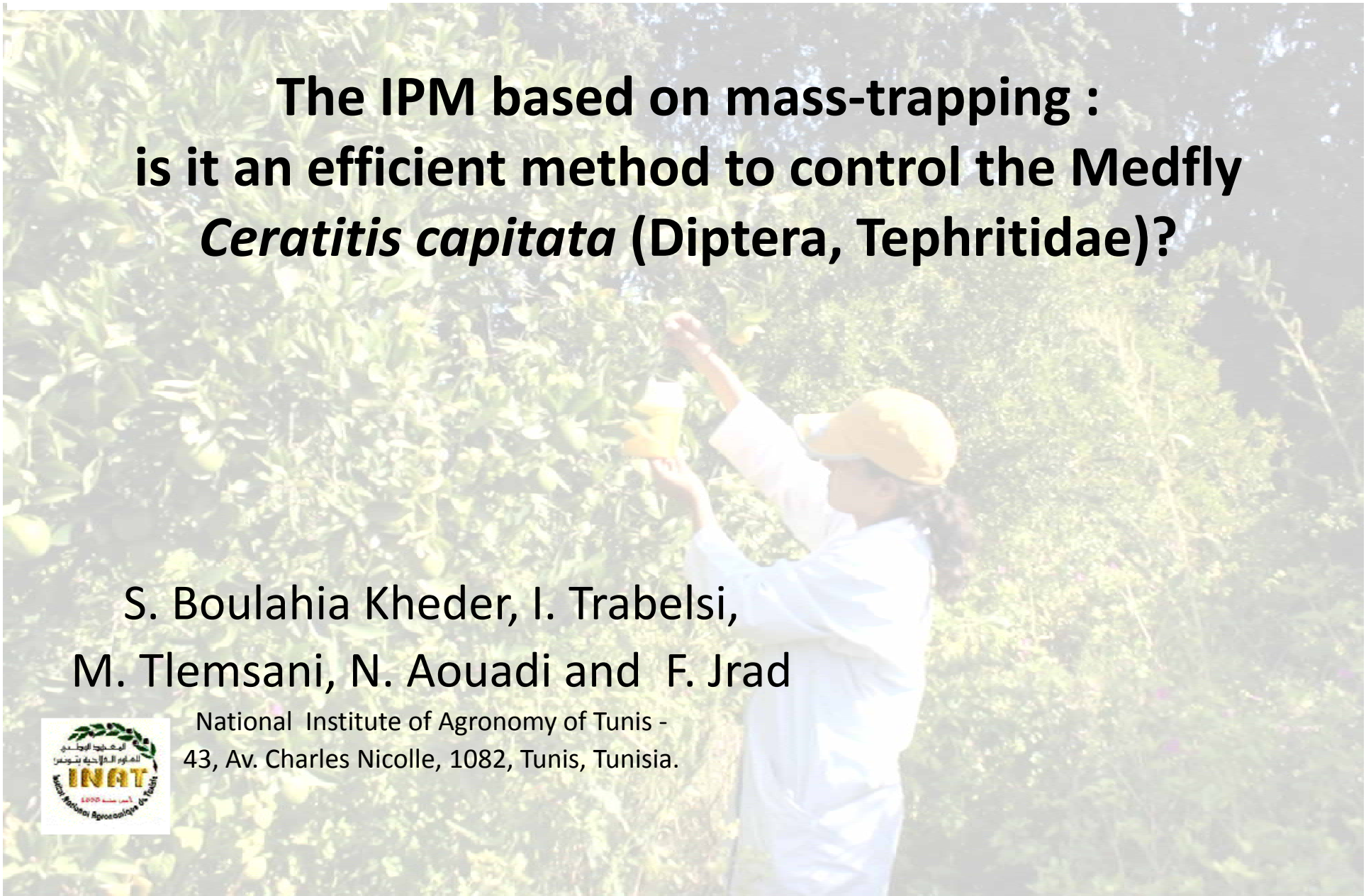
Regional Symposium on the Management of Fruit Flies in Near East Countries, 6-8 Nov. 2012, Hammamet, Tunisia

The IPM based on mass-trapping : is it an efficient method to control the Medfly *Ceratitis capitata* (Diptera, Tephritidae)?



