International Organisation for Biological and Integrated Control of Noxious Animals and Plants (IOBC)
West Palaearctic Regional Section (WPRS)
Organisation Internationale de Lutte Biologique et Intégrée contre les Animaux et les Plantes Nuisibles (OILB)
Section Régionale Ouest Paléarctique (SROP)

IOBC-WPRS
OILB-SROP

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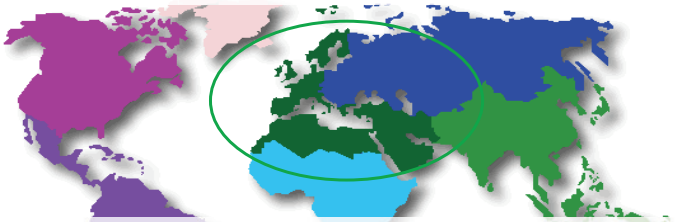
Links & Download
IOBC/WPRS Home
IOBC Global Home
http://www.iobc-wprs.org

Structure of IOBC Global and IOBC/WPRS

IPM activities of IOBC-WPRS for the control of fruit flies in Europe



Sylvia Blümel
Austrian Agency of Health and Food Safety
Spargelfeldstr. 191, A-1220 Vienna, Austria
IOBC/WPRS
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Regional Symposium on the Management of Fruit Flies in Near East Countries
Hammamet, Tunisia, 6-8 November 2012

IOBC-WPRS

SURVEY

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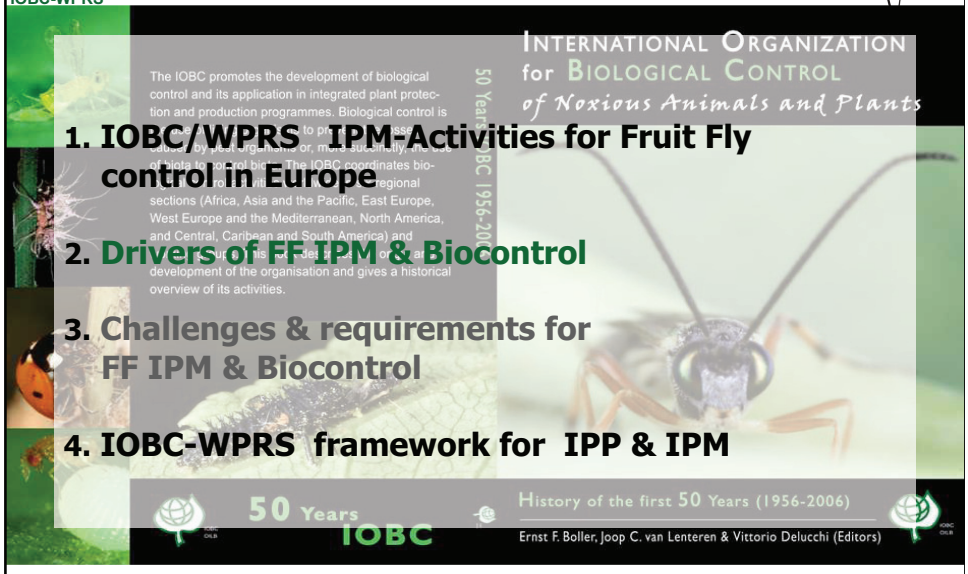
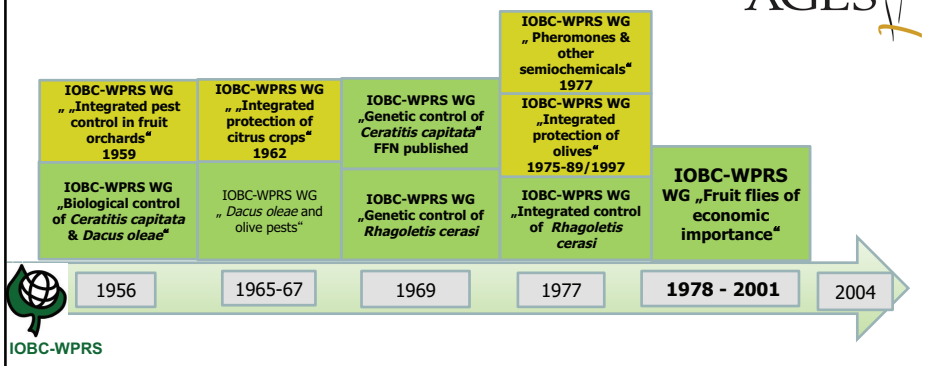


1. **IOBC/WPRS IPM-Activities for Fruit Fly control in Europe**
2. **Drivers of FF IPM & Biocontrol**
3. **Challenges & requirements for FF IPM & Biocontrol**
4. **IOBC-WPRS framework for IPP & IPM**

Historical development of IOBC-WPRS
IPM/BioControl - Activities for fruit fly control



Source: International Organisation for Biological Control: History of the frist 50 Years (1956-2006). Eds. Boller, van Lenteren & Delucchi

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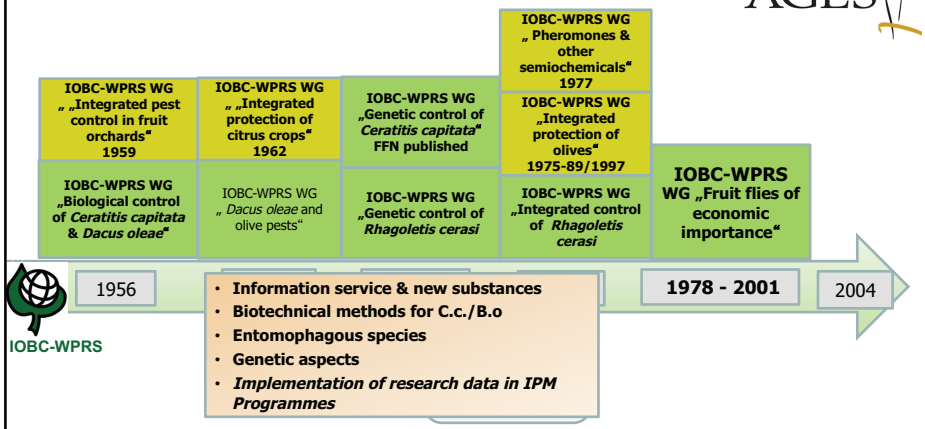

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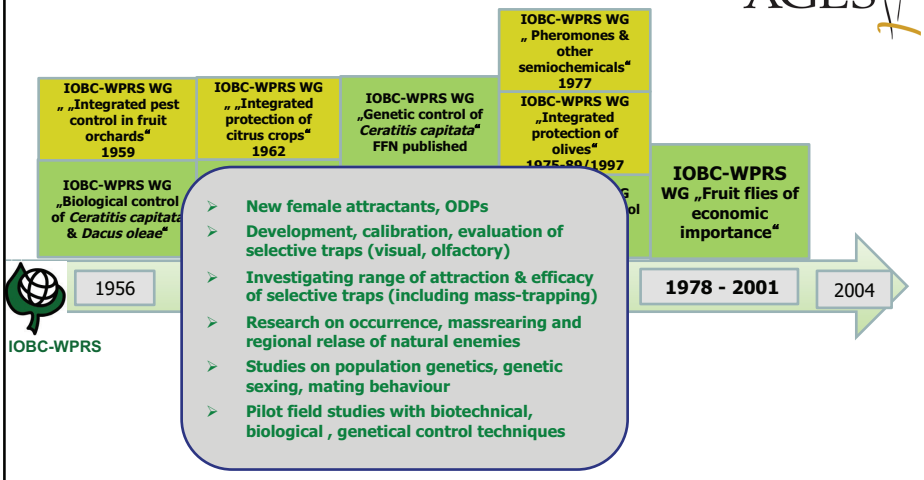

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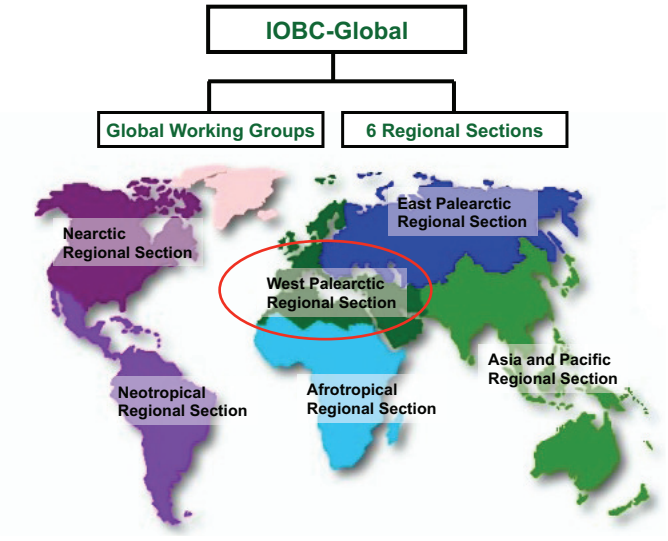
IOBC organisation



www.ages.at

Historical development of IOBC-WPRS IPM/BioControl - Activities for fruit fly control

