Insect Update

Shannon Chant
Crops Extension Specialist, Swift Current
Ministry of Agriculture
On behalf of
Dr. James A. Tansey
Provincial Insect/Vert Pest Management Specialist
Ministry of Agriculture

Saskatchewan

Outline

- lambda-cyhalothrin
- Grasshoppers
- Wheat midge
- Flea beetles
- Richardson ground squirrels (gophers)

Pest Monitoring Programs

- Please sign up to allow us access to continue this work
- **james.tansey@gov.sk.ca**
- shannon.chant@gov.sk.ca

PMRA re-evaluation decision on lambda-cyhalothrin

- Matador, Silencer and Labamba
- Resulted in the cancellation of all feed uses
- After April 2023, if a crop is treated with lambda-cyhalothrin according to label provisions, that crop and its components (fraction, meal, screenings) cannot be fed to any livestock in Canada
- Many crops are used for food and feed and they are not separated in our bulk handling system

Provinces Urge Federal Agency To Reconsider Pesticide Decision

Released on February 24, 2023

The governments of Alberta and Saskatchewan are urging the federal Pest Management Regulatory Agency (PMRA) to reconsider its decision on a crucial insecticide for farmers.

The PMRA recently changed approved uses for lambda-cyhalothrin, an effective pesticide that many farmers rely on to control grasshoppers and flea beetles.

Among other changes, it can no longer be used for any crop that may end up as livestock feed and as a result, its manufacturers have pulled their products from Western Canada.

[Provinces Urge Federal Agency To Reconsider Pesticide Decision | News and Media | Government of Saskatchewan]

Grasshoppers

Generalists: Grasshoppers

- Localized heavy pressure 2022
  - Many accounts of spraying
  - Conditions again favourable for population increases in 2023
  - 4 major pest species in SK out of the 85 species we have (81 non-pests)
  - ID webinar online:

https://attendee.gotowebinar.com/recording/7809907373792439307

Clear winged

- **Prefers cereal crops and grass forages**
- **Usually not a concern in more lush plant material**

Migratory (or lesser migratory)

- **Have a very broad host range that includes all crops and other insects**
- **They will eat almost anything**

Packard's

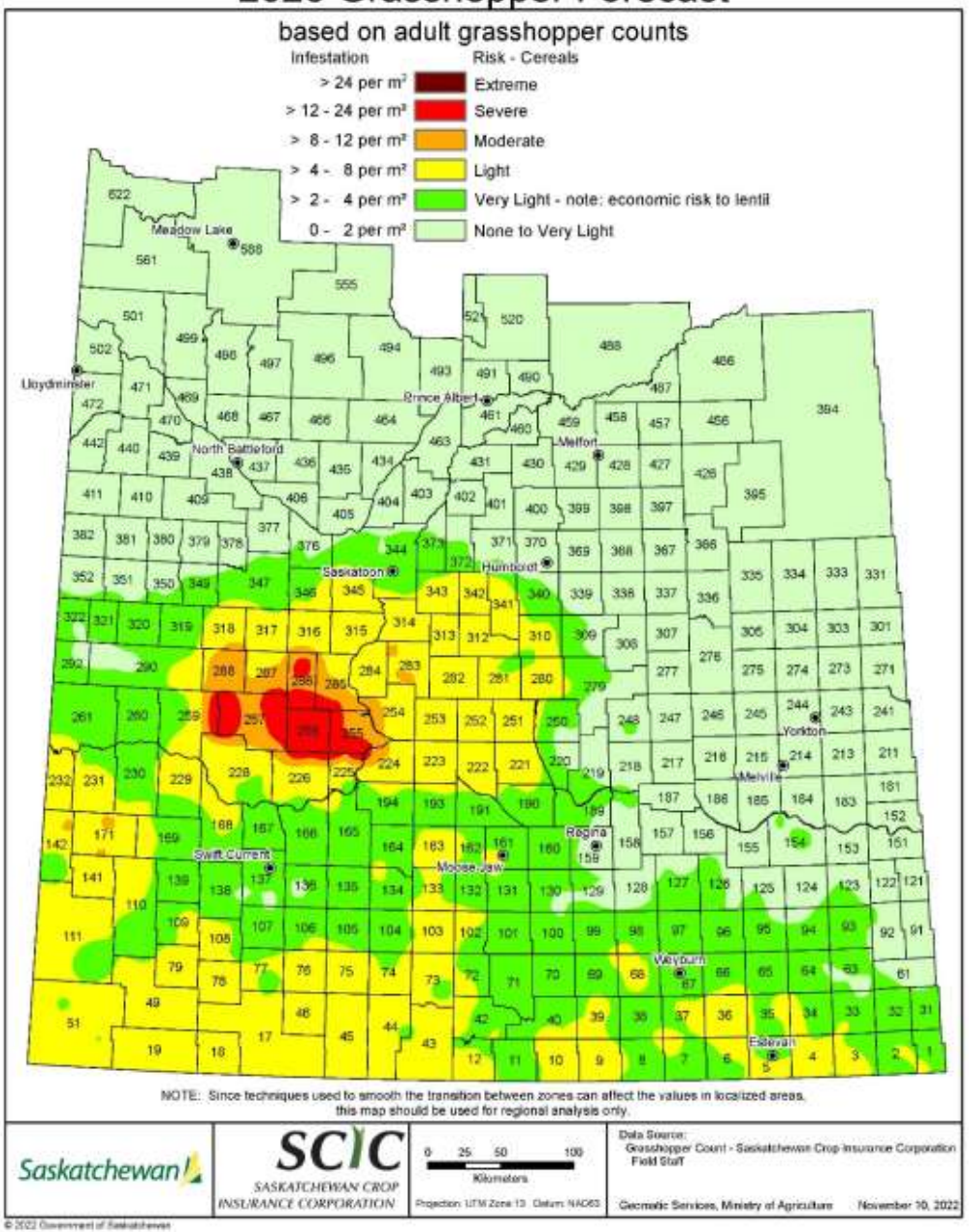
- **Really likes legumes**
- **Haven't been numerous except in the Saskatoon area**

Two-striped

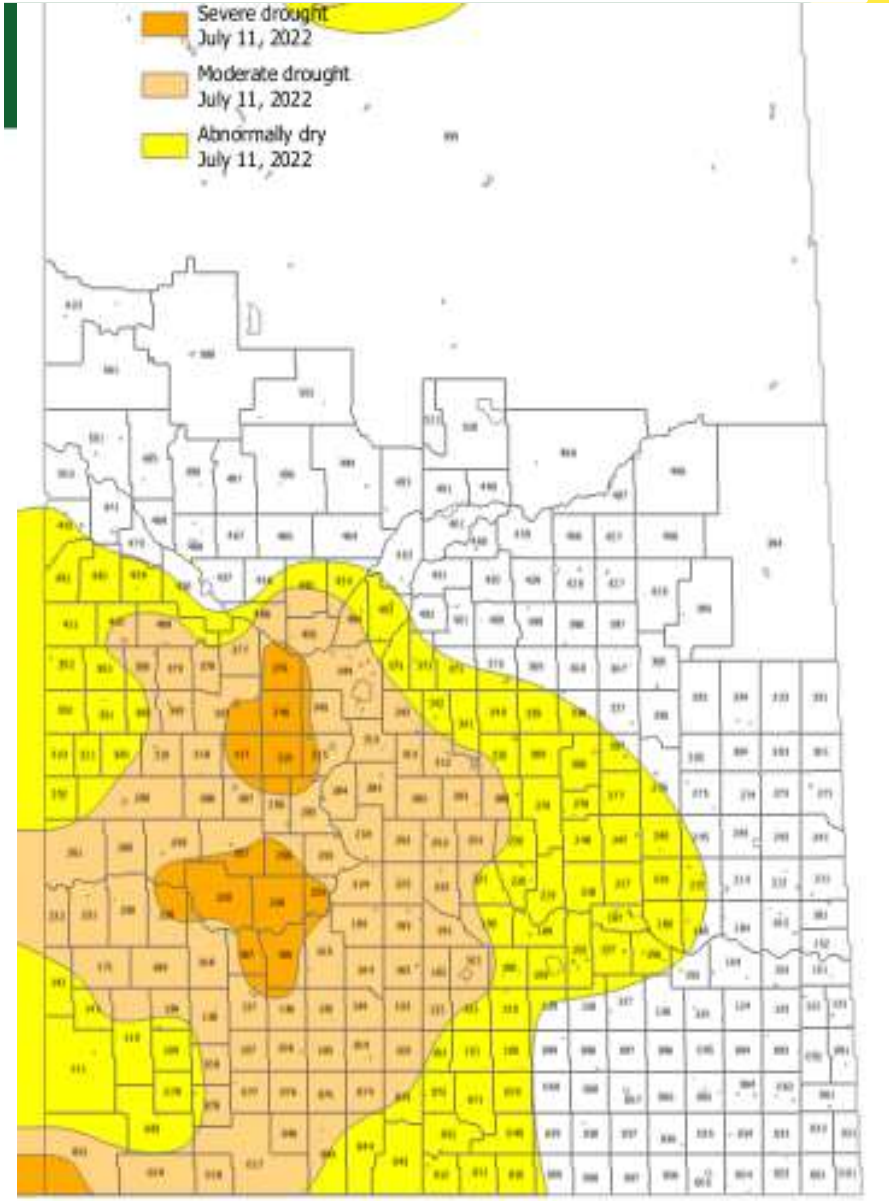
- **Main pest type in Saskatchewan**
- **Likes forbs but will eat grasses if there are no other preferred hosts**
- **Notorious clipper of wheat heads**