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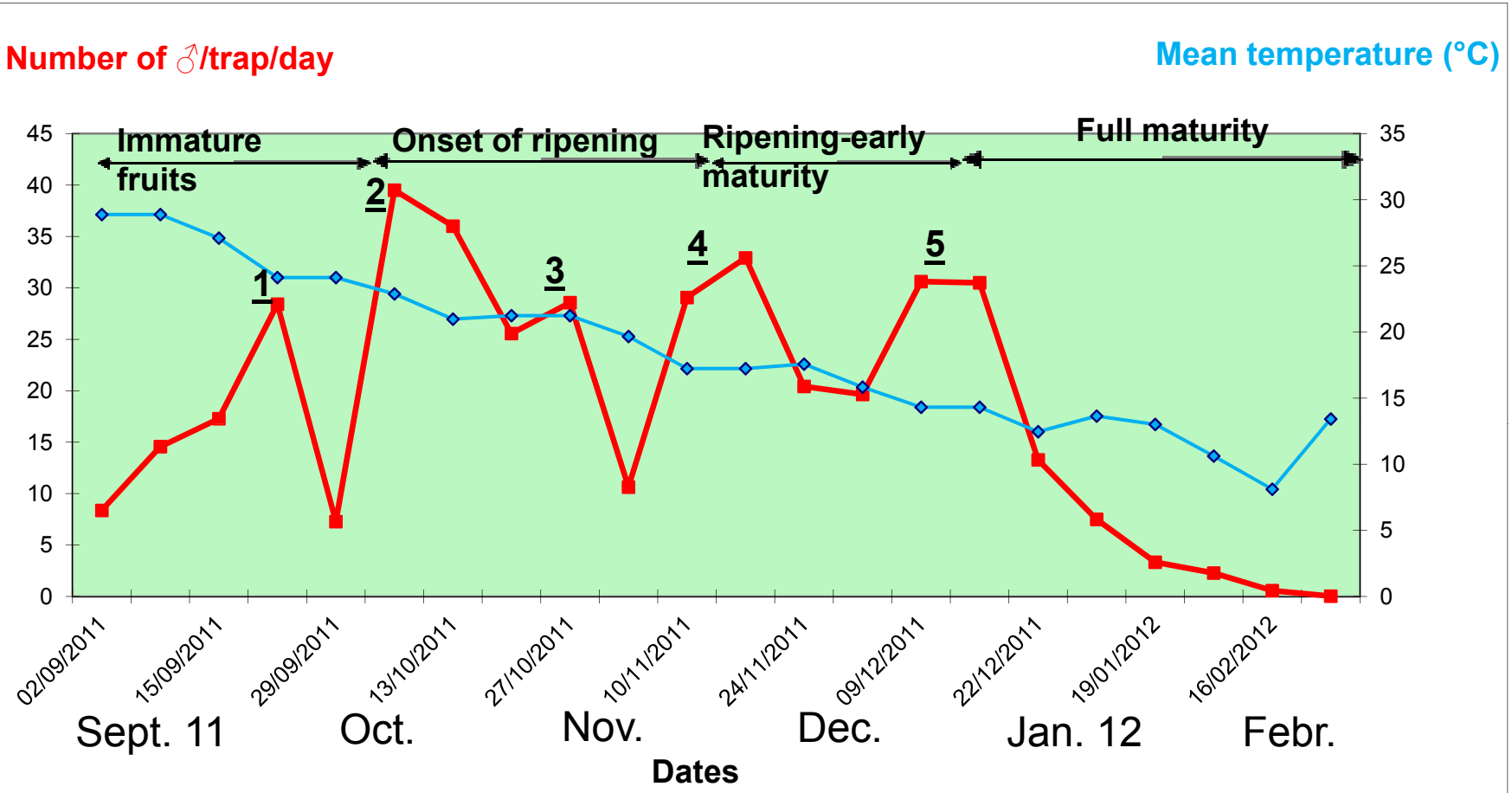
The Medfly: a major *Citrus* pest in Tunisia

