

## Alternative management of insect pests on oilseed rape in winter and spring.

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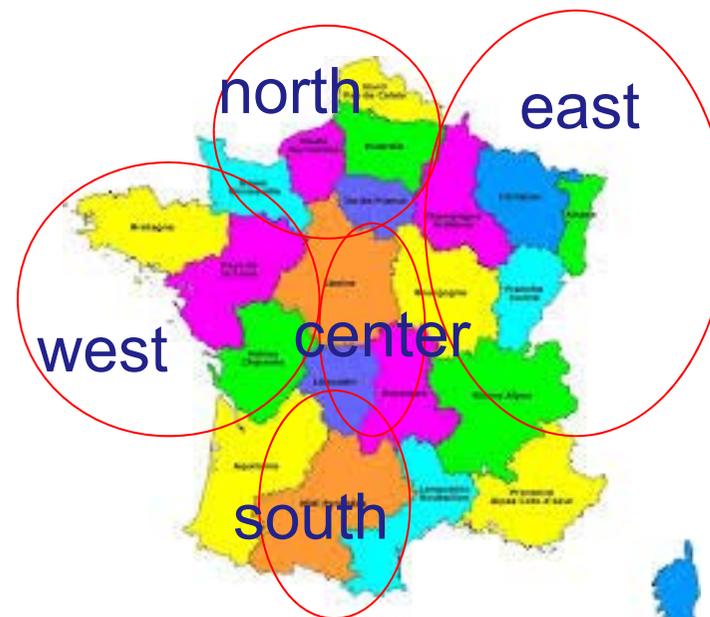
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## FROM FRENCH BIO SURVEY DEVICE

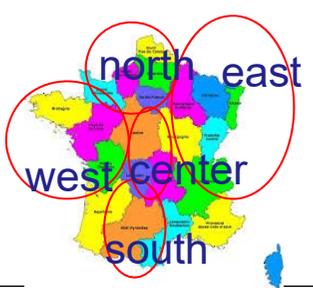
<i>Deroceras reticulatum, Arion sp</i>
<i>Phyllotreta sp</i>
<i>Athalia rosae</i>
<i>Psylliodes chrysocephalus</i>
<i>Myzus persicae</i>
<i>Delia radicum</i>
<i>Ceutorhynchus picitarsis</i>
<i>Ceutorhynchus napi</i>
<i>Brevicoryne brassicae</i>
<i>Meligethes aeneus -M. viridescens</i>
<i>Melanobaris laticolli -baris</i>
<i>Ceutorhynchus obstrictus</i> ex <i>C assimilis</i>
<i>Dasineura brassicae</i>
other caterpillars ( <i>Helicoverpa</i> ....)
<i>Pieris rapae</i>
....



	few observations	<span style="background-color: #d9ead3; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>			
	No damage	<span style="background-color: #5cb85c; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>			
	significant on less than 5% area	<span style="background-color: #4f81bd; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>		less than previous year	-
	significant on less than 20 % area	<span style="background-color: #ffc000; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>		non change /previous year	=
	significant and generalised	<span style="background-color: #d9534f; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>		more than précédent year	+



2015

	east					center		south	north				west		
	Alsace	Lorraine	Champagne - Ard.	Bourgogne	Franche Comté	Auvergne	Centre	Midi Pyrénées	Ile de France	Nord - Pas de Calais	Picardie	Normandie	Poitou Charentes	Bretagne	Pays de la Loire
 <i>slugs</i>	=	.	.	.		=	+	.	.	+	+	=	.	=	.
<i>Phyllotreta sp</i>	+	+	+	+		=	=	+	.	+	+		.	=	=
<i>Athalia rosae</i>	+	=	=	=			=	=	.	=	=		=	=	=
<i>Psylliodes chrysocephalus</i>	+	+	=	+	+	=		.	+	+	+	+	.	.	.
<i>Myzus persicae</i>	=	=	+	=		=	=	+	+	=	=	=	.	.	=
<i>Ceutorhynchus picitarsis</i>	=	=	+	+	+	=	=	=	=	+	=	=	=	=	=
<i>Ceutorhynchus napi</i>	=	=	+	+	.	=	=	=	=	+	+	=	=	=	+
<i>Brevicoryne brassicae</i>	=	=	.			=	=	.	.	.	=	=	+	=	+
<i>Meligethes aeneus -M. viridescens</i>	.	=	+	.	.	.	=	.	=	=	=	=	=	.	=
<i>Melanobaris laticolli -baris</i>				+	+	=		=	=	=	=		=	=	=
<i>Ceutorhynchus assimilis</i>	.	=	=	+	+	=	=	+	=	=	=	+	+	=	.
<i>Dasineura brassicae</i>			=	.	.	=	.	+		+	+		+	=	.
<i>Delia radicum</i>			=	=	=			.	=	.	=		.	=	
other caterpillars ( <i>Helicoverpa</i> ....)		+	+	=	=			=		=	=			+	
<i>Pieris rapae</i>				=	=			=		.	.			=	

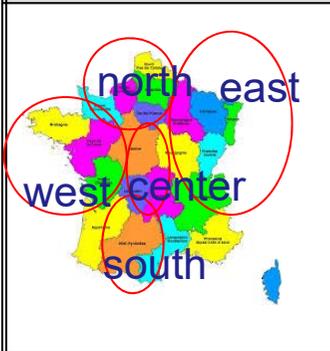
Why Pollen beetle n° 2

Concepts and old trials

New trials



## CHANGE IN 1<sup>ST</sup> GOAL

	east					center	south	north				west			
	Alsace	Lorraine	Champagne - Ard.	Bourgogne	Franche Comté	Auvergne	Centre	Midi Pyrénées	Ile de France	Nord - Pas de Calais	Picardie	Normandie	Poitou Charentes	Bretagne	Pays de la Loire
															
