

ARTHROPOD PEST MANAGEMENT ON ALFALFA SEED 2008

D.B. Walsh¹

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Activities Detailed in this report:

- I. Insecticide Efficacy Trials 2008
- II. Leafcutting Bee Pesticide Safety Trials 2008
- III. Insecticide Efficacy Trial Candidate Compound Summary
- IV. Row Spacing Seeding Density Study

I. Insecticide Efficacy Trials 2008

Insecticides were screened for their ability to control Lygus bugs in alfalfa seed fields in 2008. In early spring, field plots were established at Prosser, Touchet, and Othello in Washington State. At each location, plots were 18 ft. wide and 20 ft. long and treatments were replicated 4 times in a complete random block design. Insecticides were applied to mimic grower timing at pre-bloom and bloom periods of the alfalfa. Treatments were applied using a CO₂-powered backpack sprayer equipped with a four-nozzle boom using 15 gallons of water per acre as a carrier. Five 180° sweeps per plot were used as a means to sample Lygus and other arthropod abundance and therefore efficacy post application.

LYGUS/ ALFALFA SEED PRE-BLOOM TREATMENTS 2008

<u>Product</u>	<u>Formulated Product</u> <u>Rate/Acre</u>	<u>Plots</u>			
Rimon 0.83 EC (novuluron)	12 oz.	102	210	311	410
Dimethoate 4 EC	1 pt	108	206	302	408
Assail 70 WP (acetimprid)	1.7 oz	107	207	308	406
Lorsban 4E (chlorpyrifos)	2 pt	106	205	303	401
Bifenture EC (bifenthrin)	6.4 fluid oz	112	209	304	405
Lorsban and Bifenture	Rates as above	111	203	305	407
Beleaf 50SG (flonicamid)	2.8 oz	104	208	306	404
Warrior w/ Zeon Technology (lambda-cyhalothrin)	3.8 fluid oz	110	202	309	412
Mustang Max EC (zeta-cypermethrin)	4.0 fluid oz	101	201	312	409
Metaflumizone	0.25 lb ai/acre	109	212	307	411
Belay 2.13SC (clothianidin)	3.8 fluid oz	105	204	310	402
Untreated check		103	211	301	403

Application Dates: Prosser 6/2/2008, Touchet 6/2/2008, Othello 6/4/2008

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*/ Insect population is significantly ($p < 0.05$) lower in insecticide treated plots then in untreated control

**/ Insect population is significantly ($p < 0.01$) lower in insecticide treated plots then in untreated control

Othello Adult Lygus Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	6.75	5.75*	5.50	2.00	0.25
Belay 2.13SC (clothianidin)	3.8 fluid oz.	4.25*	7.75	6.00	1.75	3.25
Beleaf 50SG	2.8 oz.	3.25**	4.75*	6.25	0.50	5.50
Bifenture EC (bifenthrin)	6.4 fluid oz.	1.25**	3.00**	5.00	1.50	0.75
Dimethoate 4 EC	1 pt.	4.50*	6.25	7.50	1.50	2.25
Lorsban 4E (chlorpyrifos)	2 pt.	5.50	5.75*	5.25	0.50	3.25
Lorsban and Bifenture	2 pt.+6.4 oz	1.50**	2.50**	5.00	3.25	1.75
Metaflumizone	0.25 lb ai/acre	4.50*	6.25	4.5	4.00	2.50
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	1.25**	2.00**	5.00	2.00	3.00
Rimon 0.83 EC (nonvuluron)	12 oz.	8.25	4.25**	8.25	1.75	1.75
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	2.25**	0.75**	5.50	2.00	1.75
Untreated check		9.00	10.25	5.00	3.75	4.00

Othello Lygus Nymphs Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	4.00**	1.00**	0.25	1.25	6.75
Belay 2.13SC (clothianidin)	3.8 fluid oz.	3.00**	1.25**	0.25	0	5.25
Beleaf 50SG	2.8 oz.	4.00**	4.50	4.25	0.75	5.50
Bifenture EC (bifenthrin)	6.4 fluid oz.	0.25**	0.25**	0	1.00	6.25
Dimethoate 4 EC	1 pt.	6.25*	1.25**	0	2.00	7.50
Lorsban 4E (chlorpyrifos)	2 pt.	2.00**	0.25**	1	1.00	5.25
Lorsban and Bifenture	2 pt.+6.4 oz	0.75**	0	0.25	1.00	4.75
Metaflumizone	0.25 lb ai/acre	3.00**	3.00**	0	0.50	5.75
Mustang Max EC (z-cypermethrin)	4.0 fluid oz.	0.50**	0.50**	0.25	0.75	3.50
Rimon 0.83 EC (nonvuluron)	12 oz.	7.50	5.00	0	0.75	6.00
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0**	0**	0.75	0	3.50
Untreated check		11.25	5.50	0.25	1.00	6.75