AGES

IOBC-WPRS WG „ „Integrated pest control in fruit orchards“ 1959

IOBC-WPRS WG „Biological control of *Ceratitis capitata* & *Dacus oleae*“

IOBC-WPRS WG „ „Integrated protection of citrus crops“ 1962

IOBC-WPRS WG „ *Dacus oleae* and olive pests“

IOBC-WPRS WG „Genetic control of *Ceratitis capitata*“ FFN published

IOBC-WPRS WG „Genetic control of *Rhagoletis cerasi*

IOBC-WPRS WG „ Pheromones & other semiochemicals“ 1977

IOBC-WPRS WG „Integrated protection of olives“ 1975-89/1997

IOBC-WPRS WG „Integrated control of *Rhagoletis cerasi*

IOBC-WPRS WG „Fruit flies of economic importance“

TEAM

1956 | 1965-67 | 1969 | 1977 | 1978 - 2001 | 2004

IOBC-WPRS

IOBC-Global 1971

IOBC- Global WG „Fruit flies of economic importance“ 1986

Tephritid Workers Database TWD

Source: International Organisation for Biological Control: History of the frist 50 Years (1956-2006). Eds. Boller, van Lenteren & Delucchi

IOBC-WPRS

IOBC/WPRS WGs & Commission currently involved in fruit fly IPM/BioControl R&D

AGES

IOBC/WPRS WG Integrated protection of olive crops

IOBC/WPRS WG Integrated protection of citrus crops

IOBC/WPRS WG “Pesticides and beneficial organisms”

IOBC/WPRS WG “Integrated protection of fruit crops” SG Stone fruits

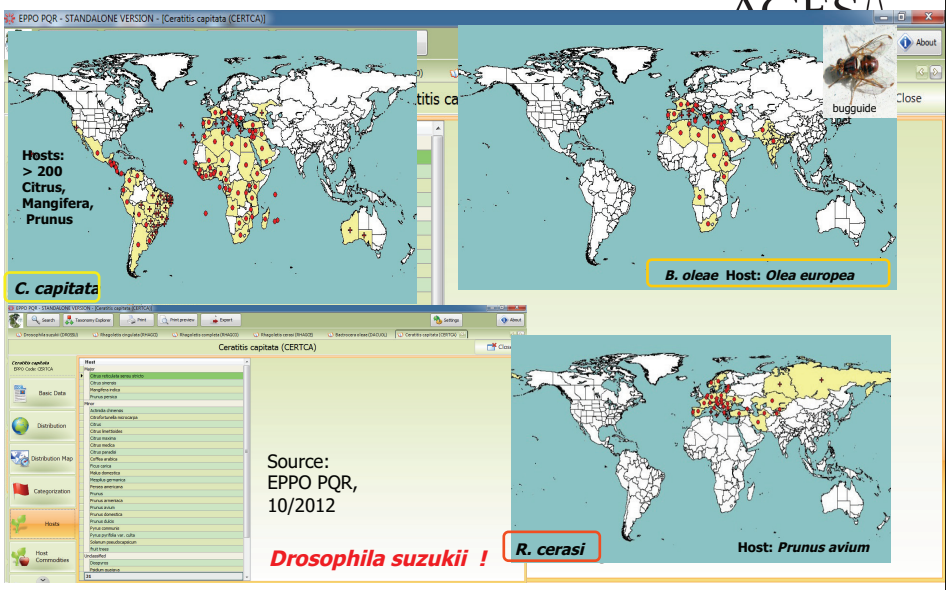
IOBC/WPRS WG Insect pathogens and entomoparasitic nematodes

IOBC/WPRS WG “Pheromones and other semiochemicals”

IOBC/WPRS Commission Integrated Production guidelines & endorsement

IOBC/WPRS Commission on Harmonized Regulation of BCAs

Major FF – species for R &D IOBC-WPRS



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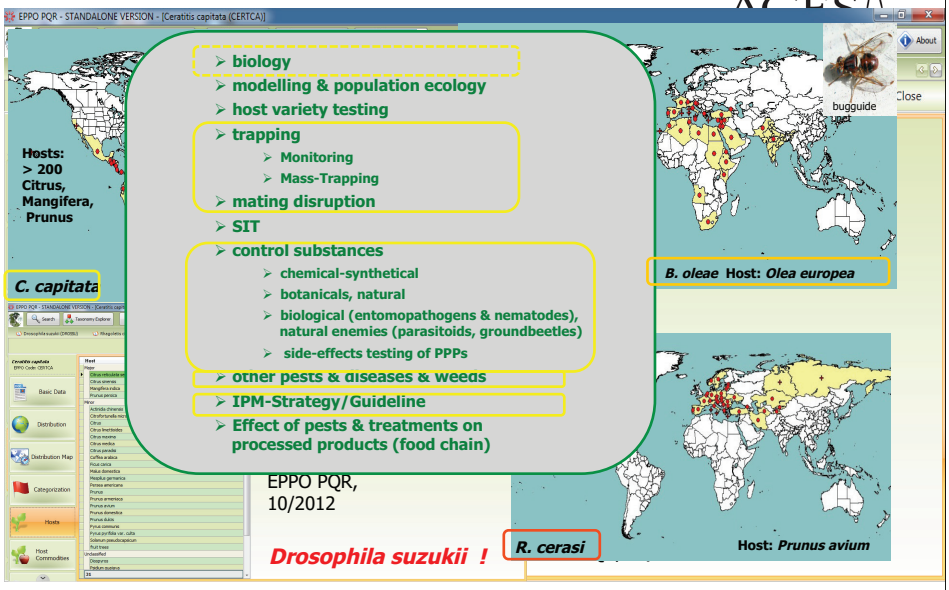

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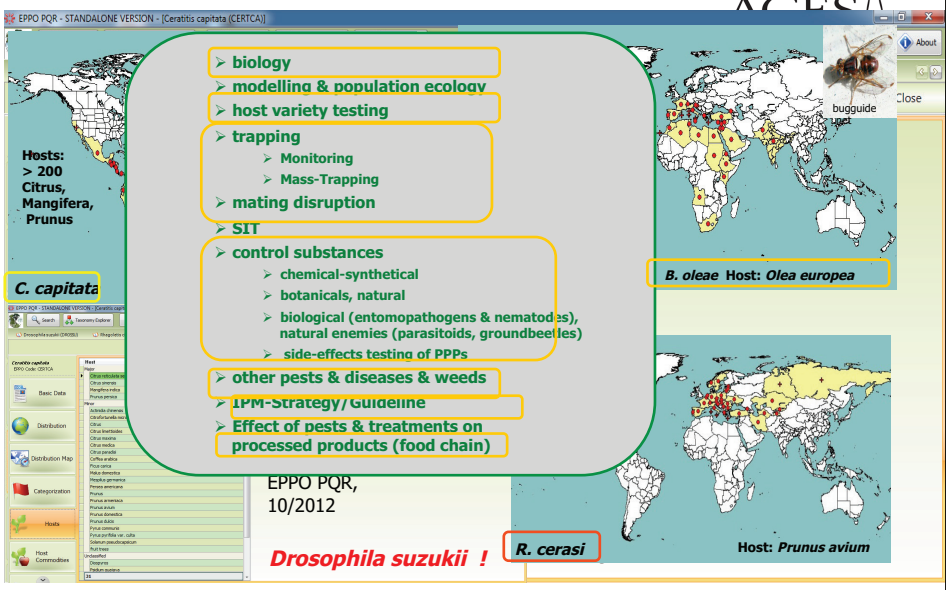

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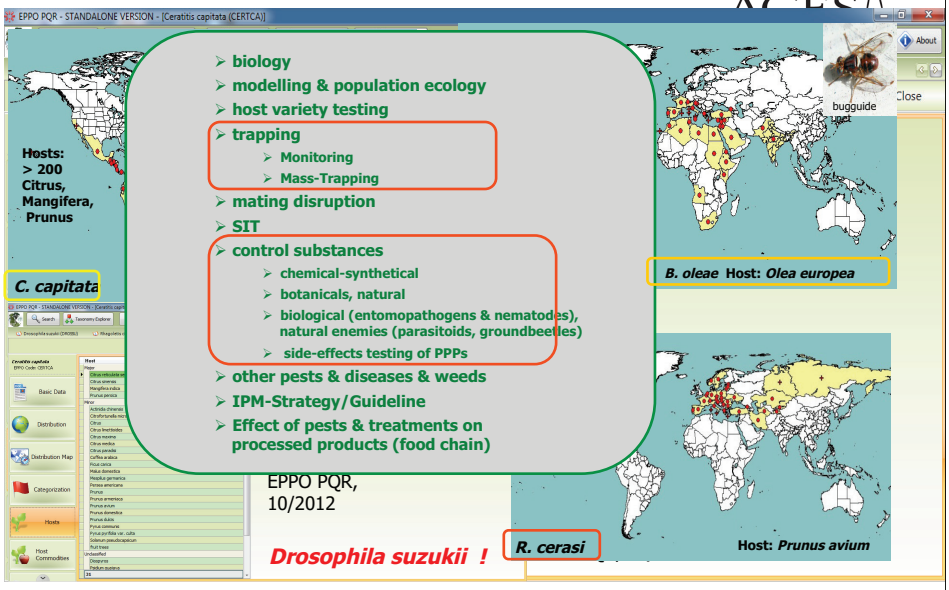
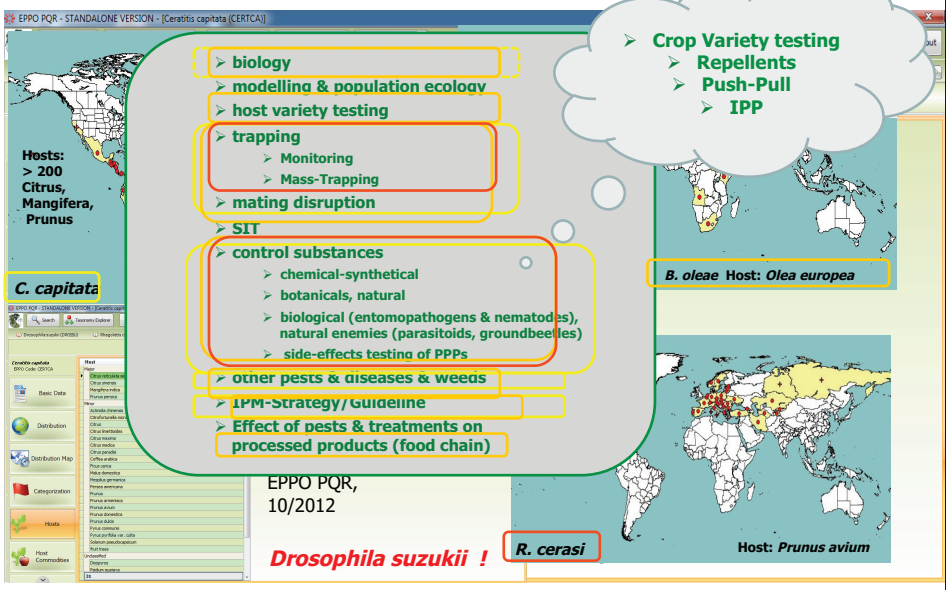


