

# INSECT PEST CONTROL

Joint FAO/IAEA Division  
of Nuclear Techniques  
in Food and Agriculture and  
FAO/IAEA Agriculture and  
Biotechnology Laboratory, Seibersdorf

International Atomic Energy Agency  
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## A. TO THE READER

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In the past years it has often been pointed out that the name of the Insect and Pest Control Subprogramme of the Joint FAO/IAEA Division, and the name of this newsletter (Insect and Pest Control Newsletter) create confusion and expectations for control of rats, birds, weeds and other non-insect pests but which are not within our mandate. All work within the Subprogramme has been on insect pests, and in 1999 an external review recommended a change to “Insect Pest Control Subprogramme” since this is simpler, reduces confusion and retains the good recognition and high reputation that already exists. The IAEA management implemented this recommendation and consequently, as of this issue this newsletter is entitled “Insect Pest Control Newsletter”.

International events during the last half-year have considerably affected a number of activities of the Insect Pest Control sub-programme. Overall, the transboundary shipments of sterile insects, which already had become more difficult since September 1, 2001, has been complicated further with airlines less willing to accepting live materials, reducing their flights and routes, and increasing their shipping fees. The war in Iraq also resulted in less travel authorizations and visas and thus the postponement or cancellation of a number of organized meetings and expert missions. Most affected, of course, were projects and activities in the Near East region, although the subsequent SARS outbreak in East Asia also affected events planned in this region, including an SIT symposium organized in conjunction with the International Plant Protection Congress in Beijing, China.

Another unfortunate issue was a sterilization accident at the screwworm mass production plant of the Mexico-USA Screwworm Commission in Tuxtla Gutierrez, Chiapas, which resulted in the release of fertile flies in the surroundings of the Tuxtla facility, as well as the transboundary shipment and aerial release of fertile flies throughout the sterile fly barrier in eastern Panama, and at some locations in Jamaica, where an eradication programme has been operating since 1998.

Most SIT mass rearing facilities have standard operation procedures in place, including radiation indicator labels, that allow verification of the sterilization process and radiation dose applied to the insects, both at origin and at destination, making such accidents virtually impossible. To put this accident in perspective, over the last 50 years the total number of sterile insects shipped has been estimated in excess of 962 billion in more than 12,000 shipments from 50 laboratories and sterile insect rearing facilities in 25 countries to 22 recipient countries. During this long period, no such accidents have been identified.

This incident had of course no effect on other programmes using the SIT against other insect pests despite the scare mongering attempts of some sections of the press. Following emergency actions, the screwworm outbreaks in Chiapas and Panama have effectively been dealt with and Chiapas is once more recognized as screwworm-free. For the Jamaica eradication project this incident was unfortunately the third major disruption, which all have had very significant negative impacts on the eradication efforts. The two previous disruptions occurred after strikes of workers at the Tuxtla facility in 2000 and 2001, and which interrupted

the supply of sterile flies to Jamaica for up to six weeks, thus representing the loss of most progress so far achieved on the island in terms of suppressing screwworm populations.

There was a very constructive consultant's meeting recently held in Vienna on the development of genetic sexing strains for the codling moth, for which the demand for SIT application is significantly increasing. Based on the discussions during this meeting a real opportunity seems now to exist to move the field of Lepidoptera genetic sexing forward. The possibility of using an allele of a dominant lethal mutation, such as the temperature sensitive *Notch*, in the development of a genetic sexing system for codling moth is very exciting. As emerged during the meeting, if an appropriate allele of this mutation can be inserted onto the female determining chromosome of codling moth, through transformation, then it may be possible to kill female embryos with a cold temperature treatment. Another approach could be to translocate an autosomal insertion of the gene onto the female determining chromosome. If the insert of the dominant lethal mutation also included a gene expressing a fluorescent protein then the strain would also have a visible marker for the sexing procedure. This latter is very important for any use of a sexing strain in mass rearing.

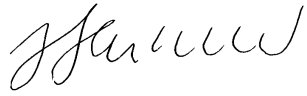
There appear to be few technical constraints to demonstrating "proof of principle" for this sexing system, which could be a model for other moth pest insects. Germ-line transformation is quite efficient in the codling moth and the appropriate *Notch* allele has already been shown by Lisa Neven at ARS/USDA in Wapato, Washington State to express correctly in transformed codling moth lines. If such a sexing system could be developed in codling moth then it would have several advantages, a) only the females would be transgenic, the sterile males to be released as part of SIT operations would carry a completely normal genome, b) as the *Notch* gene is dominant, any recombinant individuals would also be killed by the temperature treatment and not be accidentally released, c) the fluorescent marker would be very tightly linked to *Notch*, resulting in strain stability, d) stockpiles of diapausing mass reared males would require only half the storage space, and e) the system should probably be easily transferable to other economically important lepidopteran pests.

I would also like to report developments related to medfly control in Europe. Currently, medfly control requires intensive insecticide applications during the whole fruit maturation period. This is also the case of southern Spain, where the largest citrus production areas in Europe are located. Nevertheless, as a result of the detection of medfly-infested cargo at US ports of entry over a year ago, the US phytosanitary authorities banned temporarily the large citrus exports from Valencia, Spain. As the US has expensive programmes in operation to remain medfly-free, including various preventive SIT programmes, it cannot tolerate the import of infested fruit.

In view of these developments, and in order to reduce insecticide use to protect the environment, the authorities of the Autonomous Province of Valencia decided in 2002 to gradually shift their medfly control strategy from conventional large scale aerial insecticide spraying to an integrated pest control approach including the SIT. In March 2002, FAO/IAEA-trained staff initiated aerial releases of sterile medflies over two pilot areas to assess the feasibility of the technology under the specific conditions of Valencia.

The Autonomous Government of Valencia is currently purchasing sterile medfly pupae from the mass rearing and sterilization facility located in Mendoza, Argentina, from where weekly shipments are sent to Valencia. Approximately US \$500,000 have been invested in a

sterile fly emergence facility where sterile male flies are emerged and prepared for aerial release. The construction of a mass rearing facility in Spain is under consideration in view of the potential expansion of the approach to major citrus production areas.

A handwritten signature in cursive script, appearing to read 'J. Hendrichs', written in black ink.

J. Hendrichs



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The Subprogramme staff, consisting of those in the Joint FAO/IAEA Division located in the Vienna International Centre, those in the FAO/IAEA Agricultural and Biotechnology Laboratory in Seibersdorf Laboratory and field experts, are listed below.

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## C. FORTHCOMING EVENTS (2003)

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### I. Research Co-ordination Meetings (RCM's)

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*New CRP* on “Improved and harmonized quality control for expanded tsetse production, sterilization and field application” (in conjunction with IOBC meeting on QA of Mass Reared Arthropods), 15-19 September 2003, Montpellier, France. 1<sup>st</sup> RCM.

“Genetic sexing and population genetics of screwworms” 22-26 September 2003, Kluang, Malaysia. 2<sup>nd</sup> RCM.

*New CRP* on “The use of molecular tools to improve the effectiveness of SIT” 6-10 October 2003, Vienna, Austria. 1<sup>st</sup> RCM.

“Use of nuclear techniques for the colonization and production of natural enemies”, 3-7 November 2003, Vienna, Austria. 3<sup>rd</sup> RCM.

“Development of improved attractants and their integration into fruit fly SIT management programmes” (in conjunction with Western Hemisphere Meeting on Fruit Flies of Economic Importance). April/May 2004, Miami, Florida, USA. 3<sup>rd</sup> RCM.

“Improvement of codling moth SIT to facilitate expansion of field application” 9-13 February 2004, Stellenbosch, South Africa. 2<sup>nd</sup> RCM.

### II. Consultants and Other Planning Meetings

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Consultants meeting on “Development of guidelines for verification of tsetse fly free areas” 25-29 August 2003, Vienna, Austria.

Consultants meeting on “Improving sterile male performance in fruit fly SIT programmes” 20-24 October 2003, Vienna, Austria.

### III. Other Meetings/Events

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Workshop on “Moving from criteria for selection of priority areas to formulation of tsetse and trypanosomiasis field programme proposals: Ethiopia Southern Rift Valley-Case Study” in Rome, Italy 2-4 July 2003.

Regional workshop on “Tephritid Fruit Fly Identification”, 4-8 August 2003, Vienna/Seibersdorf, Austria.

Tenth workshop of the IOBC global working group on arthropod mass rearing

and quality control Montpellier, France, 21-24 September 2003.

Fourth Semi-annual meeting of the USAID-MERC Management Committee for the SIT projects in the Near East, 22-23 September 2003, Vienna, Austria.

Twenty seventh International Scientific Council for Trypanosomiasis Research and Control (ISCTRC) in Pretoria, South Africa from 29 September - 3 October 2003.

Tenth International Citrus Congress will be held on 15-20 February 2004 in Agadir, Morocco, under the auspices of the International Society of Citriculture.

Regional Workshop on “Using the Male Annihilation Technique to Control Tephritid Fruit Flies”, Reduit, Mauritius, November 17-21, 2003

**FAO/IAEA Interregional Training Course on “The Use of the Sterile Insect and Related Techniques for the Integrated Areawide Management of Insect Pests” University of Florida, Gainesville, Florida, USA, 4 May to 8 June 2004. SEE ANNOUNCEMENT ON PAGE 41.**





## D. PAST EVENTS (from July 2002 to June 2003)

### I. Research Co-ordination Meetings (RCM'S)

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“Application of genetics to improve the SIT for tsetse” 23-27 June 2003, Edmonton, Alberta, Canada. 4<sup>th</sup> and final RCM.

“Quality assurance of mass produced and released fruit flies” 19-23 May 2003, Perth, Australia. 3<sup>rd</sup> RCM.

“Improvement of codling moth SIT to facilitate expansion of field application” 19-13 August 2002, Kelowna, British Columbia, Canada. 1<sup>st</sup> RCM.

“Enhancement of the SIT through genetic transformation of arthropods using nuclear techniques” 8-12 July 2002, Capri, Italy. 4<sup>th</sup> and Final RCM.

### II. Consultants and Other Planning Meetings

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GIS and data collection strategy planning workshop for *A. arabiensis* in Northern Sudan, Vienna, Austria 18-20 June 2003.

Meeting of representatives of Israel, Jordan and the Palestinian Territories to define and to draft regional project proposals for the control of Tephritid fruit flies in the Near East, using the Sterile Insect Technique, 26-29 May 2003, Vienna, Austria.

Fourth meeting of the National Coordinators of medfly SIT projects in the Near East, 20-23 May 2003, Vienna, Austria.

Meeting on technical and management issues of the TC tsetse project MLI/5/017 “Integrated Control of Animal Trypanosomosis Through the Creation of a Tsetse Fly Free Zone” with participation from Mali, Burkina Faso, PATTEC and FAO/IAEA, 12-16 May 2003, Vienna, Austria

Consultants meeting on “Codling moth genetic sexing” 5-9 May 2003, Vienna, Austria.

Third coordination meeting on the Central America Fruit Fly Regional Project RLA5045, Guatemala City, 29-30 April 2003.

