Ctifl

Eufrin
European Fruit Research Institutes Network

Protection strategies and techniques studied in Europe to minimize residues on fruits

EUFRIN Working Group :

« Sustainable fruit production to minimize residues »

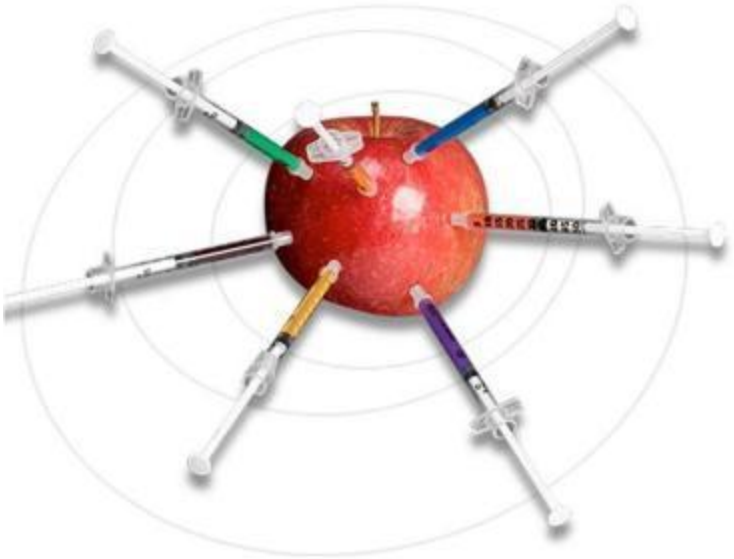
Franziska ZAVAGLI, Ctifl, zavagli@ctifl.fr
coordinator of the EUFRIN WG
"Sustainable fruit production to minimize residues"

Ctifl

Context

Eufrin
European Fruit Research Institutes Network

- use of pesticides is less and less accepted in our **society**.
- **producers** have more and more difficulties to protect their crops against pests
- **retailers** have more and more restrictive guidelines for selling fruits and vegetables



GREENPEACE

Mouvement pour le droit et le respect des générations futures - MDRGF

Pesticides, first risk in food chain for Europeans

Eufrin
European Fruit Research Institutes Network

- June 2010 : Survey realised by the European agency for food safety (26.691 persons).

To which potential risks do you think you are exposed ?

1° : economic crisis

2° : pollution

3° : sickness

4° : food risk

- **In France :**

80 % residues on fruits, vegetables & cereals,
80 % Mercury and dioxin, 72 % cloned animals,
65 % poisoning by bacteria, 64 % GMO,
52 % nanotechnologies, 46 % allergies, 40 % mad cow crisis

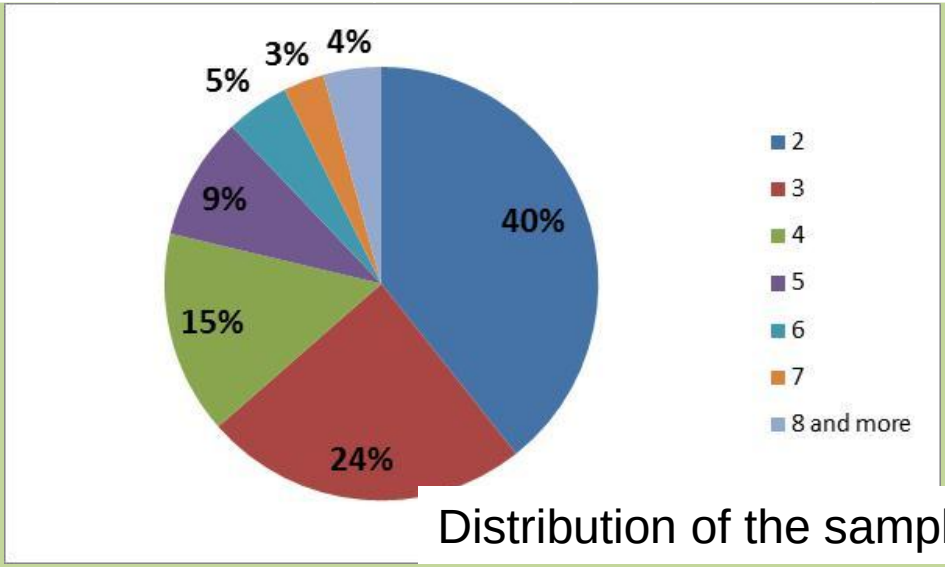
Rate of conformity of residues continues to grow on fruits, vegetables, cereals (EFSA 2007 / 2009)

