

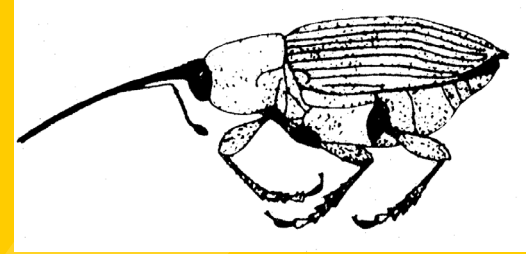
Current Status of Red Sunflower Seed Weevil in North Dakota



NDSU: Janet Knodel*, Patrick Beauzay and Victor Gomes

**SDSU: Adam Varenhorst, Philip Rozeboom,
Bradley McManus and Patrick Wagner**

2026 NSA Research Forum



EXTENDING KNOWLEDGE >> CHANGING LIVES



NDSU

EXTENSION



Red Sunflower Seed Weevil (RSSW)

Smicronyx fulvus LeConte



Red Sunflower Seed Weevil – 2025 IPM Crop Survey in North Dakota

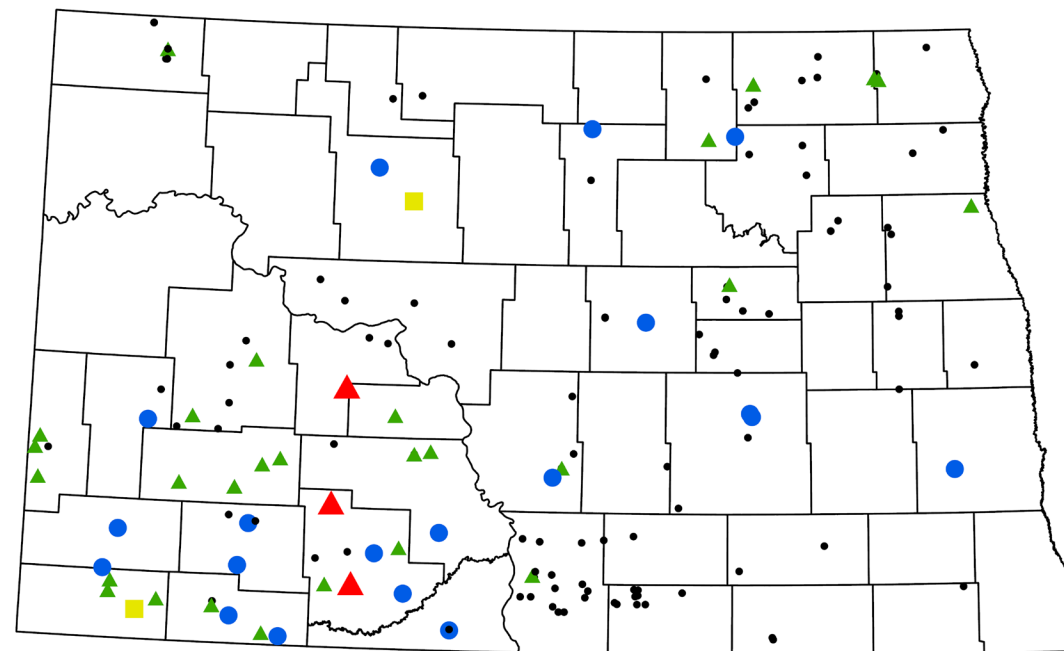


2025:
164 fields scouted in
41 counties

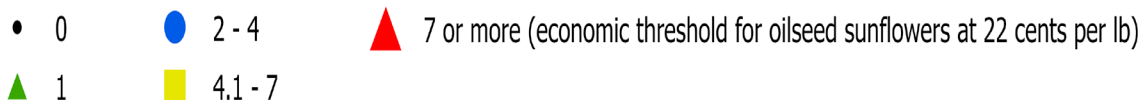
- ✓ **Average # weevils per head = 1 to 51**
- ✓ **E.T. = 7 weevils per head for oilseed sunflowers**

Red Sunflower Seed Weevils in Sunflower

Season Final, 2025



Average Number of Weevils per Head



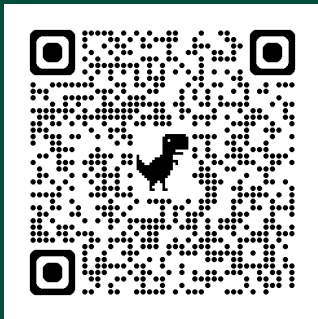
Sunflower

Foliar Insecticides

Registered Insecticides – 2026

Red sunflower seed weevil

** Restricted Use Pesticide*



Always Read and Follow Labels.