Touchet Adult Lygus Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	0	0.50	1.50	2.00
Belay 2.13SC (clothianidin)	3.8 fluid oz.	0	0.50	1.75	0.25
Beleaf 50SG	2.8 oz.	0.50	0.50	1.00	1.25
Bifenture EC (bifenthrin)	6.4 fluid oz.	1.00	0.50	1.75	0.25
Dimethoate 4 EC	1 pt.	0	1.25	0.25	0.00
Lorsban 4E (chlorpyrifos)	2 pt.	0.50	0.75	3.25	0.25
Lorsban and Bifenture	2 pt.+6.4 oz	0	0.25	1.00	0
Metaflumizone	0.25 lb ai/acre	0	0	2.50	0.50
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	0	1.00	0.75	0
Rimon 0.83 EC (nonvuluron)	12 oz.	0	0.50	2.25	0
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0.50	0.75	0.50	0
Untreated check		0	1.00	2.75	0.50

Touchet Lygus Nymphs Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	0	0	0	0.25
Belay 2.13SC (clothianidin)	3.8 fluid oz.	0	0	0	0.50
Beleaf 50SG	2.8 oz.	0	0	0	0.25
Bifenture EC (bifenthrin)	6.4 fluid oz.	0	0	0	0.25
Dimethoate 4 EC	1 pt.	0	0	0	0
Lorsban 4E (chlorpyrifos)	2 pt.	0	0	0.25	0
Lorsban and Bifenture	2 pt.+6.4 oz	0	0	0	0
Metaflumizone	0.25 lb ai/acre	0	0	0	0
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	0	0	0.25	0
Rimon 0.83 EC (nonvuluron)	12 oz.	0	0	0	0
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0	0	0	0
Untreated check		0	0	0	0

Prosser Adult Lygus Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	7/3/2008	7/10/08
Assail 70 WP (acitimidiprid)	1.7 oz.	2.75	17.00	1.00	0.50
Belay 2.13SC (clothianidin)	3.8 fluid oz.	3.25	15.00	1.75	0
Beleaf 50SG	2.8 oz.	5.50	13.50	8.75	0.50
Bifenture EC (bifenthrin)	6.4 fluid oz.	1.00	14.75	28.00	3.00
Dimethoate 4 EC	1 pt.	4.25	14.25	2.75	0
Lorsban 4E (chlorpyrifos)	2 pt.	7.00	13.50	7.75	0
Lorsban and Bifenture	2 pt.+6.4 oz	1.50	17.25	14.00	1.50
Metaflumizone	0.25 lb ai/acre	5.50	11.75	1.25	0.50
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	1.50	15.25	4.00	0
Rimon 0.83 EC (nonvuluron)	12 oz.	4.00	8.75	2.50	0.75
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	1.25	6.75	8.00	1.00
Untreated check		3.75	8.25	4.50	0.25

Prosser Lygus Nymphs Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	7/3/2008	7/10/08
Assail 70 WP (acitimidiprid)	1.7 oz.	4.00*	7.00	13.75	5.00
Belay 2.13SC (clothianidin)	3.8 fluid oz.	3.25**	6.50	9.50	4.25
Beleaf 50SG	2.8 oz.	3.25**	11.25	17.75	5.25
Bifenture EC (bifenthrin)	6.4 fluid oz.	0**	0**	25.25	8.75
Dimethoate 4 EC	1 pt.	1.00**	6.00	10.50	2.75
Lorsban 4E (chlorpyrifos)	2 pt.	2.50**	2.50*	14.25	1.25
Lorsban and Bifenture	2 pt.+6.4 oz	1.00**	0.25	32.00	3.75
Metaflumizone	0.25 lb ai/acre	5.50	5.00	10.00	2.00
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	1.50**	3.25	4.00*	1.75
Rimon 0.83 EC (nonvuluron)	12 oz.	8.25	4.75	16.25	2.50
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0.50**	1.50	11.50	3.50
Untreated check		8.25	6.75	23.00	6.00

While we applied insecticides to the plots with the primary objective of screening the compounds for their ability to control Lygus, we monitored aphid populations in these plots as well, developing some fairly substantial aphid infestations and useful data.

Othello Aphids Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	6.50	4.75**	60.25	225.50	306.25
Belay 2.13SC (clothianidin)	3.8 fluid oz.	5.00	5.00**	55.50	290.00	408.75
Beleaf 50SG	2.8 oz.	3.50	1.00**	14.75**	122.00**	300.00
Bifenture EC (bifenthrin)	6.4 fluid oz.	0.75**	0**	0.50**	41.25**	119.25**
Dimethoate 4 EC	1 pt.	9.25	0.75**	8.50**	94.75**	275.00
Lorsban 4E (chlorpyrifos)	2 pt.	4.50	1.00**	28.75**	173.00*	407.50
Lorsban and Bifenture	2 pt.+6.4 oz	0.25**	0**	1.25**	47.00**	153.50*
Metaflumizone	0.25 lb ai/acre	21.75	21.75	114.00 ^z	257.75	300.00
Mustang Max EC (z-cypermethrin)	4.0 fluid oz.	0.50**	1.50**	36.75*	369.75	647.50
Rimon 0.83 EC (nonvuluron)	12 oz.	16.50	21.75	120.75 ^{zz}	421.25	451.25
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0**	0.75**	9.75**	151.75**	575.00
Untreated check		11.75	21.00	77.50	341.00	600.00