Major FF – species for R &D IOBC-WPRS



IOBC-WPRS

Focus WG activities IOBC-WPRS: ➡ crop related - IPM/IPP

AGES

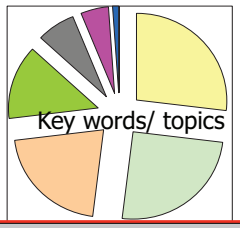
locality	date	participants	oral	poster	published
Lisbon	September 2005	105	27	38	37
Catania	November 2007	129	40	66	48

Number of communications

	2005 Lisboa	2007 Catania
California Red Scale	4	20
Medfly	19	17
Plant pathogens	2	10
Mites	8	8
Citrus Leafminer	4	7
Citrus mealybug	3	4

Source: Garcia-Mari, WG IPM Citrus2009

main topic	% of presentations 2008	2004
arthropods	66	77
diseases	27	9
cropping systems	7	14



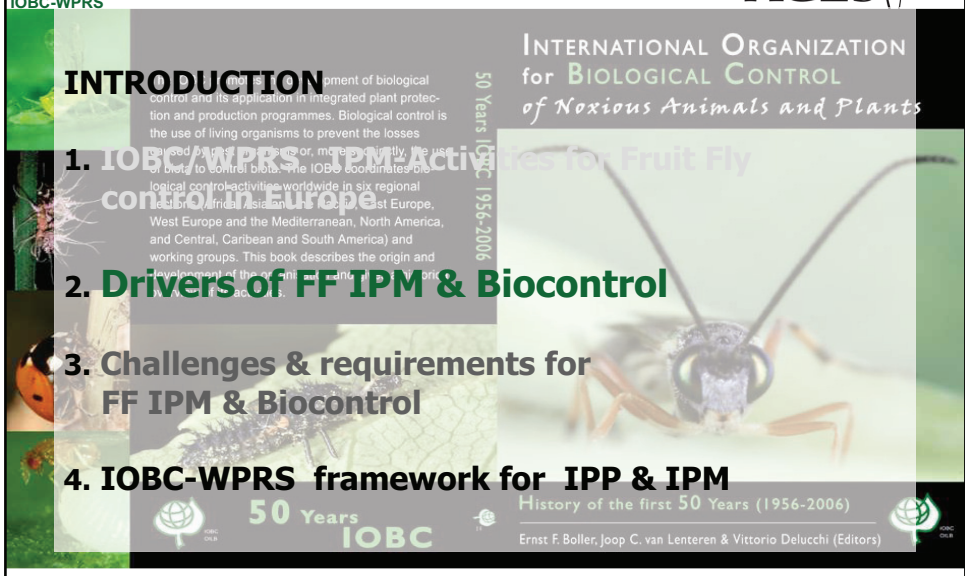
key words	% of presentations 2008	2004
integrated control/threshold/sampling	27	21
behavior/population dynamic and epidemiology/modeling	25	15
biological control/side effect on beneficials	21	18
semiochemicals development	14	36
organic production	7	5
biodiversity/habitat manipulation	5	2
area wide control strategy	1	2

Source: Ioratti, IPM orchards 2009

IOBC-WPRS

SURVEY

AGES



INTRODUCTION

1. IOBC/WPRS IPM Activities for Fruit Fly control in Europe
2. Drivers of FF IPM & Biocontrol
3. Challenges & requirements for FF IPM & Biocontrol
4. IOBC-WPRS framework for IPP & IPM

2. DRIVERS of FF IPM & BioControl

AGES

- **reduced availability** of **PPPs**
- **reduced portfolio variability** of **PPPs**
  - e.g. increase of arthropod resistance to pesticides
- **increase of new/invasive/emerging pest species**
- **Impact of the Regulation (EC) 1107/2009** concerning the placing of plant protection products on the market **& of the Sustainable Use Directive (2009/128/EC)**
- **Stakeholder demands**

The EU Directive on the Sustainable Use of pesticides

- The EU framework directive on the sustainable use of pesticides (Dir. 2009/128) obliges EU member states to develop National Action Plans (NAP) by 2013.
  - The objective of these plans is to implement and support IPM (including spraying machinery check).
  - This development increases strongly the interest in IP and IPM.
  - The annex 3 of the framework directive gives an overview of IPM and steps that should or could be taken by the member states.
  - The descriptions are fully in line with IOBC publications (notably the general IP guidelines).

© IOBC WPRS, Commission "guidelines for integrated production"

Potential effects of Directive 2009/128/EC on risk management of pest organisms

Risk management measure	+ (?)	- (?)
PREVENTION	✓ IPM as basic principle ✓ increased capacity building	
SURVEILLANCE	✓ IPM as basic principle ✓ obligatory monitoring in production with low pesticide input ✓ increased capacity building	
ERADICATION CONTAINMENT CONTROL (OUTBREAK)	✓ acceleretion of authorization of new PPPs ✓ regionally „same“ PPPs in EU ✓ derogations in „emergency cases“ ✓ IPM as basic principle ✓ application (-techniques) qm ✓ plant protection application licence ✓ increased capacity building ✓ research: alternatives to „conventional“ PPPs	! more selective PPPs ! prohibition/ restriction of use of PPPs in sensible areas ! prohibition of specific application techniques

Drivers for Farmers
to adopt IPM & BIOCONTROL

AGES

- ☺ **no/reduced exposure to pesticides**
- ☺ **no/low phytotoxic effects** on (young) plants & no premature abortion of flowers and fruit **(increase yield quantity & quality)**
- ☺ **sustainable control effect**
- ☺ **no/low development of resistance against PPP**
- ☺ **easy to apply, no expensive/specific equipment necessary**
- ☺ **low time consumption**
- ☺ **no/low detrimental effect to the environment**
- ☺ **no safety period between application and harvest**
- ☺ **no/low residues of pesticides on the marketed product**

Other stakeholder Demands
(Retailers, Consumers, Public)
as drivers **of IPM BIOCONTROL**

AGES

- ☺ **No/low pesticide residues on food**
- ☺ **Low risk of food, water & environmental pollution**
- ☺ **Contribution to sustainable food production**
- ☺ **Contribution to protection or even improvement of biodiversity**

IOBC-WPRS

SURVEY

AGES

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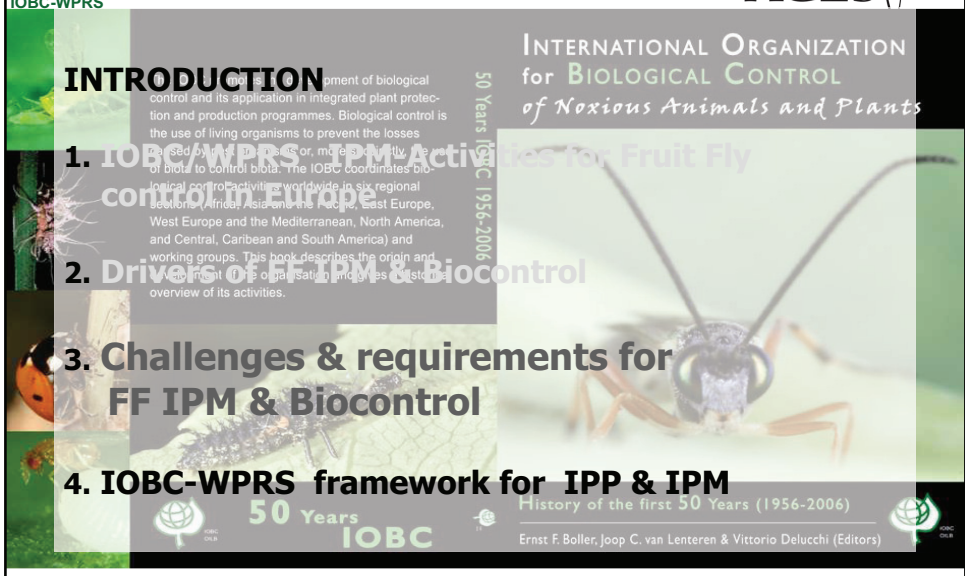


3. Challenges & requirements for FF IPM & Biocontrol

AGES

- increase of new/invasive/emerging pest species
- requirements of actual and new legistic framework (plant health EU; CBD..)
- Availability of alternative plant protection products/measures
  - (e.g. authorization pheromone s & semiochemicals; BCAs microbials & macrobials)
- Capacity building
  - incl. Diagnostics (Infrastructure QM)
- Quality/marketing requirements retailers

why: increase of new/invasive/emerging pest species as risk factors for Plant Health?

