

Post-Neonicotinoid Symposium

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New strategy for agriculture without usage of neonicotinoids and protection of the growers by a mutual insurance against pitfalls



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**IS IT POSSIBLE TO
PRODUCE GOOD
AGRICULTURAL
PRODUCTS
KEEPING/IMPROVING
FARMERS' NET INCOME
WITHOUT USING
NEONICOTINOIDS?**

TWO WAYS

1) USING INSECTICIDES ONLY
WHERE/WHEN IS NEEDED = IPM
(Integrated Pest Management)

2) USING OTHER EFFECTIVE
STRATEGIES (=IPM) OR OTHER
CHEMICALS WHEN/WHERE A
ECONOMIC POPULATION OCCURS

IPM THE KEY TOOL

IPM ACCORDING TO DIRECTIVE 2009/128/EC

1. Before any decision on pest control is taken, harmful organisms must be monitored with adequate methods and tools, where available; tools should include observations in the field as well as scientifically sound warning, forecasting and early diagnosis systems.
2. Crops may only be treated when and where the assessment has found that levels exceed set economic thresholds.
3. When economic thresholds are exceeded, agronomic solutions, mainly rotation, should be considered to prevent crop damage, as tillage timing, choice and changing of sowing dates, and crop rotation interfere with newly established pest populations.

IPM ACCORDING TO DIRECTIVE 2009/128/EC

4. When economic thresholds are exceeded and no agronomic solutions are available, biological control, physical treatment or another non-chemical pest control method should be considered as a replacement for chemical treatment.
5. When economic thresholds are exceeded and no agronomic solutions, biological controls, physical treatments or other non-chemical pest control methods are available, chemical treatments should be selected from options that pose the lowest risk to the environment and human health. It should be used so that the risk of pest resistance is minimised

CONDITIONS NEEDED

A) LOW COST STRATEGIES

B) NON TIME CONSUMING TOOLS

C) SUSTAINABLE TECHNICAL
TOOLS

ESSENTIAL FOR ARABLE CROPS

A) LOW INCOME CROPS

B) LOW MANPOWER AVAILABILITY

C) GENERAL LOW TECHNICAL KNOWLEDGE

D) DIFFERENTLY FROM
ORCHARDS/VINEYARDS (LONG TRADITION)
LITTLE TRADITION/EXPERIENCE ABOUT
MONITORING AND IPM

IPM IMPLEMENTATION FIRST STRATEGY BECAUSE:

- a) high potential as stressed by case studies
- b) IPM principles include all the alternatives
- c) can provide greater benefits than the simple replacement of neonicotinoids with other insecticides as it may reduce the total application of chemicals
- d) IPM is compulsory in Europe since January 2014 – with strong support for IPM implementation by EU Commission

IPM INCLUDES ALL THE ALTERNATIVES TO NEONICOTINOIDS

WHICH CROPS OR OTHER TARGETS?

**1) ARABLE CROPS INCLUDING RICE
(mainly against soil pests) AND VEGETABLES**

2) ORCHARDS/VINEYARDS

3) FORESTRY

4) ORNAMENTAL GOLF COURSES

5) LIVESTOCK

IS IT ACTUALLY FEASIBLE IPM?

CRITERIA TO ASSESS IPM FEASIBILITY

- 1) WHAT IS THE RISK LEVEL? ARE POPULATIONS LEVELS ABOVE THRESHOLDS EVERYWHERE AND THEN TREATMENTS NEEDED ON ALL FIELDS OR ON FEW OF THEM?
- 2) ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS, AGRONOMIC AND/OR BIOLOGICAL ALTERNATIVES) AVAILABLE?

MAIZE CASE STUDY

MAIZE PESTS AT EARLY STAGES

VIRUSES TRANSMITTED BY INSECTS



**Neonics effective but diseases have low incidence, hybrids are usually resistant
– resistant hybrids as effective as neonicotinoids**

Furlan L, Chiarini F, Balconi C, Lanzasova C, Torri A., Valoti P, Alma A, Saladini MA, Mori N, Davanzo M, Colauzzi M (2012)
Possibilità di applicazione della difesa integrata per il controllo delle virosi nella coltura del mais, Apoidea, 1-2, 39 – 44.