Touchet Aphids Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	6.00	8.00*	156.75	6.75
Belay 2.13SC (clothianidin)	3.8 fluid oz.	8.50	18.75	200.75	6.00
Beleaf 50SG	2.8 oz.	5.00	7.00*	130.75	4.75
Bifenture EC (bifenthrin)	6.4 fluid oz.	0	2.00**	105.75	4.75
Dimethoate 4 EC	1 pt.	0	0.50**	28.00**	1.75
Lorsban 4E (chlorpyrifos)	2 pt.	0.5	1.50**	55.75**	1.75
Lorsban and Bifenture	2 pt.+6.4 oz	0	0**	27.00**	2.75
Metaflumizone	0.25 lb ai/acre	6.50	4.75**	149.50	0.75
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	1.50	2.25**	79.75*	1.50
Rimon 0.83 EC (nonvuluron)	12 oz.	6.00	5.25**	146.25	1.00
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	1.00	0.75**	66.25**	2.00
Untreated check		3.50	19.25	170.75	13.75

Prosser Aphids Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	7/3/2008	7/10/08
Assail 70 WP (acitimidiprid)	1.7 oz.	3.50	29.00	7.75	1.00
Belay 2.13SC (clothianidin)	3.8 fluid oz.	2.50	20.50	7.00	0.75
Beleaf 50SG	2.8 oz.	0.75	5.50*	16.75	2.00
Bifenture EC (bifenthrin)	6.4 fluid oz.	0	0.50**	11.50	0.00
Dimethoate 4 EC	1 pt.	0.25	3.25**	7.50	3.25
Lorsban 4E (chlorpyrifos)	2 pt.	0	0.50**	11.00	1.50
Lorsban and Bifenture	2 pt.+6.4 oz	0	0.25**	21.50	0.25
Metaflumizone	0.25 lb ai/acre	7.25	61.25	7.25	0
Mustang Max EC (z-cypermethrin)	4.0 fl oz.	0	7.75*	5.25	0
Rimon 0.83 EC (nonvuluron)	12 oz.	15.00	44.00	11.00	1.00
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0	10.00*	10.25	0.25
Untreated check		5.25	41.00	14.00	3.50

We also monitored the Othello plots for a variety of other arthropods of interest.

Othello Big Eyed Bug Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	0.25	0.25	0.25	1.00	3.00
Belay 2.13SC (clothianidin)	3.8 fluid oz.	0	0.25	0	0.50	0.50
Beleaf 50SG	2.8 oz.	0.5	0	0.25	1.75	0
Bifenture EC (bifenthrin)	6.4 fluid oz.	0	0.25	0.50	1.50	1.25
Dimethoate 4 EC	1 pt.	0	0	0.75	1.00	1.50
Lorsban 4E (chlorpyrifos)	2 pt.	0.25	0	0.50	1.25	1.50
Lorsban and Bifenture	2 pt.+6.4 oz	0.25	0	0.25	2.75	1.25
Metaflumizone	0.25 lb ai/acre	0.25	0	0.25	1.50	1.50
Mustang Max EC (z-cypermethrin)	4.0 fluid oz.	0	0	0	1.50	0.50
Rimon 0.83 EC (nonvuluron)	12 oz.	0.5	0	0.5	2.50	2.50
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0.25	0.25	1.0	2.25	2.25
Untreated check		0	0	0	1.0	1.25

Othello Minute Pirate Bug Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	0.75	2.25	2.00	1.25	0.50
Belay 2.13SC (clothianidin)	3.8 fluid oz.	0	2.75	1.25	1.50	3.25
Beleaf 50SG	2.8 oz.	1.75	1.50	2.50	2.00	1.00
Bifenture EC (bifenthrin)	6.4 fluid oz.	0	0.25	3.25	3.00	1.50
Dimethoate 4 EC	1 pt.	0.75	1.00	3.25	1.25	2.50
Lorsban 4E (chlorpyrifos)	2 pt.	0.25	2.50	3.00	1.00	3.25
Lorsban and Bifenture	2 pt.+6.4 oz	0.25	1.50	1.50	1.50	1.00
Metaflumizone	0.25 lb ai/acre	2.75	1.50	4.00	3.50	0.75
Mustang Max EC (z-cypermethrin)	4.0 fluid oz.	0	0.75	2.75	1.75	1.00
Rimon 0.83 EC (nonvuluron)	12 oz.	1.25	3.25	1.50	3.00	2.25
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0	0.75	0.50	3.75	3.50
Untreated check		2.50	1.50	3.25	2.50	2.00

