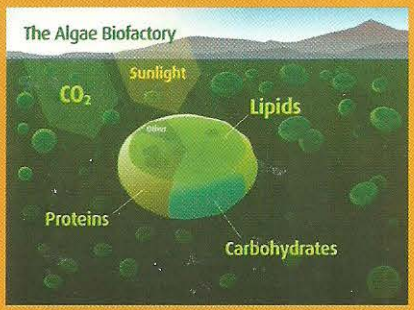
COMMUNITY MATTERS

algal biodiesel

Microalgae are unicellular photosynthetic microorganisms, living in saline or fresh water environments that convert sunlight, water and carbon dioxide to algal biomass. Microalgae species as feedstocks for biofuels (biodiesel and bioethanol) have gained considerable interest for two very reasons. First, they can be produced in areas unsuitable for crops, and secondly they can potentially grow at a much faster rate. In addition, some algae species are extremely high in lipid content, making them fit for biodiesel production. They have the potential to produce more oil per acre than any other feedstock being used to make biodiesel.



Algae Biofactory

Algae are categorized into four main classes: diatoms, green algae, blue-green algae and golden algae. There are two main populations of algae: filamentous and phytoplankton algae. Algae can grow practically anywhere where there is enough sunshine. Some algae can grow in saline water. Microalgae are very efficient solar energy converters and they can produce a great variety of metabolites, including carbohydrates, proteins, lipids and nucleic acids in varying proportions. Strains of algae high in carbohydrates as well as oils produce starches that can be separated and fermented into ethanol. While the percentages vary with the type of algae, there are algae types that are comprised up to 40% of their overall mass by fatty acids.

Isolation of Microalgae

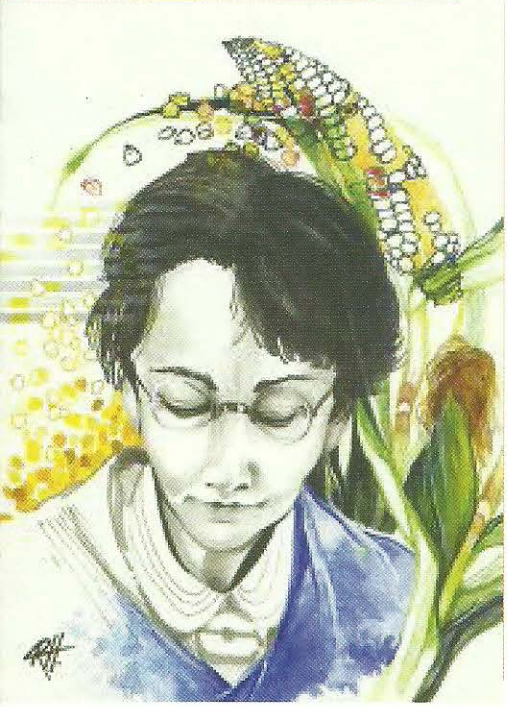
Industrial reactors for algal culture are open ponds, photobioreactors and closed systems. The most significant distinguishing characteristic of algal oil is its yield and by extension its biodiesel yield. Microalgae are the fastest-growing photosynthesizing organisms. They can complete an entire growing cycle every few days. Approximately 46 tons of oil/hectare/year can be produced from diatom algae. Different algae species produce different amounts of oil. There are three well-known methods to extract the oil from algae: (1) expeller/press, (2) solvent extraction with hexane and (3) supercritical fluid extraction. A simple process is to use a press to extract a large percentage (70–75%) of the oils out of algae.

The algae that are used in biodiesel production are usually aquatic unicellular green algae. This type of algae is a photosynthetic eukaryote characterized by high growth rates and high population densities. Under good conditions, green algae can double its biomass in less than 24 h. Additionally, green algae can have huge lipid contents, frequently over 50%. This high yield, high density biomass is ideal for intensive agriculture and may be an excellent source for biodiesel production.

Source : Dr. Natanamurugaraj Govindan & Dr. Gaanty Pragas Maniam

BARBARA MCCLINTOCK

PAST MASTER SERIES



Barbara McClintock (June 16, 1902 – September 2, 1992), the 1983 Nobel Laureate in Physiology or Medicine, was an American scientist and one of the world's most distinguished cytogeneticists.

McClintock received her PhD in botany from Cornell University in 1927, where she was a leader in the development of maize cytogenetics. The field remained the focus of her research for the rest of her career. From the late 1920s, McClintock studied chromosomes and how they change during reproduction in maize. Her work was groundbreaking: she developed the technique for visualizing maize chromosomes and used microscopic analysis to demonstrate many fundamental genetic ideas, including genetic recombination by crossing-over during meiosis. She produced the first genetic map for maize, linking regions of the chromosome with physical traits, and demonstrated the role of the telomere and centromere, regions of the chromosome that are important in the conservation of genetic information.

During the 1940s and 1950s, McClintock discovered transposition and used it to show how genes are responsible for turning physical characteristics on or off. She developed theories to explain the repression or expression of genetic information from one generation of maize plants to the next.

Later, she made an extensive study of the cytogenetics and ethnobotany of maize races from South America. McClintock's research became well understood in the 1960s and 1970s, as researchers demonstrated the mechanisms of genetic change and genetic regulation that she had demonstrated in her maize research in the 1940s and 1950s. Awards and recognition for her contributions to the field followed, including the Nobel Prize for Physiology or Medicine, awarded to her in 1983 for the discovery of genetic transposition; she is the only woman to receive an unshared Nobel Prize in that category.

