

WORKING MATERIAL

CONSULTANTS GROUP MEETING ON

***RATIONAL SUPPLY OF STERILE FLIES FOR
MEDFLY SIT IN THE MEDITERRANEAN BASIN***

VIENNA, AUSTRIA

14 & 15 AUGUST 2000

NOTE

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CONTENTS

I.	Executive summary.....	1
II.	Background	3
III.	Meeting Objectives:	4
IV.	Report.....	4
V.	Conclusions	9
VI.	Attachments	11
A	Consultants.....	11
B	Cost Free participants	12
C.	IAEA Participants	14
D	Titles of presentations.....	15
E	Agenda	17

I. Executive summary

- The medfly, *Ceratitis capitata*, is a very damaging insect pest of citrus, stone fruit, pome fruit, figs, etc. in the Mediterranean Basin (MB)
- The current insecticide based method for medfly control is causing serious environmental and insecticide residue problems throughout the MB
- Producers, exporters, plant protection officials and environmentalists all are seeking ways to reduce insecticide usage against the medfly.
- The sterile insect technique (SIT) is a proven method of managing the medfly on an area wide basis. It is the only alternative to repeated insecticide treatments for medfly control. The SIT is environmentally friendly and little or no insecticide is involved in SIT based insect control systems.
- The SIT is routinely used against the medfly in Argentina, Chile, Guatemala, Mexico and the USA.
- The SIT is not used against the medfly in the MB. There is a medfly control programme being developed in Madeira, Portugal. A demonstration is currently underway in Israel. Valencia, Spain and Algarve, Portugal are planning SIT demonstrations or programmes. Morocco and Corsica (France) are considering SIT efforts. Other MB countries are known to be considering the SIT for use against the medfly.
- The major deterrent to using the SIT is lack of confidence that it really is effective and the perceived high cost of the technology. Efficacy has been repeatedly proven in the new world. Cost studies have clearly shown the SIT is not more expensive than insecticide based medfly control systems. Regardless demonstrations projects are required in the MB.
- The limiting factor to one or more SIT based medfly control demonstrations in the MB is lack of a source of sufficient numbers of sterile male medflies. The only medfly factory in the MB is in Madeira and is too small to provide sufficient sterile flies. Thus it is imperative that for rapid development of the SIT for medfly control in the MB, a large medfly factory is essential.
- The planned (IAEA supported) medfly factory in Slovakia is the only potential source of the 100 – 150 million sterile male medflies/week needed initially for SIT development in the MB. This commercial undertaking is scheduled to start producing medflies in 2003. Commercial enterprises have shown interest in other aspects of SIT for medfly control in the MB.

II. Background

The Mediterranean fruit fly, *Ceratitidis capitata*, is a major pest of fruit throughout the world, including the Mediterranean Basin (MB). The pest, commonly called the medfly, has well over 100 hosts, including citrus (except lemons and limes), stone fruit, pome fruit, figs, grapes and most tropical fruit. It is a major quarantine insect for some of the more important fruit importing countries, such as Japan and the USA.

There are only two methods of protecting fruit from medfly attack: repeated insecticide treatments and the sterile insect technique (SIT).

The medfly is usually controlled with repeated applications of insecticides, frequently 10 –12 per year. Insecticide residue limiting legislation, increased demand for organic food and environmental concerns are forcing fruit producers and exporters to seek alternative methods of controlling the medfly.

The SIT requires huge numbers of sterile male medflies for repeated aerial dispersal over the host and adjacent area. The sterile males mate with native females, resulting in no offspring; thus the population starts to decline. The SIT must be used on an area wide basis and requires central management. It is environmentally acceptable.

These sterile flies are produced (manufactured) in factories, several of which exist in the New World. None (except a small one in Portugal) exist in the MB.

The SIT is routinely used in several countries in the new World (Chile, Argentina, Guatemala, Mexico, USA), primarily as an eradication tool. However, it is now also used in California and Florida to prevent the pest from becoming established from accidental invasions.