Othello Ladybird beetles Pre-Bloom Sprays

Treatment/ (active ingredient)	Rate	6/9/2008	6/13/2008	6/24/2008	7/2/2008	7/10/2008
Assail 70 WP (acitimidiprid)	1.7 oz.	0*	0	0	0.50	5.50*
Belay 2.13SC (clothianidin)	3.8 fluid oz.	0*	0	0.25	5.25	8.25
Beleaf 50SG	2.8 oz.	0.25*	0	0	0	0.75**
Bifenture EC (bifenthrin)	6.4 fluid oz.	0*	0	0	0.25	0**
Dimethoate 4 EC	1 pt.	0*	0	0	0.75	1.25**
Lorsban 4E (chlorpyrifos)	2 pt.	0*	0	0	0.75	2.00**
Lorsban and Bifenture	2 pt.+6.4 oz	0.25*	0	0	0.75	0**
Metaflumizone	0.25 lb ai/acre	0*	0.25	0.25	3.50	9.00
Mustang Max EC (z-cypermethrin)	4.0 fluid oz.	0*	0	0	0	1.00**
Rimon 0.83 EC (nonvuluron)	12 oz.	0.25*	0.25	0.75	1.00	5.50*
Warrior (lambda-cyhalothrin)	3.8 fluid oz.	0*	0	0	0.50	0.25**
Untreated check		1.75	0	0	0.75	12.25

Bloom Treatments

For the bloom sprays (Touchet 7/8/08, Prosser 7/11/08, Othello 7/15/08) we repeated the application of Rimon, Assail, Beleaf, and Belay over the same plots that had been treated previously with the same chemistry. We oversprayed the Dimethoate and Lorsban + Bifenture plots with Beleaf; the Lorsban plot with Dibrom; the Bifenture and Warrior plots with Rimon + Dibrom; and the Mustang and Metaflumizone plots with Metaflumizone. We then applied Metaflumizone, Dibrom, Beleaf, Rimon, Rimon + Dibrom, Beleaf + Dibrom, and Assail to 4 replicate plots that had not been previously treated with an insecticide.

Pre-Bloom Product	Formulation Rate/Acre	Bloom Product	Formulation Rate/Acre	Plots			
Rimon 0.83 EC (novuluron)	12 oz.	Rimon 0.83 EC	12 oz.	102	210	311	410
Dimethoate 4 EC	1 pt	Beleaf 50SG	2.8 oz	108	206	302	408
Assail 70 WP (acetimprid)	1.7 oz	Assail 70 WP	1.7 oz	107	207	308	406
Lorsban 4 ^E (chlorpyrifos)	2 pt	Dibrom	1.5 pints	106	205	303	401
Bifenture EC (bifenthrin)	6.4 fluid oz	Rimon + Dibrom		112	209	304	405
Lorsban and Bifenture	Rates as above	Beleaf 50SG	2.8 oz	111	203	305	407
Beleaf 50SG (flonicamid)	2.8 oz	Beleaf 50SG	2.8 oz	104	208	306	404
Warrior w/Zeon (lambda-cyhalothrin)	3.8 fluid oz	Rimon + Dibrom		110	202	309	412
Mustang Max EC (zeta-cypermethrin)	4.0 fluid oz	Metaflumizone	0.25 lb ai/acre	101	201	312	409
Metaflumizone	0.25 lb ai/acre	Metaflumizone	0.25 lb ai/acre	109	212	307	411
Belay 2.13SC (clothianidin)	3.8 fluid oz	Belay 2.13SC	3.8 fluid oz	105	204	310	402
Untreated check		Untreated check		103	211	301	403
Untreated		Metaflumizone	0.25 lb ai/acre	117	213	316	419
Untreated		Dibrom	1.5 pints	120	217	315	420
Untreated		Beleaf 50SG	2.8 oz	116	218	320	417
Untreated		Rimon 0.83 EC	12 oz.	114	226	319	415
Untreated		Rimon + Dibrom		118	216	318	413
Untreated		Beleaf + Dibrom		113	214	314	416
Untreated		Assail 70 WP	1.7 oz	119	215	313	414
Untreated		Untreated Check		115	219	317	418

Othello Adult Lygus Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	1.50**	8.25	19.25	17.25
Assail 70 WP (untreated)	1.7 oz.	2.75**	12.00	15.00	8.25
Belay 2.13SC (Belay)	3.8 fluid oz.	3.00**	11.75	11.00	10.25
Beleaf 50SG (Beleaf)	2.8 oz	2.50**	15.75	16.00	12.5
Beleaf 50SG (dimethoate)	2.8 oz	2.50**	22.50	5.750	13.5
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	3.25*	21.25	15.50	13.75
Beleaf 50SG (untreated)	2.8 oz	3.75*	13.75	18.25	13.25
Beleaf and Dibrom (untreated)		4.25*	16.00	11.00	8.00
Dibrom (Lorsban)	1.5 pints	3.50*	14.50	12.75	12.00
Dibrom (untreated)	1.5 pints	3.00*	12.25	12.00	11.25
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	4.00*	14.75	20.50	12.25
Metaflumizone (MustangMax)	0.25 lb ai/acre	4.25*	11.50	11.75	12.25
Metaflumizone (untreated)	0.25 lb ai/acre	6.25	11.25	13.00	12.75
Rimon & Dibrom (Warrior)	3.8 fluid oz.	2.75**	16.00	12.25	13.5
Rimon 0.83 EC (Rimon)	12 oz.	6.25	18.25	9.25	5.50
Rimon 0.83 EC (untreated)	12 oz.	4.75*	14.50	17.75	9.75
Rimon and Dibrom (Bifenture)		2.50**	10.00	7.00	14.25
Rimon and Dibrom (untreated)		4.00*	15.00	17.00	15.25
Untreated (untreated)		6.75	15.50	12.75	10.50
Untreated check		8.50	18.75	14.50	8.50

