Bloom Period Management of Lygus Bug in Alfalfa Seed

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Bloom period management of Lygus

Effectively managed only with insecticides

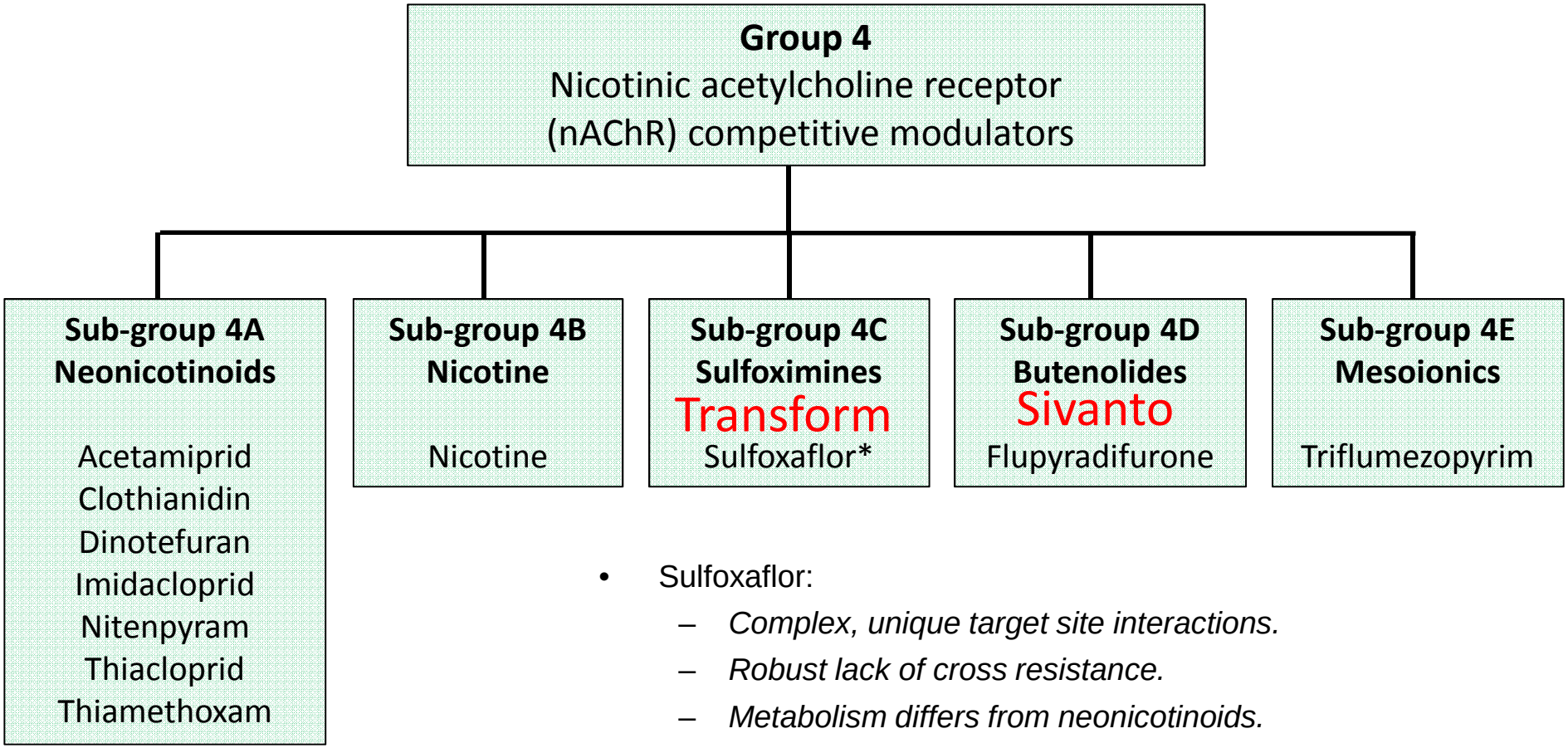
- Insecticides labeled for lygus control include:
  - Broad spectrum OP's, carbamates, pyrethroids
  - Several lower-risk insecticides available
- Usefulness of available compounds limited by
  - Efficacy and resistance management issues
  - Toxicity to pollinators: alfalfa leafcutting bee (ALCB)
- Need for effective, bee-safe insecticides during bloom

Efficacy of Transform, Beleaf and Sivanto

Treatment table

No.	Treatment	Rate (oz/acre)	MSO
1	Beleaf	2.8	2%
2	Sivanto	14.0	2%
3	Transform	1.5	2%
4	Transform	2.25	2%
5	UTC	n/a	n/a

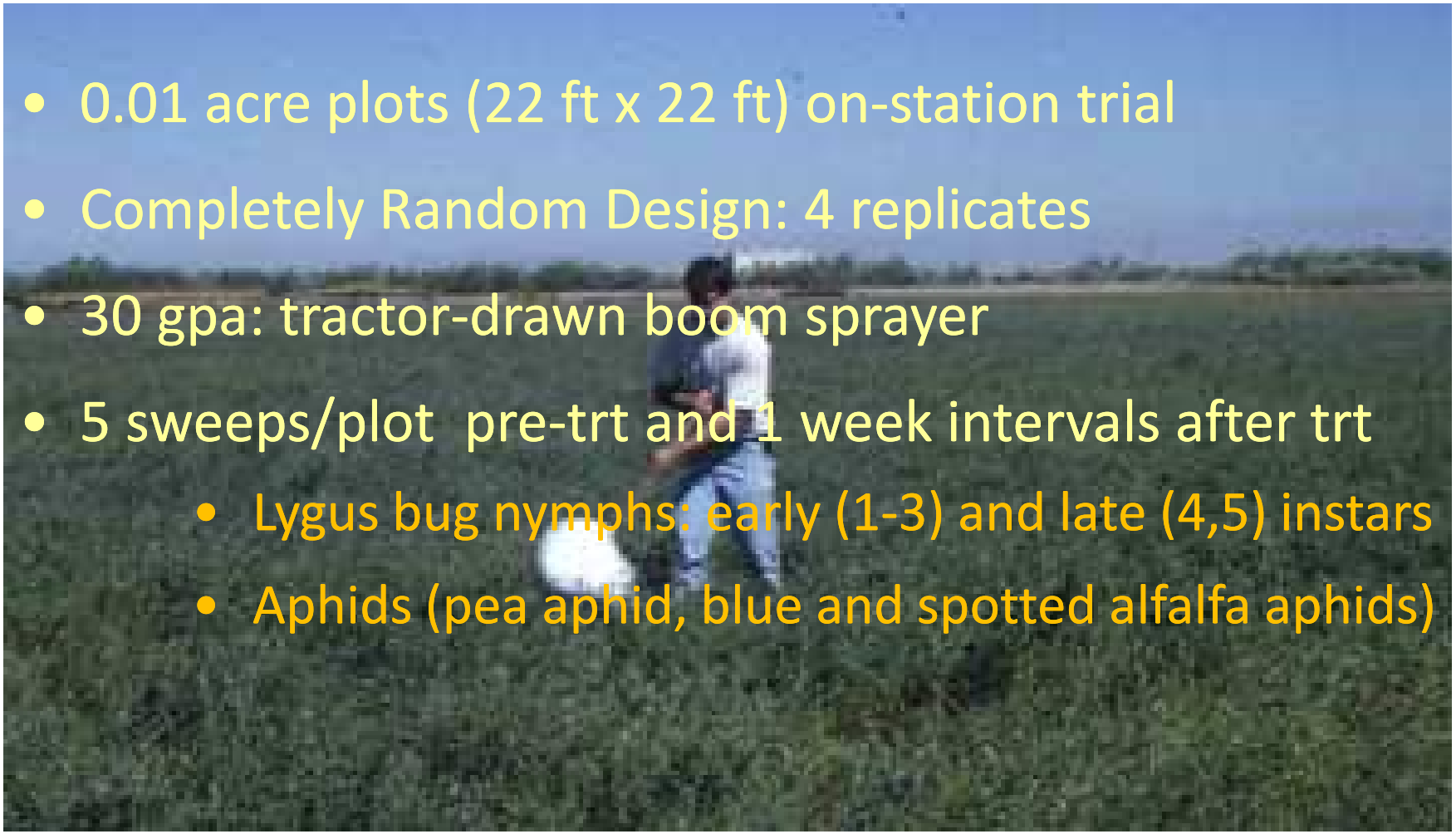
Insecticide Resistance Action Committee (IRAC) Classification of Sulfoxaflor



- Sulfoxaflor:
  - *Complex, unique target site interactions.*
  - *Robust lack of cross resistance.*
  - *Metabolism differs from neonicotinoids.*