OTHER ANIMALS



Other solutions

INSECTS AND OTHER ARTHROPODS

BLACKCUTWORMS

Agrotis ipsilon – migrante, più importante
Agrotis segetum

6 (7) stadi
3-4 generazioni



BLACKCUTWORMS

- **OCCASIONAL ATTACKS** (last significant outbreaks 1971, 1983)
- **LOW ECONOMIC DAMAGE**
- **ATTACKS NOT PREDICTABLE** at sowing
- **NEGLIGIBLE CONTROL BY SOIL INSECTICIDES (ALSO AS SEED COATING) WHEN NEEDED**
- **ALERT PROGRAMME PREDICTS WHERE AND WHEN POST-EMERGENCE TREATMENTS ARE NEEDED**



UNJUSTIFIED AT SOWING TREATMENTS

BLACKCUTWORMS

KEY QUESTION: IS IT POSSIBLE IPM?

- 1) WHAT IS THE RISK LEVEL? **LOW, < 1%**
- 2) ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS) AVAILABLE? **Yes, black cutworm alert programme producing accurate results in Italy since 1991.**

BLACK CUTWORMS: CAN IPM BE IMPLEMENTED?

1. What is the risk level? **Low, < 1%**
2. Are IPM strategies available (e.g. monitoring methods, risk assessment, key-pest thresholds, agronomic [and/or biological alternatives)? **Yes, black cutworm alert programme producing accurate results in Italy since 1991.**

WCR - DIABROTICA

- POPULATIONS BELOW ECONOMIC THRESHOLD IN MOST OF THE EUROPEAN MAIZE FIELDS
- ROTATION THE ONLY FULL EFFECTIVE STRATEGY (provisions of directive 128/2009/CE give solution)
- ROTATION CAN BE EFFECTIVE EVEN AS “SOFT” MODALITY (1 YEAR OUT OF 3 OR MORE YEARS)
- AVAILABLE SOLUTIONS FOR ROTATION THAT DO NOT REDUCE GROSS MARGIN OF LIVESTOCK/BIOGAS FARMS
- TREATMENTS AT SOWING DO NOT SIGNIFICANTLY AFFECT WCR POPULATION DYNAMICS
- POSSIBILITY OF INSECTICIDE FAILURE WHEN POPULATIONS ARE REALLY HIGH

UNJUSTIFIED AT SOWING TREATMENTS

WCR - DIABROTICA



**THRESHOLD 6 beetles/trap/day
over a 3 – 6 week period**

WCR - diabrotica

KEY QUESTION: IS IT POSSIBLE IPM?

- 1) **WHAT IS THE RISK LEVEL? LOW**
- 2) **ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS, AGRONOMIC (first of all rotation) – NON CHEMICAL SOLUTIONS,.....) AVAILABLE?**

It can be kept below economic threshold by “soft” rotation
Rotation is the first option for IPM based on directive 2009/128/CE IPM OF DIABROTICA ONLY MEANS THE IMPLEMENTATION OF RATIONAL ROTATION WITHOUT ANY CHEMICAL TREATMENTS (AT SOWING OR LATER AGAINST BEETLES)

WIREWORMS

THE ITALIAN CASE

DAMAGED FIELDS BY WIREWORMS (over 30 years observations in Italy)

- visible damage (plants with attack symptoms easily found, more than 5% of damaged plants): $< 5,0 \%$
- high damage: $< 1,0 \%$

WIREWORMS (Apenet 2010 – a big survey in Po Valley)

