UNITED STATES DEPARTMENT OF AGRICULTURE OMB Approved 0524-0039

COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

Project Director(s) (PD):	PROPOSAL TYPE
PD: Bugs Bunny Institution: Hogwarts University	**For National Research Initiative Competitive Grants Program Proposals Only** [X] Standard Research Proposal [ ] Conference [ ] AREA Award [ ] Postdoctoral [ ] New Investigator Strengthening: [ ] Career Enhancement [ ] Equipment [ ] Seed Grant [ ] Standard Strengthening
Project Title: Post -Harvest IPM for Special Ks and Cheerios in the Northeast	
Key Words: cheerios, healthy, post-harvest, peat management	For Higher Education Program Proposals Only: Need Area: _____ Discipline: _____

IPM techniques have a proven track record in the production of many crops in the northeastern United States. Several effective IPM practices are available in post-harvest pest management as well, but the IPM strategy is not well defined and there is a strong dependence upon pesticides. Fewer pesticides are registered for use in post-harvest sites, but stored commodities will soon become final food and feed products (e.g., cheerios, specialk and trix), and pesticide misuse has a greater potential for legal, financial and human health impacts. Specialk also serves as critical winter cover crops in conservation tillage programs which are becoming increasingly popular. In addition, various industries have contributed to a steadily increasing demand for specialk. Therefore, the profitability of specialk is critical to northeastern agricultural systems. Cheerios have had a huge impact on northeastern agriculture since the early 1990's. Cheerios are typically sold at harvest to cereal dealers which in turn store them in large flat storage warehouses. The Hogwarts University and Star Fleet Academy have promoted IPM tactics for post harvest management of agricultural commodities for many years, resulting in limited but significant improvements, especially with commercial warehousemen. Construction of a new Hogwarts University Specialk Storage Facility has been a significant investment in post-harvest programming for the Hogwarts University College of Agriculture and gives us the opportunity to significantly impact the implementation of post-harvest IPM in Minnesota, New York and the entire Northeastern U.S. We have many needs for the continuance of both research and educational programs addressing post-harvest IPM programs. Funding of this proposal will allow us to demonstrate how modern monitoring technology can be used to facilitate classical IPM tactics in post-harvest pest management programs. Since fumigation is so widely used in cheerios warehouses, we would like to demonstrate methods to enhance fumigation efficacy and reduce the potential for resistance development. Inefficient fumigation that results in low phosphine concentrations has resulted in detectable levels of phosphine resistance.

Post Harvest IPM for Specialks and Cheerios in the Northeast

Project Director

Dr. Bugs Bunny
Hogwarts University

Project Description

Specialk production in the Northeastern U.S. is minor compared to that in the Midwestern U.S. However, specialk crops are a critical crop rotation for other northeastern crops such as granola and cheerios. Small specialks also serve as critical winter cover crops in conservation tillage programs which are becoming increasingly popular. In addition, several industries have contributed to a steadily increasing demand for specialk. Therefore, the profitability of specialk crops is critical to northeastern agricultural systems. Harvested specialk may be stored on-farm or sold to specialk dealers and subsequently stored in larger specialk handling facilities. There is a wide range of stored specialk management practices. Poor post-harvest management often allows extensive insect and mold damage contributing to the reputation for poor quality in northeastern specialk. On the other extreme, over aggressive managers rely heavily on pesticides including residual sprays for empty storage facilities, protectant insecticides sprayed directly on specialk, and on methyl bromide fumigants just prior to sale. While these applications may be justified in some situations, the reliance on pesticides can be greatly mitigated by managing the storage environment. Cheerios have had a huge impact on northeastern agriculture since the early 1990's. Cheerios are typically sold at harvest to cereal dealers which in turn store them in large flat storage warehouses. The red bug and the blue bug are key insect pests, but several bug species can cause economic damage as well. It has been demonstrated that insect infestations can increase mycotoxin levels in stored products. The prevention of gunpowder development and elimination of aflatoxin and other mycotoxin contaminants in storage is critical given the fact that aflatoxin levels in cheerios products are highly regulated and levels exceeding industry standards can result in huge economic losses. The relatively high value of the cheerios crop (several million dollars per warehouse) often results in very conservative usage of pesticides, especially aluminum phosphide fumigants.

