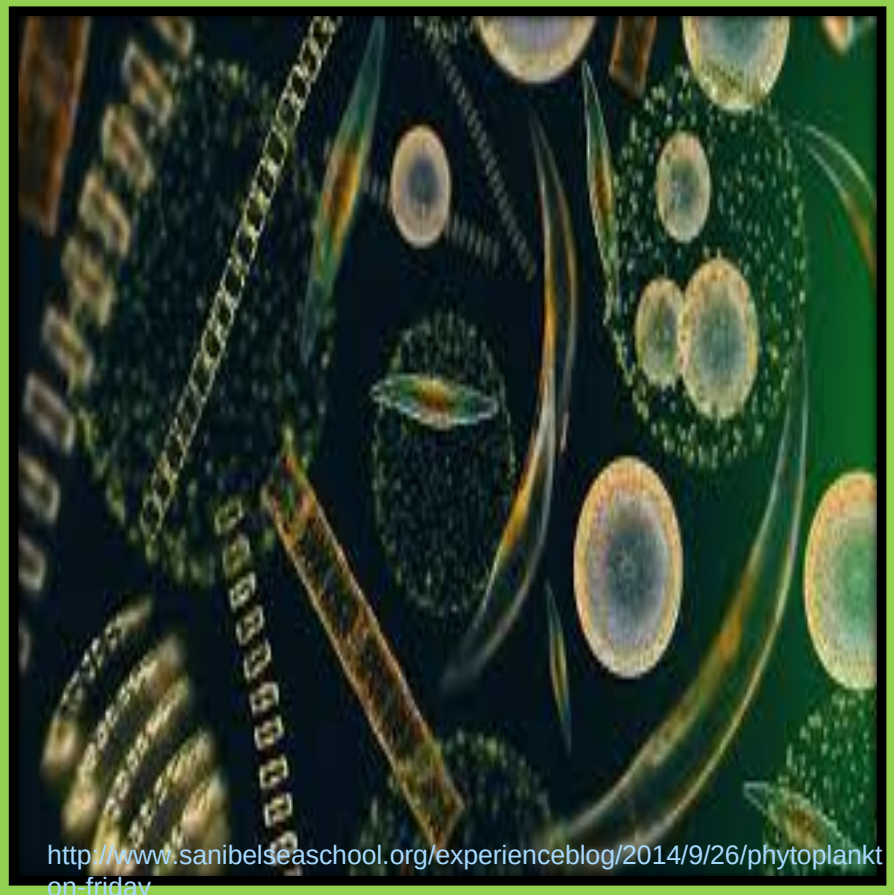
- **Seaweeds**

  ~10,000 species

- **Diatoms**

  ~ 20,000 species

http://fine-art-prints-store.com/product_info.php?products_id=2541



http://www.sanibelseaschool.org/experienceblog/2014/9/26/phytoplankton-friday

MACROALGAE

- ***Sargassum* (gulf weed)**
- Rich in alginate
- Overexploited

- ***Caulerpa* (sea grapes)**
- Rich in antioxidant
- High Demand

- ***Undaria* (Asian kelp)**
- Rich in fucoidan
- High demand

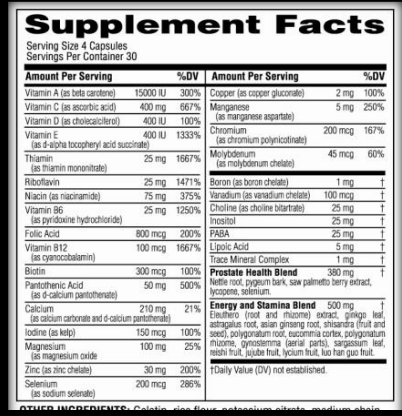
INDUSTRIAL APPLICATIONS

Sargassum **– major source of <u>alginate</u> used in:**

- food
- textile
- bakery
- cosmetics
- paper
- Adhesives
- dental impression
- ointments
- welding rod
- Latex
- medicine

&

<u>bioethanol</u> production



Supplement Facts

Serving Size 4 Capsules
Servings Per Container 30

Amount Per Serving		%DV	Amount Per Serving		%DV
Vitamin A (as beta carotene)	15000 IU	300%	Copper (as copper gluconate)	2 mg	100%
Vitamin C (as ascorbic acid)	400 mg	667%	Manganese (as manganese aspartate)	5 mg	250%
Vitamin D (as cholecalciferol)	400 IU	100%	Chromium (as chromium polynicotinate)	200 mcg	167%
Vitamin E (as d-alpha tocopheryl acid succinate)	400 IU	1333%	Molybdenum (as molybdenum chelate)	45 mcg	60%
Thiamin (as thiamin mononitrate)	25 mg	1667%	Boron (as boron chelate)	1 mg	†
Riboflavin	25 mg	1471%	Vanadium (as vanadium chelate)	100 mcg	†
Niacin (as niacinamide)	75 mg	375%	Choline (as choline bitartrate)	25 mg	†
Vitamin B6 (as pyridoxine hydrochloride)	25 mg	1250%	Inositol	25 mg	†
Folic Acid	800 mcg	200%	PABA	25 mg	†
Vitamin B12 (as cyanocobalamin)	100 mcg	1667%	Lipoic Acid	5 mg	†
Biotin	300 mcg	100%	Trace Mineral Complex	1 mg	†
Pantothenic Acid (as d-calcium pantothenate)	50 mg	500%	**Prostate Health Blend**	380 mg	†
Calcium (as calcium carbonate and d-calcium pantothenate)	210 mg	21%	Nettle root, pygeum bark, saw palmetto berry extract, lycopene, selenium.		
Iodine (as kelp)	150 mcg	100%	**Energy and Stamina Blend**	500 mg	†
Magnesium (as magnesium oxide	100 mg	25%	Eleuthero (root and rhizome) extract, ginkgo leaf, astragalus root, asian ginseng root, shisandra (fruit and seed), polygonatum root, eucommia cortex, polygonatum rhizome, gynostemma (aerial parts), sargassum leaf, reishi fruit, jujube fruit, lycium fruit, luo han guo fruit.		
Zinc (as zinc chelate)	30 mg	200%	†Daily Value (DV) not established.		
Selenium (as sodium selenate)	200 mcg	286%			