ITALIAN REGIONS	MONITORED FIELDS	WITH RISK FACTORS (A.brevis, A.sordidus)	WITH RISK FACTORS (A.litigiosus, A.ustulatus)	A. brevis mean (e.s., min-max)	A. sordidus mean (e.s., min-max)	A. litigiosus mean (e.s., min-max)	A. ustulatus mean (e.s., min-max)	STAND pp/m ² HEALTHY (mean, min, max)	same % of healthy plants out of total sown seeds	by wireworms % of emerged plants (mean, min, max)	damage on plants – no economic damage (up to 10% of damaged plants) (n°)	Fields with economic damage
VENETO	51	6	6	76 (18,3, 0,0- 691)	523 (53,1, 91-2129)	n.r.	548 (88,4, 0,00- 2786,00)	6,46 (0,07, 5,30-7,38)	90,3	1,14 (0,024, 0,0- 7,0)	2	0
EMILIA ROMAGNA	105	7	4	n.r.	245 (26,44, 4,00- 2201)	253 (24,3, 6,0- 1141)	n.r.	n.r.	n.r.	n.r.	1	0
LOMBARDIA	10	2	1	n.r.	983 (244, 189 - 2349)	629 (202, 63- 2087)	n.r.	6,48 (0,06, 4,80 - 7,3)	93,2	0,17 (0,071, 0,10- 0,81)	1	0
PIEMONTE	6	1	0	n.r.	1091 (290, 123- 2311)	243 (52, 46-549)	n.r.	7,00 (0,12, 6,40- 7,40)	94,6	5,8 (0,017, 0-12)	1	0
FRIULI	11	2	0	169 (19,7, 86 - 323)	335 (66,6, 59-763)	12 (6,41, 0,00- 52,0)	n.r.	6,63 (0,05, 6,35 - 6,90)	90,7	0,059 (0,01, 0,05- 0,1)	0	0
TOTALE	183	18	11								5	0
INCIDENZA (%)											2,7	0

WIREWORMS

WHAT ABOUT THE OTHER MEMBER STATES?

PURE PROJECT (SEVENTH FRAMEWORK PROGRAMME) 2011 - 2014

- 3 on-stations experiments - FRANCE, HUNGARY, ITALY (long-term) to investigate different
- 15 on farm experiments (FRANCE, GERMANY, HUNGARY, ITALY, SLOVENIA)

The experiments were carried out at:

- 1) Southern climatic conditions – Italy (5 locations)
and France (2 locations)
- 2) Central climatic conditions - Germany (2 locations)
- 3) Eastern climatic conditions – Hungary (4 locations)
and Slovenia (2 locations)

> 50 experiments in 4 years
Whole untreated fields/plots or
alternated treated/untreated strips
NO ECONOMIC WIREWORM
DAMAGE!!!!!!!

AVAILABLE TOOLS FOR IPM

- A) RISK FACTORS
- B) PHEROMONE TRAPS
- C) BAIT TRAPS
- D) AGRONOMIC STRATEGIES
- E) BIOCIDAL PLANTS AND MEALS
- F) OTHER BIOLOGICAL TREATMENTS

PLANTING CROPS WHERE
AND WHEN THERE IS NO
SERIOUS ECONOMIC
DAMAGE RISK

AREA-WIDE LEVEL

A) AGRONOMIC RISK FACTORS

1. **CONTINUOUS PLANT COVER**
(meadow, double crops as rye grass-maize, oilseed rape-soybean,...;
2. **PEAT SOILS** (high organic matter content)
3. **PREVIOUS DAMAGE**
4. **high beetle captures with Yf and/or high incidence of uncultivated zones like grasses, forest,....**
5. **IRRIGATION** (continuous supply of water keeping high soil moisture)