- **High polyphagy**

- **Polyvoltinism**



Evolution of *C. capitata* population level on oranges Thomson at Mornag

- 5 generations / 6 months on Citrus fruits
- Highest densities of Medfly in the ripening period

The Medfly: a major *Citrus* pest in Tunisia

- High polyphagy
- Polyvoltinism
- High economic losses (quality and quantity)

The Medfly: a major *Citrus* pest in Tunisia

- High polyphagy
- Polyvoltinism
- High economic losses (quality and quantity)
- Frequent chemical treatments required

Control of medfly in Tunisia : current situation

✓ Until now control based mainly on chemicals: Malathion, Dimethoate, Deltamethrine

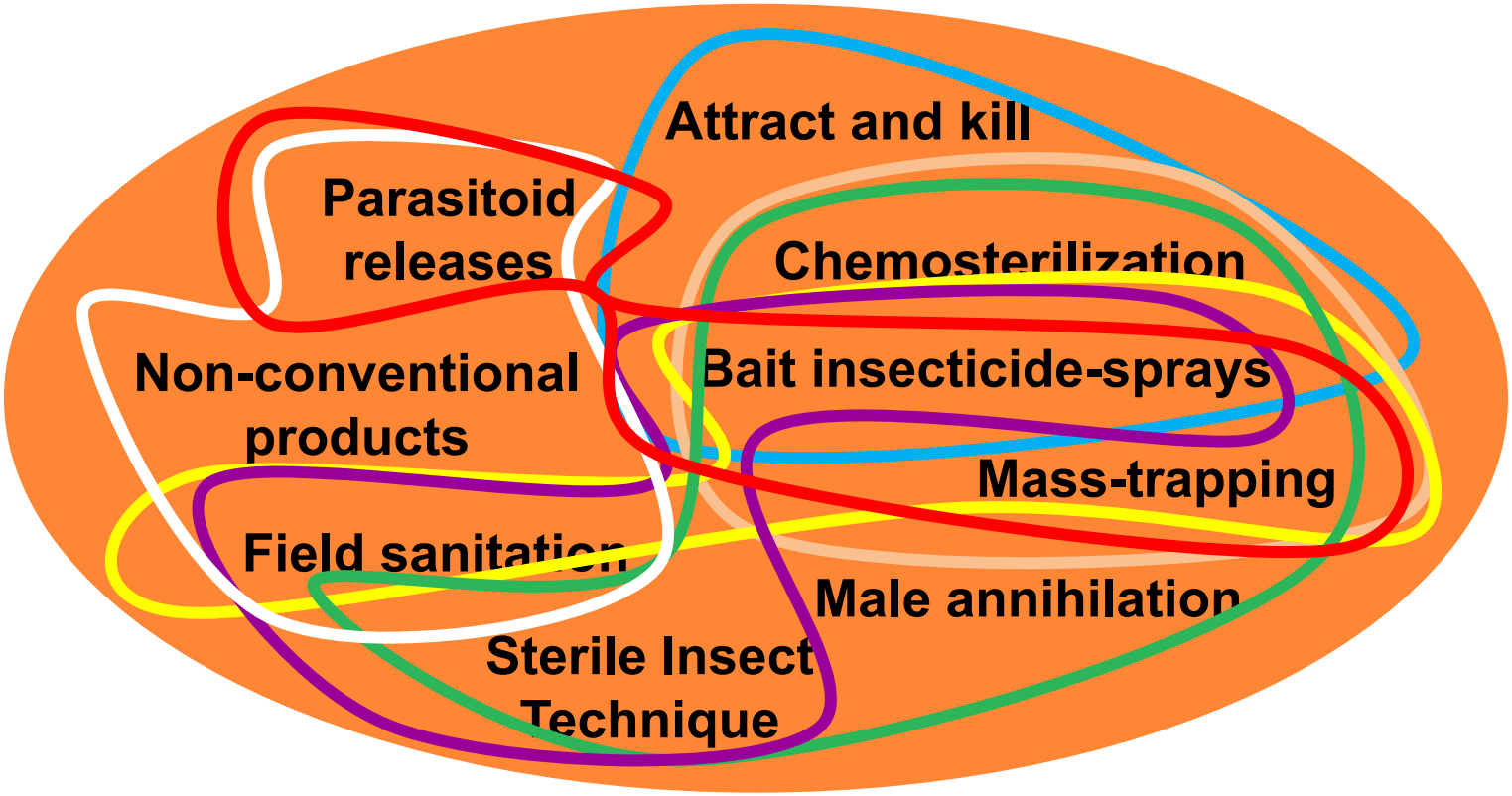
✓Rationalized methods, (localized treatments, biopesticides/ spinosad), alternatives methods little used