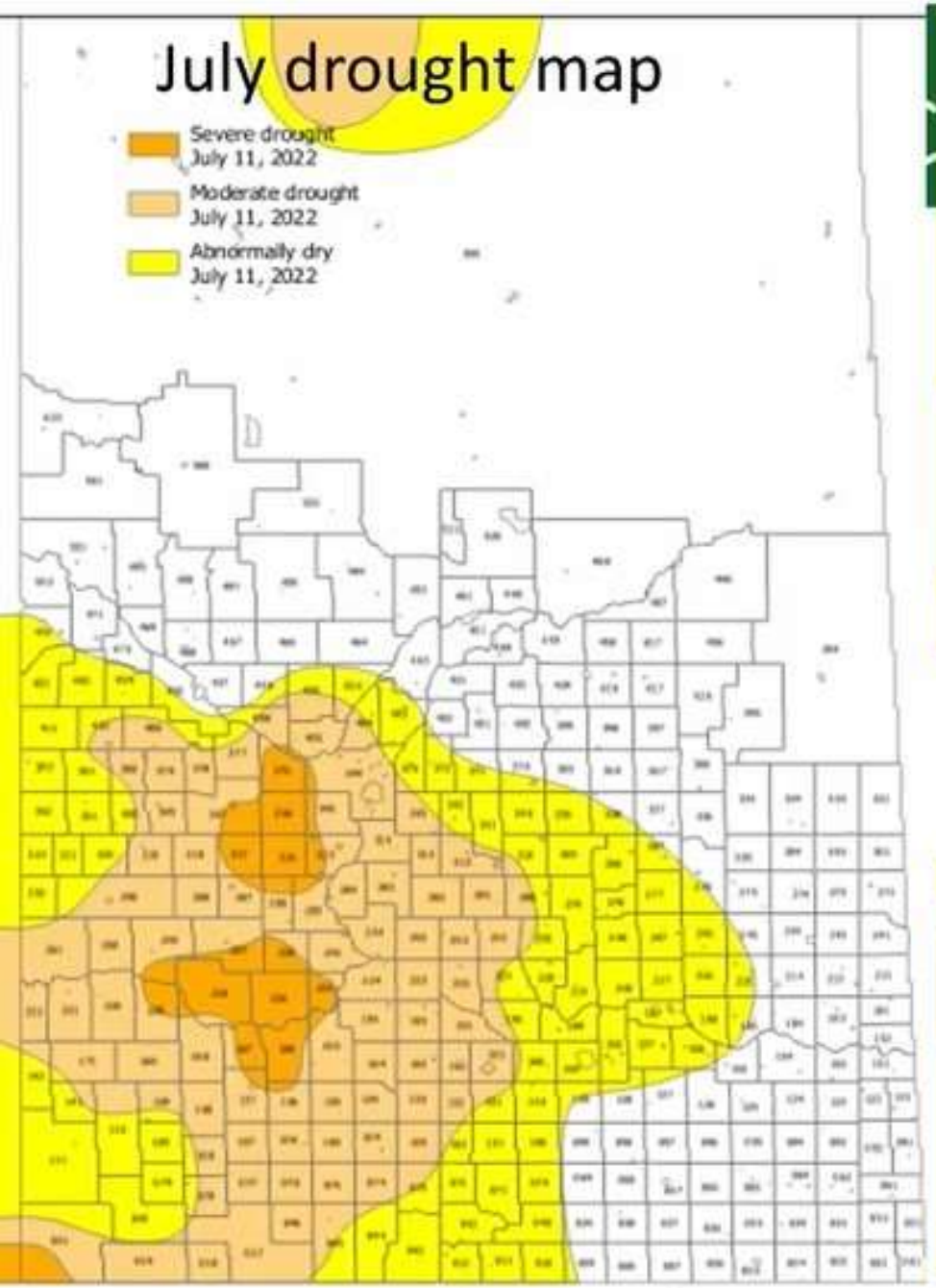
Grasshoppers

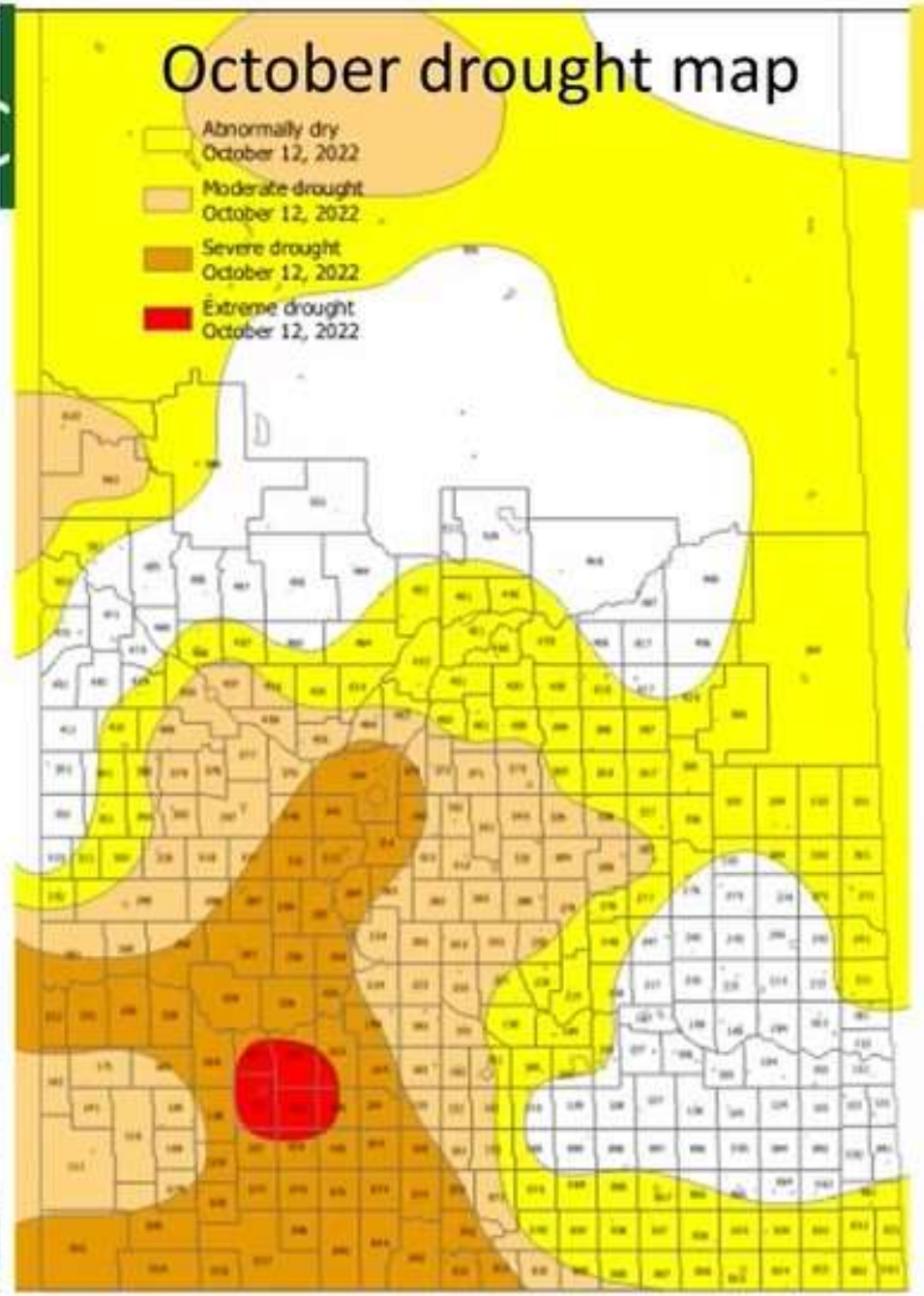
- Migratory GH oviposition model
  - Olfert et al. 2020 (AAFC)
  - Warm spring
    - Earlier hatch
    - Increased nymphal survival and increased fecundity
  - Warmer, dryer growing seasons
    - More rapid development of eggs, nymphs, and adults
  - Oviposition
    - Adult densities, timing of adult emergence and weather conditions in July and August