AREA-WIDE LEVEL

B) PHEROMONE TRAPS YATLORf

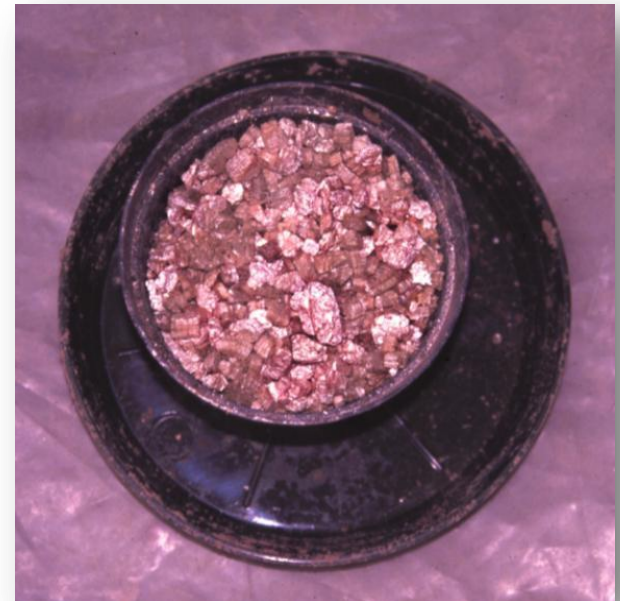
- RELIABLE (NON SATURABLE)
- FEW INSPECTIONS
- EASY, QUICK MANAGEMENT
- LOW COSTS
- MULTIBAITED (MORE SPECIES MONITORED AT THE SAME TIME BY ONE TRAP)



B) BAIT TRAPS FOR COMPLEMENTARY LIMITED IN FIELD EVALUATION

**a) IF AND WHERE THERE IS A RISK
OF ECONOMIC POPULATIONS
PLACING BAIT TRAPS**

**b) EVALUATION OF
LARVAL THRESHOLDS**



wireworm species	wireworm catches (larvae/trap)	sampled fields	fields with yield reduction (maize)	%
<i>Agriotes ustulatus</i>	0-1	64	0	0,0
	1,01-2	7	0	0,0
	2,01-5	9	0	0,0
	5,01-10	9	1	11,1
	>10,01	5	2	40,0
<i>Agriotes brevis</i>	0-1	54	0	0,0
	1,01-2	6	2	33,3
	2,01-5	7	4	57,1
	> 5,01	3	1	33,3
<i>Agriotes sordidus</i>	0-1	113	0	0,0
	1,01-2	10	0	0,0

Furlan, L. (2014) IPM thresholds for *Agriotes* wireworm species in maize in Southern Europe. J Pest Sci , DOI 10.1007/s10340-014-0583-5.

. . .

WIREWORMS: CAN IPM BE IMPLEMENTED?

1. What is the risk level? **Low**
2. Are IPM strategies available (e.g. monitoring methods, risk assessment, key-pest thresholds, agronomic and/or biological alternatives)? **Yes**

WHAT THE ACTUAL SOIL PEST RISK FOR MAIZE?

A 30 Ys DATA SET MAKES CLEAR THAT A RISK OF YIELD REDUCTION OCCURS IN LESS THAN 4% OF THE CULTIVATED LAND

MAIZE IPM AGAINST SOIL PESTS IN BRIEF

1. **Low** risk level
2. **Reliable** IPM strategies available

**WHEN RISK IS LOW THE INSURANCE
APPROACH IS CONVENIENT FOR
FARMERS AND MUCH SAFER FOR
PEOPLE & THE ENVIRONMENT
(INCLUDING BEES)**

**A INSURANCE APPROACH MUCH BETTER
THAN INSECTICIDES**

INSURANCE APPROACH vs PESTICIDE APPROACH

ASSUMPTIONS (prudential) for 100 ha of arable crops: 1) Mutual fund cost (MF) 5 €/ha; 2) soil insecticides cost 40 €/ha; 3) the highest damage cost 500 €/ha on 4 ha out of 100; 4) **soil insecticides efficacy 100%**

STRATEGY	MF (ha)	soil insecticides (ha)	IPM COST (€)	MF COST (€)	insecticide cost (€)	damage cost (€)	TOTAL COST (€)	COST DIFFERENCE MF vs insecticides	Effects on humans/ environment	compliance with directive 2009/128/ CE	Syntetic general evaluation (1 to 5 stars)
Mutual funds only	100	0	0	500	0	2000	2500	-1500	no	yes	*****
IPM with mutual funds based on risk factors	100	20	100	500	800	0	1400	-2600	reduced	partial	***
IPM with mutual funds based on risk factors + monitoring	100	10	1000	500	400	0	1900	-2100	very reduced	yes	****
soil insecticides (prophylactic use)	0	100	0	0	4000	0	4000	=	yes	no	*