The SIT is not used against the medfly in the MB, even though several successful small SIT pilot tests have been conducted over the past 20 years. The most common reasons given are high cost, lack of proven success and the attitude that insecticides are doing a good job so why change.

Recently several MB countries have approached the IAEA for assistance in developing the technology, including the construction of small medfly factories. The IAEA believes large factories to supply sterile medflies to several countries are much more economically than small individual national factories.

Of particular importance is the plan for a commercial medfly factory in Slovakia to eventually produce up to one billion sterile male medflies per week. Initially the target production level is one or two hundred million sterile flies per week. This facility could sell sterile medflies to MB organizations developing or using the technology. This undertaking is supported by the IAEA.

III. Meeting Objectives:

- A. The consultants and other participants were to determine the need for sterile medflies over the next 5 – 10 years.
- B. The most cost effective way to meet the demand for sterile medflies was to be identified.
- C. The numbers and locations of factories in the MB were to be suggested.
- D. The consultants were to propose the most efficient way to proceed with making available sufficient numbers of sterile male medflies at competitive prices so as to promote the SIT in the MB.

IV. Report

The presentations as listed in the Agenda (attachment E) were given and discussed on the first day of the meeting.

The second (final) day was devoted to detailed discussions.

A brief summary of the presentations and discussions follows.

Description of area wide control and the SIT were provided. It was emphasized that the SIT must be used in an area wide programme. The SIT cannot be used for local control, i.e. by individual producers. The SIT is routinely used in several countries for medfly eradication and prevention and is being developed for control.

The economics of the technique were presented based on data from the New World and a cost/benefit analysis made for a large medfly SIT programme in the Middle East. The Sit is very competitive with insecticides for medfly control even without considering environmental factors.

The maximum market for sterile medflies in the MB was estimated to be 50 – 75 billion per week. It was emphasized this is a maximum and that it was unlikely the figure would ever be reached.

The status of the proposed commercial medfly factory to be built in Slovakia was presented. A conceptual design for the physical plant has been produced, equipment requirements identified and costed, staff requirements estimated and costed, etc. A business plan is in draft form. Contacts with potential purchasers of sterile medflies have been established, and preliminary plans have been made regarding technical backstopping of operational programmes. This latter is essential for a successful enterprise, particularly one like the SIT, which requires a complete change in procedures.

The European Union (government) and CLAM (commercial) both supported the rapid development of the SIT for use against the medfly in the MB; the EU primarily because of environmental and insecticide residue problems with repeated insecticide medfly control procedures and CLAM because of public pressure to reduce insecticide use. Thus both

government and commercial interests recognize the essential need to reduce insecticide use for medfly control. Both are anxious that the SIT be evaluated in the MB on a practical scale. Thus both support, at least indirectly, the planned commercial medfly factory in Slovakia.

Reports were presented by representatives of 5 countries (Spain, Portugal, Morocco, Israel and France) about plans for medfly control programmes using the SIT. Other MB countries were not represented and no information on additional medfly SIT programmes was presented.

Spain

The province of Valencia has about 1,800 sq. km of citrus production area, about half of the total in Spain. Medfly is controlled with insecticide sprays. The producers are concerned about possible EU restrictions on insecticide use and residues resulting from medfly control. The Valencia provincial government has decided that the repeated applications of insecticides for medfly control is not compatible with tourism, a major industry in the area. Alternatives were reviewed, such as mass trapping, alternative chemicals (Spinosad, SureDye) and the SIT. The SIT was the only acceptable alternative to insecticide treatments against the medfly. An SIT demonstration is planned for about 60 sq. km. in Castellon Province.

The producers and plant protection practitioners are concerned about the perceived high cost of the SIT and the efficacy (as compared with insecticide sprays), and hence the need for an SIT demonstration.

The Spanish authorities are working with the staff of the planned Slovakia commercial medfly factory regarding a supply of sterile medflies. At present there are no plans to construct a medfly factory in Spain.