Several disadvantages….

Why should we reduce the use of pesticides?

- High risk for human health (farmers and consumers)
- Toxicity toward biodiversity, useful insects
- Environmental pollution
- Increasing development of resistance
- Chemical control not completely effective / very expensive
- Malathion: removed from the European market (decision 2007/389/CE)

It’s necessary to develop alternative methods to control the medfly



Which to choose? How to use ? To combine ?

The mass-trapping technique

Objective

To capture the maximum of ♀ of Medfly in an area

How ?

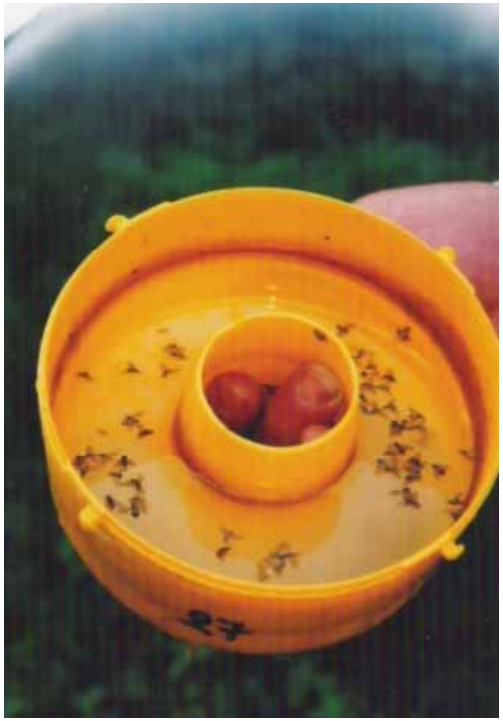
- By placing a high density (≈ 50 / ha) of food-baited traps (type Mac Phail)
- Start mass-trapping early at low populations of Medfly and before the ripening of fruits

First step (2006 – 2007):
using only the mass-trapping

- On summer fruits then oranges Thomson
- Traps manufactured in Tunisia then Mc Phail at 40 traps/Ha
- Bait: Diammonium Phosphate