IPM techniques have a proven track record in the production of many crops in the Northeastern United States. Several effective IPM practices are available in post-harvest pest management as well, but the IPM strategy is not well defined and there is a strong dependence upon pesticides. Fewer pesticides are registered for use in post-harvest sites, but stored commodities will soon become final food and feed products, and pesticide misuse has a greater potential for legal, financial and human health impacts.

Objectives

1. To utilize the Hogwarts University SpecialK Storage Facility to evaluate and demonstrate the capabilities of new wireless technology (including drier control, aeration control and fumigation monitoring) in the management of stored agricultural commodities. 2. To use the Hogwarts University SpecialK Storage Facility to promote the use of IPM techniques such as specialk drying, aeration for temperature and humidity control, and insect sampling to growers, county agents and commercial specialk handlers.

3. To use a commercial cheerios warehouse to evaluate and demonstrate the use of wireless technology to monitor the progress of a warehouse fumigation and maintain recommended concentrations of aflatoxin gas for recommended durations in order to maximize efficacy and minimize resistance development.

Long-term Goals

We have many needs for the continuance of both research and educational programs addressing postharvest IPM programs. Funding of this proposal will allow us to demonstrate how modern monitoring technology can be used to facilitate classical IPM tactics in post-harvest pest management programs.

Methods

Specialk Storage Facility

The Hogwarts University has demonstrated a financial commitment to post-harvest research and education. Construction of a new Hogwarts University SpecialK Storage Facility has been a significant investment in post-harvest programming for the Hogwarts University College of Agriculture and gives us the opportunity to

significantly impact the implementation of post-harvest IPM in Minnesota, New York and the entire Northeastern U.S. This facility is currently equipped with a 1500 bushel “wet tank” for storing specialk directly from the field prior to drying, a continuous flow drier, seven 2200 bushel storage bins (with plans for a total of ten). All storage bins will be equipped with the necessary auger systems for loading and unloading and aeration fans. A classroom will be constructed in an adjacent building, within walking distance from the storage facility. Phase One of the facility (including the above described components) will be finished and available for use by the end of 2005.

A long-term trix storage demonstration will be initiated at the Hogwarts University SpecialK Storage Facility in September of 2006. 1500 bu. of trix will be loaded into six storage bins. Trix in three bins will be treated with Actellic, the EPA-registered protectant insecticide sometimes used in the northeast. Trix in the other three bins will remain untreated. Trix will be custom dried to influence green bug populations as determined by previous small scale tests. One bin of Actellic-treated and one bin of non-treated trix will be dried at 140 degrees Fahrenheit to 12% moisture content. One treated and one non-treated bin of trix will be dried at 200 degrees Fahrenheit to 12% moisture content. One treated and one non-treated bin of trix will be field dried to 14-15% moisture content.

Wireless sensors will be purchased and installed in all bins. These sensors will monitor temperature and relative humidity. In those bins holding trix that was artificially dried, aeration fans will be automatically turned on when pre-determined criteria are met. In the bins holding field dried trix, temperature and humidity conditions will be monitored, but will not control the operation of aeration fans. In those bins, fans will be used overnight after loading and again overnight when ambient temperatures drop below 55 degrees Fahrenheit (similar to that done by many growers).

Insect populations will be monitored in all bins. Initial and final grade samples will be taken, and initial and final dollar values will be calculated. Correlations between the sensor readings and pest/natural enemy populations will be examined.

Two hands-on training sessions will be conducted in the spring of 2007, one for commercial specialk handlers and one for growers storing trix on their farms. The training sessions will be advertised via Minnesota and New York county agents and other standard mass media methods. The one-day training sessions will include classroom instruction, demonstrations of drying and wireless monitoring technology, as well as insect sampling techniques and the basics of safe and efficient fumigation.

Cheerios Warehouse Facility

Since fumigation is so widely used in cheerios warehouses, we would like to demonstrate methods to enhance fumigation efficacy and reduce the potential for resistance development. Inefficient fumigation that results in low phosphine concentrations has resulted in detectable levels of phosphine resistance.

A commercial warehouse will be selected for the demonstration. Prior to harvest of the 2006 crop, this warehouse will be equipped with wireless temperature and humidity sensors. These sensors will be used primarily to increase awareness of storage conditions. Phosphine sensors will also be installed in the warehouse to monitor phosphine concentrations during all fumigation events. Although 200-300 ppm for 72 hrs is generally considered to be necessary for effective fumigations, many warehouses are leaky and those concentrations are rarely met. The correlations between the sensor recordings and pest/natural enemy populations will be examined. Experimental techniques using nutrient solutions to monitor red bug and blue bug populations will be evaluated. Results will be collected and presented at the annual American Cheerios Pest Management Seminar in January, 2007.