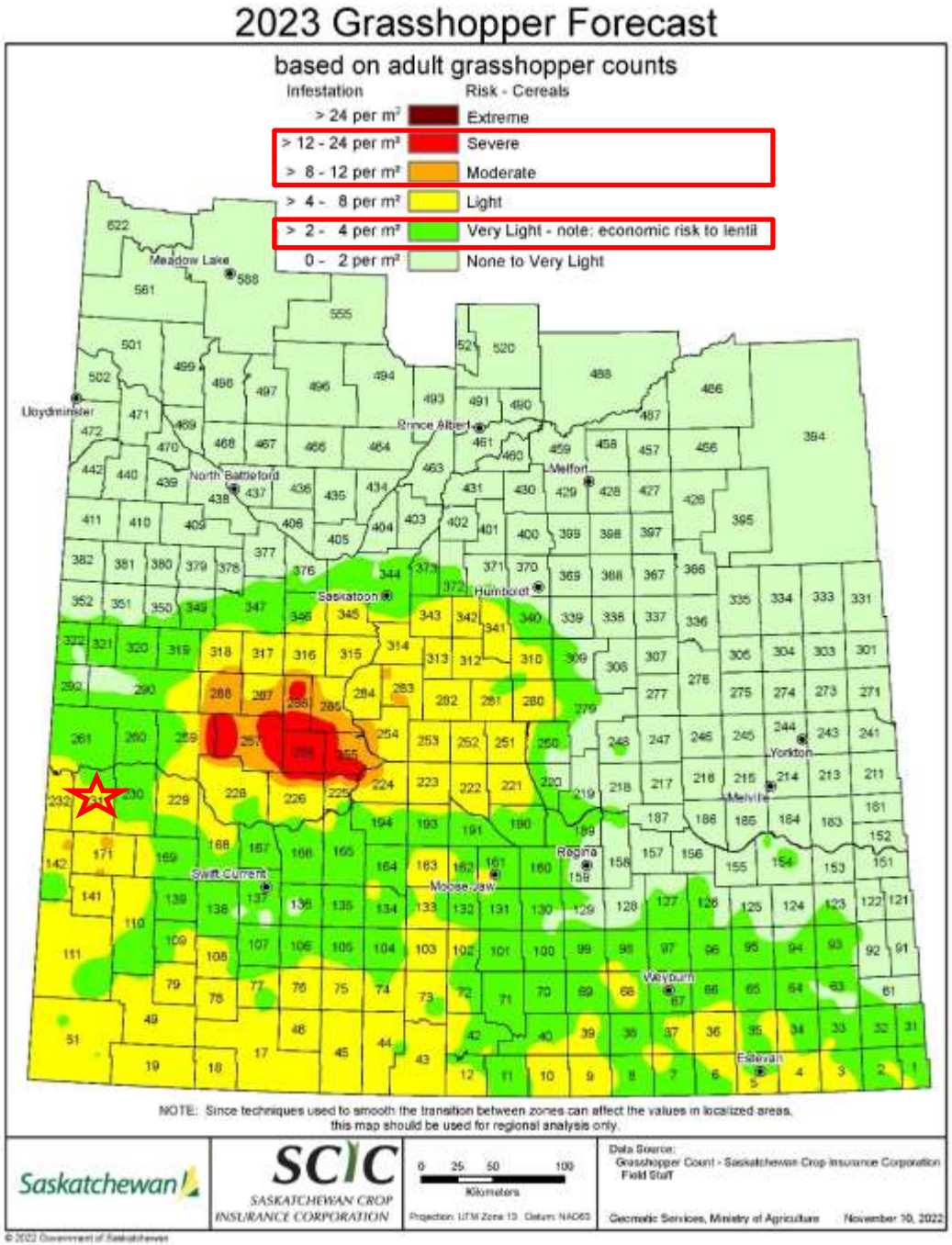
July 2022 drought map







Tansey, J.A. 2022. WCCP AGM, Grande Prairie, AB. October 26-28.



Grasshoppers

Crop	Economic threshold
Cereals	8-12 per m^2
Lentil	2 per m^2 during flowering and podding
Flax	2 per m^2 once bolls have formed
Canola, Mustard	7-12 per m^2 (depends on the weather and crop)
Pea	Over 10 per m^2 (not a preferred host)
Chickpea, Soybean	Not a preferred host and may eat weeds first
Dry bean	35%+ defoliation before bloom and 15% after bloom

Natural Enemies

Entomopthora grylii

- Bacteria that takes over
- Makes the grasshopper go to the top of the plant, grab on really tight and then die
- The bacteria's spores are released and spread down

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Natural Enemies

Two species of field crickets in Saskatchewan

- Both eat grasshopper eggs
- Spring crickets
- Fall crickets

Field cricket with nematomorph

- An obligate parasite
- The worm gets its host to seek out water and when it contacts water, the worm exits the host

n/ar

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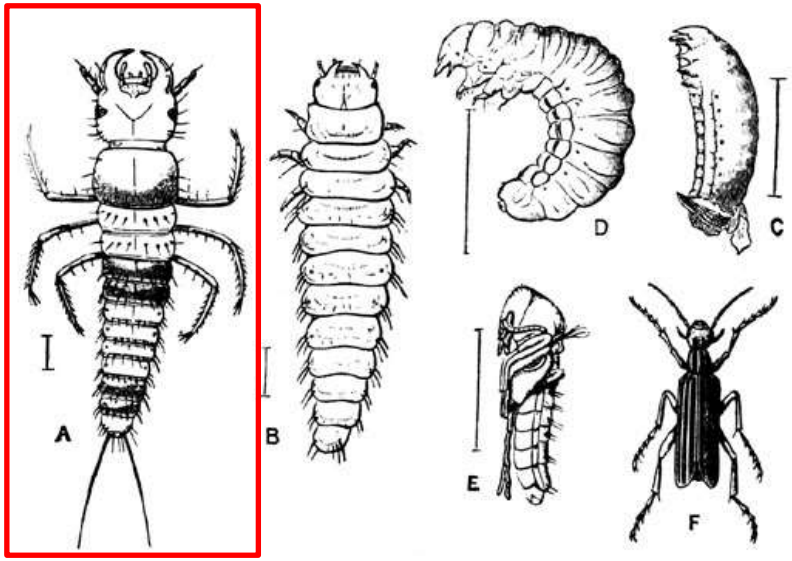
Natural Enemies

Gray blister beetles

- Not the iridescent ones
- The first larval instar does the damage
- They are very small but eat a lot of grasshopper eggs



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Insecticide Options in 2023

Lambda-cyhalothrin, belonging to the synthetic pyrethroids chemical group (Group 3), is a widely used insecticide with extensive product labels covering key pests of numerous pulse, cereal, and oilseed crops. Extensive outbreaks of flea beetles, grasshoppers, and pea aphids during the 2022 growing season serve as a recent reminder of how valuable this active ingredient is to have in the crop production toolbox.

The re-evaluation decision on lambda-cyhalothrin and its associated end-use products (PMRA, 2021) resulted in the cancellation of all feed uses. After April 2023, if a crop is treated with lambda-cyhalothrin according to label provisions, that crop and its components (fractions, meal, screenings) cannot be fed to any livestock in Canada. This label change results in an unmanageable risk mitigation option as many crops are grown for both food and feed, with no segregation by food or feed in our bulk grain handling system.

Due to the cancellation of the feed use and the challenges that this presents to the entire value chain, the availability of products containing lambda-cyhalothrin and farmers ability to utilize these products for the 2023 growing season is uncertain. A worst-case scenario is that all products containing lambda-cyhalothrin will be effectively unusable during the 2023 growing season. Therefore, it is important to consider alternative active ingredients and product options for insect pest control. The following document provides information on thresholds and damage of key pests covered by labels of products containing lambda-cyhalothrin and summarizes alternative options for foliar, seed treatment, and grasshopper bait products.

Key Pests & Thresholds

It is important that growers and agronomists diligently scout for insect pests that impact their crops as rapid outbreaks can occur that may severely impact crop yield or quality (Table 1). However, presence of a pest insect alone does not automatically warrant an insecticide application as it is important to consider crop stage, environmental conditions, threshold information, and presence of beneficial insects.

Economic Injury Level describes the lowest amount of crop injury or smallest number of insect pests that cause damage at a value equivalent to the economic costs of management.

Economic Threshold describes the level of damage or density of insects at which control measures are economically warranted. Under these conditions, the cost of control is less than the value of the crop damage due to pest pressure. Intervening at this timing is intended to prevent an increasing pest population from reaching the economic injury level.

Nominal Threshold describes a decision guideline only. This educated estimate is based on experience or from extrapolating economic threshold information from pests that impact similar crop hosts. Research has not been conducted to quantify the impact of the insects on the specific crop.

Table 1. Summary of key pests and crop hosts including damage and intervention guidelines.

Crop(s)	Intervention Guidelines
Bertha Armyworm: *Causes defoliation evidenced by outer layers of stems and pods chewed resulting in whitish appearance and holes chewed in pods. Scout for larvae two weeks after peak adult emergence (usually late July through early August) by shaking plants in a 1/4 square metre area and carefully check soil surface for dislodged larvae. Provincial Ag Ministries trap adults and post results, weekly on provincial websites and through the Prairie Pest Monitoring Network. It takes about 6 weeks to complete development. During heat of the day, larvae will often be found under leaves or on soil surface. Small larvae can be easily confused with diamondback moth larvae but don't wriggle or drop from silken threads. To help get an idea of potential risk levels, consider participating in the provincial monitoring programs.*	
Canola, Mustard	Find the number of larvae per square metre and consult the economic threshold chart on Canola Encyclopedia.
Cabbage Seedpod Weevil: *Although adults feed on flower buds, most of the economic crop damage occurs when larvae feed within pods and destroy developing seeds. When larvae exit pods, they leave small holes which leave the pods susceptible to premature shattering. Scout as crops begin to flower and, if warranted, apply insecticide to target adults when crops are 10 to 20 percent flower to avoid eggs being laid in newly formed pods.*	
Canola, Mustard	An economic threshold of 25 to 40 weevils per 10 sweeps on average is recommended. An insecticide should be applied at 10 to 20 percent bloom. Yellow mustard is resistant and only brown and oriental mustard varieties require monitoring and potentially insecticide control of the weevil.

