Flax Seed Biodiesel, Phase IV: Omega 3 Extraction

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Flax is an agricultural commodity produced in the Northwestern United States, including Montana and Minnesota. Because of high omega 3 fatty acid concentrations, flax seed oil is valuable in the health food industry to lower cholesterol, treat arthritis, and as a laxative. This research, Phase IV, attempts to remove 9, 12, 15-octadecatrienoic acid (linolenic acid, omega 3) from flax seed biodiesel fuel. Flax seed oil (linseed oil) was first converted to biodiesel through transesterification. Four separate 200-milliliter samples of biodiesel were individually vacuum distilled at varying temperatures and pressures to establish the most efficient separation conditions. In order to determine the success of distillation, gas chromatograph-mass spectrometer analyses of the fatty acid profiles of each fraction were completed. Resulting chromatograms showed high concentrations of hexadecanoic acid (palmitic acid) in the first fractions. Short chain fatty acids such as these perform well in a compression ignition engine. The second and third fractions contained high concentrations of 9, 12, 15-octadecatrienoic acid, the desired omega 3 molecule. These fractions are precursors for food supplements. Future research will test the potential for the first fractions as a fuel or fuel additive and the second and third fractions as a food-grade supplement.

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