OTHER INGREDIENTS: Gelatin, rice flour, potassium citrate, medium chain

http://www.amitcellulose.com/sodium-alginate.html

http://www.yijiahuayi.com/product-dental_impression_specialized_alginat 474.html

http://www.yijiahuayi.com/photo.html?t =P&pID=472

ELSEVIER

Bioresource Technology

Volume 138, June 2013, Pages 22-29

BIORESOURCE TECHNOLOGY

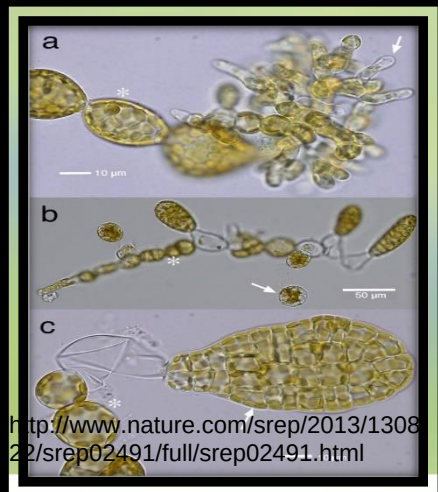
Bioethanol production from the macroalgae *Sargassum* spp.

Myra G. Borines [a], Rizalinda L. de Leon [b], Joel L. Cuello [c]

Environmental Sustainability

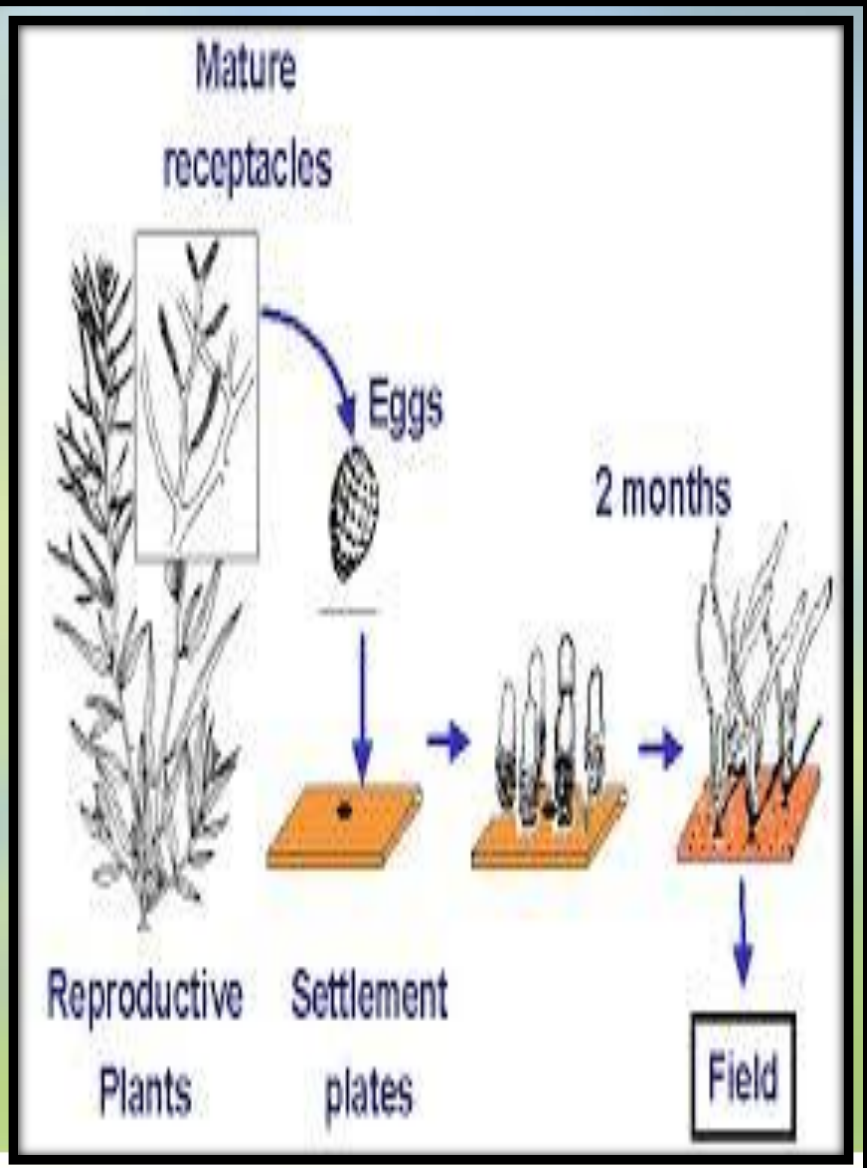
http://www.esapubs.org/archive/ecol/E084/046/appendix-C.htm

"Growth and Survival of *Sargassum crassifolium* Germlings Under Laboratory Conditions"