Efficacy of Transform, Beleaf and Sivanto

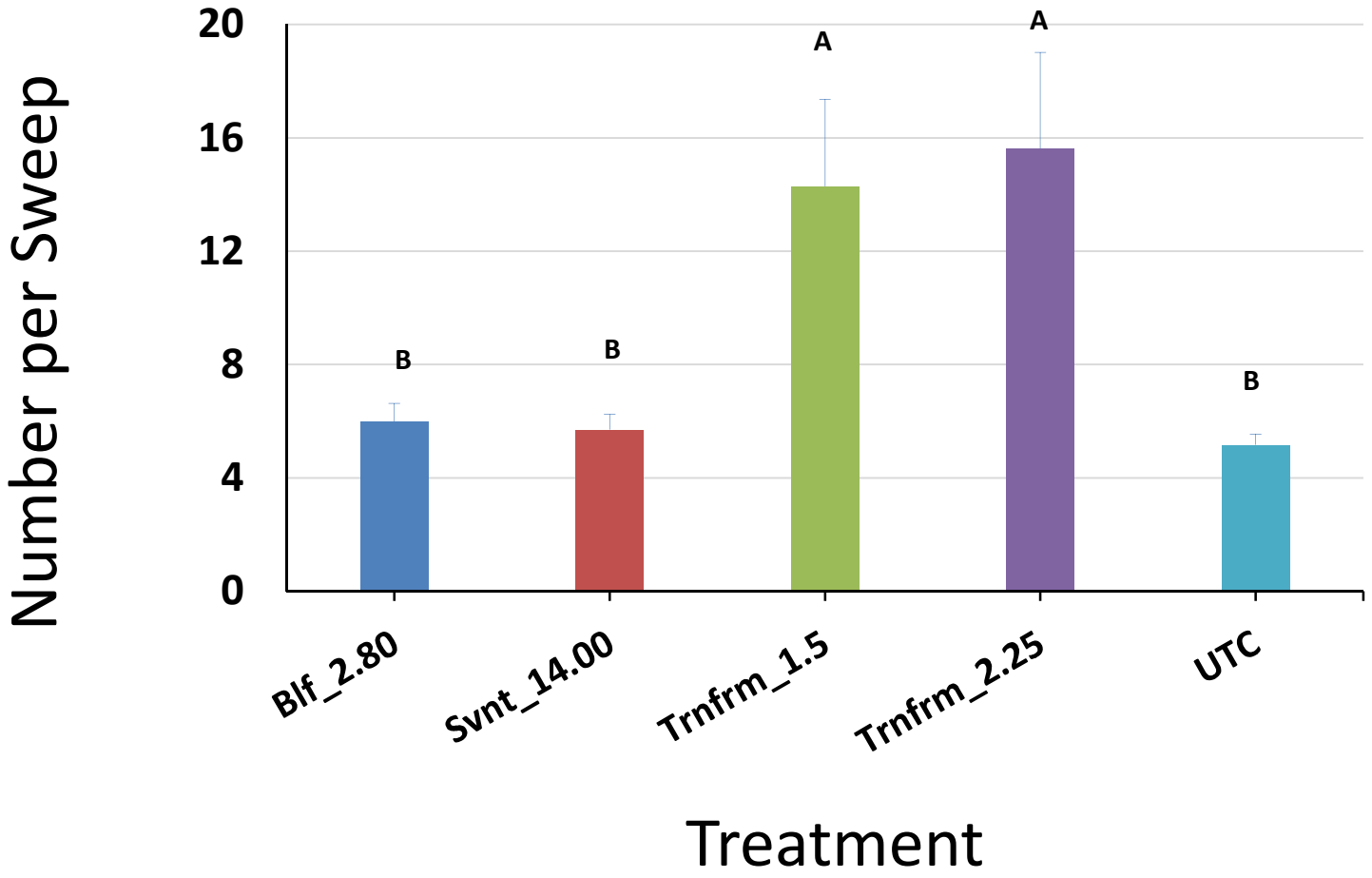
Pesticide trial methods



- 0.01 acre plots (22 ft x 22 ft) on-station trial
- Completely Random Design: 4 replicates
- 30 gpa: tractor-drawn boom sprayer
- 5 sweeps/plot pre-trt and 1 week intervals after trt
    - Lygus bug nymphs: early (1-3) and late (4,5) instars
    - Aphids (pea aphid, blue and spotted alfalfa aphids)

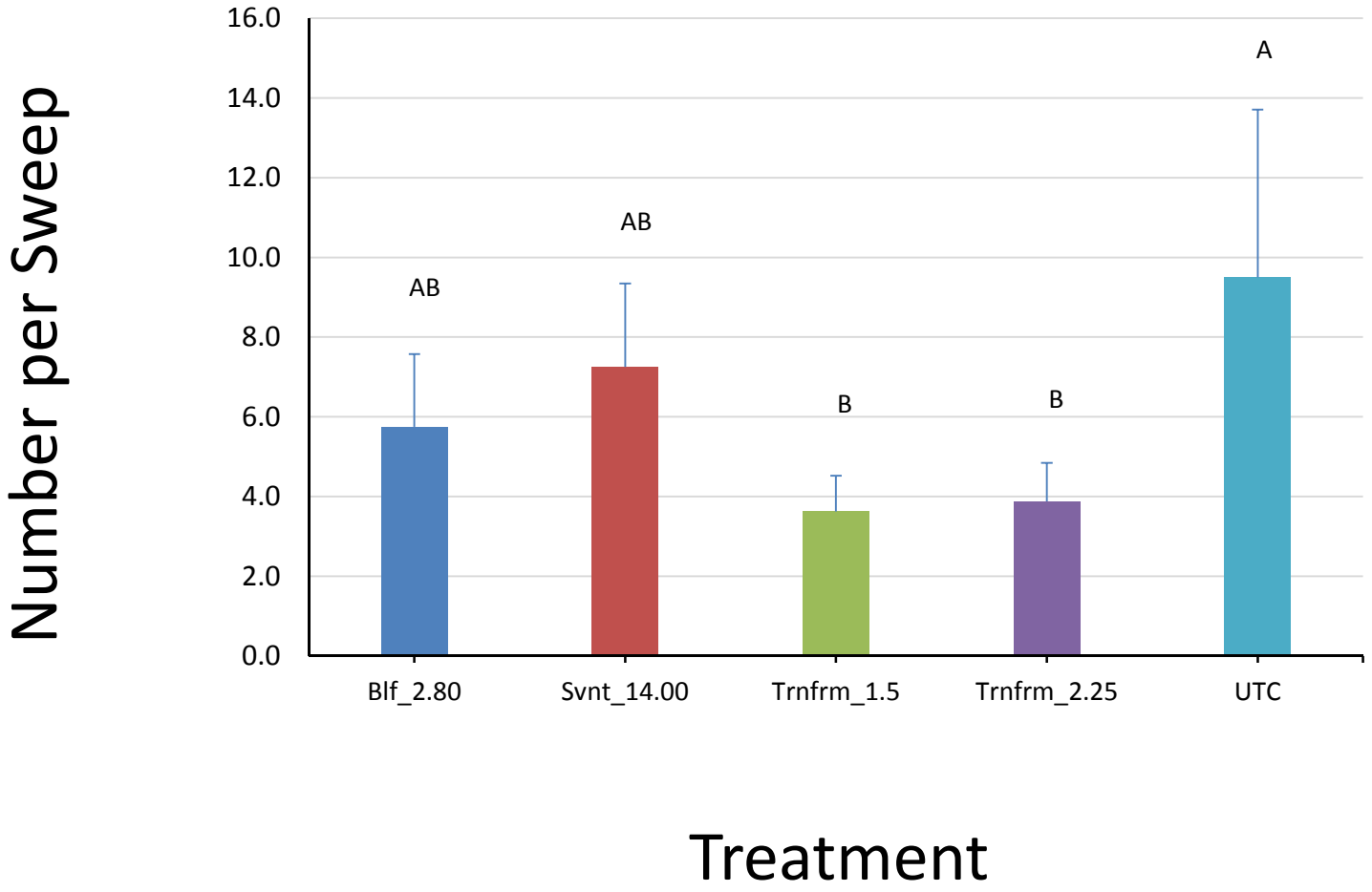
Transform, Beleaf and Sivanto small plot efficacy trial

Mean number of *Lygus* adults over all sample days on treated and untreated plots



