

**Higher Education Research Council**  
**Idaho Global Entrepreneurial Mission Program**  
Year End Report

<b>Proposal No.</b>	<b>IF16-006</b>
<b>Project Title:</b>	<b>Plant Extracts as Natural Pesticides and Potato Sprout Inhibitors</b>
<b>Name of Institution:</b>	<b>University of Idaho</b>
<b>Principle Investigator (s):</b>	<b>Matthew J. Morra</b>
<b>Reporting Period:</b>	<b>July 1, 2015-June 30, 2016</b>

**1. Summary of Project Accomplishments**

Sufficient amounts of our sprout inhibitor biopesticide have been produced such that our business partner the 1,4GROUP in Meridian, ID has been able to test efficacy on 20 pounds of potatoes, followed by a larger scale test on 200 pounds of potatoes. In both tests, our product has proven extremely effective. We have sent the 1,4GROUP three separate batches of our extract and each has proven efficacious. Our product will be tested on 12,000 pounds of potatoes in October 2016. Bioherbicultural formulations of our product have been shipped to our business partner in California, Farm Fuel Inc. One of the formulations has been tested by our business partner and shown to be effective in controlling liverwort, a weed in the horticultural industry. A second shipment of extract was sent and weed control testing by Farm Fuel is in progress. Technology transfer agreement have been secured with both partners and a patent was advanced in the review process. A \$59,625 grant from the Murdock Charitable Trust to be matched with \$59,625 from the University of Idaho was secured for scaling up our extraction procedure. Additional funding of \$59,324 was also secured to continue our efforts. In summary, we achieved our goal of producing sufficient product such that our business partners were able to perform necessary testing for continued support and interest in our products. Commercialization efforts are proceeding with scale-up efforts that will produce a pilot plant for collecting the required engineering parameters for full-scale commercial production of our extracts.

**2. Summary of Budget Expenditures**

Equipment was purchased to dry the seed meal extracts as proposed. The cost of the equipment was \$43,309. Salary dollars for the balance of the funding were expended on a full-time employee hired to support the project. The hired employee produced the product as needed for our two business partners.

**3. Demonstration of Economic Development/Impact**

- a) **Patents, Copyrights, Plant Variety Protection Certificates received or pending.**

A Provisional Patent entitled “Mustard Meal Extracts as Biopesticides” was filed July 9, 2015 by the UI’s Office of Technology Transfer (OTT). Additional data generated by IGEM funding was forwarded to the UI patent attorney. An international patent filed under the Patent Cooperation Treaty (PCT) was submitted in July 2016. A Disclosure to OTT concerning our research on nematode hatch stimulation generated by mustard extracts and identification of the responsible active ingredient is in preparation.

**b) Technology licenses signed, start-up businesses created, and Industry Involvement**

Non-disclosure and option agreements are in place with our commercial partners, Farm Fuel and the 1,4GROUP. Both companies continue to be involved in product testing and are fully engaged in commercialization efforts.

**c) Private sector engagement**

We are collaborating with three business partners to achieve project goals. Pacific Northwest Grain Growers will provide the feedstock to Farm Fuel who will act as the producer and supplier of biopesticidal extracts to end users such as the 1,4 GROUP. We are addressing the entire supply chain in our efforts.

**d) Jobs created**

A full-time employee to operate the spray dryer was hired. Funding received from other grants is being used to continue support for this individual.

**e) External Funding**

A \$59,625 grant from the Murdock Charitable Trust to be matched with \$59,625 from the University of Idaho was secured for scaling up our extraction procedure. Three separate USDA grants were secured for an amount of \$59,324. Total funding received from other grants was thus \$178,574.

**f) Any other pertinent information**

Data are being collected for a disclosure to OTT that will focus on phytotoxic active ingredients from our mustard extracts. We have identified new compounds that appear to have herbicidal activity. A collaboration with a USDA employee has been developed to test these compounds on weeds. The results of that testing will be used in the disclosure.