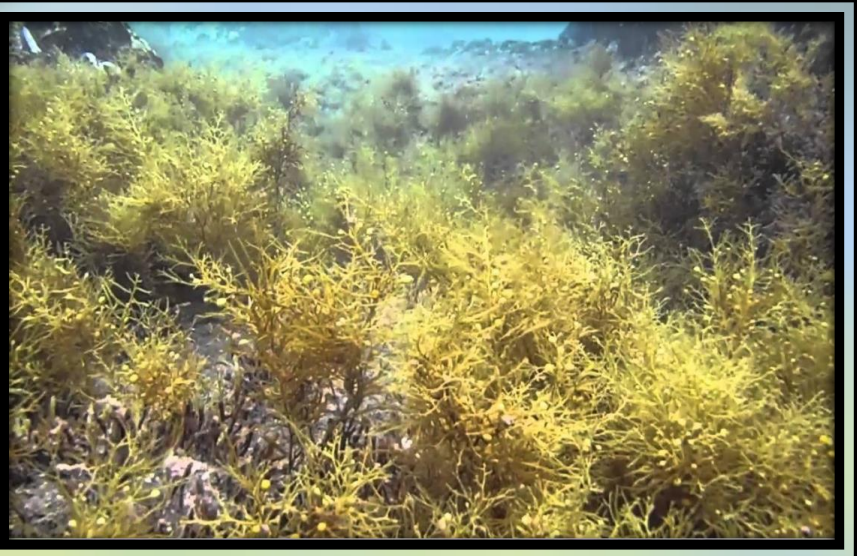


http://www.nature.com/srep/2013/130822/srep02491/full/srep02491.html

http://www.virtualherbarium.org/teach/plantsys/crown.html

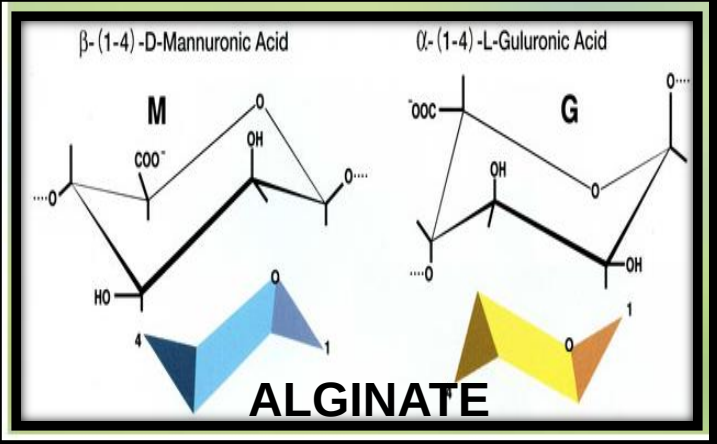


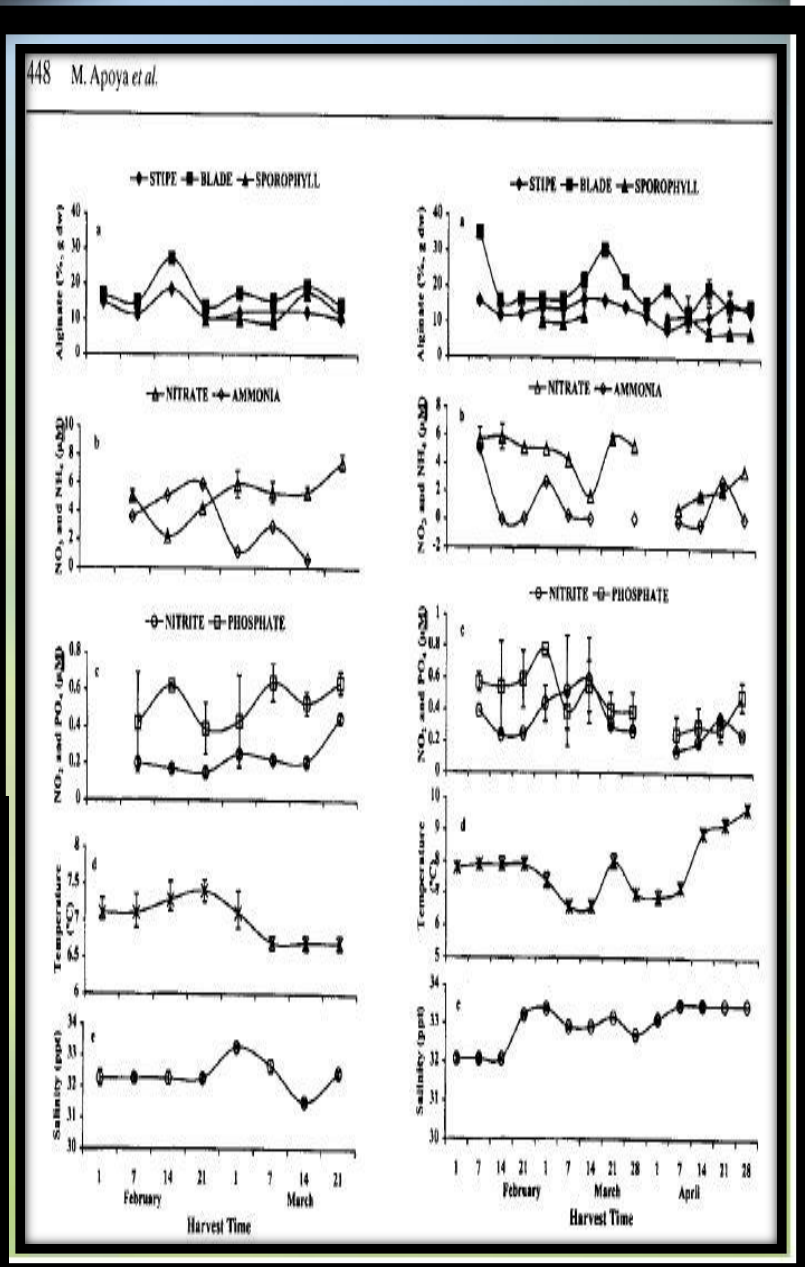
Coastal Restoration



Sustainable Farming

“Alginate content of farmed *Undaria pinnatifida* Harvey Suringar from the three bays of Iwate, Japan during harvest period”



