Insect Pests in Wheat

(from an non-entomologist's perspective)

Advanced Crop Advisors Workshop

Jochum Wiersma

Wheat Stem SawFly

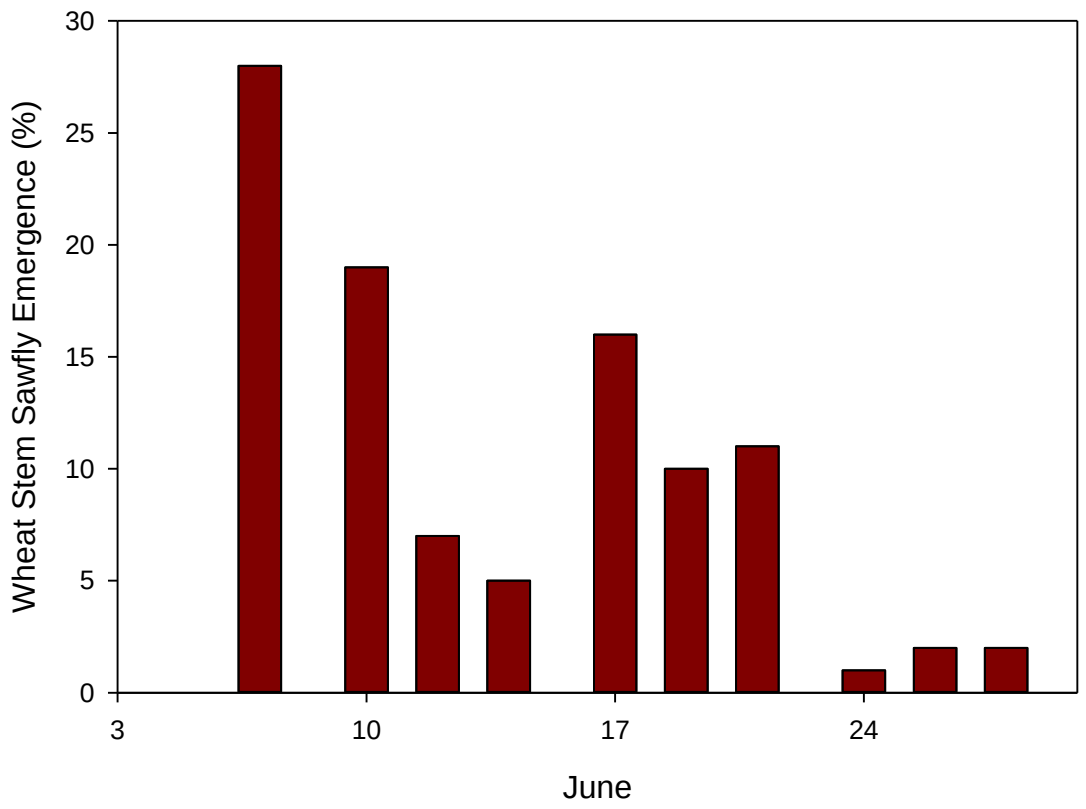
My First Encounter (2018)

Management

- **NO** effective chemical control of adults or larvae

- Very limited to **no** success with tillage
  - Tillage and destruction of standing stubble detrimental to parasitoids populations (no-till systems better than reduced tillage in MT)
- Variety selection
  - Semi-solid and solid stem varieties best option to avoid lodging (reduced success larvae tunneling down to crown)
- Swathing/stripper header to alleviate harvest problems

Time of Emergence (2019 and 2020)



- Peak emergence male WSS first week June.
- Peak emergence females WSS about 7-10 days later.