Portugal

The island province of Madeira has a developing medfly control programme. Based on the anticipated success of this, the province of Algarve has requested funds to initiate a similar programme. Included is a medfly factory. The citrus area in Algarve is about 18 sq. km. and receives from 8 –12 insecticide treatments annually. Tourism is the major industry and the extensive insecticide use does not mix well with tourism. Thus the local government wishes to use the SIT as a replacement for insecticide control of the medfly.

The plans are to collect the needed biological data during the next 2 – 3 years, plan the factory and then make a decision about constructing the fly factory and moving ahead with the programme. There is a strong determination that insecticide use in the Algarve must be reduced. The SIT for medfly control is the only possible method except eliminating citrus production.

Morocco

There are about 750 sq. km. of citrus in Morocco, scattered in several large areas throughout the country. Some are relatively isolated but most are adjacent or within areas where other hosts are common. The government and large

producers are concerned about insecticide residue restrictions imposed by importing countries. As citrus export is a significant foreign exchange earner, a reduction in insecticide use is required. The SIT is the only solution.

The first step would be a demonstration of SIT efficacy and a cost analysis of an SIT programme in parts of the citrus production areas. No specific plans are being developed, but the need is obvious.

Israel

Israel has a centrally managed medfly control programme to protect citrus. It is very successful, resulting in only about 0.05% of the harvested fruit infested with medfly. It is based on insecticide treatments. However, environmental concerns and insecticide residue problems are causing the Israelis to conduct an SIT demonstration. The sterile flies are purchased from Guatemala and transported by air (about 60 hours travel time). The SIT demonstration in Israel is part of a regional programme including Jordan and the Palestine Territories. To date it has been very successful and has encouraged the Israel officials to move ahead with planning other SIT demonstrations.

The primary concerns of the producers and exporters are cost and efficacy of the SIT. There are no plans to construct a medfly factory in Israel.

France (Corsica)

The government officials in Corsica are developing preliminary plans for using the SIT to control medfly on the island. Basic biological data are being collected. The island is similar to Madeira in that the medfly is present all year along the coastal areas and apparently absent in the central highlands. The plans are for a pilot trial in 2002. No medfly factory is foreseen in Corsica. The Corsica plans should be carefully reviewed by the IAEA as soon as possible.

It is obvious that the driving forces to consider the SIT for medfly control in the MB are environmental problems (frequently regarding the incompatibility of tourism and intensive insecticide use) and insecticide residues. The constraints preventing the immediate use of the SIT are lack of confidence in efficacy and perceived high cost.

Neither of these constraints can be eliminated without the availability of large numbers of sterile male medflies for SIT demonstration projects in the MB. The numbers initially required are from 100 to 300 million/week on a continuous basis.

Thus there is an urgent need for at least one large medfly factory in the MB.

Three commercial organizations reported on their potential interest in medfly SIT programmes in the MB.

K & K

K & K is a commercial concern primarily dealing with aerial services for SIT programmes. They operate in the USA, Mexico, Central America and Portugal

using twin-engine planes for aerial release of sterile medflies and screwworm flies. Their interest is thus in contracting to disperse sterile male medflies in the MB.

Prospero Biotech Ltd. & InSecta Ltd.

The UK biotech venture development company Prospero is involved in the biotech venture company, InSecta Ltd. InSecta intends to provide insect control programmes for agriculture, environment and healthcare. Included will be the SIT against the medfly. Other insects will be included later. The company is thus interested in the development of the SIT for medfly control in the MB.

Lallemand/Coltec

Lallemand is a privately held company that produces specialized yeast. Since the medfly larval diet uses large quantities of yeast to provide protein, the company is interested in the SIT development in the MB.

The company is working closely with a Guatemala company, Coltec, which is collaborating with the Guatemala medfly eradication programme with regard to supplying yeast. This programme currently rears about 800 million sterile flies/week and thus uses huge amounts of diet.

One of the R & D efforts of the company is to develop and market a standard larval diet that has no bulking agent and is totally consumed by the larvae during their growth period. This would eliminate the heat build up problem in medfly larval rearing and also the problem of disposing of used larval diet.

