



eFly Northeastern IPM Working Group Spotted Wing Drosophila

Cornell University, NY, September 16, 2014
Quebec update

Liette Lambert, MAPAQ, Montreal



**Agriculture, Pêcheries
et Alimentation**

Québec



Collaborators:

Quebec Ministry of Agriculture (MAPAQ)

Christian Lacroix, Québec

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AND

Nathalie Roullé, entomologist, PELI

Annabelle Firlej, entomologist, IRDA



Weekly updates

By June until end of Sept.

No counts,
just presence (in red) or
absence



JP TRAP

ACV - ethanol (90%-10%)

N° kit de piégeage	Région administrative	MRC	Date de relevé des pièges			Semaines cumulatives avec captures
			24 août au 30 août	31 août au 6 septembre	7 au 13 septembre	
11	Bas-Saint-Laurent	Rivière-du-Loup	☉ (framboise)	● (framboise)	● (framboise)	3
12	Bas-Saint-Laurent	La Matapédia	☉ (framboise)	☉ (framboise)	☉ (framboise)	0
13	Saguenay-Lac-Saint-Jean	Le Domaine-du-Roy	● (framboise)	● (framboise)	-	4
14	Capitale-Nationale	L'Île d'Orléans	☉ (framboise)	● (framboise)	● (framboise)	5
15	Capitale-Nationale	La Côte-de-Beaupré	☉ (framboise)	● (framboise)	● (framboise)	2
16	Capitale-Nationale	Portneuf	☉ (fraise)	● (fraise)	-	2
17	Mauricie	Les Chenaux	● (framboise)	● (framboise)	-	4
18	Mauricie	Trois-Rivières	● (framboise)	● (framboise)	-	4
19	Estrie	Coaticook	● (bleuet)	● (bleuet)	-	3
20	Estrie	Le Val-Saint-François	● (framboise)	● (framboise)	● (framboise)	3
21	Outaouais	Les Collines-de-l'Outaouais	-	-	-	1
22	Gaspésie-Îles-de-la-Madeleine	Bonaventure	☉ (fraise)	☉ (fraise)	-	0
23	Chaudière-Appalaches	Robert-Cliche	● (framboise)	● (framboise)	-	2
24	Chaudière-Appalaches	L'Islet	☉ (framboise)	● (framboise)	● (framboise)	2
25	Chaudière-Appalaches	Lévis	● (fraise)	● (fraise)	-	5
26	Montréal-Laval-Lanaudière	D'Autray	● (framboise)	● (framboise)	● (framboise)	3
27	Montréal-Laval-Lanaudière	Laval	● (framboise)	● (framboise)	● (framboise)	7
28	Laurentides	Mirabel	● (mûre)	● (mûre)	-	4
29	Laurentides	Mirabel	● (framboise)	● (framboise)	-	4
30	Laurentides	Thérèse-De Blainville	● (framboise)	● (framboise)	-	4
31	Montréal-Est	Brome-Missisquoi	● (fraise)	● (fraise)	● (fraise)	7
32	Montréal-Est	Rouville	☉ (framboise)	● (framboise)	-	3
33	Centre-du-Québec	Nicolet-Yamaska	● (fraise)	● (fraise)	-	3
34	Centre-du-Québec	Arthabaska	● (bleuet)	● (bleuet)	● (bleuet)	4
35	Montréal-Est	Le-Haut-Saint-Laurent	● (bleuet)	-	-	2
36	Montréal-Est	Beauharnois-Salaberry	● (framboise)	● (framboise)	-	5

Légende :

- ☉ = DAT absente
- = DAT présente
- = relevé non disponible

- Provincial network (RAP): 26 of 26 sites with captures
- Consultants, extension, growers,: cover over 200 sites in the province

Adult SWD caught in the north of the province in raspberries in mid-August (2013 and 2014)



First captures: Strawberry field Southwest of Montreal

2014:

- Start trapping: early June
- First capture: still around Mid-july (similar in 2012-2013-2014)
- **LESS SWD and LESS pesticides**
- **More monitoring based on salt tests**
- 'larvae float-out' method for fruits

Température minimale atteinte en 2014 (°C)

Station Météo	Région	1 ^{er} au 7 janvier	19 au 25 janvier
Saint-Arsène	Bas-Saint-Laurent	-31,0	-23,9
Satin-François, I.O.	Capitale-Nationale	-31,3	-26,8
Nicolet	Centre-du-Québec	-33,7	-27,0
Beauceville	Chaudière-Appalaches	-34,9	-33,6
Saint-Michel	Chaudière-Appalaches	-35,5	-29,5
Coaticook	Estrie	-28,5	-30,5
L'Assomption	Lanaudière	-29,7	-30,2
Saint-Thomas-de-Caxton	Mauricie	-37,0	-32,0
Champlain	Mauricie	-33,0	-28,0
Granby	Montérégie-Est	-28,0	-28,5
L'Acadie	Montérégie-Ouest	-27,9	-28,0
Alma	Saguenay-Lac-Saint-Jean	-46,0	-32,0

- 31 °F

- 22 °F

- 51 °F

Note: First captures were in the same strawberry field since 2012 !