AGES

GENERAL

Globalisation

TRADE: increased
TRAVEL: faster
TRANSPORT: further
TOURISM: increased

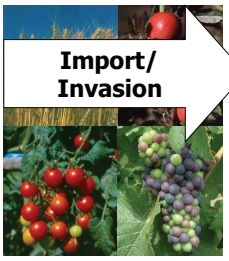
Land use

Population Increase

Climate Change

Production System

Import/ Invasion



SPECIFIC

PEST ORGANISMS

natural spread ; establishment

abiotic / biotic damage factors

production site seed/plant propag. material quality

why: increase of new/invasive/emerging pest species as risk factors for Plant Health?

AGES

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Type of Consignments with interceptions

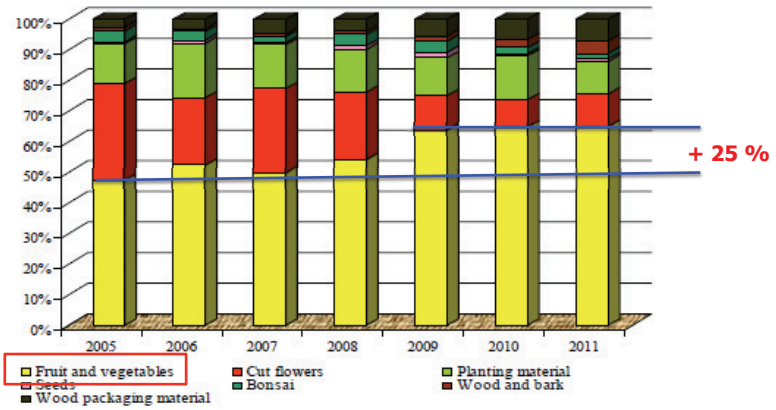


Figure 6. Type of consignments, intercepted with HO (2005-2011)

Source: EUROPHYT

Portion HOs in Interceptions

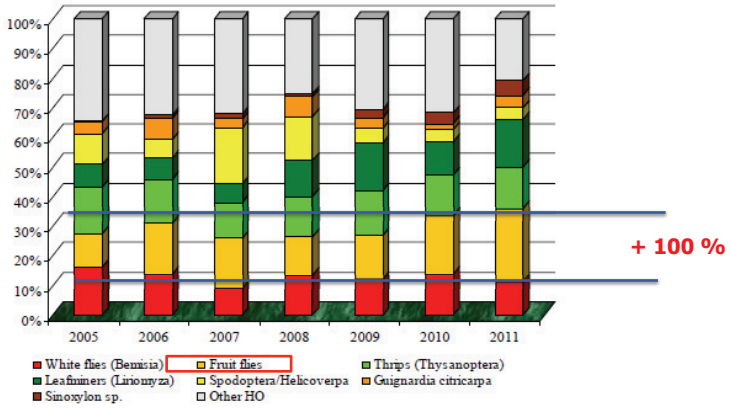
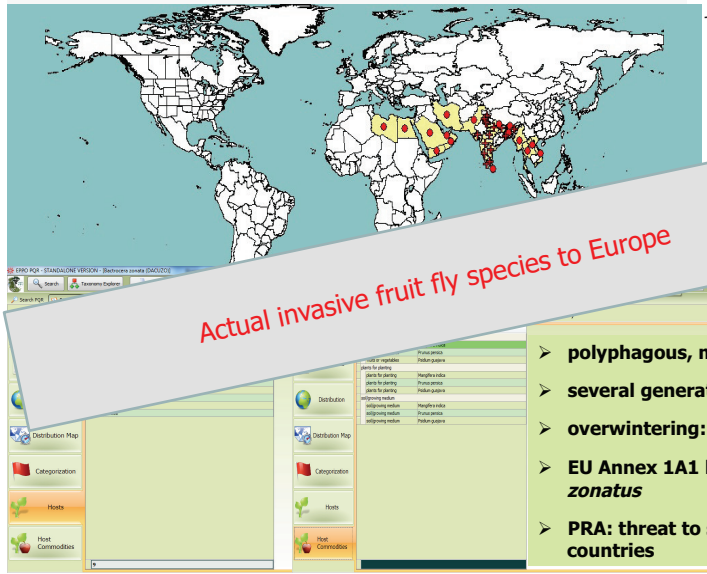


Figure 8. Share of harmful organisms in interceptions

Source: EUROPHYT

Bactrocera zonata Peach fruit fly



Actual invasive fruit fly species to Europe

- **polyphagous, mainly stone fruits**
- **several generations/year**
- **overwintering: pupae/soil**
- **EU Annex 1A1 listed as *Dacus zonatus***
- **PRA: threat to southern European countries**

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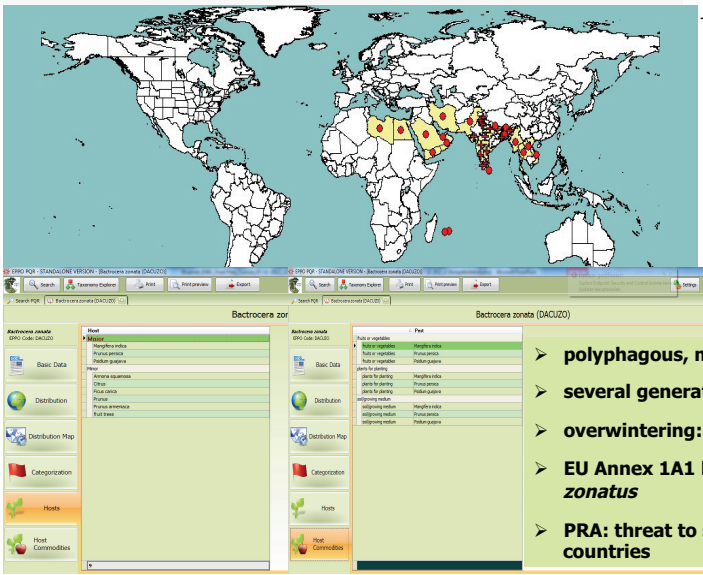

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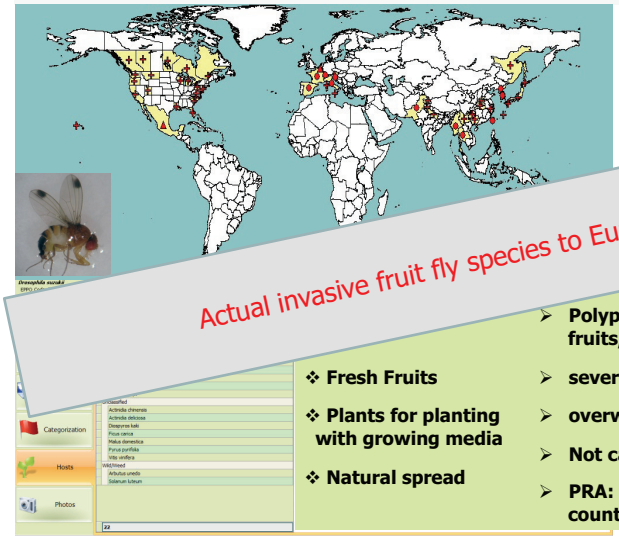
Drosophila suzukii Spotted wing drosophila

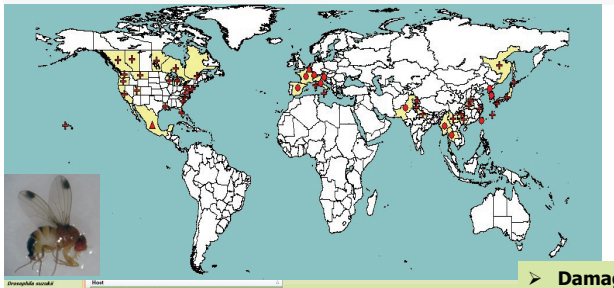


Actual invasive fruit fly species to Europe

- ❖ Fresh Fruits
- ❖ Plants for planting with growing media
- ❖ Natural spread

- ➢ **Damage to healthy fruits**
- ➢ **Polyphagous: soft fruits, stone fruits, grapevines, pome fruits**
- ➢ **several generations/year**
- ➢ **overwintering: adult**
- ➢ **Not categorized in EU**
- ➢ **PRA: threat to European countries except northern region**

Drosophila suzukii Spotted wing drosophila



❖Main pathways:

- ❖ Fresh Fruits
- ❖ Plants for planting with growing media
- ❖ Natural spread

- ➢ **Damage to healthy fruits**
- ➢ **Polyphagous: soft fruits, stone fruits, grapevines, pome fruits**
- ➢ **several generations/year**
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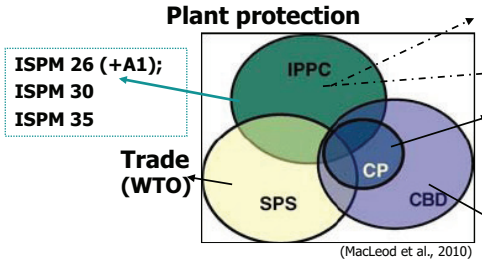
- ➢ **PRA: threat to European countries except northern region**

Development of Fruit Fly detections/ notifications in Austria 2007-2012

3. Challenges & requirements for FF IPM & Biocontrol

- increase of new/invasive/emerging pest species
- **requirements of actual and new legistic framework (plant health EU; CBD..)**
- **Availability of alternative plant protection products/measures**
  - **(e.g. authorization pheromone s & semiochemicals; BCAs microbials & macrobials)**
- **Capacity building**
  - **incl. Diagnostics (Infrastructure QM)**
- **Quality/marketing requirements retailers**

Plant Health & Plant Protection & related International legistic framework
as BASIS for REGULATIONS of quarantine pests



ISPM 26 (+A1);
ISPM 30
ISPM 35

Trade (WTO)

EPPO A1, A2 , Alert list

EU-Dir. 2000/29 review CPHR...