The 1,4GROUP will test our extracts on 12,000 pounds of potatoes in October 2016. In support of this effort, the 1,4GROUP funded an engineering group at Penn State to develop equipment for application of our product to potato storage facilities. A prototype applicator was developed and will be used in the October tests. This could lead to a spinoff industry that would produce these applicators.

A large capacity freeze dryer with a cost of approximately \$39,000 was ordered using USDA funds secured through an external grant. This unit will be used as an alternate drying technique for our extracts, thus increasing product output.

**4. Numbers of Faculty & Students Involved**

Three faculty members and two undergraduate students were involved in the project.

**5. Future Plans for Project Continuation**

The project is being continued with \$178,574 in grant funding. We will thus continue to provide extracts to our commercial partners for testing. Scale up in the form of pilot plant development will begin with funds received from the Murdock Charitable Trust. A \$15 million USDA proposal focused on oilseeds and coproducts from those oilseeds is in preparation. The project includes approximately \$300,000 year for 5 years to fund biopesticide development with an emphasis on scaling up extraction, concentration, and formulation.

**6. Final Expenditure Report (See Attached Template)**

Funds were dispensed very closely in amounts as requested (see attached).

**7. Commercialization Revenue**

No revenue was received directly from a commercial product developed in this project.

**8. Additional Metrics established if applicable (varies by project, must be consistently reported on during each reporting period)**

**FINAL EXPENDITURE REPORT**

<b>A. FACULTY AND STAFF</b>		
Name/Title	\$ Amount Requested	Actual \$ Spent
Matt Morra/Professor	2,400	\$2,384
Jeremy Eilers/staff hourly	18,700	\$15,173
<b>B. VISITING PROFESSORS</b>		
Name/Title	\$ Amount Requested	Actual \$ Spent
<b>C. POST DOCTORAL ASSOCIATES/OTHER PROFESSIONALS</b>		
Name/Title	\$ Amount Requested	Actual \$ Spent
<b>D. GRADUATE/UNDERGRADUATE STUDENTS</b>		
Name/Title	\$ Amount Requested	Actual \$ Spent
David Graybill/TH student (including 2% fringe)	\$0	\$3,045
<b>E. FRINGE BENEFITS</b>		
Rate of Fringe (%)	\$ Amount Requested	Actual \$ Spent
30	700	\$753
43	8,100	\$8,001
<b>PERSONNEL SUBTOTAL:</b>		<b>29,900</b>
<b>PERSONNEL SUBTOTAL:</b>		<b>\$29,356</b>
<b>F. EQUIPMENT: (List each item with a cost in excess of \$1000)</b>		
Item/Description	\$ Amount Requested	Actual \$ Spent
1. Spray dryer	43,000	\$43,544
2.		
4.		
5.		
<b>EQUIPMENT SUBTOTAL:</b>		<b>43,000</b>
<b>EQUIPMENT SUBTOTAL:</b>		<b>\$43,544</b>
<b>G. TRAVEL</b>		
Description	\$ Amount Requested	Actual \$ Spent
1.		
2.		
3.		
<b>TRAVEL SUBTOTAL:</b>		
<b>TRAVEL SUBTOTAL:</b>		

<b>H. PARTICIPANT SUPPORT COSTS:</b>			
Description		\$ Amount Requested	Actual \$ Spent
1.			
2.			
3.			
<b>PARTICIPANT SUPPORT COSTS SUBTOTAL:</b>			
<b>F. OTHER DIRECT COSTS:</b>			
Description		\$ Amount Requested	Actual \$ Spent
1.			
2.			
3.			
<b>OTHER DIRECT COSTS SUBTOTAL:</b>			
<b>TOTAL COSTS (Add Subtotals):</b>		72,900	\$72,900
<b>TOTAL AMOUNT REQUESTED:</b>			72,900
<b>TOTAL AMOUNT SPENT:</b>			\$72,900