At-plant, seed treatment options for the control of seed corn maggot in processing sweet corn

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Midwest Food Products Association
Raw Products Committee
Year 1 Project

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https://vegedge.umn.edu/

https://twin-cities.umn.edu/gopher-athletics/goldy-gopher
Seedcorn Maggot, *Delia platura* (Meigen)

- Found in northern temperate regions worldwide (35-60° N)
- Saprophagous, but also feeds on plants (polyphagous)
- Life cycle is 18 – 60 d (temp dependent)
- Three-four generations/year
- Overwinters as puparium in soil
- Time of emergence and risk is predictable
Integrated pest management

Cultural controls
 Phenology models

Natural enemies

Sweet corn
 IPM

Host plant resistance

Transgenic plants
 IR traits

Reduced-Risk
 Insecticides

Entomopathogens

Baits and baiting systems

Population disruption
Vegetable Disease and Insect Forecasting Network

https://agweather.cals.wisc.edu/vdifn
Global Insecticide Seed Treatment Use is Increasing

“The global insecticide seed treatment market is projected to reach nearly $1.6 billion by 2016, growing at a CAGR of 11.4%.”

Insecticide Seed Treatment Use Continues to be a Standard Agricultural Practice

![Graph showing the share of acres planted with treated seed from 2006 to 2018, including data from Kynetec and ARMS sources.](https://doi.org/10.1093/biosci/biaa019)
Factors Influencing Insect Pest Management
‘Food Safety and Residues’

– Major food retailers are setting acceptable residue levels below those set by government regulatory agencies.

“No detectable residues” will be a competitive advantage for food retailers.

– Older insecticides that do not meet these requirements are not being re-registered, resulting in increased use of novel insecticides (bio-pesticides & reduced-risk).
EPA Cancellation - chlorpyrifos

Chlorpyrifos; Cancellation Order
PRE-PUBLICATION NOTICE

On August 18, 2021, Edward Messina, the EPA Director of the Office of Pest Management Programs, signed the following document:

Action: Final Rule
Title: Chlorpyrifos; Tolerance Revocations
FR#: 5993-04-OCSPP
Docket #: EPA-HQ-OPP-2021-0523

EPA is submitting this document for publication in the Federal Register (FR). EPA is providing this document solely for the convenience of interested parties. It is not the official version of the document for purposes of public notice and comment under the Administrative Procedure Act. This document is not disseminated for purposes of EPA's Information Quality Guidelines and does not represent an Agency determination or policy. While we have taken steps to ensure the accuracy of this Internet version of the document that was signed, the official version will publish in a forthcoming FR publication, which will appear on the Government Printing Office's govinfo website (https://www.govinfo.gov/app/collection/fr) and on Regulations.gov (https://www.regulations.gov) in the docket identified above.

February 9, 2020
Corteva Announces It Will Discontinue Making Insecticide Chlorpyrifos

Corteva Agriscience says it will stop making chlorpyrifos (chlor-pyr-i-fos) insecticide by years end. In a statement given to Brownfield, Corteva calls it a "strategic business decision" because of falling sales of the chemical. The state of California stopped sales of chlorpyrifos this week.

Corteva says its customers "will have access to enough chlorpyrifos supply to cover current demand through the end of the year, while they transition to other products or other providers." Corteva is the top maker of the insecticide. Environmental groups claim it causes neurological problems and are suing the EPA for denying a petition to ban it.

Corteva Statement: Corteva Agriscience has one of the largest and most diverse product pipelines in the industry with multiple exciting, upcoming brand launches. Demand for one of our long-standing products, chlorpyrifos, has declined significantly over the last two decades, particularly in the U.S.
EPA Releases Proposed Interim Decisions for Neonicotinoids

For Release: January 30, 2020

EPA is taking the next step in its regulatory review of neonicotinoid pesticides - a group of insecticides used on a wide variety of crops, turf, ornamentals, pets (for flea treatment), and other residential and commercial indoor and outdoor uses. The agency’s proposed interim decisions for acetamiprid, clothianidin, dinotefuran, imidacloprid, and thiamethoxam contain new measures to reduce potential ecological risks, particularly to pollinators, and protect public health.

EPA is proposing:

- management measures to help keep pesticides on the intended target and reduce the amount used on crops associated with potential ecological risks;
- requiring the use of additional personal protective equipment to address potential occupational risks;
- restrictions on when pesticides can be applied to blooming crops in order to limit exposure to bees;
- language on the label that advises homeowners not to use neonicotinoid products; and
- cancelling spray uses of imidacloprid on residential turf under the Food Quality Protection Act (FQPA) due to health concerns.

Additionally, the agency is working with industry on developing and implementing stewardship and best management practices.

https://www.epa.gov/pesticides/epa-releases-proposed-interim-decisions-neonicotinoids
Endangered Species Litigation and Associated Pesticide Limitations

Among other things, the Endangered Species Act (ESA) helps ensure that actions taken or permitted by the federal government will not jeopardize the continued existence of a listed species or result in adverse modification of designated critical habitat. The ESA requires federal agencies to:

- determine whether their actions might harm a listed species or its designated critical habitat (procedural obligations); and
- ensure the action taken or permitted will not jeopardize the continued existence of a listed species or result in adverse modification of its designated critical habitat (substantive obligations).

https://www.epa.gov/endangered-species
• Biological investigations have been litigated over the last 30 years

• Revised NAS method suggests, “to be delivered over next 3 years”

• Investigations will ask if, “continued use could affect >1 member”

• Rudimentary range maps currently exist – need refinement
## Insecticide Seed Treatments for Vegetable Crops in the U.S.