<b>2015</b>															
<i>Psylliodes chrysocephalus</i>	+	+	=	+	+	=		-	+	+	+	+	-	-	-
<i>Meligethes aeneus</i> - <i>M. viridescens</i>	-	=	+	-	-	-	=	-	=	=	=	=	=	-	=
<b>2006</b>															
<i>Psylliodes chrysocephalus</i>															
<i>Meligethes aeneus</i> - <i>M. viridescens</i>															



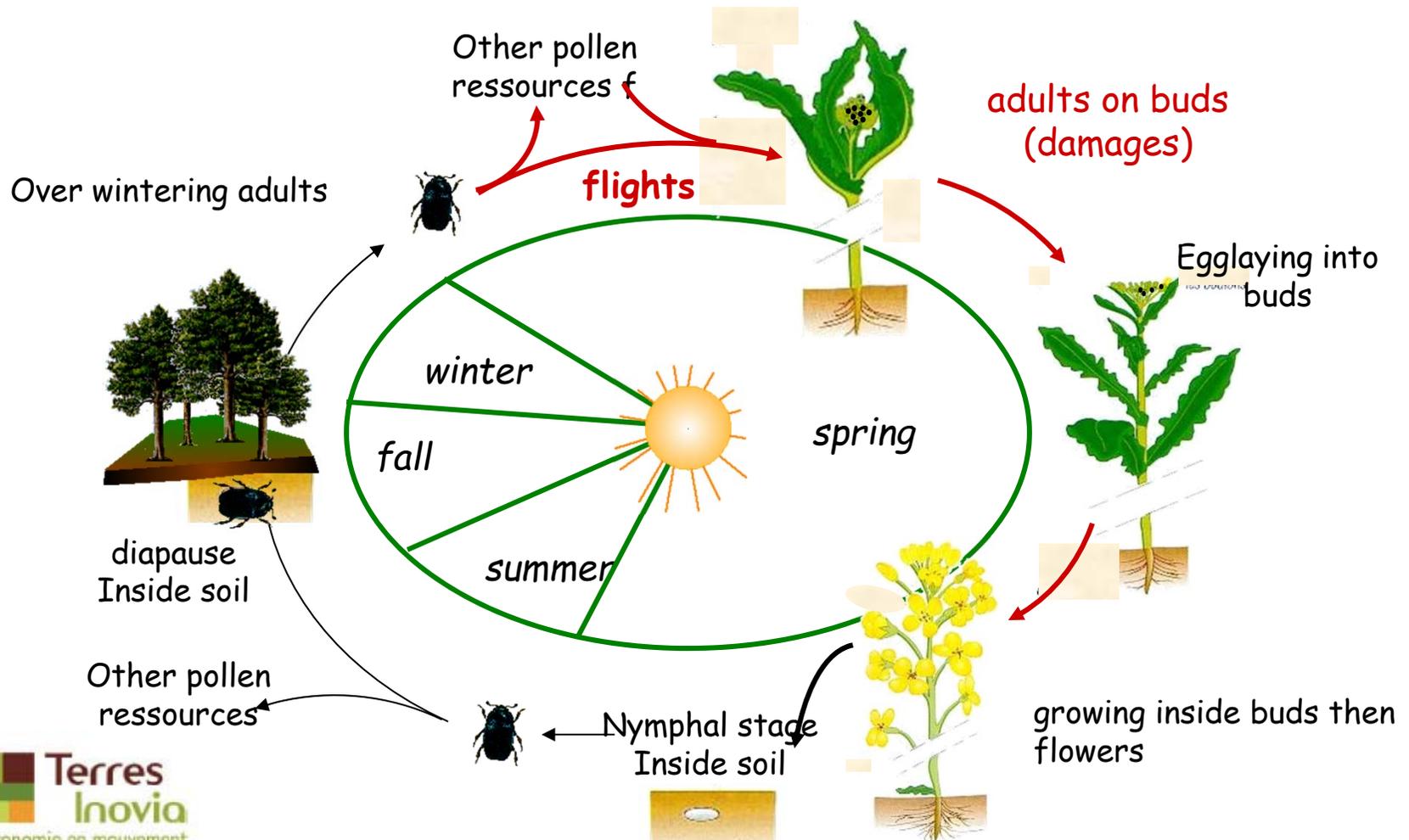


		east					center		south	north		west		
		Alsace	Bourgogne	Rhone-Alpes	Champagne - Ard.	Lorraine	Centre	Auvergne	Midi Pyrénées	Ile de France	Nord - Pas de Calais	Normandie	Bretagne	Pays de la Loire
2016	slugs	<i>Deroceras reticulatum,</i> <i>Arion sp</i>	=	=	=	+	=	+	=	=	=	+	+	=
		<i>Phyllotreta sp</i>	.		.	=	=	=	+	.	+	=	=	
		<i>Athalia rosae</i>		=	.	=	=	.	+	+	=		=	.
cabbage stem flea beetle	<i>Psylliodes chrysocephalus</i>	=	+	=	+	+	+	=	+	+	+	+	+	=
green peach aphid	<i>Myzus persicae</i>	=		.	.	.	.	.	.	.	.	.	.	.
	<i>Delia radicum</i>			=	=	=	=	.	=	=		=		
rape winter stem weevil	<i>Ceutorhynchus picitarsis</i>	=	=	.	=	+	=	=	+	=	=	=	=	+
rape stem weevil	<i>Ceutorhynchus napi</i>	.	+	=	.	.	=	.	.	.	.	=	=	.
	<i>Brevicoryne brassicae</i>	.		+	+	+	+	+	+	+	+	+	+	=