Traps

Bait : DAP solution



Results of first step (2006 – 2007):
using only the mass-trapping

- **Insufficient protection of fruits: 20-34% of punctured fruits**

- **Short action (7 days) of DAP and non-selective to non-target insects**

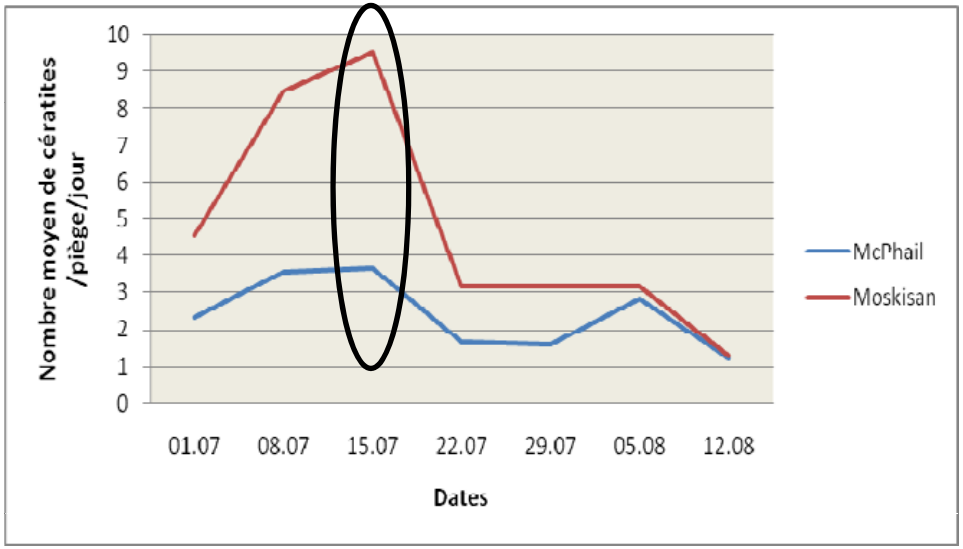
The MT must be combined with other measures / sanitation in IPM programs and the attractants should have longer duration and be more selective

Next step (2008 – 2012):

IPM programs based on mass-trapping

- On oranges Thomson
- Mc Phail® / Moskisan® traps at 40 traps/Ha
- Biolure® Tripack **(AA, TMA, P)**

	Traps	
	McPhail	Moskisan
Nbre medfly/trap/day	2,41 b	4,74 a



Best performances of captures with Moskisan® traps / Mc Phail ®

Next step (2008 – 2012):
IPM programs based on mass-trapping

Which methods ?

Program 1

- Mass-trapping (MT)
- Sanitation
- Rationalized treatments (RT)

Program 2

- MT
- Sanitation
- Chemosterilization
- RT

Program 3

- MT
- Sanitation
- GA_3 applications
- RT

When ?

On immature oranges Thomson before ripening and when the population is still low (mid-august)

Where ?

Cap-bon region

- **Main *Citrus* production area**
- **22 000 Ha**
- **350 000 T in 2011/12**

How ?

- **Mass-trapping**

40 Moskisan® traps/Ha baited by Biolure®, south-east, 2m


Mass-trapping using
Moskisan® traps

How ?

- **Mass-trapping**

40 Moskisan® traps/Ha baited by Biolure®, s-e, 2m

- **Sanitation**

Collecting of dropped fruits 2 times/week

Field sanitation by eliminating dropped fruits

How ?

- **Mass-trapping**

40 Moskisan® traps/Ha baited by Biolure®, s-e, 2m

- **Sanitation**

Collecting of dropped fruits 2 times/week

- **Chemosterilization**

20 chemosterilants traps/ha baited by Trimedlure, Biolure and Lufenuron gel


Chemosterilants traps
Address®

How ?

- **Mass-trapping**

40 Moskisan® traps/Ha baited by Biolure®, s-e, 2m

- **Sanitation**

Collecting of dropped fruits 2 times/week

- **Chemosterilization**

20 chemosterilants traps/ha baited by Trimedlure, Biolure and Lufenuron gel

- **GA_3 applications**

1g of Gibbelex/hl at early july and august (6 cm Ø fruits)

Oranges without GA_3

Oranges with GA_3

2 applications of GA_3 on oranges Thomson → ripening delay of 3 weeks → escaping to Medfly attack

How ?