Pyrethroids (Group 3A)

Asana*, Baythroid XL*, Tombstone*, Delta Gold*, Asana XL*, Lambda-Cy*, Warrior*, Mustang Maxx*

Carbamates (Group 1A)

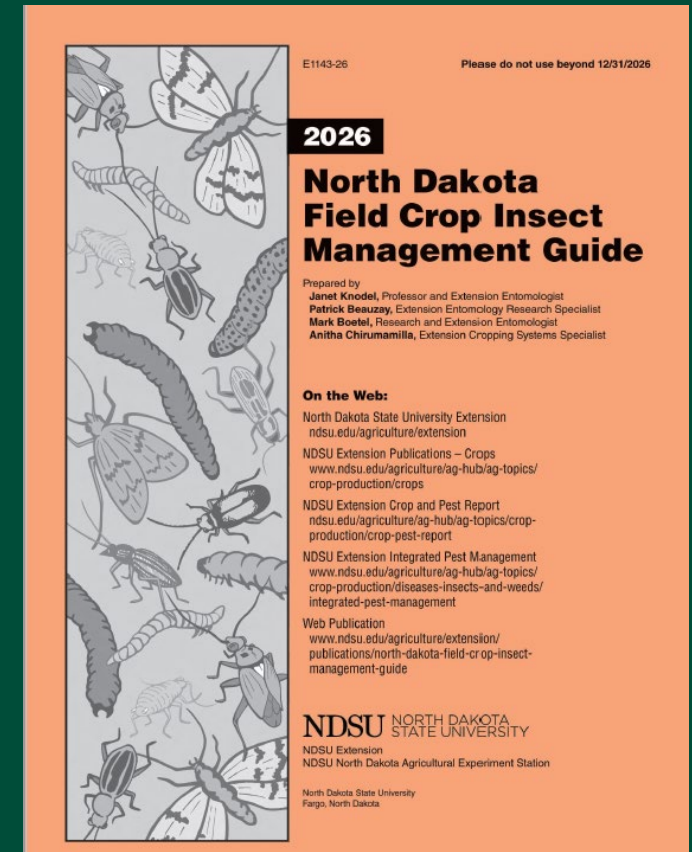
Sevin 4F, Sevin XLR Plus

Diamides (Group 28)

Harvanta 50SL

Premixes:

Besiege*
(Coragen 28 + Warrior 3A)



2025 NSA RSSW Insecticide Study – ND

Site	Planting Date	Spray Date	Harvest Date
NCREC, Minot, ND	May 29	August 12	October 15

- **Nuseed N4H470 CLP hybrid sunflower**
- **Target stand = 24,000 plants per acre**
- **ND - Plots 10 x 25 feet, 4 rows,
30-inch row spacing**



2025 NSA RSSW Insecticide Study – ND

- **Spraying**
 - Tractor-mounted CO₂ boom sprayer, 40 PSI, 22 GPA
 - Spray timing – R 5.3 growth stage (30% florets open)
- **Yield – 10 heads per plot**
 - Hand-threshed heads
 - ‘South Dakota’ benchtop seed cleaner
 - A 1,000 seed subsample from each treatment for the assessment of RSSW-damaged seeds



2025 NSA RSSW Insecticide Study – ND

Treatment	Active Ingredient	Rate	Chemical Class (IRAC #)	Registration Status
Asana XL	Esfenvalerate (3A)	9.6 fl oz/acre	Pyrethroid (3A)	Yes
Asana XL + Induce	Esfenvalerate + Induce	9.6 fl oz/acre + 0.25% v/v	Pyrethroid (3A)	Yes
Warrior II	Lambda-cyhalothrin	1.92 fl oz/acre	Pyrethroid (3A)	Yes
Baythroid XL	Beta-cyfluthrin	2.8 fl oz/acre	Pyrethroid (3A)	Yes
Harvanta 50SL	Cyclaniliprole	20.4 fl oz/acre	Diamide (28)	Yes
Steward EC	Indoxacarb	11.3 fl oz/acre	Oxadiazines (22A)	Yes
Malathion 57EC	Malathion	32 fl oz/acre	Organophosphate (1B)	24(c) in SD
Pilot 4E	Chlorpyrifos	32 fl oz/acre	Organophosphate (1B)	No
Plinazolin	Isocycloseram (30)	1.54 fl oz/acre	Isocycloseram (30)	No
Untreated Check	---	---		---