pollen beetle	<i>Meligethes aeneus -M. viridescens</i>	+	.	=	=	=	+	=	+	=	=	+	=	.
	<i>Melanobaris laticolli - baris</i>		+	=	+			=	=		=			
cabbage seed weevil	<i>Ceutorhynchus obstrictus ex C assimilis</i>	.		+	.	.	+	+	.	.	+	.	.	.
brassica pod midge	<i>Dasineura brassicae</i>			+	.	.		+	=			.	=	.
	other caterpillars ( <i>Helicoverpa...</i> )				=				+				.	
	<i>Pieris rapae</i>				=							=		





## GROWTH CYCLE FOR MELIGETHES AENEUS (SOURCE CETIOM)





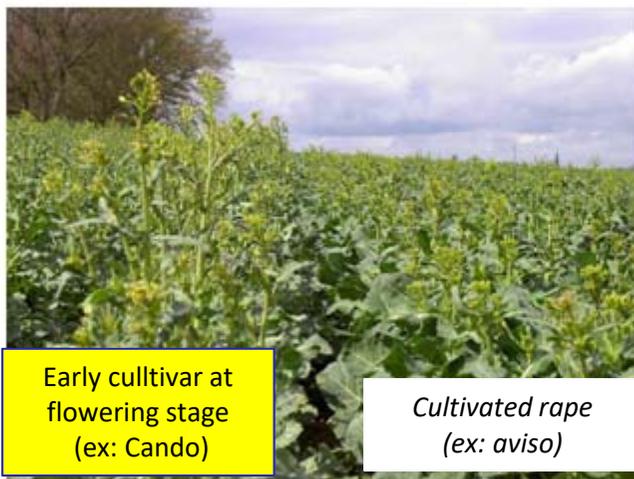
## Trap pollen beetle An old concept since 2003

Pollen beetle are attract by  
1- yellow color of flowers  
2- volatile compounds from rape crop during flowering  
And taller stage in general



### 1- PULL and DESTROY strategy

5 or 10 lines Earlier flowering cultivars  
of winter rape sown beside or around  
the main rape crop

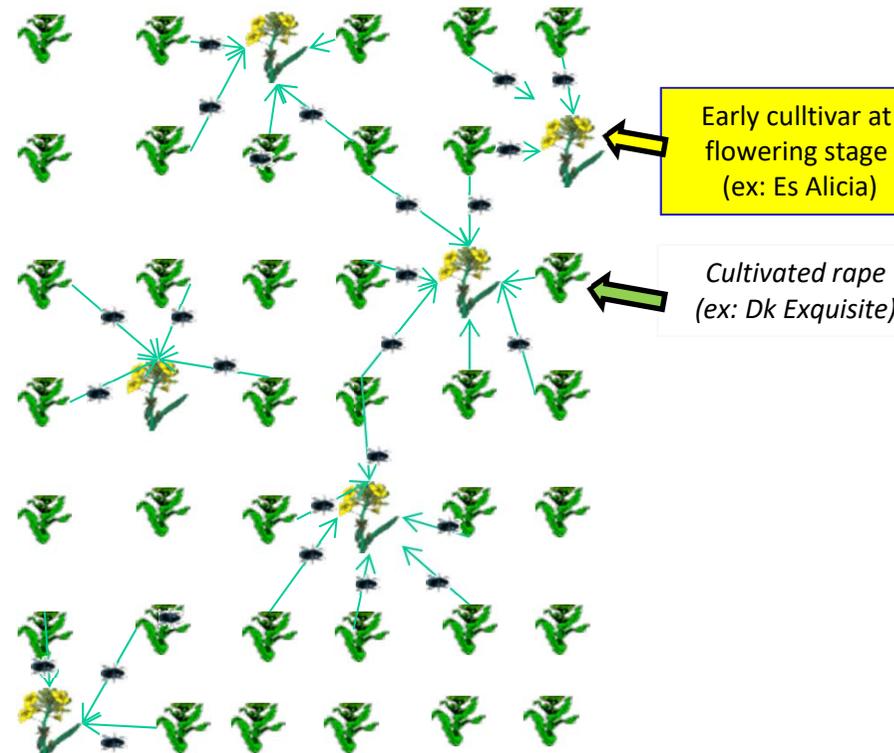


Early cultivar at  
flowering stage  
(ex: Cando)

Cultivated rape  
(ex: aviso)

### 2- PULL only strategy

Sowing 5 to 10% early flowering cultivar mixed with the  
main interesting cultivar ( 90 to 95%) – late flowering



Destruction of beetle only on trap lines is  
possible before beetle move into the crop