Foliar Insecticides

Active Ingredient	Product(s)	Pulses (PHI)[1]	Cereals (PHI)	Oilseeds (PHI)
Grasshopper				
Chlorantraniliprole	Coragen®/Coragen® MaX	Chickpea (1), Dry Bean (1), Faba Bean (1), Lentil (1), Pea (1), Soybean (1)	Barley (1), Oat (1), Wheat (1)	Canola (1), Flax (1), Mustard (1)
Cypermethrin	UP-Cyde® 2.5 EC		Barley (45), Wheat (30)	Canola (30)
Deltamethrin	Decis®100 EC/ Decis®5EC	Chickpea (7), Dry Bean (7), Faba Bean (7), Pea (7)	Barley (40), Oat (31), Wheat (40)	Canola (7), Flax (7), Mustard (7)
	Advantage Deltamethrin 5EC, Poleci® 2.5 EC		Barley (40), Oat (31), Wheat (40)	Canola (7), Flax (40), Mustard (7)
Dimethoate	Cygon® 480-Ag			Canola (21)
	Lagon® 480		Barley (35), Oat (35), Wheat (35)	
Malathion	Malathion 85E	Lentil (14)	Barley (7), Oat (7), Wheat (7)	Canola (7), Flax (7), Mustard (7)
	Malathion 500	Lentil (30)	Barley (7), Oat (7), Wheat (7)	Canola (7), Flax (7)

From: Insecticide Options in 2023 by SPG, SaskCanola, SaskBarley, SaskWheat

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Grasshopper Bait Products

- Spreadable wheat bran bait products offer additional solutions as part of IPM
- Grasshoppers have to consume it
- Apply when grasshoppers are small (3rd instar stage)
- Higher rates are needed for larger grasshopper or denser populations

Grasshopper Bait Products

- Eco Bran – will be available for 2023
  - Dry bean, barley, oat, wheat, canola
  - Death after 18 hours to 3 days
  - Has carbaryl
  - Formulated to not break down under UV light for 21 days but rain can break it down
- Nolo Bait – unknown supply for 2023
  - All crops
  - Death in 3 to 6 weeks
  - Organic product that has spores of a protozoan that reduces feeding and reproductive capacity

Wheat Midge

Wheat Midge

Wheat midge need 1 inch (25 mm) of precipitation by the end of May

- Larvae overwinter in the upper few inches of the soil
- The moisture triggers them to move just below the soil surface and go to their next stage (pupae) and then become adults
- If they don't receive enough moisture, the larvae can stay there for a year or two or more

Wheat Midge

- Products
  - Group 1B
    - Dimethoate (Lagon/Cygon)
    - ~~chlorpyrifos (Lorsban)~~

- Use a varietal blend with *Sm-1* gene

Wheat Midge

- Scouting
  - Count adults daily at sunset from heading to flowering
  - Emergence: 90% at 875 dd (~Canada day, termperature dependent)
  - **Yield threshold:**

    1 midge/4-5 heads
  - **Grade threshold:**

    1 midge/8-10 heads


Photo: Tyler Wist

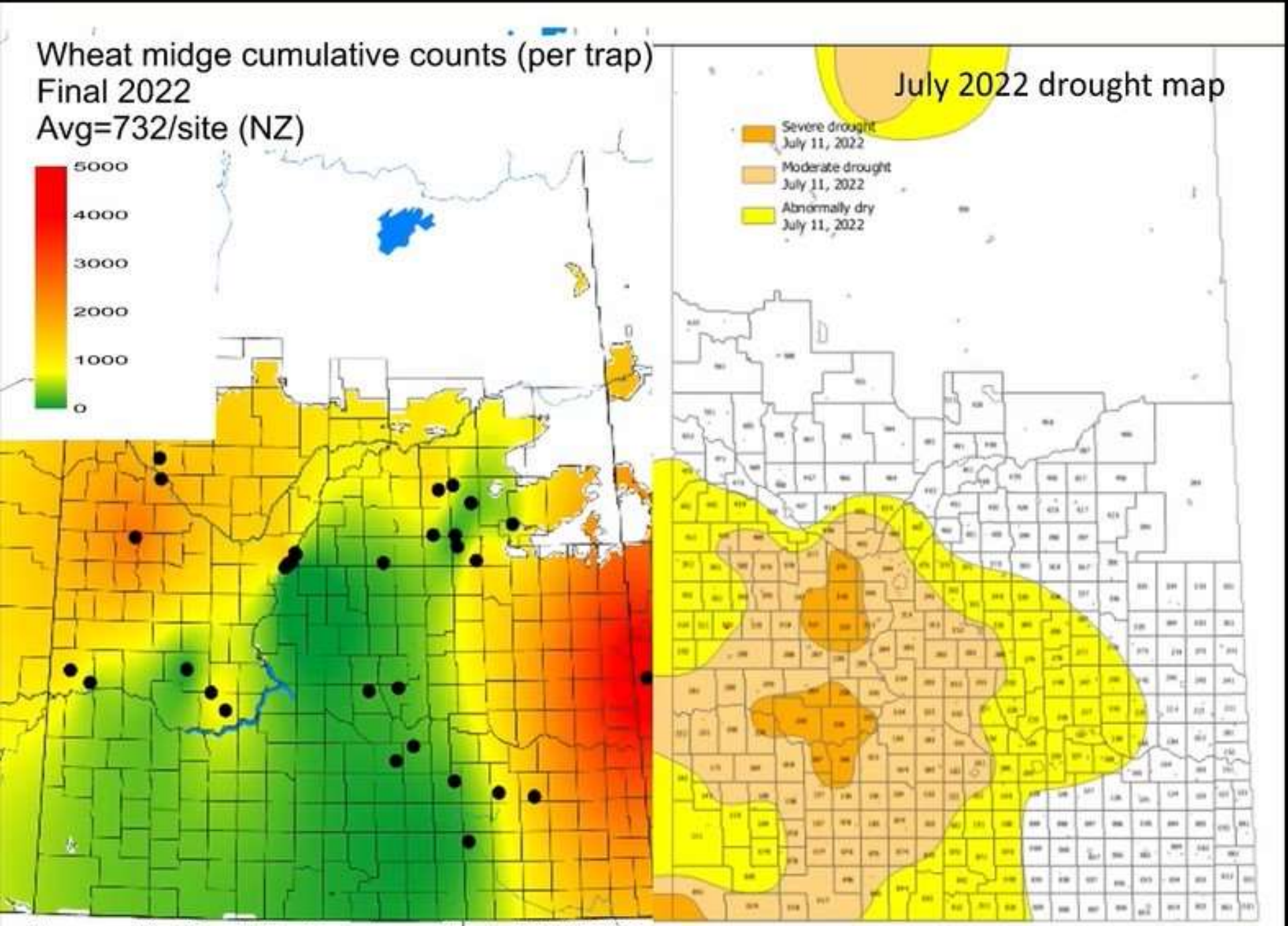

Figure modified from Wist, Vankosky, and Weiss (AAFC), 2022

Varietal Blends

- midgetolerantwheat.ca
- There is only **one** gene for wheat midge tolerance
- The Stewardship Agreement for Midge Tolerant Wheat limits the use of farm-saved seed to one generation past Certified Seed
  - To keep the ratio of tolerant wheat (90%) to susceptible wheat (10%) the same to prevent wheat midge that is resistant to the sm-1 gene
  - If tolerant wheat is used alone, wheat midge tolerance could break down in 10 years

All midge tolerant wheat

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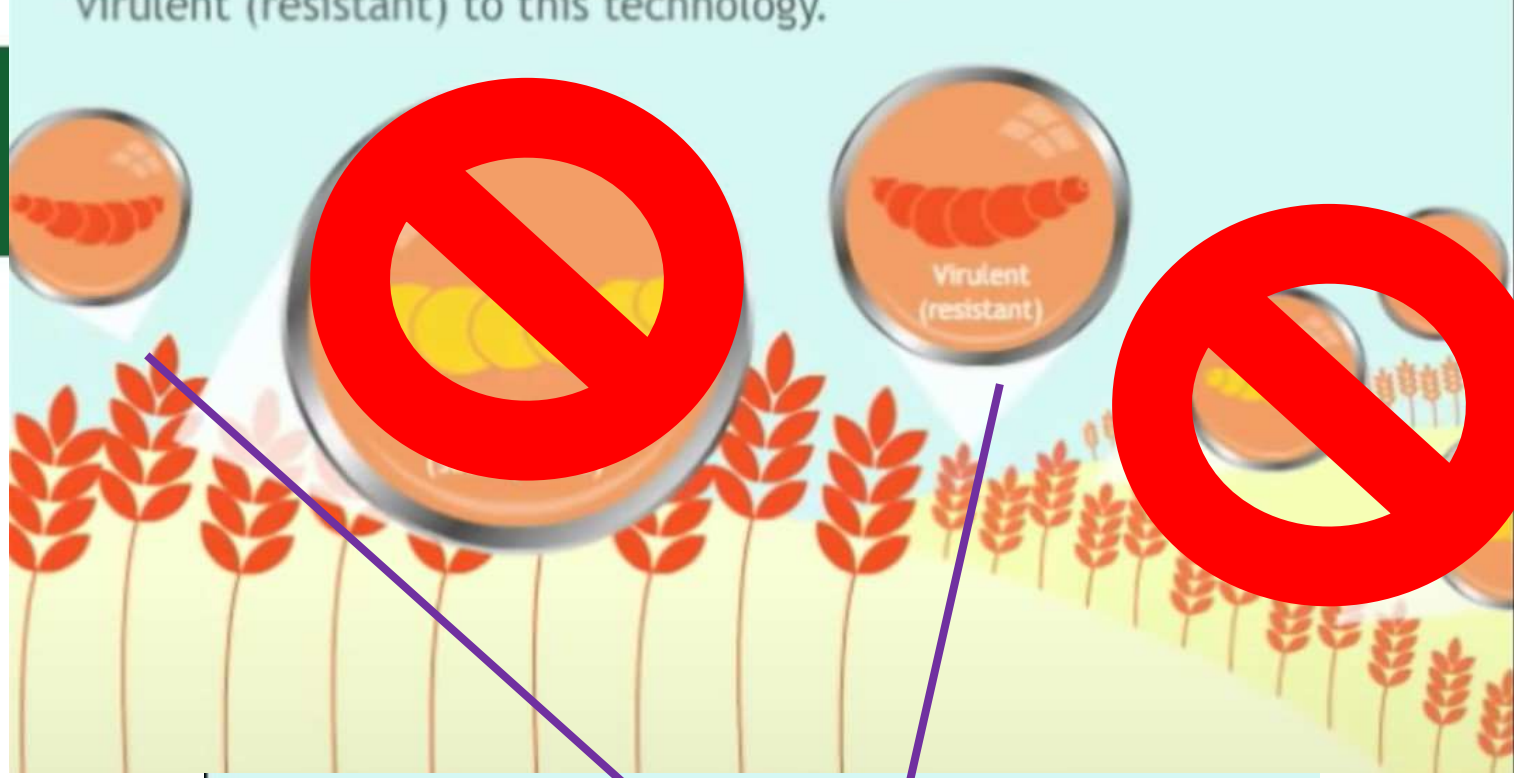

