

HOST PLANT VISUAL SAMPLING AND INSECTICIDE EFFICACY RESEARCH

Tom Kuhar
Associate Professor
Dept. of Entomology
Virginia Tech



Observing BMSB in its (un)natural habitat



Favorite Spring Host Plants



Paulownia



Peach



Mature Mustard



Tree of Heaven



Mulberry



Catalpa



Wild cherry

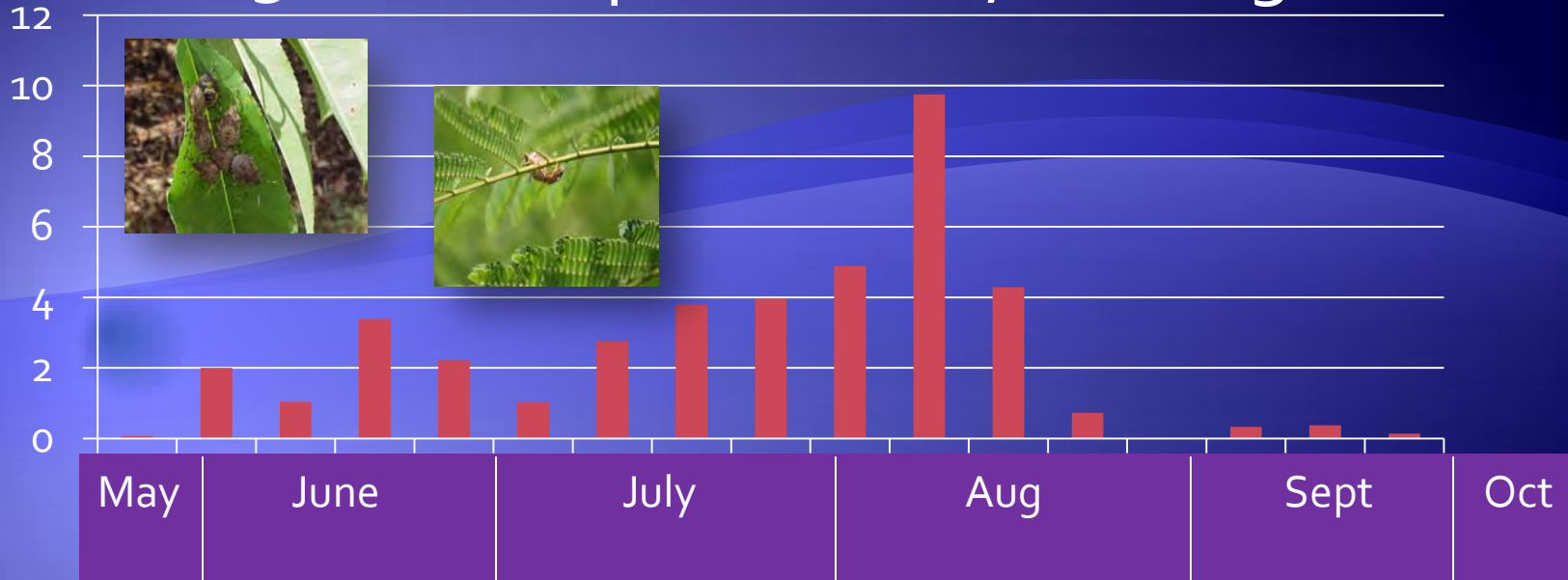


Mimosa



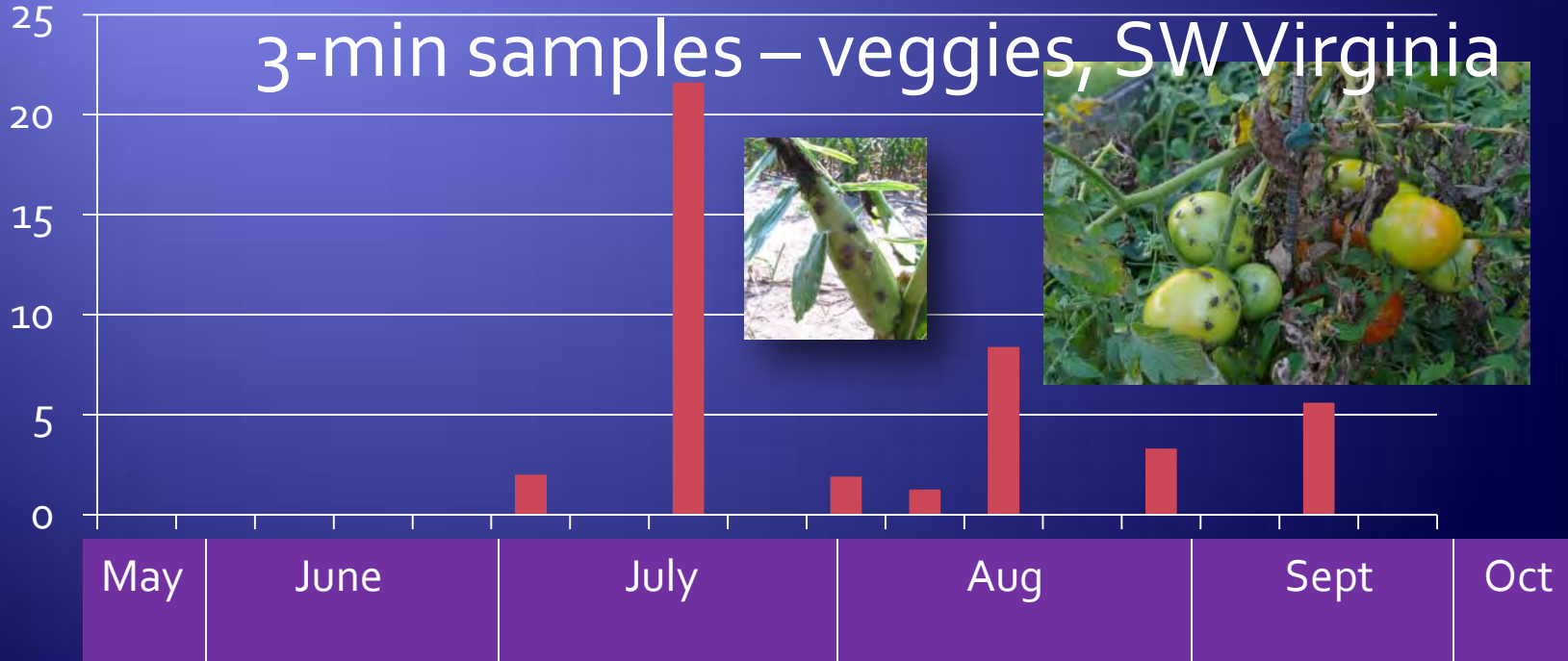
3-min samples – trees, SW Virginia

Mean # BMSB nymphs
per sample



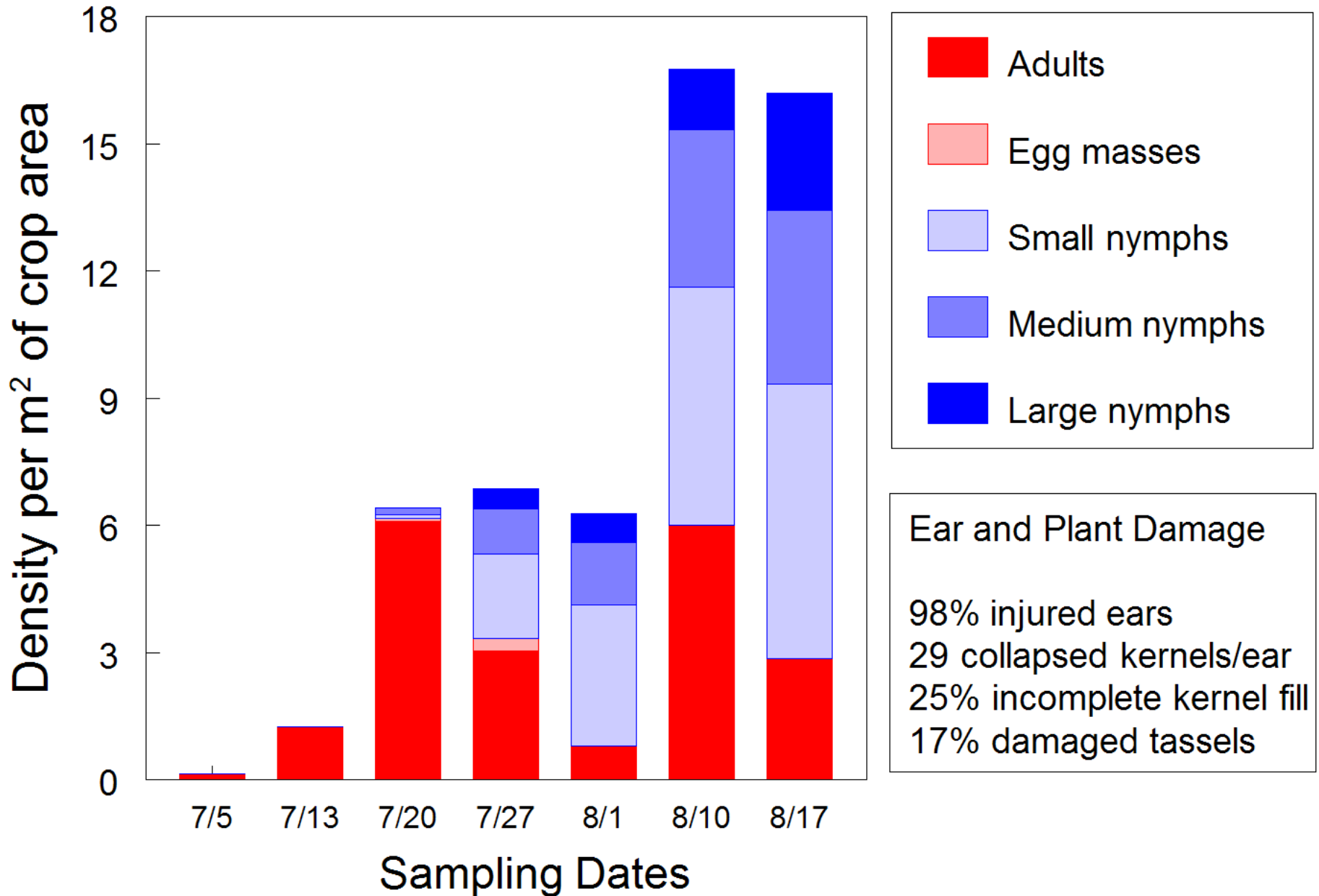
3-min samples – veggies, SW Virginia

Mean # BMSB nymphs
per sample

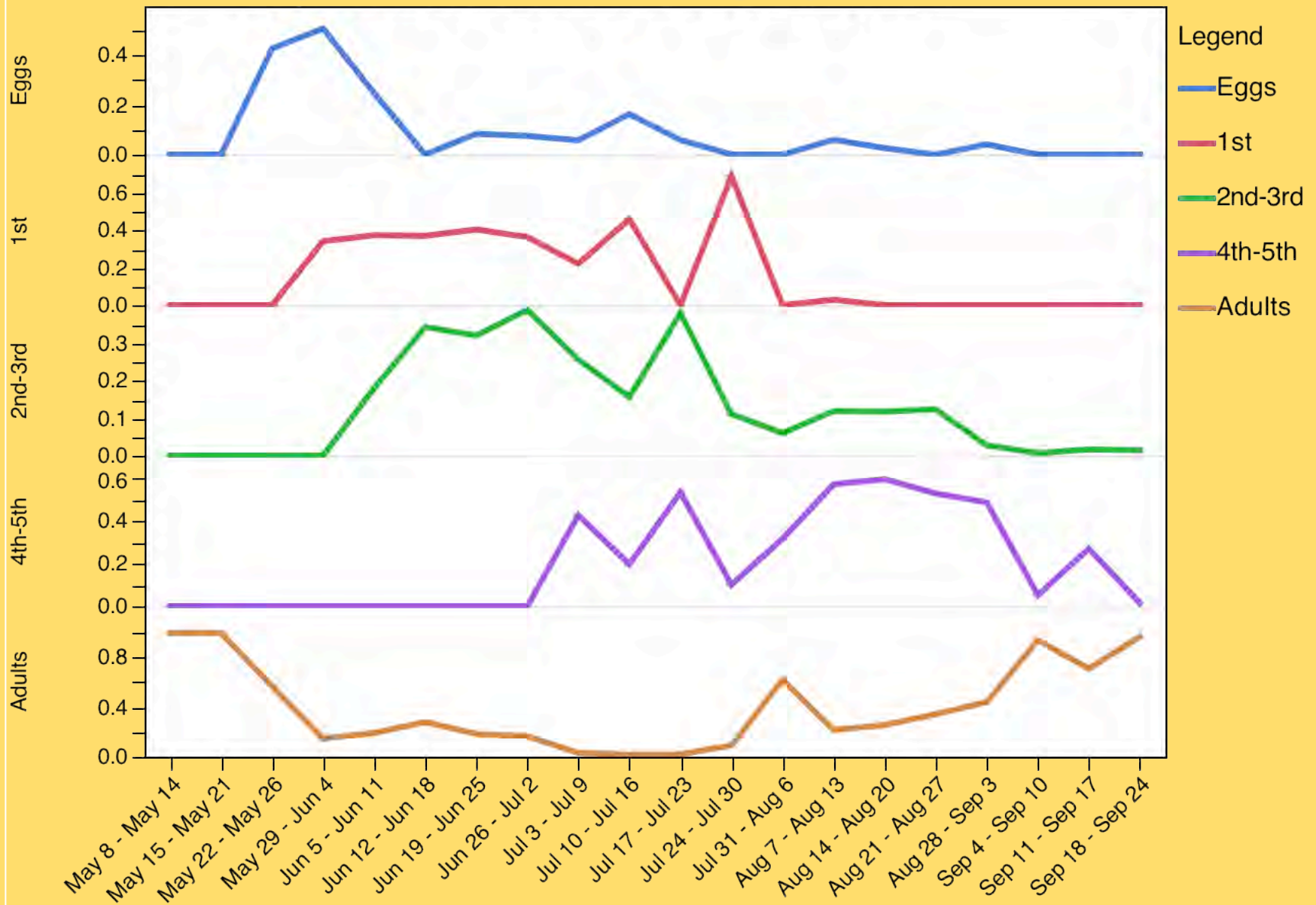


