Actual Situation of Insect Control in Winter Oilseed Rape (WOSR) in France:

Example of the rape winter stem weevil and cabbage stem flea beetle management.

C. Robert, L. Ruck, G. Sauzet, S. Cadoux, J. Lieven, A. Van Boxsom, J.Carpezat

Contact:
c.robert@terresinovia.fr

GCIRC – Technical meeting
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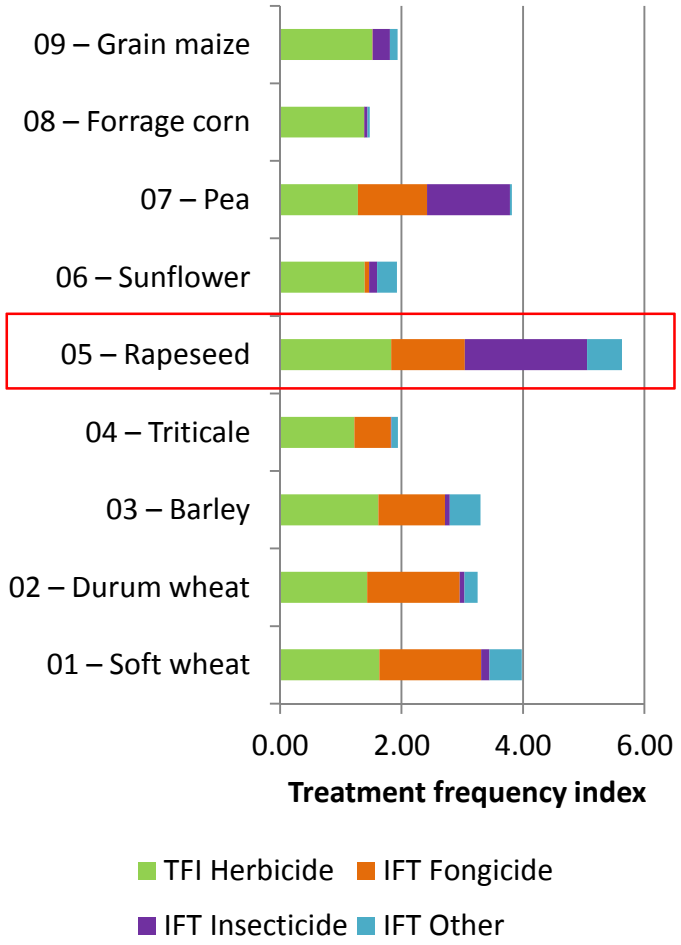
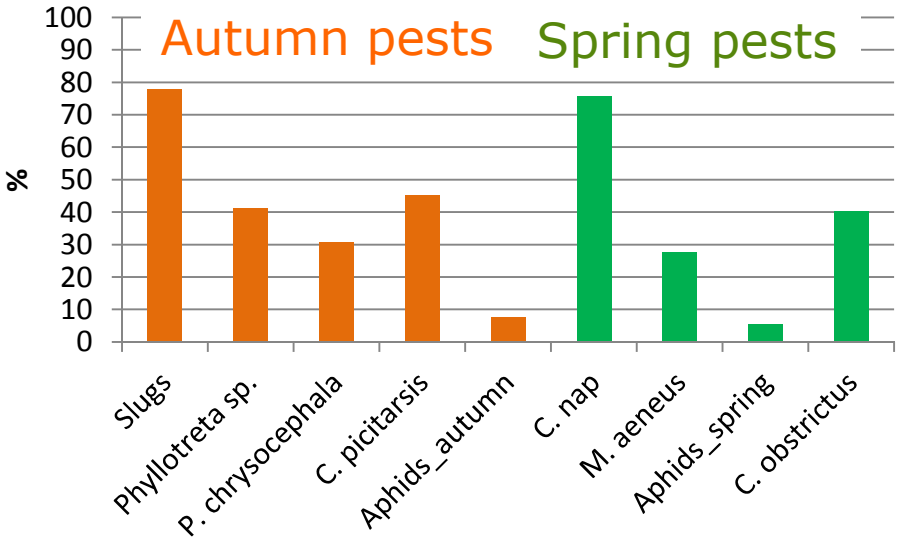
Targets of insecticides on WOSR

(Agreste, 2014)



(Survey Terres Inovia, 2014)

Percentage of the surface sprayed at least once against:



Pests – mostly beetles and slugs - are the main problem on WOSR in France.

