Wheat IPM Management -Emphasis on Cereal Aphids and Wheat Curl Mite

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http://txppipm.blogspot.com



http://twitter.com/TXPIPM



Toughest Crop for Insect Control

- Small grains have the most exposed risk
 - 210 days
 - Corn and sorghum 140 days
 - Cotton 120 days
- What we do today may not impact tomorrow
 - Know your goals





Production Systems

- Graze out
- Dual purpose
- Grain only





Seasonal Movement of Aphids and Mites



Aphid/Viral Disease Complex



Cereal Aphids

- Greenbug Schizaphis graminum (Rondani)
- Russian Wheat Aphid Diuraphis noxia (Kurdjumov)
- Bird Cherry-Oat Aphid Rhopalosiphum padi (L.)
- English Grain Aphid Sitobion avenae (F.)
- Corn Leaf Aphid Rhopalosiphum maidis (Fitch)



Cereal Aphids

- All cereal aphids are phloem feeders.
- Greenbugs and Russian wheat aphids inject a toxin during feeding.
- Greenbugs and Bird cherryoat aphids are vectors of Barley yellow dwarf and Cereal yellow dwarf viruses.





Photo: Alton N. Sparks Jr., Bugwood.org



Frank Peairs, Colorado State University, Bugwood.org

Greenbug

Darker green stripe down body

Antenna 2/3rd body length

Tear drop shaped body

Cornicles present (tailpipes)

Without forked tail





Russian Wheat Aphid No strip Short antenna **Elongated Body** Without cornicles (tailpipes) Forked tail

Bird cherry oat aphid

Photo: Erin Hodgson, ISU

reddishorange base



Greenbug Schizaphus graminum (Rondani)				
Plant height (inches)	Number of greenbugs per linear foot			
Seedling - 3	25-50			
	20.00			
3-6	100-300*			
4-8	200-400			
6-16	300-800			

Wheat becomes less susceptible to GB as it grows * When wheat is stressed early then may need to lower threshold to 50 per linear foot



Greenbug – Schizaphis graminum (Rondani)

"Glance 'n Go" Sampling

- A computer program located at <u>http://entoplp.okstate.edu/gbweb/index.htm</u>, iwheat.org
- Developed by USDA ARS, SST Development Group and OSU
- It has several elements:
 - 1. Information on cereal aphids
 - 2. A calculator for determining economic thresholds for greenbug infestations
 - 3. A natural enemy module
 - 4. A pesticide information module
 - 5. A set of sampling plans for each economic threshold



Russian Wheat Aphid – *Diuraphis noxia* (Kurdjumov)

- Over-summer on wild grasses.
- Long periods of temperatures below 15°F, extended snow cover, and rapid freezing and thawing are detrimental to RWA.



 Feed on newest leaves, cause leaves to roll around them.



Russian Wheat Aphid – Diuraphis noxia (Kurdjumov)



Photos: Frank Peairs, Bugwood.org



RWA Economic Thresholds

- Fall thresholds 20% to 30% infested plants
- Spring thresholds

Threshold: % Infested Tillers		Yield								
		25 bu/ac		40 bu/ac		60 bu/ac				
Wheat Price (\$/bu)		\$3/bu	\$4/bu	\$5/bu	\$3/bu	\$4/bu	\$5/bu	\$3/bu	\$4/bu	\$5/bu
	Spring Thresholds									
Control Costs	\$5/ac	13%	10%	8%	8%	6%	5%	5.5%	4%	3%
	\$10/ac	27%	20%	16%	17%	12%	10%	11%	8%	7%
Heading Stage Thresholds										
Control Costs	\$5/ac	33%	25%	20%	21%	16%	12%	14%	10%	8%
	\$10/ac	67%	50%	40%	42%	31%	25%	28%	21%	17%



Bird Cherry-Oat Aphid – Rhopalosiphum padi (L.)

- Under cool conditions can be black in color.
- Heavy populations can cause the flag leaf to curl into a corkscrew shape and traps the awns.
- At the boot to heading stage, densities of 50 or more can be damaging.
- Sample 25 to 50 randomly selected tillers to determine need for control.
- Seed treatments have been shown to reduce BYDV infection by suppressing early BCOA infestations.







Photo: Frank Peairs, Bugwood.org

 Virus strains – barley yellow dwarf or cereal yellow dwarf





Photos: W. M. Brown Jr. Bugwood.org



- Virus host range wheat, barley, oats, triticale +150 grasses
- Symptoms
 - Leaves begin to yellow and turn reddish or purple at leaf tip.
 - Apparent 2 wks after infection at 68° F and 4 wks at 77° F.