- **Mass-trapping**

40 Moskisan® traps/Ha baited by Biolure®, s-e, 2m

- **Sanitation**

Collecting of dropped fruits 2 times/week

- **Chemosterilization**

20 chemosterilants traps/ha baited by Trimedlure, Biolure and Lufenuron gel

- **GA_3 applications**

1g of Gibbelex/hl at early july and august (6 cm Ø fruits)

- **Rationalized treatments**

Monitoring of the population level by traps and treatments made if threshold reached (0,5-3 MPTD with spinosad or OP)

Rationalization of treatments

Monitoring the Medfly level

When the threshold is reached

Treatment is carried

IPM programs based on mass-trapping
Assessment of efficiency

- **On the medfly population level**

By monitoring the population weekly (delta or Moskisan) in treated plots and control

- **On the fruit damage**

By assessing the punctured fruits (%) on marked ones from the ripening until the harvest (400 fruits in average checked weekly)

IPM programs based on mass-trapping

Results

Results of IPM programs based on mass-trapping against *C. capitata*

IPM programs	Punctured fruits (%)	
	with IPM	Control
1 [Sanitation + MT + RT]	10	30
2 [Sanitation + MT + Chemost. + RT]	16	51
3 [Sanitation + MT + GA_3 + RT]	12	37

IPM programs based on mass-trapping and other measures protected fairly well oranges Thomson lowering Medfly damage at the harvest to 10-16%

Next step (2010 – 2011):

Large-scale expansion of IPM based on mass-trapping

- Application of IPM on an area of 300 Ha (Takelsa) from mid-august

- IPM:
  - **Mass-trapping** with Moskisan® traps at 40/Ha
  - **Field sanitation**
  - **4 aerial sprays** with spinosad when threshold reached

- Assessment of the efficiency of the IPM by monitoring the Medfly level and the punctured fruits (%) weekly from ripening until the harvest

Large-scale expansion of IPM based on mass-trapping

Results

Results of IPM programs based on mass-trapping against *C. capitata*

IPM program	Punctured fruits (%)	
	with IPM	Control
[Sanitation + MT + RT*]	5	30

* Rationalized treatments were aerial mainly or by ground

IPM programs based on mass-trapping, spinosad aerial sprays protected well oranges Thomson lowering damage at the harvest to 2-8%

Final step (2011 – 2012):

Testing IPM based on mass-trapping in organic orchard

IPM program

- **Mass-trapping** with Moskisan®, Flycap® at 40/Ha and Ceratrap® at 100/Ha


Mass-trapping using
Ceratrap system®


Mass-trapping using
Flycap system®
10

Final step (2011 – 2012):

Testing IPM based on mass-trapping in organic orchard

IPM program

- **Mass-trapping** with Moskisan®, Flycap® traps at 40/Ha and Ceratrap® at 100/Ha
- **Field sanitation**
- **Ground sprays** only with spinosad when threshold reached

Spinosad treatment

- Localized in the center of canopy
- 1 row/3
- 1 L/Ha

Final step (2011 – 2012):

Testing IPM based on mass-trapping in organic orchard

IPM program

- **Mass-trapping** with Moskisan®, Flycap® traps at 40/Ha and Ceratrap® at 100/Ha
- **Field sanitation**
- **Ground sprays** with spinosad when threshold reached

Assessment of IPM efficiency →

- by monitoring the Medfly level
- and the punctured fruits (%) weekly from ripening until the harvest

Testing IPM based on mass-trapping in organic orchard

Results

Results of IPM program based on mass-trapping against *C. capitata*

IPM program	Punctured fruits (%)	
	with IPM	Control
[Sanitation + MT + RT]	1-2	20

- IPM program based on mass-trapping, 6 spinosad sprays protected very well oranges Thomson in an organic orchard with only 1-2% damage at the harvest
- No significant difference between the 3 systems tested

Conclusions

- **IPM based on mass-trapping, field sanitation and rationalized treatments is efficient to control the Medfly on *Citrus***
  → the areas treated by chemicals could be reduced

- **Several trapping systems are available in Tunisia and can be used in such programs,**

- **However the success of IPM is closely linked to the cooperation and support of the farmers who need to be trained.**

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Thanks for your attention