Eufrin
European Fruit Research Institutes Network

- Number of participating EU and EFSA-States : 29

	Rate of conformity(*)	% > MRL (*)	% without residues (**)	% multiple residues (*)(**)
2007	95,8 %	4,2 %	58,0 %	26 %
2008	96,5 %	3,5 %	62,1 %	27 %
2009	97,4 %	2,6 %	61,4 %	25,1 %

(*) national monitoring programme : ± 68.000 samples
(**) EU coordinated programme : ± 11.000 samples



Distribution of the samples with multiple residues in 2007

TOP 10 in fruits and vegetables in 2007 : Chlorpyrifos, imazalil, cyprodinil, iprodione, thiabendazole, procymidone, fludioxonil, dithiocarbamates, boscalild, imidacloprid.

Focus on apples purchased from national retail outlets (examples)

Eufrin
European Fruit Research Institutes Network

Crunch apples
… not pesticides

	No residues	> MRL	With residues	2-5 compounds
UK	0 %	0 %	100 %	86 %
EU (F, G, SP)	30 %	0 %	70 %	50 %
Outside EU (NZ, Chile, South Africa)	10 %	0 %	90 %	81 %

	No residues	> MRL	With residues	2-8 compounds
Germany	26 %	1/407	74 %	50 %
EU (I, F, NL, Aust., SP, B)	28 %	0 %	72 %	47 %
Outside EU (NZ, Chile, Arg., Brazil, South Africa)	46 %	1/103	54 %	34 %

UK : Health and Safety Executive : PRiF (pesticide residues in food) – Pesticide Residues Monitoring Programme report of the expert committee. July 2012. 53 samples **between July and December 2011.**

Germany : Verbraucherschutzministerium – Pestizidreport NRW (Nordrhein-Westfalen. August 2012. 739 samples **between 2009 - 2012**

Ctifl

Eufrin
European Fruit Research Institutes Network

An European working group on residues

- **What is EUFRIN ?** A place of exchange of experiences with the aim to mutualise the research on a given theme.
- **Why a new WG in 2008 named "Sustainable fruit production to minimize residues" ?**

  The « zero residues », a common problem.
- **15 countries actually :** Austria, Belgium, Denmark, France, Germany, Italy, Netherland, Norway, Romania, Poland, Slovenia, Spain, Sweden, Switzerland, UK.
- **Technical partners:** research stations, universities, technical institutes.
- **Funds :** "own" budget of each structure
- **Fruits :** apples, pears, peaches, soft fruits, citrus

Working group members

Eufrin
European Fruit Research Institutes Network

Austria– Versuchstation für Obst und Weinbau (Haidegg)

Belgium – Pcfruit Kerkom

Denmark – Aarhus University

France - Ctifl

Germany – ESTEBURG – Obstbauzentrum Jork

Italy – Univ. de Bologna ; Obstbau Versuchszent. Laimburg ; I. Agr. San Michele all'Adige

Netherlands – Applied Plant Research (Randwijk, Wageningen UR)

Norway – Institut pour la recherche agronomique et envir. (Bioforsk)

Poland – Research institute of horticulture (Skierniewice)

Romania – Univ. of Agronomic sciences and veterinary medicine (Bucarest)

Slovenia – Faculty of Agriculture and Life Sciences (Maribor)

Spain – IRTA (Catalonia)

Sweden – Swedish Board of Agriculture Plant Protection Division

Switzerland – Research station Agroscope ACW (Wädenswil)

UK – East Malling Research station

Different ways to work on the pesticide residues topic

Eufrin
European Fruit Research Institutes Network

Test strategies, technics on experimental orchards

- Evaluation of their efficiency and comparison with a reference (local, national, IPM)
- Combine them in a “system” approach

Application in a network of commercial orchards

- Develop a “residue programme” with producers and technicians

Compounds knowledge

- Survey on pesticide residues on fruits
- Determination of less risk pre-harvest intervals
- Spray schedules to limit residues according to retailers demands and specific markets