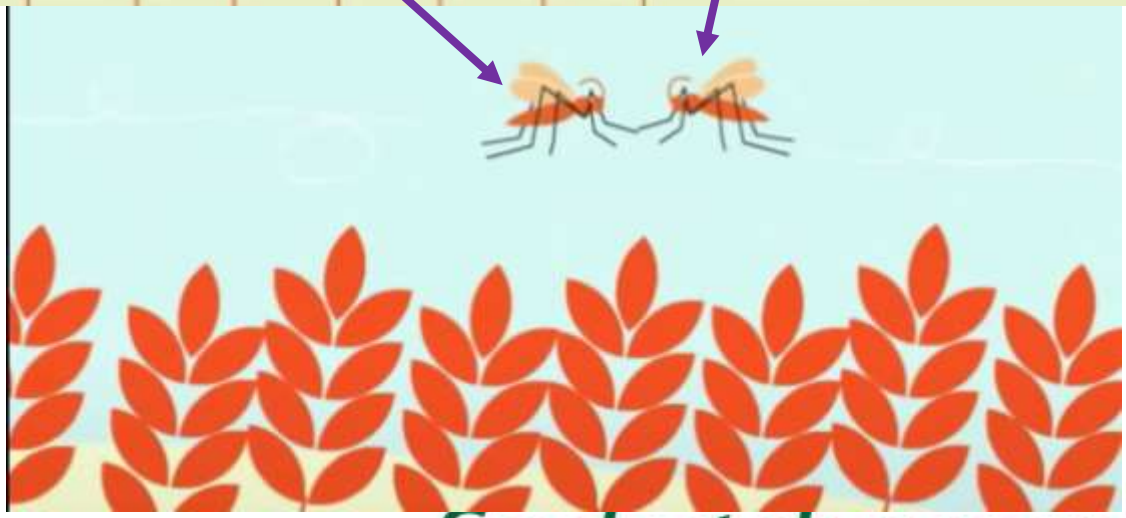

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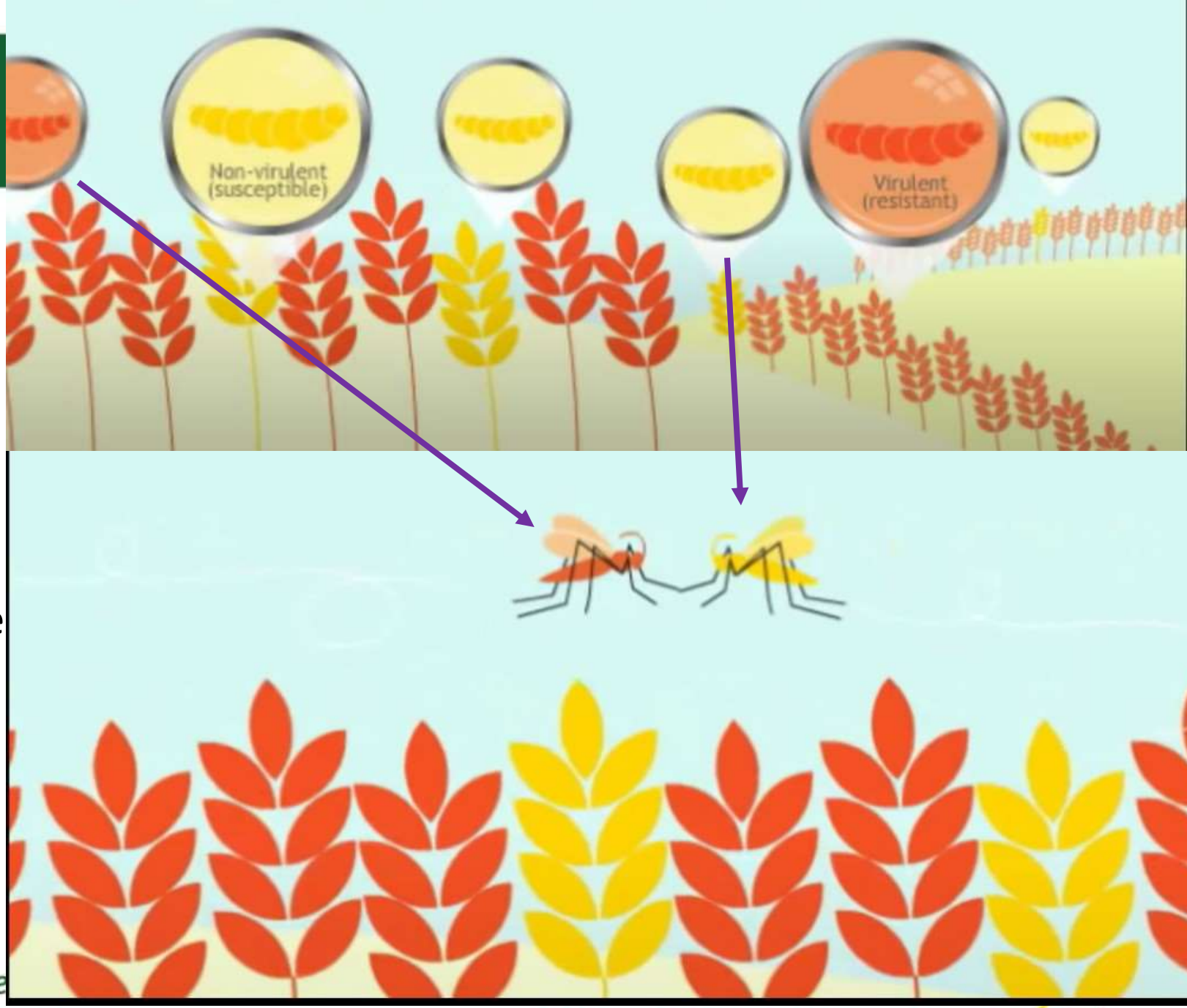
Varietal Blend

90% Tolerant

10% susceptible



midgetolerantwheat.ca

Category and Variety	Years Tested[1]	Yield (%)			Protein (%)	Resistance To									Head Awnedness	Stem Solidness[3]	Rel. Maturity (days)	Seed Wt. (mg)	Volume Wt.[4] (kg/hL)	Ht. (cm)
		Area 1 & 2	Area 3 & 4	Irrigation[2]		Lodging	Sprouting	Stem Rust	Leaf Rust	Stripe Rust	Loose Smut	Bunt	Leaf Spot	FHB						
CWAD		--- Relative to Strongfield ---															--- Relative to Strongfield ---			
Strongfield	6	100	100	100	14.4	P	F	R	R	MR	R	MR	I	S	Y	H	102	43	79.7	88
CDC Alloy	5	107	109	107	-0.4	F	F	MR	R	R	I	R	MS	MS	Y	H	+1	-0.6	+0.8	+3
AAC Antler	1	109	108	---	-0.2	F	---	R	R	R	---	R	---	MS[6]	Y	H	+1	-2.0	+0.8	+2
Brigade	5	106	113	110	-0.9	F	F	R	R	MR	S	R	I	MS[6]	Y	H	+2	+0.6	+0.4	+7
AAC Congress	5	109	107	113	-0.5	P	F	MR	R	R	MR	R	MS	MS	Y	H	+1	-0.8	+0.5	+2
CDC Covert	4	109	108	110	-0.5	G	G	R	R	R	---	R	---	S	Y	H	+1	-4.6	+0.3	-1
CDC Credence	5	108	110	102	-0.7	F	F	MR	R	MR	MR	R	I	MS[6]	Y	H	+1	-0.7	0.0	+7
CDC Defy	4	112	112	113	-0.9	G	F	MR	R	I	---	R	---	MS[6]	Y	H	0	-3.2	+1.3	+4
AAC Donlow	4	112	107	111	-0.7	F	G	R	R	R	---	R	---	MS[6]	Y	H	+1	-3.3	+1.0	0
CDC Dynamic	5	105	106	110	+0.1	F	G	MR	R	MR	I	R	I	MS	Y	H	0	-1.0	+0.6	+1
CDC Evident	1	115	113	---	-0.7	F	---	R	R	R	---	R	---	MS	Y	H	+1	-1.2	0.0	+2
CDC Flare	5	102	103	108	-0.3	VG	F	MR	R	S	R	R	I	MS	Y	H	0	+0.5	-0.9	-1
CDC Fortitude	5	104	103	98	-0.2	F	F	MR	R	R	MS	R	MS	MS	Y	S	+1	-1.3	+0.2	-2
AAC GoldNet	4	109	110	112	-0.3	G	G	MR	R	R	---	R	---	S	Y	H	+1	-3.2	+0.7	+3
AAC Grainland	5	105	108	104	-0.3	F	G	MR	R	R	R	R	MS	MS	Y	S	+1	-0.5	-0.6	+1
CDC Precision	6	106	109	107	-0.4	G	F	MR	R	R	MS	R	MS	MS	Y	H	+1	-0.8	+0.9	+2
AAC Schrader	2	107	106	---	-0.4	F	F	R	R	R	---	MR	---	I	Y	H	+1	-1.0	+0.5	+5
AAC Spitfire	5	108	110	111	-0.4	G	F	R	R	R	MS	R	MS	S	Y	H	0	0.0	-0.1	-2
AAC Stronghold	5	101	100	112	-0.3	VG	G	R	R	MR	R	I	I	MS	Y	S	+2	+0.8	+0.6	-3
AAC Succeed VB	5	106	108	105	-0.2	F	F	MR	R	I	R	R	MS	MS	Y	H	0	+1.6	-0.5	+2
Transcend	5	102	105	93	-0.2	F	G	R	R	R	S	R	I	MS[6]	Y	H	+1	-1.1	+0.1	+7
CDC Vantta	2	108	96	---	-0.8	G	G	I	R	R	---	R	---	MS	Y	H	+3	-1.1	+0.9	-8
CDC Verona	5	102	106	103	-0.2	G	F	R	R	R	MS	R	MS	MS	Y	H	+1	-0.7	-0.1	+2
AAC Weyburn VB	3	111	109	---	-1.1	F	G	MR	R	R	---	R	---	MS	Y	S	+2	+0.4	-0.3	0