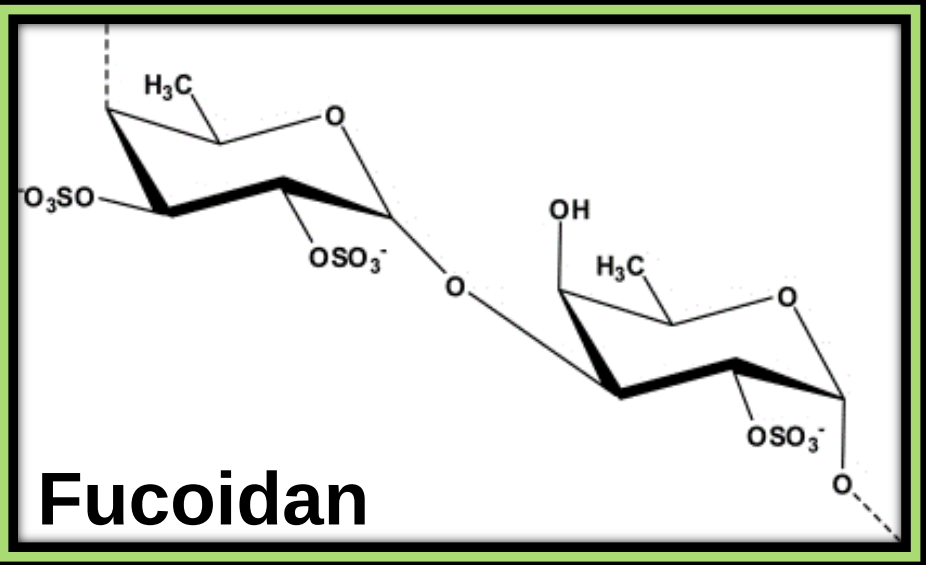


INDUSTRIAL APPLICATIONS

Fucoidan- sulfated polysaccharide found in brown seaweeds used as:

- anti-oxidant
- anti-inflammatory
- stem cell modulator
- antiatherosclerotic, etc…

Biofuel



Fucoidan

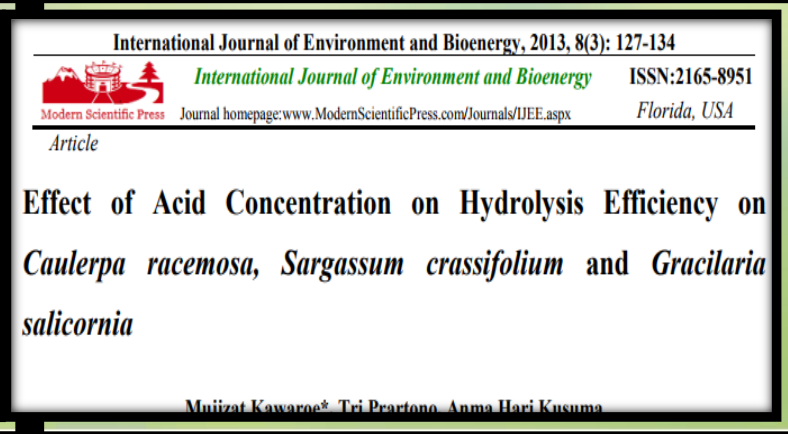
Articles

Biogas production performance of *Undaria pinnatifida* using a bio-based pH buffer—Shell of *Venerupis* species (Asari)

Gian Powell B. Marquez ✉, Hisae Takeuchi & Tatsuya Hasegawa

Sustainable Farming

"Comparison of the growth of *Caulerpa* between sheltered and exposed habitats"



International Journal of Environment and Bioenergy, 2013, 8(3): 127-134

Modern Scientific Press

International Journal of Environment and Bioenergy ISSN:2165-8951

Journal homepage:www.ModernScientificPress.com/Journals/IJEE.aspx *Florida, USA*

Article

Effect of Acid Concentration on Hydrolysis Efficiency on *Caulerpa racemosa, Sargassum crassifolium* and *Gracilaria salicornia*

Mujizat Kawaroe*, Tri Prartono, Anna Hari Kusuma

INDUSTRIAL APPLICATIONS

Caulerpa **- green alga used as source of:**

- **antioxidant**
- **antidiabetic**
- **anti-cancer**
- **anti-tuberculosis**
- **heavy metal biosorption, etc.**

& biofuel production

J Appl Phycol
DOI 10.1007/s10811-012-9813-5

Preparation and antioxidant property of extract and semipurified fractions of *Caulerpa racemosa*

Zhongrui Li · Bin Wang · Qihong Zhang · Youle Qu · Huanzhi Xu · Guoqiang Li

Int. J. Environ. Res., 5(3):725-732, Summer 2011
ISSN: 1735-6865

Removal of Lead and Cadmium Ions From Aqueous Solutions Using Dried Marine Green Macroalga (*Caulerpa racemosa*)

Dekhil, A. B.[1], Hannachi, Y.[1,2*], Ghorbel, A.[1] and Boubaker, T.[1]

