FINAL REPORT
IAEA/FAO INTERREGIONAL TRAINING COURSE ON
USE OF RADIATION IN INSECT CONTROL AND ENTOMOLOGY
WITH SPECIAL EMPHASIS ON THE STERILE INSECT TECHNIQUE

DOE/IS/40025--T1

4 MAY TO 15 JUNE, 1994
GAINESVILLE, FLORIDA

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THE INTERNATIONAL ATOMIC ENERGY AGENCY AND THE FOOD AND
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and
THE DEPARTMENT OF ENERGY, U.S.A.

Hosted and supported by:
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Course Director

Cooperating Institutions

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Dr. Gary Mount, Laboratory Director

Insect Attractant, Behavior and Basic Biology Research Laboratory, USDA, ARS
Dr. Herbert Oberlander, Laboratory Director

Division of Plant Industry
Florida Agricultural and Consumer Services Department
Mr. Richard Gaskalla, Director

Technical Director and Course Coordinator
Dr. Leo E. LaChance, Consultant
Fargo, North Dakota

Assistant Course Director
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Gainesville, Florida

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Course Secretary, Mrs. Glinda Burnett

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MASTER

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INTRODUCTION

This was the 16th presentation of the course in Gainesville, Florida since 1963. The course would not have been possible without the support and assistance of many organizations and individuals in the International Atomic Energy Agency, the Food and Agriculture Organization, the U.S. Department of Energy, the Department of Entomology and Nematology of the University of Florida, the Medical and Veterinary Entomology Research Laboratory and the Insects Attractants, Behavior and Basic Biology Laboratory of the USDA, Agricultural Research Service in Gainesville, Florida, the Florida State Department of Agriculture and Consumer Services through its Division of Plant Industry in Gainesville; and the Faculty Computer Support Department of the University of Florida.

The list of participants in the course is shown in Appendix 1 and the course schedule is shown in Appendix 3. There were 12 male and 10 female participants. The principal focus of the course was the application of Radiation in Entomology to achieve Area Wide Pest Suppression or Eradication. To achieve this objective formal lectures, discussion groups, laboratory exercises and field trips were held covering the details of: 1. Principles, programs and research of all aspects of the Sterile Insect Technique; 2. Insect biology and control, 3. Integrated pest management; 4. Population dynamics and models related to the development of SIT and insect population suppression; 5. Fundamentals of computers for helping in development of SIT; 6. The importance of economic considerations in formulating area wide pest management programs. The course included tours of local laboratories of the University, USDA, and the State Division of Plant Industry (DPI), and a site visit to a citrus production area in which the pest-free zone concept of pest management for fruit export is utilized.

In general, the course participants were a truly motivated and energetic group. This was evident throughout the course by the intensity of their questions and discussions during the lectures and laboratory exercises and visits. All were working in the area of insect biology, control and/or teaching.

The organizers of the course are greatly indebted to all the scientists who volunteered their time and talents to participate in the course (Appendix 2). Some lecturers traveled great distances to be able to share their knowledge and experience with the participants. The quality of the lectures was outstanding. Top personnel in the field of SIT, IPM and Insect Biology and Control presented information on a wide variety of research and operational programs. The participants were provided with reprints, VHS tapes, handouts, and computer programs covering the subject matter. In addition to travel and lectures, many of the visiting lecturers participated in informal evening discussions with the course participants. Always, these sessions proved to be lively, informative and greatly appreciated by the participants.

GENERAL SUMMARY OF THE COURSE AND ITS CONTENTS WITH RECOMMENDATIONS

1. STUDENT ACCOMMODATIONS

Participants were housed at the Holiday Inn West, in Gainesville. The accommodations were excellent. The participants were assigned two to a room and the cost was \$US 45 per room per night plus taxes. There were no complaints except for one participant who preferred a single room, but accepted double occupancy after the alternatives were explained. It was the first time that the participants had been housed at the Holiday Inn West.

The location was chosen because in the past many participants complained that there were very few places within walking distance of the hotel for them to shop, eat, etc. It was recommended by past course directors and assistants to change the hotel location.

This proved to be a good choice, since the present location affords the participants a wide variety of eating establishments within walking distance, and a large, air-conditioned shopping center nearby. Also, the hotel personnel were very courteous and solicitous. In addition, the hotel offered a warm breakfast buffet to all guests at \$US 1.99. Most of the participants took advantage of this opportunity for starting the day with a good breakfast. Having visited the Holiday Inn--University Center (former location) and compared it with the Holiday Inn-West it appears that the choice was a good one and we recommend use of this hotel in future courses.