New Insecticide - Plinazolin



A NEW GENERATION
OF PEST PROTECTION

EQUENTO[®]
insecticide

Wireworms

OPELLO[™]
insecticide

Corn
rootworms

PLINAZOLIN[®] technology
Isocycloseram – Group 30

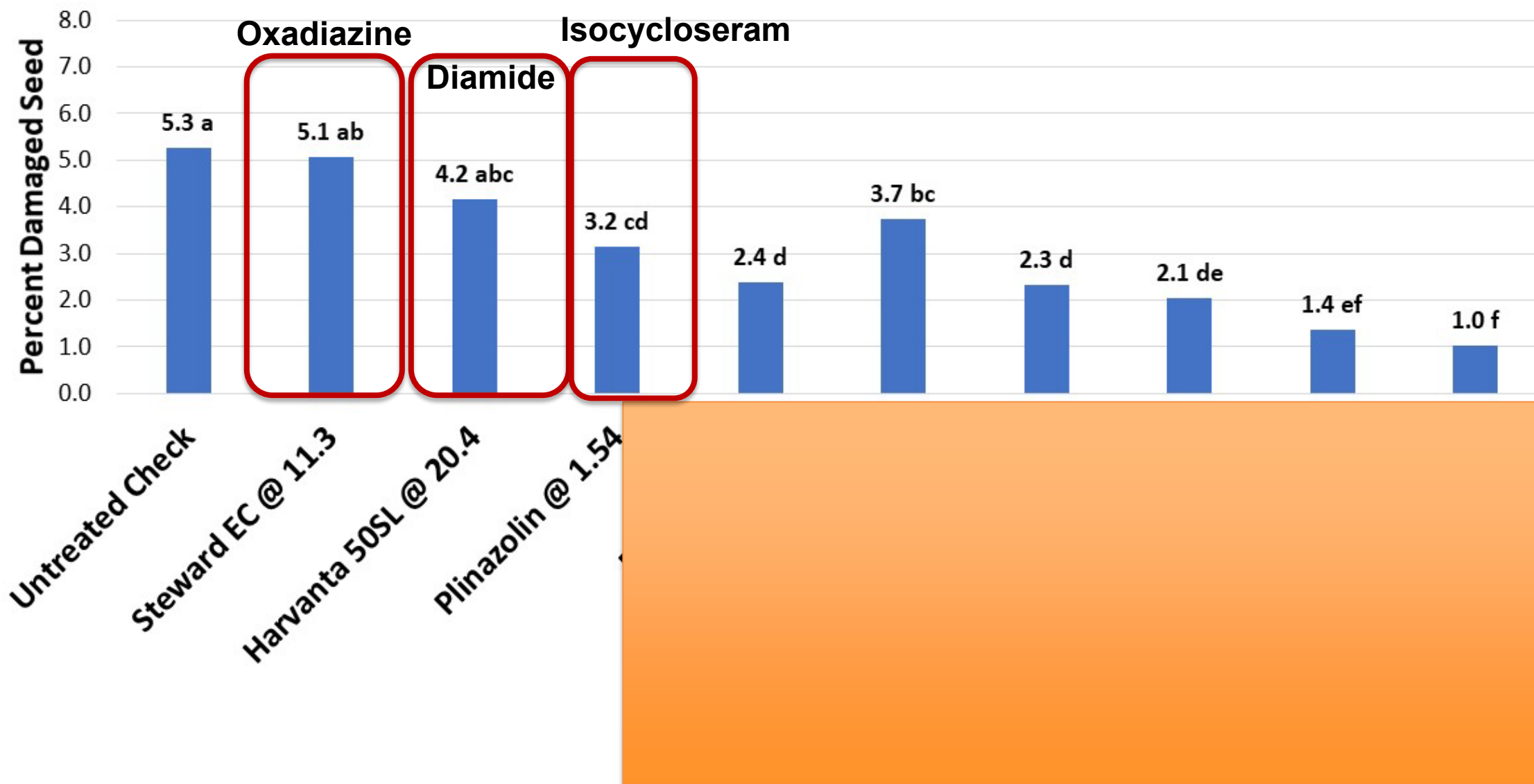
INCIPIO[™]
insecticide

VERTENTO[®]
insecticide