Othello Lygus Nymphs Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	5.50**	3.00	2.75	4.00
Assail 70 WP (untreated)	1.7 oz.	7.00*	5.75	1.00	2.00
Belay 2.13SC (Belay)	3.8 fluid oz.	10.50	3.25	3.00	3.50
Beleaf 50SG (Beleaf)	2.8 oz	4.00*	6.50	1.50	3.25
Beleaf 50SG (dimethoate)	2.8 oz	6.00*	7.50	2.00	5.50
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	9.75	9.75	3.75	4.00
Beleaf 50SG (untreated)	2.8 oz	8.00*	2.75	4.25	6.25
Beleaf and Dibrom (untreated)		6.50**	4.25	0.50	2.75
Dibrom (Lorsban)	1.5 pints	6.00**	2.25	7.00	4.00
Dibrom (untreated)	1.5 pints	10.00	2.25	4.25	3.5
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	11.50	4.75	2.50	6.00
Metaflumizone (MustangMax)	0.25 lb ai/acre	13.50	7.25	2.25	8.00
Metaflumizone (untreated)	0.25 lb ai/acre	11.25	1.75	1.75	3.50
Rimon & Dibrom (Warrior)	3.8 fluid oz.	12.00	2.00	1.25	2.25
Rimon 0.83 EC (Rimon)	12 oz.	12.75	7.00	3.00	3.50
Rimon 0.83 EC (untreated)	12 oz.	6.00**	5.25	4.00	3.25
Rimon and Dibrom (Bifenture)		4.50**	4.00	1.75	0.75
Rimon and Dibrom (untreated)		9.00*	1.00	2.25	1.50
Untreated (untreated)		9.50	7.75	5.00	8.50
Untreated check		17.75	5.25	2.25	5.50

Othello Aphids Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	7.25**	4.00*	2.00	0.75
Assail 70 WP (untreated)	1.7 oz.	17.00*	14.75*	46.25	8.75
Belay 2.13SC (Belay)	3.8 fluid oz.	67.50	59.00	15.00	3.25
Beleaf 50SG (Beleaf)	2.8 oz	22.50*	10.00*	9.75	0.25
Beleaf 50SG (dimethoate)	2.8 oz	37.50	5.50*	23.25	0.50
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	37.50	3.75*	7.00	1.50
Beleaf 50SG (untreated)	2.8 oz	30.75*	33.25	42.25	1.50
Beleaf and Dibrom (untreated)		14.25**	4.75*	24.25	2.50
Dibrom (Lorsban)	1.5 pints	32.75	36.25	79.00	4.00
Dibrom (untreated)	1.5 pints	91.25	78.00	27.75	6.00
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	108.50	97.00	21.5	4.25
Metaflumizone (MustangMax)	0.25 lb ai/acre	150.00 ^a	50.00	33.00	2.25
Metaflumizone (untreated)	0.25 lb ai/acre	93.00	31.50	13.25	4.00
Rimon & Dibrom (Warrior)	3.8 fluid oz.	94.00	59.00	30.75	7.25
Rimon 0.83 EC (Rimon)	12 oz.	171.00 ^a	172.25 ^a	79.00	7.25
Rimon 0.83 EC (untreated)	12 oz.	120.00 ^a	50.00	25.75	0.50
Rimon and Dibrom (Bifenture)		20.00**	54.25	9.25	4.75
Rimon and Dibrom (untreated)		14.00**	20.00	11.50	7.25
Untreated (untreated)		111.75 ^a	174.00 ^a	24.25	8.00
Untreated check		63.75	71.50	17.75	1.50