- BYDV/CYDV are not soil or seed borne diseases.
- Potential infection in fall and/or spring.
- Virus restricted to phloem of the infected plant.
 - Inhibit translocation
 - slows plant growth
 - loss of chlorophyll



- BYDV/CYDV transmitted from plant to plant by aphids (except Russian wheat aphid)
- Circulative transmission in the aphid
- Virus remain in aphid for days or weeks



Photo: C. D'Arcy, Univ. Illinois



Disease Management Tools

- Plant disease tolerant or resistant cultivars
- Reduce secondary spread of aphids
- Crop Rotation
- Seed treatments for aphids
- Control "green bridge" hosts



Seed Treatment Trial - 2013

Dr. Jerry Michels Research Entomologist Texas AgriLife Research Amarillo, TX



Improving Life Through Science and Technology.

Seed Treatments

	g Al/100k	seed	fl oz/cwt		
Treatment	CruiserMaxx Vibrance Cereals		CruiserMaxx Vibrance Cereals	Cruiser 5 FS	
TAM 110 Treated	24.1	43.0	5.0	1.10	
Hatcher Treated	24.1	43.0	5.0	1.10	

- Planting date October 14, 2012
- Seeding rate 114 lbs/ac
- Furrow irrigated



Improving Life Through Science and Technology



Improving Life Through Science and Technology.

Effect of Gaucho Rate on Aphid Control, Dr. Bob Hunger, OSU, Dep. of Ent. & PLPA, Stillwater, OK, 1999

Effect of Gaucho Rate on Aphid Number

Rate fl oz/cwt	43 DAP (Nov 30)	122 DAP (Feb 16)
0	27	17
0.4	12.3	13.4
0.8	8	6.3
1.2	5.6	5.4
1.6	2.5	2
2.4	0.4	0.4

Planted Sep 17, 1998



Seed Treatments for Aphid Control

- Seed Treatments (insecticide only)
 - Clothianidin 47.8%
 - Nipslt Inside, Valent
 - Thiamethoxam 47.6%
 - Cruiser 5FS- Syngenta
 - Imidacloprid 40.23%
 - Attendant 480 FS Chemtura AgroSolutions
 - Imidacloprid 40.7%
 - Nitro Shield IV AgriSolutions



Seed Treatments for Aphid Control

- Seed Treatments (insecticide only)
 - Imidacloprid 48.7%
 - Attendant 600 Chemtura AgroSolutions
 - Axcess BASF
 - DynaShield Imidacloprid 5 Loveland
 - Gaucho 600 Flowable Bayer CropScience
 - Macho 600 ST AgriStar
 - Nitro Shield AgriSolutions
 - Senator 600 FS Nufarm
 - Sharda Imidacloprid 5 SC Sharda USA



Seed Treatments for Aphid Control

- Seed Treatments (insecticide + fungicides)
 - NipsIt Suite Cereals, contains clothianidin @ 2.93% plus fungicides - Valent (wireworm)
 - Cruiser Maxx Cereals, contains thiamethoxam @ 2.80% plus fungicides – Syngenta
 - Cruiser Maxx Vibrance Cereals, contains thiamethoxam @ 2.78%
 plus fungicides Syngenta
 - Gaucho XT, contains imidacloprid @ 12.7%, plus fungicides Bayer CropScience
 - Raxil MD-W, contains imidacloprid @ 1.538%, plus fungicides Bayer CropScience
 - Sativa IM Max, contains imidacloprid @ 11.374%, plus fungicides
 Nufarm
 - Sativa IMF Max, contains imidacloprid @ 11.16%, plus fungicides Nufarm



Seed Treatments

- Lots of seed treatments, but suppliers may not keep very many products or amount in stock.
- Costs \$1.50 to \$2.50 / bu fungicides only, \$3.00 to \$4.50 / bu for insecticide + fungicides
- Fungicides don't control BYDV/CYDV diseases
- Panhandle acres using seed treatments
 ~ 10% with fungicides only
 - ~ 2% with insecticide + fungicides
 - Commercially purchased certified seed often will be treated with an insecticide and fungicides
- Reasons for low use
 - Low disease pressure, dryland acreage, cost of control



Aphid Management Tools

Chemical Control

- Seed treatment for early planted wheat
- Chlorpyrifos is the most effective for foliar applications
- Applications more effective when temperature is above 50° F and no rain chances for a few days following application
- Avoid using multiple applications of the same insecticide class during the same season
- Control can be difficult for RWA protected within curled leaves