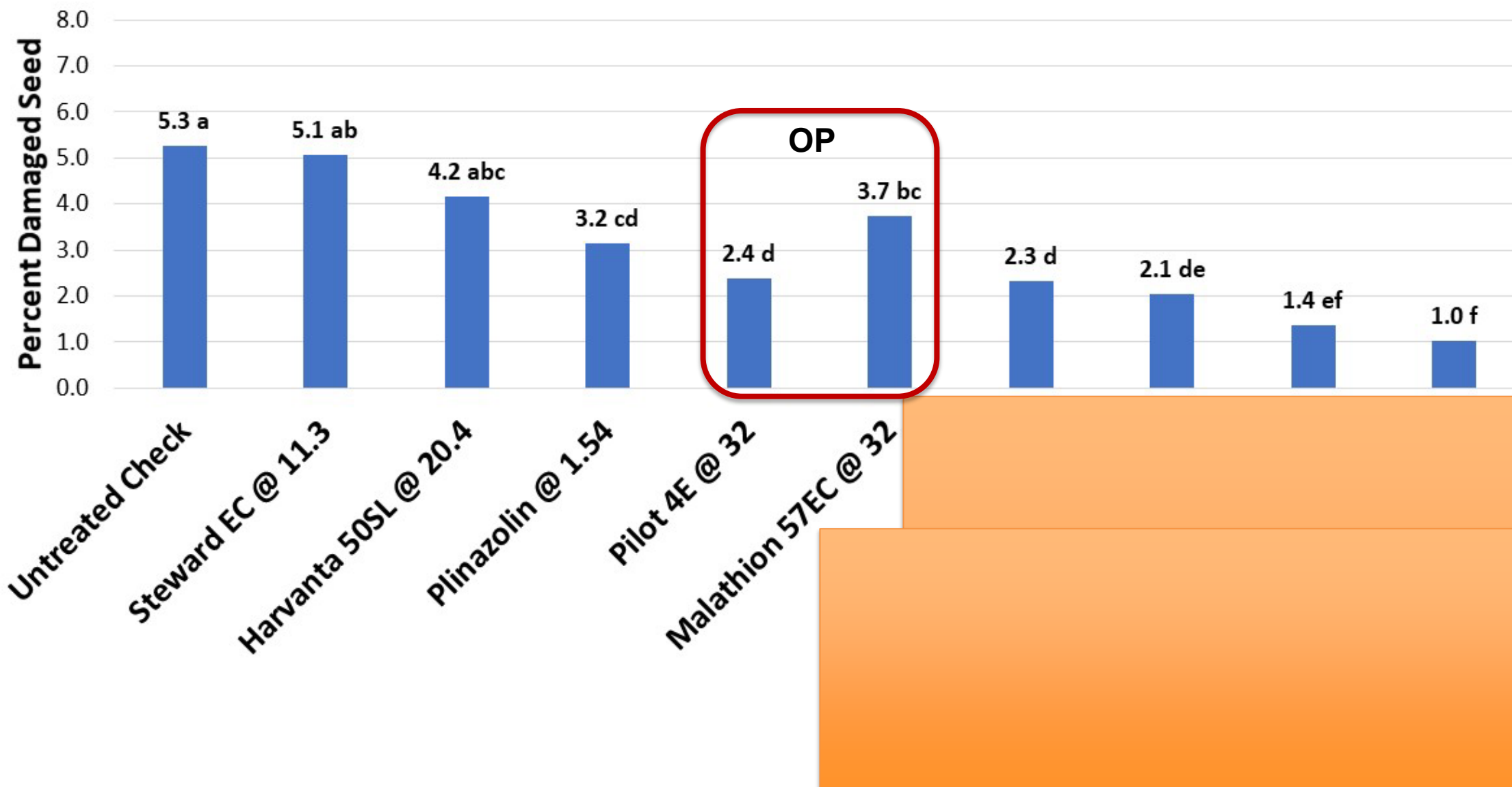
ZIVALGO[™]
insecticide



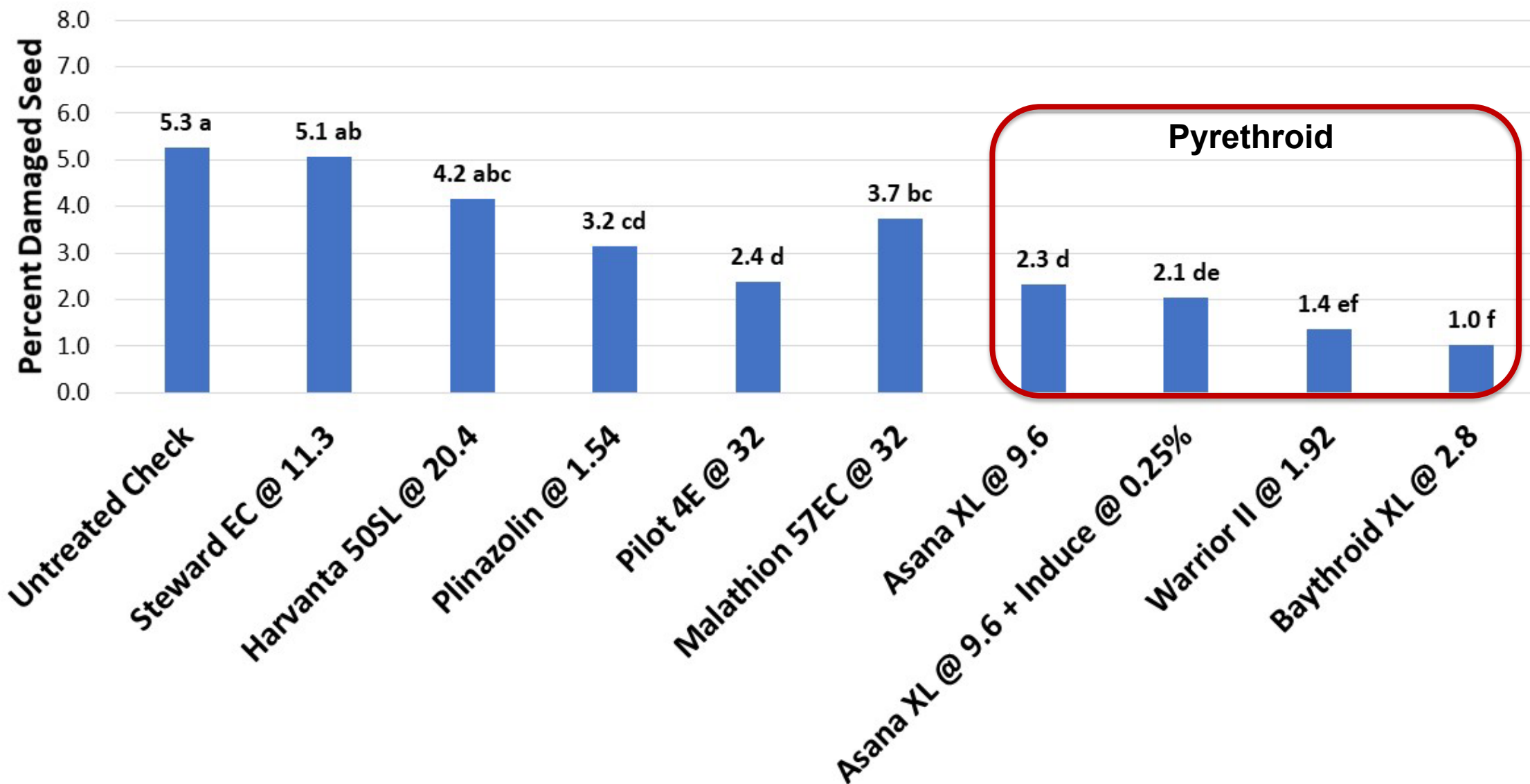
Treatment Means for RSW Percent Damaged Seed at Minot, 2025