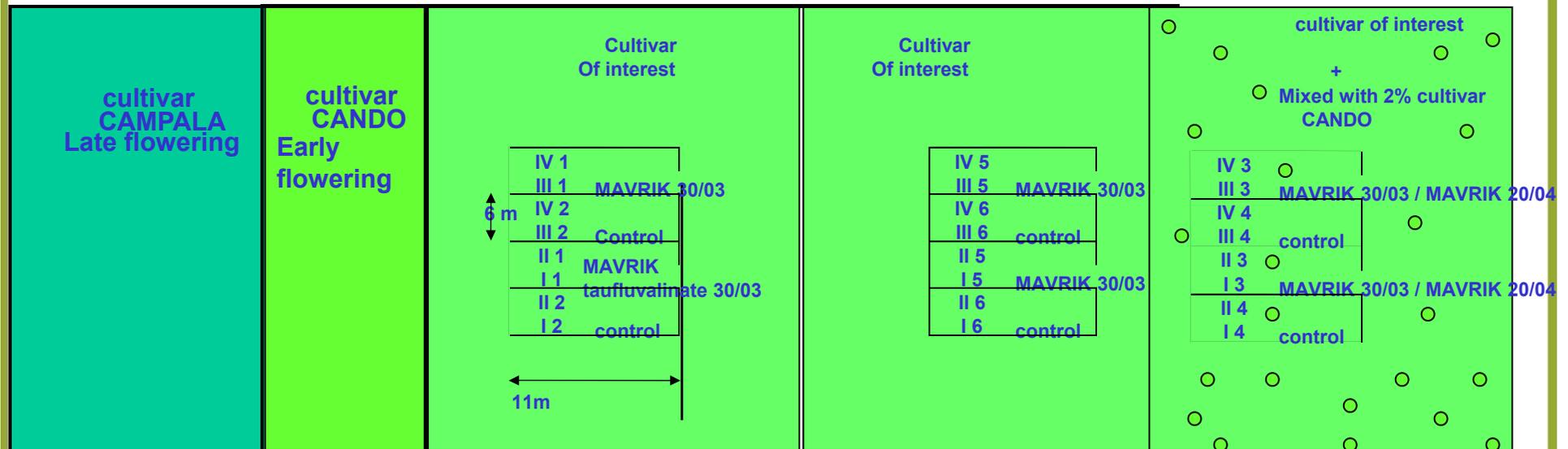


## 2003 and 2004

An exemple of trial in 2004

Trial for MELIGETHE : bands early and late + mixed cultivar + insecticide

JEAN VAUDREY (Franche Comté)



2 Seed machine large (10 meters)

2 Seed large (10 meters)

6 seed machine (30 meters)

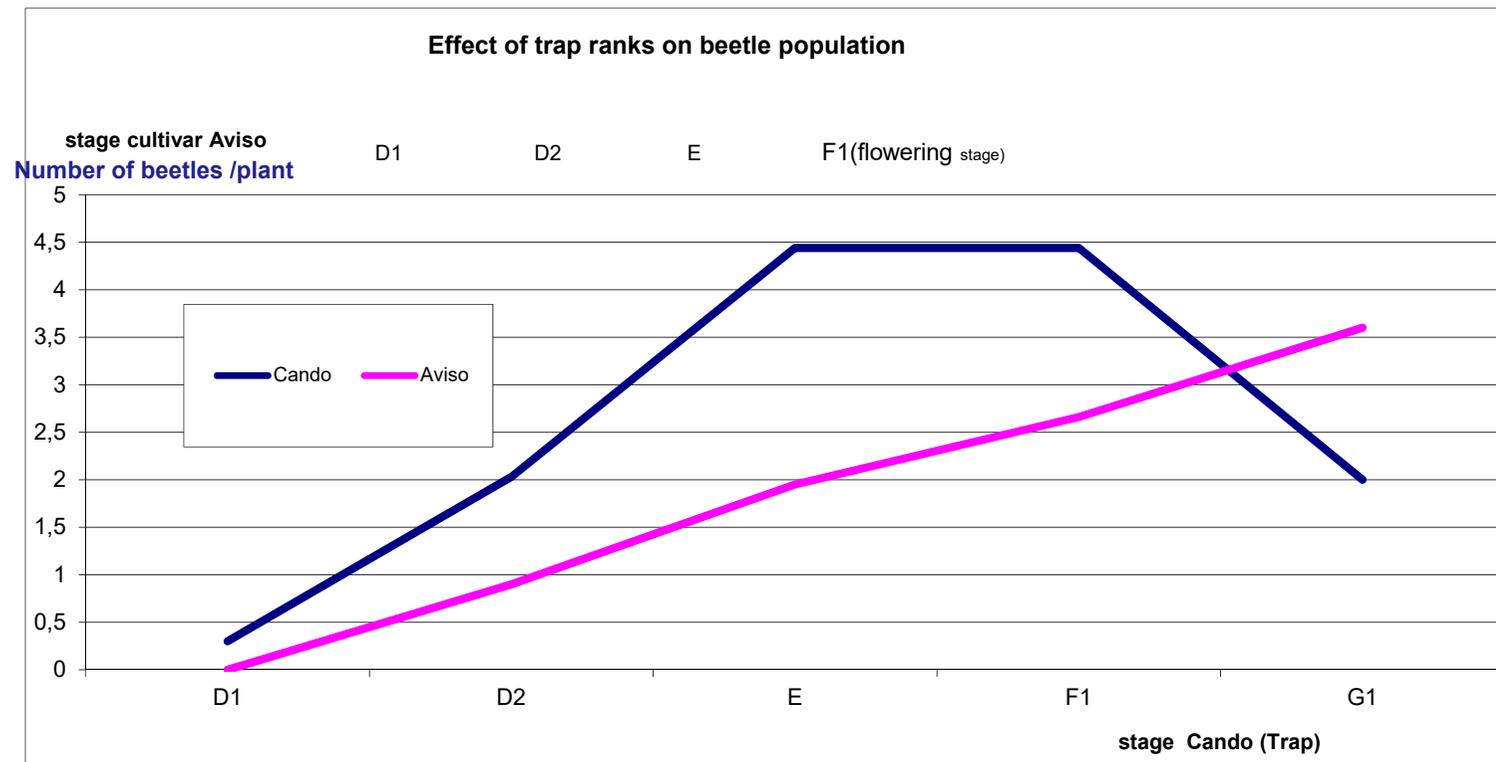
10 Seed machine large ( 50 meters)

