Department of Agriculture, Trade and Consumer Protection
Division of Agricultural Development
Agricultural Development & Diversification Program (ADD)
Grant Project Final Report

Contract Number: 20054

Grant Project Title: Recovery of health-promoting constituents from onion processing waste for use as dietary supplements.

Amount of Funding Awarded: $28,000.00

Name of Principal Contact Person: Kevin E. Griep, President

E-Mail Address: kegriep@aglio.us

WEB Address: http://www.aglio.us

Report Submitted on: 9/10/06

Please use the following questions as a guide for writing your grant project final report. In your final report, please answer each question as it relates to your grant project.

1) What was the original intent of the grant?
   - What did you want to accomplish with the grant?
   - How was it expected to benefit Wisconsin Agriculture?
   - What makes this project work important or significant?

The original intent of the project was to develop the technical feasibility for recovering health-promoting organosulfur compounds (OSC) from onion waste for use as a food ingredient or dietary supplement. The approach taken was to identify ways to extract, concentrate and stabilize the extracted OSC in a manner that would evolve as intellectual property that could be patented and protected. This is expected to provide the technical foundation for the manufacture and marketing of health-promoting isolates for use as dietary supplements and food ingredients for human consumption. A company was formed (Aglio, Inc.), by assembling a group of people with diverse and established talents, to develop the required technology and plans to ultimately manufacture and market the resulting products. This company is based in Racine, WI and all intents are to keep business development within the state. The immediate impact on Wisconsin Agriculture is the transformation of agricultural waste (or culled) materials into value-added derivatives. While a major agricultural opportunity was identified as ameliorating an onion waste problem within the state, the developed technology is seen as being applicable to all *Allium* (onion, garlic, leek, chive, etc.) tissues, and thus, the technology is expected to be more broadly applicable. Considering that garlic is one of the top selling dietary supplements globally, it is reasonable to expect that demand for extracted OSC from Alliums could easily expand beyond simple abating of an onion waste problem in Wisconsin. This work completed under the DATCP-ADD grant is unique in that it attempts to transform agricultural waste into products of value, and the resulting products are expected to be new to the marketplace and may prove to be superior to similar products existing in the market on the basis of stability and functionality.

2) What steps did you take to reach your goal?
   - What worked?
   - What challenges did you face?
   - What would you do differently?

The steps taken to achieve the objectives of this project involved: 1) identifying appropriate solvents and volume: mass ratios to conduct the extraction of OSC from onion tissue, 2) identifying effective means of evaporating as much of the solvent as possible while maximizing retention of OSC (which are also volatile), and 3) stabilizing OSC in aqueous medium by chemical processes. We were successful in achieving these objectives within the guidelines originally stated in terms of degree of OSC extraction and retention as a result of three individual steps

just identified. There were two challenges that were not anticipated. One was the lack of cooperation of an onion processor in providing us with waste onion material to work with. Although this was perplexing (since any technology we developed would be to onion processors' benefit), it did not impede the process of technical/technology development. We used onions of retail origin as materials to study, and it is reasonable to expect that onions processed (minced, diced) in a laboratory setting yields material similar to that prepared by analogous processes in a commercial setting. However, it is possible that some unique characteristics of commercially processed onion (and waste derived from it) may have impact on the degree or efficiency of OSC extraction, retention and stabilization using the process we developed. The second challenge involved the chemical processes for stabilizing extracted OSC. While the chemistry behind the approaches taken is established, then application to the specific material and process we were assembling was not as simple or straightforward. We did find ways to chemically stabilize OSC, but this may render the OSC somewhat difficult to handle or process further. At the end of this project, we identified alternative processes that may represent improvements in the stabilization process and improved handling characteristics. These are still being evaluated, even though the funding period has ended. In retrospect, there is little we would do differently, as a linear pursuit of objectives originally proposed was necessary. It would have been appropriate to budget more time for OSC stabilization, but that was not evident at the point of conception of the project.

3) What were you able to accomplish?
   - What are the results from this project?
   - Include any analysis of data collected or materials developed through project work.

We have developed the technical means to extract, concentrate and stabilize OSC from onion tissue. Measures were used that distinguish our process from patented processes that are related in that they intend to achieve similar objectives. The distinctions between our and previous processes lie in the specific materials and sequence of steps used to assemble the process, as well an incorporating novel steps.

4) What conclusions can you make based on project work the analysis of collected data?

It is technically feasible to recover OSC as enriched preparations from onion and other *Allium* tissues. The basis for intellectual property was developed to permit the manufacture of enriched OSC preparations from onion and other *Allium* tissues. The types of steps required are currently in commercial practice in the food processing and allied industries, so no unique equipment or processes are required.

5) What do you plan to do in the future as a result of this project?

The obvious next steps from a technical perspective are to continue to improve the OSC stabilization step, and conduct pilot or scale-up trials for the purpose of both adapting the laboratory process and simulating manufacture of OSC preparations in a practical setting. Such a step would also produce sufficient amounts of material to make available for testing (e.g., utilization in foods or as a supplement, shelf-stability, laboratory or clinical trials to determine efficacy in animals or humans). Filing of a patent (or provisional patent) is another obvious next step.

6) What information or additional resources are needed to commercially develop this enterprise?

Resources are required to fund the pilot/scale-up trails, patent filing and making improvement of the process pending the outcome of the pilot trails. In addition, continued process improvement based on both laboratory and pilot activities would help improve the efficiency of the process. Resources to facilitate these steps could be acquired through the competitive grants process as well as attracting investment from the private sector.

7) How should the agricultural industry use the results from your grant project?

It is premature for the agricultural industry to use the information generated from the grant, and at this point the details of the process developed must not be disclosed to protect intellectual property. One way in which the industry could assist is to make available commercial onion waste as substrate for at least one of the pilot/scale-up trials.