Journal of Energy Technologies and Policy
ISSN 2224-3232 (Paper) ISSN 2225-0573 (Online)
Vol.3, No.1, 2013
www.iiste.org

Cultivation of Caulerpa Taxifolia as Feedstock of Bioenergy

Tri Poespowati (Corresponding author)
Chemical Engineering Dept., The Institute of National Technology

Document heading doi:10.12980/APJTB.4.2014APJTB-2014-0091

Anti-diabetic effects of *Caulerpa lentillifera*: stimulation of insulin secretion in pancreatic β-cells and enhancement of glucose uptake in adipocytes

Bhesh Raj Sharma, Dong Young Rhyu*

MICROALGAE

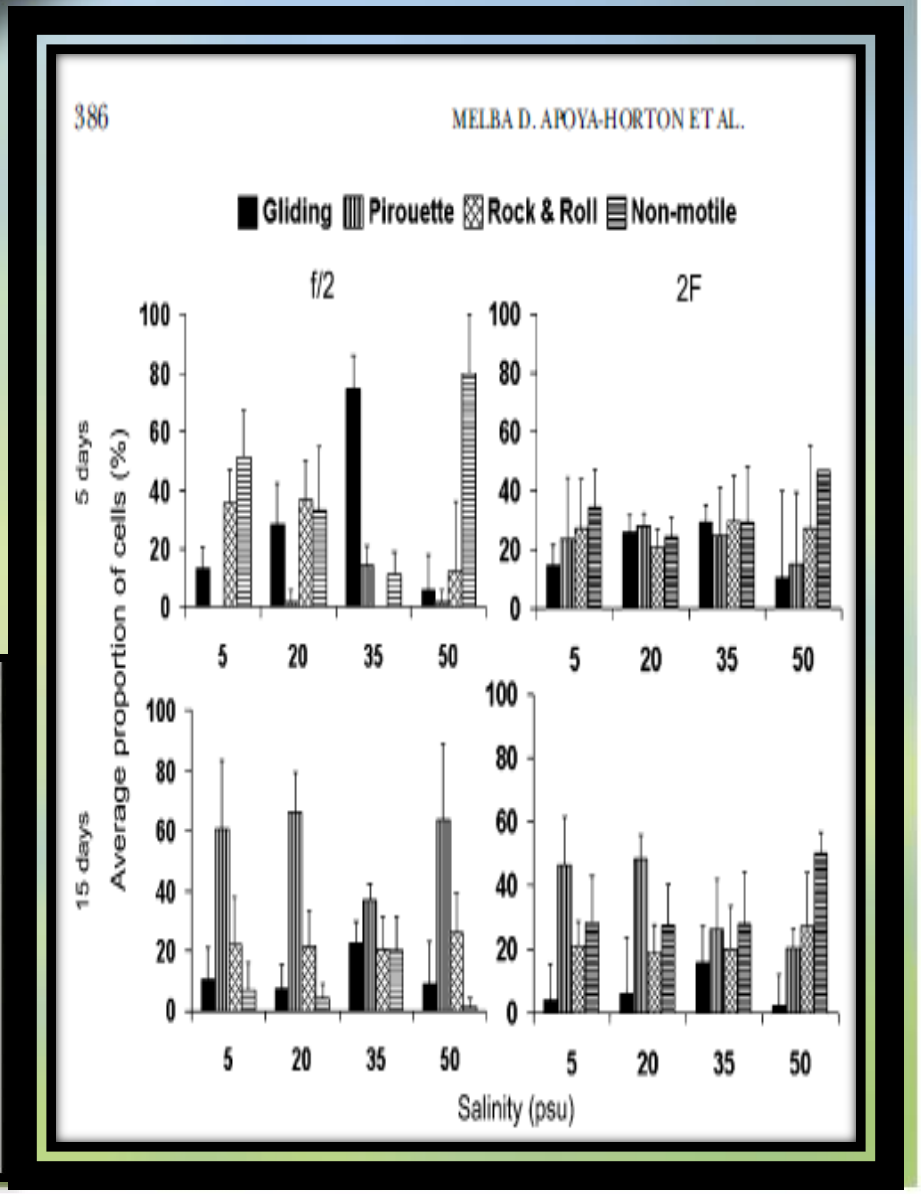
- ***Spirogyra***
- Benthic/Planktonic
- Biofuel

- ***Cylindrotheca***
- Silica cell wall
- Mudflat stabilization

- ***Scenedesmus***
- Phytoplankton
- Biofuel

Environmental Sustainability

“Movement modalities and responses to environmental changes of the mudflat diatom *Cylindrotheca closterium* (Bacillariophyceae) ”