Washing process in packing house

Strategies : The main principles

Eufrin
European Fruit Research Institutes Network

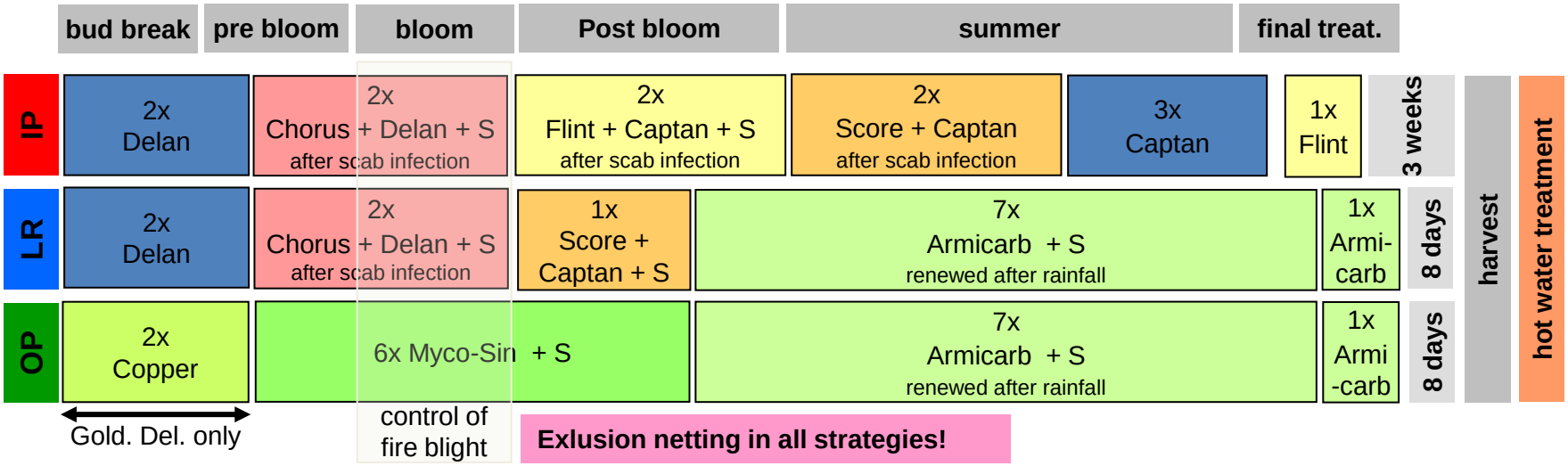
- Limit or even stop "chemical“ treatments from “petal fall” by developing the use of "alternative” products on the secondary contaminations of apple scab or on rising population of codling moth during summer time.
- Choose pesticides according to their eco-toxicity.
- Increase the harvest interval.
- Study autumnal spray application strategies (aphids, apple scab)
- Promote mating disruption, mass trapping, enclosure netting, preventive measures in autumn, mechanical thinning.
- Lean on decision-making tools (evaluation of the risk and simulation by models)

Low – Input apple production trial (Wädenswil)

2012 strategy example

Varieties : Golden Delicious, Ariane, Otava, Topaz

Disease control



Pest control, weed control, thinning

	aphids	codling moth	smaller fruit tortix	weed control	thinning
IP	1x triazamate (Aztec) ahead of boom	mating disruption	1x fenoxycarb (Insegar) end of May	herbicides	Chemical thinning
LR					
OP	1x azadichratin A (Neem Azal) ahead of boom		1x spinosad (Audienz) end of May	mechanical weeding	mechanical thinning (Darwin)

IP: integrated pest management **LR:** low pesticide residue pest management **OP:** organic pest management

ESTEBURG
OBSTBAUZENTRUM JORK

OVR

Long-term strategy trial 2009-2014

number	strategy	description
1	No insecticides; no fungicides from BBCH 74 onwards	• **no** insecticides after blossom • fungicides application stop BBCH 74 (mildew fungicides until shoot growth stops)
2	No fungicides from BBCH 74 onwards	• fungicides application stop BBCH 74 (mildew fungicides until shoot growth stops) • integrated pest control
3	Ecological plant protection starting mid July	• integrated plant protection (fungicides) until mid July, afterwards ecological products only • ecological insecticides after
4	Precaution	• preventive plant protection until BBCH 70 • no residual relevant pesticides after blossom, starting in summer use of ecological pesticides only
5	Standard without storage fungicides	• integrated plant protection • Captan containing storage fungicides only
6	**Standard**	• **integrated plant protection**
7	Standard + fruit mummies removed	• integrated plant protection • fruit mummies removed before bud break
8	Anti-resistance	• integrated plant protection • resistance management optimized