2. TRAVEL ARRANGEMENTS

For the most part the travel arrangements were made efficiently and in good time. However, some of the participants had great difficulty with their travel arrangements. Perhaps this was nobody's fault; however, one must remember that many of the participants have not travelled extensively and had no idea how traumatic it could be. A few of the problems are enumerated below. Perhaps it will help future participants and COSMOS in arranging their travel. In retrospect all of these problems could have been foreseen and avoided.

The participant from Turkey was routed to Jacksonville (2 hours from Gainesville by car) and we had to drive there to pick him up. His return also had him leaving from Jacksonville at 0800 to fly to New York to catch at 1800 flight. We attempted to change his return ticket and found this was impossible. Upon checking with IAEA we learned that instructions had been given to COSMOS to route him to Gainesville but there was no way this could be accomplished without staying overnight in Europe or New York. So he was routed to Jacksonville because he was not allowed an overnight. Also there was confusion about how to route him to Gainesville. The best routing is via Atlanta. He was offered a routing Jacksonville, Orlando, Gainesville.

The participant from Mexico claimed she did not get a ticket. Her institute provided a ticket to Miami and she had to pay for her ticket from Miami to Gainesville. Later we learned that her ticket had been in Tapachula, Mexico at least one month before the course. However, because of the hyphenation in her family name (Guillen - Conde) it was stored in the computer under the wrong name. We didn't find this out until the course was almost over. We were finally able to arrange a prepaid return ticket for her. When we went to pick it up at the airport we learned that IAEA/Cosmos had canceled the ticket. We had to re-apply for her ticket and barely got it by the end of the course after three trips to the airport.

The participant from Cameroon was provided with a ticket via Paris with a change of airports in Paris. She did not notice this and when she attempted to board the plane for Paris she did not have a transit visa for France and was not allowed to board the flight. Her luggage did get on the Paris flight. She was finally re-routed via Zurich and arrived in Gainesville on time, but her luggage was lost for two weeks and it took daily phone calls and faxes to get it. There were other problems with travel arrangements; perhaps not so drastic.

In the future we recommend that the IAEA notify each participant well in advance of the course as follows: 1) which airline has the participants' prepaid ticket, 2) what name is it listed under, 3) route students with no change of airports in major cities where a transit visa is required, 4) check to be sure each participant is routed to Gainesville and not some other city, 5) encourage participants to make their own reservations before a prepaid ticket is made. 6) Instruct COSMOS that when Gainesville is the destination the best routing is via Atlanta (from Europe) or via Miami (from South and Central America)

3. ARRIVAL OF STUDENTS

All students arrived on time except for one participant who did not obtain her ticket on time. She arrived one day late. However, the policy of allowing students from Asia to arrive 2 days before the course starts and all others to arrive one day before the course starts is not realistic. Some of the participants, from regions other than Asia, had no choice but to arrive two days before the course started because many international flights are scheduled only 3 times a week. In addition, when students are housed two persons to a room, we have to pay the hotel for the room, whether there is one or two people in it. Furthermore, virtually none of the students arrived on the flight they were scheduled to arrive on. Most arrived several hours later or the next day. There seems to be little advantage for anyone with the present policy. We recommend that in future courses, the participants be given the choice to arrange their flights and arrive one or two days before the course starts.

4. SUPPORT FUNDING

The Course is conducted with funds from IAEA/FAO and the US Department of Energy. This year we were exceedingly fortunate that funding from both Agencies was available in Gainesville before the course started. This was an enormous advantage and allowed us to be able to pay the participants their living expenses and make all other necessary arrangements easily and promptly. We are deeply grateful to the IAEA and the US Department of Energy for their efforts in this very important matter. We recommend that in future courses, every effort continue to be made to have funding present in Gainesville well before the course begins.

5. DATES FOR THE COURSE.

The dates of 4 May to 15 June were good. This coincided with the end of the University's spring semester so that the course started during the spring break and before the start of the summer semester. The weather during this period was excellent although the temperatures were very warm in June. However, there were no complaints from the participants. However, I would not recommend holding the course any later than May - June.

6. GOALS OF THE COURSE

During the first day of the course, the participants were given a thorough briefing about the city of Gainesville, security measures in the hotel and recommended security measures outside the hotel. We also presented them with maps and other city information. The first day, the participants were also presented with a written document entitled "Goals of the course" and this was discussed in detail. This discussion lasted several hours and the students were thoroughly briefed concerning the content of the course, its objectives, the procedures that would be followed, etc. We recommend that this procedure be followed in future courses.