Othello Minute Pirate Bugs Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	0.25	0.25*	1.75	1.5
Assail 70 WP (untreated)	1.7 oz.	0.50	0.50*	2.75	1.25
Belay 2.13SC (Belay)	3.8 fluid oz.	0.75	0.75*	2.75	1
Beleaf 50SG (Beleaf)	2.8 oz	1.00	1.00*	2.75	3
Beleaf 50SG (dimethoate)	2.8 oz	3.25	3.25	4.50	2
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	1.50	1.50*	4.50	1
Beleaf 50SG (untreated)	2.8 oz	2.75	2.75	3.00	1.25
Beleaf and Dibrom (untreated)		0.25	0.25*	3.50	1.25
Dibrom (Lorsban)	1.5 pints	1.50	1.50*	3.75	2.5
Dibrom (untreated)	1.5 pints	2.25	2.25	3.50	2
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	2.75	2.75	3.50	2.75
Metaflumizone (MustangMax)	.25 lb ai/acre	4.00	4.00	3.75	4.25
Metaflumizone (untreated)	0.25 lb ai/acre	7.75	7.75 ^a	5.75	1.75
Rimon & Dibrom (Warrior)	3.8 fluid oz.	1.25	1.25*	4.00	2.5
Rimon 0.83 EC (Rimon)	12 oz.	0.50	0.50*	1.75	1.25
Rimon 0.83 EC (untreated)	12 oz.	1.75	1.75	4.00	4.5
Rimon and Dibrom (Bifenture)		2.75	2.75	5.00	3.75
Rimon and Dibrom (untreated)		1.75	1.75	3.50	3.5
Untreated (untreated)		3.50	3.50 ^a	2.25	1.5
Untreated check		2.50	2.50	1.75	4.50

Touchet Adult Lygus Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/10/2008	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	0.25	0	1.50	8.25	6.75
Assail 70 WP (untreated)	1.7 oz.	0.50	0.25	0.50	4.00	2.50
Belay 2.13SC (Belay)	3.8 fluid oz.	0	0	2.25	3.25	4.50
Beleaf 50SG (Beleaf)	2.8 oz	0	.025	1.00	4.00	8.75
Beleaf 50SG (dimethoate)	2.8 oz	0	0.75	1.25	2.75	5.75
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	0.50	0.25	2.50	3.75	9.00
Beleaf 50SG (untreated)	2.8 oz	0	0.25	3.00	3.25	2.00
Beleaf and Dibrom (untreated)		0	0.50	3.00	5.75	5.50
Dibrom (Lorsban)	1.5 pints	0	1.75	1.50	4.00	5.25
Dibrom (untreated)	1.5 pints	0	0.75	2.25	4.25	4.00
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	0	1.25	1.00	3.25	4.50
Metaflumizone (MustangMax)	0.25 lb ai/acre	0	0.75	2.50	4.00	4.50
Metaflumizone (untreated)	0.25 lb ai/acre	0	0.75	1.75	3.50	6.50
Rimon & Dibrom (Warrior)	3.8 fluid oz.	0.75	0	1.25	6.00	2.00
Rimon 0.83 EC (Rimon)	12 oz.	0	0.75	0.75	3.50	5.00
Rimon 0.83 EC (untreated)	12 oz.	0.50	0.25	1.25	3.50	5.75
Rimon and Dibrom (Bifenture)		0.25	0.25	2.00	5.25	8.50
Rimon and Dibrom (untreated)		0.75	0.25	0.50	2.75	3.75
Untreated (untreated)		0	1.00	1.00	2.00	6.75
Untreated check		1.25	0	1.25	4.50	5.75

Touchet Lygus Nymphs Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/10/2008	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	0	0	0	1.25	1.25
Assail 70 WP (untreated)	1.7 oz.	0.25	0	0	0.25	1.50
Belay 2.13SC (Belay)	3.8 fluid oz.	0	0	0	0.50	1.00
Beleaf 50SG (Beleaf)	2.8 oz	0.50	0	0.50	0	1.25
Beleaf 50SG (dimethoate)	2.8 oz	0	0.50	0.75	1.50	2.25
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	0	0.75	0.75	2.00	1.50
Beleaf 50SG (untreated)	2.8 oz	0	0.25	0.25	1.00	2.25
Beleaf and Dibrom (untreated)		0.75	0.25	0.75	1.50	1.75
Dibrom (Lorsban)	1.5 pints	0	0.75	0	1.25	1.50
Dibrom (untreated)	1.5 pints	0.50	0.50	0.25	1.25	1.25
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	0	0.25	0.25	1.50	2.00
Metaflumizone (MustangMax)	0.25 lb ai/acre	0.25	1.00	0.50	1.25	1.50
Metaflumizone (untreated)	0.25 lb ai/acre	0	0	0	1.50	2.00
Rimon & Dibrom (Warrior)	3.8 fluid oz.	0	0	0	1.00	1.50
Rimon 0.83 EC (Rimon)	12 oz.	0.25	0.25	0	1.00	1.50
Rimon 0.83 EC (untreated)	12 oz.	0.75	0.25	0.75	1.25	1.00
Rimon and Dibrom (Bifenture)		0	0.50	0	1.25	2.00
Rimon and Dibrom (untreated)		0.25	0	0	1.25	0.75
Untreated (untreated)		1.00	1.75	0.25	1.00	2.50
Untreated check		1.00	0.50	0.75	1.25	2.25