Terres Inovia purpose:
Reduce the use of chemicals, while maintening good yields.

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Several insect species are resistant to insecticides

For decades, pest management in WOSR was mainly based on insecticide strategies. Few chemical families are available.

➡ **EMERGENCE OF RESISTANT POPULATIONS**

Today, difficulties to manage these 2 species

In France :

1997:
Green peach aphid (*Myzus persicae*) resistance to PYR

1999:
Pollen beetle (*Meligethes aeneus*) resistance to PYR

2009:
Green peach aphid (*Myzus persicae*) resistance to pirimicarb

2014-2015:
Rape winter stem weevil (*Ceutorhynchus picitarsis*) and cabbage stem flea beetle (*Psylliodes chrysocephala*) resistance to PYR.

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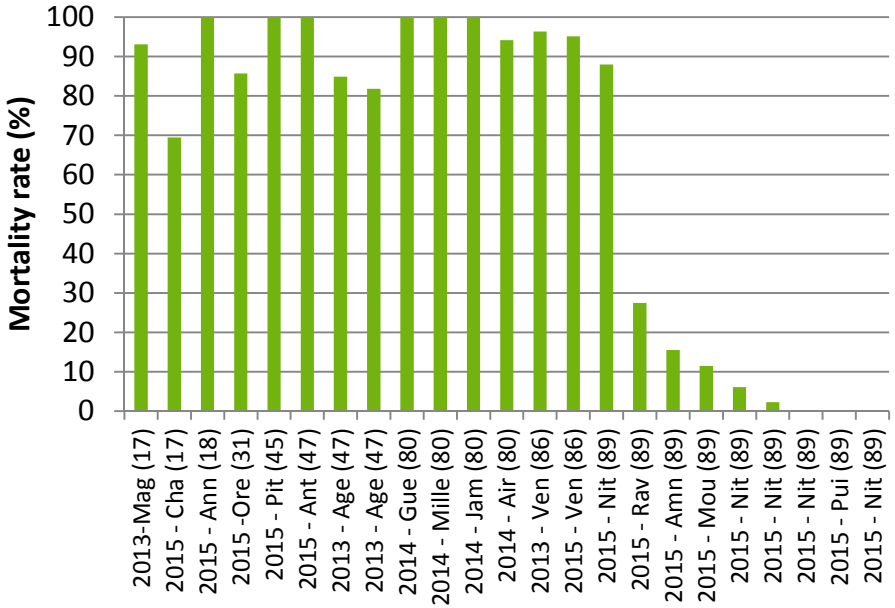
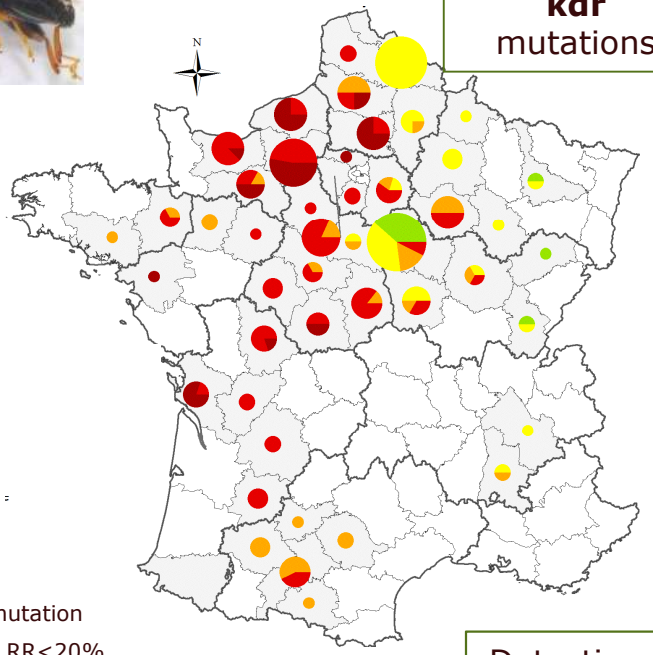
High level of resistance of cabbage stem flea beetle

