UA team works to take agriculture research from lab to farms

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Robert Martinez, a post-doctoral fellow in the department of biological sciences is shown in the Sobecky Lab in the University of Alabama Science and Engineering Complex Building on Thursday. Martinez is leading research for sustainable agriculture.

TUSCALOOSA | Research rooted to the development of the atomic bomb during World War II may someday lower the costs of growing crops, making agriculture more efficient and more sustainable.

That's the hope of a team of researchers at the University of Alabama who formed a company called MicroGreen to take their research from the laboratory to commercial development.

Robert Martinez, a post-doctoral fellow who heads MicroGreen, said the team has isolated a bacteria that exists naturally in soil. The bacteria has properties that allow it to attract phosphorus, one of the three key ingredients in commercial fertilizer.

Phosphorus, the most expensive ingredient in commercial fertilizer, is a mined mineral whose supply is being depleted, particularly in the United States.

Martinez, who has a Ph.D. in microbiology from Georgia Tech, said MicroGreen addresses that issue by reducing the amount of phosphate-containing fertilizers farmers need to use to get the same yields.

Here's how the process works:

MicroGreen isolates the bacteria. It then could be packaged as a dry powder, which is added to water. Seeds are then soaked in the water, allowing the bacteria to attach to the seeds. The seeds are dried before planting.

Later, when the planted seeds germinate and send out roots, the bacteria would "chisel away at the phosphates in the soil allowing plant roots to absorb the needed nutrient following rains.

Without the treated seeds, farmers must spread more fertilizer on their fields to assure enough phosphates reach the plants. That's because phosphates tend to stick to the soil, making it harder for nutrients to reach plant roots.

"This all came about when we were doing uranium clean-up," Martinez said, explaining how the research started.

While working on his doctorate at Georgia Tech, he was involved in research to clean up uranium-contaminated groundwater near Oak Ridge, Tenn., where the federal government secretly produced enriched uranium as it developed the atomic bomb during World War II. That research was funded with a grant from the U.S. Department of Energy.

That research showed a particular bacteria in soil could capture the radioactive contaminants threatening the groundwater.

That prompted the question of what other practical uses the bacteria might have, and led to the phosphorus research when Martinez came to UA in 2009 to carry on his research. Another researcher from the uranium research, Melanie Beazley joined the MicroGreen team. Beazley has a Ph.D. in geochemistry from Georgia Tech.

Martinez said his goal is to make MicroGreen a commercially available product.

About 95 percent of the fertilizer used on U.S. farms has phosphorus in it. Only about 5 percent is animal manure, he said.

But only 6 percent of the world's phosphate reserves are in the United States, and projections indicated those reserves could be depleted in 30 years at current rates of usage.

That would leave American agriculture dependent on imported phosphorus, particularly imports from China and Africa, which have the world's biggest reserves. Should those areas cut their phosphate exports, U.S. agriculture could be crippled, he said.

The U.S. accounts for about $8 billion of the $30 billion annual global phosphate market, he said. The demand remains high, but the supply is diminishing. That has already been seen in the price of manufactured fertilizers containing phosphorus. In 2000, farmers paid less than $200 per ton for such fertilizer. By 2010, the price had jumped to nearly $900 a ton, according to a presentation Martinez gave Thursday at UA's annual Alabama Innovation and Mentoring Entrepreneurs Day.

The use of MicroGreen would reduce the amount of fertilizer farmers would need, he said. In short, they could get the same crop yield with less fertilizer.

MicroGreen plans to move from the laboratory to the greenhouse this year where it will test its products on different plants in different soils, said Martinez.

If that proves successful, the product might then be tested on some farms in West Alabama.

The ultimate goal would be a product that someday is sold commercially, not only to farmers but to home gardeners also, he said.

Bringing the product to market is still a ways off and would require additional financing.

Beazley said research funding has become harder to find. Federal and privately funded grants have diminished and competition for the funds has increased.

On Tuesday, MicroGreen will be among the 12 finalists competing in the State Launchpad Competition, sponsored by the Economic Development Partnership of Alabama. The finalists are all state university-related research companies. The winner of the competition will receive up to $25,000 to continue its research.

Nanogn, a UA biotech research company, is also in the competition.