

ABSTRACT

Biodiesel is defined as monoalkyl esters of long chain fatty acids used in diesel engines. Major contaminants in biodiesel may impose negative impacts on its fuel properties. These may lead to operational problems such as premature or failed ignition, filter clogging, corrosion of vital engine components, carbon deposit build-up, etc. This study aimed at determining the effects of common contaminants such as methanol, water and triglycerides on fuel properties of biodiesel.

EXPERIMENTAL

Preparation of Biodiesel

Canola biodiesel was prepared via the conventional KOH-catalyzed transesterification with methanol at MSU-Northern's Biodiesel Pilot Plant.



MSU-N Biodiesel Pilot Plant

Effect of Methanol

Biodiesel was treated with methanol at varying levels. All samples were tested for flash point.

Effects of Water

Biodiesel was treated with various levels of water and samples were analyzed for moisture content by Karl-Fisher titration. Each of the samples was further tested for oxidation stability, cold flow properties, copper strip corrosion, and acid number. The tests were conducted immediately after treatment and on a weekly basis for one month.

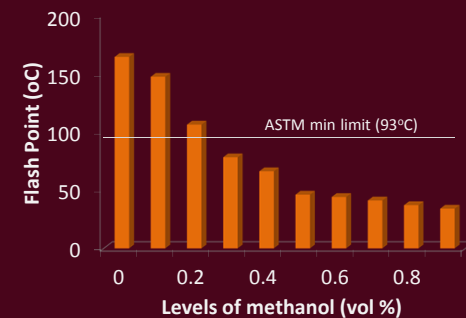
Effects of Triglycerides

Biodiesel was treated with canola oil at various levels. Samples were analyzed for viscosity, vacuum distillation, carbon residue and cold flow properties.

All tests were performed to specifications of the ASTM D 6751 standard. Test not included in D 6751 were performed according to appropriate ASTM methods.

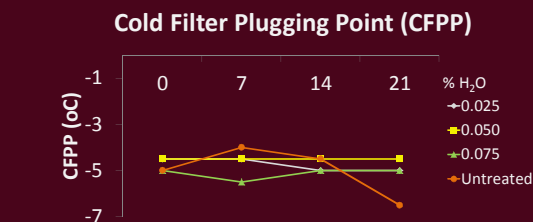
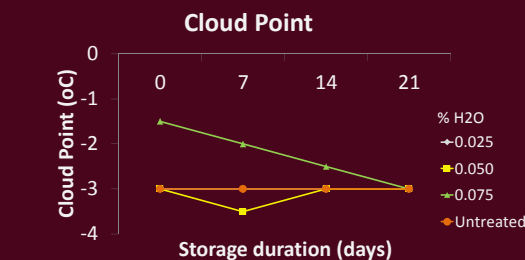
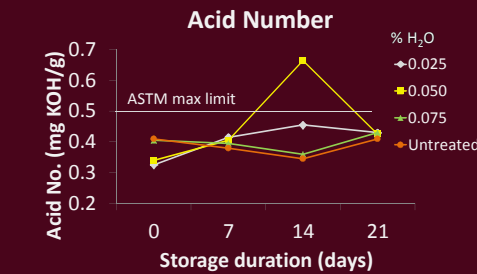
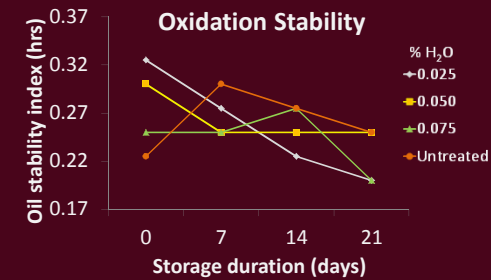
RESULTS

Effect of Methanol on Flash Point



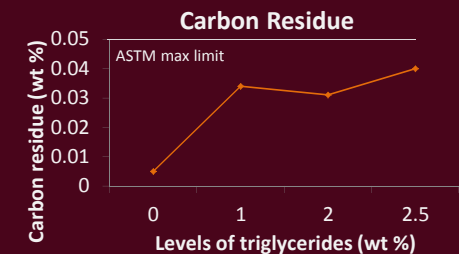
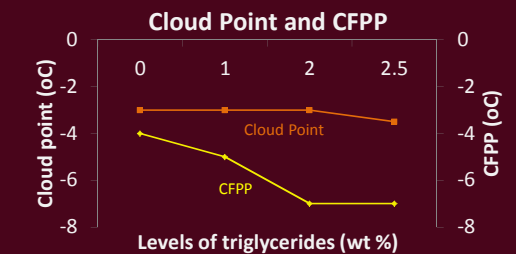
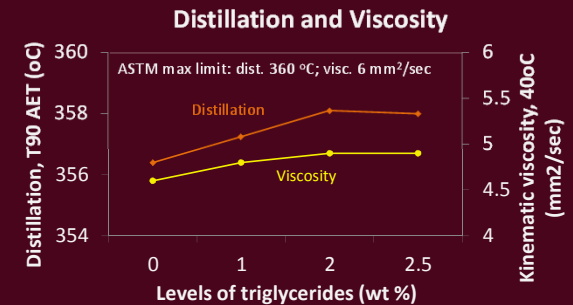
Neat biodiesel containing 0.3% or more methanol carry-over did not meet the ASTM minimum specification for flash point of 93°C.

Effects of Water



ASTM limits the water and sediment content of biodiesel to 0.05% (vol). There was no significant impact observed on the biodiesel properties tested even up to 0.075% level of water contamination.

Effects of Triglycerides



Incomplete conversion during processing may lead to biodiesel with unacceptable levels of triglycerides. Even with 2.5% triglyceride content, neat biodiesel still met the ASTM specifications for distillation, viscosity and carbon residue. Based on the cloud point and CFPP results, triglycerides (up to 2.5%) impede agglomeration while leaving the start of crystallization unaffected.