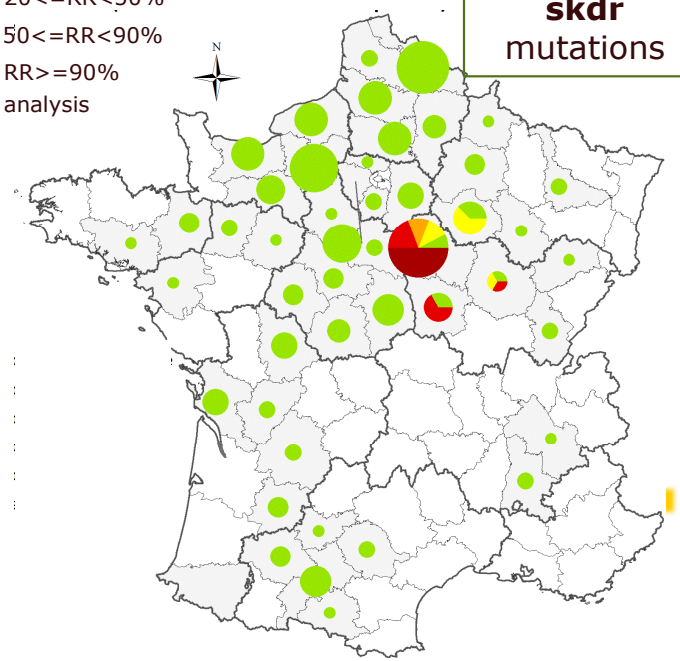
Mortality rate after a 24-hours exposure to l-cyhalothrin at 15 ng/cm2



Detection of **kdr** mutations



Detection of **skdr** mutations



•The selection pressure was so high that many different resistance mechanisms were selected: mutations (kdr and skdr) ; metabolic resistance.

• In trials, on populations with kdr mutations (38-95% RR), pyrethroids efficacy varies from 25% to 75%.

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Context

- **High pressure of the general public to develop a less pesticides dependant agriculture**

- **A difficult technical context**:
  - Several insect species are resistant to insecticides
  - The number of insecticides molecules is decreasing (difficulties to alternate)
  - Lack of efficient alternative solutions to manage insect pests

Difficulties are currently particularly important for rape winter stem weevil and cabbage stem flea beetle