Third semi-annual meeting of the USAID-MERC Management Committee for the SIT projects in the Near East, 3-4 February 2003, Vienna, Austria.

Consultant meeting on “Identification of improved rearing techniques for *Anastrepha* and *Bactrocera* species” 23-27 September 2002, Vienna, Austria.

Second semi-annual meeting of the USAID-MERC Management Committee for the SIT projects in the Near East, 15-16 July 2002, Vienna, Austria.

Consultants meeting on “Mitigating the threat of *Cactoblastis cactorum* to international agriculture and ecological systems and biodiversity” 14-18 July 2002, Vienna, Austria.

Consultant meeting to “Identify and establish molecular technologies to improve the effectiveness of SIT” 8-12 July, 2002, Capri, Italy.

### III. Other Meetings/Events

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Postgraduate Course On Codling Moth SIT in Neuquen, Argentina. Organized by The University of Comahue from 10 to 14 March 2003.

International Fruit Fly Workshop in Buenos Aires Argentina, from 24 to 26 March 2003.

Fruit Fly Regional Workshop in Hanoi, Vietnam, 12-14 March 2003, organized by Griffith University, Queensland, Australia.

Technical and steering meeting on the screwworm project in Jamaica. Kingston, Jamaica, 4-5 December, 2002.

Seventh meeting of the PAAT Programme Committee, WHO, 25-26 November 2002, Geneva, Switzerland.

Entomological Society of America (ESA) Annual Meeting. 17-20 November, 2002, Fort Lauderdale, Florida, USA.

Conference on "*Cactoblastis cactorum* in North America: Issues and Action" as part of the Entomological Society of America (ESA) Symposium. 18 November, 2002, Florida, USA.

Planning meeting on "Eradication and Control Programs for Pests and Diseases of

Animals and Plants". November 15, 2002 Washington, D.C., USA.

Regional East Africa Training Course on Establishing National GIS Capacity for Ongoing and Planned Tsetse/Trypanosomosis Intervention Campaigns, Oct/Nov 2002, Addis Ababa, Ethiopia.

Presentation on Tephritid fruit flies of economic significance for citrus production at the CIRAD-CLAM Professional Meeting on "The Quality of Fresh and Processed Citrus Fruits: New Responses to the Expectations of Professionals". 10-11 October 2002, Montpellier, France.

Regional Latin America Training Course on "Fruit Fly Management with Emphasis in the Sterile Insect Technique (SIT)", Retalhuleu, Guatemala, 22 September to 9 October 2002.

Regional West Asia Workshop on Tephritid Fruit Flies Trapping and Fruit Sampling, 2-6 September 2002, Chios, Greece.

Interregional Training Course on the "Use of the Sterile Insect and Related Techniques for the Integrated Areawide Management of Insect Pests", Okanagan University College, 6-29 August 2002, Kelowna, British Columbia, Canada.



## **E. TECHNICAL CO-OPERATION PROJECTS** **(Highlights of some of the TCP's)**

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### **Area-wide Fruit Fly Suppression in Thailand Using the Sterile Insect Technique (THA5046): A Report on Current Project Status**

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Fruit flies are the main constraint to improve production and trade of fruits and vegetables in Thailand. Therefore, since 1987, the Department of Agricultural Extension (DOAE) in cooperation with the Office of Atomic Energy for Peace (OAEP) set up a pilot project initially for control of the Oriental fruit fly (OFF), *Bactrocera dorsalis* (Hendel) and recently also for control of the Guava fruit fly (GFF) (*B. correcta*), by integrating the SIT with other monitoring and control methods in the mango production areas of the Paktor District in the Ratchaburi Province. The project includes the mass rearing and sterilization of both species, with a current production of 20 million OFF and 10 million GFF, at the facility of the Irradiation for Agricultural Development Institute (IAD), DOAE, located in the Pathumthani Province and field releases of sterile flies complemented by other population suppression methods such as bait sprays and the Male Annihilation Technique (MAT) and a trapping network of methyl eugenol baited traps. The IAEA has provided technical assistance since 1991 through a Technical Cooperation Project. The assistance has resulted in improved rearing and field operation activities and in effective fruit fly control in the selected pilot areas.

Given the successful control of OFF in Paktor, and in an effort to promote the use of SIT among mango growers in other locations of Thailand, the DOAE launched in September 2002 a second SIT campaign in a pilot area in the Province of Phichit

located 450 km northwest of Bangkok. Historically twenty to thirty percent of the mango crop is lost every year in this area due to OFF and GFF damage. The mango growers in this Province are well organized and are working in close collaboration with the DOAE for the implementation of the SIT pilot project in an area of 35 km<sup>2</sup>. The DOAE has for the past year been providing support through the Agriculture Office in the Province, transferring the technology by means of training courses, expert missions and visits to the SIT pilot project in Paktor located 150 km south of Bangkok.

Although the size of the selected area in Phichit seems too small to get the full benefit of the approach, the technology has shown to work in a even smaller mango production area in Paktor where damage has been reduced from more than 50% before SIT use, to an average of less than 5% in the past five years. As a result of the application of a SIT based IPM, Paktor farmers are exporting 60% of their crop to countries which discriminate against pesticide residues and fruit quality in general but not against fruit fly presence per se. The farmers in Phichit are eager to also benefit from SIT as the ones in Paktor who have at least doubled their gross revenues as a result of mango exports.

The DOAE Provincial office in Phichit has created a specific organizational structure for field operations with full time staff dedicated to project activities. All staff has been trained in area-wide SIT as mentioned

above. The field plan consists basically of three MAT cycles for population suppression followed by weekly sterile fly releases. The third MAT cycle was finalized at the end of January after which sterile fly releases of both species have been routinely released. Sterile flies are being shipped in a thermoking truck from the factory near Bangkok to the holding and emergence unit in Phichit. This project is a joint venture between the government and mango producers with the government supplying the sterile flies and the farmers conducting field operation activities including the MAT campaign and the release of sterile flies in the orchards and buffer areas under the supervision of the Agriculture Office of the Province. An information system for monitoring of field activities has been set which includes feedback of information from the Provincial Office to the DOAE Project Manager which is located in Bangkok. The GPS/GIS information system was set with the support of an IAEA Expert Mission. At present most trap sites in both pilot SIT areas have been geo-referenced and information management and flow has initiated.

In Phichit the first mango season under this IPM approach finalized in May with the last harvest. Results are encouraging in that infestation levels were reduced from an average of 30% to 19%. This first year results have convinced the mango producer to continue using SIT under an integrated approach and the DOAE authorities to continue support of this pilot project.

The strong points of this pilot project are: 1) the pilot project in Pakhor has convinced the mango farmers of Phichit that the technology works (farmer to farmer communication), 2) the mango growers have a strong leader with vision who has understood the area-wide concept and the need to control fruit fly populations outside

the orchards and during the off season as a preventive measure and 3) the DOAE staff in the Province are highly motivated and have in the past two years acquired an acceptable level of knowledge on areawide SIT application.

One possible weak point would be the inability to keep production and quality of sterile flies at the required levels. So far the facility has not produced more than 30 million pupae per week. With a second release area (Phichit) and a second species involved (*B. correcta*), production levels will have to be increased to 40 million per week. *B. correcta* has in the past only been reared at small scale and released in a research area but has never been released in the field for SIT control. Currently the factory is in the process of building up the *B. correcta* colony to the levels needed for a production of 15-20 million pupae per week. The effective irradiation dose for *B. correcta* has been set at 80 Gy compared to 90 Gy for *B. dorsalis*.

Effective suppression of OFF and GFF in Thailand integrating SIT with other methods at a pilot level is a step in the right direction. Current environmental policy and market forces call for environment-friendly pest control methods such as SIT.

Furthermore, the projects in Pakhor and Phichit were recently recognized with a national award as one of the outstanding projects in more than a century of existence of the Ministry of Agriculture and Cooperative (MOAC).

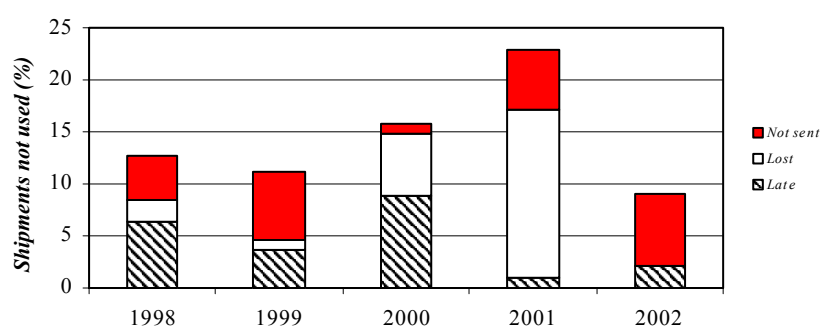
In the coming years, the Agency, through the Nuclear Application Department, Joint FAO/IAEA Division and the Technical Cooperation Department will continue supporting the expansion of SIT technology for fruit fly control in Thailand.

## **An Update of the Area-Wide Control of the Mediterranean Fruit Fly Using the SIT in Israel, Jordan and The Palestinian Territories Under Projects ISR/5/010, JOR/5/009 and PAL/5/002: Towards the Establishment of a Medfly Rearing Facility in the Near East**

Shipping of sterile medfly pupae from the El Pino USDA-Moscamed mass rearing facility in Guatemala, has made possible the use of SIT in the Middle East. However, long distance shipping (and duration) have been a limiting factor for the SIT control projects in the region and for future expansion of areas under SIT.

The problem became more acute immediately after September 11<sup>th</sup>. The

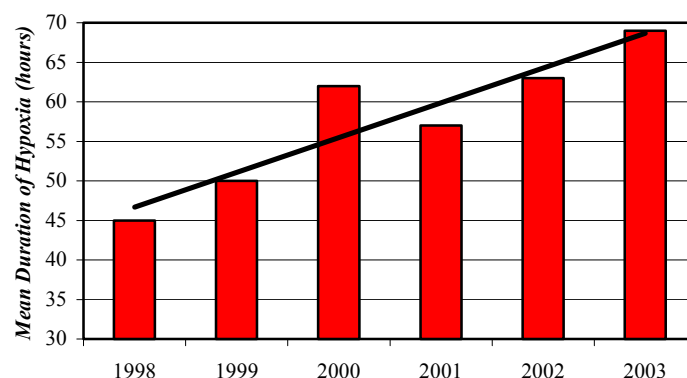
restrictions placed on some flights for security reasons as well as the overall decrease in air-traffic have even more severely affected the delivery of sterile medfly pupae to the projects. As shown in Figure 1 below, up to 22 per cent of all the bi-weekly shipments sent to Israel from Guatemala in 2001 could not be used due to cancellation of the flight, package loss or late arrival specially after September 11.



**Fig. 1.** Evolution of the proportion of shipments of sterile male pupae from Guatemala that could not be utilized due to cancellation (mostly by airlines), loss or late arrival of shipment (plain bar, empty bar and dashed bar respectively) (after Y. Rossler, ICI CMB).