LMos as pests

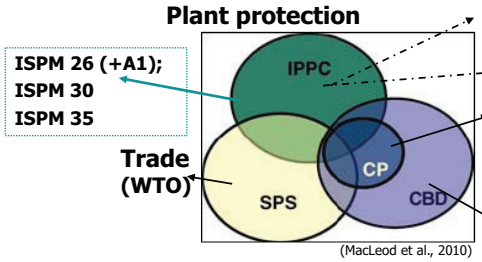
Biological diversity

Nagoya protocol on ABS, ISPM 3, EPPO GL6/2, veterinary regulations

prevent from

introduction of **pests, diseases, disease-causing organisms, or other damage** caused by entry, establishment or spread of pests (country)

Plant Health & Plant Protection & related International legistic framework
as BASIS for REGULATIONS of quarantine pests



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LMos as pests

Biological diversity

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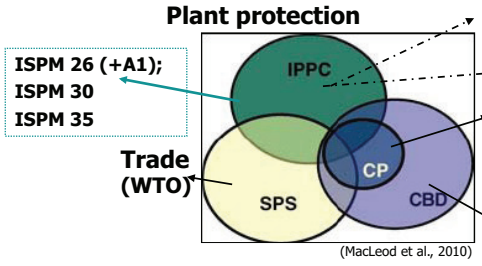
SPS Agreement –Basic Right Article 2.1

"Members have the right to take SANITARY and PHYTOSANITARY MEASURES NECESSARY for the PROTECTION of human, animal or PLANT LIFE OR HEALTH, provided that such measures are NOT INCONSISTENT with the PROVISIONS OF THIS AGREEMENT"

Plant Health & Plant Protection & related International legistic framework
as BASIS for REGULATIONS of quarantine pests

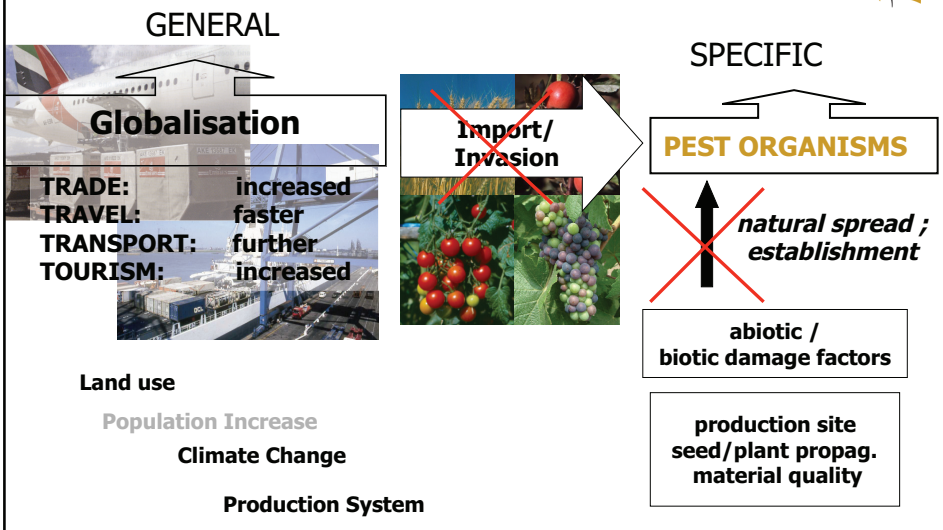


➢ **SCIENTIFIC JUSTIFICATION**

Pest risk analysis (PRA):

The **process** of **evaluating biological or other scientific and economic evidence** to determine **whether a pest should be regulated** and the strength of any phytosanitary measures to be taken against it [ISPM No. 5; ISPM 11] (FAO, 2004) (carried out by EPPO/EFSA)

why: increase of new/invasive/emerging pest species as **risk factors for Plant Health?**



why: increase of new/invasive/emerging pest species as risk factors for Plant Health?

AGES

GENERAL

SPECIFIC

TRADE:
TRAVEL
TRANS
TOURISM:

PEST ORGANISMS

- Prevention
- Eradication
- Containment
- Control

Land use

Population Increase

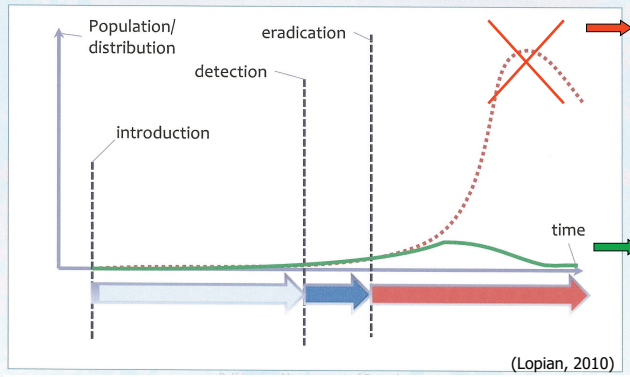
Climate Change

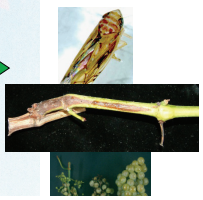
Production System

site
seed/plant propag. material quality

Management of Emerging Plant Health Threats

Three Phases in the Managment of Emerging Threats (optimal)





- Early detection of introduction/invasion of HO
- Short initial response phase
- Effective preliminary eradication
- comprehensive eradication concept + consistent implementation

3. Challenges & requirements for FF IPM & Biocontrol

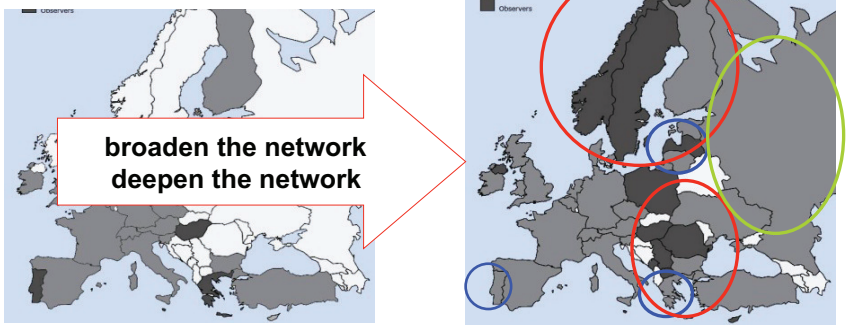
- increase of new/invasive/emerging pest species
- requirements of actual and new legistic framework (plant health EU; CBD..)
- **Availability of alternative plant protection products/measures**
  - **(e.g. authorization pheromone s & semiochemicals; BCAs microbials & macrobials)**
- **Capacity building**
  - **incl. Diagnostics (Infrastructure QM)**
- **Quality/marketing requirements retailers**

Pre-requisites for SUCCESSFUL IMPLEMENTATION of IPM & BIOCONTROL

- **IPP – crop specific framework**
- **Availability of alternative IPM tools e.g. Pheromones/ BCAs (regulatory aspects)**
- **Quality, Safety & Efficacy of BCAs**
- **Research and development**
  - **efficacy testing in the field**
  - **diagnostics**

- **increased application of new technologies (-omics) for identification & characterisation**
- **transportable & multiple diagnostics sets for on-site identification**
- **development of rapid, non-invasive detection methods**

SCOPE-EUPHRESCO:
ERA-net for research policy development & implementation in the area of STATUTORY and EMERGING PLANT PESTS, diseases & invasive species (~~but not GMOs~~)"



EUPHRESCO 1 (FP6 2006-2010)
23 partners & 6 observers,

EUPHRESCO 2 (FP7 2011-2014)
31 partners & 14 observers

Euphresco Phytosanitary ERA-NET

Pre-requisites for SUCCESSFUL IMPLEMENTATION of IPM & BIOCONTROL

AGES

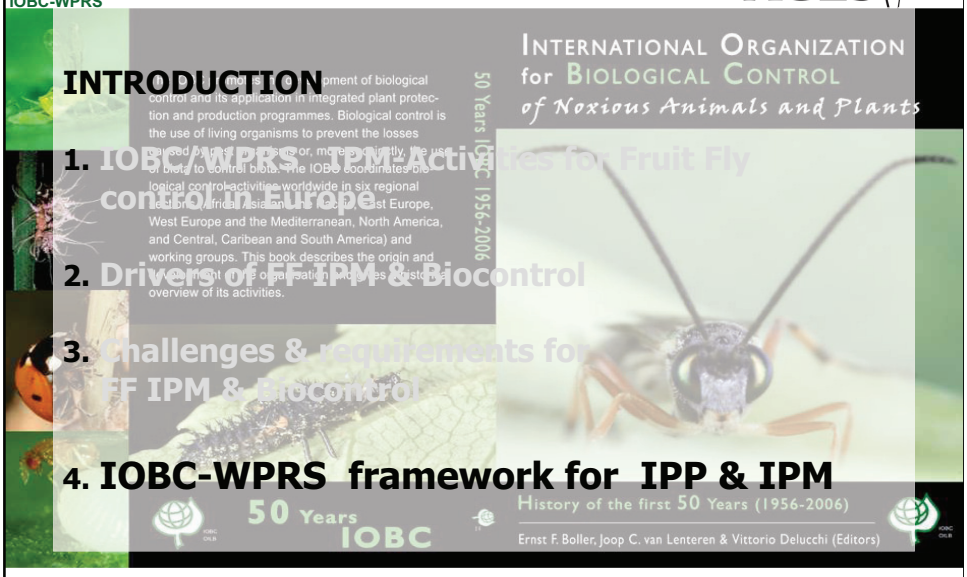
- Capacity Building: training **(incl. diagnostics)**
- + Transfer of Know-how
  - training of farmers
  - advisory service
  - special guidelines for IPM & organic production
- Marketing options of „IPM & bio" products !!
- Incentives for farmers
- **PR (public awareness)**
- Success control /feed back/ supervision