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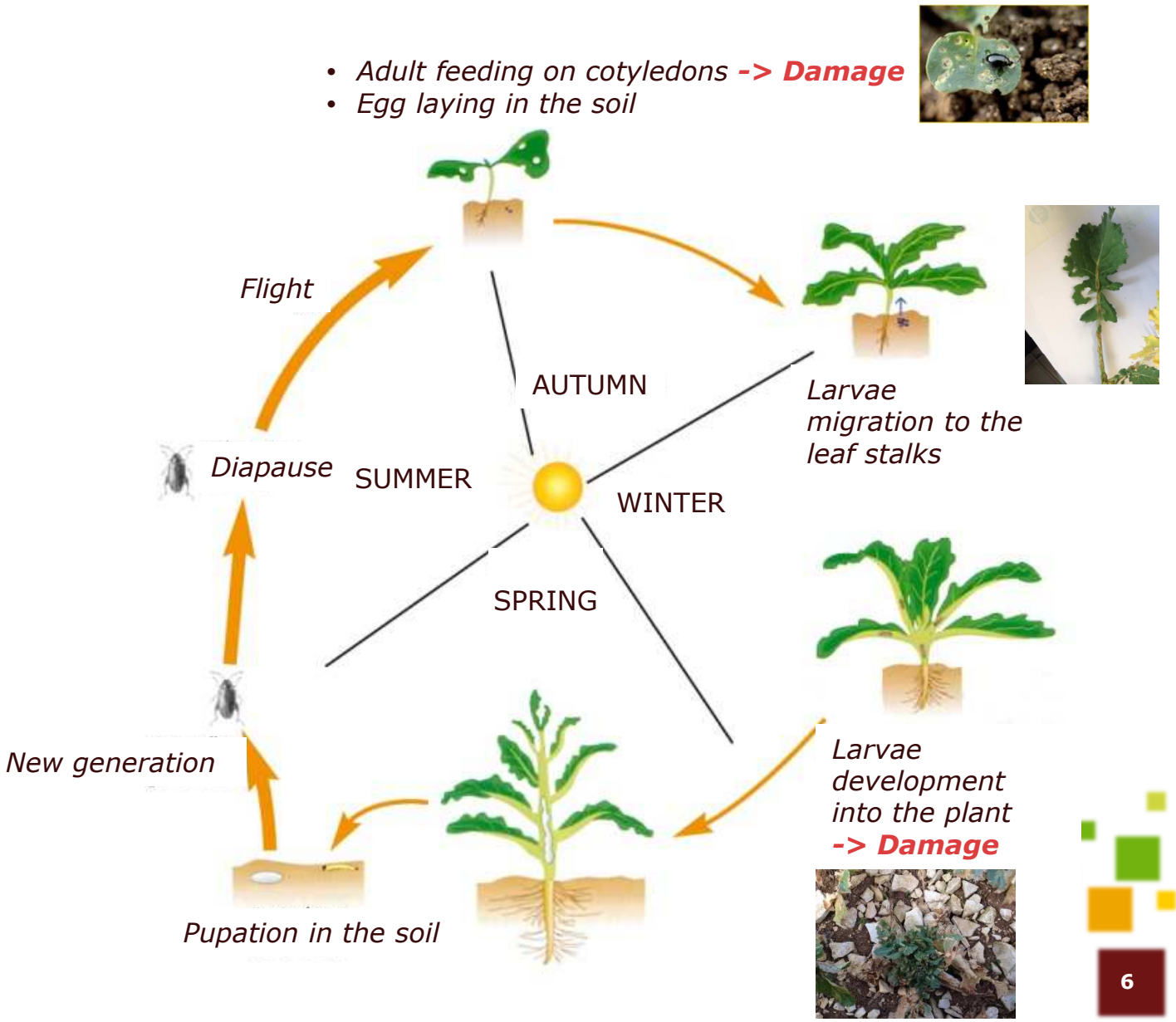
The life cycle of *P. chrysocephala*

The life cycle of *C. picitarsis* is very similar BUT:

-Weevil adults do not induce damage.

- Weevil eggs are laid in the leaf stalks

- Weevil larvae stay into the leaves and cannot be killed by insecticides.



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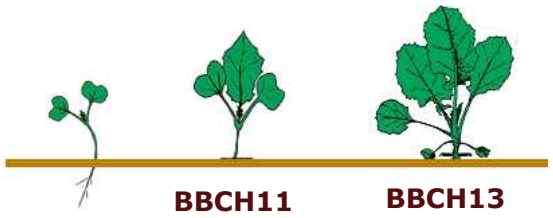
Preventive measures



Slow growing phase

adults - risk avoidance approach

Adults migrate into the fields around the 20th september.

The strategy is to adapt the sowing date to reach the BBCH14 stage around the 20th september (sowing date between 15th - 31th August).

larvae - win the sprint between plant growth and larvae that tend to reach the plant heart.

Mobilise all the agronomical techniques to succeed in having a quick and continuous growth of the crop in autumn and at the beginning of spring:

–Pay attention to crop establishment and favor the root system growth (sowing date, soil preparation…)
–Avoid nitrogen deprivation (organic fertilizer, WOSR with frost sensitive legume crop…)
– Pay attention to phytotoxicity or to any accident that could stop the crop from growing.