One of the major limiting factors for long-distance shipment is the time spent by the sterile male pupae under hypoxia. Following increasing restrictions by air-companies for transportation of live material along the years and re-routing of

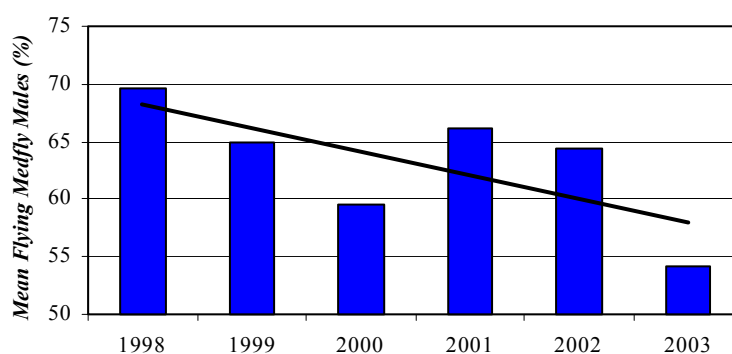
the shipments, the average time under hypoxia has drastically increased from  $\pm 45$  hours at the beginning of the project in 1998 up to 63 hours in 2002 (69 hours in February 2003) (see Fig. 2).



**Fig. 2.** Evolution of mean duration of hypoxia in shipments of sterile male pupae from USDA-Moscamed facility in Guatemala, to the Sapir Center in Israel, since the initiation of the project in 1998 (*after Y. Rossler, ICI CMB*).

The immediate effect of exceeding transportation time under hypoxia is a decrease in the emergence and the flight ability of the male adult flies. Since 1998, the mean flight ability of adult males decreased from 69.6 to 64.4 percent in

2002, and to 54.1 percent for the first two months of 2003 (see Fig. 3), meaning that only half of the pupae received (and paid for) result in medfly male adults useful for aerial release, thus greatly affecting the efficiency of medfly control operations.



**Fig. 3.** Evolution of mean percentage of flying males emerged from pupae shipped from USDA-MOSCAMED facility in Guatemala, to the Sapir Center in Israel, since the initiation of the project in 1998 (*after Y. Rossler, ICI CMB*).

The increasing difficulties to receive regular shipments of sterile male pupae of acceptable quality, as well as the present lack of alternative source of sterile pupae that would permit extension of SIT activities to other areas in the region, led the project management in Israel and in Jordan to consider the feasibility of the establishment of a medfly rearing facility in the Near East that would serve the needs of medfly control operations in the future.

Various possibilities have been considered regarding the type, capacity and location of the rearing facility: 1) a “larval” rearing facility based upon shipment of thermally-treated eggs from another rearing facility, 2) a standard “full-scale” rearing facility, 3) a production capacity from 150 million to 500 million male pupae per week, 4) a location on the Israeli-Jordanian border south of the Dead Sea or north of the West Bank, 5) a mode of operations (mixed

Israeli-Jordanian manpower and co-management) and 6) funding (private or public-private partnership). Based upon preliminary review and advice of experts, the authorities in the region have approached or have been approached by some potential investors. Though no final

decision has yet been taken, trilateral meetings have been held in the region with the private sector and authorities from Israel and Jordan and there is good hope that a rearing facility will be established in the region in the near future.

### **Establishment of a Medfly Mass-Rearing Facility and Introduction of a Pilot Sterile Insect Technique Control Programme (TCP TUN5020): Initiation of Rearing Activities**

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A small medfly rearing facility was constructed by the Tunisian authorities on the campus of the Centre National des Sciences et Technologies Nucléaires

(CNSTN) in Sidi Thabet (see Figure 1). The equipment was largely produced and assembled locally with high quality materials (see Figure 2).



**Fig. 1.** Overview of the medfly rearing facility in Sidi Thabet (ground floor only) (photo IAEA). The objective of this facility is to train staff to develop the local technical capacity.

One of the primary objectives of this facility is to train staff to develop the local technical capacity for possible future larger scale medfly SIT interventions in Tunisia. This facility will only be capable of producing up to 12 million medfly males to be used to control medfly in a pilot citrus production area of the Cape Bon region of Tunisia. By the end of February 2003, the latest medfly genetic sexing strain, Vienna-8, carrying both white pupae (*wp*) and temperature sensitive lethal (*ts/l*) mutations has been transferred to the rearing facility from the FAO/IAEA Laboratories at Seibersdorf. The transfer has been made through two air shipments of about 6

million pupae. In spite of initial fine-tuning required in the facility, the rearing team in Tunisia has already been maintaining the colony at about half a million flies per week.

In the meantime, the monitoring of medfly wild population undertaken by the Ministry of Agriculture has demonstrated that, as expected, the medfly was present all year round in the region, with low-level populations remaining in winter in backyards of cities such as Hammamet. It is foreseen that the first sterile males could be released by early February 2004 in the citrus pilot areas surrounding Hammamet.





**Fig. 2.** Cages designed and assembled in Tunisia to be later used for the filter rearing (*photo IAEA*).

**Establishing options to export fruits and vegetables through the creation of fruit fly pilot low prevalence and free zones using an integrated pest management approach, including the sterile insect technique (SIT), in Central America and Panama. Project RLA/5/045.**

This report presents a summary of the major achievements obtained as a result of the first project phase which covers years 2001 and 2002.

**1. Government new position in relation to the fruit fly problem**

The approval of the Project as a response of IAEA to a request from Member States of the Central American Region (Costa Rica, El Salvador, Guatemala, Nicaragua and Panama) and the direct support offered by USDA/APHIS-Guatemala to the Project, has encouraged Member States to strengthen actions against fruit flies.

This new position has allowed that the Project activities be implemented with greater efficiency, improving the possibilities to have a positive and measurable impact. Changes have been of two types:

- The ministries of agriculture (MAG) have consolidated the activities against the pest

that were dispersed and hence not effective enough, creating special programs dedicated exclusively to fruit fly control. The programs are now part of the national plant protection organizations (NPPO) functional structure.

- The countries efforts have surpassed the conformation of programs. They consolidated project funds and delivered additional financial resources. The amount of resources provided by the governments during this time period (2001-2002) was of US \$850 thousand, equivalent to 1.5 times the amount contributed by IAEA and FAO.
- Costa Rica incorporated into the national programme the Mediterranean fruit fly (medfly) and parasitoid mass rearing facility that belonged to another national project. Modifications of the facility, financed by the government of Costa Rica, are underway to also produce the West Indies fruit fly, *Anastrepha obliqua*.



## **2. Scientific visits for high level government officials**

### Impact on present-day activities

Scientific visits of MAG's officers to fruit fly low prevalence and free areas in Mexico and United States provided them with the essential elements to undertake initiatives aimed at recognizing in their own country pest free areas. Thus, in 2002 they started the preliminary process for declaration of medfly free areas:

- Costa Rica is preparing technical files to declare the absence of medfly at Los Inocentes zone (Guanacaste Province).
- Panama is preparing technical files to do the same thing at Azuero Peninsula.
- Guatemala has already prepared the files for the peach production zone in Quetzaltenango's valley certified as medfly free. In addition, negotiations are under way with Mexico to export this product through a systems approach.
- Nicaragua officially declared the Ometepe island (Rivas Department) as medfly free.

## **3. Training**

Over 20 technicians and officials from MAG have been trained in the Mexican, Guatemala, United States of America and Argentina programmes that integrate the sterile insect technique. This hands-on training provided them with the needed field practice to apply the technology in their country.

As a result, it is possible now to effectively execute the survey activities required to obtain the type and quality data needed to certify zones as low prevalence or free of fruit flies. These data feed the technical files that support official statements on the

pest status. This is shown by the following examples:

- Nicaragua certified the absence of medfly at Ometepe Island. Although the more relevant achievement has been the capability to develop a medfly early detection system (that detected some medfly females) and to launch a contingency plan to eliminate these medfly outbreaks.
- Costa Rica certified the absence of medfly at Los Inocentes' pilot zone. However, once it was able to detect two medfly females, an immediate response trapping was increased and control measures executed in such a way that there were no further detections.

These two cases of rapid enforcement of contingency plans would have not been possible in the past. In addition, this reflects that the NPPO have a better understanding of what a medfly free zone represents and how it should be managed.

- In Panama, trained technicians have certified through extensive trapping the absence of medfly from the east part of the Azuero Peninsula.

In addition two regional courses on fruit fly management with emphasis on SIT were held in the past two years. Apart from the IAEA's fellowships given to MAG staff from the participating countries, other professionals from the Region attended the events through fellowships provided by FAO, IICA, OIRSA and the industry. Forty professionals from Central America have been trained. This has very much contributed to the development of a critical mass of human resources so necessary in the region to run these large-scale projects.

#### **4. Studies on technical and economic feasibility and institutional sustainability**

The studies were carried out through outsourcing with USDA/APHIS-Guatemala. The following two studies have supplied information that never before had been available in the Region:

##### Study on technical and economical feasibility

A number of feasibility studies have been carried out in the region in the past years. However, these studies have a general outlook, thus are not sufficient for decision-making and implementation of pest management projects at specific zones. Additional studies, specific for the pilot zones will provide well-founded and reliable information; consequently, based on them, MAGs will be in a position to take adequate decisions on the type of control that they must implement in the pilot zones.

##### Study on institutional sustainability

The model developed to measure the capability level that NPPO have to sustain by themselves large scale pest control projects, without active support from international organisations, will become a basic tool to assess the viability of those projects that could in the future be implemented in the Region.

The most relevant feature of the study is that it allows to make a precise diagnosis of the NPPO weaknesses and determine their main strengths. For FAO and IAEA, it will be an opportunity to be acquainted with the country's infrastructure in support of the project. This will in turn allow visualizing in advance the possibilities that the countries will have to maintain and enlarge the pilot zones once the IAEA and

FAO Technical Co-operation Projects come to an end.

#### **5. Project Promotional Activities**

The interest and level of participation of the fruit industry in the project is gradually increasing.

The most important motivation that the Project has brought to the fruit industry is that the producers of the pilot zones will be in a position to trade their fruit commodities, without the need for a country-wide pest control approach. This fact has raised the interest of other producers to join in similar projects.

- In Nicaragua, the initiative to eliminate fruit flies from the north coast of the Lake of Managua is led by the private company Mangos, S. A. A.
- In Guatemala, the pest monitoring and control activities at the peach production zone in Quetzaltenango and Totonicapan, are carried out by the industry. Government cooperates only with materials and technical expert advice. In addition, the tomato producers from other areas also participate actively in pest surveillance.
- In Costa Rica, mango producers associations from Atenas, and of guava from Turrialba, both at the central plateau of the country, have asked the MAG to develop an integrated pest management plan to establish low prevalence areas.

In addition, a major group of fruit and vegetables exporters have requested a special program to eliminate fruit flies from the Nicoya Peninsula. As a response from the government, the President of Costa Rica declared as MAG's priority action the elimination of fruit flies from the Peninsula and has made a strong call to the industry to take active part in this plan.

