Red Sunflower Seed Weevil: Results of the Insecticide Field Studies in ND and SD

NDSU: Janet Knodel*, Patrick Beauzay, T.J. Prochaska, Ryan Buetow and Veronica Calles Torrez

SDSU: Adam Varenhorst, Philip Rozeboom and Patrick Wanger 2023 NSA Research Forum









Red Sunflower Seed Weevil Smicronyx fulvus LeConte

- Annual economic insect pest of sunflower grown in SD and ND
- Crop Damage: Larvae feed on developing seed and consume about ¹/₃ of kernel
 - Severe infestations result in 50 80% of seeds infested
 - Reduce seed weight and yield
- Primarily managed using foliar insecticides







Red Sunflower Seed Weevil – Life Cycle 1 generation per year



Adult emerges and feeds on buds or wild sunflowers (July-August)

NDSU

Live for 53 days

Adult moves to flowering sunflower heads and continue to feeds on pollen and florets (July-August) Female weevil deposits a single egg inside the seed (July-August)



Oviposition 20 days

Egg hatch into larva in about 1 week



Larva feeds on kernel (July-fall)



EXTENSION

Pupae in soil (mid-June to early July)



Larvae drops to soil for overwintering (mid-August – fall)

Overwintering as larvae



Source: Jarrad Prasifka USDA-ARS, Fargo, ND

Red Sunflower Seed Weevil – 2022 IPM Survey in ND

EXTENSION



Red Sunflower Seed Weevils in Sunflower



2022: 223 fields scouted in 43 counties

72% on field edge 28% in field

Sunflower

Foliar Insecticides

Registered Insecticides - 2023

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

Premixes:

Besiege* (Coragen 28 + Warrior 3A)



2022 RSSW Insecticide Study - ND

- NDAES Agronomy Farm, Casselton, ND
- Planting date May 24 (17,500 seeds per acre)
- Spray date August 3
 - Tractor mounted CO₂ boom sprayer, 40 PSI, 20 GPA
- Hand-threshed heads
- 300 seed subsample to record RSSW-damaged seed
- Yield 10 heads per plot

2022 RSSW Insecticide Study - ND

NDSI

Trt No	Treatment	Rate(s)	Group	IRAC MOA
1	Untreated Check			
2	Asana XL	9.6 fl oz/a	Pyrethroid	3A
3	Warrior II	1.92 fl oz/a	Pyrethroid	3A
4	Baythroid XL	2.8 fl oz/a	Pyrethroid	3A
5	Delta Gold	1.5 fl oz/a	Pyrethroid	3A
6	Sevin XLR Plus	48 fl oz/a	Carbamate	1A
7	Dimate 4E	16 fl oz/a	Organophosphate	1B
8	Malathion 5	32 fl oz/a	Organophosphate	1B
9	Asana XL + Exponent	9.6 + 8 fl oz/a	Pyrethroid + PBO	3A
12	Delta Gold + Exponent	1.5 + 2.8 fl oz/a	Pyrethroid + PBO	3A
10	Warrior II + Exponent	1.92 + 4.8 fl oz/a	Pyrethroid + PBO	3A
11	Baythroid XL + Exponent	2.8 + 3.5 fl oz/a	Pyrethroid + PBO	3A
13	Vantacor + MSO	2.5 fl oz/a + 1% v/v	Diamides	28
14	Entrust SC	12 fl oz/a	Spinosyns	5
15	Neemix 4.5	16 fl oz/a	Botantical- Azadirachtin	UNK



Exponent[®] Insecticide Synergist

- Valent
 - Insecticide synergist to make active ingredients more effective
 - Active Ingredient Piperonyl butoxide (PBO)
 - Mode of Action Inhibits mixed function oxidative system
- Uses: Tank mix partner with insecticides and acaricides
- Aids in extending resistance management
 - Improves efficiency of the partner insecticide
 - Increase level of insect susceptibility



NDSU EXTENSION



NDSU EXTENSION



NDSU EXTENSION

Economics - 2022 RSSW Insecticide Study

Cost of Exponent with Pyrethroid Insecticides

Insecticide	Rate	Cost	t/fl oz	Cos	t/acre	PBO Rate	PBC) cost/fl oz	PBC) cost/acre
Asana XL	9.6	\$	0.59	\$	5.66	8	\$	1.50	\$	12.00
Baythroid XL	2.8	\$	3.00	\$	8.40	3.5	\$	1.50	\$	5.25
Delta Gold	1.5	\$	2.00	\$	3.00	2.8	\$	1.50	\$	4.20
Warrior II	1.92	\$	3.08	\$	5.91	4.8	\$	1.50	\$	7.20
LambdaStar Plus	1.92	\$	1.52	\$	2.92	4.8	\$	1.50	\$	7.20