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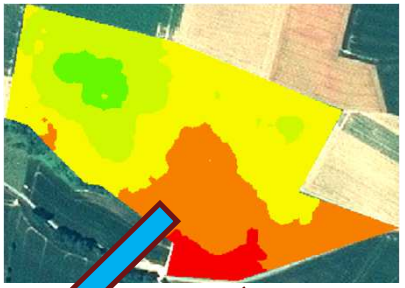
Flea beetle larvae are less harmful on continuous growing crop.

Map Farmstar biomass



Carte de biomasse

Biomasse de matière verte (kg/m²)		% Surface
	0.0 - 0.2	0.0
	0.2 - 0.4	0.0
	0.4 - 0.6	5.7
	0.6 - 1.0	27.3
	1.0 - 1.5	40.9
	1.5 - 2.0	21.1
	2.0 - 2.5	5.1
	2.5 - 3.0	0.0
	> 3.0	0.0

Biomasse moyenne produite	1.3	kg/m²
Azote moyen absorbé	82	Unités

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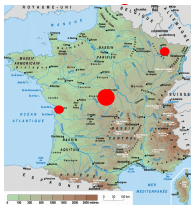
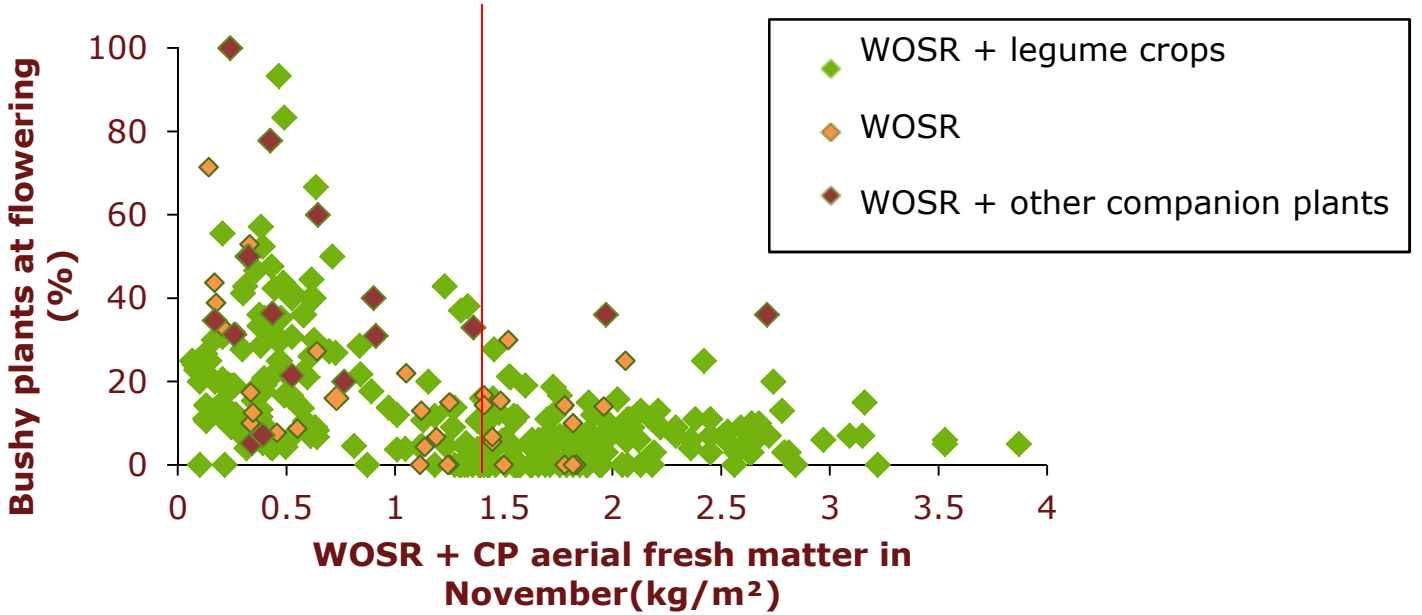
Importance of plant growth to reduce autumn beetles harmfulness



(14 trials - 2011-2014)

(Cadoux et al. , 2015)



- Positive impact of a good crop establishment and of a good crop growth (**WOSR + legume crop = 1500 g/m²**) to limit the % of bushy plants at flowering.