(Condensed from Wikipedia)

Biosensor Technology

SOURCE: DR. TAN LING LING

Biosensor is an analytical device developed by incorporating biological molecule, e.g. tissues, microorganisms, organelles, cell receptors, enzymes, antibodies and nucleic acids into a biocompatible immobilisation matrix. Association of the biologically derived material with a physicochemical transducer, which may be optical, electrochemical, thermometric, piezoelectric or magnetic would ultimately form a reagentless system for specific determination of a desired analyte. Biosensor which uses enzyme, cell, bacteria and tissue for reaction with analyte and producing a new molecule is known as catalytic biosensor.

Affinity biosensor on the other hand, entails simple binding of biological molecules such as antibody and deoxyribonucleic acid (DNA) with substrate.

Biosensor is usually produced for use in applications such as environmental monitoring, biomedical sensing and industrial process control. The principle of its detection is based on a biochemical recognition phase coupled with a transduction element to provide an optical or electrical signal parameter for a given compound.

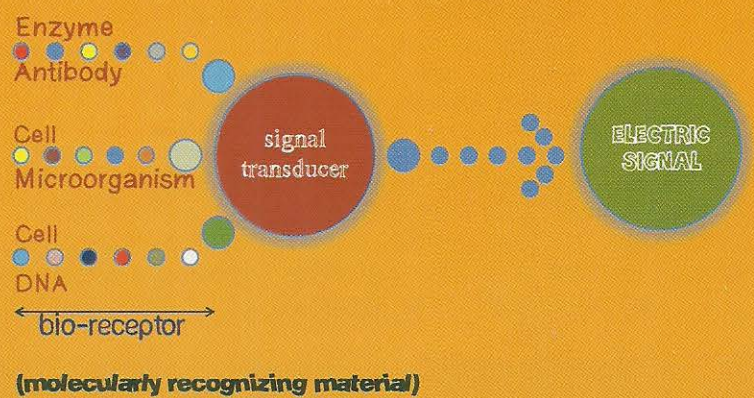


Figure 1: Principle of biosensor

Figure 1 shows the principle of biosensor. The procedures of biosensing involve placing the biosensor in a liquid sample and measuring either an electrical or optical signal, which is related to the concentration of analyte. The importance of biosensors has increased during the past decade due to high selectivity of the biological recognition elements and the sensitivity of signal transduction. This has triggered the development of various types of optical and electrochemical biosensors for rapid, accurate and specific measurement of target analyte on-site.

SPOTLIGHT ON FACULTY MEMBER

ASSOCIATE PROFESSOR DR. MD REZAUL KARIM, Biochemist

Dr. Md. Rezaul Karim was born in 1965, a third of six siblings comprising five brothers and one sister. His late father, Md. Bozlar Rahman was a school teacher and mother, Mrs. Hawa Bibi, a housewife. His father dreamt of getting all of them involved in the teaching profession, struggling with his small income to provide education for his children.

Upon completion of his higher secondary education in 1982 he was admitted to Rajshahi University, and conferred a BSc Honors and MSc in Biochemistry in 1985 and 1986, respectively. He was also awarded a gold medal from his residential hall for his outstanding results during his undergraduate and Masters programs. He joined as a lecturer in the same university in 1991 and was promoted to Assistant Professor in 1994.

... to share the power of knowledge with those who love to be educated.

In 2009, Dr. Karim assumed a Postdoctoral position at the Faculty of Food Science and Technology (Universiti Putra Malaysia) working on supercritical fluid technology to extract and fractionate lipids and essential oils from animals and plants. He joined the Faculty of Industrial Sciences and Technology as Associate Professor in January 2011.

Dr. Karim's present revolves around antidiabetic principles from plants, use of immobilized lipase in biodiesel production, biodegradation of plant and seaweed polyphenols and study of their bioactivity. To date, he has 21 publications and is a reviewer for several journals.

He obtained a second Masters degree in 1999 from Kagoshima University and PhD in March 2002 for his work on "Enzymatic debittering of citrus juice" under the MONBOSHU scholarship. After completion of his study, Dr. Karim returned to Bangladesh and was promoted to Associate Professor. He became chairman of the Department of Biochemistry and Molecular Biology starting 2004 and was promoted to Professor in 2007. Dr. Karim also performed responsibilities as House Tutor and Provost of student residential halls.

SPOTLIGHT ON GRADUATE STUDENT

HAZRULRIZAWATI ABD HAMID, PhD (Industrial Chemistry) candidate

Hazrulrizawati Abd Hamid , 29 years old was born in Kedah. She received her early education in Alor Setar and pursued her BSc in Chemistry Education at Universiti Teknologi Malaysia, Skudai Johor. Upon finishing her studies, she worked as a teacher at SMK Ulu Tiram, Johor (2004 - 2009). While working, she pursued an MSc in Chemistry Education also at UTM as a part time student, graduating in 2008. Cikgu Hazrul was then awarded a scholarship from the Ministry of Education and registered for PhD studies in Chemistry in 2009. Supervised by Prof. Dr. Mashitah Mohd Yusoff, her research encompasses isolation of secondary metabolites from the plant, *Tinospora crispa* or "akar seruntun" in Malay The plant is a traditional Malay medicinal plant used for the treatment of many ailments. Surmounting research challenges everyday, Cikgu Hazrul's patience and determinatish has paid off, discovering a number of biologically active compounds.

... patience and determination has paid off...

Besides being busy and enjoying research, she has also found time to be with her 2-year old daughter, (Delisha Qasrina), 1-month old son (Mohd Darwisy) and husband (Cikgu Mohd Adib Haron). Weekends are joyful when everyone gets the chance to spend quality time

Eureka!

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