Western Regional IPM Grants Research/Extension Accomplishments Report

INSTRUCTIONS: PLEASE PROVIDE ONLY THE ESSENTIAL COMPONENTS OF ACCOMPLISHMENT WHICH ARE:

1. A CLEAR IDENTIFICATION OF THE PROBLEM/ISSUE ADDRESSED BY THE RESEARCH/EXTENSION.
2. A CONCISE EXPLANATION OF HOW THE RESEARCH/EXTENSION ACHIEVEMENT CONTRIBUTED TO THE SOLUTION OF THE PROBLEM/ISSUE BEING RESEARCHED.
3. THE IDENTIFICATION OF OTHER BENEFITS RESULTING FROM THE RESEARCH/EXTENSION, EVEN IF UNPLANNED.
4. PLEASE ATTACH A SUMMARY OF THE PAST YEARS PROGRESS, ONE PAGE MINIMUM.

CONTACT: S. Patricia Stock

PROJECT NUMBER: 2006-34103-16956

TELEPHONE: 520-626-3854

PROJECT TITLE: Assessment and Implementation of Native Insecticidal Nematodes: An Alternative for Control of Urban Pests

PRINCIPAL INVESTIGATOR: S. Patricia Stock

INSTITUTIONAL ADDRESS: Department of Entomology. University of Arizona. Forbes 410. 1140 E. South Campus Dr. Tucson, AZ 85721

CO-PIs or TEAM MEMBERS: Dawn H. Gouge

THE PROBLEM, ISSUE, OR REASON FOR CONDUCTING THE RESEARCH/EXTENSION:

The National IPM Road Map Program for residential and public areas states that "the greatest human population exposure to pests and the tactics used to control them occur where people live, work, and play". Therefore, the expansion of integrated pest management programs in urban and suburban area will help minimize human health risks posed by pests, and also will contribute to reducing or mitigating the adverse environmental effects of pest management practices. To address these needs we propose to develop an alternative tool for use in urban integrated pest management systems by considering commercially-available and Arizona-native entomopathogenic nematodes (EPN) for control of arthropod pests in western USA.

THE SINGLE MOST IMPORTANT ACCOMPLISHMENT OR BENEFIT RESULTING FROM THIS RESEARCH/EXTENSION:

The research and extension activities proposed in this project address several future IPM needs outlined by the national IPM program such as the adoption of new pest management strategies including development of new generation low-risk suppression tactics including biological control agents, and the creation of public awareness and understanding of IPM programs throughout education programs in schools, colleges, and creative mass media.

ADDITIONAL BENEFITS, SUCH AS:

SOCIAL BENEFITS -

If proven successful, EPN may provide an alternative option for urban pest management and may help reduce potential risks to human health a caused by pests themselves or by the use of chemical pesticides. Stakeholders and representatives of many pest control companies and school districts from the state of Arizona have identified the need of environmentally-safe alternatives for the control of urban and suburban pests. Therefore this research will directly benefit these stakeholders' needs.

ECONOMIC BENEFITS

Not yet estimated

ENVIRONMENTAL BENEFITS

EPN offer numerous advantages in terms of safety to humans and non-target organisms, reduction of pesticides residues, preservation of other natural enemies, and increased biodiversity in managed ecosystems safe to non-target organisms including humans, other vertebrates, and plants, and do not pollute the environment. Results from this research will assist in developing EPN as an environmentally friendly alternative (reduced-risk alternative) to urban IPM practices.

OTHER

EPN can be mass-produced in large fermentation tanks, can be stored for long periods and applied by conventional methods using standard spray equipment, making them a desirable alternative for commercial formulation.

PLEASE SUBMIT A HIGH RESOLUTION DIGITAL IMAGE REPRESENTATIVE OF YOUR RESEARCH/EXTENSION PROJECT THAT WE CAN USE TO HIGHLIGHT YOUR PROJECT!