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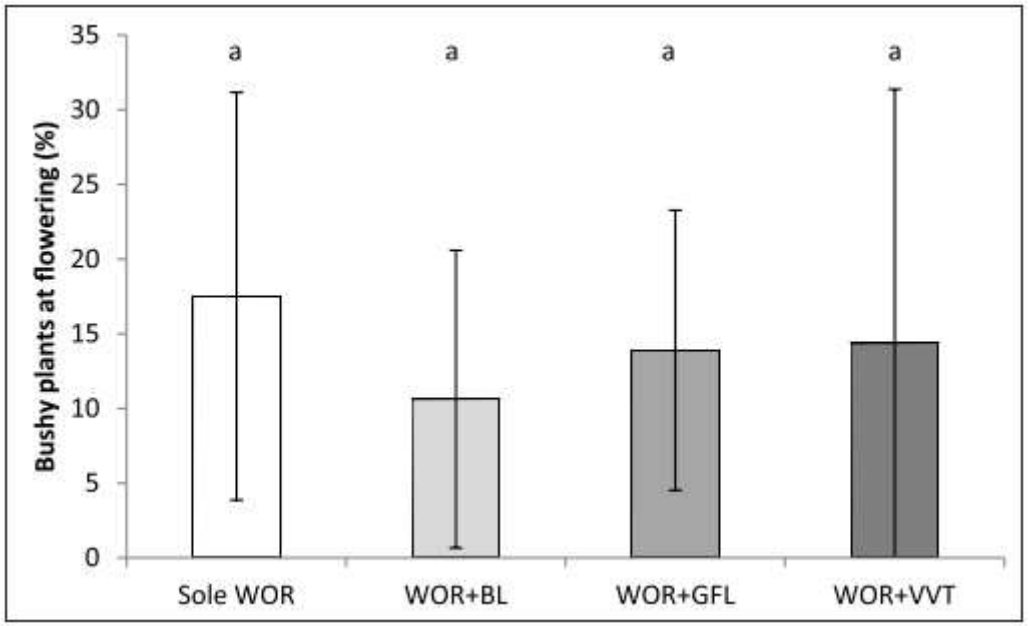
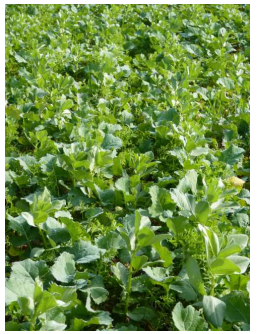
WOSR with frost sensitive legume crops

(Cadoux et al. , 2015)

(14 trials - 2011-2014)





BL: faba bean (*Vicia faba*) + lentil (*Lens culinaris*)

GFL : grass pea (*Lathyrus sativus*) + fenugreek (*Trigonella foenum-graecum*) + lentil

VVT: purple vetche (*Vicia benghalensis*) + common vetch (*Vicia sativa*) + berseem clover (*Trifolium alexandrinum*)

- Lower % of bushy plants at flowering for intercrop treatments.
- The difference is not significant but the p-value is low (p=0.095)
- Unknown mechanisms (physical barrier, olfactory cues changes, strongest WOSR growth …)

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Monitoring tools

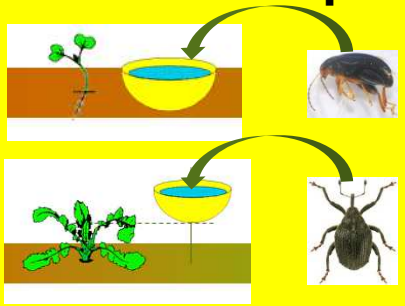
BSV (Plant health newsletter)= A real time warning tool

- **A field regional network**
- **Common protocols**
- **Laboratory analyses**

The « BSV » gives each week indications on:

- the crop health status
-pest and disease risk assessment
-pest and disease biology and thresholds