Touchet Aphids Post-Bloom Sprays

Treatment/ (pre-bloom)	Rate	7/10/2008	7/17/2008	7/24/2008	7/30/2008	8/6/2008
Assail 70 WP (Assail)	1.7 oz.	7.25	18.50*	21.25	9.00	0.75
Assail 70 WP (untreated)	1.7 oz.	2.25*	4.25**	14.00*	5.75	0
Belay 2.13SC (Belay)	3.8 fluid oz.	9.75	44.00	50.25	4.00	0
Beleaf 50SG (Beleaf)	2.8 oz	6.50	11.50*	11.75*	4.50	1.50
Beleaf 50SG (dimethoate)	2.8 oz	7.75	3.00**	11.00*	4.50	0.50
Beleaf 50SG (Lorsban + Bifenture)	2.8 oz	12.50	6.50**	10.50*	3.75	1.00
Beleaf 50SG (untreated)	2.8 oz	6.25	1.75**	5.25**	3.75	0
Beleaf and Dibrom (untreated)		8.75	12.25*	14.25*	6.00	0
Dibrom (Lorsban)	1.5 pints	15.00	31.75	34.00	2.25	0
Dibrom (untreated)	1.5 pints	10.25	15.50*	33.25	6.50	0.50
Metaflumizone (Metaflumizone)	0.25 lb ai/acre	14.75	42.00	32.50	4.25	1.75
Metaflumizone (MustangMax)	0.25 lb ai/acre	24.00	36.25	28.50	4.50	0
Metaflumizone (untreated)	0.25 lb ai/acre	4.00*	10.00*	22.50	5.00	0.25
Rimon & Dibrom (Warrior)	3.8 fluid oz.	10.25	49.50	67.75	4.75	0
Rimon 0.83 EC (Rimon)	12 oz.	10.50	30.00	47.25	2.75	0.50
Rimon 0.83 EC (untreated)	12 oz.	10.75	20.25	26.25	4.75	0.25
Rimon and Dibrom (Bifenture)		10.00	36.00	59.00	1.50	2.00
Rimon and Dibrom (untreated)		6.00	9.25*	24.00	2.50	0
Untreated (untreated)		15.50	51.75	45.25	3.00	1.00
Untreated check		6.25	16.00*	29.25	8.50	0.25

II. Leafcutting Bee Pesticide Safety Trials 2008

These tests were designed to determine the residue hazard of the products listed below. The products were tested at the maximum label rate if registered or at the maximum rate that that the registrants suggested for the use of their product for insect or mite control on alfalfa seed.

- acetamiprid (Assail)
- clothianidin (Belay)
- flonicamid (Beleaf)
- fenpyroximate (Fujimite)
- paraffinic oil (JMS Stylet Oil)
- metaflumizone
- etoxazole (Zeal)

Tests were conducted with pesticides applied with a R&D CO₂ pressurized sprayer at a rate of 26 gallons per acre using a hand-held boom applied to 0.01-acre plots of first- or second-growth alfalfa. Field-weathered residual test exposures were replicated 4 times with 4 foliage samples per treatment. Samples consisting of about 400 cm of foliage taken from the upper 15 cm portions of plants and clipped to 1-inch lengths were placed into each plastic Petri dish (15 cm diameter), the tops and bottoms of which were separated by a wire screen (6.7 meshes/cm) insert (45 cm long and 5 cm wide).

Alfalfa leafcutting bees (LB) were collected and chilled at 35 degrees F. to facilitate handling. Residual test exposures were replicated 4 times by caging 20 LB with each of four foliage samples per treatment. Bees in cages were fed syrup (91:1 ratio) in a wad of cotton (5 x 5 cm) and held at 75 degrees F. for 24-hour mortality counts.

Dr. Dan Mayer had concluded that materials or rates of materials that cause less than 25% mortality with 2-hour residues can probably be applied during early morning with little or no hazard to bees and those that cause less than 25% mortality with 8-hour residues can probably be applied during late evening with little or no hazard to bees.

**Mortalities of alfalfa leafcutting bee (LB) exposed to different age residues
of pesticides applied to 0.01 acre plots of alfalfa. Prosser, WA. 2008.
Percent corrected mortality for control mortality after 24 hours of exposure**

<u>Treatment</u>	<u>Residues at 1 hr</u>
acetamiprid (Assail)	53.0
clothianidin (Belay)	95.2
flonicamid (Beleaf)	12.3
fenpyroximate (Fujimite)	10.2
paraffinic oil (JMS Stylet Oil)	8.2
metaflumizone	1.1
etoxazole (Zeal)	11.0

Based on our studies this year caution should be used when applying acetimiprid and we will not pursue registration of Belay during the bloom period.

III. Insecticide Efficacy Trial Candidate Compound Summary

Lygus populations as measured in our spray trials in 2008 were substantially lower than they were in 2007. In 2007 Lygus reached outbreak population levels and there were areas in which complete control failures occurred. Fortunately the reduced population abundance of Lygus in 2008 made control efforts easier and more successful. However, spring weather conditions in south-central Washington State were cool and relatively wet. This created weather conditions perfect for aphid outbreaks. Populations of cowpea aphid *Aphis craccivora* peaked at our Othello, WA test site at over 600 aphids per five 180° sweep net sample during the extended pre-bloom period in early July. When temperatures finally (and consistently) warmed in late July, the aphid populations dropped dramatically.