INSURANCE APPROACH vs PESTICIDE APPROACH

ASSUMPTIONS (prudential) for 100 ha of arable crops: 1) Mutual fund cost (MF) 5 €/ha; 2) soil insecticides cost 40 €/ha; 3) the highest damage cost 500 €/ha on 4 ha out of 100; 4) soil insecticides efficacy **50%**

STRATEGY	MF (ha)	soil insecticides (ha)	IPM COST (€)	MF COST (€)	insecticide cost (€)	damage cost (€)	TOTAL COST (€)	COST DIFFERENCE MF vs insecticides	Effects on humans/ environment	compliance with directive 2009/128/ CE	Syntetic general evaluation (1 to 5 stars)
Mutual funds only	100	0	0	500	0	2000	2500	-1500	no	yes	*****
IPM with mutual funds based on risk factors	100	20	100	500	800	1000	2300	-1700	reduced	partial	***
IPM with mutual funds based on risk factors + monitoring	100	10	1000	500	400	1000	2400	-1600	very reduced	yes	****
soil insecticides (prophylactic use)	0	100	0	0	4000	0	4000	=	yes	no	*

PRACTICAL IMPLEMENTATION



**CONDIFESA
VENETO**

CONDIFESA FVG



**AGRIFONDO
MUTUALISTICO**

Associazione Mutualistica Dei Condifesa
Del Veneto E Friuli V.G.
(PRIVATE ASSOCIATION OF FARMERS)



**MAIZE
MUTUAL FUND
SINCE 2014**



MUTUAL FUND

Instrument **managed by farmer consortia** aimed to create a compensation and to balance the risk through an interregional distribution of risks

No profit, vehicle of innovation with transparency rules



Compensation commensurate with the financial resources of the Fund

Fund stock increased by savings in forecast costs

Solutions that are not offered by the traditional insurance market

RISKS COVERED	<ul style="list-style-type: none"> • Insufficient plant density (stand) due to adverse weather conditions (i.e. drought, flooding, freezing cold) • Insufficient plant density (stand) due to soil pests (e.g. wireworms, black cutworms), or diseases, such as Fusarium spp. (rotten roots, seedlings) • Diabrotica (WCR) damage
TARGET	Members of farmer consortia
OBLIGATIONS	<ul style="list-style-type: none"> • Contract to be signed before sowing; • Implementation of good cultivation practices; • Implementation of Directive 128/2009/EC; • Connection and implementation of suggestions in “Arable Crops Bulletin”
COSTS	€ 5/ha all inclusive (including flooding [excessive rain], freezing cold, drought); pest risk alone is covered with less than € 5/ha
COMPENSATION	<p>Up to € 500/ha including:</p> <ul style="list-style-type: none"> • Resowing (up to € 250/ha) if stand below 4 pls/m² • Yield reduction (up to € 250/ha) based on sowing delay, crop change • up to € 1000/ha for WCR damage

RESULTS 2015

- 1) 53.000 ha with MF cover
- 2) COST: 3,5 €/ha (TEN TIME LESS THAN A SOIL INSECTICIDE)
- 3) DAMAGE PAID < 30.000 €
- 4) SIGNIFICANT INCREASE OF **MF STOCK** FOR NEXT YEARS

RESULTS

**DETAILED STUDY OF A REPRESENTATIVE AREA (450 HA)
INCLUDING RISK FACTORS WITH MONITORED FIELDS
ENTIRELY UNTREATED OR WITH UNTREATED AND
TREATED STRIPS UNTREATED WHERE PEST SIGNIFICANT
PEST POPULATIONS HAD BEEN FOUND (2014-2015)**