Variety : Elstar

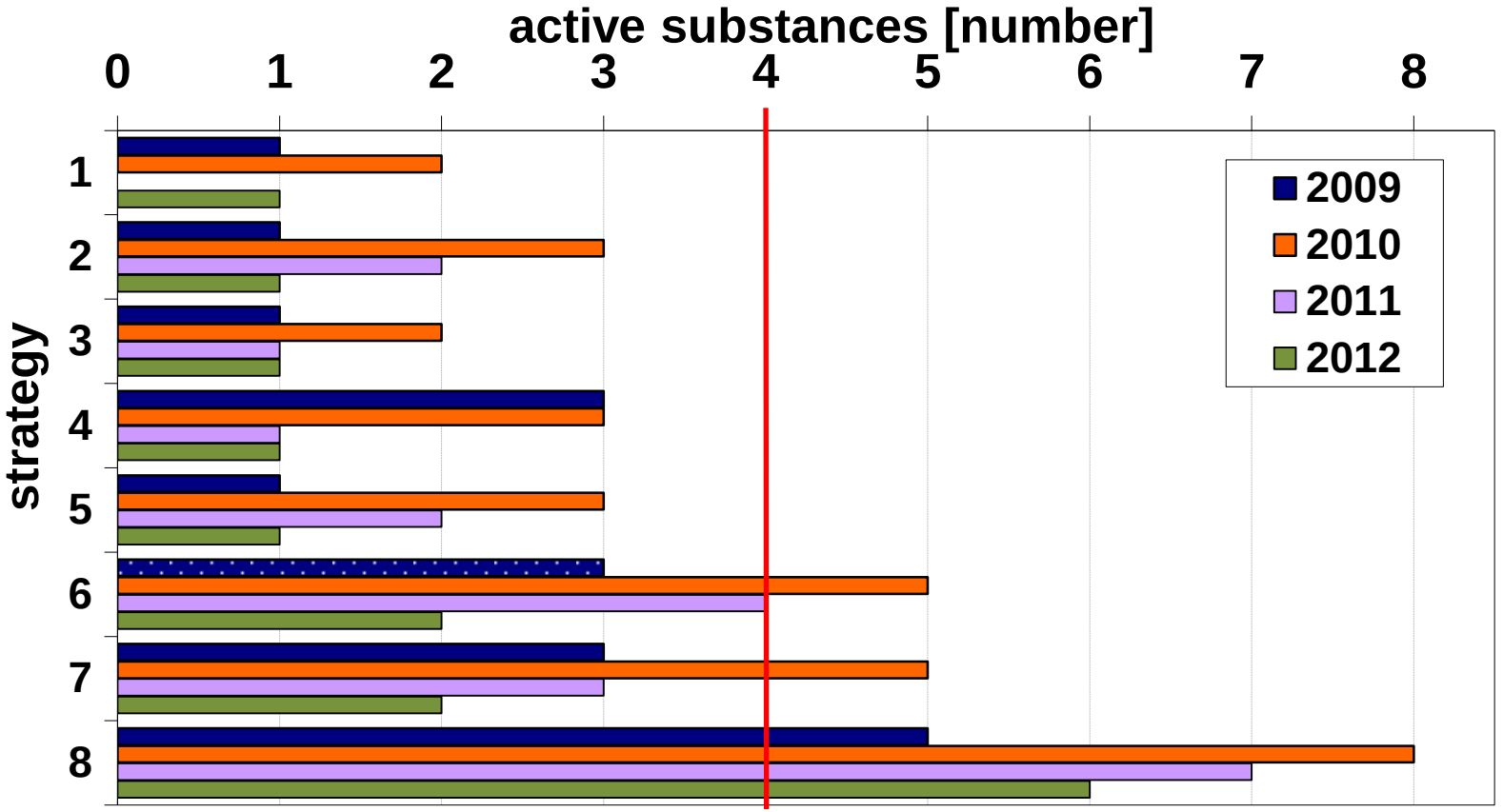
Key points : efficiency levels & consequences

- Good control on **apple scab & powdery mildew** with potassium bicarbonate + sulphur in secondary contamination period. (e.g. in Wädenswil in 2009, 2010, 2011. 2 % on fruits in 2012).
- Strategies without **storage disease** control present the highest losses. (e.g. in Jork, symptoms mid - December up to 50 % on Elstar)
- Hot water treatments against **Bull's eye rot** at storage on Otava and Topaz helps to reduce the damages. (e.g. in Wädenswil)
- Appearance or development of **other bio-aggressors**.

  (e.g. premature leave fall on Topaz and Otava in untreated control plots in Wädenswil).
- Increase of the protection **costs** in the program with limited residues (e.g. in Jork, strategy 3 and 4)

Pesticides reduction

- From July, treatments with more "ecological" profiles, reduce the detected number of active substances at harvest (e.g. to Jork < 4 a.s).