7. STUDENT PRESENTATIONS

During the second week of the course the students were given a handout which outlined the "presentations" they were expected to make at the end of the course. Groups of 2 - 3 students each were selected by the students for this exercise. These student presentations proved to be well prepared and demonstrated that the participants had absorbed and assimilated the material presented in the six week course. We recommend that this practice be continued.

8. OTHER PROBLEMS

We repeatedly reminded the students that they were responsible for their own personal property. However, one participant reported a lap-top computer stolen from one of the vans while she was in class. The van was locked, there was no sign of forced entry and other materials in the van were left undisturbed. Unfortunately the same participant left a notebook with all the notes on the course in the lobby during breakfast and it disappeared. Fortunately, on the last day of the course, her notes arrived by mail and the computer was found. No theft had occurred.

Another problem is that we had to constantly remind the participants that we expected them to be on time. Transporting 22 participants to classes, computer facilities, libraries, laboratories, etc. daily presents tremendous organizational problems unless everyone cooperates. We had to continually remind the same participants about being on time, but the situation improved greatly as the course progressed.

9. SOCIAL ACTIVITIES

The organized social activities during the course included: 1) a reception for the participants and local lecturers at the Holiday Inn-West during the first week of the course, 2) two picnics at the University of Florida Lake Warburg, where free swimming, boating, games etc were available to the participants. One picnic was catered by a local restaurant, and the second one was prepared by the students who demonstrated considerable ingenuity and skill in cooking a marvelous "international picnic". 3) a trip to Disney World, 4) a picnic provided by David and Mrs. Dame at their summer lake home, and 5) a closing dinner held at Mr. Han's restaurant the last week of the course. In addition, some of the students rented a car and were able to visit other parts of Florida during the long Memorial Day week-end. All the participants enjoyed these events. During a field trip to Ft. Pierce to observe the Insect-Free zone projects of the Florida Department of Agriculture the students had a chance to visit the J.F. Kennedy Space Center at Cape Canaveral. We recommend these types of activities be included in future courses.

10. LUNCH TIME ACTIVITIES AND LIBRARY VISITS

Two vans provided by the University were used to transport the participants daily from the hotel to the classrooms, computer facilities and laboratories. We found that some of the participants wanted to go back to the hotel for lunch while others preferred to go shopping or to have lunch at other locations. For this reason, we generally arranged for one van to routinely go to the hotel for the lunch break while the other van took the students to a shopping mall, the post office, etc, during the lunch break. At times, some of the students stayed at the University to visit with faculty members or friends or use the computer room.

Since a number of participants wanted to use the excellent library facilities at the University we organized a number of evening trips to the library. This was optional and all participants who wanted to use the library had the opportunity to do so. These practices should definitely be continued in future courses.

11. COMPUTER TRAINING AND EXPOSURE

The scheduled computer training was very well received. The instructors and staff at the University of Florida's Faculty Computer Support Facility did an excellent job in working with the participants. As recommended in earlier courses, extra time was scheduled for computer practice at the facility and in addition, the Department of Entomology and Nematology has an excellent computer room which was adjacent to our lecture room. This was available to the participants during the lunch break, evenings and week-ends.

Several of the lecturers included computer models in their lectures. All of them gave the programs to the students and had them practice these programs in the computer room. The students were able to take these models (Models of SIT, Inherited Sterility, Population Growth Trends etc.) home with them on diskettes for further use. It is strongly recommended that this be included in future courses.

12. ORIENTATION TOURS AND FIELD TRIPS.

During the course, tours of local research facilities were provided. This included the Department of Entomology and Nematology, the Division of Plant Industry, the Medical and Veterinary Research Laboratory and the Insect Attractant, Behavior and Basic Biology Research Laboratory. These tours were held early in the course so that the students would have a chance to become oriented concerning the wide range of research activities in these organizations. In addition they had the opportunity to meet many faculty and researchers and they were helped to arrange private visits with these scientists. Local scientists graciously gave of their time in order to help the students.

13. INFORMAL EVENING DISCUSSIONS

The Holiday Inn - West provided a private lounge room for the participants to use during evenings and week-ends. Whenever visiting lecturers came to present lectures for a few days we usually arranged for them to meet informally with the students in the lounge after dinner. These informal discussions provided the students an ideal opportunity to get to know these scientists and discuss their work and plans with them. These sessions were extremely popular with the students and we strongly recommend that this practice be continued in future

courses.

LIST OF APPENDICES

1. LIST OF INTERNATIONAL PARTICIPANTS
2. LIST OF VISITING AND LOCAL LECTURERS
3. COURSE SCHEDULE

APPENDIX 1.