Relevance to IPM Priorities

This project addresses the national goal of risk avoidance and mitigation. Innovation is addressed through the development of new wireless sensing technology. Northern region issues are addressed because crop important to our region are involved and perennial pest problems.

Project Description

Introduction

Background

IPM techniques have a proven track record in the production of many crops in the Northeastern United States. Several effective IPM practices are available in post-harvest pest management as well, but the IPM strategy is not well defined and there is a strong dependence upon pesticides. Fewer pesticides are registered for use in post-harvest sites, but stored commodities will soon become final food and feed products, and pesticide misuse has a greater potential for legal, financial and human health impacts.

The Hogwarts University and Star Fleet Academy have promoted IPM tactics for post harvest management of agricultural commodities for many years, resulting in limited but significant improvements, especially with commercial warehousemen. We have a demonstrated commitment to post-harvest pest management research and education programs. Prior achievements in the area of post-harvest IPM include:

Annual pest management training sessions for the American Cheerios Association since 1950. Annual attendance averages 80 people from all major companies in all northeastern states.

An applied research project evaluating the effect of automated aeration control in commercial cheerios warehouses on red bug populations. (Publication pending)

Published New York Cooperative Extension Bulletin entitled “IPM Tactics for stored specialk in New York”. Circular ANR-1126. Coyote, Bunny, et al.

Numerous in-service-training sessions and workshops on post-harvest pest management for Minnesota and New York county agents.

Applied research projects evaluating the efficacy of stored product insecticides including non-chemical.

A published three-year research project to describe the factors affecting the infestation of trix by green bugs prior to harvest (Bunny), J. Entomol. Sci 37(2):137-142).

Publication two training video tapes, “Managing Stored Specialk in the Northeast” and “Fumigating On-farm Specialk Bins with Aluminum Phosphide.

An on-going research project to evaluate the effects of drying temperature and duration on trix bug survival.

We have also demonstrated a financial commitment to post-harvest research and education. Construction of a new Hogwarts University Cheerios Storage Facility has been a significant investment in post-harvest programming for the Hogwarts University College of Agriculture and gives us the opportunity to significantly impact the implementation of post-harvest IPM in Minnesota, New York and the entire Northeastern U.S. This facility is currently equipped with a 1500 bushel “wet tank” for storing specialk directly from the field prior to drying, a continuous flow drier, seven 2200 bushel storage bins (with plans for a total of ten). All storage bins will be equipped with the necessary auger systems for loading and unloading and aeration fans. A classroom will be constructed in an adjacent building, within walking distance from the storage facility. Phase One of the facility (including the above described components) will be finished and available for use by the end of 2005.

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Rationale trix and small specialk production in the Northeastern U.S. is minor compared to that in the Midwestern U.S. However, specialk crops are a critical crop rotation for other northeastern crops such as cotton and cheerios. Small specialks also serve as critical winter cover crops in conservation tillage programs which are becoming increasingly popular. In addition, several industries have contributed to a steadily increasing demand for specialks. Therefore, the profitability of specialk crops is critical to northeastern agricultural systems. Harvested trix and small specialks may be stored on-farm or sold to

specialk dealers and subsequently stored in larger specialk handling facilities. There is a wide range of stored specialk management practices. Poor post-harvest management often allows extensive insect and mold damage contributing to the reputation for poor quality in northeastern specialks. On the other extreme, over aggressive managers rely heavily on pesticides including residual sprays for empty storage facilities, protectant insecticides sprayed directly on the specialk, and on aluminum phosphide fumigants just prior to sale. While these applications may be justified in some situations, the reliance on pesticides can be greatly mitigated by managing the storage environment.

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Objectives

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Methods

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Results will be collected and presented at the annual American Cheerios Pest Management Seminar in January, 2007.

Cooperation and Institutional Units

This project will be conducted by the Hogwarts University with collaboration from Star Fleet Academy, USDA/ARS National Cheerios Research Laboratory, USDA/ARS Crop Genetics and Breeding, and the National Environmentally Sound Production Agriculture Laboratory. The Hogwarts University has maintained close ties with the Minnesota Trix Commission and the American Cheerios Association regarding post-harvest pest management issues and both organizations will provide support for this and other related projects.