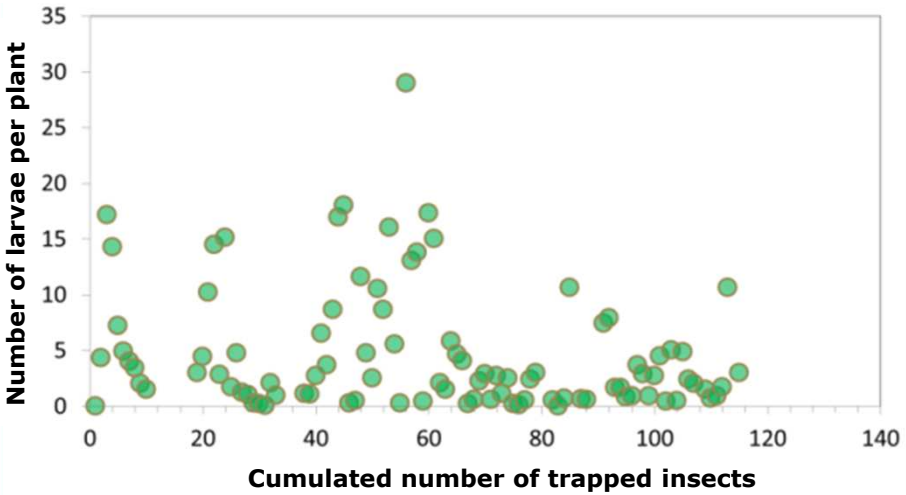
Yellow trap <- presence indicator



Burried yellow trap

On top of the vegetation

Relationship between the number of larvae per plant at the beginning of winter and the cumulated number of trapped insects



No correlation between the number of trapped insects and the number of larvae per plant.

Decision rules

TI recommands to distinguish adult and larva management

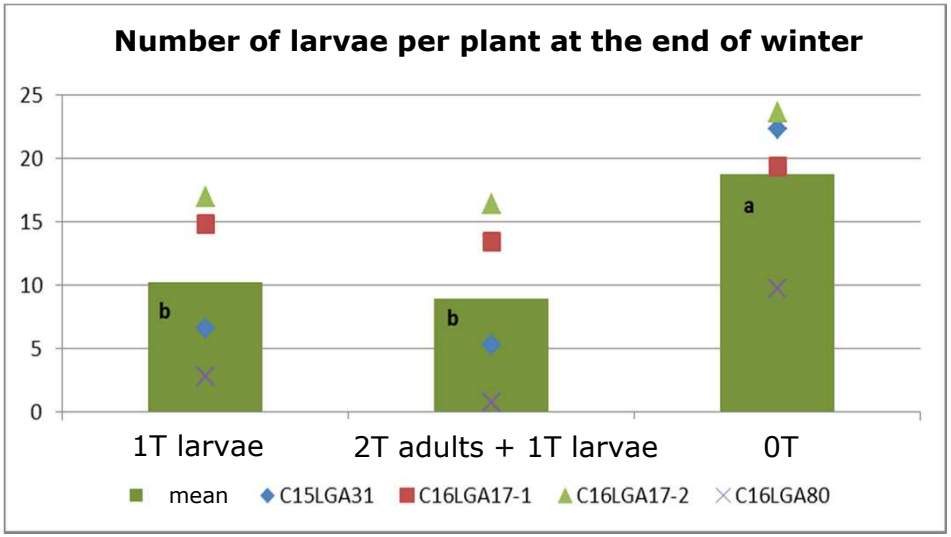
Adult thresholds

Up to the BBCH13 (included): **8 plants / 10 with bites**

Larvae thresholds

7 plants / 10 with at least 1 larvae ⇔ 2-3 larvae per plant

T adult: BBCH10-11
& BBCH12-13
T larva : november



(4 trials – 2015-2016)

Treatments against adults are not efficient enough to control larva infestation

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Conclusions

- Insecticides showed their limits
- The only way to reduce pest harmfulness is to combine all preventive measures we can find and to use chemicals as the last resort = IPM
- Current and future directions of Terres Inovia works:
  - Crop associations
  - **Improvement of crop growth (levers combination : sowing date, crop association, fertilization…)**
  - Varietal comparisons
  - Risk evaluation
  - Promotion of natural regulation

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