CWRS – 19 varieties; CPSR – 2 varieties; 3 – CWSWS;

CWSP – 2 varieties; CWHWS – 1 variety

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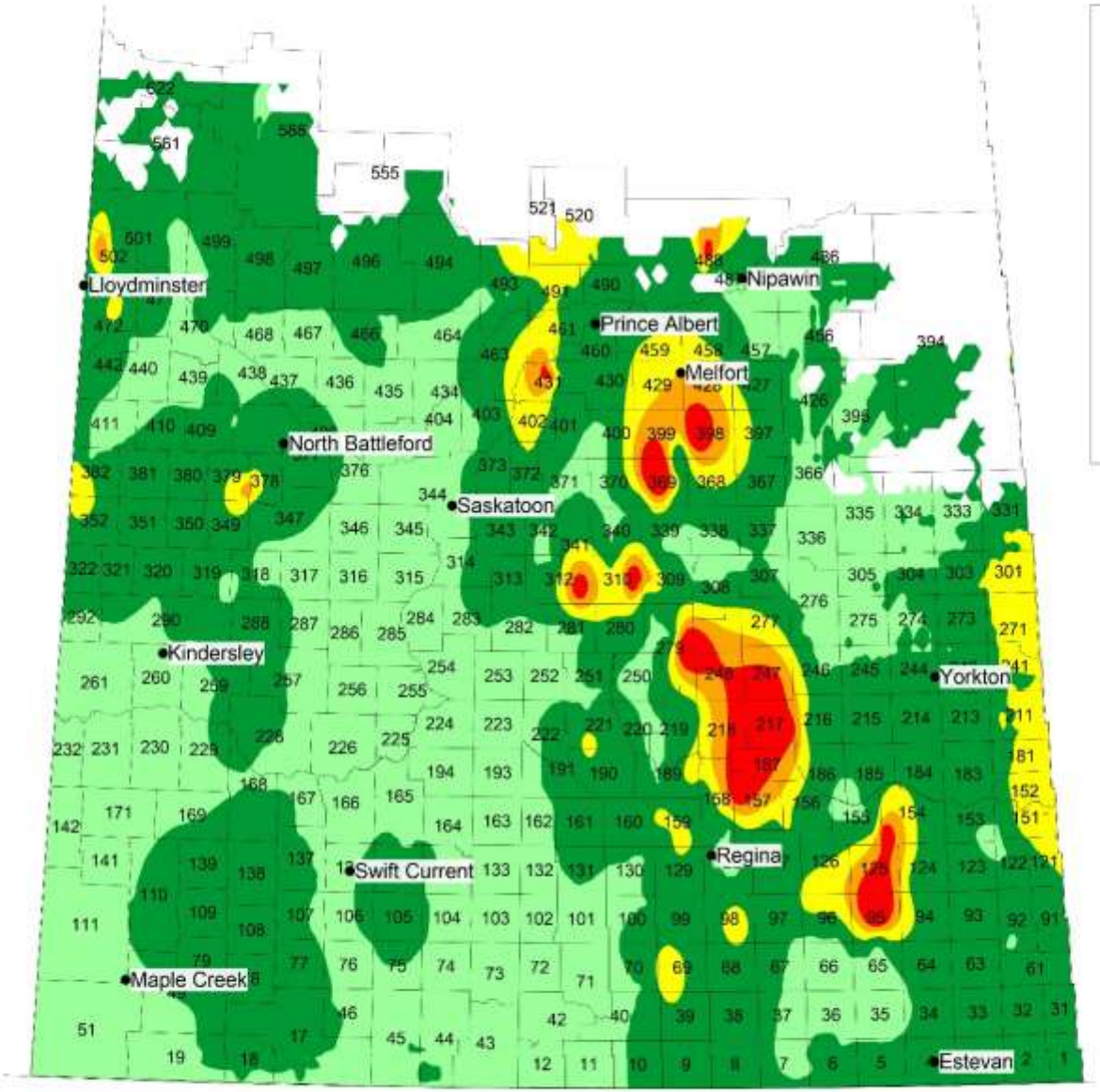
Wheat Midge Forecast 2023



Wheat midge per m^2

- > 1800
- 1200 - 1800
- 600 - 1200
- < 600
- 0

Target populations for wheat is 210 to 250 plants/m^2

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SCIC Saskatchewan Crop Insurance Corporation

Sask Wheat Development Commission

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

Flea Beetles

Flea beetles

- The most serious pest of seedling canola
  - Damage can occur very quickly in the spring
  - They move in from the field edge
  - Usually move by hopping or walking
  - But they are excellent fliers and can go up to 6 m in the air and can move kms by flight

Flea beetles

- Significant populations in 2022
  - Some areas with 3 or 4 foliar insecticides on top of seed treatment last year
  - Crucifer – *Phyllotreta cruciferae*
    - Mainly eat crucifer plants
    - Can also be seen in the fall
  - Striped – *Phyllotreta striolata*
    - Broader host range
    - Are not usually seen in the fall but there are a lot of them in the spring
    - Less heat tolerant and comes up 2 weeks or more earlier (can be mid-April) but they can coexist

Life History

Figure: Ruth Hazzard

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Seed Treatments

- Clothianidin (4A, neonics)
  - NipsIt INSIDE 600 Insecticide, Poncho 600 FS
  - Prosper EverGol
  - Vercoras (Poncho 600 FS)
- Cyantraniliprole (28)
  - Lumiderm: mixed with Prosper EverGol, Helix Vibrance
  - Fortenza: mixed with Vibrance 500 FS
- Flupyradifurone (4D)
  - BUTEO start 480 FS Seed Treatment
- Sulfoxaflor (4C)
  - Fortenza Advanced: co-pack of Rascendo (sulfoxaflor – 4C) and Fortenza (cyantraniliprole)
- Imidacloprid (4A)
  - Sombrero 600 FS
- Thiamethoxam (4A)
  - Helix Vibrance

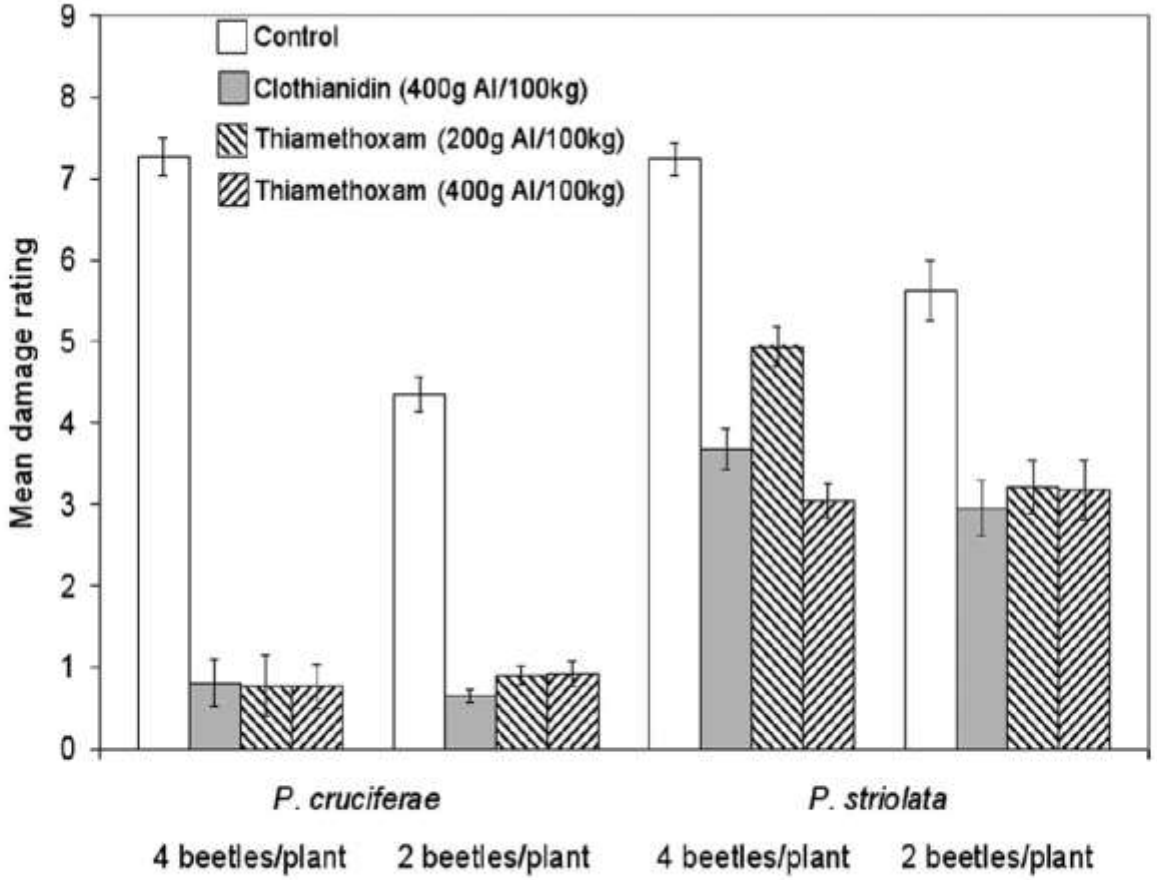


Fig. 3. Mean feeding damage ratings mean ± SEM for *P. cruciferae* and *P. striolata* after 72 h on treated (Prosper 400, Helix and Helix XTra) seedlings at densities of two and four beetles per seedling, August 2006.