## **6. Project actions for 2003-2004**

During this second phase of the Regional Project, the NPPO's of the participating countries must implement the establishment of low prevalence and pest free zones following the protocols for integrated fruit fly management specifically prepared for each zone. They must also declare the pilot zones as low prevalence or free and request the Regional Plant Protection Organization (RPPO) to certify the fruit fly phytosanitary status in these zones.

In view that often conducting a negotiation for recognition of a low prevalence and free zone takes more time than establishing them, in parallel to the development of the zones, the NPPO's must initiate discussions with the phytosanitary authorities of the importing countries on the possibility

of exporting at least one fruit commodity coming from the low prevalence or free area.

To support the previous actions, NPPO's must prepare phytosanitary norms to legally launch national programmes, establish free zones, determine zones of low prevalence and constitute plant protection grower committees. This last aimed at strengthening the ties between the industry and the NPPO's.

Also it will be necessary to prepare standard operation procedures (SOP's) for the management and operation of the national programs. These are mainly SOP's related to field operations and quality assurance of field activities, so that the activities can be tracked and evaluated at any point in the system.



## **F. REPORTING ON ONGOING AND PLANNED CO-ORDINATED RESEARCH PROJECTS AND RCM'S**

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### **CRP on “Quality Assurance of Mass Produced and Released Fruit Flies for SIT Programmes” (3<sup>rd</sup> RCM, 19-23 May) in Perth, Australia.**

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Twenty-four scientists and observers attended the meeting. The meeting was formally opened by the Executive Director, Plant Industries who welcomed the participants and explained the activities that have been carried out in the Southwest of Australia against fruit flies, their achievements and expected goals. In his remarks he highlighted the role of SIT in the Queensland Fruit Fly Eradication Programme and other similar projects in Australia.

Participants discussed results of work accomplished since the last RCM focusing mainly on the field of research of each participant and the objectives, activities

and outputs of the CRP framework. The progress report of the participants covered the results obtained during the second phase of the CRP. During the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> days the participants were divided into 4 separate working groups to co-ordinate the individual research, and recommendations made on research to be carried out during final phase of the CRP. The RCM report is available upon request.

A new updated version, 5.0, of The Manual of Quality Control for Fruit Flies was distributed to the participants for its further application/implementation in the different fruit fly SIT operational programmes.

### ***New CRP on “Improved and Harmonized Quality Control for Expanded Tsetse Production, Sterilization and Field Application” (D4.20.10) 1<sup>st</sup> RCM 15-19 September 2003, Montpellier, France.***

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A new CRP has been approved in the field of tsetse quality control. Increasing interest in tsetse SIT is leading to increased demand for sterile flies. Little systematic work has been done specifically on the quality of mass reared and sterilized tsetse, and there is now an urgent need to harmonize and improve the existing ad hoc measures. The result of the CRP should be a quality control manual similar to the one already produced for tephritid fruit flies.

The Consultants Group Meeting that advised us on the need for this research identified seven main areas: quality control protocols for reproductive behaviour; colony maintenance; tsetse fly diet; irradiation of tsetse flies; fly handling, transporting and release; field quality

control protocols for released flies; and standardized facilities, equipment, and materials for quality control. It is planned to hold the first RCM in conjunction with IOBC meeting on “QA of Mass Reared Arthropods”, 15-19 September 2003, Montpellier, France.

Expected duration: 5 years (2003-2007).

We invite colony managers and researchers from tsetse affected countries and other laboratories to participate in this CRP, and research proposal in any of the above topics or related field will be welcome. Details of the IAEA Research Coordination Programme and the necessary application forms can be found at the IAEA web site:

(<http://www.iaea.or.at/programmes/ri/uc.html>)

The past ten years have seen an explosion in the use of molecular biology in all biological sciences; especially in the fields of medicine and agriculture and particular emphasis has been placed on gene transfer technology. The recognition that the development of gene transfer techniques in pest insects may lead to improvements in the SIT, encouraged the Joint FAO/IAEA Division to support and co-ordinate activities in this field by funding two CRPs. Scientific progress in the field is now such that transgenic technology in pest insects can be moved from the laboratory to initial evaluations of strains under operational conditions of large scale rearing and in contained field-cage situations to assess mating competitiveness of the transgenic strains. The new CRP will address these areas with the objective of delivering improved transgenic strains for eventual use in SIT programmes.

The two previous CRPs have provided the groundwork for this new proposal that will facilitate moving the field of the use of transgenic insects from the laboratory towards field application. During the implementation of the previous CRP highly efficient vectors for pest insect transformation have been developed and widely applicable transformation markers have been identified. These developments have made the screening of putative transgenic individuals in any pest species extremely efficient and have led to the creation of transgenic strains in more than 10 pest insect species. In many pest insects molecular analyses of important gene systems have produced useful biological reagents for the development of transgenic strains. The project will involve transfer of transgenic strains to larger rearing situations, evaluation in contained field-cage conditions and initial model studies

on the impact of transgenic insects on the environment.

The new CRP will also begin the first major studies on the biological fitness of transgenic insects. Whilst not directly focused on risk assessment issues, the data produced will be of considerable importance to the development of a regulatory framework for any eventual open field release of transgenic insects. In order to maximize the chance that transgenic technology can be effectively transferred to field programmes, participation of operational SIT managers, regulators, ecologists and other stakeholders will be encouraged.

Overall objectives of the CRP:

To move transgenic insect technology from the laboratory gradually towards the field for the eventual management of insect pests through the improvement of the SIT.

Specific objectives:

- To improve gene transfer technology for the safe and effective use of transgenic or paratransgenic insects in pest management.
- To assess the performance of transgenic strains in large-scale rearing and under contained field-cage conditions.
- To define ecological and population concepts and models associated with the release of transgenic insects for pest management.

Expected research outputs:

- A collection of characterized molecular reagents and promoters/regulatory elements to be used for the expression of

effect or genes or selectable markers in pest insects.

- Increased knowledge of molecular mechanisms of sex determination and dosage compensation in pest insects.
- Data on the interaction between the transgene and the whole host genome in target pest insects.
- Development and definition of systems to maintain stability and strain integrity under large scale rearing.
- Transgenic strains of pest insects including: a) genetically marked strains, b) male producing strains and c) refractory strains.
- Data on transgene stability and fitness of transgenic strains during large scale rearing and contained evaluation.

- Mathematical models to predict the interactions between transgenic and wild type populations in the environment.
- Knowledge and data to support risk assessment analysis for the eventual release of transgenic insect strains.

Expected duration: 5 years (2003 – 2008); first RCM is planned for 6-10 October 2003, in Vienna, Austria.

**Appropriate applications from developing countries scientists for contracts to participate in research on the above topics are still welcome. Details of the IAEA Research Co-ordination Programme and the necessary application forms can be found in the IAEA web site:**  
**<http://crp-dev.iaea.org>.**



G.

## DEVELOPMENTS AT THE ENTOMOLOGY UNIT SEIBERSDORF

Tsetse R & D

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### Survival of tsetse flies after exposure to low temperature

Investigations into the possibility of using the chilled adult release system are continuing as an alternative to releasing sterile tsetse flies in cardboard boxes (Newsletter 58). Exposure of adult male tsetse flies to low temperature should be for as little duration as possible so that the fitness of the released sterile flies is not unduly compromised. It is necessary that the flies are completely immobile and do not stick to each other when loading and emptying the release machine. In some insect species it has been shown that very short exposure to sub-zero temperature can prepare the insects to tolerate very low temperature for long periods immediately after the cold shock. Seven days old male *G. pallidipes* and *G. fuscipes fuscipes* were cold shocked at 4°C for 30 minutes or one hour then returned to normal colony holding conditions for one hour prior to chilling for six hours at 4°C. Humidity was maintained at about 40% or 70%. The flies were then returned to normal colony holding conditions to observe survival without feeding. Survival was initially recorded on the morning after return to normal colony conditions. Survival about eighteen hours (overnight) after removal from low temperature was variable for both *G. pallidipes* (85-100%) and *G. f. fuscipes* (75-100%). The survival trend was similar irrespective of the humidity level in the chilling chamber.

Male *G. pallidipes* of different ages that were starved for one, two or three days were chilled at 4°C for six or twenty-four

hours at 50% or 70% relative humidity then returned to normal colony holding conditions. Chilling for six hours had a small impact on survival whereas chilling for twenty-four hours reduced survival rates to as low as fifty percent by the following morning after removal from the chilling chamber. Generally, the survivors were active up to seven days after removal from the chilling chamber without any feeding. The starved flies could still feed through a silicone membrane like other colony flies. Starvation for one to three days did not significantly affect survival. Survival was reduced for flies older than nine days when exposed to low temperature. This latter group of low temperature experiments was carried out in a programmable growth chamber. Using the chamber there was no significant effect of chilling at 4°C on survival or feeding response, however, following mating of the males there was some evidence that spermatophore filling was reduced. Further experiments are underway to quantify this effect.

### Salivary gland hypertrophy virus (SGHV)

Following the initial work to sequence the SGHV DNA, two suitable primers were identified and prepared. Dr Francois Cousserans from the University of Montpellier visited Seibersdorf for two weeks to test the primers. Initially no amplification was achieved, but this was found to be due to DNAase inhibition, and amplification of the viral DNA was achieved at 10<sup>-3</sup> dilution. Virus was identified in all dissected glands exhibiting

hypertrophy as well as in whole insect extracts and one individual without hypertrophy. Attempts to identify virus in faeces and haemolymph of hypertrophy positive individuals met with mixed success, with no virus detected in haemolymph and only one faecal sample showing positive.

Dr Herve Bossin from France joined the group in June for 7 months to continue this work, and to try to develop a practical test to identify SGHV free individuals without killing them. He will also study the mode of transmission of the virus, and assess the distribution of the virus in our colony and the incidence of SGHV infection without patent hypertrophy.

### **Response of tsetse to environmental stress**

Colleagues from South Africa, USA and UK have been successful in obtaining funding for an extensive study of tsetse distribution, physiology and genetics. As much of the data that will be generated by the group will be of relevance to SIT planning and implementation we have started a collaboration with the group. As a first step in this effort, Jaco Klok and John Terblanche from the University of Stellenbosch spent 3 weeks in the Unit collecting base line data on the response of tsetse to environmental stress, particularly temperature and humidity stress. Cuticular hydrocarbon washes of the stressed flies were also made.

### **Use of citrate as an anti-coagulant for blood diet**

In the preparation of tsetse blood diet, clotting is prevented by the removal of fibrin by stirring the blood for 15 minutes and removing the clot. This process is time consuming and may also remove some blood components that are important for tsetse nutrition. Following initial small-

scale experiments using sodium citrate as an anti-coagulant, a large-scale trial has been completed in collaboration with the Veterinary Department at the University of Vienna. Initial results are very encouraging, and if confirmed, sodium citrate will be used for blood collection for all the colonies at Seibersdorf. The system would also be very appropriate for use in African tsetse rearing centers.

