

Algae: A Renewable Resource

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We live in a society that is very dependent on fossil fuels in order to maintain our daily lives. The necessity for this type of fuel has been costly to our country and environment. Global warming, air and water pollution are just a few problems associated with the retrieval and usage of fossil fuels; this nonrenewable source of energy is used in abundance to power vehicles, homes, and factories. Why not utilize a material that can be made readily available and environmentally friendly? Let's explore the contributions of algae as a biofuel. One benefit is that in its production, fewer overall greenhouse gas emissions are yielded. In other words, a most beneficial alternative fuel source could be produced without our overall environment being compromised to include global warming; oil can be produced from algae with comparable effects of fossil fuels used every day. "Growing algae for biofuel not only provides a viable source of alternative energy, but also yields significant economic benefits" ("Economic Benefits of Algae," n.d.).

Algae oil is acquired much like oil obtained from plants and vegetables. Oil from algae is a triglyceride, which can be reformed into numerous beneficial assets, mainly biofuels to biodiesel fuels ("What is Algae Oil," n.d.). The amount of oil produced from algae is dependent on the particular strain grown; various strains of algae produce more or less oil during the extraction process. Studies have shown that depending on the strain of algae, "up to 80% lipid" ("What is Algae Oil", n.d.) substance can be obtained. Oil manufactured from algae is increased by "up to 500 times" ("What is Algae Oil," n.d.) more than from other plant oil sources (such as soybean or vegetable). The algae collected start as a viscous and tacky-like substance that is then dehydrated by heating or using a centrifuge so that the oil can be removed by a chemical

process or a pressurized screw press. The algae oil is isolated and configured for use as a biofuel (“What is Algae Oil,”n.d.).

Algae can be accumulated numerous ways: open-pond algae farming, closed loop algae system farming, wastewater and algae farming, the use of bioreactors, dark fermentation, or synthetic algae. Open-pond algae farming provides an inexpensive method of growing algae, but the amount of oil-producing algae can be unstable. The open pond is exposed to the elements of temperature variance, animals, and the risk of different strains of algae trying to grow because the environment is not sterile. “HR BioPetroleum sidesteps these risks by growing algae strains first in sterile transparent tubes before transferring them to open saltwater ponds for a day or two—long enough to flourish and produce plenty of oil but not long enough to be contaminated”(Rothstein, 2008, p. 178).

The closed loop system of algae farming allows algae to grow in a closed transparent container that allows sunlight to enter and avoid contamination from other algae forms or bacteria. Enough sterile carbon dioxide is needed to ensure proper growth of the algae. This particular way of growing algae is effective; however, the process is tedious, time-consuming and yields a low quantity of algae. Wastewater and algae farming has potential even though wastewater has contaminants that could render a less effective product. The water would have to be manipulated in order to retrieve an operable specimen; if the water is left untreated, the growth of the algae will be put to a halt. Algae growth in this manner could prove to be a great benefit to our environment; it absorbs unsuitable waste products normally found in waste water like nitrogen and phosphorus (“Closed Loop System Algae Farming,” 2010).

The bioreactor is similar to the closed loop system, but the plastic containers are filled with water enriched with nourishments that stimulates rapid algae development. This method of algae harvesting comes from only one particular strain of algae and is very costly (“Closed Loop System Algae Farming,” 2010). Dark fermentation is the opposite of what most researchers have been attempting to do in the field of harvesting algae for oil. Around the second grade, most children are taught about photosynthesis being one of the only ways to grow plants—until now. Solazyme is a company that has come up with a way for algae to receive the nutrients they need to grow in the dark. This technique has shortened the length of time it takes from growth to production from weeks to days. Sapphire Energy has begun research on synthetic algae. The synthetic algae consist of a very similar carbon make-up as gasoline. “Sapphire’s gasoline emits as much carbon as petroleum, but because algae consumes atmospheric carbon, Sapphire claims its system is carbon neutral” (Rothstein, 2008, p. 178).

All of the above methods have a common agenda: finding a reliable strain of algae, efficiently growing the algae, extracting the oil, and refining it as a fuel source for America. Algae’s growth not only benefits the production of a biofuel; it also has the capability of continued growth while absorbing harmful emissions produced from factories. Algae production is not relied on as a food source for human consumption. Options for growing algae do not require as much land to be sacrificed for the growth of algae (like soybeans or corn). Due to the need for the manufacturing of plant sources at a rapid rate, chemicals preparations for killing insects and synthetic fertilizers are introduced to speed up the process of growing

and gathering plant-based stock. Algae production also cuts down on the overflow plants leave behind like stems, leaves, and roots (Ciampi, 2010).

Growing algae to produce biodiesel fuel has its challenges, particularly in the area of cost. This research needs to continue so that a more cost-effective solution can be found. This research will not only aid the environment; it could help the economy as well. Algae are sustainable and continue viability even in not-so-favorable conditions like waste water; algae also thrive near carbon-emitting factories and absorb many of the pollutants prior to their entering air. Sunlight and water are the prerequisites for algae growth; not much space or extensive land work are required in order to see results. Converting algae to algae oil is a great start to finding a renewable resource for the American people.

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