<table>
<thead>
<tr>
<th>Crop Group</th>
<th>Major Pests</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>aster leafhopper</td>
<td>Sepresto 75WS, Cruiser 5FS</td>
</tr>
<tr>
<td>Bulb crops</td>
<td>onion maggot, seedcorn maggot</td>
<td>Trigard 75WP, CAPS, FarMore FI500</td>
</tr>
<tr>
<td>Legumes</td>
<td>seedcorn maggot, potato leafhopper, aphids, etc.</td>
<td>Cruiser 5FS, Lorsban 30F</td>
</tr>
<tr>
<td>Cucurbits</td>
<td>seedcorn maggot, cucumber beetles, aphids, etc.</td>
<td>FarMore FI400</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>seedcorn maggot, corn flea beetle, corn rootworms, etc.</td>
<td>Poncho 600, Poncho 1250, Poncho VOTiVo, Cruiser 5FS, Lorsban 30F, Fortenza</td>
</tr>
</tbody>
</table>
Insecticides Evaluated as Seed Treatments for Seed Maggot Control in Sweet Corn (2011), Elba, NY

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Rate</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruiser 5FS</td>
<td>thiamethoxam</td>
<td>0.25 mg ai/seed</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>Poncho 600</td>
<td>clothianidin</td>
<td>0.25 mg ai/seed</td>
<td>Neonicotinoid</td>
</tr>
<tr>
<td>*Entrust</td>
<td>spinosad</td>
<td>0.25 mg ai/seed</td>
<td>Spinosyn</td>
</tr>
</tbody>
</table>

* Product NOT currently labeled as seed treatment on sweet corn; Registered now as Regard SC by Syngenta for seed treatment in onion (OMRI approved).
Seed Maggot Control in Sweet Corn

‘Incredible SE’ planted 17 May 2011; Data taken 13 dap; Elba, NY

![Graph showing seed maggot control in sweet corn]

- **Untreated**: Mean Damaged Seedlings (%) = 34
- **Cruiser 5FS**: Mean Damaged Seedlings (%) = 2
- **Entrust**: Mean Damaged Seedlings (%) = 5

P < 0.0001
Evaluating new seed treatments (novel MoA)

– Fortenza (cyantraniliprole) – MoA Group 28

Protection against early-season damage caused by cutworms, grubs, wireworms, fall armyworm and seedcorn maggot on sweet corn (https://www.syngenta-us.com/seed-treatment/fortenza).

– Regard SC (spinosad) – MoA Group 5.

Commercial seed treatment, Regard™ SC offers protection for dry bulb onions against seedcorn maggot and onion maggot (https://www.syngenta-us.com/seed-treatment/regard-sc)

- Reatis 480 FS (tetraniliprole) – MoA Group 28

Designed as commercial seed treatment against rootworm, wireworm, white grubs and seedcorn maggot (https://www3.epa.gov/pesticides/chem_search/ppls/000264-01192-20210310.pdf)

- Poncho 600(clothianidin) – MoA Group 4A

- Cruiser 5FS (thiamethoxam) – MoA Group 4A
Insect targets

- Seed corn maggot (*Delia platura*)
- Corn flea beetle (*Chaetocnema hortensis*)
- Black cutworm (*Agrotis ipsilon*)
Experimental Approach

• Arlington Agricultural Experiment Station

• Two planting dates (1\textsuperscript{st} and 2\textsuperscript{nd} generation SCM)

• Syngenta/Seminis processing varieties

• Bone/blood meal attractants

• 6 experimental replicates / treatment

• 5 seed treatment active ingredients

• Potential for new experimental treatments (2022 & 2023)
First planting – Stand Counts

First planting
Stand count 2 (19 DAP, crop stage V2-V3)

Hybrid  | Seminis  | Syngenta

P=0.0006

(May 26, colonized by second gen SCM)

https://agweather.cals.wisc.edu/vdifn?panel=insect&model=seedcorn-maggot
First planting - Percent Undamaged Plants

First planting
Percent undamaged plants

Hybrid  |  Seminis  |  Syngenta

Undamaged plants

P=0.283

Second planting – Stand Counts

Second planting
Stand count 2 (14 DAP, crop stage V2-V3)

https://agweather.cals.wisc.edu/vdifn?panel=insect&model=seedcorn
- maggot (June 23, colonized by third gen SCM)

P=0.075

(Click for more information on seedcorn maggot colonization)

Insecticide

Percent emergence

Cruiser 5FS, Entrust, Fortenza, Poncho 600, Reatis, UTC

P=0.075
Second planting – Percent Undamaged Plants

Second planting
Percent undamaged plants

Hybrid  Seminis  Syngenta

Undamaged plants

P=0.029

Acknowledgements and Thanks

http://labs.russell.wisc.edu/vegento/