1=No insecticides; no fungicides from BBCH 74 onwards; **2=**No fungicides from BBCH 74 onwards; **3=**Ecological plant protection starting mid July; **4=**Precaution; **5=**Standard without storage fungicides; **6=Standard; 7=**Standard + fruit mummies removed; **8=**Anti-resistance

Fruit.Net

Generalitat de Catalunya
Departament d'Agricultura, Ramaderia, Pesca, Alimentació i Medi Natural

IRTA
RECERCA I TECNOLOGIA AGROALIMENTÀRIES

Fruit.Net Program: OPTIMIZING THE USE OF PESTICIDES AND RESIDUE MINIMIZATION ALONG THE FRUIT PRODUCTION

- Validation of strategies using alternative methods (mating disruption, mass trapping, biological control) & predictive models
- Research activities : Developing techniques and new systems
- Transferring the results to the end users
- Integrating Agriculture Department, IRTA, Universities and fruit sector
- Results 2012 :

Fruits	Commercial orchards	Reduction of fungicides (%)	Reduction of insecticides (%)
	28 (67 ha)	20	29
	23 (37 ha)	7	36
	14 (22,4 ha)	14	7

Fruit.Net

Generalitat de Catalunya
Departament d'Agricultura, Ramaderia, Pesca, Alimentació i Medi Natural

IRTA
RECERCA I TECNOLOGIA AGROALIMENTÀRIES

Research activities:

Spray schedules to limit residues at harvest

AIM:

To know the residues content of the active ingredients at harvest

METHODOLOGY:

- Field trial (3 years)
- Spraying at different dates before harvest (days)
- Samples Analysis: 'Laboratori Agroalimentari del DAAM'

RESULTS:

Advised period according the residues found at harvest

Active Ingredient	Preharvest Interval (days)	Advised period (days)
Propargite	21	60
Chlorpyrifos-etyl	21	45
Thiacloprid (*)	14	45
Methoxyfenozide	14	45
Folpet	10	45
Captan	10	45
Boscalid +Pyraclostrobin (*)	7	45
Rynaxypyr(*)	14	45
Dithianon(*)	21	45
Pyridaben	15	30
Etoxazole	28	30
Indoxacarb(*)	7	30
Abamectin	28	30
Emamectin	-	15
Deltamethrin	7	7
Lamda-cyhalothrin	7	7

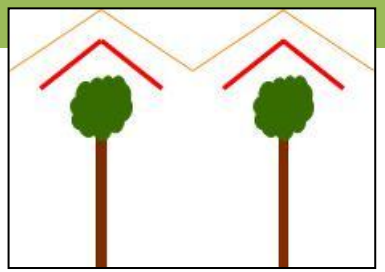
(*) Data of one year only

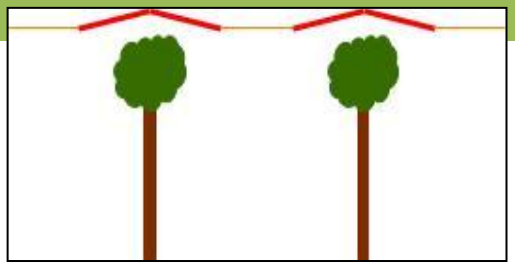
Looking for innovative methods : rain protection

