Chemists identify compounds to lure nutria, a rat-like pest ravaging Gulf Coast wetlands

March 6 2008

A 10-pound rodent pest called nutria ravaging southern wetlands in the US, which has been especially damaging to the marshland ecology in the Mississippi Delta following Hurricanes Rita and Katrina, may have finally met its match thanks to molecular science that includes the work of Professor Athula B. Attygalle, an expert in molecular chemistry and mass-spectrometry based at Stevens Institute of Technology in Hoboken, New Jersey, and a team of scientists from Cornell University and University of Iowa.

The biology of the nutria species allows it to reproduce at rapid speed, making it an unwieldy animal to control if released into the wild. A female nutria averages about five young per litter, but can birth as many as 13 at a time. A female can breed again within two days after giving birth, meaning one nutria can have up to three litters per year.

To get a sense of their productivity, 20 nutria brought to Louisiana in the 1930s bred an estimated 20 million animals within two decades, according to a wildlife group in Maryland that tracks nutria data, quoted in a recent report by Louisiana journalist Chris Kirkham.

Although nutria were brought to all parts of the country, said Kirkham's report , warm weather in Louisiana has boosted their numbers. Already under pressure from saltwater intrusion, the marshes also have to deal with the nutria and their voracious appetite for the vital marsh roots that keep wetlands intact.

Professor Attygalle and his biological colleagues, Professor Thomas Eisner and Steven Finckbeiner believe they have located the correct chemical compounds that offer an alternative to free-form hunting and trapping, or ecologically harmful poisoning, in the management of the nutria population.

“Several volatile compounds, including terpenoids, fatty alcohols, fatty acids and some of their esters, were identified from solvent extracts prepared from anal scent glands of nutria, a.k.a. coypu,” said Attygalle. “These compounds can serve as a powerful attractant to the animals, and thus, when applied strategically, serve as a tool in the efforts to control their spread in the easily damaged coastal ecosphere.”

The major terpenoid constituents were identified as (E,E)-farnesol and its esters by a comparison of their gas chromatographic retention times, and electron-ionization (EI) and chemical-ionization (CI) mass spectra with those of authentic compounds. EI mass spectra of the four farnesol isomers are very similar, however, the ChemStation (Agilent) and GC–MS Solution (Shimadzu) software algorithms were able to identify the natural compound as the (E,E)-isomer, when a high-quality mass spectral library was compiled from reference samples and used for searching. Similarly, the esters were identified as those of (E,E)-farnesol. In contrast to EI spectra, the CI spectra of the (E,E)- and (E,Z)-isomers are distinctly different from those of the (Z,E)- and (Z,Z)-isomers.

Moreover, the infrared spectrum of the (E,E)-isomer is distinctly different from those of the other three isomers in the 2962–2968 cm−1 and 2918–2922 cm−1 bands, which represent asymmetric CH3 and CH2 stretching vibrations, respectively. Finally, the GC retention indices of farnesol and farnesyl ester isomers determined from authentic samples were used to confirm all identifications.

For many years, Tabasco sauce magnate E.A. McIlhenny received most of the blame for introducing the rodents from South America to Avery Island in the 1930s. McIlhenny wanted to expand the fur trade in Louisiana at that time, so he brought nutria from South America to his home on Avery Island, the story went. But a hurricane blew down the nutria pen, releasing them into the wild.

The myth held for decades, sometimes perpetuated by family members themselves. Five years ago, a historian hired by the family found records that McIlhenny actually bought the nutria from a St. Bernard Parish fur dealer in 1938. He did eventually set the nutria loose, but not because of hurricane damage, said McIlhenny historian and curator Shane Bernard, quoted in reporter Kirkham's recent newspaper interview.

"I'm confident that all the myth has been stripped away," he said. "Anybody who knows oral history or folklore knows how stories can change when they're passed down from one generation to the next."

While Federal agencies have looked at various poisoning methods, none of those efforts has gone very far because of the effects on other species. The work of Professor Attygalle and his associates offers an environmentally friendly bait technique intended to lure nutria to traps for transport away from sensitive coastal zones and marshlands.

Source: Stevens Institute of Technology