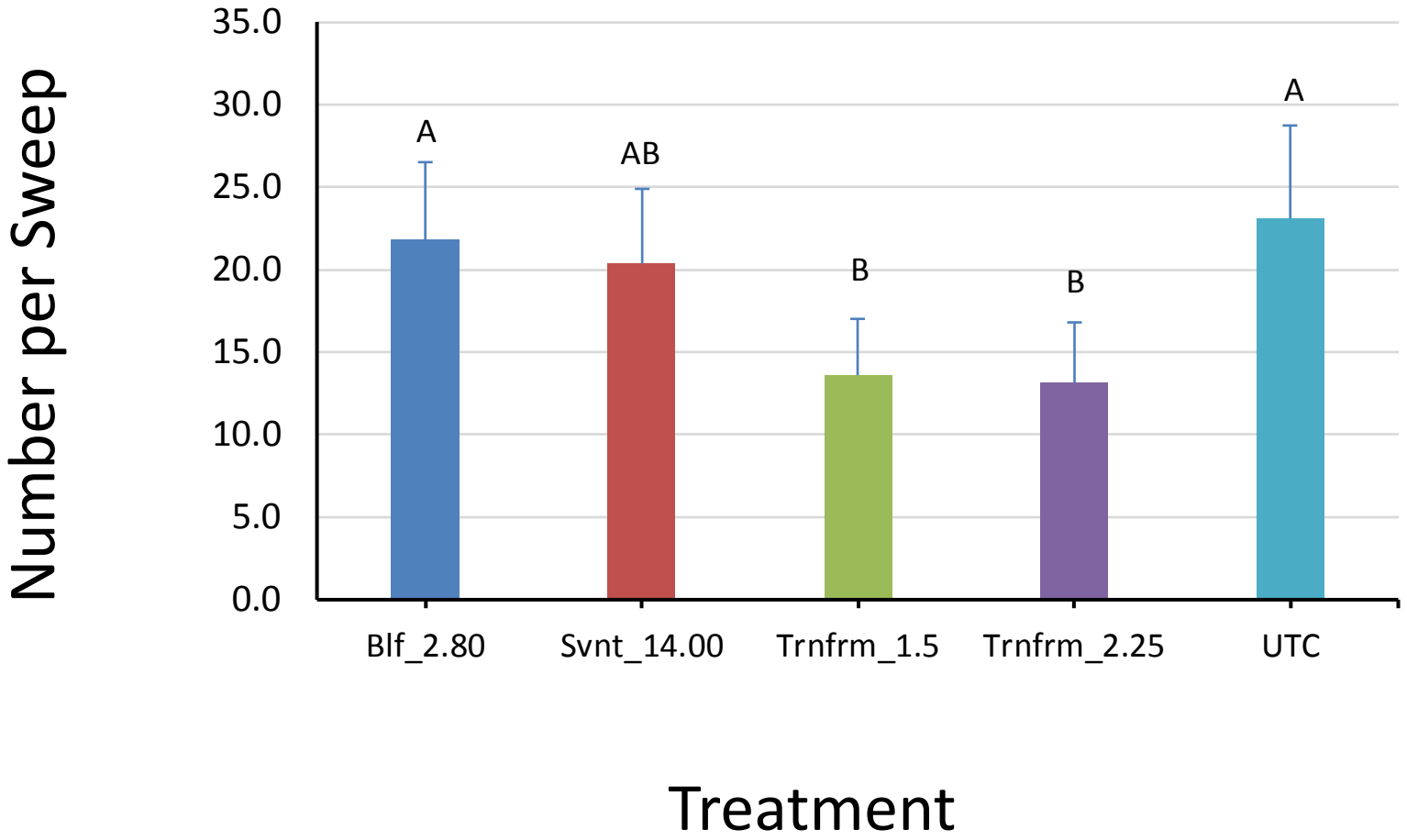
Efficacy of Transform, Beleaf and Sivanto

Mean number of small *Lygus* nymphs over all sample days on treated and untreated plots



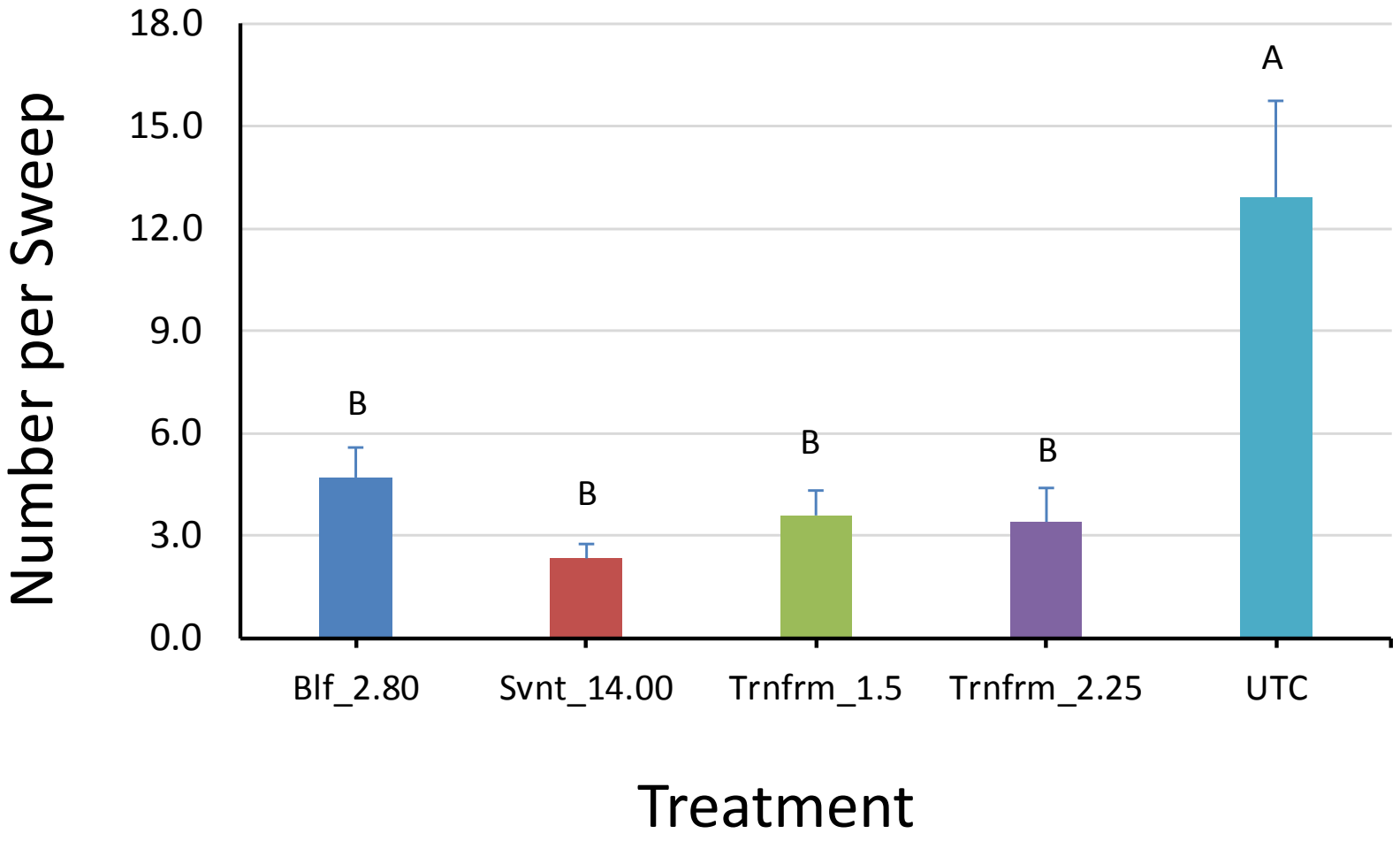
Efficacy of Transform, Beleaf and Sivanto

Mean number of large *Lygus* nymphs over all sample days on treated and untreated plots



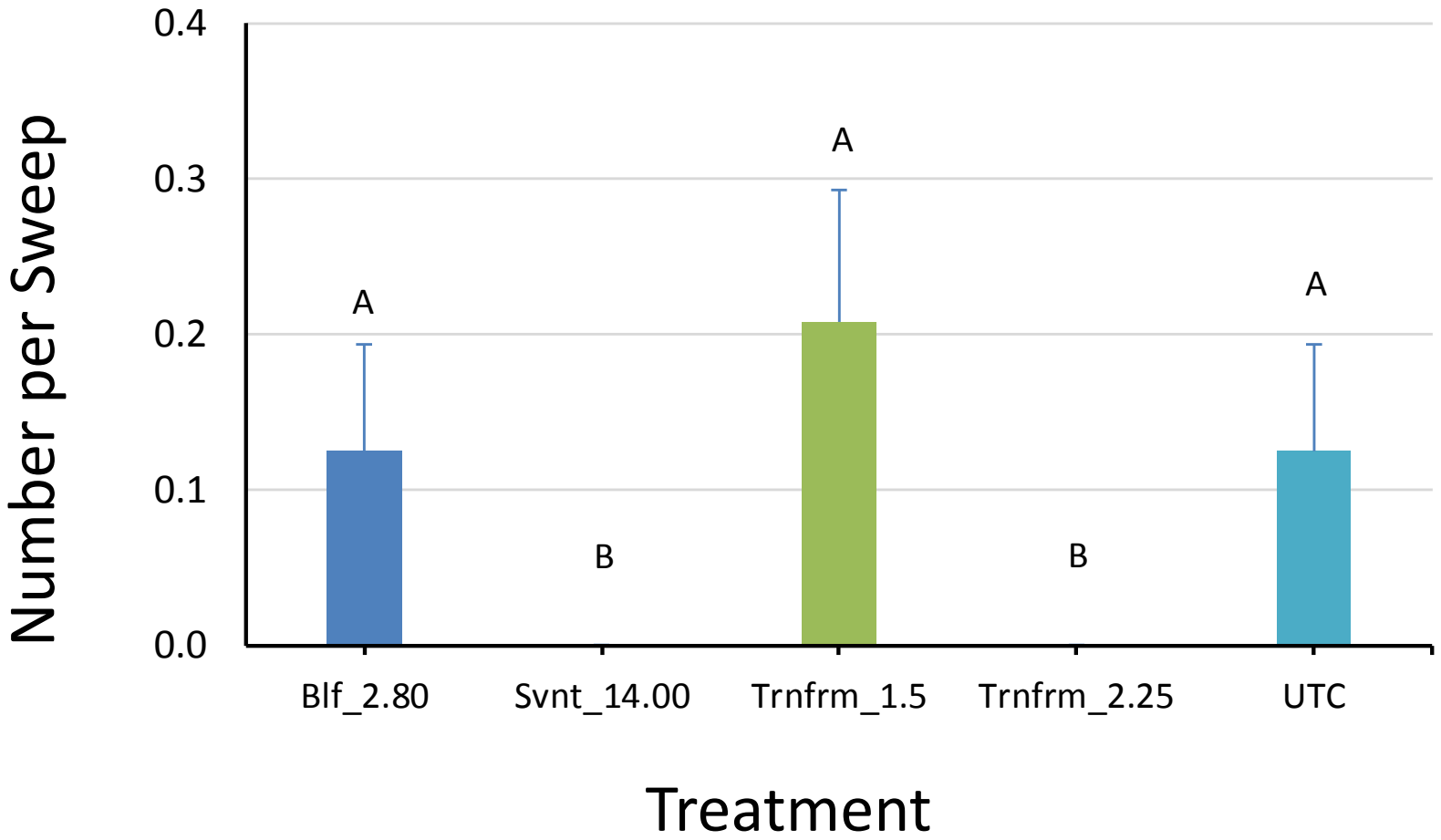
Efficacy of Transform, Beleaf and Sivanto

Mean number of pea and blue alfalfa aphids over all sample days on treated and untreated plots



Efficacy of Transform, Beleaf and Sivanto

Mean number of spotted alfalfa aphids over all sample days on treated and untreated plots



Conclusions

For lygus adults

- Significantly higher numbers on Transform plots???