Potential factors for Failure of IPM & BioControl

- ☹ **Lack of knowledge about principles & use of biological control**
- ☹ **Scouting of crops sometimes time consuming**
- ☹ **BCAs cannot control all pests in a crop**
- ☹ **sometimes the pest reduction effect is late**
- ☹ **sometimes BioControl can be more expensive**

IOBC-WPRS

SURVEY



INTRODUCTION

1. **IOBC-WPRS IPM activities for Fruit Fly control in Europe**
2. **Drivers of FF IPM & Biocontrol**
3. **Challenges & requirements for FF IPM & Biocontrol**
4. **IOBC-WPRS framework for IPP & IPM**

Principles of IPM & design of strategies (IOBC-WPRS)

IOBC-WPRS

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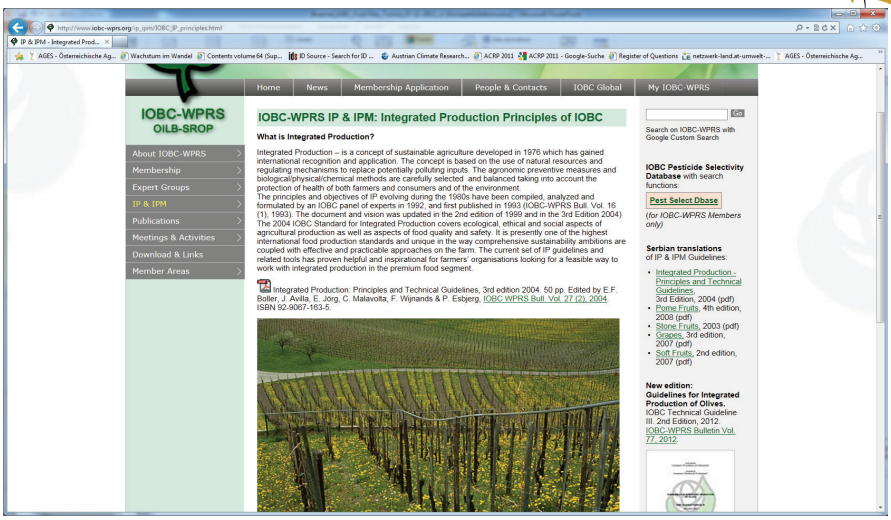

Principles of IPM & design of strategies (IOBC-WPRS)

IOBC-WPRS

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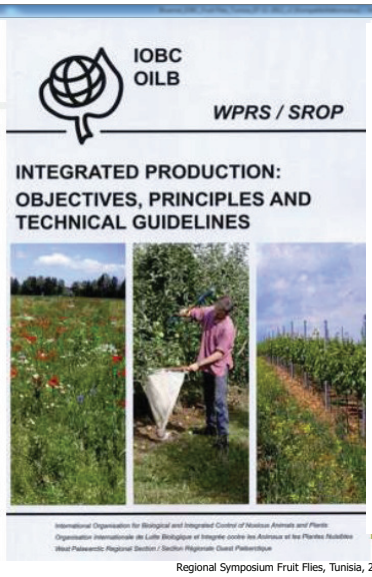


- **Prevention**
- **Justification of direct control**
- **Control**
- **Biological diversity**
- **Farmer**

1.2 The principles of IPM, design of IPM strategies

When designing an IPM strategy for a specific region, farm or cropping system, the following principles should be followed (Table 1). The order of the principles follows the general IPM strategy. These principles have found their way into Annex III of the DIRECTIVE 2009/128/EC EU on "Sustainable use of pesticides".

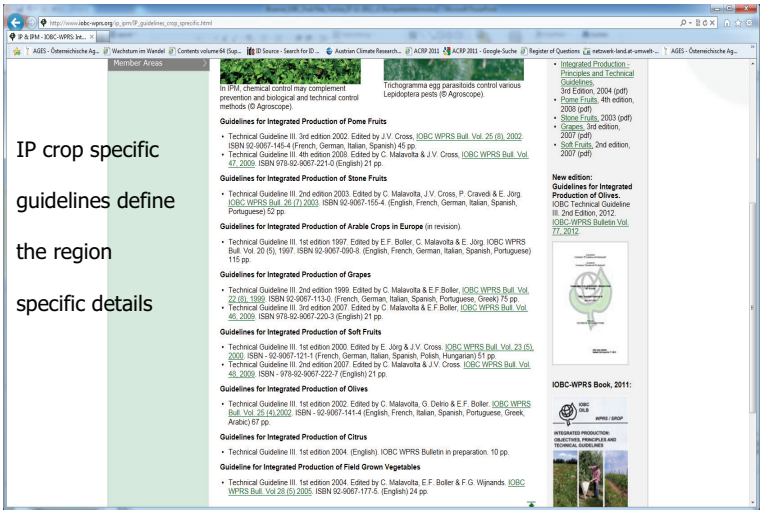
Table 1: Principles of IPM. Strategic objectives and management.

Principle	Explanation	Strategic objectives	Management
1. Prevention and/or suppression of pests, diseases and weeds	The incidence and severity of most pest, disease and weed problems can be greatly lowered by applying agricultural measures that favor the competitive advantage of the crops against their harmful organisms	Prevent build-up of pest, disease and weed populations Escape periods of high pest, disease and weed pressure Optimize crop fitness against attacks Make use of resistance, tolerance and competitive ability Prevent spreading pest and diseases and weeds Keep your agro-ecosystem fit by supporting functional biodiversity Design of the complete agro-ecosystem	Crop rotation Timing of sensitive crop stages Fertilizing strategies, crop management, cultivar choice etc. Field hygiene and adapted agricultural practice Enhance & protect beneficial organisms Ecological infrastructure [1]
2. Monitoring of pest organisms and applying of economic damage thresholds	Assessing the necessity of intervention (control) based on knowledge about the real situation and the potential of losses leads to more targeted interventions	Know the pests, diseases and weeds: Know the beneficial organisms Monitor pest, disease and weed incidence: Define action threshold levels: Define early warning systems	Identify the *site-specific* key pests, diseases and weeds that require regular interventions Identify *site-specific* key beneficial organisms Use Monitoring traps and crop inspection Use Intervention thresholds, Forecasting models for pest and disease incidence, Decision support systems
3. Non-chemical control	Many interventions with pesticides can be replaced or supported by non-chemical alternatives	Optimize Interference with pest, disease and weed biology: Use Physical interference:	Mating disruption, Sterile insect technique.. Use of bio-pesticides Crop covers such as nets, exclusion fences, mechanical weed control
4. Chemical control methods	Pesticides chosen with minimum side-effects and with minimal interference with preventive and non-chemical control methods	Select pesticides specifically targeted to harmful organisms and with minimal side effects, protect your allies (beneficial organisms) Optimize application technique and timing Optimize the dosage of pesticide Prevent development of resistance: Check efficacy	Classify pesticides according to toxicity, ecotox etc., special emphasis on protection of key beneficial organisms. Establish transparent criteria of preferred and less preferred pesticides Use well maintained and calibrated spraying equipment operated by trained persons. Use weather and efficacy forecasts when available to optimize timing and dosage Consider row or spot applications Anti-resistance strategies based on sequence or combinations of active ingredients and alternation with other IPM methods Adapt application rates and frequencies, Small untreated areas, (zero treatment or "spray windows"),
5. not permitted methods	Some interventions (mostly chemical) are prohibited because they interfere with the agro-ecosystem in a way that prevents sustainability	Chemical soil disinfection	

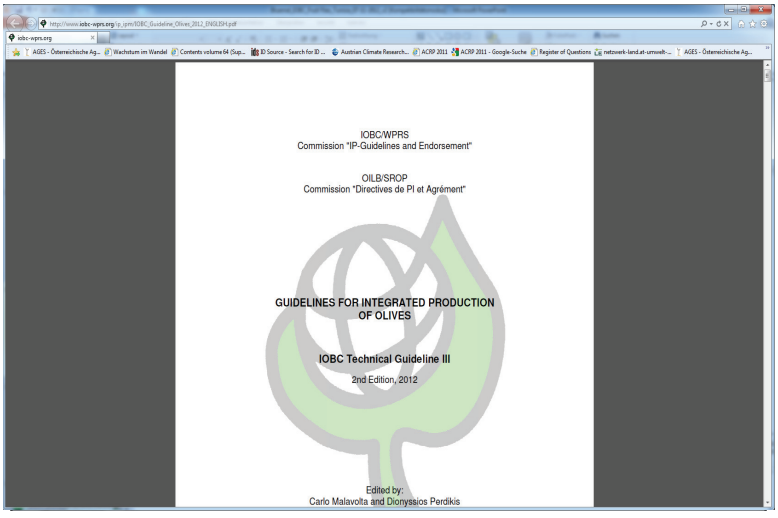
1: .Utilization of ecological infrastructures inside and outside production sites to enhance a supportive conservation biological control of key pests by antagonists.