### **Other developments in tsetse rearing**

In other developments, the tsetse rearing container is now connected and undergoing testing for temperature and humidity stability. A test colony of flies will be introduced as soon as this is complete. After some delays the new injection moulded cage design is now finalized and the first samples for testing will be available before the end of June. And a contract is currently being negotiated with an engineer to revise the design of version 3 of the semi-automated tsetse production unit, TPU3.2, to reduce the cost of materials used and improve some small details of the design. This will include an improved heating surface for the blood feeding, and redesigned arms for holding the cages, with an anticipated 30% reduction in cost.

At present sex separation of tsetse can be carried out using differences in pupal development time. Whilst this method is effective, it can only be carried out at the adult stage which has certain disadvantages. New developments in Raman infra-red spectroscopy may enable male and female tsetse pupae to be differentiated and a collaboration has been initiated with the University of Vienna. An initial analysis of a random sample of pupae indicated two spectral distributions and further work will assess if these correspond to male and female pupae.



## Fruit Fly R & D

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In line with increasing the laboratory activities on other fruit flies, in addition to medfly, several new R and D areas have been initiated. This trend will continue as it represents an opportunity to stimulate the development of SIT for these other very important fruit flies.

### **Compatibility studies between different populations of *A. fraterculus*.**

The South American fruit fly, *Anastrepha fraterculus*, is a fruit fly pest of major economic significance in Latin America. As such, the implementation of environmentally safe control methods, such as the SIT, should be encouraged. In order to develop the tools needed for the implementation of SIT projects, research and development should focus on two major aspects. Firstly, the suggestion that *A. fraterculus* could represent a complex of cryptic species needs to be thoroughly addressed. Whether mechanisms of mating isolation operate among populations is as yet unknown and clarification of the mating compatibility of the different populations is important to determine the feasibility of SIT implementation using generic strains on a regional basis.

During the last 9 months, Dr. Teresa Vera from the Tucuman, Argentina Experiment Station has been working in Seibersdorf on a study that aims to analyse the reproductive compatibility among different *A. fraterculus* populations originating from various locations within its distribution range. Pupae from wild populations and from laboratory colonies were sent from Mexico, Guatemala, Colombia, Peru, Brazil (Piracicaba and Bahia) and Argentina to the laboratory. Flies were used to establish colonies to allow

synchronization of material and avoid any possible detrimental effect of the shipments. Mating compatibility tests were carried out on screened-cages with host trees inside and are still in progress. Some sexual isolation was found between populations from Argentina and Peru, and from Argentina and Piracicaba. In the last case, it was found that, while Piracicaba males mated freely with Argentina females, the reciprocal cross was very unusual. Flies from Colombia were sexually active at sunset (opposite to that previously reported for *A. fraterculus*) so almost no matings were recorded under the protocol performed. Further analysis will confirm this trend, which if reproducible can lead to temporal isolation between this population and the ones that exhibit an early morning activity pattern (i.e. Argentina and Piracicaba). It was found that the time elapsed from the moment that the females were released in the cage until they start mating was different for some populations. The shortest time was recorded for the Argentina strain, followed by flies from Piracicaba and then from Peru. The extreme case was for Colombia in which flies showed a mating peak at sunset.

### **Support for fruit fly rearing in Brazil**

There are now serious initiatives being taken to implement SIT technology for fruit flies in Brazil, especially for medfly. To help with these initiatives, Dr. Raimundo Braga Sobrinho from the Research and Development Institute of Brazil (EMBRAPA) has joined the Unit on a sabbatical leave for one year. He will conduct research on *A. fraterculus* and *C. capitata* in relation to the integration of SIT for these two species in Brazil. He will firstly focus his activities on developing larval diets for these two species

using components that are available in Brazil. These components will be shipped from Brazil as required. His second task will be to conduct mating compatibility tests with wild medflies from Brazil and the new medfly genetic sexing strain.

#### **Establishment of a colony of the olive fly, *Bactrocera oleae***

The olive fly is the major pest of olives in many countries and there was some development of SIT for this species in the 1970's. Two problems encountered during this early work were an expensive larval diet and the lack of a genetic sexing strain. The laboratory at Seibersdorf will begin to address these two issues in collaboration with colleagues in Greece and Italy and a proposal for EU support has been submitted. Initial attempts to establish a colony of this species were not successful but with the help of a consultant from the Department of Biology, University of Crete, Greece the problems appear to have been solved. The colony will be used to hopefully develop cheaper larval diets and as a source of mutations for developing a genetic tool box for this species.

#### **Medfly genetic sexing strain VIENNA 8.**

The new sexing strain, VIENNA 8, was reared for over 50 generations at a level of ca. 2000 flies per generation. This strain consists of the translocation T(Y;5)101 in combination with the inversion D53 (*wp tsl*), i.e. the males are heterozygous, the females homozygous for the inversion. The productivity of the strain is better than all other strains tested so far and represents an improvement of 59% for males and 40% for females compared to strain VIENNA 6. The overall recombination frequency was 0.012% per generation (VIENNA 6:

0.019%). However, some of the exceptional wild type females (*wp*<sup>+</sup>) observed with VIENNA 8 are presumably not due to recombination but are the consequence of adjacent-1 segregation. If one calculates the recombination frequency based only on the number of exceptional males, the frequency is reduced to 0.005% (VIENNA 6: 0.012%), i.e. a reduction by ca 58%. Tests were also conducted to determine the overall egg to adult viability of the strain. Egg hatch was 71.3% (VIENNA 6: 64.5%), recovery of white pupae (*wp*) was 41% (VIENNA 6: 28%) and that of brown pupae (*bp*) 42% (VIENNA 6: 52%). At the pupal stage the sex ratio (i.e. *bp/wp*) is 1.04, while in VIENNA 6 it is highly distorted towards brown pupae (1.84). Male emergence was 90%, i.e. close to the wild type level and clearly better than the value for VIENNA 6 with 67% (where a large fraction of the brown pupae is genetically unbalanced and dies at this stage). It can be concluded that the strain VIENNA 8 shows a significant increase in productivity. The stability is good, although recombination is not zero. During the first half of the year, the strain was transferred to facilities in Guatemala, Peru and Chile.

#### **Transgenic strains**

One line of research was aimed at generating transgenic lines where a fluorescent marker gene, like EGFP or DsRed, is inserted into the inversion D53. Eight transgenic lines are available where the insertion site is on the D53 chromosome. Southern analysis revealed that four independent insertions are present, i.e. three with DsRed and one with EGFP. Preliminary cytological analysis, (Dr. A. Zacharopoulou, Univ. of Patras), shows that unfortunately all insertions are outside of the inverted region. Further attempts will be made to generate transgenics where the

insertion is inside the inversion. In collaboration with Dr. A. Handler (USDA, Gainesville) new transgenic lines were generated that carry temperature inducible lethal genes. The goal is to determine whether these genes can be utilized to construct sexing strains. In total 1584 embryos were injected out of which 895 (57%) survived. In the offspring of the mating of the 602 G0 flies, 60 transgenic flies were detected. The analysis of these lines by genomic Southern analysis is ongoing.

### **Mosquito Developments**

On the laboratory side, the Seibersdorf insectary to carry out R & D on rearing, sexing and sterilization of *Anopheles arabiensis*, is scheduled for completion at

the end of June 2003 at which time mosquitoes will be brought in from other laboratories and the field sites.

The development of field sites for eventual release of sterile *Anopheles arabiensis* continues with activity in both locations. A GIS planning meeting in Vienna (June 18-20) was held to design the GIS and strategy for entomological field sampling in northern Sudan. This meeting was attended by counterparts from Sudan and their collaborator in the Center for Remote Sensing along with former experts and IAEA personnel.

The Reunion Island project began colonization of mosquitoes from the island during the visits of an expert from South Africa.



## H. SPECIAL NEWS AND REPORTS

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### Consultants Meetings

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#### Consultants Meeting on “Codling Moth Genetic Sexing” 5-9 May 2003.

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The Codling Moth, *Cydia pomonella*, a key pest of most pome fruit in the temperate regions of the world, is considered to be one of the best candidates for SIT application as part of an areawide integrated approach. A new CRP was initiated in 2002 entitled “Improvement of Codling Moth SIT to facilitate field expansion” with the specific objective to conduct research to improve the SIT for codling moth control in areawide IPM programmes. Participants of the CRP will conduct research to improve 1.) the quality and efficiency of rearing of CM, 2.) the implementation of field programmes and 3.) the knowledge on genetics with the aim to develop genetic sexing strains. Especially the last group was under-represented in the CRP and it was recommended that more researchers should be contacted to join the CRP.

The development of a genetic sexing strain, allowing the release of male moths only, will greatly decrease production costs and increase the efficiency of the field programme (avoiding assortative mating between sterile male and female moths). Little knowledge is however available on genetics of Lepidoptera in general and genetic sexing has only been documented for 2 species, the silkworm (*Bombyx mori*) and the flour moth (*Ephesia kuehniella*). Therefore, a consultants meeting was organised in Vienna from 5-9 May 2003, to advise on the most appropriate strategy to

advance the development of genetic sexing strains for Codling Moth.

The group of consultants recommended that priority be given to study the feasibility of using dominant conditional lethal mutations (DCLM) linked to the female determining chromosome (W) to construct a sexing strain for CM. This can be accomplished through transgenesis with the pink bollworm Notch gene ( $N^{60g11}$ ) including injections of piggyBac-BmA3-DsRed-Notch constructs and screen for germline transformants and chromosomal localization of the transgene.

Alternatively, sexing strains can be developed based on DCLMs from CM linked via translocation to the W chromosome. This will require the induction of conditional dominant lethal mutations (e.g., temperature-dependent) that can be used for developing genetic sexing strains, followed by a translocation of the isolated mutation onto the W chromosome and characterization of the resulting strains for their structure and applicability for mass rearing.

In addition, it was recommended to reduce the present emphasis on the development of balanced lethal strains in CM and to promote the basic knowledge of CM genetics i.e. to generate genetic and molecular tools required for the construction and analysis of genetic sexing strains (including the

development of molecular markers, the construction of linkage maps; the construction of a BAC library) and to search for sex-linked phenotypic markers in existing mass rearing facilities.

The report of the meeting can be made available at the Insect Pest Control Section upon request.

#### **Consultants Group Meeting On “Developing Product Quality Control For Standardization of Tsetse Mass Production”, Vienna, Austria, 10 – 14 June 2002.**

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The recent Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC), approved at the African Heads of State and Government Assembly in 2000, calls for the establishment and gradual expansion of tsetse free areas as a lasting solution to the problem of trypanosomosis. The Sterile Insect Technique (SIT), integrated with other techniques, can play a significant role in integrated area-wide tsetse fly elimination. Currently however worldwide tsetse production is only 1/40 of the projected requirement in 2006. If the SIT is to play a significant role in reaching the objectives of PATTEC sterile fly production will have to be expanded rapidly, and it is essential that quality control (QC) measures suitable for the expanded production be in place.

dology has become a top priority and will help to ensure the attainment of these production goals and improve quality of rearing, minimize production costs and generate trained QC and production staff required to successfully produce flies and monitor their quality and suitability for release.