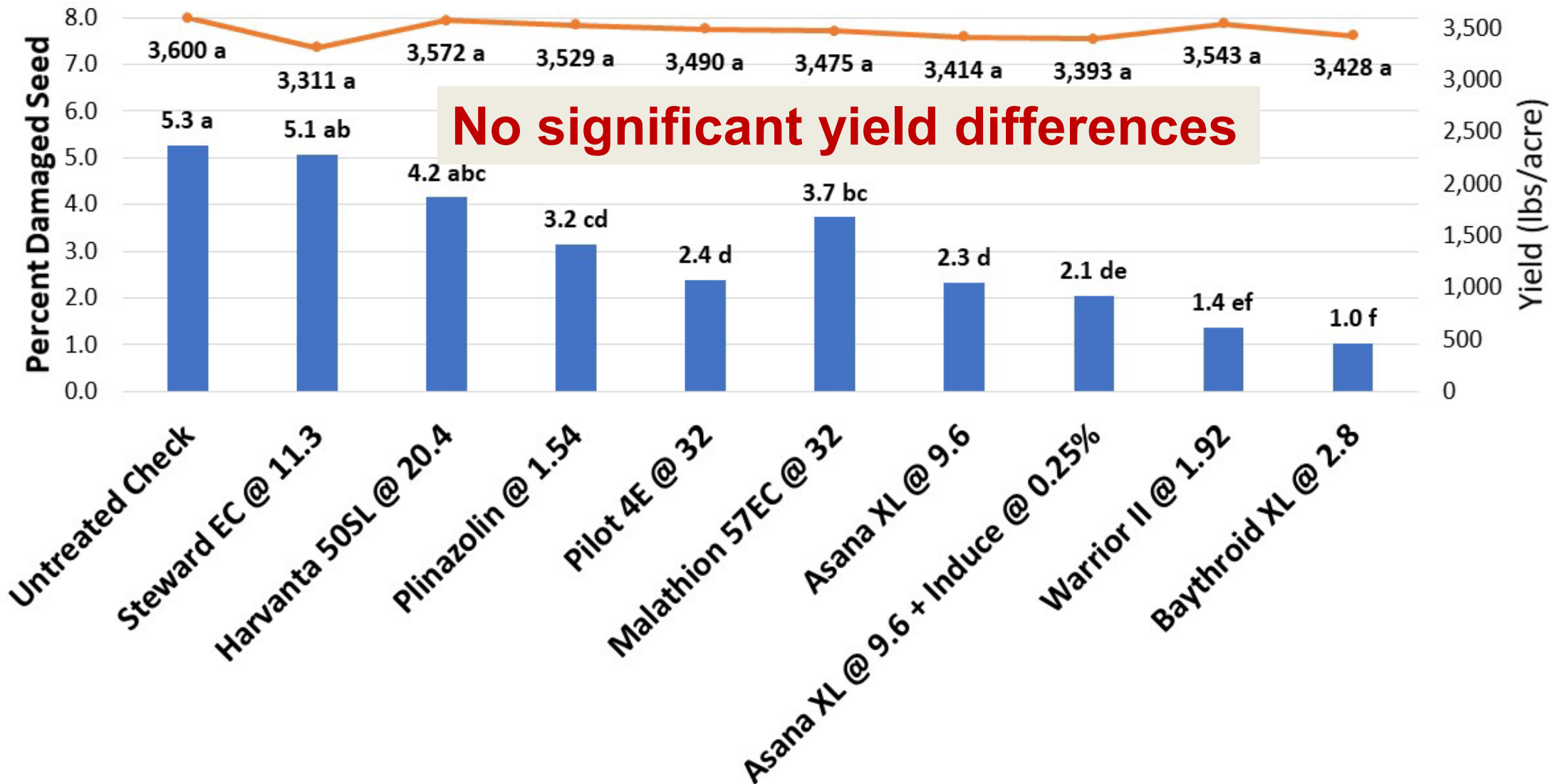
Treatment Means for RSW Percent Damaged Seed at Minot, 2025



Treatment Means for RSW Percent Damaged Seed at Minot, 2025



Treatment Means for RSW Percent Damaged Seed and Yield at Minot, 2025



2025 NSA RSSW Insecticide Study



Product(s)	Rate (fl oz/acre)	Cost per fl oz	Cost/acre
Asana XL	9.6	\$0.62	\$5.95
Asana XL + Induce	9.6 + 0.25% v/v	\$0.62 + \$0.25	\$6.20
Baythroid XL	2.8	\$2.94	\$8.23
Warrior II	1.92	\$3.08	\$5.91
Harvanta 50SL	20.4	\$2.35	\$47.94
Steward EC	11.3	\$2.67	\$30.17
Malathion 57EC	32	\$0.59	\$18.88
Pilot 4E	32	\$0.41	\$13.12
Plinazolin	1.54	UNK	UNK

Performance of foliar insecticides for RSSW control in North Dakota

Insecticide Tested	Rate(s)	Insecticide Class	Active Ingredient	IRAC #	ND Performance	Year Tested
Sevin XLR Plus	48 fl oz	Carbamate	Carbaryl	1A	Poor	2022
Vantacor	2.5 fl oz	Diamide	Chlorantraniliprole	28	Poor	2021 - 2022
Harvanta 50SL	20.4 fl oz	Diamide	Cyclaniliprole	28	Poor	2025
Steward EC	11.3 fl oz	Oxadiazine	Indoxacarb	22A	Poor	2021 - 2022, 2025