Brown Marmorated Stink Bug Populations in Sweet Corn

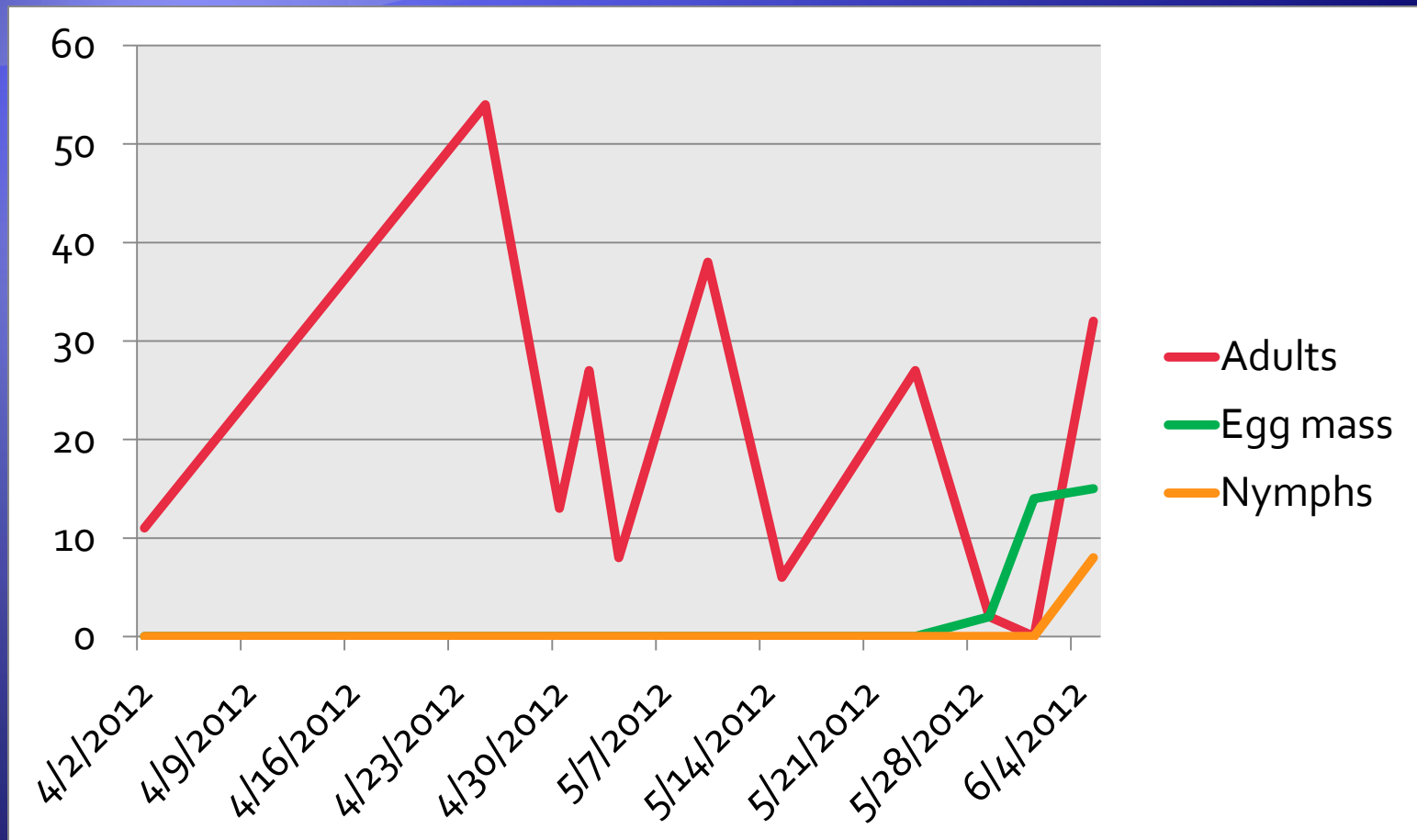
Beltsville, MD 2011 (G. P. Dively data)



Proportion of BMSB Life Stage by Week 2011



Proportion of BMSB Life Stage by week – spring 2012 Blacksburg/Roanoke, VA



Effects of BMSB on the species complex of stink bugs



Stink bug complex in SW Virginia - 2011

Stink bug	Species	Adult
BMSB	<i>H. halys</i>	1585
Green stink bug	<i>Acrosternum hilare</i>	0
Rough stink bug	<i>Brochymena</i>	12
Twice-stabbed stink bug	<i>Cosmopepla lintneriana</i>	12
Brown stink bug	<i>Euschistus servus</i>	7
Dusky stink bug	<i>Euschistus tristigmus</i>	11
Brown complex	<i>Euschistus sp.</i>	0
Spined soldier bug	<i>Podisus maculiventris</i>	0
Harlequin bug	<i>Murgantia histrionica</i>	19
	Total	1646
	Proportion <i>H. halys</i> of total	0.96294

Stink bug complex in western NC – 2011 (Walgenbach)