A Consultants Group Meeting was organized in Vienna to advise the sub-programme on this subject. The consultants identified seven main areas where improved standardized procedures are required, and specific topics within these main areas were listed. In order to achieve this, a Co-ordinated Research Project (CRP) was proposed and has now been accepted (see announcement of new CRPs, page 17).

The current rearing has only limited quality control measures. Improved QC metho-

#### **Workshops and Co-ordination Meetings**

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##### **Fruit Fly Regional Workshop in Hanoi, Vietnam, 12-14 March 2003, Griffith University, Queensland, Australia**

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A working group meeting was hosted by the Ministry of Agriculture and Rural Development in Hanoi, Vietnam, from 12-14 March 2003 to discuss the formation of an international centre to assist with the problem of pest fruit flies that have a devastating impact on horticulture and cause huge economic losses both in Australia and

Asia. The meeting was attended by 29 senior government officials representing the Ministries of Agriculture and Departments of Quarantine of seven countries in South East Asia (Vietnam, Thailand, Malaysia, Indonesia, Philippines, Singapore and Brunei), together with representatives of the Queensland Government, Griffith

University, Asian Development Bank, ASEAN Secretariat, CAB International, FAO/IAEA and a major fruit producer and exporter from Malaysia.

Nine presentations were made covering the aims of the Centre, previous regional cooperation in the Pacific, international agency activities in support of fruit fly control programs and trade promotion, socio-economics, fruit industry perspectives, and finally current status of knowledge on taxonomy, pest management, market access technologies, quarantine surveillance and eradication of pest fruit flies. This extensive information provided the basis for three in-depth group discussions on the second day of the meeting covering individual country and regional needs, funding and project financing, and a memorandum of understanding. The third and final day of the meeting proposed nine key projects for immediate implementation.

The attendees on behalf of their respective governments and agencies unanimously endorsed the establishment of an international centre to assist with the serious problem of pest fruit flies in the region. It was agreed that effective management of pest fruit flies through regional collaboration would directly contribute to increase food security, reduce poverty and facilitate international trade within the region.

It was agreed that the head office of the International Centre for Management of Pest fruit Flies would be based at Griffith University, Nathan campus in Brisbane, with a regional office to be set up in Malaysia. Following the signing of a memorandum of understanding between the seven participating countries in South East Asia and Griffith University, the headquarters of the Centre is expected to be launched in June 2003, followed by the launch of the regional office in Malaysia in August 2003.

### **Summary of the Third Meeting of the Coordination Group for Technical Co-operation Project RLA/5/045**

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The third meeting of the Coordination Group for Project RLA/5/045 "Establishing options to export fruits and vegetables through the creation of fruit fly pilot low prevalence and free zones using an integrated pest management approach, including the SIT, in Central America and Panama" was held from 28 to 30 of April 2003, in Guatemala City.

The aim of the meeting was to evaluate progress made during the first project phase (2001-2002) and to plan the activities for the second phase which will cover the 2003-2004 project cycle.

Participants to the meeting included project counterparts from Costa Rica, El Salvador,

Guatemala, Nicaragua and Panama and from Honduras who recently re-joined the IAEA and Belize who participated under the FAO Technical Cooperation Project RLA/0172.

Other organizations including IICA, OIRSA, USDA and the Ministry of Agriculture of Mexico, who are Members of the Project Alliance, were also present at the meeting.

The most relevant issues discussed and conclusions drawn were the following:

- Improve in each country the GIS information system data base for trapping data and establish a regional information network. The countries will make available the personnel and

equipment that is currently being used for this purpose.

- Create a Regional Communications Group integrated by the PR managers of the NPPO's of each country. The objective is to develop and execute an harmonized regional communication plan.
- Conduct sterile medfly release trails in the participating countries with the objective of fine tuning the procedures for establishing routine releases for SIT application. For this activity the countries committed an aircraft, a vehicle and the necessary infrastructure for handling of the sterile flies. Sterile flies will be supplied by the USDA-Moscamed El Pino mass rearing and sterilization facility or by the fruit fly rearing facility in Costa Rica.
- The project for construction of a mass rearing and sterilization facility in Honduras for 250 million sterile male flies per week at an estimated cost of US \$3 million.
- Take advantage of the current specialized infrastructure for fruit fly management that exists in each country to create regional centres specialized in subjects such as advanced taxonomy, mass rearing and sterilization of *Anastrepha* spp. and medfly, biological control, pest

risk analysis, economic feasibility assessments and preparation of work plans and phytosanitary norms.

- The perspectives for economic and social regional development that the free trade agreement between Central America and the US will offer and the Puebla-Panama Development Plan for Meso-america, opens new possibilities for a regional fruit fly suppression and eradication project. For this purpose it has been suggested that a Regional Group be formed to develop a plan that could serve as a platform to promote the production and commercialisation of non-traditional horticultural products and at the same time contribute to the reduction of social and ecological problems. These are partially due to the collapse of coffee prices and of other non-traditional crops, resulting in human migration, drug production and traffic and reduction of the environment degradation.
- Define a mechanism to assure the continuation of the Regional Coordination Group of fruit fly management programmes in the region once the IAEA and FAO projects have come to an end. This will be necessary in order to provide sustainability to fruit fly management activities in the region.

### **3<sup>rd</sup> semi-annual meeting of the USAID-MERC Management Committee for the SIT projects in the Near East, 3-4 February 2003, Vienna, Austria.**

The Management Committee (composition and responsibilities were described in Newsletter 60), in its third semi-annual meeting, reached the following major conclusions:

- Regional efforts permitted to maintain the peach fruit fly, *Bactrocera zonata*, out of the boundaries of Israel, Jordan and the Palestinian Territories. To date all outbreaks that occurred in the vicinity

of the Gaza Strip have been eradicated through emergency MAT operations.

- Marketing and environmental pressures lead to the need to move from pesticide usage to SIT and the three parties expressed their commitment to facilitate the expansion of the integrated areawide control activities. Though current SIT projects are still highly dependent on donor contributions; funds currently used for pesticide-based control could be a source of funding for a wider and sustainable use of SIT.
- The current sterile pupae supply is insufficient. In addition, the long distance transportation is unreliable, and results in poor fly quality.
- In spite of the fact that medfly-free export markets have been created for commodities from the Arava Valley, (reaching close to US \$25 million in 2002) there is still a lack of knowledge and understanding of the full benefits of SIT among key decision-makers in the region.

Based on the above conclusions, the MERC Management Committee recommended:

- To the three parties, to strengthen regional action against introduction of Tephritid fruit fly species, through the development of emergency action plans,

the organisation of regional coordination workshops on *Bactrocera zonata* in order to prevent the introduction of the pest into other countries in the region.

- To create a local demand for sterile flies and an environment that facilitates the expansion in the application of an integrated areawide approach. In particular, official commitment should be obtained from the relevant authorities for the purchase of a given amount of sterile pupae in the medium term, and funds allocated by the Marketing Boards and others for pesticide-based control should be gradually shifted for expansion of SIT application.
- To identify key decision-makers among the various stakeholder groups in order to create support for the establishment of a local medfly rearing facility.
- To maximise the benefits resulting from the experience of the Arava Valley in Israel, expand the technology to the Arava Valley in Jordan and other areas in order to open additional export markets and to create a grounds-well of support among identified stakeholders, to facilitate the transfer from pesticide usage to SIT.

## **Other Important News and Reports**

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### **Pilot Trial for Mediterranean Fruit Fly (*Ceratitis capitata*) Control Using the Sterile Insect Technique (SIT) in Valencia, Spain.**

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The Valencia Community is located East of Spain at the Mediterranean Coast and has an historical tradition of citrus cultivation. At present, the agriculture in Valencia is based on citrus and is considered to be the most

important region in the world exporting fresh citrus. Under this context the fight against pests, in particular the Mediterranean fruit fly (or medfly), is of major importance for both the producers and the Valencia



Authorities. In the last years the number of aerial and ground insecticide treatments used to control this pest has substantially increased. With the objective of finding an alternative, the Valencia Institute of Agriculture Research, through the public firm Tragsa, has launched a pilot project for medfly suppression integrating SIT into control operations. This trial is being conducted in two different areas of the Valencia Community. Both have the characteristic of being relatively isolated from the rest of the agriculture area. One of the areas is the Prat de Cabanes in the Castellón Province with a surface of 10,000 hectares. The other is the Valley of Valldigna located in the Province of Valencia and has a surface of almost 5,000 hectares. The project currently receives weekly 30 million sterile male pupae from the mass rearing and sterilization facility of the Instituto de Sanidad y Calidad Agrope-

cuaria (ISCAMEN) of the Mendoza Province in Argentina. The sterile pupae shipments initiated in March 2003 with two shipments per week sent using the Mendoza-Buenos Aires-Madrid route. The sterile flies are being released by air using initially the paper bag system as in the case of Argentina. The objectives of this pilot trial are, first, to fine tune SIT technology to the prevailing conditions in Valencia and, second, to validate the use of SIT as a method for medfly control. With time, the expectations are to expand the use of this technology to the rest of the fruit production area in the Valencia Community. For this purpose a large centre for reception, holding and emergence of sterile flies with a weekly capacity of 300 million sterile flies has been built as well as an identification laboratory to process traps and fruit samples

## **Latest SIT Developments in Argentina**

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### **Codling Moth**

Field visits and office discussion with technical and managerial staff were held in the Provinces of Neuquen and Mendoza to assess the codling moth problem. Its magnitude soon became clear with growers losing 10 to 20% of the crop despite spraying from 8 to 14 times organophosphate insecticides at an average cost of US \$300 per hectare per year. The economic loss accrued from codling moth direct damage amounted in the 2002-2003 cycle to US \$26 million for the Province of Neuquen only. Growers using a more integrated approach with pheromone wing traps for population monitoring, reduced amounts of insecticide spray, mating disruption and tree banding spend from US\$450 to 850 per hectare per year with a residual damage that

oscillates from 3 to 20 percent. SENASA currently has a codling moth mating disruption IPM national programme in the Provinces where apples and pears are commercially grown, however, the results have not been satisfactory. The apple and pear industry are desperate for a cost-effective and environment friendly pest control method and the use of an IPM approach including the area-wide SIT application is being visualized by the industry and Provincial Governments as a real possibility given the excellent results obtained in Canada and also given the infrastructure and know-how available in the country for medfly control using SIT.

A meeting with SENASA's President (Bernardo Cané) and Vice-President (Daniel Welschen) was held in Buenos Aires to discuss the possibility of using SIT for

codling moth control in Argentina as the next step for SIT application in the country. The possibility of submitting a request for an IAEA TC Project for the next cycle (2005-2006) was discussed and SENASA decided to submit a project proposal by June 2003 through the official channels, in this case the Atomic Energy National Commission (CNEA). The project will include capacity building in all the provinces in Argentina where apples and pears are commercially grown, although initial applications would focus on selected small pilot areas. The technology could be transferred to Argentina from Canada Okanagan-Kootenay Sterile Insect Release (SIR) Programme through fellowships and expert missions.