For lygus small and large nymphs

- Significantly lower numbers on Transform than on control plots. Numbers on Transform plots lower, sometimes significantly, than Beleaf and Sivanto plots.

For aphids

- No. of pea and blue alfalfa aphids lower on treated than n control plots: no difference among trts .
- No. of spotted aphids very low

Beleaf 50SG (flonicamid)

- Insecticide class: pyridinecarboxamide
- IRAC resistance group: 9C
- Mode of action: nerve poison. Blocks pre-synaptic potassium channels resulting in uncontrolled acetocholine release at synapse: inhibits/ reduces feeding

- Route: contact, ingestion
- Systemic in plant: systemic, translaminar
- Insect stages affected: adult and immature insects
- Activity spectrum: sucking insects only: aphids, plant bugs, white flies, etc. **Safe to ALCB**

Beleaf 50SG (flonicamid)

- Appears slow acting
  - Insects stop feeding within an hour of contact/ ingestion
  - Starve or desiccate over several days
  - Larger instars and adults likely to die more slowly
  - Activity spectrum: sucking insects only (aphids, plant bugs)
- Growers interested in:
  - Higher application rate (4.2 oz. / acre vs. 2.8 oz. / acre)
    - High rate labeled in some vegetable crops
  - NIS impact on efficacy (FMC input)
    - Need efficacy data for lygus in alfalfa seed

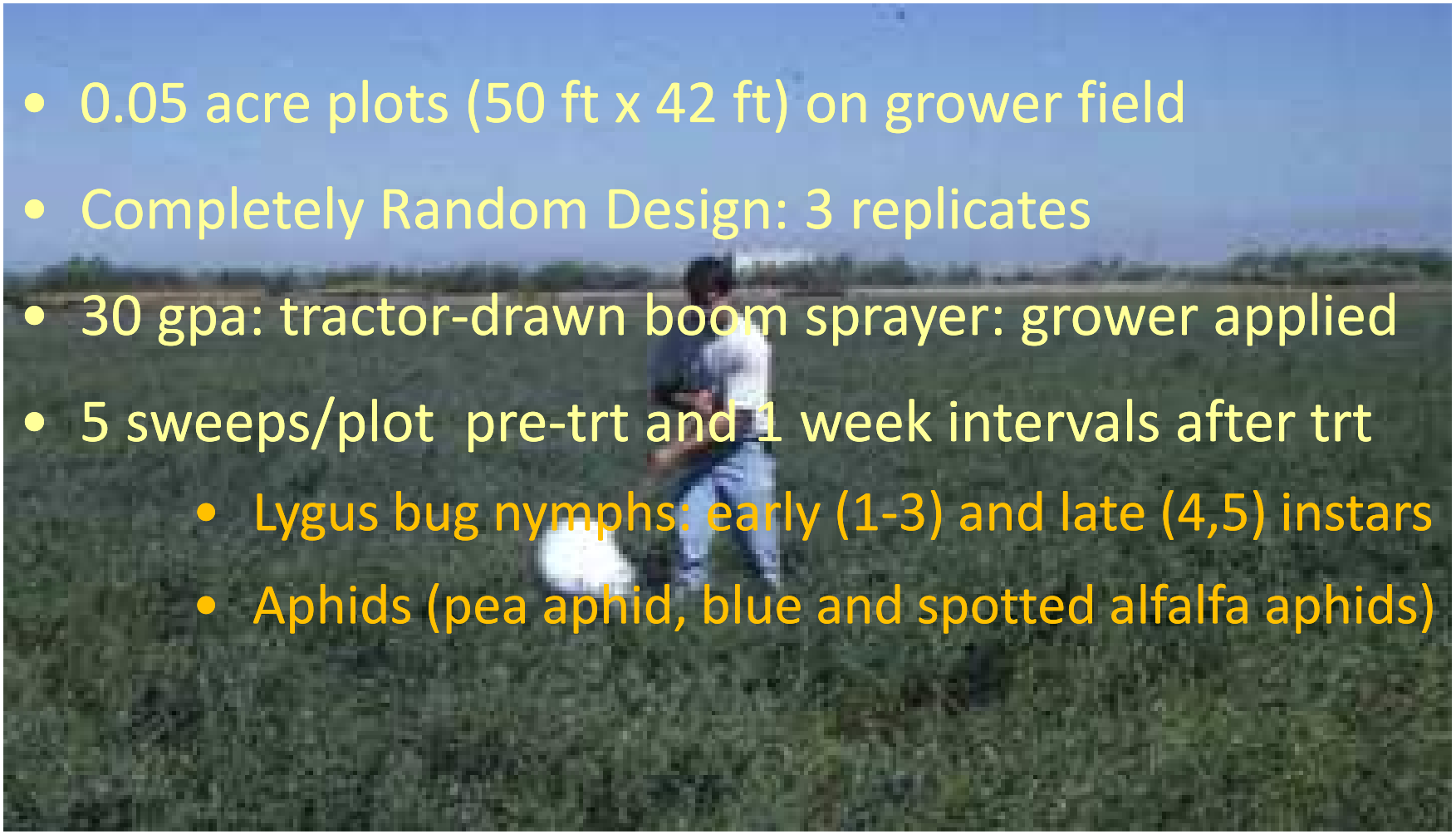
Beleaf rate by MSO trial

Treatment table

No.	Treatment	Rate (oz/acre)	MSO
1	Beleaf	2.8	None
2	Beleaf	4.2	None
3	Beleaf	2.8	2%
4	Beleaf	4.2	2%
5	UTC	n/a	n/a

Beleaf (flonicamid) rate by MSO trial

Pesticide trial methods



- 0.05 acre plots (50 ft x 42 ft) on grower field
- Completely Random Design: 3 replicates
- 30 gpa: tractor-drawn boom sprayer: grower applied
- 5 sweeps/plot pre-trt and 1 week intervals after trt
    - Lygus bug nymphs: early (1-3) and late (4,5) instars
    - Aphids (pea aphid, blue and spotted alfalfa aphids)