Cultural Control

- Delay planting
- Healthy, well watered plants can withstand more aphid feeding than weak or drought stressed plants
- Crop rotation
- Destroy volunteer wheat and alternate hosts to break the "green bridge"



Aphid Management Tools

- Biological Control
 - Conserve native predators and parasitoids
 - GB Delay insecticide application: 1-2 predators/ft or 15-20% parasitized.
 - RWA Predation is improved when other aphids are present.
- Host Plant Resistance
 - GB resistant varieties TAM-112 and TAM-204
 - RWA
 - Surveys during 2010 2013 indicated RWA Biotype 1 was predominate on the Texas High Plains.
 - Wheat varieties with resistant genes Dny and Dn4 are protected from RWA Biotype 1 (ex. Hatcher).







- Wheat is the preferred host for the mite, but can survive on oats, barley, rye, corn, and some native grasses.
- Mites are about 1/100 of an inch long and are sausage shaped.
- Requires a magnifying glass to see mites on a leaf.



AgriLIFE **EXTENSION**

Texas A&M System

- Transmits WSMV, HPV, and TriMV.
- Cause rolling effect of the leaf margins.
- The mites and virus persist on living, susceptible plants.
- Mites depend on wind for dispersal across and from field to field.





Pic. By Chris Wilmshurst GRDC

- At 65°-85° F, mites buildup rapidly within the high humidity in the micro environment of the plant.
- Humidity is really important for survival.
- Eggs hatch (3 to 4 days), 2 nymphal instars (8-10 days), adults live (2 wks 2 mos.) = one generation in ~ 14 days.
- At 32° F, mites do not go into diapause, but can survive at least 3 months at near freezing temperatures.



- Virus is only picked up by nymphs, but carried in the mid and hind gut by both nymphal and adult stages.
- Virus is picked up during a 10 to 30 min. feeding period.
- Virus remains active in the mite for 7 to 9 days.
- Continually feeding on infected plant material keeps mites carrying the virus.





Effect of Wheat Curl Mite Populations on WSMV infection

No. of Curl Mites/ Tiller	% Infested Tillers on Wheat	% Wheat Streak Mosaic
0.03	3	0
0.2	10	20
0.7	23	30
3	75	75
9	95	93



Remove the "Green Bridge"



Glyphosate and Tillage effect on Wheat Curl Mite Infestation

Drought Stressed – 1998 (Treatment Date 8/19/98)				
Wheat Curl Mite per Tiller on Volunteer Wheat				
TreatmentPrior to Trt7 Days Post-Trt				
None	5	72		
Glyphosate	16	16		
Tillage	18	0		

Good Growing Conditions – 1999 (Treatment Date 8/26/99)					
Wheat Curl Mite per Tiller on Volunteer Wheat					
Treatment	tment Prior to Trt 7 Days Post-Trt 14 Days Post- Trt				
None	105	109	127		
Glyphosate	111	8	1		
Tillage	112	1	trace		

Resource – Thomas, J. A., et al. 2004. Spread of Wheat Curl Mite and Wheat Streak Mosaic Virus is Influence by Volunteer Wheat Control Methods. Online. Plant Health Progress doi: 10. 1094/PHP-2004-1206-01-RS.



Wheat Curl Mite Lab Test



0.00 / 0.00 0 / 0.000

Management of Wheat Curl Mite

- Management Not Control
 - Consider the system
 - If grain production then delay planting
 - If grazing then need three weeks of no green material prior to planting
 - Tam 112 and Tam 204 exhibit resistance to the wheat curl mite and wheat viral diseases.
 - Reduced tillage source for volunteer wheat.



Thank You





Greenbug Schizaphus graminum (Rondani)

Temp. Range (⁰ F) 10:14 h N:D	Total Longevity (d)	Total fecundity (nymphs)
50°F – 73°F	60	51
57°F – 80°F	38	50
64°F – 88°F	27	40
72°F – 95°F	12	18

Pendleton, Copeland, & Michels. 2009. JEE 102(4):1624-1627



Russian Wheat Aphid – Diuraphis noxia (Kurdjumov)

Constant Temp (°F)	Mean Adult Life Span (d)	Mean no. Nymphs / Adult		
41 ⁰	19.1	7.1		
50°	32.3	23.4		
59°	23.3	31.4		
68°	19.8	33.8		
77°	10.5	15.0		
86°	5.3	4.7		
Michels & Behle, 1988, JEE 81(4): 1097-1101				

Grossheim (1914) – Temps over 100°F with dry winds resulted in 75% mortality (Russia)