As part of the efforts to assess a potential SIT project on codling moth, the Province of Mendoza has planned the preparation of an economic feasibility study and requested that advice be given. A number of discussions were held with the team in charge of the economic study. An outline of the study was prepared and will be used as the basic structure to carry out the study.

#### **Mediterranean fruit fly:**

The government of Argentina through SENASA is preparing for an expansion of the current SIT programme against medfly and reviewing the extension of the use of SIT against other pests of economic importance.

After months of dealing with unfounded negative public opinion about the effects of the irradiation process and waste waters emanating from the mass rearing and sterilization facility on the health of the people living in the surroundings of the facility, the Government of the Province of Mendoza has taken the decision to move the

facility from its current location to an industrial park which has the necessary conditions to guarantee effective operation of the factory. The new factory will have a modular design with an initial production capacity of 200 million male medflies per week and with plans to scale up production to 400 and 600 million per week as the programme expands to other provinces. A module for codling moth mass rearing will be included in the new facility design. It was estimated that the required area in square meters to produce one million sterile codling moth pupae is six fold the amount required to produce the same amount of medfly pupae (151 m<sup>2</sup> of construction are per million codling moth compared with 25 m<sup>2</sup> for medflies). This is basically due to the intrinsic characteristics of the biological cycle of these species with codling moth having more larval stages and a longer life cycle among other reasons.

#### **Exports of sterile flies to Spain:**

One relevant event that occurred during the visit was the starting of the sterile male pupae shipments from Mendoza to Valencia Spain. The facility in Mendoza is selling 30 million sterile flies per week to the Autonomous Community of Valencia that is initiating through a public firm (TRAGSA) a SIT pilot trial in citrus orchards in the Province of Castellon. This was a significant event in Mendoza that included a press conference with the Ministry of Economy of the Province and other provincial authorities, the TV and main local newspapers. (Newspaper clippings are available in the Insect Pest Control Section).

### **Fruit Fly International Workshop in Buenos Aires**

From 24 to 26 March 2003, a lecture on current status and future perspectives of fruit fly SIT was given at the International Fruit Fly Workshop in Buenos Aires, organized by SENASA.

Mr. Daniel Welschen, Vice-President of SENASA, opened the workshop. He pointed out that the new strategy for medfly control in Argentina would be one that focuses on a regional approach rather than on a provincial approach with active participation of the provincial governments and the industry. He mentioned that the new facility would take into account the needs of sterile flies for all the provinces where commercial medfly fruit hosts are grown and that BID would finance the construction of the facility.

Mr. Eduardo Cosenzo, Head of Plant Protection, pointed out that the Fruit Fly Workshop has been organized since 1997, with the aim of updating information on fruit fly management and identifying priorities that serve as the basis for establishing co-operative agreements with national and international institutions. He mentioned that SENASA had already declared as medfly free the Andes Valley (Valles Andinos) and the rest of the Patagonia region and the Province of Mendoza as medfly low prevalence area. This recognition was also granted by COSAVE and constitutes the first fruit fly free and low prevalence phytosanitary norm for Argentina.

Mr. Oscar de Longo, Co-ordinator of the fruit fly control and eradication programme in Mendoza (PROCEN, Mendoza), indicated that in the 2002-2003 cycle only 147 fertile medflies had been captured in a

total of 4,582 traps equivalent to a fly trap day index (FTDI) of 0.00005. This clearly shows the effectiveness of SIT technology when properly applied.

Mr. Ricardo Sanchez, Co-ordinator of PROCEN Patagonia, mentioned that apples and pears grown in areas, even though medfly-free, are still not recognized by the main trading partners as medfly-free and therefore had to be subjected to a post harvest treatment based on low temperatures as a prerequisite for exports. This represents a cost of US \$1.5 million per year that will be saved once the areas are recognized as medfly free, and the post harvest treatment required by the USA and Mexico is lifted.

The SENASA Authorities pointed out that, under the umbrella of the Regional Plant Protection Organization (COSAVE), they are leading a South American regional initiative for fruit fly control using SIT and are in the process of preparing a regional TC Project proposal for submission to the IAEA for the 2005-2006 cycle.

### **Postgraduate Course On Codling Moth SIT in Neuquen**

The University of Comahue located in the Southern Province of Neuquen organized from 10 to 14 March 2003, a training course on "The Use of SIT for Area-wide Control of Carpocapsa". The course was offered to University postgraduate students, agronomists and biologists interested in the topic. The course was given by Dr. Stephanie Bloem specialist in codling moth SIT and former researcher at the SIR Programme in Canada. The subscriber covered the last day with a 4-hour lecture on economics of SIT.

## **The Potential of Sterile Insect Technique (SIT) As One of the Strategies for Control of *Liriomyza trifolii* (Diptera: Agromyzidae) Infesting Greenhouse Crops.**

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**Roy Kaspi, Michael Parrella**

Department of Entomology, University of California, One Shields Avenue, Davis, CA 95616, USA, E-mail: [rkaspi@ucdavis.edu](mailto:rkaspi@ucdavis.edu)

**Abstract:** *Liriomyza trifolii* (Burgess) is a serious pest of chrysanthemum and other greenhouse crops around the world. The objectives of this study were to determine the possibility of using the Sterile Insect Technique (SIT) against *L. trifolii* infesting greenhouse chrysanthemum. We found that a high level of sterility was achieved with a dose of 155 Gy for both sexes. The copulatory success, longevity, percent emergence and flight ability of irradiated males were similar to that of the unirradiated males. The SIT experiments indicated that the release of sterile *L. trifolii* can

significantly reduce the reproductive capacity of the normal leafminer population. Our study indicates that sterilization of *L. trifolii* flies is feasible and that sterile males are of high quality and competitive with normal males. Based on this data, we will continue research on the use of SIT against *L. trifolii* populations in greenhouses. We will also determine the feasibility and efficacy of the combination of the SIT with the augmentative release of the parasitoid *Diglyphus isaea* for *L. trifolii* control.

*Paper available in:* Integrated Control in Protected Crops, Temperate Climate. IOBC/wprs Bulletin Vol. 25 (1) 2002. pp 123-126.



## I. ANNOUNCEMENTS

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### STAFF CHANGES

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#### Zowinde Koudougou moves to Mali

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Zowinde spend almost two years at the IAEA Headquarters in Vienna supporting the Joint FAO/IAEA Division with the application of geographical information systems (GIS) for the planning and implementation of various animal pests programmes including tsetse in Sub-Saharan Africa. During his time in Vienna, Zowinde made significant contributions to the Insect Pest Subprogramme with the spatial analysis

of field collected data and the development of tsetse distribution and abundance maps of a number of the Sub-Saharan countries. This information is vital for proper planning of tsetse intervention campaigns. Zowinde has temporarily moved to Mali from where he will continue to support tsetse GIS activities. We thank Zowinde for his contributions and wish him all the best for the future.

#### Teresa Vera concludes her research work

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After nine months working at the Entomology Unit in Seibersdorf conducting mating compatibility tests between South American fruit fly (*Anastrepha fraterculus*) populations from six locations in Latin America, Teresa returns to Argentina to the Experiment Station of the National Institute of Agricultural Technology (INTA) in Tucuman. Teresa's work was facilitated by national institutions who kindly supplied the

*A. fraterculus* populations for the compatibility tests. The results obtained will no doubt be a major contribution to any SIT intervention against this pest in Latin America and especially in South America. We wish Teresa all the best in her future family and professional activities and hope to have an opportunity to work together again in the near future.

#### Raimundo Braga Sobrinho

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Raimundo has a B. Sc.(1975) and M.Sc. (1978) in Agronomy from Brazil, and a Ph.D in Entomology in USA (1988). He has been an Embrapa' researcher since 1976. From 1977 to 1995 his research program focused on cotton IPM. From 1995 up to now research program focused on fruit crop pests with emphasis on fruit flies. He has been an FAO consultant on cotton IPM programs in

Paraguay, Argentina and China. His work as a cost free expert funded by Brazil at the Seibersdorf Laboratory, is focused on developing artificial diets for mass rearing of the South American fruit fly (*Anastrepha fraterculus*) and to test diets for new genetic sexing strains of the Mediterranean fruit fly (*Ceratitidis capitata*). The Government of Brazil is planning to build a mass rearing

and sterilization facility for SIT application against these two species in North Eastern

Brazil and Raimundo will facilitate the technology transfer.

### **Herve Bossin**

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Herve is a Cellular and Molecular Biologist. He obtained his Ph.D. at the Molecular Virology Unit of the Laboratoire de Pathologie Comparee, Univ. Montpellier II, France studying the lepidopteran *Junonia coenia* densovirus (Parvoviridae) conducting both basic (integration properties of the viral DNA into the host cell genome) and applied research (development of recombinant densoviruses for the stable expression of economically important proteins in cultured insect cells, densovirus-derived vectors for invertebrate transgenesis). During the last three years, he worked as a Foreign Research

Scientist at the USDA-ARS-CMAVE Research Center in Gainesville, Florida conducting research on the development of transgenic-based genetic sterilization for post-harvest insect pests. Herve will spend seven months in Seibersdorf on a consulting contract to work on Baculoviruses that affect the massrearing of tsetse flies. During this time he will study the mode of transmission of the virus in laboratory populations and will develop a non-invasive Polymerase Chain Reaction (PCR)-based diagnostic system that will be used to establish a virus-free strain.

### **Bart Knols Joins the Entomology Unit in Seibersdorf**

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From the Netherlands he will join the Entomology Unit at Seibersdorf as of July 1, 2003. Bart is a mosquito biologist and will oversee the development of mass rearing technology for *Anopheles arabiensis*. His arrival coincides with completion of the

mosquito-rearing laboratory at Seibersdorf. For the past 12 years Bart has been involved in a variety of mosquito field projects in Africa where one of his main interests was the study of mating behaviour in *Anopheles* mosquitoes.

## Yoram Roessler:

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### ***The Man Behind Medfly Genetic Sexing***

As Yoram has very recently “hung up his boots” we thought it appropriate to recognise the pioneering work that he did on the early development of genetic sexing strains in medfly. Yoram Roessler initiated the science of medfly genetics by isolating and characterizing a whole range of phenotypic mutants and constructing the first rudimentary genetic maps for this species. These early studies were laborious and painstakingly slow in a species like medfly where the logistics of doing “fly pushing” were rudimentary to say the least. In addition, there were very few collaborators in the early days. One of the very early experimental improvements introduced by Yoram was a closed rearing system for maintenance of medfly mutant lines. This greatly reduced the problem of contamina-

tion and enabled an increasing number of lines to be maintained in a relatively efficient way. He also co-authored the first paper on medfly cytology and was the first to realize that recombination in male medflies could have an impact on the application of genetic sexing strains.

One of the first mutants isolated by Yoram was an autosomal recessive black pupa mutant and he quickly realized that it had potential to be used in a genetic sexing strain. He succeeded in doing this and published the first paper on genetic sexing in medfly in the journal *Entomophaga* in 1979. One year later he participated in an Agency consultant’s meeting where the groundwork was laid for the future development of this technology. Almost 25 years later and all medfly operational SIT programmes now use genetic sexing strains and they incorporate a white pupa mutation that was isolated in Yoram’s lab in 1977. Yoram can take great pride in his contribution to this successful example of technology transfer starting, as it did, in his laboratory in Rehovot. Of course, Yoram made many other important contributions in other areas such as biocontrol and the successful Citrus Marketing Board. Knowing Yoram, retirement is just another way he has found to continue contributing to the medfly community as he has done in the past with experience, knowledge and a good sense of fun and we wish him all the best in his “retirement”.