Eufrin
European Fruit Research Institutes Network

Ctifl Centre de Lanxade

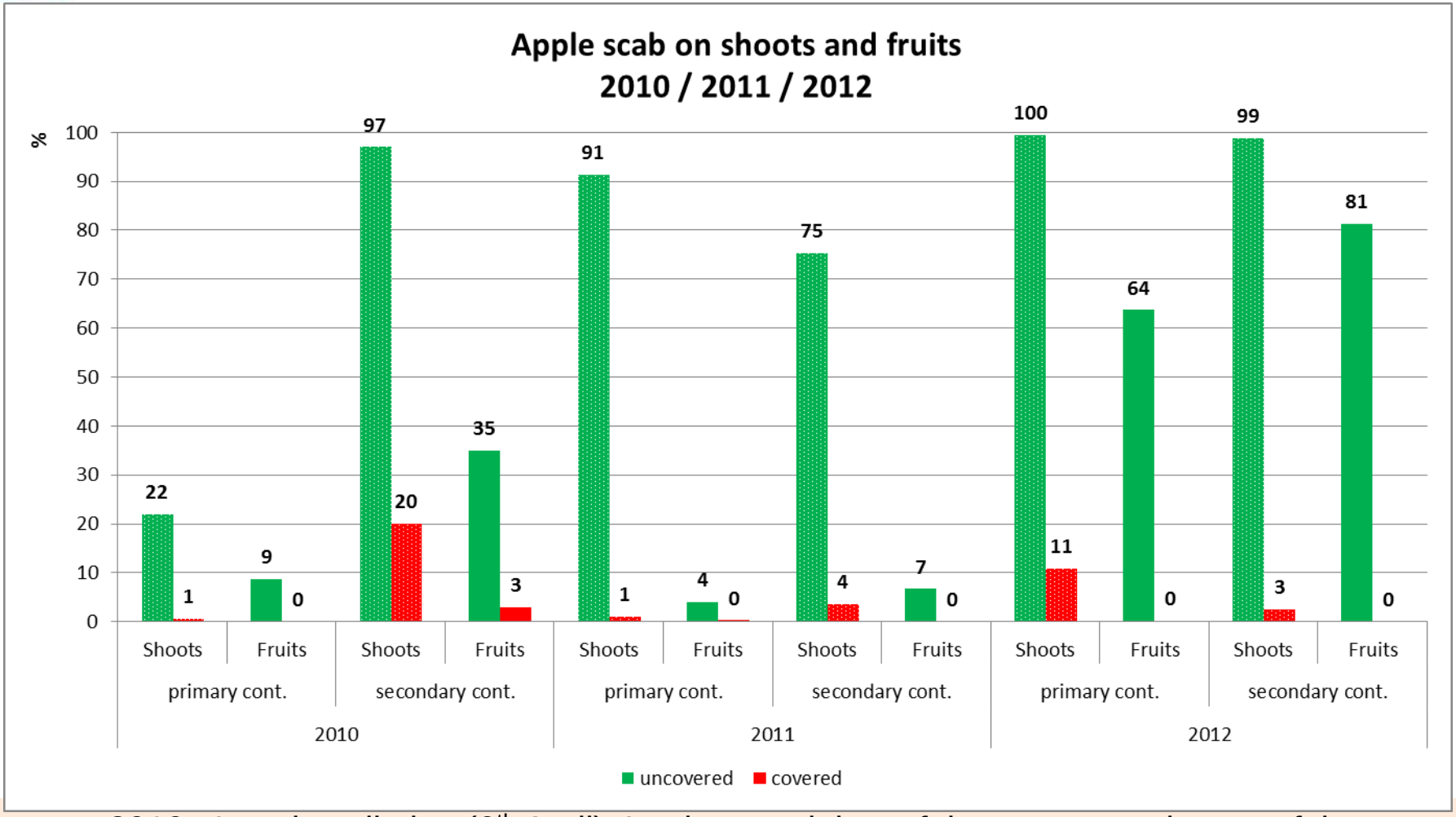
Principle : plastic cover (1.40 or 1.60 m wide) used on cherries on the row under the hail nets or combined with the hail nets (0.70 m).





Braeburn : Three seasons trials (2010, 2011, 2012)