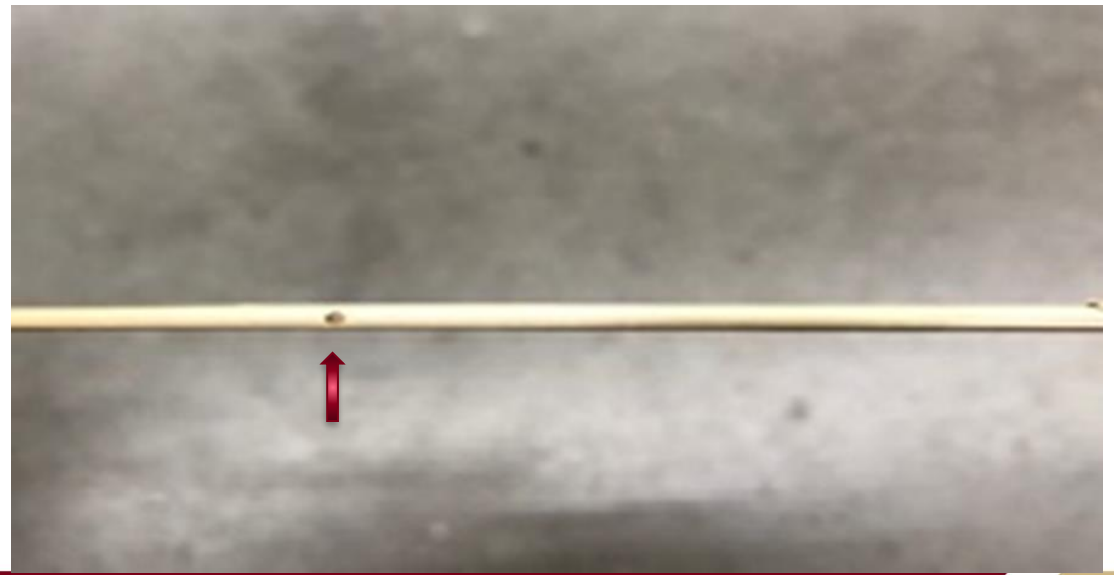
Stem SOLIDNESS

- ‘Rescue’ (1946) derived stem solidness
  - Solid stems throughout stem development
  - The original source of WSS resistance
  - Selected from a Portuguese landrace

- ‘Conan’ (1999) derived stem solidness
  - High stem solidness early in plant development, but solidness disappears prior to heading
  - Initially misidentified
  - Selected from the cross Rambo/Westbred 906R

Variety Screening

- Little to no stem clipping in 2020 and 2021 visible in plot
  - Not able to rate in the field
  - Cut 50 stems and rate absence/presence of frass and/or parasitized larvae



Variety Screening (2020)

- Little to no stem clipping
  - What happened?
- Very variable data when dissecting 50 stems per plot:
  - Solid stemmed varieties also contained frass (scoring errors?)
  - Mummified larvae indicate parasitism.
  - Recent work indicate that stem solidness disappears as plant matures.

Cultivar	WSS	Cultivar	WSS
Bolles	57.3%	Linkert	56.3%
Boost	30.7%	MN-Washburn	23.3%
CP3530	60.0%	MS Barracuda	62.0%
CP3888	20.0%	MS Camaro	41.3%
CP3910	44.7%	MS Chevelle	36.7%
CP3915	10.7%	ND-VitPro	45.0%
CP3939	36.0%	Prosper	34.0%
Duclair	31.3%	Rollag	55.3%
Dyna-Gro Ambush	48.7%	Shelly	32.7%
Dyna-Gro Ballistic	58.0%	Surpass	59.3%
Dyna-Gro Caliber	32.7%	SY 611 CL2	44.7%
Dyna-Gro Commander	60.0%	SY Ingmar	31.3%
Dyna-Gro Velocity	16.0%	SY Longmire	43.3%
G17C2020	15.6%	SY McCloud	49.3%
Gunnison	38.7%	SY Valda	66.0%
Lang-MN	28.7%	TCG-Climax	14.6%
Lanning	60.7%	TCG-Heartland	36.7%
LCS Breakaw ay	46.0%	TCG-Spitfire	17.3%
LCS Cannon	39.3%	WB-Mayville	58.0%
LCS Rebel	19.3%		
LCS Trigger	20.3%		
LSD(0.1)	**20.9%**		**20.9%**

What we learned in 2020 ABOUT WSS

- The ‘ink stain’ is spreading further in all directions from Crookston
- Crop consultants have little trouble finding WSS adults when scouting and edge effect is very noticeable
- Most growers are probably unaware or indifferent to the problem (meaning it is not bad enough yet).
- This is now my least favorite problem in wheat to work on
  - It requires a lot of tedious labor to get good data.

Time of Emergence (2021)

- Peak emergence male WSS was a few days earlier than in 2019 and 2020 but in much lower total numbers than either 2019 and 2020.