### **Workshop on “Tephritid Fruit Fly Identification”, Vienna, August 4-8, 2003.**

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This workshop will aim at providing hands-on-training on identification of wild vs. sterile medfly adults, as well as on identification of

major *Bactrocera*, *Dacus* and *Ceratitis* species of economic and/or quarantine significance for the Near East region. Lectures and training will be

provided by Dr. K. Hoffman (CDFA, USA), Dr. I. White (National History Museum, UK) and Dr. M. De Meyer (Royal Museum for

Central Africa, Belgium). The workshop will be attended by participants from Israel, Jordan and the Palestinian Territories.

### **Fruit Fly Training Course**

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The International Fruit Fly Training Centre of the MOSCAMED-MOSCAFRUIT Programme in southern Mexico is organizing its XV Course on Integrated Fruit Fly Management with Emphasis on the Sterile Insect Technique for Latin American countries. The Course is being offered as part of the XV Anniversary Celebrations of the Training Centre.

operative aspects of large scale fruit fly SIT programmes including mass rearing and sterilization activities and field activities with a very balanced program of theoretical lectures and hands-on practical training.

The course will be mostly in Spanish and will be held from 8 to 26 September 2003 in Metapa de Domínguez, Chiapas, México.

The course will cover the main technical

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MOSCAMED – MOSCAFRUIT PROGRAMME  
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**XV ANNIVERSARY**

**International Fruit Fly Training Center**

**COURSE PROGRAM**

**XV**  
**International**  
**Training**  
**Course on**  
**Fruit Flies**

8 to 26 Sept. 03

Metapa de Domínguez, Chiapas.  
México



## **Training Course on Cactus Moth (*Cactoblastis cactorum*) Surveillance and Control , 17-21 of November 2003, Tallahassee Florida**

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The course is organized by the IAEA under the framework of the Technical Cooperation Project MEX5028 and INT5145, in close cooperation with the USDA/APHIS/ARS Office in Florida and the Center for Biological Control of the University of A&M, Tallahassee, Florida. The course will be offered to participants from Cuba, Mexico and the Dominican Republic.

The cactus moth (*C. cactorum*) feeds on cactus mainly of the *Opuntia* group and has the potential to cause devastating social, economic and ecologic effects in the areas where *Opuntia* is commercially grown or is part of the natural habitat. This pest has recently established in Florida and it is rapidly spreading along the Gulf of Mexico to the Southwest of the USA and to Mexico.

The main objective is to provide the participants with updated theoretical and practical information on the taxonomy, biology, ecology and monitoring and control methods of the pest. Participants will also be exposed to the latest developments for monitoring and control of this pest including improved survey systems and the SIT that is considered to be a suitable complementary technology to contain further spread of the pest and eventually to eliminate the pest from its current distribution in Florida and the Caribbean.

The Course has been designed with a good theoretical-practical balance that will allow participants to implement actions against the pest in their countries if necessary.

The Course Programme includes the following activities:

1. Theory and practice in identification of immature and adult stages.
2. Theory on the biology and ecology of the pest including population phenology, sexual communication, dispersion, geographical distribution, impact on *Opuntia* vegetation and rearing protocols.
3. Trip to the St. Marks Wildlife Refuge field station to observe damage on site and for demonstration of the monitoring techniques.
4. Visit to the USDA-ARS laboratories at Tallahassee to check trapping information and discuss aspects on radiobiology, host preference, monitoring and control strategies with emphasis on the SIT.

## FAO/IAEA Interregional Training Course on “The Use of the Sterile Insect and Related Techniques for the Integrated Areawide Management of Insect Pests” University of Florida, Gainesville, Florida, USA, 4 May to 8 June 2004.

Nominations should be submitted on the standard IAEA application form for training courses available on the web site: (<http://www-tc.iaea.org/tcweb/participation/astraine/default.asp>). Completed forms should be endorsed by and returned through the official channels (Ministry of Foreign Affairs, Ministry of Agriculture, National

Atomic Energy Authority, Office of the United Nations Development Programme or Office of the FAO). Nomination forms must be received by the IAEA, P.O. Box 100, A-1400, Vienna, Austria **not later than 5 January 2004**. A course prospectus is available upon request.

## New Look of the World-Wide Directory of SIT Facilities (DIR-SIT)

The database compiles information on biofactories mass-rearing insects for reproductive sterilization using ionizing radiation. The sterile insects can be used either in SIT programmes, as hosts for augmentative biological control or as a research tool to determine sperm precedence in mating insects.

In order to improve the search capacity and data browsing, new tools were added to the database presentation. However, the con-

tent of the database is still the same: production size, radiation process, quality control parameters, dosimetry, programme objective, trans-boundary shipment, field release data, and the contact address.

Furthermore, it is now possible to link any species datasheet in IDIDAS (Intl. Database on Insect Disinfestation and Sterilization) to the corresponding mass-rearing facilities in the DIR-SIT database.

## Example of data in the Directory of Mass Rearing Facilities (DIR-SIT)

International Database on Insect Disinfestation and Sterilization IDIDAS

Facilities Identity Production Irradiation QC Shipment Release Notes

Facility	City	Country	Entities	Objective
Infurtec Medfly Facilities	Stellenbosch	South Africa	Ceratitis capitata	

Edit

Type of irradiation source Co60

Model Panoramic

Initial capacity (Ci)/date 9500 Ci as of September 20, 1999

Type of dosimetry Fricke / Gafchromic

Frequency of dose measurement monthly

Radiosterilization dose (Gy) 90 Gy

Dose rate (Gy/hr)/date 540 Gy/hr. (November 10, 2001)

Temperature before irradiation (°C) 20-25 °C

Temperature at irradiation (°C) 20-25 °C

Atmosphere condition Air

Time of anoxia before irradiation (min) 60 minutes from packing at 8°C

Stage of insect treated Pupa

Age of the stage at irradiation (hours) 24-48 hours before emergence

Home | Bulletin Board | Statistics | Database | DIR-SIT | Contact Us | Glossary | References | Pictures | Tutorial | FAQs | FAO | IAEA

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Click here to view the entity record.

## Example of IDIDAS Datasheet

**International Database on Insect Disinfestation and Sterilization IDIDAS**

**Ceratitidis capitata**

[Factories and test facilities](#) | [Distribution](#)

**Class:** [Insecta](#)  
**Order:** [Diptera](#)  
**Family:** [Tephritidae](#)  
**Genus:** [Ceratitidis](#)  
**Species:** [capitata](#)  
**Synonyms:** [Ceratitidis citriparda](#) MacLeay; [Ceratitidis hispanica](#) De Breme; [Pardalaspis asparagi](#) Bezzi; [Tephritidis capitata](#) Wiedemann

**Common Names:** Mediterranean fruit fly, Medfly, Moscard, Doubabat al fakiha, la ceratite, Mittelmeerfruchtfliege, Mosca mediterranea della frutta, Mosca da fruta  
**Common Host:** Citrus, Coffee, Guava, Mango, Peach, Plum

**Last updated:** 26/6/2002  
**IDIDAS code:** CECAP  
**External links:** [EcoPort page for this Entity](#)

Life stage	Disinfestation	Sterilization									
<b>Egg</b>											
<b>Larva</b>	<table border="1"> <thead> <tr> <th>Treatment dose (Gy)</th> <th>Efficacy</th> <th>Ref</th> </tr> </thead> <tbody> <tr> <td>40 Gy instar 3 in artificial medium (most tolerant) no adult emergence</td> <td>&gt;99.997%</td> <td>●</td> </tr> <tr> <td>150 Gy generic dose for fruit fly (ICGFI)</td> <td>&gt;99.997%</td> <td>●</td> </tr> </tbody> </table>	Treatment dose (Gy)	Efficacy	Ref	40 Gy instar 3 in artificial medium (most tolerant) no adult emergence	>99.997%	●	150 Gy generic dose for fruit fly (ICGFI)	>99.997%	●	
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Click here to generate the navigation frame

The content is under the responsibility of editors from the respective facilities whose task is to regularly update the information over the Internet in accordance with the developments in their programme.

In this regard, we invite the subscribing editors, who have not yet done so, to kindly send us photos of their biofactory together with their feedback in order to improve the service.

### Call for contribution:

There's still a chance for you to send us information about your own insect mass-rearing facility and be part of the database. Contact: [A.Brakri@iaea.org](mailto:A.Brakri@iaea.org)

Many thanks to everyone who contributed so far.

## Revised version of the “Fruit Fly QC Manual”

After 5 years “in service”, the FAO/IAEA/ USDA Manual for Product Quality Control and Shipping Procedures for Sterile Mass-Reared Tephritid Fruit Flies has been thoroughly revised and its version 5.0 is now available for download on our website. Among major changes, the manual now contains a section dedicated to Dosimetry, some forms have been added and some tests have been updated and/or redesigned based on findings of the ongoing Coordination

Research Project on Quality Assurance of Mass Produced and Released Fruit Flies for SIT Programmes. This manual is a living document and, though we hope this version better fits the needs of the fruit fly rearing facilities, we expect to receive your feedbacks, comments and suggestions to improve the next version even further.

## **Farewell to Tsetse**

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A video clip on the eradication of tsetse from the island of Zanzibar is available in the IAEA website:

<http://www.iaea.org/worldatom/Press/Multimedia/Videos/tsetse.shtml>

## **The Griffith University in collaboration with the Australian-Asian International Fruit Fly Center announces a “Masters of Quarantine Studies”**

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Griffith University will offer a course work Masters Degree in Quarantine studies, starting from the 1<sup>st</sup> semester 2004. The course runs for one academic year, beginning either in February or July. It is based at Nathan campus in Brisbane, Queensland, Australia and is designed to prepare staff for employment at the technical and management level in quarantine services in Australia and Asia

Pacific region. For further information contact:

Professor R.A.I Drew  
Australian-Asian International Fruit Fly Center  
Griffith University, Nathan campus  
Brisbane, Queensland 4111, Australia  
E-mail: [D.Drew@griffith.edu.au](mailto:D.Drew@griffith.edu.au)

## **Recent SIT video now available in French and Spanish versions.**

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The English teaching video “The Sterile Insect Technique. An environment friendly method of insect pest suppression and eradication” is now also available in Spanish (La Técnica del Insecto Estéril)

and in French (La Technique de l’Insecte Stérile). Copies, in PAL, NTSC and SECAM formats, are available on request from the Section. Contact one of the secretaries to obtain a free copy.

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## **Insect Pest Control Newsletter**

The new Insect Pest Control Newsletter is the successor of the Insect and Pest Control Newsletter.

The IPC Newsletter is issued twice a year by the Insect Pest Control Section,  
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