Grower cultivar :POLLEN Sown LE 2/09/03



## 1- PULL and - “possible” DESTROY strategy

### Some observation on lines device in 2003

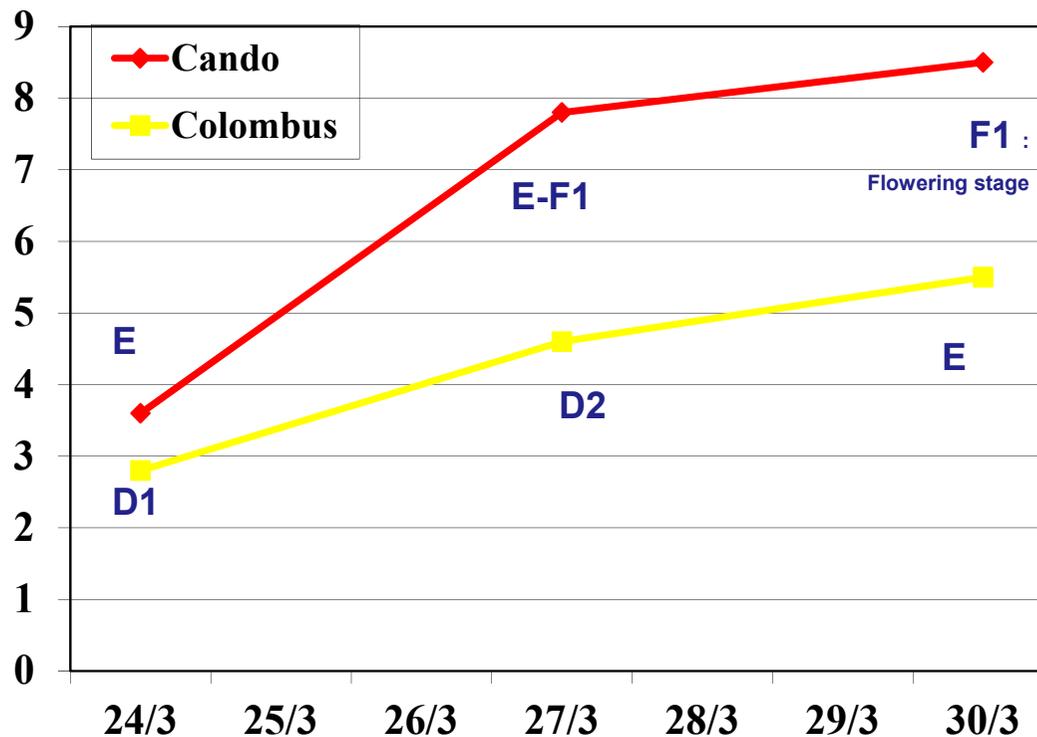




## 1- PULL and - “possible” DESTROY strategy

### Some observation on line device in 2003

Number of beetles /plant



**Late infestation and frost**

**Good stage difference between trap ranks and cultivated rape**

**Quite good effect for Cando ranks- trap (+30% beetle and more at sensitive stage on cando).**

**Colombus, main cultivar, is maintained below the treshold.**



## Some limitations in trials until 2013: What we learn

Not enough delay between flowering of trap cultivar and cultivar of interest.

For Destroy effect, pyrethroids tested were not enough efficient by have also a repellent effect, surviving beetle back into the cultivar of interest.

Not possible to maintain for a long time beetle on trap bands or trap plants.  
mixed, attractiveness too short.

Need for specific cultivar to become efficient traps.

Need for specific insecticide with attractive compound (Better destroy effect)



## Trial and field test since 2003

### Time

**1-2003 and 2004** in all area in France , 10 elaborated devices, 4 with enough pollen beetle, but technical difficulties ( short flowering delay between trap cultivar and interest cultivar , not full efficacy of insecticide and repelent effect ...)

**2- 2006 and 2007** in Poitou Charente area several fields with a specific device

<b>Cultivar choice by the grower</b> Part treated with insecticide	<b>cultivar Cando or Caribou, 4-5 % mixed with grower cultivar</b> vwith Part treated with insecticide
<b>Cultivar choice by the grower</b> Part control ( untreated)	<b>cultivar Cando or Caribou, 4-5 % mixed with grower cultivar</b> with Part control ( untreated)

**3- Since 2007** communication on mixed cultivar use ( 4% early cultivar with 96% interest cultivar to limit beetle pressure on interest cultivar)

