



Biodiesel is a renewable, clean-burning diesel replacement/supplement that is expected to reduce U.S. dependence on imported diesel, create green jobs and improve our environment. Biodiesel is made from an increasingly diverse mix of resources including agricultural oils, recycled cooking oil and animal fats and meets the strict specifications

Biodiesel Feedstock Determination Using an Electronic Nose

Who cares and why?

The increasing demand for energy independence and interest in biodiesel has led researchers to experiment on many types of animal and plant oils in an effort to increase the productivity and availability of biodiesel fuels as alternatives to petroleum based fuels. Some of these biodiesel feedstocks include oils from nut products known as possible allergens for those sensitive to the feedstock source and its by-products. Current methods of biodiesel testing rely strictly upon chemical analysis; therefore there is no quick, easy way to test for known allergens. This research was aimed at filling this void by developing protocol for the use of an electronic nose (e-nose) to sample odors emitted by different known allergen feedstocks used for biodiesel production. Electronic nose sampling could provide a relatively inexpensive, real-time method for determining which biodiesel fuels have the proclivity to produce allergic reactions in those sensitive to potential allergen feedstocks, thus being able to provide an early warning to those sensitive to the allergen feedstocks. Results may support the development of a portable, economically feasible system, which can test for multiple known allergen-oil sources in a relatively short amount of time. The development of such a system could lead to a warning labeling system similar to that seen on food items that inform consumers of the type of oil used in food preparation, serving as an early warning to the possibility of an allergic reaction.

What has the project done so far?

Through coordinated efforts, we have been able to conduct research, provide instruction and outreach to constituents across the state of Georgia, and encourage and facilitate the development of the FVSU Mobile Biodiesel Unit.

Several investigations were conducted to evaluate the ability of an electronic nose to distinguish between raw oils (biodiesel feedstocks) and processed biodiesel. Students were versed in the techniques used to process oil into biodiesel. Multiple training samples of oil were prepared and presented to the electronic nose. From the training set, the electronic nose develops a model (smell-print) of the training odorant. The e-nose uses this smell-print to compare with odors presented in the sampling mode. Smell-prints were developed for each feedstock and for each corresponding biodiesel fuel.



Researchers and students gained valuable research experience in the following areas:



- Converting feedstock oils into biodiesel fuel.
- Developing and implementing research methodology.
- Operating the electronic nose for odor training and sampling.
- Analyzing and differentiating data sets.
- Developing and defending poster presentations discussing findings.

Both feedstock and biodiesel odors were sampled by the e-nose. Findings indicate that the e-nose was not able to reliably distinguish between the various feedstocks or biodiesel samples. The e-nose also could not reliably associate feedstocks with their corresponding biodiesel samples.



Researchers continue investigating alternate agricultural applications where e-nose technology may be applicable. Related biodiesel inquiries continue as research projects to provide undergraduate & high school students' research experiences.

Impact Statements

We have introduced biodiesel processing basics to over 500 4H and FFA students in Georgia.

One high school student who participated in this project won a county-wide science fair and continued on to compete in an international science fair.

Fifteen students have gained undergraduate research experience directly related to this project.

What research is needed?

Additional research may be conducted with the other areas to determine the likelihood of biodiesel producing allergic reactions in those sensitive to known allergen feedstocks.

Want to know more?

Dr. Archie Williams

478-825-6262

WilliamsA01@fvsu.edu

Strategic Priority:

Energy Bio-products; Agricultural Systems

Additional links:

<http://www.umes.edu/ard/Default.aspx?id=46285>

Year and Institution

2014, Fort Valley State University

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