THIS FORM WAS COMPLETED BY:

(Dr. S. Patricia Stock, Assistant Professor)

When you have completed this form, return to both:

Dr. Frank Zalom
Department of Entomology
One Shields Avenue
University of California
One Shields Avenue
Davis, CA 95616
fgzalom@ucdavis.edu

Rick Melnicoe
Western IPM Center
Department of Environmental Toxicology
University of California
One Shields Avenue
Davis, CA 95616
rsmelnicoe@ucdavis.edu

U.S. Department of Agriculture

AD-421 Progress Report (investigator copy)

U.S. Dept. of Agriculture, State Agricultural Experiment Stations and Other Institutions

Date (Month, Day, Year): 08/07/2007

1. Accession	Agency Identification No.	5. Work Unit/Project No.	6. Status
0206983	2. CSREES 3. ARZT	ARZT-355630-G-31-530	Progress

7. Title

Assessment and Implementation of Native Insecticidal Nematodes: An Alternative for Control of Urban Pests

12. Investigator Name(s) (Last Name and Intitials)

Stock, S. P.; Gouge, D. H.

20. Termination Date 06/30/2008

40. Period Covered (mo/da/year): 07/01/2006 TO 06/30/2007

41. Progress Report:

To effectively implement Arizona-native EPN for the management of desert urban pests in western US, some basic data on their ecological traits needs to be first established. This information is currently very limited, yet is fundamental for the evaluation of the efficacy of these native nematodes, and critical for subsequent experimental or management activities. Efficacy of EPN is usually reduced due to their sensitivity to environmental extremes such as high temperatures, low humidity and solar (UV) radiation. In this respect and, during the first year of this project we have assess temperature, moisture and UV tolerance of three Arizona-native EPN (*Steinernema* ML-18, *Steinernema* SR-5, *Steinernema* 'Bubbling Ponds' and *Heterorhabditis* CH-35) we are considering in this study. Specifically we have evaluated the effect of temperature (20, 25, 30 and 35 C) on EPN infectivity and reproduction. Assessed parameters were: insect host mortality, time of death, number of nematodes established/insect and time of death, nematode progeny production. Results indicate that two of the four isolates tested, *Steinernema* SR5 and *Heterorhabditis* Ch-35 better perform at temperatures ranging between 30 and 35C. These findings are promising as they show these two isolates may be better adapted to desert and semi-desert environments. Additionally we are currently evaluating the effect of soil moisture on infectivity. The range of soil water potential (3%, 5%), 7%, 9%, 13%, 19%) in which IJ of different EPN species are capable of seeking out and infecting a host is currently being examined. Tolerance of Arizona-native isolates was also assessed by exposing juvenile nematodes to a UV radiation (medium wave length ~ 300 nm).

Host foraging behavior of these three native EPN was also evaluated. Attachment of infective juveniles (IJ) to a mobile host on a soil surface and the ability of IJ to find a host at different depth was tested and compared to a sit-and-wait forager (ambusher) species, *Steinernema carpocapsae*, and a widely active forager (cruiser), *Steinernema glaseri.* A graduate student, who joined the Stock Lab this past August 2007, will continue with these experiments and other objectives outlined in this proposal as part of her Masters thesis research.

42. Impact

The overall goal of this project is to assess commercially available and Arizona-native entomopathogenic nematodes as an alternative tool for integrated pest management for control of urban arthropod pests in western US, and to consider the use of EPN alone and/or in combination with chemical pesticides to help minimize current chemical pesticide practices, therefore reducing the risk of health problems and protection and conservation of ecosystem quality and diversity.

43. Publications

No Publications Reported

Approved (Signature)	Title	Date

This copy was printed by the investigator.

Legend for picture

A. Infective juvenile nematoes of Steinernema Ml-18; B. A selection of targeted insect pests: bark scorpion *Centuroides exilicauda*, termites (*Heterortermes aureus,* and *Pheidole* sp. ants; C. Nematodes emerging from insect cadaver; D. One-on-one bioassay (each well containing an insect cadaver (Galleria mellonella larvae) infected with *Heterorhabditis* Ch-35)