The detailed discussions on the use of the SIT in the MB are summarized below:

1. All parties involved in the use of the SIT for medfly control must understand the concept of area wide control. In local control, the producer treats his crop to protect it from medfly attack. In area wide control the target is the entire medfly population in the target area. Thus much of the treated area is not medfly host production area but back yard hosts, wild hosts (such as *Opuntia*), etc. Thus in area wide control a much larger area is treated than with local control.

Further, an understanding of the basic principles of the SIT is mandatory.

2. The SIT probably will be used initially in high quality citrus production areas. This is because of the size of the industry and pressure about the environment and insecticide residues. Also, the citrus producers are much better organized than other commodity groups.
3. The numbers of sterile male medflies required in the MB will be market driven. Several billion/week will be eventually required. However, the initial numbers required will depend on the size and number of demonstration projects conducted and the starting dates for practical use of the SIT.

4. Every effort should be made to reduce the number of demonstration projects to a minimum. The technology works and is cost effective when compared with insecticides. Certainly every country does not need a demonstration project.
5. It was generally agreed that the numbers of sterile male medflies needed to initiate demonstration projects in the MB, where needed, and to implement practical medfly control programmes in the MB was between 100 and 300 million/week. A start with 100 to 150 million/week would be acceptable with increased production as the market demanded.
6. The schedule for the Slovakia medfly factory is to produce 250 million steriles/week in 2003, about 36 months from August 2000. There will be a need for sterile male medflies before the Slovakia factory's production is scheduled to begin. This problem needs a solution.
7. Training the staff for the Slovakia factory will probably take place at a number of the factories in the New World and at the IAEA, Seibersdorf. Also, it is anticipated that the IAEA will provide technical support to the Slovakia Factory for several years, until it is fully operational with its own R & D staff.
8. The plans for the Slovakia medfly company to backstop the sale of sterile male medflies with field support are essential. The primary risk for the Slovakia sterile medfly factory is not selling enough sterile flies to make the undertaking profitable. Thus the company will provide strong field support for SIT programmes, either demonstration or practical, to insure sales.
9. There are few individuals in the MB that understand area wide control or the SIT. Without assistance, initial trials in the MB will likely fail. This should be avoided at all costs.
10. The discussions regarding why the SIT was so slow in being adapted in the MB revealed a number of reasons. However, the overriding reason was the reluctance of producers to change from proven insecticide treatments to the "unknown" SIT method. University plant protection scientists, plant protection organizations, exporters and EU officials have not supported the SIT in the MB.
11. However, the environmental problems of continuous insecticide applications, the restrictions on insecticide residues on citrus and other medfly hosts, the increasing demand for organic foods in the MB, the impending cancellation of permission to use malathion because of it being suspected to be a carcinogen, the EU efforts to reduce insecticide usage in all agriculture production systems, etc. have forced the citrus producers to seek medfly control systems that use little or no insecticide.
12. From an initial economic aspect, the availability of fruit grown under an SIT programme can probably be produced as organic and sold for a higher price than competitors. Since medfly control costs are the same or even less with SIT, the increased profits will rapidly increase SIT use.
13. One point not discussed was insecticide resistance. The medfly has never developed resistance to any insecticide. The organophosphorous materials are almost exclusively

used for medfly control. However, the probable loss of permission to use malathion has resulted in seeking alternative materials. The most likely replacement for malathion is Spinosad, a fermentation product with less negative environmental impact than malathion. However, there is no guarantee that the medfly will not become resistant to Spinosad. Resistance occurs when insecticides are used repeatedly against a large part of an insect population. Medfly resistance to Spinosad would be serious.

