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Small Business Innovation Research (SBIR)

New Test Kits Help Manage Farm Nitrate Levels

by Stacy Kish, CSREES

Nitrate is a nutrient needed for plant growth. Excess nitrate, however, can pose a serious threat to human health and the environment if levels accumulate in animals or water systems. A new test kit will help producers manage nitrate concentrations, reduce costly nitrogen fertilizer applications, and protect the environment from pollution. >>

With funding from USDA's Cooperative State Research, Education, and Extension Service (CSREES), the Nitrate Elimination Company, Inc. (NECi), in Lake Linden, Mich., developed a series of on-farm nitrate test kits that allow farm managers to see how nitrate is accumulating and being transferred on the farm.

NECi's president, Bill Campbell, and team designed the kits to test nitrate concentrations in soil, water, plants and livestock. "We've developed these nitrate test kits to help farmers save money, maximize yields while staying in compliance with water quality protection regulations," said Ellen Campbell, NECi's vice president. "With the cost of nitrogen fertilizer increasing rapidly over the past five years, applying excess nitrogen on fields is no longer the easiest option — and, drought occurs somewhere in the U.S. every year. Nitrate toxicity from accumulated nitrate in hay or corn stalks can be a real problem for growers."

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Right: Nitrogen test kit.
Credit: Darlene Basto

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Above: A nitrate test kit in action on corn stalks.

Below: Dr. W.H. Campbell, NECi president, and G.G. Barbier, NECi employee, working on the equipment for the protein expression of the nitrate reductase used in the test kits.

Credit: Matt Monte

Nitrogen is applied on the farm in a number of forms, including fertilizer. In soils, nitrogen is converted to nitrate, a form easily used by plants for production of proteins and nucleic acids. Nitrate is also released in animal waste. Over time, the excessive accumulation of nitrate on the farm increases the potential of pollution. Nitrate toxicity occurs when nitrate levels become too high and pose a threat to plant and livestock health and vitality.

NECi conducted a market research study to determine how to effectively educate and inform Michigan farmers about the latest nitrate management strategies and tools available.

In addition, scientists tested the accuracy of the test kits and published the results of their study in peer-reviewed journals, including the *Environmental Science & Technology* (January 2002), *Crop Science* (January/February 2004), and *Environmental Chemistry Letters* (June 2006) and the trade publications *American Lab News* (February 2001 and September 2004).

Leveraging Small Business Innovation Research (SBIR) funds, NECi obtained funds through *The Agricultural Innovation Program*, a competitive grant program managed by the Michigan Department of Agriculture, in 2006 for additional research and development funding.

CSREES funded this research project through the SBIR program. Through federal funding and leadership for research, education, and extension programs, CSREES focuses on investing in science and solving critical issues impacting people's daily lives and the nation's future. For more information, visit www.csrees.usda.gov. ■

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