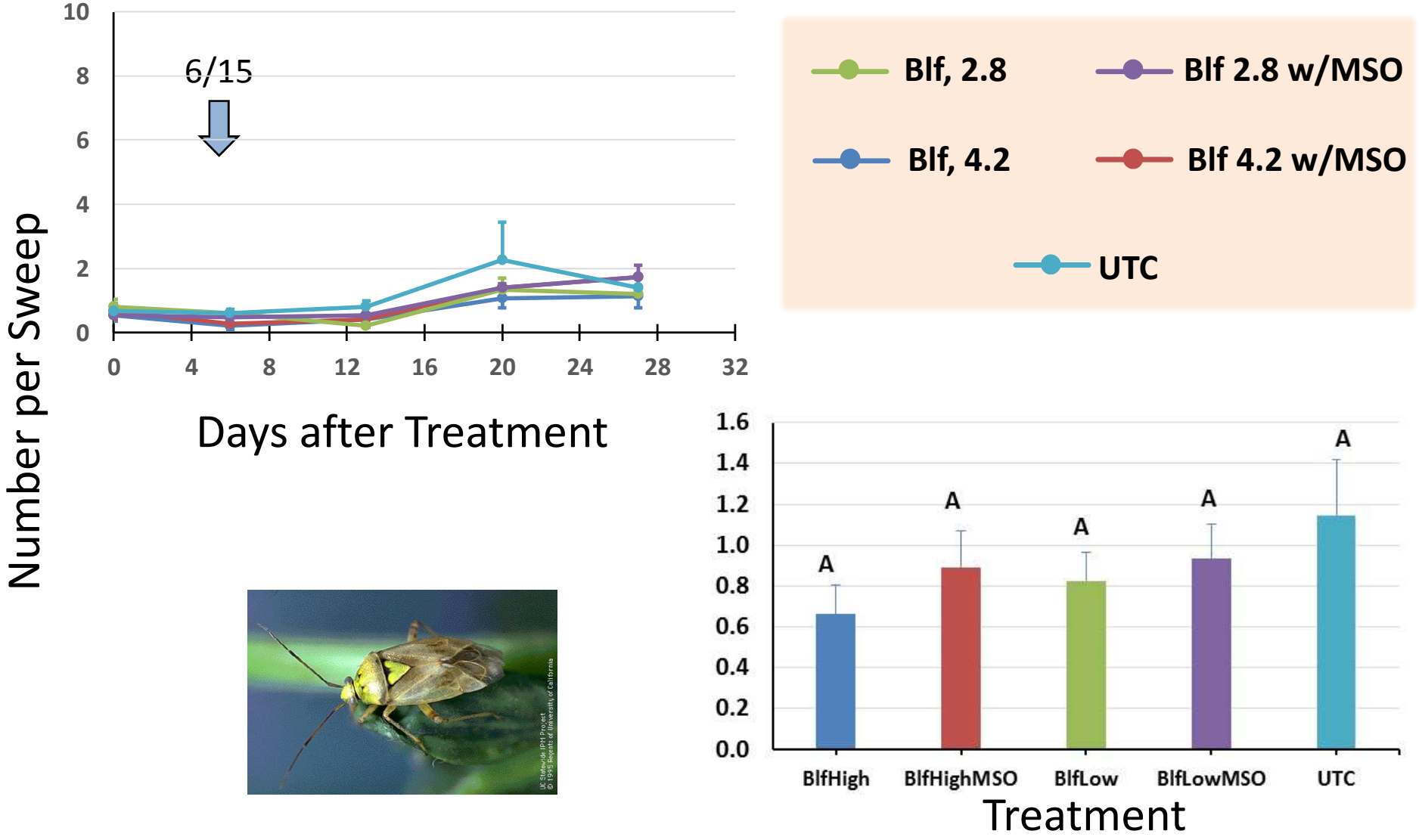
Beleaf (flonicamid) rate by MSO trial

Pesticide trial methods

- Analyzed by ANOVA:
- Completely Random Design: 3 replicates
- Separate treatment means by LSD

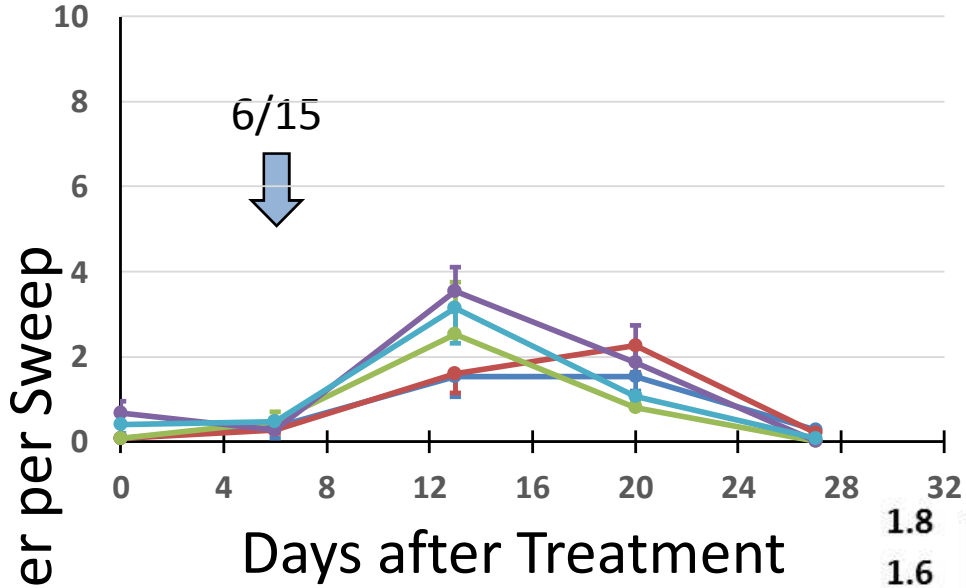
2016 Beleaf rate by MSO grower trial

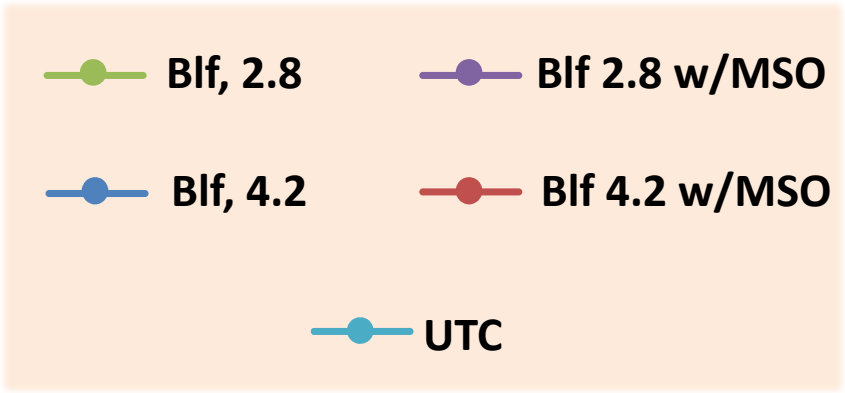
Mean number of Adult *Lygus* on each sample day and over all sample days on treated and untreated plots

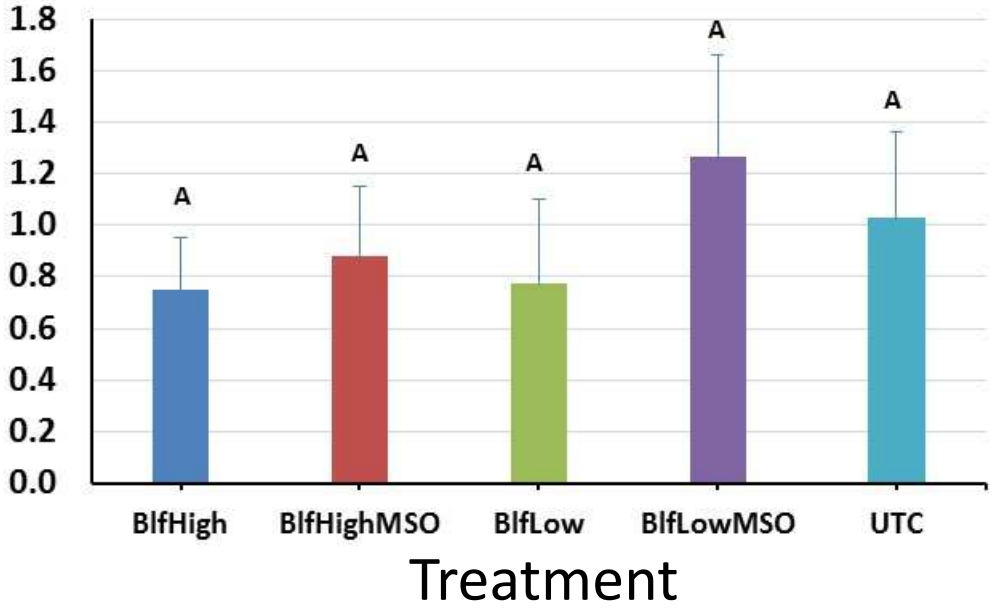


2016 Beleaf rate by MSO grower trial

Mean number of small Lygus nymphs on each sample day and over all sample days on treated and untreated plots