Eufrin
European Fruit Research Institutes Network



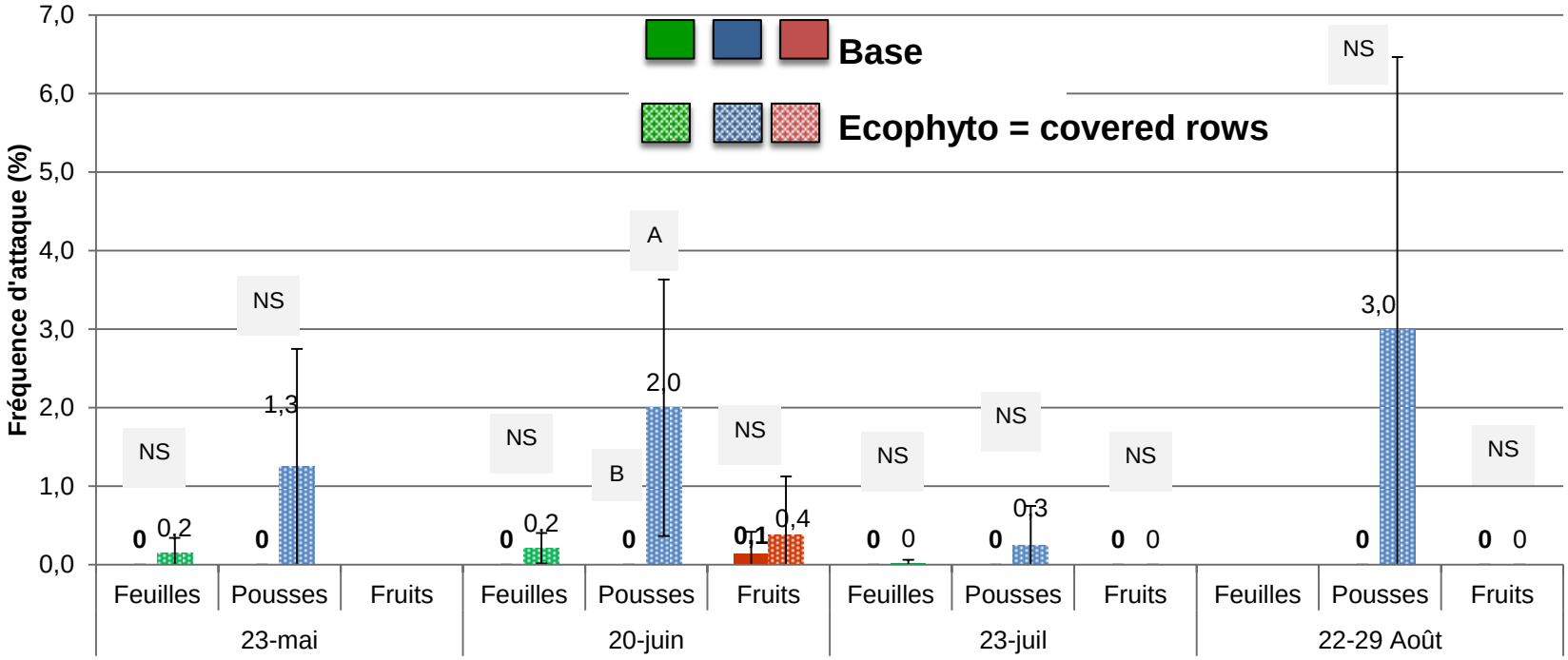
- 2010 : Late installation (6th April). Inadequate joints of the covers on the top of the trees.
- 2011 : Covered on the 9th March. Improved joints.
- 2012 : Covered in the middle of march. Frost on 18th April.

Rain protection trial : Gala apple scab results 2012

Eufrin
European Fruit Research Institutes Network

Apple scab pressure on leaves, shoots and fruits in untreated plot.

Dates	Leaves	Shoots	Fruits
23 May	2.4 %	16.5 %	
20 June	18.5 %	80.5 %	20.8 %
23 July	22.3 %	92 %	32.9 %
22-29 August		94 %	63 %



Anova + test de Newman Keuls à 5 %

PERSPECTIVES

Eufrin
European Fruit Research Institutes Network

- Adapted irrigation to compensate the rain water
- Incidence of less luminosity / fruit colours
- Technical improvements (fixation, combination of hail nets and plastic cover, resistance …)
- Environmental aspects (energy, recycle conditions, image)
- Costs :

- plastic cover alone : 8 x compared to chemical treatments
- Plastic cover combined with hail nets : 1000 €/ha/year more compared to chemical treatments done under hail nets.

What can be done in packing house ?

- **<u>Ozonation</u> (Wageningen):**

➢ Efficiency in the water, but not on fruits

➢ Combination with soaps : 60 % of reduction of the concentration

➢ **Inconveniences :** long process, the *number* of residues stays the same, no systematic effect, costs.

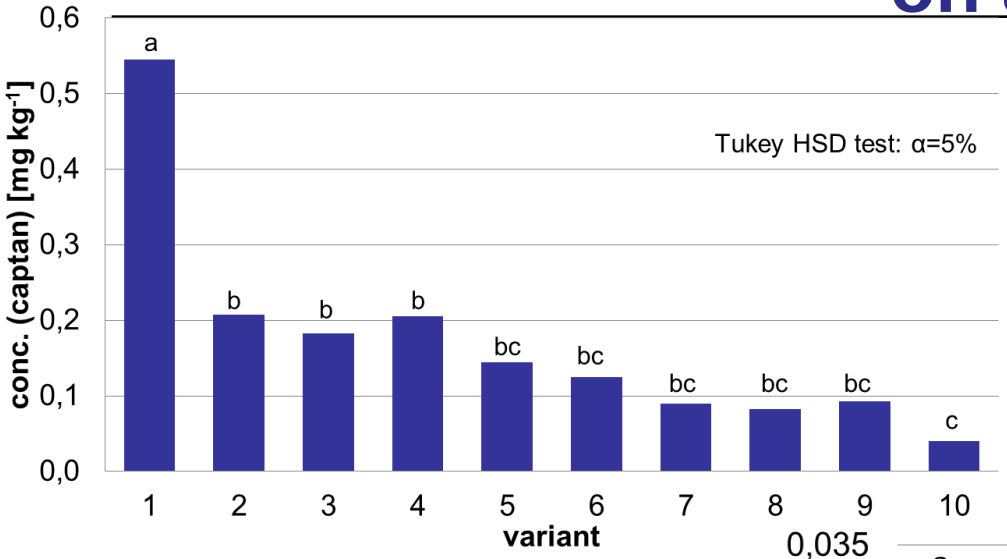
- **<u>Soaps, warm water, brushes</u> (Wageningen, Jork, Ctifl):**