The 3 main traps used in the province of Quebec

Dome-trap
from Solida

Droso-trap
from Biobest

JP-trap
(homemade)



Flies enter from
bottom only

Flies enter from
bottom + sides

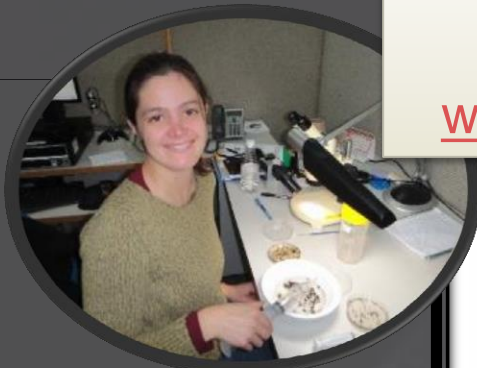
Based on 'Zorro Trap'



Now available in english_2014

Click here: [SWD BOOKLET](#)

www.lutteintegree.com/IMG/pdf/swd_booklet_quebec_2014.pdf



Nathalie Roullé, biol.-entomologist
Pôle d'Excellence en lutte intégrée (PELI)

The Spotted Wing Drosophila is Attacking our Berries



Drosophila suzukii

Drosophile à ailes tachetées (Quebec)
Drosophile du cerisier (France)



- The Spotted Wing Drosophila (SWD) is the only fruit fly in Québec to lay its eggs in healthy ripening fruit (except blueberry maggot).
- The eggs, larvae and some pupae then develop inside the fruit, causing a rapid deterioration. Many larvae can be found in a single fruit.
- Very high multiplication rate, rapid development and many generations per year.
- First observed in Québec in October 2010. Since 2012, first captures of the season have been from early to mid July. Damage has been observed in the late berry crops from August to September.

Female ♀
3-4 mm

Male ♂
2-3 mm

No black spot

1 black spot at the tip of each wing

Saw-like ovipositor for laying eggs

Visible with a 30x magnifier

2 black spots on the front legs

Notes:
- At the end of the season, some adults are smaller
- Some males have no spot on their wings

For more information, click [here](#).

Spotted Wing Drosophila

Photos: M. Hauser



Roxana Bindea, agronomist

Spotted Wing Drosophila 1

Life cycle

Egg
2-72 hours;
0,6 mm
The two visible filaments outside the fruit are breathing tubes

3 larval stages
3-15 days

Pupae
3-15 days;
2-3 mm (outside or inside the fruit)

Male **Adult** **Egg** **Female**

One generation:
8 to 10 days at 25°C,
21 to 25 days at 15°C.

Adults live for over 60 days

Spotted Wing Drosophila 3

DO NOT CONFUSE

Prominent ovipositor for SWD and usually very small for other drosophila.

Stripes on the abdomen are full lines for SWD and are broken lines for certain other drosophila.

Diptera (Fly family) = No head or legs

Other larvae (head is visible)

Respiratory tubes are a characteristic for Drosophila, including SWD

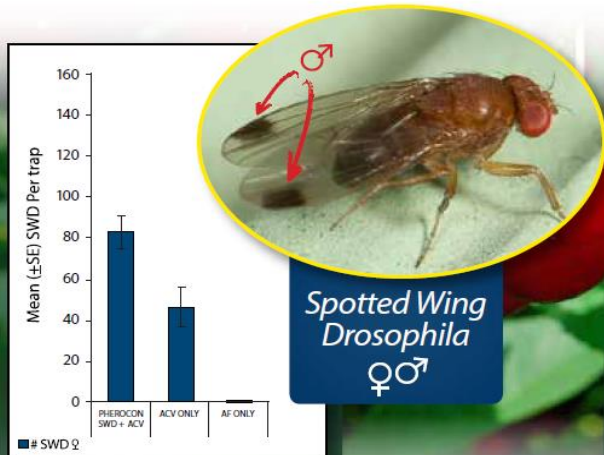
Blueberry maggot (*Rhagoletis mendax*)

Plum curculio

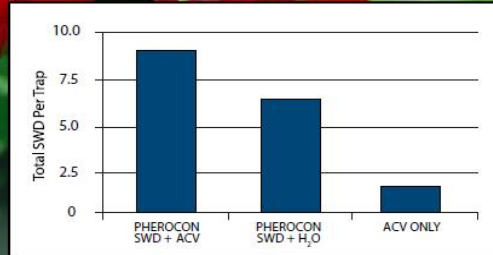
Spotted Wing Drosophila 4



The NEW Monitoring System for Spotted Wing Drosophila, *Drosophila suzukii*



Source: David Haviland, Farm Advisor, Cooperative Extension Kern County, CA. Drowning solutions = ACV: Apple Cider Vinegar, AF: Antifreeze