**4- 2013** new concept with spectific trap cultivar and tests by terres Inovia and Euralis – Alicia net



**But**

**Resistance to pyrethroids was detected in Fall pests**

**Lack of diversity in insecticides authorized increase resistance spread**

**Fall pests damages increased with resistance spread**

**pollen beetle management became an objective second.**

**simple strategies were preferred to manage them**



## Réseau Es ALICIA 2013 Nord-Ouest France



Mélange variétal avec 5 à 10% d'une  
variété plus précoce à la floraison



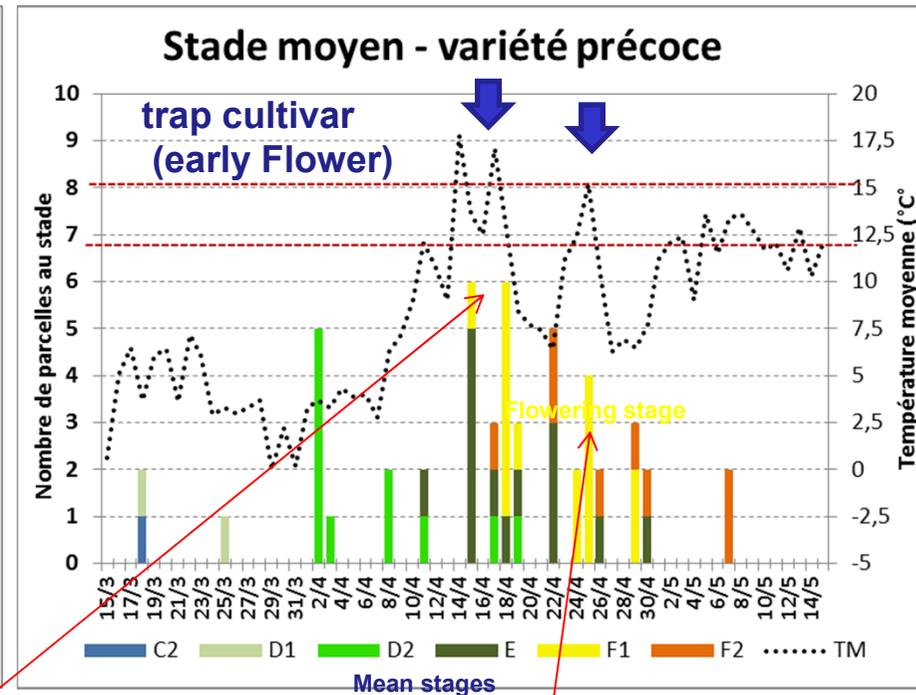
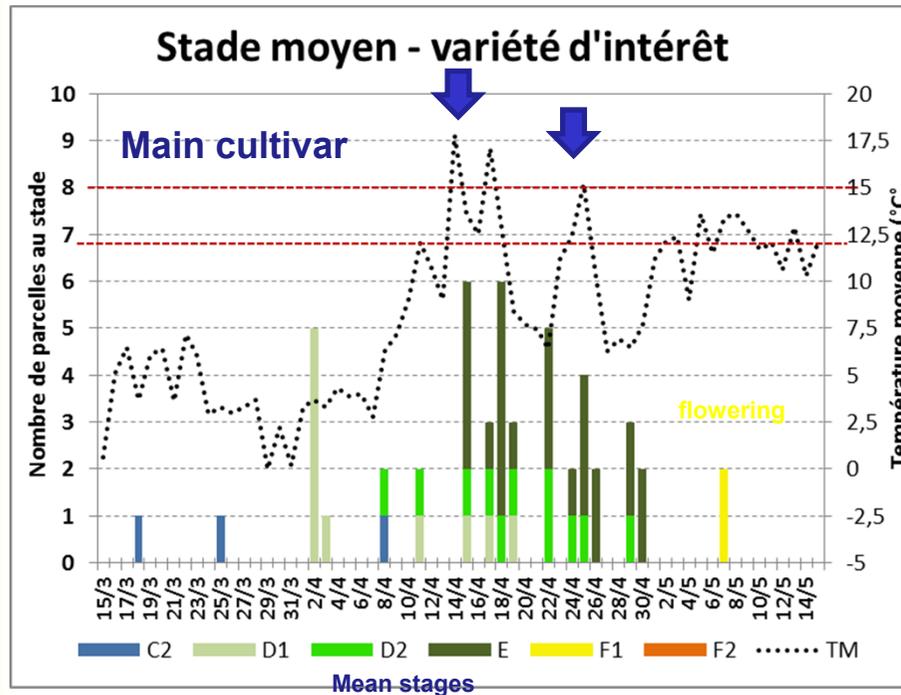
### Mixed cultivars: main with 5 à 10% an early flowering