➢ Concentration reduced by 30 to 50 % and even more, but no complete elimination and same number of residues

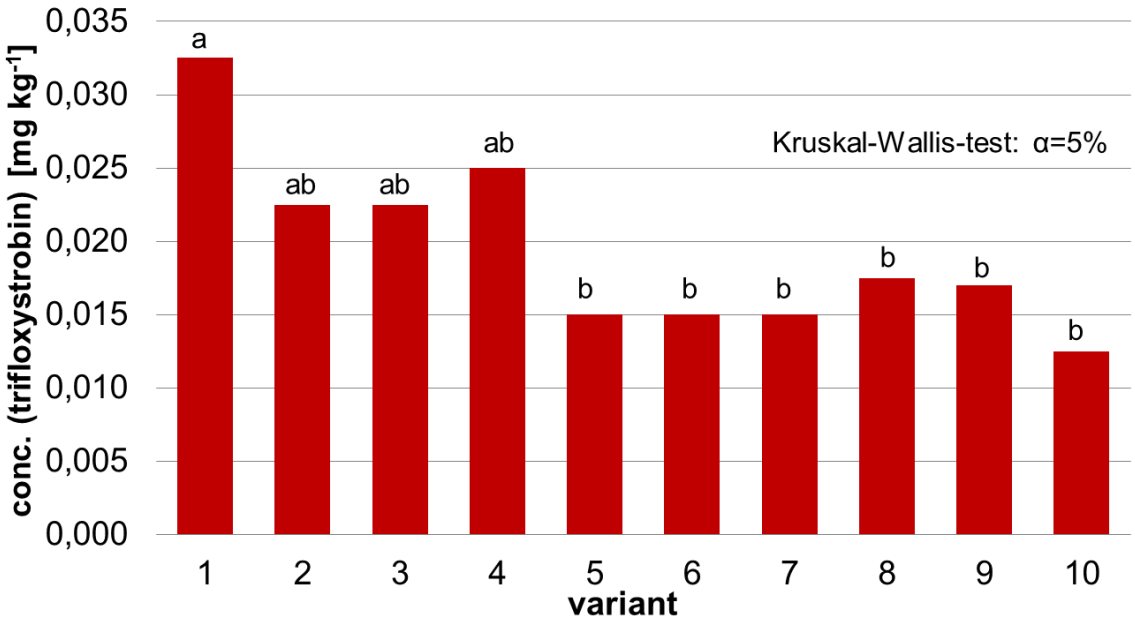
➢ The effect of brushes is not always seen.

➢ **Inconveniences :** management of the foam, the stability of the concentration in the prepared soap, management of the remainder effluent, the complexity of the process.

Examples for fungicides residues on apples



1= untreated control
2= tap water, 180 sec.
3= tap water, 360 sec.
4= peroxyacetic acid (0.07 %), 180 sec.
5= product 1 (0.625 %), 180 sec.
6= product 1 (0.625 %), 360 sec.
7= product 2 (0.625 %), 180 sec.
8= product 2 (0.625 %), 360 sec.
9= brushing machine (dry), 70 sec.
10= brushing machine (wet), 70 sec.



Abt. Integrierter Pflanzenschutz und Diagnostik;
H. Holthusen

CONCLUSION

- A lot of other studies : soft fruits, cherries, on post-harvest treatments, with UV-light, on grading water …
- **Same** concern with **different pest pressures**
- A lot of work has be done, but there is still a lot to do and achieve the transfer to commercial fruit production.
- Find the right balance between pesticides reduction and fruit quality as economic viability.

EUFRIN WG, a way to contribute to the European fruit industry and innovate fruit protection.

If you are interested in EUFRIN WG, please contact us : zavagli@ctifl.fr