Common name	Species	Adults
BMSB		125
Brown stink bug	<i>Euschistus servus</i>	161
Green stink bug	<i>Acrosternum hilare</i>	70
--	<i>Parabrochymena</i> sp.	17
Twice-stabbed stink bug	<i>Cosmopepla lintneriana</i>	16
Rice stink bug	<i>Oebalus pugnax</i>	10
Rough stink bug	<i>Brochymena</i> sp.	8
Florida predatory stink bug	<i>Euthyrhynchus floridanus</i>	--
Anchor stink bug	<i>Stiretrus anchorago</i>	2
--	<i>Holcostethus</i> sp.	1
--	<i>Banasa dimidiata</i>	1
Harlequin bug	<i>Murgantia histrionica</i>	152
	Total	563
	Proportion <i>H. halys</i> of total	0.222025

Stink bug complex in eastern NC - 2011 (Bickerton & Abney)

Stink bug	Species	Adult
BMSB	<i>H. halys</i>	37
Green stink bug	<i>Acrosternum hilare</i>	241
Rough stink bug	<i>Brochymena</i>	23
Thyanta	<i>Thyanta</i> spp.	45
Brown stink bug	<i>Euschistus servus</i>	157
Dusky stink bug	<i>Euschistus tristigma</i>	30
Rice stink bug	<i>Oedeobolus pugnax</i>	25
Spined soldier bug	<i>Podisus maculiventris</i>	25
Harlequin bug	<i>Murgantia histrionica</i>	329
	Total	912
	Proportion <i>H. halys</i> of total	0.0406

Stink bug complex in SW Virginia – spring 2012

Stink bug	Species	Adult
BMSB	<i>H. halys</i>	218
Green stink bug	<i>Acrosternum hilare</i>	0
Rough stink bug	<i>Brochymena</i>	3
Twice-stabbed stink bug	<i>Cosmopepla lintneriana</i>	0
Brown stink bug	<i>Euschistus servus</i>	2
Dusky stink bug	<i>Euschistus tristigmus</i>	2
Brown complex	<i>Euschistus sp.</i>	0
Spined soldier bug	<i>Podisus maculiventris</i>	1
Harlequin bug	<i>Murgantia histrionica</i>	46
	Total	272
	Proportion <i>H. halys</i> of total	0.8015

Evaluating insecticides for BMSB control on vegetables



Performance of insecticides – all tests

Product	Rate/Acre	Bean - Nymph	Bean - Adult	% control peppers	Avg. of all three
Permethrin 3.2EC	8	97.5	98.8	60.6	85.6
Scorpion 3.24	7.7	76.7	90.0	85.4	84.0
Bifenture 10DF	12.8	100.0	81.9	56.3	79.4
Trebon	8	100.0	100.0	36.5	78.8
Baythroid XL	2.8	92.5	88.2	52.8	77.8
Venom 70	4	100.0	80.0	46.0	75.3
Endigo ZC	4.5	75.0	98.7	49.2	74.3
Acephate 97UP	16	100.0	51.8	70.4	74.1
Lannate LV	40	66.7	75.3	79.8	73.9
Leverage 360	2.8	97.3	74.5	49.9	73.9
Brigadier	9.85	76.7	70.0	69.9	72.2
Hero EC	10.3	91.7	50.0	72.8	71.5
Vydate L	48	85.0	47.0	79.7	70.6
Warrior II	2.5	100.0	72.8	38.0	70.3
Belay	4	75.0	67.5	66.7	69.7
Actara 50 WG	5.5	66.7	81.0	60.3	69.3
MustangMax	4	100.0	35.0	72.8	69.3
Danitol	16	93.3	42.5	60.3	65.4
Assail 30 G	4	90.0	32.8	70.4	64.4
Lambda-cy	3.84	86.0	32.3	62.0	60.1
Asana XL	9	35.0	27.5	76.4	46.3

Green bean dip bioassays

- ◆ Insecticide solution based on 100 gal / acre water output
- ◆ Filter paper + one green bean were:
 - ◆ dipped in solution for 5 seconds
 - ◆ dried ½ hr under a fume hood
 - ◆ placed in a 9-cm Petri dish
- ◆ 5 adults or 2nd to 3rd instars per dish
- ◆ 4 Petri dishes per treatment for a total of 20 insects per bout
- ◆ Mortality at 24, 48, and 72 hrs