Performance of foliar insecticides for RSSW control in North Dakota

Insecticide Tested	Rate(s)	Insecticide Class	Active Ingredient	IRAC #	ND Performance	Year Tested
Asana XL	9.6 fl oz	Pyrethroid	Esfenvalerate	3A	Excellent	2021 - 2025
Asana XL + Exponent*	9.6 fl oz + 8 fl oz*	Pyrethroid	Esfenvalerate	3A	Excellent	2021 - 2025
Asana XL + Induce**	9.6 fl oz + 0.25%**	Pyrethroid	Esfenvalerate	3A	Excellent	2025
Baythroid XL	2.8 fl oz	Pyrethroid	Beta-cyfluthrin	3A	Excellent	2022 - 2025
Baythroid XL + Exponent*	2.8 fl oz + 3.5 fl oz*	Pyrethroid	Beta-cyfluthrin	3A	Excellent	2022 - 2025
Delta Gold	1.5 fl oz	Pyrethroid	Deltamethrin	3A	Good	2022 - 2023
Delta Gold + Exponent*	1.5 fl oz + 2.8 fl oz*	Pyrethroid	Deltamethrin	3A	Excellent	2022 - 2023
Mustang Maxx	4 fl oz	Pyrethroid	Zeta-cypermethrin	3A	Excellent	2022
Warrior II	1.92 fl oz	Pyrethroid	Lambda-cyhalothrin	3A	Excellent	2022 - 2025
Warrior II + Exponent*	1.92 fl oz + 5 fl oz*	Pyrethroid	Lambda-cyhalothrin	3A	Excellent	2022 - 2025

Performance of foliar insecticides for RSSW control in North Dakota

Insecticide Tested	Rate(s)	Insecticide Class	Active Ingredient	IRAC #	ND Performance	Year Tested
Neemix***	16 fl oz	Botanical	Azadirachtin	UN	Poor	2022
Dimate 4E***	16 fl oz	Organophosphate	Dimethoate	1B	Poor	2022
Malathion 5 or 57 EC***	32 fl oz	Organophosphate	Malathion	1B	Poor - Good	2022 - 2025
Pilot 4E***	24 fl oz	Organophosphate	Chlorpyrifos	1B	Poor	2024-2025
Sefina***	10 fl oz	Pyropene	Afidopyropen	9D	Poor	2024
Entrust SC***	12 fl oz	Spinosyn	Spinosad	5	Good - Excellent	2022 - 2024
Plinazolin***	1.03 fl oz, 1.54 fl oz	Isoxazoline	Isocycloseram	30	Good - Excellent	2023 - 2025

Insecticide for RSSW Control



- Tested 22 insecticides over 5 years
- Support future registration of Plinazolin in sunflowers for RSSW control
 - NOT labeled in sunflower yet – Plinazolin Group 30
 - Efficacy = good to excellent!
 - 2026 in South Dakota - Section 18, Emergency Exemptions
 - Unregistered uses of pesticides to address an emergency



RSSW Bioassay – North Dakota

- **Objective:** Evaluate the susceptibility of RSSW to the active ingredients for Asana XL, Baythroid XL, Delta Gold and Warrior II.



Bioassay Materials & Methods

- 2025 – collected RSSWs from two locations in SW ND: Carson (Grant Co.) and Beulah (Mercer Co.)



Photo by A. Hargens, SDSU

Dose-response Glass Vial Bioassay

– RSSW 2025

- 10 RSSWs were introduced to each vial x 6 reps for a total of 60 RSSWs per insecticide dose
- Mortality was assessed at 24 and 48 hours



Product Name	Active Ingredient	High Labeled Rate (fl oz/acre)	Test Concentrations ($\mu\text{g}/\text{cm}^2$)	Equivalent Product Rates (fl oz/acre)
Asana XL	Esfenvalerate	9.6	0.555, 0.185, 0.062, 0.021, 0.007, 0.002	9.6, 3.2, 1.07, 0.36, 0.12, 0.04
Baythroid XL	Beta-cyfluthrin	2.8	0.245, 0.082, 0.027, 0.009, 0.003, 0.001	2.8, 0.93, 0.31, 0.10, 0.034, 0.012
Delta Gold	Deltamethrin	1.5	0.197, 0.066, 0.022, 0.007, 0.002, 0.0008	1.5, 0.5, 0.17, 0.056, 0.019, 0.006
Warrior II	Lambda-cyhalothrin	1.92	0.35, 0.12, 0.039, 0.013, 0.004, 0.001	1.92, 0.64, 0.21, 0.071, 0.024, 0.008

Percent mortality for the high rate of each insecticide at 24 and 48 hours

- Untreated check vials = 0% mortality at 24 hours, 1.7% at 48 hours

Time	Active Ingredient	Percent Mortality
24 Hours	Esfenvalerate	94.8
	Beta-cyfluthrin	93.8
	Deltamethrin	90.2
	Lambda-cyhalothrin	90.2
48 Hours	Esfenvalerate	94.8
	Beta-cyfluthrin	95.3
	Deltamethrin	90.2
	Lambda-cyhalothrin	90.2