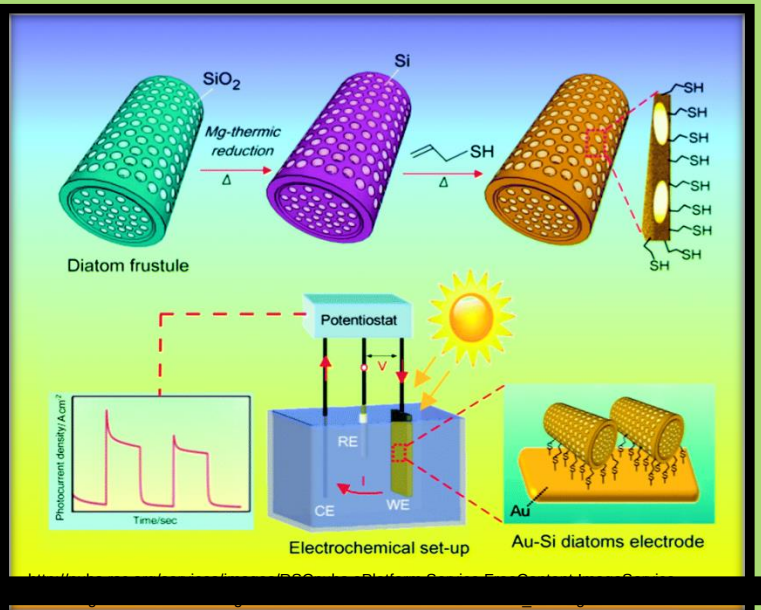


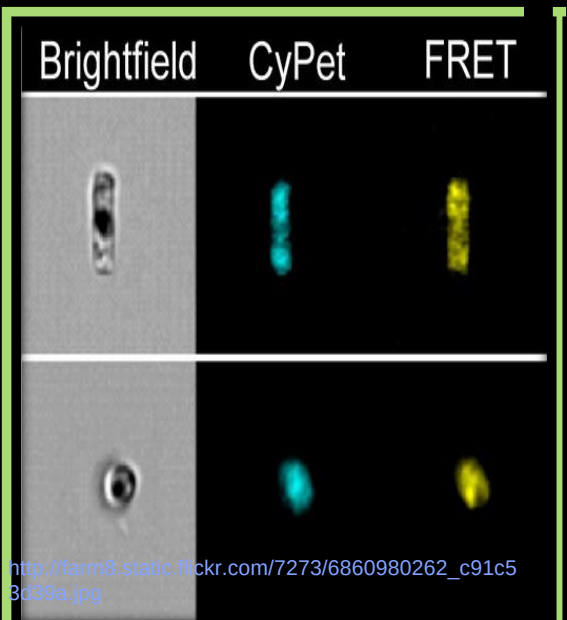
DIATOM IN MOTION

INDUSTRIAL APPLICATIONS

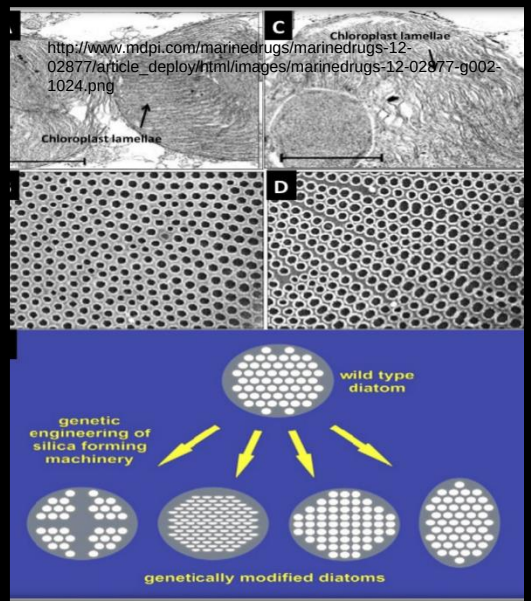
Diatom Frustules used in:

- **Nanostructured photoelectrode**
- **Drug delivery**
- **Biosensors**
- **Nanocomposites**
- **cell encapsulation-space filler etc…**

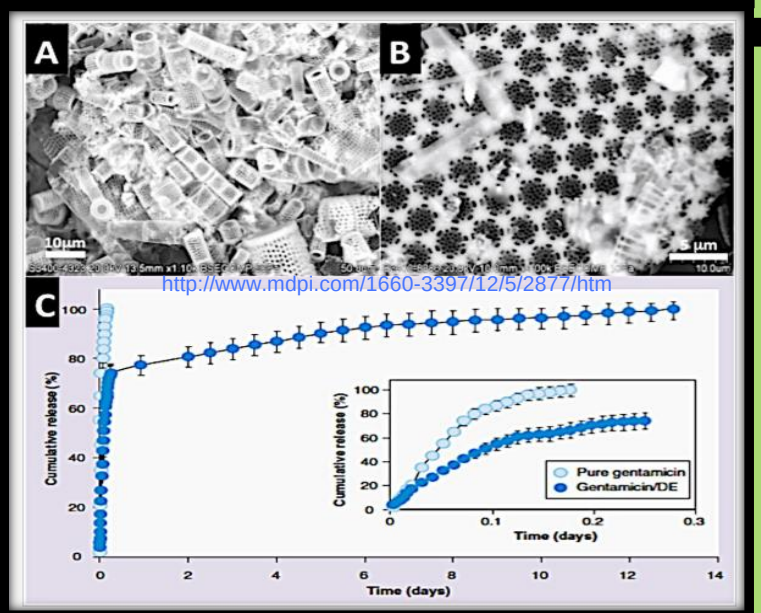




http://farm6.static.flickr.com/7273/6860980262_c91c53d39a.jpg



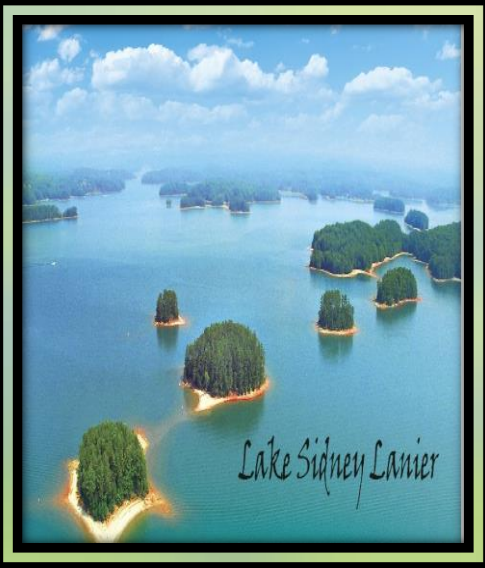
http://www.mdpi.com/marinedrugs/marinedrugs-12-02877/article_deploy/html/images/marinedrugs-12-02877-g002-1024.png