Hectars with economic damage: 2014: 0,56% - 2015: 0,00 %

Value of yield reduction: 2014: 700 €/100 ha - 2015: 0,00 %

Value of yield reduction average 2014 – 2015

350 €/100 ha

ADVANTAGES OF MUTUAL FUNDS

1. Reduces costs/ha;
2. Covers risks due to mistakes or difficulties in IPM implementation (e.g. delay in black cutworm treatments);
3. Covers other risks, e.g. flooding and drought, not covered by insecticides;
4. Reduces health risk for farmers, as there is no contact with insecticides;
5. No negative impact of insecticides on soil beneficials;
6. No pollution risks for soil and water tables;

ADVANTAGES OF MUTUAL FUNDS

7. No risk to bees and other wild pollinators; more generally, reduces risk to fauna;
8. Covers weather risks, including weather causing soil insecticides to fail (Furlan *et al.* 2011, Ferro and Furlan, 2012, Furlan *et al.* 2014).

Furlan L., Benevegnu' I, Cecchin A., Chiarini F., Fracasso F., Sartori A., Manfredi V, Frigimelica G., Davanzo M., Canzi S., Sartori E., Codato F., Bin O., Nadal V., Giacomel D, Contiero B (2014) *Difesa integrata del mais: come applicarla in campo*. L'Informatore Agrario, 9, Supplemento Difesa delle Colture, 11-14.

Furlan L., Cappellari C., Porrini C., Radeghieri P., Ferrari R., Pozzati M., Davanzo M., Canzi S., Saladini M.A., Alma A., Balconi C., Stocco M. (2011) *Difesa integrata del mais: come effettuarla nelle prime fasi*. L'Informatore Agrario, 7, Supplemento Difesa delle Colture: 15 – 19.

Ferro G., Furlan L. (2012) *Mais: strategie a confronto per contenere gli elateridi*, 42, L'Informatore Agrario, 42, Supplemento Difesa delle Colture: 63 – 67.

MUTUAL FUNDS IN THE FUTURE EU SUPPORT

Since 2015 “Mutual Insurance” (**Regulation EU 73/2009, Art. No. 68**) is governed by the National Rural Development Programs.

The measures in the RDP are related to:

1. Risk management
2. Irrigation system
3. Genetic Improvement and Animal Biodiversity

Risk Management

Support under this measure, as established in the article 36 of the **Reg. EU No. 1305/2013**, shall cover:

- a) Crop, animal and plant insurance (Art. 37)
- b) Mutual Funds (Art. 38)
- c) Income stabilization tool (Art. 39)

Art. 38 Mutual Funds

Financial contributions to mutual funds to pay financial compensations to farmers for economic losses caused by:

- Adverse climatic events
- Animal or plant diseases
- Pest infestation
- Measure adopted in accordance with Directive 2000/29/EC to eradicate or contain a plant disease or pest or an environmental incident

Minimum amount for compensation damage is 30%

Maximum amount of rate: 65% of the eligible investments

No contributions by public funds can be made to initial capital stock

WHAT CAN PUBLIC INSTITUTIONS DO TO MAKE EFFECTIVE IPM IMPLEMENTATION?

- 1) SUPPORT RISK ASSESSMENT STUDIES FOR ALL THE CROPS TO IMPROVE IPM STRATEGIES AND COST EVALUATION FOR MUTUAL FUNDS
- 2) GIVE FEASIBLE (NO 30% LIMIT!) CONTRIBUTIONS TO MUTUAL FUNDS IN ORDER TO “TURN THE KEY” IMMEDIATELY
- 3) SUPPORT INDEPENDENT ADVISORY SYSTEM
- 4) SUPPORT APPLIED RESEARCH FOR PRACTICAL SOLUTIONS AND INNOVATION TRANSFER – A DRAMATIC CHANGE IS IMMEDIATELY POSSIBLE – JUST A QUESTION OF WILLINGNESS

WHICH OTHER CROPS WITH THIS APPROACH IN EUROPE?

Sunflower
Rapeseed (canola),

**AND WHAT ABOUT OTHER CROPS
WITH MEDIUM/HIGH RISK
PESTS???**

**MUTUAL FUNDS TO COVER THE
RISK OF IPM IMPLEMENTATION**

**SPECIFIC PROTOCOLS UNDER
STUDY**