- Virtually no female emerged during the whole month of June.
  - Secondary diapause triggered by drought

A Simple Correlation in 2021

Pearson's Correlation	% WSS Infected Stems
Days to Heading	-0.5924
(p-value)	(0.0001)

Variety Scores

2019/2020

Entry	%WSS		Entry	%WSS
LCS Trigger	12.4		Driver	40.4
Dyna-Gro Velocity	17.6		SY 611 CL2	41.0
TCG-Spitfire	19.0		AP Murdock	43.5
WB Gunnison	19.7		Bolles	44.1
CP3915	23.1		CP3530	44.6
MS Chevelle	30.4		CP3910	44.8
Shelly	30.5		Lang-MN	46.1
Prosper	31.3		Dyna-Gro Ambush	47.0
SY Ingmar	33.1		MN-Washburn	48.5
TCG-Heartland	35.3		LCS Cannon	48.5
LCS Rebel	35.8		WB-Mayville	48.6
Dyna-Gro Ballistic	36.0		Dyna-Gro Commander	50.9
MN-Torgy	37.6		Linkert	54.3
SY McCloud	39.3		SY Valda	55.5
SY Longmire	40.4		MS Barracuda	57.8
LSD(0.10)	**17.1**		**LSD(0.10)**	**17.1**

2021

Entry	Days to Heading (days)	WSS (%)	Entry	Days to Heading (days)	WSS (%)
LCS Buster	60	0	WB9479	54	15
LCS Trigger	60	0	Dyna-Gro Ambush	55	18
WB-Gunnison		1	MS Ranchero	55	20
PFS-Buns	62	1	CP3188	56	21
CP3119A	61	1	MS Cobra	55	21
Dagmar		1	Dyna-Gro Ballistic	57	23
CAG Reckless	56	2	Dyna-Gro Commander	55	28
Duclair		2	SY 611 CL2	56	28
SY Longmire	57	4	Prosper	58	29
MN-Torgy	56	6	AP Murdock	55	30
CP3915	57	7	AP Gunsmoke CL2	56	30
Bolles	58	8	TCG-Heartland	54	31
TCG-Spitfire	59	8	CAG Justify	58	32
CP3099A	61	9	Driver	58	32
MN-Washburn	57	10	SY Valda	57	32
TCG-Wildcat	58	12	LCS Rebel	55	37
AP Smith	58	13	MS Barracuda	53	38
Shelly	58	14	Linkert	55	40
Lang-MN	57	14	SY McCloud	55	44
WB9590	55	14	CP3530	58	45
ND Frohberg	57	15	LCS Cannon	54	65

Wheat Stem Sawfly in 2022

- Ink stain continued to spread in all directions, however:
  - Overall very little damage reported in 2022.
  - Overall very low numbers detected established areas in 2022:
    - Reduced survival from 2021 (extended diapause mortality and/or increase parasitism/predation?)
    - Late spring
- It feels like the worst is behind us, but time will tell.

- SY Longmire's expression of stem solidness varies.

What I still don’t know

- Absence/Presence of Conan-derived WSS resistance
  - Pith is solid initially but is reabsorbed during heading
  - WB-Gunnison carries this resistance – based on pedigree I do not expect this allele to be in many of the HRSW varieties adapted to our region
  - Score stem solidness at Feekes 6/7
  - Collaborate with USDA-ARS genotyping lab and private seed companies to test presence/absence of the Qss.msub-3BL.c QTL
  - What does it mean if we find that this QTL is not present in our materials and we continue to find low incidence of WSS infections that can not be explained by later heading date?

Management Suggestions

- Seed a solid stem variety (SY Longmire) around the edge of a field where wheat neighbored the field in 2019 and WSS was present.
  - Leading edge effect is very strong

- Seed a solid stem variety (SY Longmire) in wheat-on-wheat situation where stem clipping was noticeable last season.

Hessian Fly

Hessian Fly (*Mayetiola destructor*)

- Probably one of the earliest invasive species to the North American continent.
- Two generations per year (adults only live about 3 days)
- Overwinters in winter cereals as puparia that look like flax seeds
- Management:
  - Use HF resistant varieties
  - Seed winter cereals after fly-free date

Hessian Fly in 2022

- HF is/was a biological curiosity in HRSW production.
- Readily found in HRSW in 2022 in a triangle between Twin Valley – Crookston – Halstad.
- Number of lodged/clipped stems was substantial enough that people noticed

Hessian Fly in 2022

- Hypothesis 1 – producers opted for less tillage in wheat stubble to manage volunteer wheat in the two very dry falls preceding the 2022 growing season, thereby creating an opportunity for successful ovipositioning and winter survival of HF
- Hypothesis 2 – adoption of cover crops that include rye creates an opportunity for successful ovipositioning and winter survival of HF

Cautionary Tale

If hypothesis 2 is true than:

Cover crops species that can serve as host should not be seeded prior to HF fly-free date

QUESTIONS[1,2]?

Just e-mail me (wiers002@umn.edu)

1 Social psychologists have determined that most people will refrain from asking questions once the group is larger than twelve

2 Social psychologists also determined that you have to give your audience at least twelve seconds to formulate a question and/or react the claims made by the speaker