# Climate during spring 2013

% fields at stage

% fields à stage

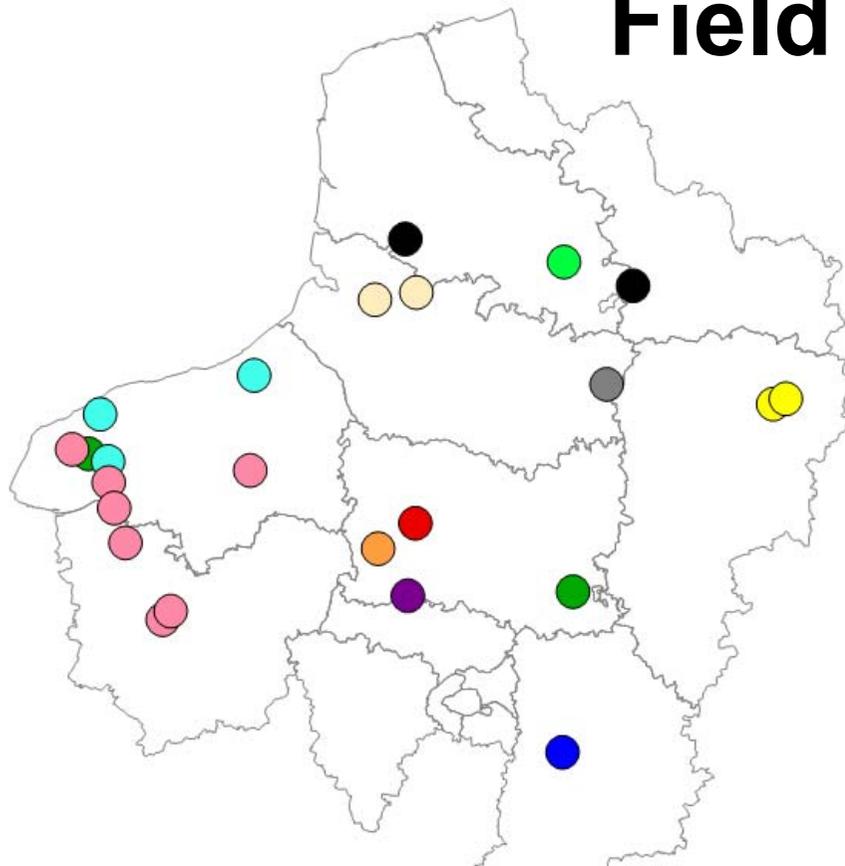


- During first flights (15/04), main cultivar at E stage very exposed .
- The trap cultivar starts to flower but not all fields, efficacy is not full
- During second flights ((24/04), The trap cultivar is full flowering and attracts the beetles and is full efficient



# Field net

- 24 fields followed in 2013
- 53 observations
- 14 members



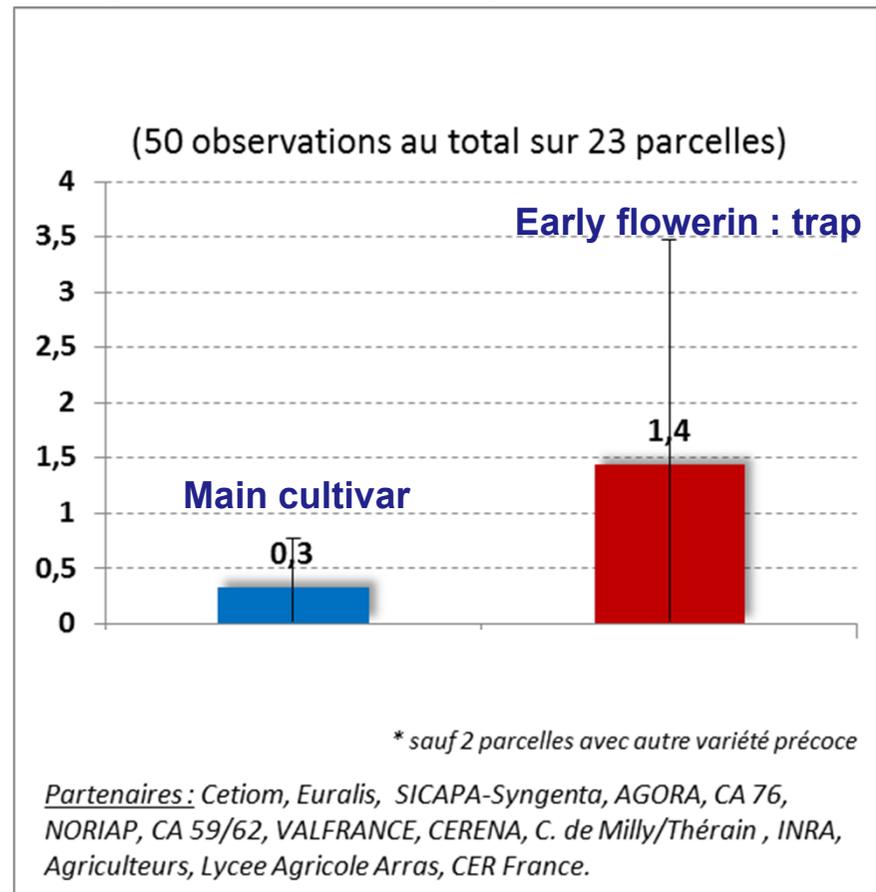
Organismes		
<span style="color: red;">●</span> SICAPA-Syngenta	<span style="color: cyan;">●</span> CA 76	<span style="color: black;">●</span> CA 59/62
<span style="color: grey;">●</span> INRA	<span style="color: purple;">●</span> AGORA	<span style="color: yellow;">●</span> NORIAP-CETIOM
<span style="color: blue;">●</span> VALFRANCE-EURALIS	<span style="color: yellow;">●</span> CERENA-EURALIS	<span style="color: orange;">●</span> C. de Milly/Thérain-EURALIS
<span style="color: green;">●</span> Agriculteur-EURALIS	<span style="color: green;">●</span> Lycee Agricole Tilloy L,M,	<span style="color: pink;">●</span> CER France





