Project: Bio-energy Research Center at MSU-Northern.

Brief Description: MSU-Northern requests continuation funding of $2 million for projects furthering the development of new technologies based on known chemical processes for the production of high-value industrial products using Camelina oil as a base feedstock alternative to petroleum.

Executive Summary: Petroleum has been and remains the basis for fuels, lubricants, fuel additives, polymers and plastics worldwide. With increasing concerns on the impact of petroleum utilization to the environment and energy security, advanced countries are becoming more motivated to shift from petroleum-based economy to renewable-based economy. Vegetable oils are attractive alternative base oils for the production of functional fluids due to their high viscosity index, high lubricity, high flash point, low evaporative loss, excellent biodegradability, low toxicity and renewability. However, poor cold-flow properties and low resistant to oxidation make the utilization of vegetable oils as functional fluids problematic. Hence, further chemical modifications of vegetable oils are necessary to achieve the desirable physico-chemical properties for various applications by exploiting the different functional groups in vegetable oil.

Project Description: With continued funding MSU-Northern will engage in the following projects: 1) **– Development of Alternative Bio-based Aviation Fuel** - explore developing technologies based on silver nitrate-impregnated silica gel and silica-supported ionic liquids with silver salts for the selective adsorption of polyunsaturated fatty acid components to make the utilization of Camelina oil suitable for biodiesel production; 2) **Improving the Fatty Acid Methyl Ester Profile of Biodiesel derived from Camelina -** utilize the alkene metathesis of supercritical ethylene with biodiesel optimized to favor the formation of C9 to C12 fuel suitable for jet turbine engine application; and 3) **Camelina-derived Estolides as Cold Flow Improvers -** develop processes to enhance Camelina oil fatty acid to improve the performance of biodiesel during cold weather.

Congressional Action Needed: Funding of $2 million in FY 11 is requested.

Importance to Montana: Recent studies indicate that aircraft are responsible for about 3.5% of global warming, a figure that could rise to 15% in 50 years. The United States consumes about 22 billion gallons of jet fuel from the 73 billion gallons produced worldwide. Based on current consumption, If 20% of jet fuel came from renewable sources, U.S. oil imports could be reduced by about 3.2 billion gallons annually. Agriculture is a cornerstone of the great part of Montana's economy. With the recent decision by the FDA approving Camelina feedstock up to 10% blend for beef feed, it is estimated that Camelina as a feedstock for biodiesel will become profitable. In Montana alone, cultivation of Camelina has dramatically increased from 450 acres in 2005 to over 50,000 acres in 2007. Camelina is a low-input crop that can grow on marginal lands, requires very little fertilizer and compliments wheat farms for use as a rotational crop to help protect against disease. Most importantly, Camelina is an industrial oilseed and does not conflict with the food market. The market for Camelina will grow as more industrial-value added products are developed. Customers from local, national and International markets have identified Northern as a leader in the development of some of the technologies that will lead to these products.

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