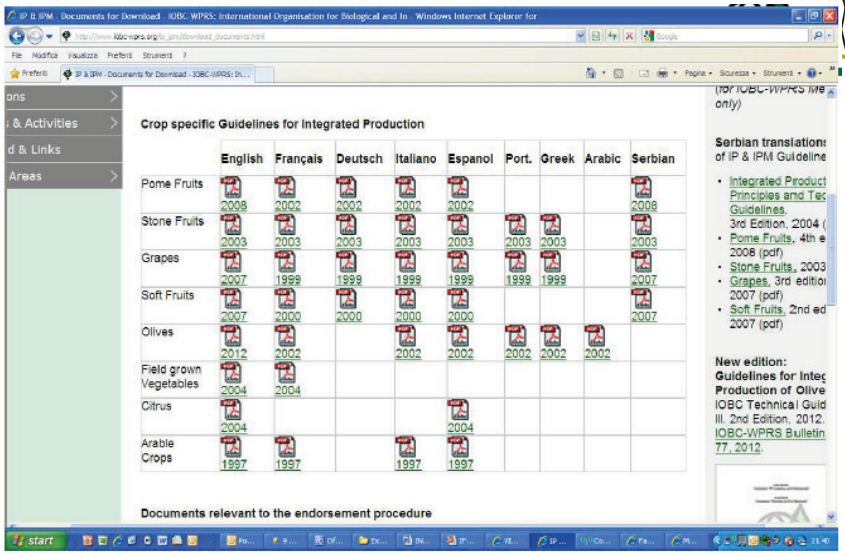
IOBC-WPRS IPM crop specific guidelines

IP crop specific guidelines define the region specific details



IOBC-WPRS IPM crop specific guidelines





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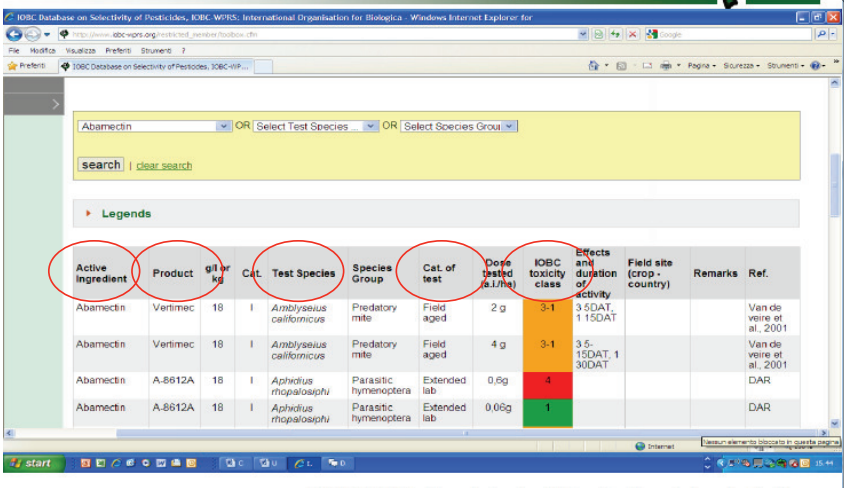
Toolbox: Pesticide selectivity DBase



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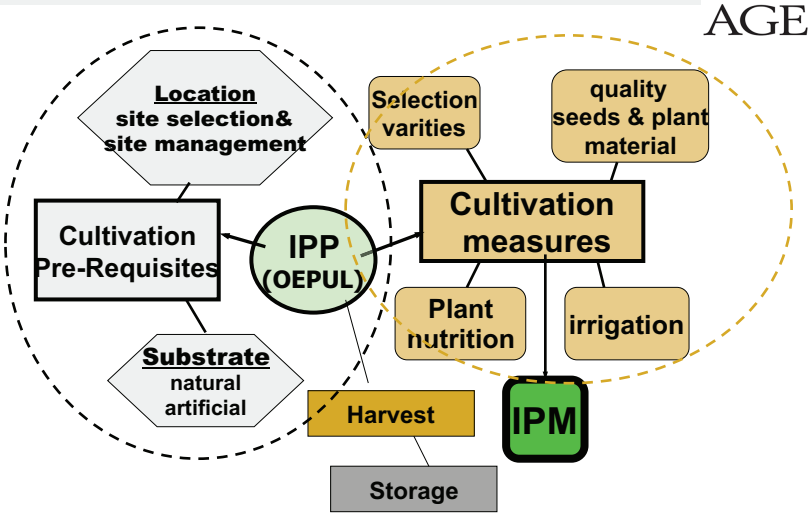
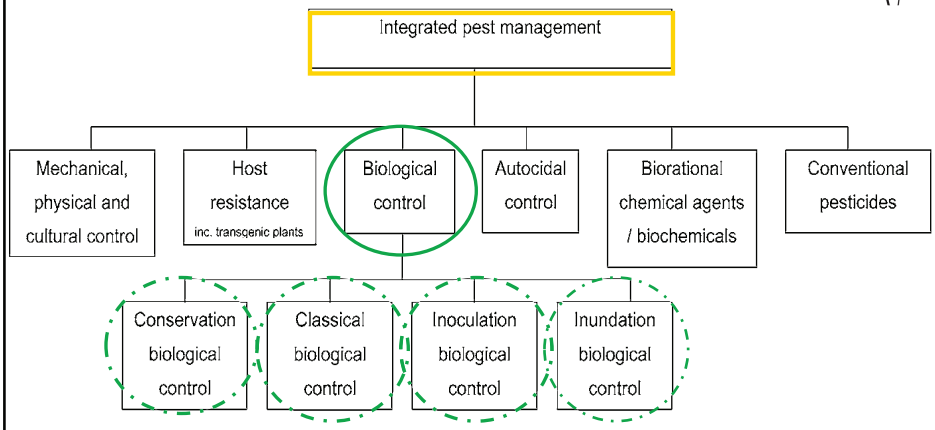
INTEGRATED PLANT PRODUCTION - IPM