Striped flea beetles are more tolerant of neonics, diamides than crucifer flea beetles

Tansey, J. A., Dosdall, L. M., Keddie, B. A., & Sarfraz, R. M. (2008). Differences in Phyllotreta cruciferae and Phyllotreta striolata (Coleoptera: Chrysomelidae) responses to neonicotinoid seed treatments. *Journal of Economic Entomology*, *101*(1), 159-167.

Flea beetle control

- Foliar applications
  - Carbaryl (group 1A)
    - Sevin XLR
  - Malathion (group 1B)
    - Malathion 500, Malathion 85E
  - Permethrin (group 3)
    - Pounce, Perm-Up, IPCO Syncro, Ambush
  - Lambda-cyhalothrin (group 3)
    - ~~Matador,~~ Silencer?, Labamba?
  - ~~Lambda-cyhalothrin + chlorantraniliprole (group 3 + group 28)~~
    - ~~Voliam Xpress~~
  - Cypermethrin (group 3)
    - UP-Cyde 2.5 EC, Ship 250 EC
  - Deltamethrin (group 3)
    - Decis 100 EC, Decis 5 EC, Advantage Deltamethrin 5 EC, Poleci

- **Economic threshold: 25% defoliation and flea beetles present (no damage without the flea beetles, unless warm and dry)**
- Economic injury: 50%

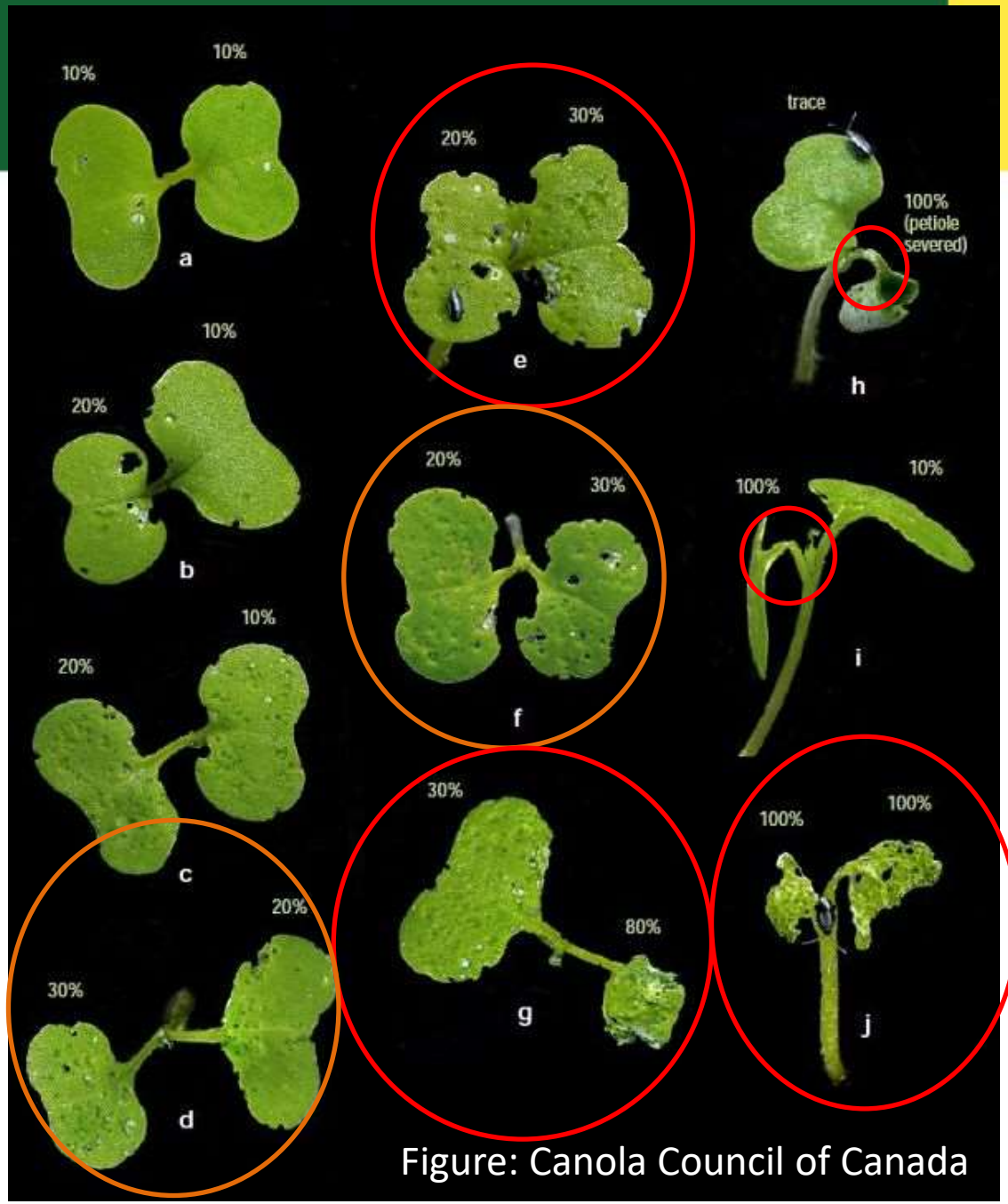


Figure: Canola Council of Canada

Flea beetle control

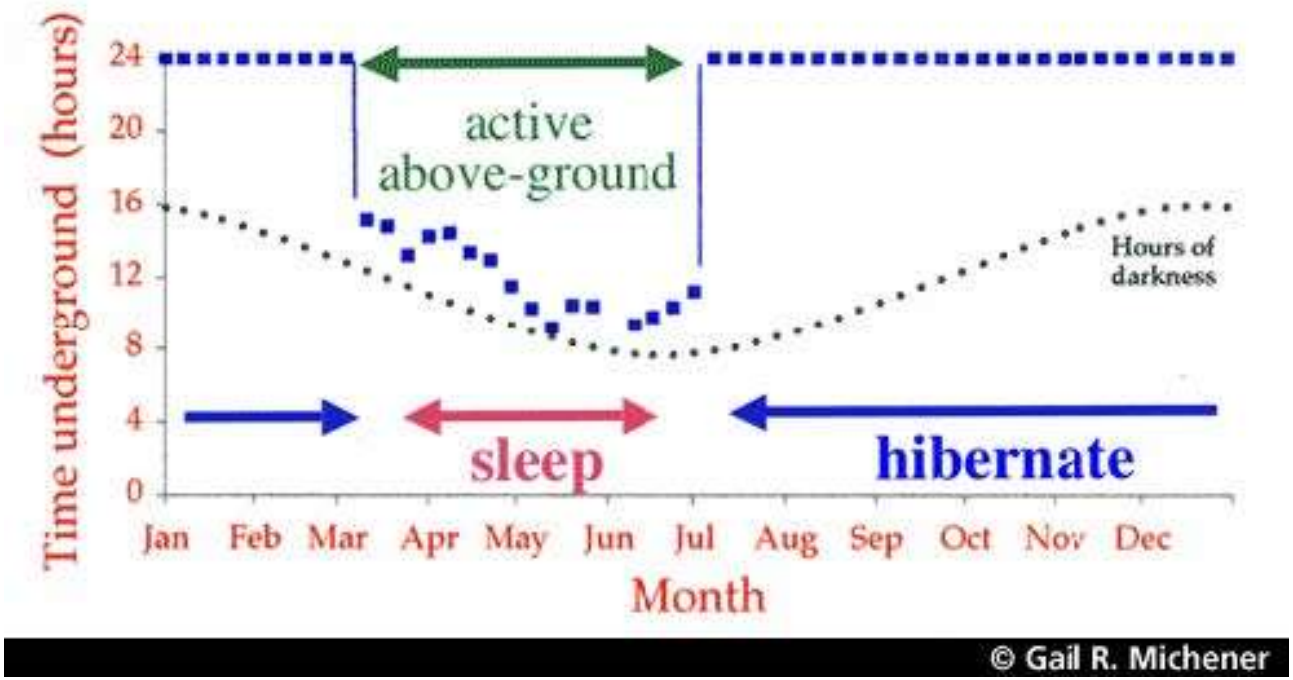
- Cultural control
  - Plant as shallow as available moisture will allow
    - Produces seedlings that germinate and emerge quickly and grow vigorously
  - Early seeding?
  - Seed into standing stubble
    - Microclimate less suited to FB
  - Increasing seeding rates
    - More plants per unit area
  - Wider row spacings of 20-30 cm

Richardson's Ground Squirrel Control

Also known as gophers and dakrat (Dakota rat)

Gophers

- Males usually emerge 2 weeks before females
- Females:



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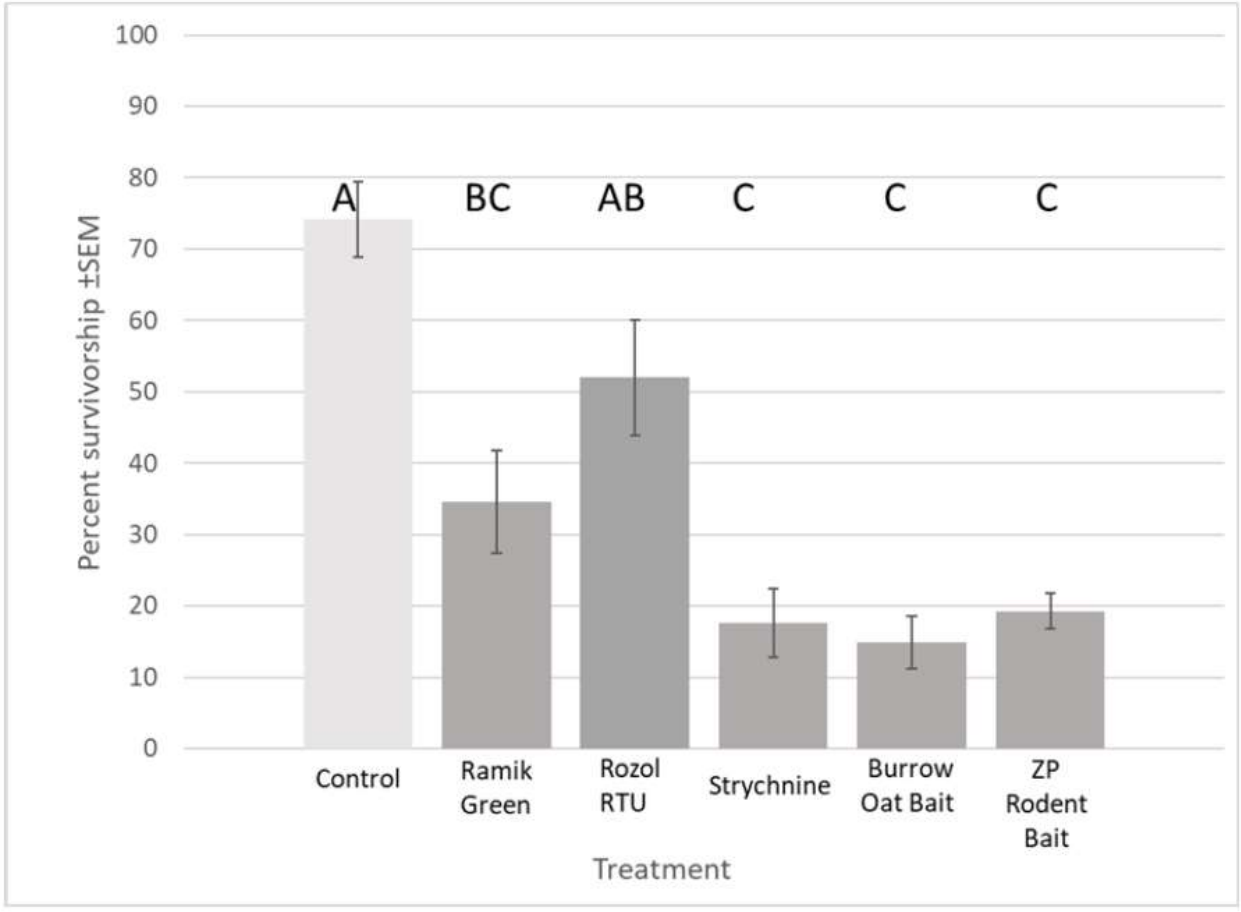
Strychnine alternatives

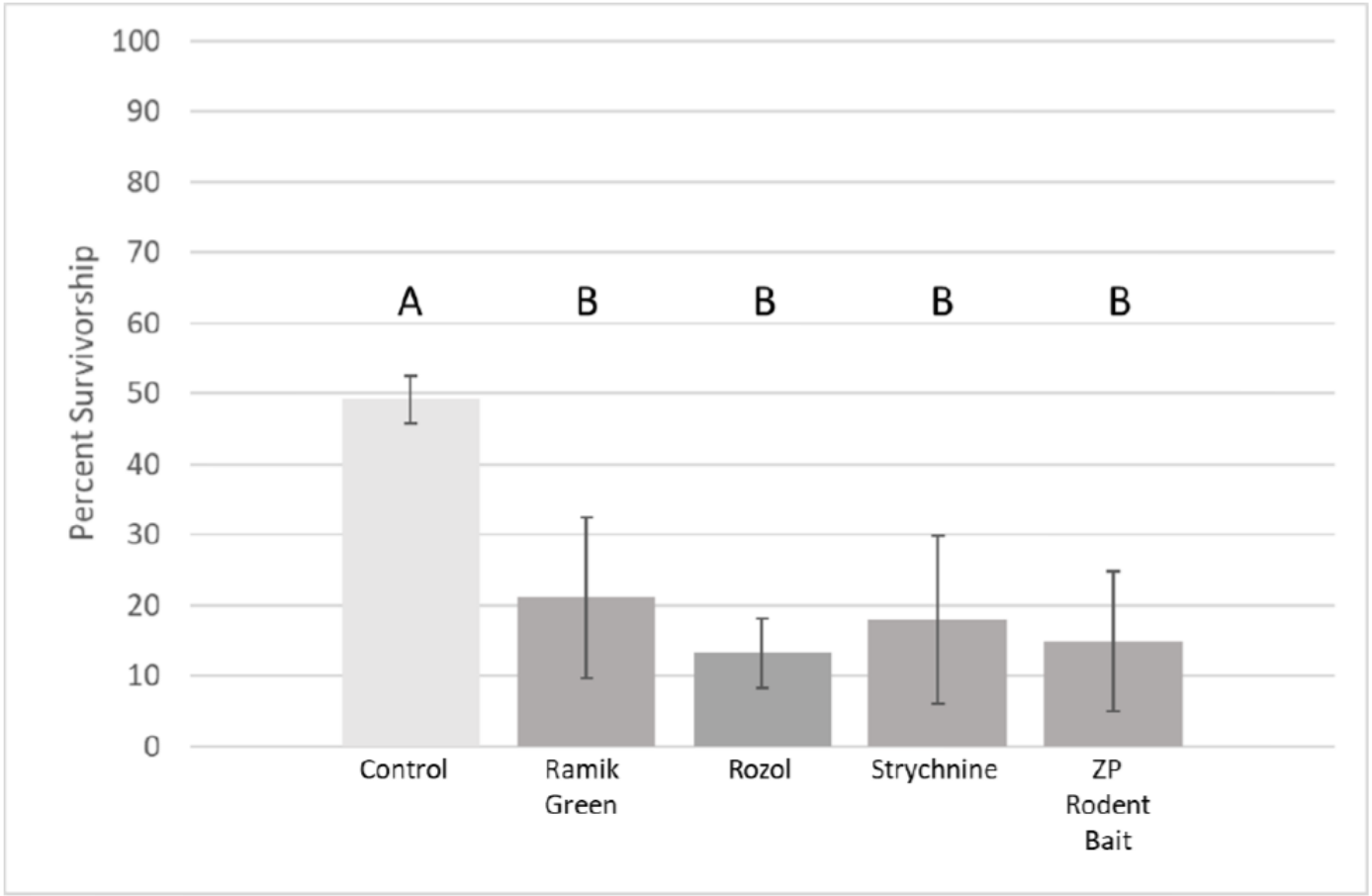
- Saskatchewan 2022 data



No significant differences among like-lettered groups (Tukey HSD, $\alpha = 0.05$)

Strychnine alternatives

- Alberta 2022 data



No significant differences among like-lettered groups (Tukey HSD, $\alpha = 0.05$)

Strychnine alternatives

- Economic analysis
  - Rozol and Ramik can require multiple applications
  - Costs are per application

Product	$ per acre
2% Liquid Strychnine Concentrate	12.97
Burrow oat bait	**4.54**
ZP Rodent oat bait AG	**8.80**
Rozol RTU Field Rodent Bait	14.73
Ramik Green	10.60

Strychnine alternatives

- **An important consideration with all baits is timing**
  - **Best results are achieved if baits are applied before spring green-up**
  - This can be as early as late February in some regions
- Anti-coagulants
  - Fresh plant material, particularly legumes, provide RGS with vitamin K
  - This is the antidote
- Strychnine and zinc phosphide have no antidotes
  - ZP products need weak acidic solution to break down (animal gut)

Contributors

- SK
  - Rural Municipality of Maple Creek (RM111): Christine Hoffman, Shawn Kramer, ratepayer cooperators
  - Rural Municipality Edenwold (158)
  - Saskatchewan Ministry of Agriculture: Dr. James Tansey, Richard Wilkins, Raul Avila, Austin Baron, Jordan Johnson, and Brooke Fiala
  - SARM PHOs: Joanne Kwasnicki and Colleen Fennig
- AB
  - Alberta Agriculture: Dr. Karen Wickerson DVM
  - Municipal District of Willow Creek: Carla Preachuk, Kirby Hugo and Gary Murray
  - Cypress County: Lisa Sulz

Lygus bugs


Photo: David Wrobel

- For canola, the threshold has changed to a nominal threshold of:
  - **2-3 adults or nymphs with wing buds that are the same size as adults per sweep at late flower to early pod**
  - At 1/sweep or lower:
    - control isn't recommended
    - plants may compensate for the injury and there can be a yield bump (compensatory regrowth)

Pest Monitoring Programs

- Please sign up to allow us access to continue this work
- **james.tansey@gov.sk.ca**
- shannon.chant@gov.sk.ca