# Synthesis from the net

## Average number of beetles/plant

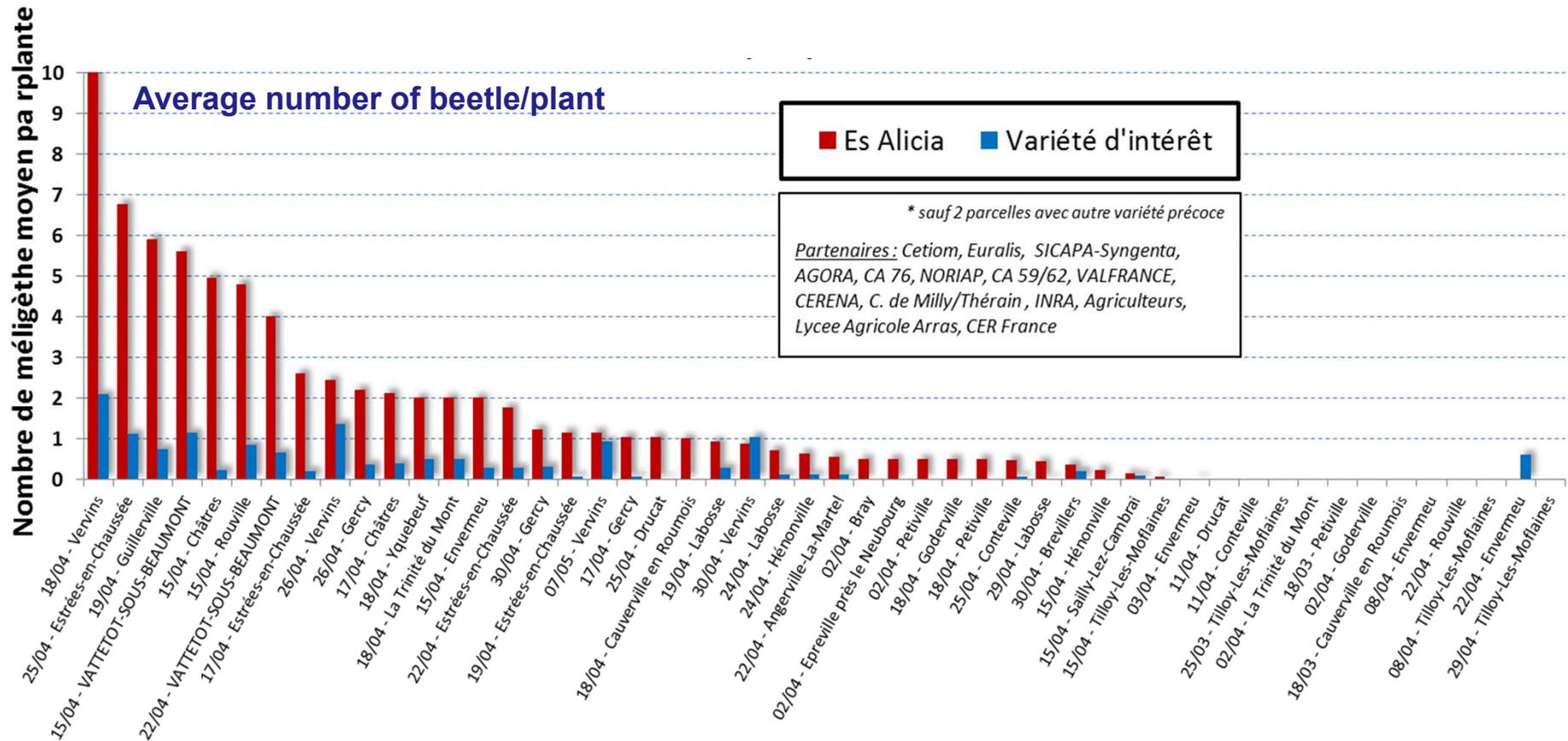


## Globaly trap cultivar attracts pollen beetle with efficacy:

- 1,4 beetle / plant on early cultivar (Alicia)
- 0,3 beetle / plant on main cultivar

4 time less beetles in average on main cultivar (« variété d'intérêt » or interesting cultivar)

But variability of observations is high between fields and dates.



### 50 observations on 24 fields :

- 11 with non beetle observed
- 39 with beetles : 36 more beetles on trap plants (**92% of observations**) but 3 with opposite result.

A high diversity of situations : from 0,04 to 10 beetles per plant.



## Rationalize to conclude

- Time difference for flowering stage between trap cultivar and main cultivar must be as large as possible- a goal for breeders to provide very early cultivars of rape without glucosinolates.
- Trap cultivar have to catch pollen beetle until main cultivar reach flowering stage / flowering stage and pollen production must be as long as possible in the trap cultivar or different trap cultivars have to be mixed to maintain attractiveness as long as possible.
- Pollen attractiveness of trap cultivar for pollen beetles have to be higher and stable - difference in volatile compounds have to be tested on a large population of pollen beetle.
- Pyrethroids are better as repellent insecticide ( kill or push) than destroy insecticide ( maintain and kill) – For destroy strategy, we need to identify other insecticides mixed with attractive compound .
- a strong rape is able to compensate pollen beetle damage so early sowing, adequate nitrogen and mineral fertilisation, no stress to the crop are required to prevent any yield reduction even pollen beetle destroy some buds.



MINISTÈRE  
DE L'AGRICULTURE  
ET DE  
L'ALIMENTATION



## We see :

it is possible to **PULL** the pollen beetle with early flowering single plants or plots traps  
It may be possible to **DESTROY** them on side plots traps.

We observed **PUSH** effect, but against our goals ...to integrate in new strategies.

Perfects tools in 2027...Maybe!

**PUSH, PULL and DESTROY** with cultivars and as natural compounds as possible would be an  
**agro-ecological** way to prevent excessive pollen beetle damage?

5 beetles treshold and time reached

# Thank you for your attention