	Insecticide	Cost/acre	without PBO	Cost	/acre with PBO	Diff	erence
	Asana XL	\$	5.66	\$	17.66	\$	12.00
	Baythroid XL	\$	8.40	\$	13.65	\$	5.25
	Delta Gold	\$	3.00	\$	7.20	\$	4.20
	Warrior II	\$	5.91	\$	13.11	\$	7.20
U	LambdaStar Plus	\$	2.92	\$	10.12	\$	7.20

2022 FMC RSSW Insecticide Study

- NDAES Agronomy Farm, Casselton, ND
- Dakota Lakes Research Farm, SD
- Planting date May 24 (ND); May 16 (SD)
- Hand-threshed heads
- 300 seed subsample to record RSSW-damaged seed in ND and 50 seed subsample in SD
- Yield 10 heads per plot



2022 FMC RSSW Insecticide Study

XTENSION

Treatment	Rate	Group	IRAC MOA		
Untreated Check					
Mustang Maxx	4 fl oz/a	Pyrethroid	3A		
Vantacor	1.7 fl oz/a	Diamides	28		
Steward EC	11.3 fl oz/a (2x)	Oxadiazine	22A		
Steward EC	11.3 fl oz/a	Oxadiazine	22A		
Steward EC	9.2 fl oz/a	Oxadiazine	22A		

Note: Red box not registered in sunflowers

2022 FMC – Steward EC



- FMC Corporate
- Active ingredient Indoxacarb (22A)
- Controls Lepidopteran, beetles and weevils

 Alfalfa weevil, corn rootworm beetles, numerous caterpillers
- Fast acting and long lasting (14 days of residual control)
- Rainfast within 2 hours
- Excellent fit in IPM and insect resistance management programs

NDSU EXTENSION

Source: FMC Website

2022 FMC – Vantacor

- FMC Corporate
 - A.I. Chlorantraniliprole (Diamides, IRAC group 28)
 - MOA Muscle poison activate muscle ryanodine receptors, leading to contraction and paralysis
 - Registered for <u>foliar</u> use in sunflower, soybean, corn, wheat and other crops
 - Above ground lepidopteran pests, and grasshoppers
 - Grasshoppers use MSO adjuvant at 1% v/v and target 2nd-3rd instars)
 NDSU EXTENSION





Source: FMC Website







2022 FMC RSSW Insecticide Study

=XTENSION

Treatment	Rate	Сс	ost/fl oz	Cost/acre		
Untreated Check						
Mustang Maxx	4 fl oz/a	\$	1.44	\$	5.76	
Vantacor	1.7 fl oz/a	\$	14.73	\$	25.04	
Steward EC	11.3 fl oz/a (2x)	\$	2.24	\$	50.62	
teward EC 11.3 fl oz/a		\$	2.24	\$	25.31	
Steward EC	9.2 fl oz/a	\$	2.24	\$	20.61	

Note: Red box not registered in sunflowers

Bioassay with New Insecticide

- Syngenta Crop Protection
 - Plinazolin technology; active ingredient Isocycloseram
 - Group 30 Isoxazolines
 - GABA receptor antagonist
 - GABA = Gamma-AminoButyric Acid is a neurotransmitter
- Because of its novel mode of action, Plinazolin can control pests that have developed resistance to many other insecticide modes of action, such as pyrethroids and neonicotinoids



Photo by A. Hargens, SDSU

Not able to show Plinazolin efficacy data publicly



Insecticide Summary for RSSW Control

Big Insecticide Trial

- Entrust SC good efficacy and comparable to pyrethroid efficacy; new MOA (5); needs to be registered in sunflowers
- Exponent increases efficacy of pyrethroids for control pyrethroid-resistant RSSW in SD!
 - Negative expensive, added \$4.20 to \$12.00 per acre
 - Won't recover cost under low RSSW pressure
 - Continue to evaluate further under higher populations and pyrethroid-resistant RSSWs
- FMC
 - Vantacor + MSO and Steward EC

EXTENSION

- Needs to be retested under higher populations and pyrethroid-resistant RSSWs
- Adjuvant-surfactant testing (MSO, NIS, COC)

Insecticide Summary for RSSW Control

Syngenta

- Plinazolin excellent efficacy against ND pyrethroid-susceptible RSSWs, and SD pyrethroid-resistant RSSWs
- Need to conduct field efficacy tests in ND and SD in 2023
- Work with Syngenta on further evaluations to get Plinazolin registered in sunflowers (next >10 years)
- Zero regulatory work on plinazolin in sunflower
- Need IR4 project for sunflower (residual data)
- Hope in the long-term future!

XTENSION











Send any question to: janet.knodel@ndsu.edu



EXTENSION