14. The management of SIT programmes in the MB must be well planned. Centrally managed insect control programmes are not common in the MB. Extensive training, both formal and on the job, will be required. Well-organized training courses and written material will be needed. The IAEA should play a leading role, possibly as a regional project, in this matter.
15. A public relations programme targeted at producers must be initiated to help overcome producer reluctance to adopt SIT. Commodity group organizations could lead this effort.
16. Public relations programmes also are required for each medfly SIT programme because they are large, centrally managed, visible to the public and new and different than previous insect control systems.
17. The legal aspects of shipping living insects, guarantees of sterility when selling sterile flies, guarantees of fly quality, insurance against failure of centrally managed programmes which use the SIT, etc. were briefly discussed as factors important to developing the medfly SIT programmes in the MB.
18. In conclusion, large numbers of sterile male medflies are urgently needed in the MB to initiate medfly SIT programmes. These programmes must be well planned and executed to produce acceptable results. Funding from governments will be required during the transition from insecticide control to SIT control. Technical, managerial and social expertise is required; much of this is not available in the MB, thus extensive training is needed. A source of sterile male medflies, such as the Slovakia medfly factory, is essential to develop the SIT for medfly control in the MB.

V. Conclusions

1. The SIT is needed as a tool for medfly control in the Mediterranean Basin (MB).
2. The primary deterrent to rapid development of the SIT for medfly control in the MB is lack of a source of sufficient numbers of sterile male medflies.
3. The planned medfly factory in Slovakia can solve the sterile medfly shortage but their planned production schedule is somewhat late.
4. Extensive training programmes will be required to insure technical, managerial and social expertise is available within the MB for successful implementation of area wide medfly control programmes using the SIT.

5. Public relations activities will be required to obtain support for medfly SIT programmes from producers, exporters, financial institutions, environmentalists and the general public.

VI. Attachments

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C. IAEA Participants

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Andrew Parker

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D Titles of presentations

SIT- Insect and Pest Control Programme

Dr. Jorge Hendrichs

Economics of Area-wide Fruit Fly Control

Dr. Enkerlin

Potential demand for sterile flies in the Mediterranean Basin.

Mr. Parker

Business Plan for a Commercial Sterile Insect Mass Rearing Facility in the Republic of Slovakia

Dr. Novotný/Dr. Kozanek/Mr. Beans

Sterile Insect Mass Rearing Facility in the Slovak Republic

Dr. Huber

Algarve-Med, SIT Control against Medfly in Algarve (Ceratitis capitata Wied.)

Dr. E. Fernandes

Industry Perspectives on Management of Fruit Flies in the Mediterranean

Dr. Davidson

Rational Supply of Sterile Flies for Medfly SIT in the Mediterranean Basin – Moroccan perspective

Dr. Al-Bashir Nadori

The Technique SIT in Corsica

Dr. Lecat

InSecta Ltd.- A Biotech Venture that Aims to Control Pests and Diseases with Insects

Dr. Goldsmith

Aircraft Operations in Sterile Insect Technique Programme

Mr. Kenneth D. Slagell

Copies of these presentations may be requested from the Insect Pest Control office.

E **Agenda**

Chairman: Dr. D. A. Lindquist

Monday, 14 August

09:00	Administrative Matters	Mr. Parker
09:15	Introduction and objectives	Dr. Hendrichs

Background information:

09:30	Economics of area wide fruit fly control	Dr. Enkerlin
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10:30 *Coffee Break*

11:00	Potential demand for sterile flies	Mr. Parker
11:30	Feasibility study for an insect mass rearing and sterilization facility in Slovakia	Dr. Novotný/Dr. Kozanek

12:30 *Lunch*

International perspective on the future of SIT for medfly control in the Mediterranean basin area:

13:30	European Union	Dr. Huber
13:45	CLAM	Dr. Ramón

Assessment of the prospect for medfly SIT, including likely time frame and demand for flies:

14:00	Spain (Valencia)	Dr. Giménez
14:20	Portugal (Algarve)	Dr. Fernandes
14:40	Morocco	Dr. Nadori
15:00	Israel	Dr. Davidson
15:20	<i>Coffee Break</i>	

15:40	France (Corsica)	Dr. Lecat
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Commercial interest in medfly production and control:

16:00	K & K	Mr. Slagell
16:20	Prospero	Dr. Goldsmith/Dr. Gardiner
16:40	Lallemand/Coltec	Dr. Degré/Dr. Busto

Tuesday, 15 August

Discussion 0900 – 1700 hrs