Individual Insecticide Summaries

Assail 70 WP (a.i. acetimid) is a chloronicotinyl insecticide registered by United Phosphorus. It is registered on alfalfa seed in Washington State under a 24C Special Local Needs registration. In the pre- and post-bloom applications it was effective at controlling Lygus adults, nymphs, and cowpea aphids. The product is considered safe for bees when it is applied in the evening. Morning applications have proven to be unsafe for both alkali and leafcutting bees. Use the product cautiously at bloom.

Belay 2.13 SC (a.i. clothianidin) is a chloronicotinyl insecticide manufactured by Valent Chemical Co. It is not registered for use on alfalfa seed. It was effective in controlling Lygus nymphs and adults and moderately effective at controlling cowpea aphids. It was extremely toxic to leafcutting bees in our 1 hr bioassays and it is unlikely that we will pursue a registration for this product.

Beleaf 50 SG (a.i. flonicamid) is an A-type potassium channel active insecticide that prevents aphids and bugs from using their piercing and sucking mouthparts. Beleaf is registered on alfalfa seed in Washington State under a 24C Special Local Needs registration. This product has proven effective at controlling aphids and Lygus adults and nymphs. In our pollinator insecticide bioassay studies Beleaf proved to be safe for both alkali and leafcutting bees when applied evening or morning.

Metaflumizone (trade name Alverde) is a semicarbazone. It is being developed by BASF Corp. and is not registered for use on alfalfa seed. It was relatively inconsistent in the level of control it provided on Lygus and cowpea aphid populations. In our first study with it on leafcutting bees, early indications were that it could be considered safe. We will conduct additional research with this compound.

Rimon 0.83 EC (a.i. novaluron) is an insect growth regulating insecticide that is only effective on Lygus nymphs. It is registered on alfalfa produced for seed in Washington under a 24C Special Local Needs registration. We have not observed direct contact toxicity with this product on leafcutting or alkali bees. However, there have been concerns from some producers about reduced bee return for leafcutting bees from fields treated at bloom with Rimon. We have not observed this. We have also not seen a reduction in alkali bee abundance near fields that have been treated with Rimon.

IV. Row Spacing Seeding Density Study

In June of 2007 we received a second 2-year grant from the Washington State Department of Ecology Agriculture Burning Task Force. Our first project with the taskforce covered the period from July 2005 through June 2007. In this original project we studied the impacts of various treatments including freezing, steaming, mowing, and tilling field stubble residues compared to burning field residues and doing nothing on pest and beneficial insect abundance, disease incidence and severity, weed competition, and seed yield. Results from this project were contained in our annual report to the Washington Alfalfa Seed Commission in 2007 and can be made available via email if requested at dwalsh@wsu.edu. As a result of these studies we thought that one way to reduce smoke emissions from field burns would be to decrease the plant density thereby decreasing straw stubble in the field. However, we knew that decreasing plant density could also have some important effects like decreasing the alfalfa stand's competitive ability against weeds, changing the field's susceptibility to white mold, and impacting the population abundance of pest or beneficial insects. For our second project, we sought to assess the impacts of row spacing and seeding density.

On July, 31, 2007, using a precision planter that was graciously provided for us by Forage Genetics we established our plots using pelleted seed at Wagoner farms near Touchet, Washington. Plots were established on a row spacing of 22 or 30 inches with a seeding density of 1-5/8 or 3-3/8 inches in row for a total of 4 treatments. During this establishment year our grower collaborators Mark and Tim Wagoner farmed the field commercially and we took readings on stand establishment in September 2007, weed density in May 2008, white mold incidence in spring (no significant differences in white mold; data not shown), and yield when the plots were harvested in late August 2008. A total of 16 replicate plots of 30 to 33 feet wide by 490 or 720 feet long were planted in each row-spacing/seeding-density combination. These plots will be divided in February 2009, at which time we will impose the additional treatments of burning, tillage, residue harvest/removal, and nontreated control on 4 replicate plots within each row-spacing/seed-spacing combination.

<u>Row Spacing</u>	<u>Seeds in Row</u>	<u>Plants per acre</u>	<u>Prickly lettuce Incidence¹</u>	<u>Salsify Incidence</u>	<u>Yield lbs/acre²</u>
22"	1 5/8"	117,000	1.6±0.50	1.70±0.70	571±36
22"	3/ 3/8"	80,000	1.8±0.40	1.80±0.58	565±54
30"	1 5/8"	71,000	1.7±0.48	1.90±0.68	899±44**
30"	3 3/8"	48,000	1.7±0.48	1.90±0.57	696±53

**/ yields were significantly ($p < 0.01$) greater in the 30" row space an 1/58" seed in row plots than any of the other treatment combinations in pairwise *t*-tests.

1/ Weed incidence ± standard deviation rated on a 1-3 scale where 1=<0.5 plant/m²; and 3=1 plant per m²

2/ Yield in pounds per acre ± standard error.

For this establishment year, the 30" spacing rows with the 1-5/8" seeding within the row provided the greatest seed yield. We will be conducting our further experiments in February and monitoring for weeds, insects, and disease through the growing season. We will report on those results in fall 2009.