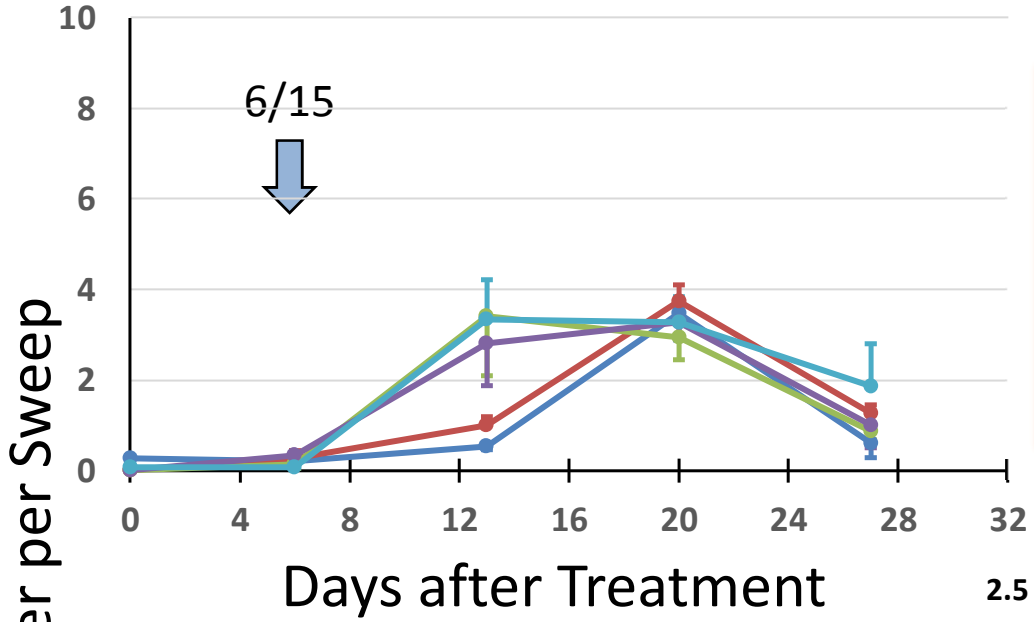


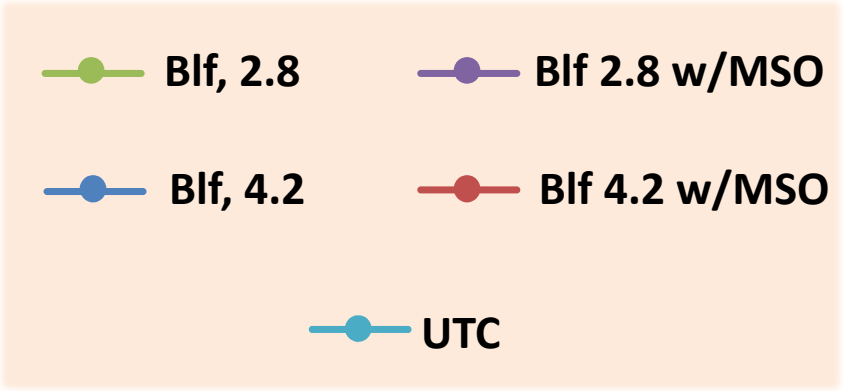


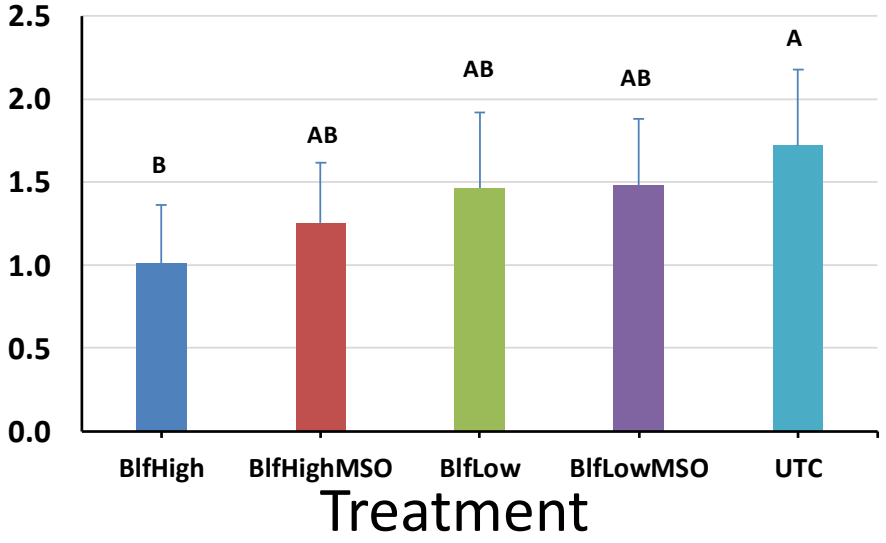


2016 Beleaf rate by MSO grower trial

Mean number of large *Lygus* nymphs on each sample day and over all sample days on treated and untreated plots

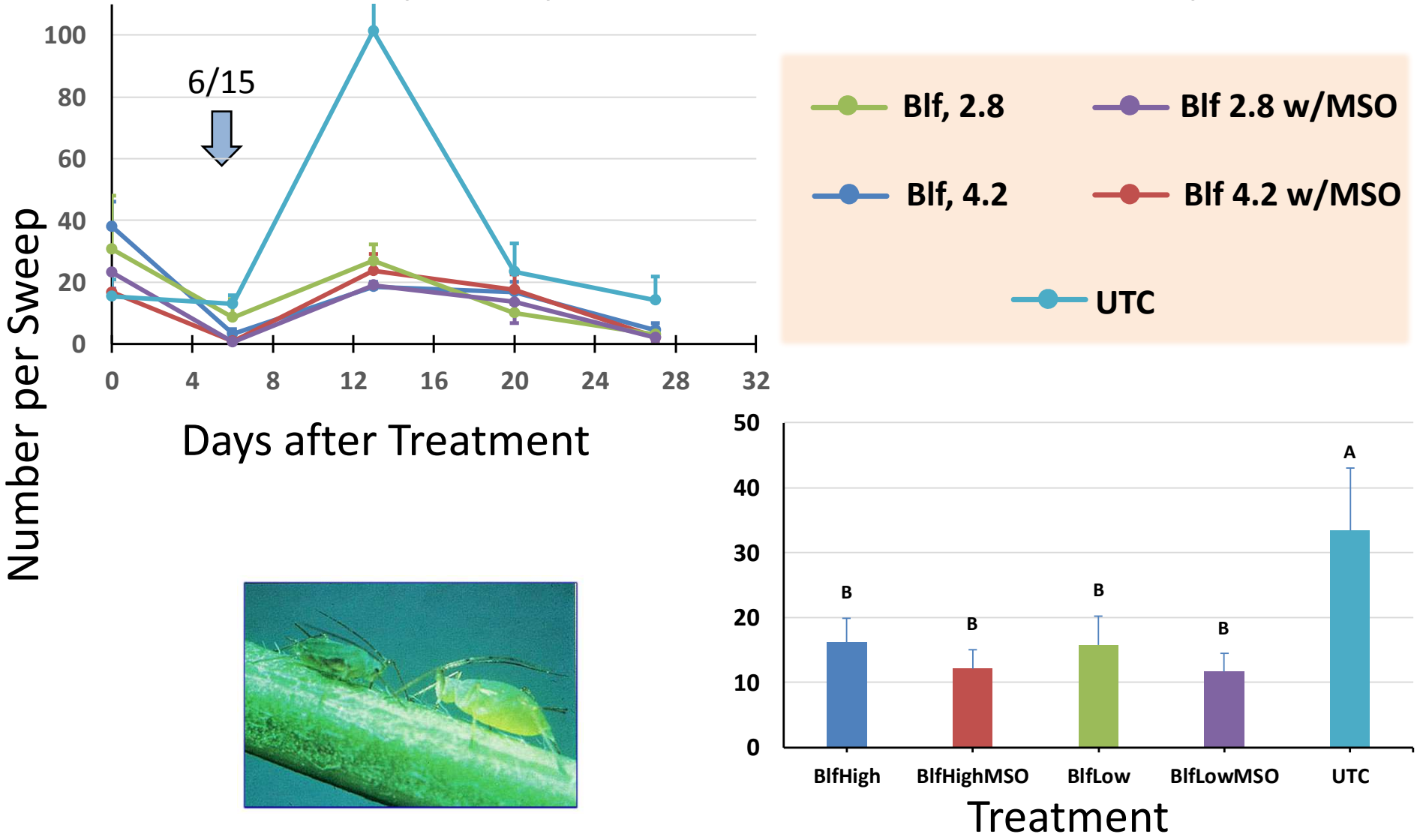






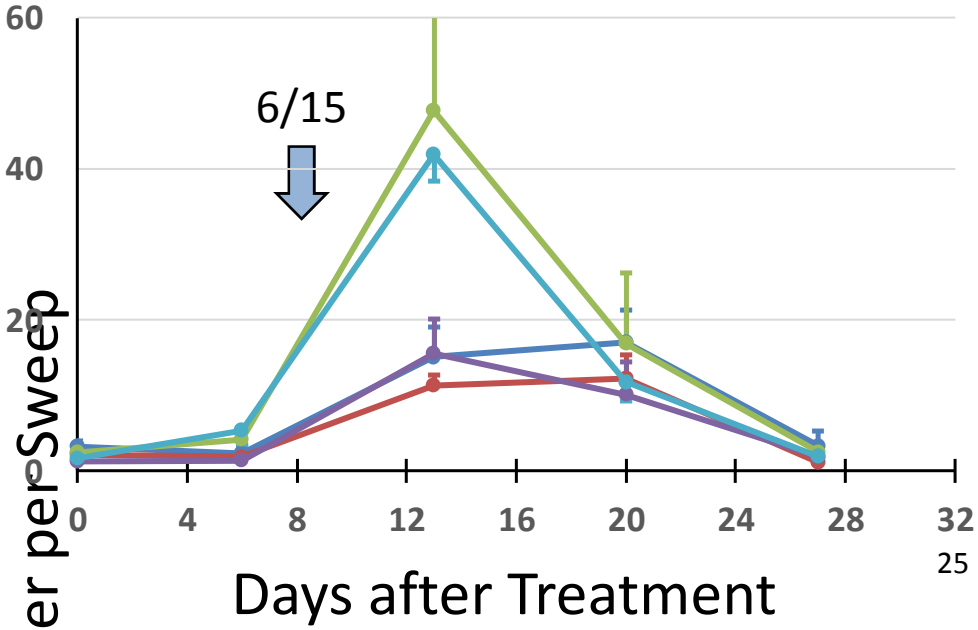
2016 Beleaf rate by MSO grower trial

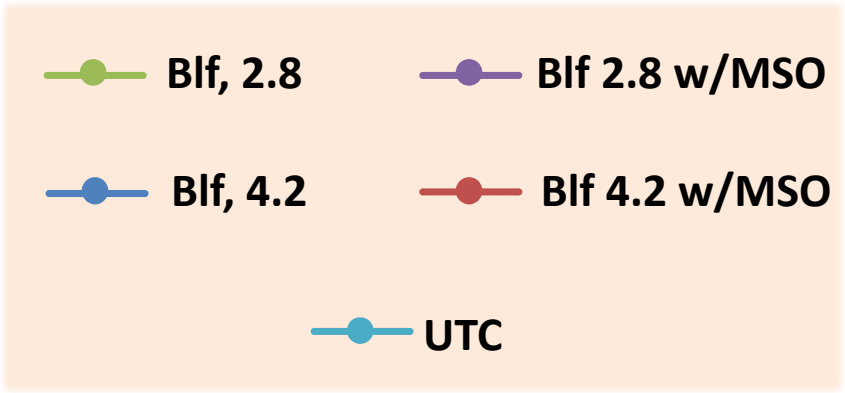
Mean number of pea and blue alfalfa aphids on each day and over all sample days on treated and untreated plots