LC₅₀ & LC₉₀ values and equivalent product field rates at 24 hours

Carson, Grant County RSSW population, 2025

- Untreated check vials = 0% mortality at 24 hours

Time	Active Ingredient	LC ₅₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
24 Hours	Esfenvalerate	0.001	0.017	9.6
	Beta-cyfluthrin	0.001	0.011	2.8
	Deltamethrin	0.003	0.023	1.5
	Lambda-cyhalothrin	0.003	0.016	1.92

LC₅₀ & LC₉₀ values and equivalent product field rates at 24 hours

Carson, Grant County RSSW population, 2025

Time	Active Ingredient	LC ₅₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
24 Hours	Esfenvalerate	0.001	0.017	9.6
	Beta-cyfluthrin	0.001	0.011	2.8
	Deltamethrin	0.003	0.023	1.5
	Lambda-cyhalothrin	0.003	0.016	1.92
	Active Ingredient	LC ₉₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
	Esfenvalerate	0.168	2.88	9.6
	Beta-cyfluthrin	0.072	1.02	2.8
	Deltamethrin	0.28	2.02	1.5
	Lambda-cyhalothrin	0.504	2.79	1.92

LC₅₀ & LC₉₀ values and equivalent product field rates at 48 hours

Carson, Grant County RSSW population, 2025

Time	Active Ingredient	LC ₅₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
48 Hours	Esfenvalerate	0.0002	0.003	9.6
	Beta-cyfluthrin	0.0003	0.003	2.8
	Deltamethrin	0.001	0.008	1.5
	Lambda-cyhalothrin	0.002	0.011	1.92

LC50 & LC90 values and equivalent product field rates at 48 hours

Carson, Grant County RSSW population, 2025

Time	Active Ingredient	LC ₅₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
48 Hours	Esfenvalerate	0.0002	0.003	9.6
	Beta-cyfluthrin	0.0003	0.003	2.8
	Deltamethrin	0.001	0.008	1.5
	Lambda-cyhalothrin	0.002	0.011	1.92
	Active Ingredient	LC ₉₀ (µg/cm ²)	Equivalent Field Rate (fl oz/acre)	High Field Rate (<u>fl</u> oz/acre)
	Esfenvalerate	0.123	2.4	9.6
	Beta-cyfluthrin	0.045	0.5	2.8
	Deltamethrin	0.24	1.8	1.5
	Lambda-cyhalothrin	0.242	1.3	1.92

ND RSSW Bioassay 2025 - Summary

- RSSWs at Carson, southwestern North Dakota
 - Esfenvalerate and beta-cyfluthrin - NO reduced susceptibility
 - Deltamethrin and lambda-cyhalothrin - reduced susceptibility
 - Beginning of pyrethroid resistance development
- Annual monitoring of more fields in SC and SW North Dakota
 - To detect evolving pyrethroid resistance in RSSWs –
CRITICAL!

Integrated Pest Management IPM for RSSW

**Pest
Identification**

**Pest
Monitoring**

**Economic
Thresholds**

**Predictive
Models**

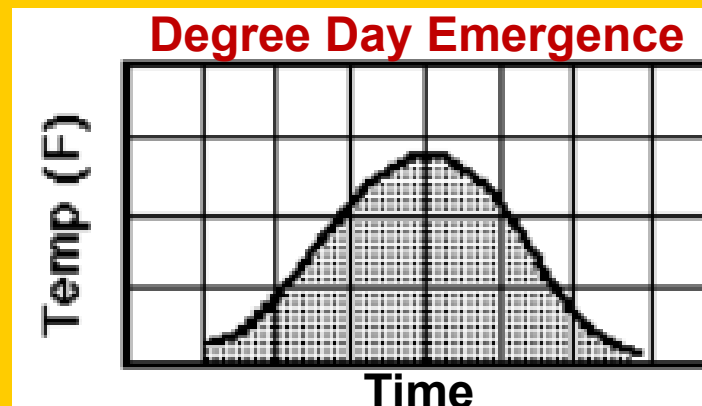


**Cultural
Control**

**Biological
Control**

**Host Plant
Resistance**

**Chemical
Control**





Sarah & Miro



Tommy & Ashlyn



Pat



EXTENDING KNOWLEDGE >> CHANGING LIVES

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EXTENSION

Send any question to:
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