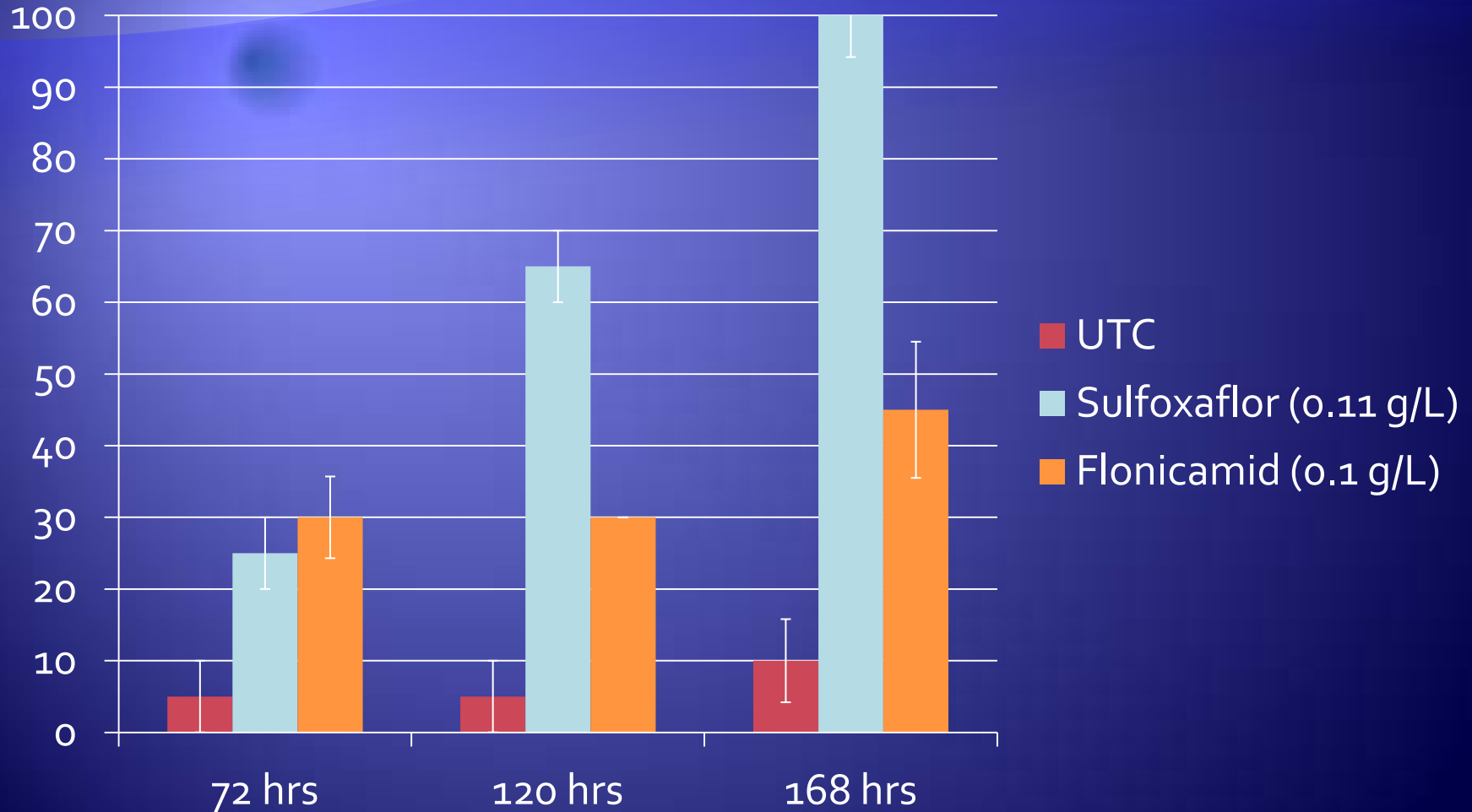
Flonicamid

- ◆ Beleaf™ 50SG from FMC
- ◆ a pyridinecarboxamide compound
- ◆ a novel systemic insecticide with selective activity against hemipterous pests, such as aphids and whiteflies
- ◆ main insecticidal mechanism of flonicamid is starvation based on the inhibition of stylet penetration to plant tissues.
- ◆ Inhibits feeding behaviour within 0.5 h of treatment without noticeable poisoning symptoms such as convulsion
- ◆ antifeeding activity is non recoverable