LIST OF PARTICIPANTS

Mr. Cesar Campio Saez-- ARGENTINA

Mr. Jeffrey E. Jones - BARBADOS

Mr. Jose Tadeu de Faria--BRAZIL

Ms. Rose Ngeh Ndemah --CAMEROON

Mr. Daguang Lu -- CHINA

Mr. Frantisek Marec--THE CZECH REPUBLIC

Mr. Luis Andrade -- GUATEMALA

MR. Byron Papadopoulos -- GREECE

Ms. Sandra Wattimena -- INDONESIA

Mr. Soualika Boire -- MALI

Ms. Harriet Thindwa -- MALAWI

Mr. Chandramohun Dunhawoor -- MAURITIUS

Ms. Virna Larissa Guillen - Conde --MEXICO

Ms. Virginia Ocampo -- PHILIPPINES

Ms. Julia Roberts -- SIERRA LEONE

Ms. Hayat Makee -- SYRIAN ARAB REPUBLIC

Ms. Alies Elizabeth van Sauers-Muller -- SURINAME

Mr. Satit Vongcheeree -- THAILAND

APPENDIX 2.

VISITING AND LOCAL LECTURERS

INTERNATIONAL

Jorge Hendrichs, IAEA, Vienna, Austria

Gerald Franz, IAEA, Vienna, Austria

Udo Feldman, IAEA, Vienna Austria

Walter Enkerlin, Mexico

O. Iwahashi, Japan

Aldo Malavasi, Brazil

Pedro Rendon, Guatemala

Kenneth Bloem, Osoyoos, B.C., Canada

NATIONAL

University of Florida

John Capinera

James Nation

Harvey Cromroy (retired)

Department of Plant Industry

Richard Gaskalla

Danny Phelps

Wayne Dixon

Nancy Cole

Ed Burns

Burrell Smittle

Tim Shubert

Callie Jenkins

N C State University

Gerald Carlson

APPENDIX 2 (con't)

U.S. Department of Agriculture, ARS

Fred Adams	
James Carpenter	Carrol Calkins
Andrew Cockburn	Dana Focks
David Dame (retired)	Danel Haile
Al Handler	Pat Greany
Steven Miller	Everett Mitchell
Sharon Mitchell	Leo LaChance (retired)
J.W. Smith	Jack Seawright
James Tumlinson	Don Weidhaas (retired)

U.S. Department of Agriculture, APHIS

H.C. Hoffman	Victor Mastro
Charles Schwalbe	Robert Staten
Fred Stewart	Gordon Tween
John Worley	

**FAO/IAEA/UNIV OF FLORIDA INTERNATIONAL TRAINING COURSE
SCHEDULE - WEEK OF MAY 3-6**

	Monday May 2	Tuesday May 3	Wenesday May 4	Thursday May 5	Friday May 6
0830 - 1200		STUDENTS ARRIVE	Course Opening Ceremony Orientation of Students	Introdduction to DOS Computer Facility 2215 Turlington	Introduction to DOS Computer Facility 2215 Turlington
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700		STUDENTS ARRIVE	Student Goals IAEA Progs. & Support Local Arrangements Banking Security OPENING RECEPTION	Tour Dept. of Entomology & Nematology Facilities Individual Student Introductions	Individual Student Introductions

WEEK OF MAY 9 - 13

	MONDAY MAY 9	TUESDAY MAY 10	WEDNESDAY MAY 11	THURSDAY MAY 12	FRIDAY MAY 13
0830 - 1200	Dr. Jim Nation Radiation Effects on Insects	DPI Caribfly Program Mass Rearing Caribfly & Parasites	9:00 am Dr. Everett Mitchell 10:45 am Dr. Jim Tumlinson	Visit to Ft. Pierce Caribfly Field Program Drive Down	Ft. Pierce Field Program
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	Word Perfect Computer Facility	DPI Caribfly Program	Word perfect Computer Facility	Visit Ft. Pierce-- Caribfly Field Work Overnight Ft. Pierce	Return Gainesville via Cape Canaveral

WEEK OF MAY 16-20

	MONDAY MAY 16	TUESDAY MAY 17	WEDNESDAY MAY 18	THURSDAY MAY 19	FRIDAY MAY 20
0830 - 1200	H. Cromroy Basic Radiobiology Weidhaas Theory, Sterile Insect Technique	TOUR Medical and Veterinary Entomology Research Laboratory	H. Cromroy Effects of Radiation on Cells U. Feldman Tsetse SIT Field Programs	U. Feldman SIT on Tsetse L. LaChance Mechanisms of F1 Sterility	D. Weidhaas Insect Life History Analysis L. LaChance Hybrid Sterility
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	TOUR Insect Attractants Behavior & Basic Biology Laboratory	LOTUS 1-2-3 Computer Facility Architecture 131B	Dr. Jack Seawright & staff Genetics Studies with Mosquito Populations	LOTUS 1-2-3 Computer Facility Architecture 131B	D. Weidhaas Population Modelling