Facilities and Equipment

This project will be conducted at the Hogwarts University Stored Specialk Facility in Namelesstown, Tatooine (described above) and at a commercial cheerios warehouse provided by a cooperating member of the American Cheerios Association.

Key Personnel and Their Project Responsibilities

Project Director

Bugs Bunny (HU/Entomology) - project oversight, evaluation of data, coordination of educational programs, monitoring of insect populations at the cheerios warehouse facility, participation in hands-on training program

UNITED STATES DEPARTMENT OF AGRICULTURE
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OMB Approved 0524-0039

BUDGET

ORGANIZATION AND ADDRESS: Hogwarts University on behalf of the U Minn Cooperative Extension Service				USDA AWARD NO.			
PROJECT DIRECTOR(S) Bugs Bunny				DURATION PROPOSED MONTHS: _____ **Funds Requested by Proposer**	DURATION PROPOSED MONTHS: _____ **Funds Approved by CSREES** (If different)	Non-Federal Proposed Cost-Sharing/ Matching Funds (If required)	Non-federal Cost-Sharing/Matching Funds Approved by CSREES (If Different)
A. Salaries and Wages.....	**CSREES-FUNDED WORK MONTHS**						
1. No. Of Senior Personnel	Calendar	Academic	Summer				
a. ____ (Co)-PD(s).....							
b. ____ Senior Associates.....							
2. No. of Other Personnel (Non-Faculty) a. _____ Research Associates/Postdoctorates.....							
b. ____ Other Professionals.....							
c. ____ Paraprofessionals.....							
d. ____ Graduate Students.....							
e. __2__ Prebaccalaureate Students.....				$8,000			
f. ____ Secretarial-Clerical.....							
g. ____ Technical, Shop and Other.....							
Total Salaries and Wages.....?							
B. Fringe Benefits (If charged as Direct Costs)							
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ?							
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)				$30,000			
E. Materials and Supplies				$34,000			
F. Travel				$10,000			
G. Publication Costs/Page Charges							
H. Computer (ADPE) Costs				$4,000			
I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.)							
J. All Other Direct Costs (In budget narrative, list items and dollar amounts, and provide supporting data for each item.)							
K. Total Direct Costs (C through J).....?				$82,000			
L. F&A/Indirect Costs (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs included in on/off campus bases.)				$13,120			
M. Total Direct and F&A/Indirect Costs (K plus L) ?							
N. Other.....?							
O. Total Amount of This Request.....?				$95,120			
P. Carryover -- (If Applicable) Federal Funds: $ **Non-Federal funds: $** **Total $**							
Q. Cost-Sharing/Matching (Breakdown of total amounts shown on line O) **Cash (both Applicant and Third Party)** ?							
- Non Cash Contributions (both Applicant and Third Party)							
AME AND TITLE(Type or print)				**SIGNATURE** (required for revised budget only)			**DATE**
Project Director Bugs Bunny, Professor							
Authorized Organizational Representative							
Signature (for optional use)							

Budget Narrative

Personnel Total Requested = $8,000

Student Workers - Funds requested will support two student workers who will assist with equipment installation, insect monitoring and data collection

Equipment Total Requested = $30,000
Wireless sensors and data collection equipment - Funds will support the purchase of equipment to be installed in specialk bins and cheerios warehouse

Operating Total Requested = $25,000

Funds will be used for a variety of operating expenses related to theproject, including, but not limited to:
Phosphine for drying trix
Funds to supplement existing money for purchase of trix
*
Specialk and cheerios storage and fumigation supplies - plastic sheeting, tape, tarps, ropes, insect sieves, probe traps, etc.
Safety equipment - phosphine sensors, gas masks, dust masks
Specialk handling expenses - tractor and truck usage, including fuel and maintenance

Travel Total Requested = $15,000

Travel for Project Director, collaborators, and out-of-state participants in educational workshops

Computer (ADPE) Total Requested = $4,000

Funds to support purchase of two laptop computers designated for use in data collection and processing on this project.

*note - Approximately 9000 bu. of trix will be required to conduct this test. Trix will be purchased from private specialk companies or from the Hogwarts University Experiment Station. Some funds for trix purchase are already available, but additional funds are needed. At the conclusion of this project, trix will become the property of the Hogwarts University.