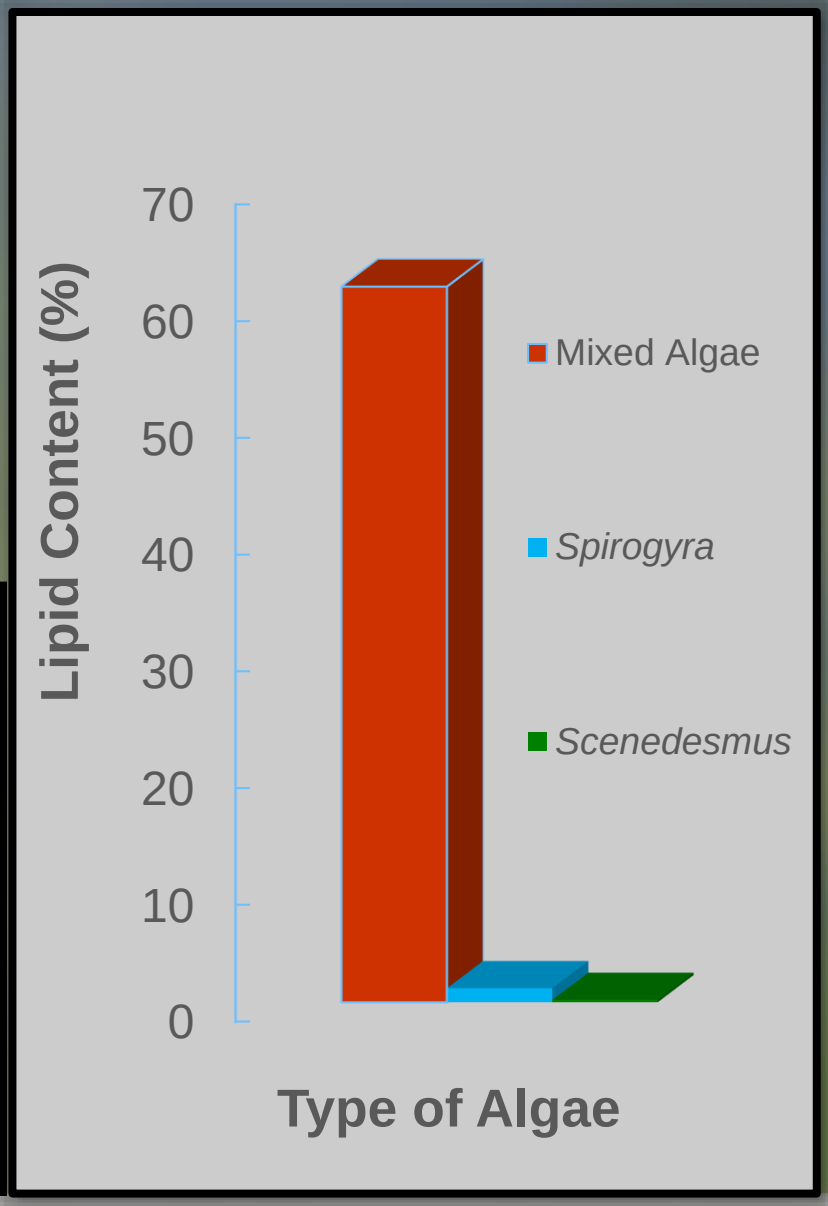


http://www.mdpi.com/1660-3397/12/5/2877/htm

Renewable Energy

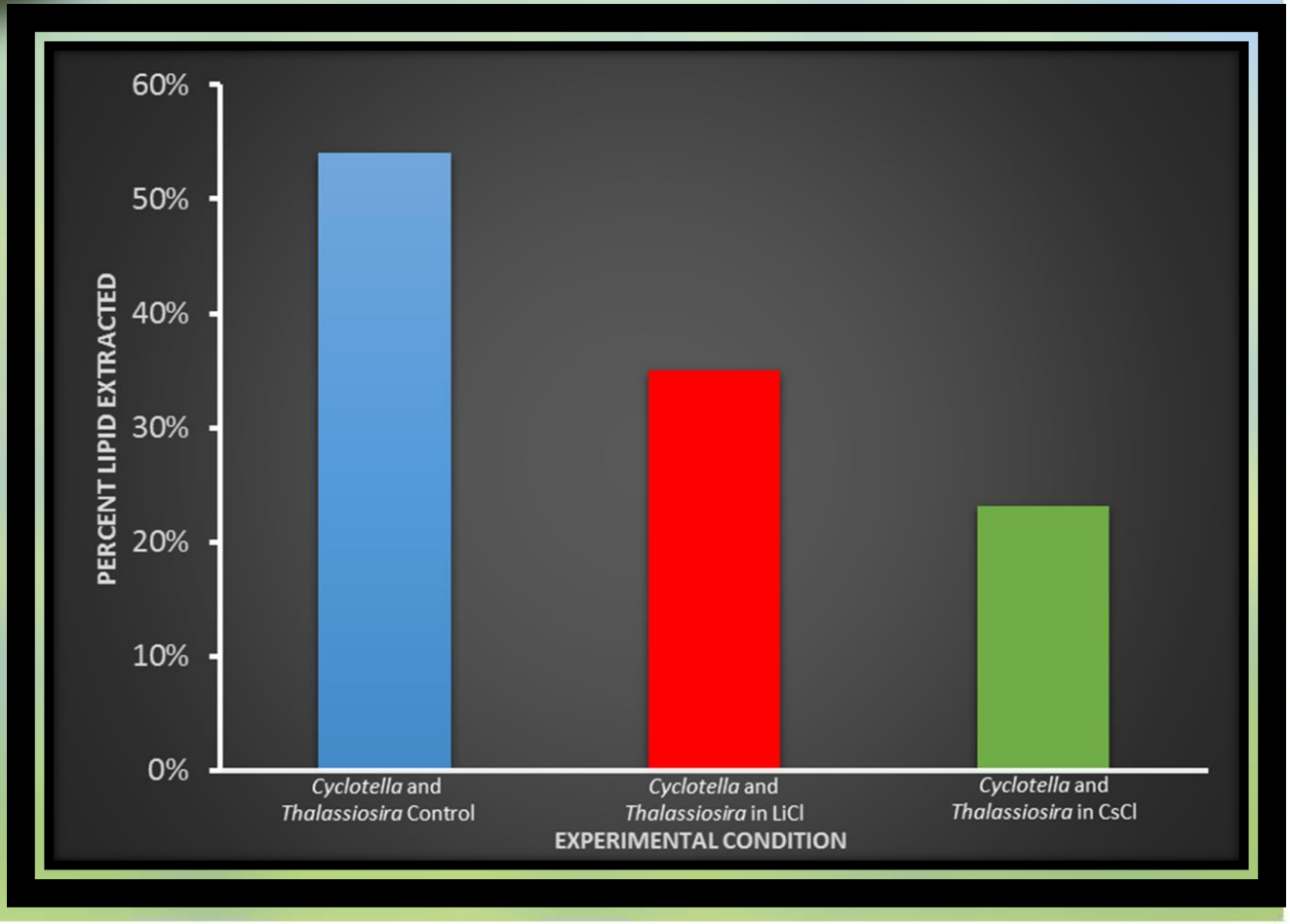
“Lipid Production Of Algae From Lake Lanier Waters For Biofuel Utilization ”





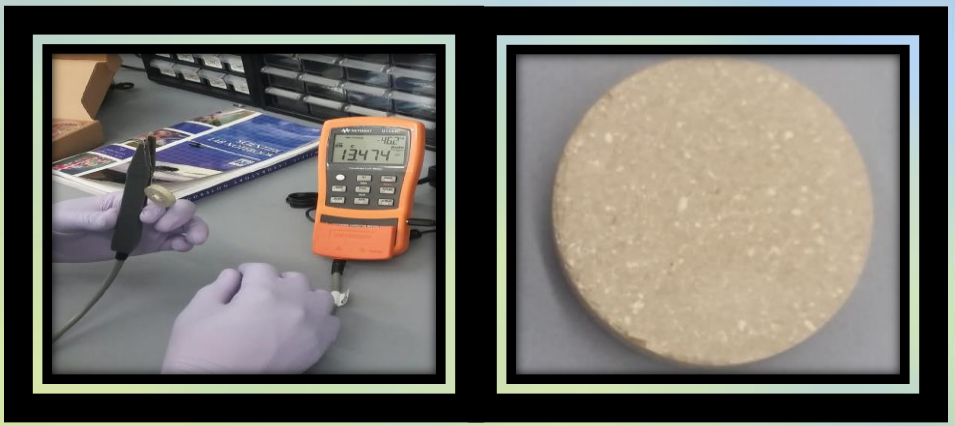
Renewable Energy

"Effect of Metal Salt on Diatom Lipid Production"

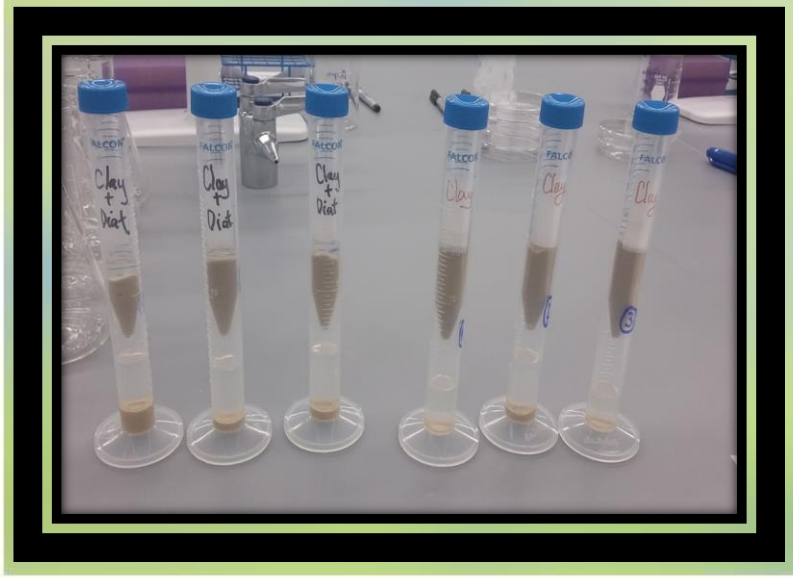


Biomass Utilization

"Phosphatic Clay-Diatom Mixture: Potential Material for Supercapacitor"



"Enhancing Phosphatic Clay Permeability Using Diatom Frustules"



"MASS PRODUCTION OF ENDEMIC DIATOMS IN POLK COUNTY WITH CONCOMITANT BIOFUEL EXTRACTION AND COST ANALYSIS"

Sponsor Agency

Florida Industrial and Phosphate Research Institute


Social
Sustainability
Economic
Environmental
Thank you!