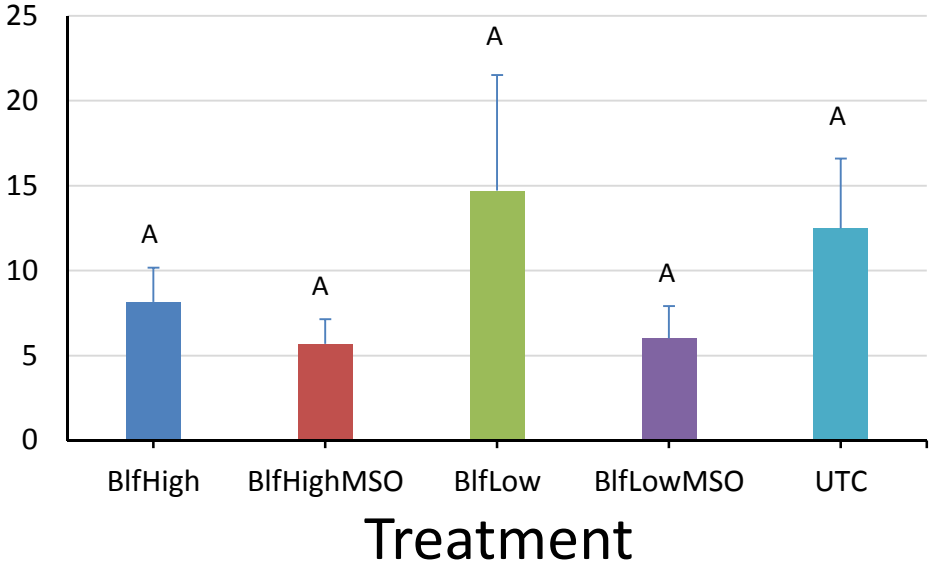


2016 Beleaf rate by MSO grower trial

Mean number of spotted alfalfa aphids on each day and over all sample days on treated and untreated plots







Conclusions

Impact of Beleaf on lygus and aphid numbers

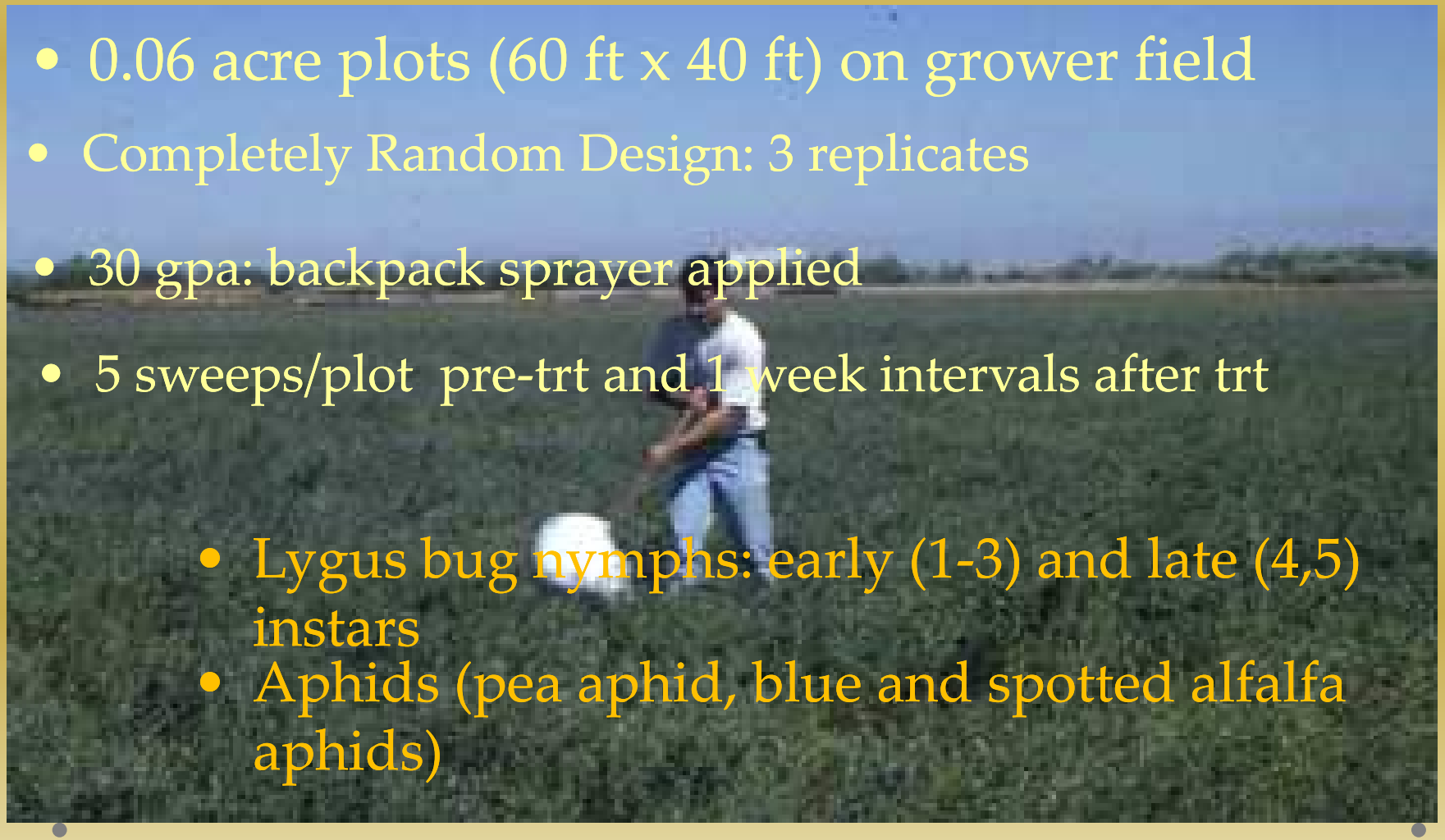
- Interpretation complicated by low lygus numbers
- Non-significant trend for lower numbers of lygus adults and small instar nymphs on plots treated with high Beleaf rates
- Significant trend for lower numbers of large instar lygus nymphs and pea aphids on plots treated with high rates

Impact of MSO lygus and aphids

- Non-significant trend for lower pea and blue alfalfa aphid and spotted alfalfa aphid numbers on plots treated with MSO

Beleaf (flonicamid) rate by MSO trial

Pesticide trial methods



- 0.06 acre plots (60 ft x 40 ft) on grower field
- Completely Random Design: 3 replicates
- 30 gpa: backpack sprayer applied
- 5 sweeps/plot pre-trt and 1 week intervals after trt
  - Lygus bug nymphs: early (1-3) and late (4,5) instars
  - Aphids (pea aphid, blue and spotted alfalfa aphids)

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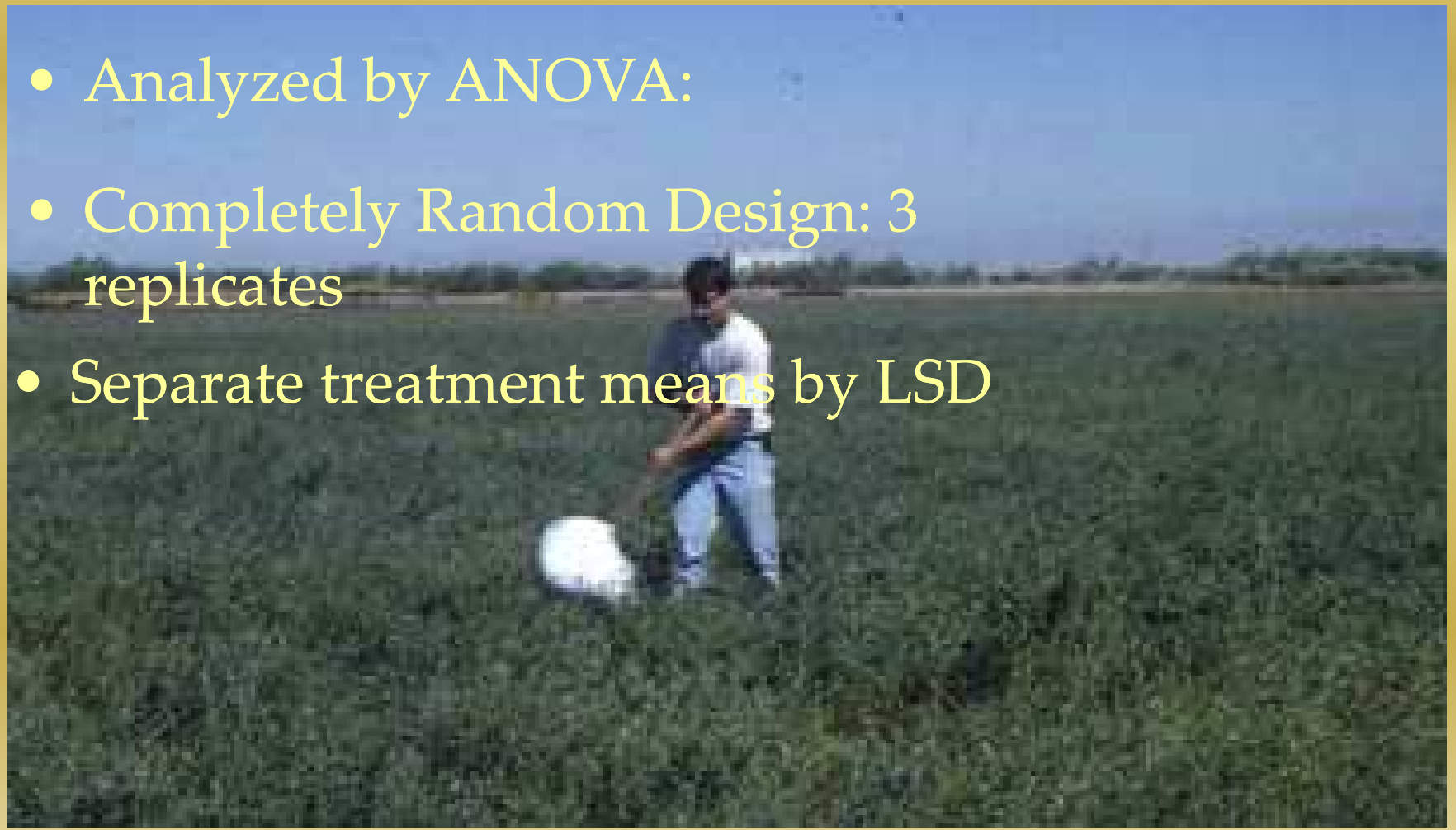