WEEK OF MAY 23 - 27

	MONDAY MAY 23	TUESDAY MAY 24	WEDNESDAY MAY 25	THURSDAY MAY 26	FRIDAY MAY 27
0830 - 1200	Dr. Carpenter F-1 Sterility in Lepidopteran Species Dr. C. Hoffman History of Screwworm Eradication	Dr. Carpenter Field Studies with F-1 Sterility Dr. C. Hoffman Screwworm Eradication in Mexico	Dr. Carpenter Population Modeling with F-1 Sterility Dr. P. Greany Gibberellic Acid in Fruit Fly Control	Dr. Carlson Economics of Area Wide Pest Management J. Seawright Genetic Studies in Mosquito Populations	Dr. Carlson Economics of Area Wide Pest Management - Dr. Al Handler Molecular Genetic Approaches to Genetic Sexing
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	Room 2216 Dr. Carpenter Laboratory Exercise on Sperm Transfer and Sperm Types in Lepidoptera	Dr. Carpenter Laboratory Exercise on Chromosome Aberrations in Progeny of Irradiated Lepidoptera	Dr. E. Mitchell Tour of Lepidopteran Rearing Facility	J. Seawright Genetic Studies of Mosquito Populations LAB Group A (T) LAB Group B (F)	J. Seawright Mosquito Population Genetics LAB Group B (T) LAB Group A (F)

WEEK OF MAY 30 - JUNE 3

	MONDAY MAY 30	TUESDAY MAY 31	WEDNESDAY JUNE 1	THURSDAY JUNE 2	FRIDAY JUNE 3
0830 - 1200	MEMORIAL DAY HOLIDAY	Dr. R. Staton Pink Bollworm Program Dr. Malavasi Pest Free Zones in Brazil	Dr. R. Staton Pink Bollworm Program Dr.G. Tween Fruit Fly SIT Programs in Central America	Dr. Iwahashi Oriental Fruit Fly Program in Japan Dr. G. Tween Management of Fruit Fly SIT Programs	G. Franz Medfly Genetic Sexing Dr. Iwahashi SIT Programs in Japan
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	MEMORIAL DAY HOLIDAY	1:45 pm Dr. C. Calkins Fruit Fly Quality Control W. Enkerlin Medfly Eradication in Mexico.	Dr. C. Calkins Fruit Fly SIT Programs W. Enkerlin Future Fruit Fly Control in Mexico	1:45 pm Dr. P. Rendon Rearing of Genetic Sexing Strains Dr. John Worley Mexican Fruit Fly Control	Dr. P. Rendon Medfly Program in Guatemala Dr. John Worley Mexican Fruit Fly Program

WEEK OF JUNE 6 - 10

	MONDAY JUNE 6	TUESDAY JUNE 7	WEDNESDAY JUNE 8	THURSDAY JUNE 9	FRIDAY JUNE 10
0830 - 1200	Dr. V. Mastro F-1 Sterility in Gypsy Moths	Dr. V. Mastro Gypsy Moth Programs in the U.S.	Dr. S. Miller Molecular Genetic Studies with Heliothis Dr. D.Dame. SIT Trials with Mosquitoes	Dr. K. Bloem Codling Moth Program in Canada Dr. J.W. Smith Boll Weevil Program in the US	Dr. K. Bloem Codling Moth Program in Canada
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	Dr. V. Mastro Gypsy Moth Mass rearing Discussion Period	Computer Practice Architecture Computer Center	Dr.Dan Haile & Dr. Dana Fockx Modelling of Insect Populations	Computer Practice Architecture Computer Center	C. Schwalbe Overview of APHIS Insect Eradication/ Control Programs

WEEK OF JUNE 13 - 17

	MONDAY JUNE 13	TUESDAY JUNE 14	WEDNESDAY JUNE 15	THURSDAY JUNE 16	FRIDAY JUNE 17
0830 - 1200	J. Hendrichs Student Interviews	J. Hendrichs Student Interviews STUDENT PRESENTATIONS	J. Hendrichs Student Interviews	 STUDENTS DEPART	
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1330 - 1700	STUDENT PRESENTATIONS	1:45 pm STUDENT PRESENTATIONS CLOSING RECEPTION	 FACULTY VISITS	STUDENTS DEPART	