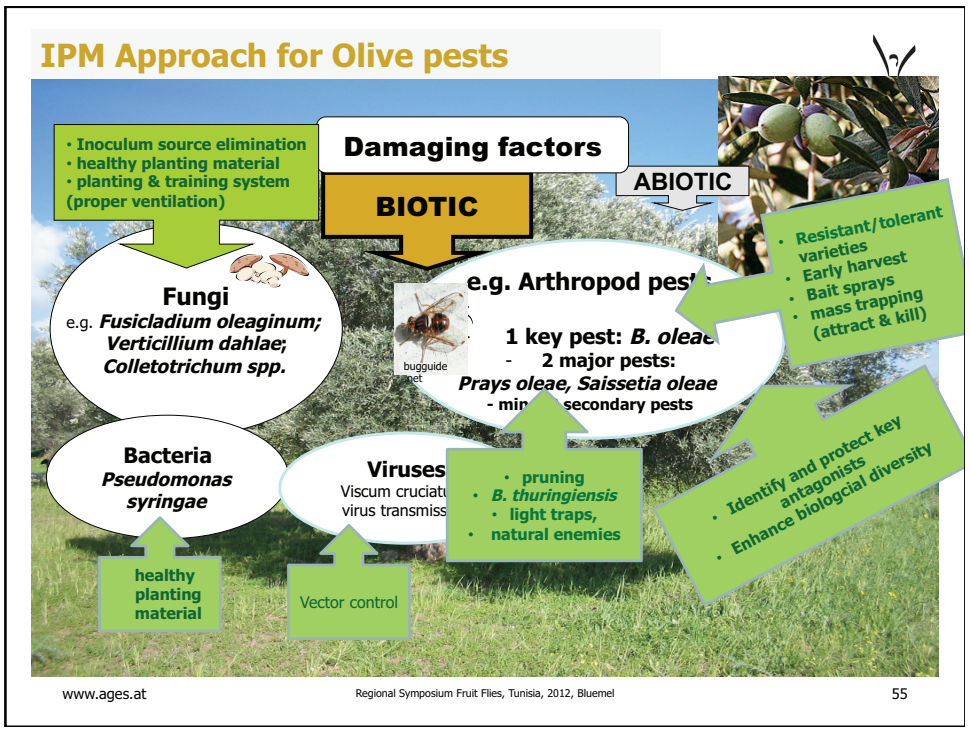
FARM-PRE-REQUISITES

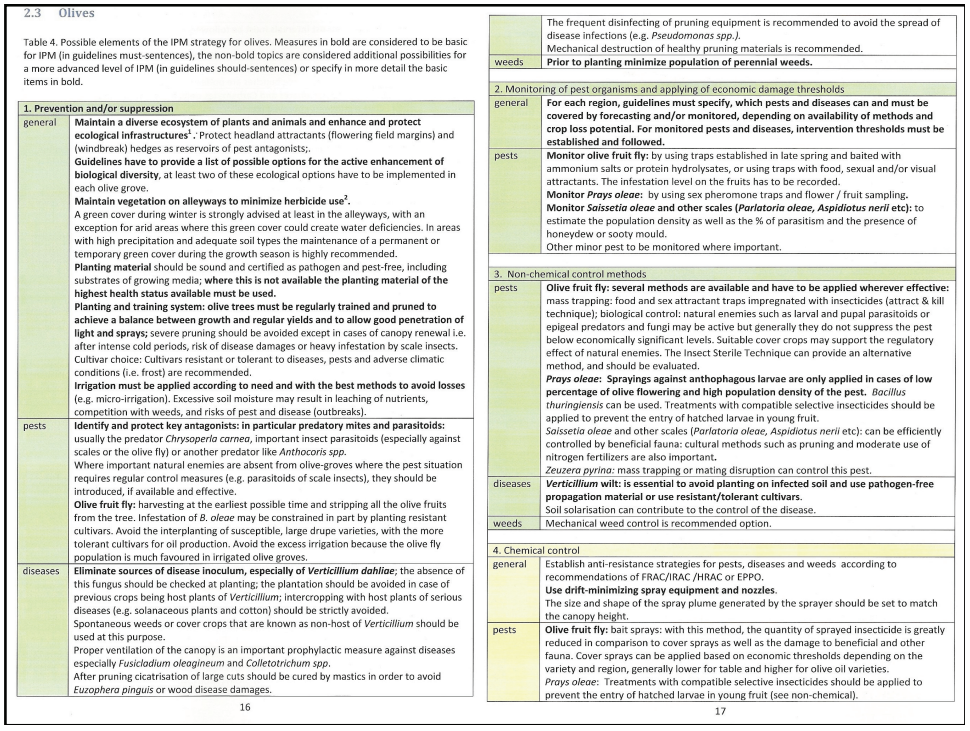
BIOLOGICAL CONTROL and IPM



PP measures (preventive, curative)

Source: EILENBERG, HAJEK & LOMER (2001)





2.3 Olives

Table 4. Possible elements of the IPM strategy for olives. Measures in bold are considered to be basic for IPM (in guidelines must-sentences), the non-bold topics are considered additional possibilities for a more advanced level of IPM (in guidelines should-sentences) or specify in more detail the basic items in bold.

1. Prevention and/or suppression	
general	**Maintain a diverse ecosystem of plants and animals and enhance and protect ecological infrastructures[1]**.: Protect headland attractants (flowering field margins) and (windbreak) hedges as reservoirs of pest antagonists;. **Guidelines have to provide a list of possible options for the active enhancement of biological diversity**, at least two of these ecological options have to be implemented in each olive grove. **Maintain vegetation on alleyways to minimize herbicide use[2]**. A green cover during winter is strongly advised at least in the alleyways, with an exception for arid areas where this green cover could create water deficiencies. In areas with high precipitation and adequate soil types the maintenance of a permanent or temporary green cover during the growth season is highly recommended. **Planting material** should be sound and certified as pathogen and pest-free, including substrates of growing media; **where this is not available the planting material of the highest health status available must be used.** **Planting and training system: olive trees must be regularly trained and pruned to achieve a balance between growth and regular yields and to allow good penetration of light and sprays;** severe pruning should be avoided except in cases of canopy renewal i.e. after intense cold periods, risk of disease damages or heavy infestation by scale insects. Cultivar choice: Cultivars resistant or tolerant to diseases, pests and adverse climatic conditions (i.e. frost) are recommended. **Irrigation must be applied according to need and with the best methods to avoid losses** (e.g. micro-irrigation). Excessive soil moisture may result in leaching of nutrients, competition with weeds, and risks of pest and disease (outbreaks).
pests	**Identify and protect key antagonists: in particular predatory mites and parasitoids:** usually the predator *Chrysoperla carnea*, important insect parasitoids (especially against scales or the olive fly) or another predator like *Anthocoris spp.* Where important natural enemies are absent from olive-groves where the pest situation requires regular control measures (e.g. parasitoids of scale insects), they should be introduced, if available and effective. **Olive fruit fly:** harvesting at the earliest possible time and stripping all the olive fruits from the tree. Infestation of *B. oleae* may be constrained in part by planting resistant cultivars. Avoid the interplanting of susceptible, large drupe varieties, with the more tolerant cultivars for oil production. Avoid the excess irrigation because the olive fly population is much favoured in irrigated olive groves.
diseases	**Eliminate sources of disease inoculum, especially of *Verticillium dahliae***; the absence of this fungus should be checked at planting; the plantation should be avoided in case of previous crops being host plants of *Verticillium*; intercropping with host plants of serious diseases (e.g. solanaceous plants and cotton) should be strictly avoided. Spontaneous weeds or cover crops that are known as non-host of *Verticillium* should be used at this purpose. Proper ventilation of the canopy is an important prophylactic measure against diseases especially *Fusicladium oleagineum* and *Colletotrichum spp.* After pruning cicatrisation of large cuts should be cured by mastics in order to avoid *Euzophera pinguis* or wood disease damages.

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	The frequent disinfecting of pruning equipment is recommended to avoid the spread of disease infections (e.g. *Pseudomonas spp.).* Mechanical destruction of healthy pruning materials is recommended.
weeds	**Prior to planting minimize population of perennial weeds.**
2. Monitoring of pest organisms and applying of economic damage thresholds	
general	**For each region, guidelines must specify, which pests and diseases can and must be covered by forecasting and/or monitored, depending on availability of methods and crop loss potential. For monitored pests and diseases, intervention thresholds must be established and followed.**
pests	**Monitor olive fruit fly:** by using traps established in late spring and baited with ammonium salts or protein hydrolysates, or using traps with food, sexual and/or visual attractants. The infestation level on the fruits has to be recorded. **Monitor *Prays oleae*:** by using sex pheromone traps and flower / fruit sampling. **Monitor *Saissetia oleae* and other scales (*Parlatoria oleae, Aspidiotus nerii* etc):** to estimate the population density as well as the % of parasitism and the presence of honeydew or sooty mould. Other minor pest to be monitored where important.
3. Non-chemical control methods	
pests	**Olive fruit fly: several methods are available and have to be applied wherever effective:** mass trapping: food and sex attractant traps impregnated with insecticides (attract & kill technique); biological control: natural enemies such as larval and pupal parasitoids or epigeal predators and fungi may be active but generally they do not suppress the pest below economically significant levels. Suitable cover crops may support the regulatory effect of natural enemies. The Insect Sterile Technique can provide an alternative method, and should be evaluated. ***Prays oleae*: Sprayings against anthophagous larvae are only applied in cases of low percentage of olive flowering and high population density of the pest.** *Bacillus thuringiensis* can be used. Treatments with compatible selective insecticides should be applied to prevent the entry of hatched larvae in young fruit. *Saissetia oleae* and other scales (*Parlatoria oleae, Aspidiotus nerii* etc): can be efficiently controlled by beneficial fauna: cultural methods such as pruning and moderate use of nitrogen fertilizers are also important. *Zeuzera pyrina:* mass trapping or mating disruption can control this pest.
diseases	***Verticillium* wilt: is essential to avoid planting on infected soil and use pathogen-free propagation material or use resistant/tolerant cultivars.** Soil solarisation can contribute to the control of the disease.
weeds	Mechanical weed control is recommended option.
4. Chemical control	
general	Establish anti-resistance strategies for pests, diseases and weeds according to recommendations of FRAC/IRAC /HRAC or EPPO. **Use drift-minimizing spray equipment and nozzles.** The size and shape of the spray plume generated by the sprayer should be set to match the canopy height.
pests	**Olive fruit fly:** bait sprays: with this method, the quantity of sprayed insecticide is greatly reduced in comparison to cover sprays as well as the damage to beneficial and other fauna. Cover sprays can be applied based on economic thresholds depending on the variety and region, generally lower for table and higher for olive oil varieties. *Prays oleae*: Treatments with compatible selective insecticides should be applied to prevent the entry of hatched larvae in young fruit (see non-chemical).

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Summary

Several drivers , challenges & requirements to implement FF IPM & biocontrol

- **reduced availability & portfolio variability** of **PPPs**
- **increase of introduction, spread, establishment of new/invasive/ emerging pest species**
- **requirements & Impact of actual and new legistic framework** (plant protection, plant health EU; CBD..) e.g SUD (2009/128/EC)
- **stakeholder demands** (farmers, retailers, consumers, public)
- **availability of alternative plant protection products/measures**
- **availability of an IPP – crop specific framework**
- **capacity building & Transfer of Know-how**
- **research, advisory service, training, starting incentives**

- **INCREASING FUTURE NEED for IPM & BioControl** as selective, sustainable, feasible holistic pest management approach

Integrated production (IP)

- Integrated Production – is a concept of sustainable agriculture developed in 1976 which has gained international recognition and application.
  - The principles and objectives of IP evolving during the 1980s have been compiled, analyzed and formulated by an IOBC panel of experts in 1992, and first published in 1993 (IOBC/WPRS Bull. Vol. 16 (1), 1993).
  - The document and vision was updated in the 2nd edition of 1999 and in the 3rd Edition 2004.

- **The 2004 IOBC Standard for Integrated Production is presently one of the highest international food production standards and unique in the way comprehensive sustainability ambitions are coupled with effective and practicable approaches on the farm.**

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Integrated production (IP)

IOBC offers & Access to the worldwide network of biocontrol and IPM collaboration of IOBC

IOBC offers the ideal platform and network for IPM & Biocontrol research and its implementation !

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THANK YOU FOR YOUR ATTENTION

special acknowledgements to:

- **Prof. Mohamed Besri, Chair of IOBC-WPRS Commssion on IP and Biocontrol in North-African countries**
- **IOBC-WPRS- Commission on Guidelines for integrated production (C. Malavolta et al.)**
- **C. Lethmayer & A. Egartner (AGES)**