Source: Elizabeth H. Beers, PhD, Professor of Entomology, Washington State University. Drowning solutions = ACV: Apple Cider Vinegar, H₂O: Water



Tested on 1 site (Southwest Montreal) :

1-TRECE with water

2-TRECE with ACV-ethanol

3- ACV-ethanol

4- Solida bait (equivalent to Susuki trap bait, as evaluated by Richard Cowles,)

Solida bait caught LESS insects, less SWD, with an early detection





2014	WATER + TRECE LURE			ACV-ÉTHANOL + TRECE LURE			SOLIDA BAIT (equivalent to Susuki bait)			ACV-ETHANOL			Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	
June 27	TRAPS IN THE FIELD												
July 3	0	0	0	0	0	0	0	0	0	0	0	0	0
July 8	0	0	0	0	0	0	0	0	0	0	0	0	0
July 14	0	0	0	0	0	0	0	0	0	0	0	0	0
July 21	0	0	0	0	0	0	0	0	0	0	0	0	0
July 29	0	0	0	1	1	2	0	1	1	0	0	0	3
August 5	1	0	1	4	1	5	1	1	2	2	1	3	11
August 12	4	0	4	25	15	40	3	5	8	6	0	6	58
August 19	0	1	1	1	1	2	1	2	3	10	3	13	19
Total	6			49			14			22			

2 year project: 2014-2015

Testing baits to develop a mass trapping system in fall raspberries



Mathieu Coté,, RLIO



Isabel Lefebvre, student intern, MAPAQ

2 year project (2014-2015):

Testing baits to develop a mass trapping system in fall raspberries

- **Objective**: Evaluate the effects of different baits/lures with an insecticide on SWD captures (attract vs attract and kill strategy)
- 7 sites located in different areas across the province
- 2 traps / farm with 5 treatments / site : 70 traps

2014 : Testing baits (starting mid-August up to the end of September)

T1: ACV-ethanol

T2: ACV + Trece dual-lure

T3: Yeast-sugar mix

T4: Kombucha

T5: Kombucha + vaportape II



Agriculture, Pêcheries
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2 YEAR PROJECT
2013-2014 :

Net Exclusion in
Highbush Blueberry Field:

a Solution to Protect Crop
from Spotted Wing
Drosophila?

on organic farm (Bluecrop cv)



Net exclusion to control SWD in highbush blueberries

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Objectives of the Study

Testing net exclusion as a pest management strategy

- Prior study in Japan on mesh size (Kawase & Uchino 2005)
- Experiment on blueberry farms in Japan (Kawase et al. 2008)
 - ◉ Testing efficiency of nets to protect the crop from SWD infestation
 - ◉ Impact on the fruit (caliber, brix and yield)
 - ◉ Impact on other pests (not yet analyzed)

Collaboration with Dubois Agrinovation

Proteknet : mesh of 1.00 x 0.60 mm - 80gr/m²



Results: Net exclusion to control SWD in highbush blueberries

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- **SWD population in summer 2013 and 2014**
 - **0 SWD adults in traps under the net until the end of the experiment**
 - **A mean of 200 *Drosophila* spp. and 10 SWD per trap in control plots each week**
 - **0% of fruit infested under the net until the end of the experiment**
 - **Over 70% of fruits infested in control plot at the last harvest**

It works!

- **Effect on the fruit and bushes**
 - **No effects on Brix, yield and damages from other pests or diseases**
 - **Data on calibre and leaf photosynthesis are under analysis**



ACV + yeast





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- Atomic agency of Vienna, Austria (AIEA) started experiments to irradiate SWD
 - Under discussion to avoid duplication in experiment
- In Quebec, three year project to evaluate the potential of SIT
 - Team: Annabelle Firlej, Jacques Brodeur, François Fournier, Véronique Martel
 - Objectives:
 - SWD rearing on artificial diet
 - Protocol for sterilization (age of pupae, dose-response)
 - Study of irradiated male competitiveness in laboratory and semi-field conditions (multiple mating, sperm precedence...)





PIERRE LAFONTAINE, agr., Ph.D.
Director and Researcher, CIEL

2 year project on SWD (2014-2015):

**1- Evaluation of the addition of sugar to
insecticides:**

Pyganic, Delegate, Entrust, Malathion, Ripcord

2- Testing insecticide efficacy:

**Delegate, Danitol, Bioceres (*Beauveria bassiana*)
Suffoil-X, Pure Green, Entrust, Exirel, Movento,
Evergreen, Matador, Ripcord**

FUTURE RESEARCH IDEAS

-In Italian cherry orchards, they use the net exclusion as a fence without a cover over the crop. Would it be possible in blueberry fields ?

-Studies on symbiotic Wolbachia bacteria? Currently being evaluated in France.

-Repellents? Garlic or any others (need a registration in Canada)

-Attract-and-kill strategies.....



THANK YOU !

For information:

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Berry and greenhouse crop specialist

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