Sulfoxaflor

- ◆ New sap-feeding insecticide from Dow Agrosiences
- ◆ Closer 2SC™ for fruit and veggies
Transform 50WG™ for field crops
- ◆ Registration expected summer 2012
- ◆ IRAC classification of 4C . A nicotinic acetylcholine receptor agonist that binds at an entirely different site than the neonicotinoids (4A) or nicotine (4B)
- ◆ No cross-resistance to any of the neonicotinoids or nicotine
- ◆ Demonstrated toxicity against several hemipteran pests such as aphids, leafhoppers, and Lygus bugs

Bean dip bioassays – BMSB nymphs



2011– Bell Peppers , Blacksburg, VA

(4 weekly sprays)

Treatment	Rate / acre	% stink bug fruit damage			% control (dmg reduction)	Mean no. green peach aphids / 20 leaves
		8-Aug	19-Aug	30-Aug		
Untr. Control		40.0	15.0	32.5		2.8
Mustang Max	4 fl. oz	7.5	8.8	7.5	72.8	155.0
Brigadier 2SC	8 fl. oz	15.0	7.5	3.8	69.9	0.3
Hero	6.4 fl. oz	17.5	2.5	10.0	65.7	1014.0
Athena	16 fl. oz	12.5	5.0	17.5	60.0	63.3
Beleaf 50SG	2.8 oz	23.8	7.5	16.3	45.6	1.0
Baythroid XL	2.8 fl. oz	25.0	6.3	10.0	52.8	201.8
Leverage 360	2.8 fl. oz	20.0	8.8	15.0	49.9	0.5



Neonicotinoids

- Neonicotinoids including imidacloprid, dinotefuran, thiamethoxam, and clothianidin can be applied to vegetables via soil application (i.e., drench, drip chemigation)



Trial # 4 – Bell Peppers , Blacksburg, VA

(4 weekly sprays or 2 soil drenches)

Treatment	Rate / acre	% stink bug damage			% control (damage reduction)
		8-Aug	19-Aug	30-Aug	
Untreated Control		28.8 a	17.5 a	65.0 a	
Scorpion 35SL (soil application)	10.5 fl. oz	8.8 b	3.8 b	18.8 b	71.8
Admire Pro (soil application)	10.5 fl. oz	17.5 ab	2.5 b	10.0 b	73.0
Scorpion 35SL	5 fl. oz	13.8 b	6.3 b	8.8 b	74.0
Vydate L	24 fl. oz	13.8 b	5 a	7.5 b	76.4
Lannate LV	24 fl. oz	12.5 b	6.3 a	3.8 b	79.7
Asana XL	9 fl. oz	7.5 b	7.5 a	11.3 b	76.4

Greenhouse Bioassays

- ◆ Greenhouse tomato trial
 - ◆ Soil drench applications of four neonicotinoid insecticides will be made to 'Patio' tomatoes grown in the greenhouse.
 - ◆ 5 stink bugs will be placed in mesh bags and placed over tomato leaf clusters
 - ◆ Mortality (dead + moribund) will be assessed after 72 h.



Current Kuhar Lab Projects on BMSB

- ◆ NE-RIPM pepper project
- ◆ Temperature extremes of BMSB
- ◆ Residual field efficacy of different neonicotinoids
- ◆ Efficacy of deltamethrin-incorporated polyethylene netting for control on vegetables
- ◆ Trap-cropping potential with sweet corn and sunflower
- ◆ Olfactory responses to various repellents
- ◆ Screening novel insecticides



Thanks to my wonderful lab crew

And funding sources:

USDA AFRI Specialty Crops Grant, USDA NE RIPM, USDA SRIPM, IR-4, Virginia Ag Council, and various industry sponsors