- Analyzed by ANOVA:
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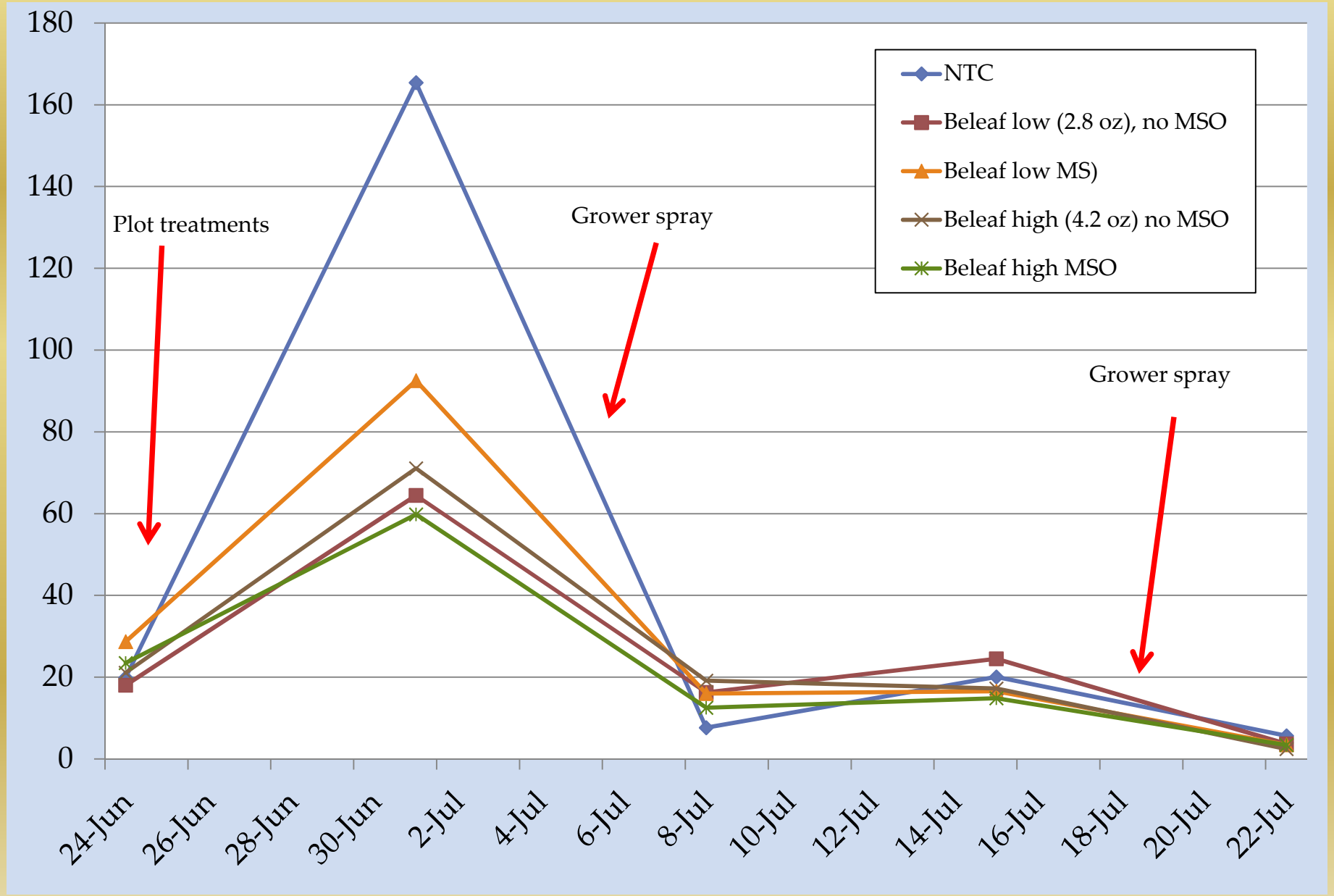
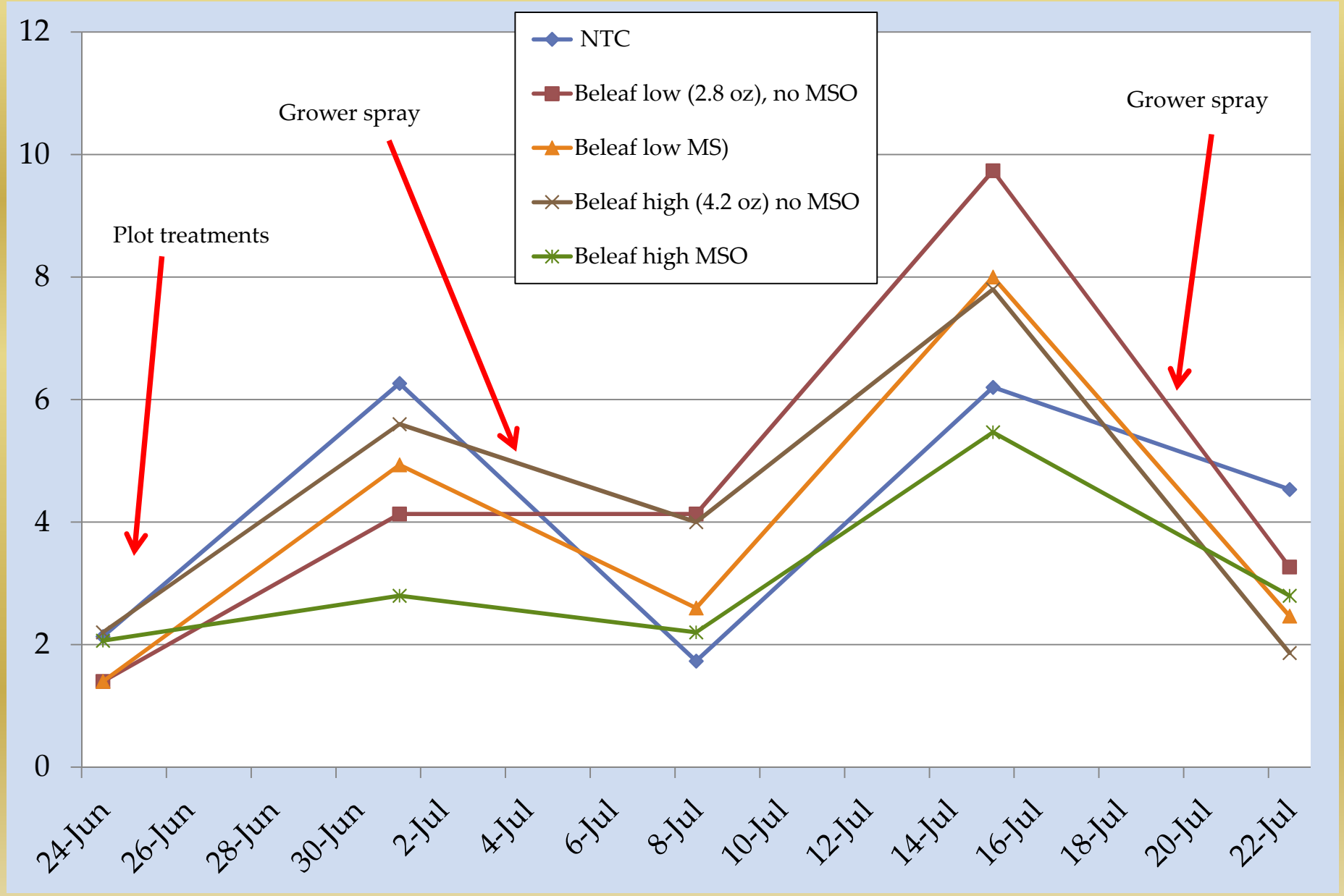
- Separate treatment means by LSD

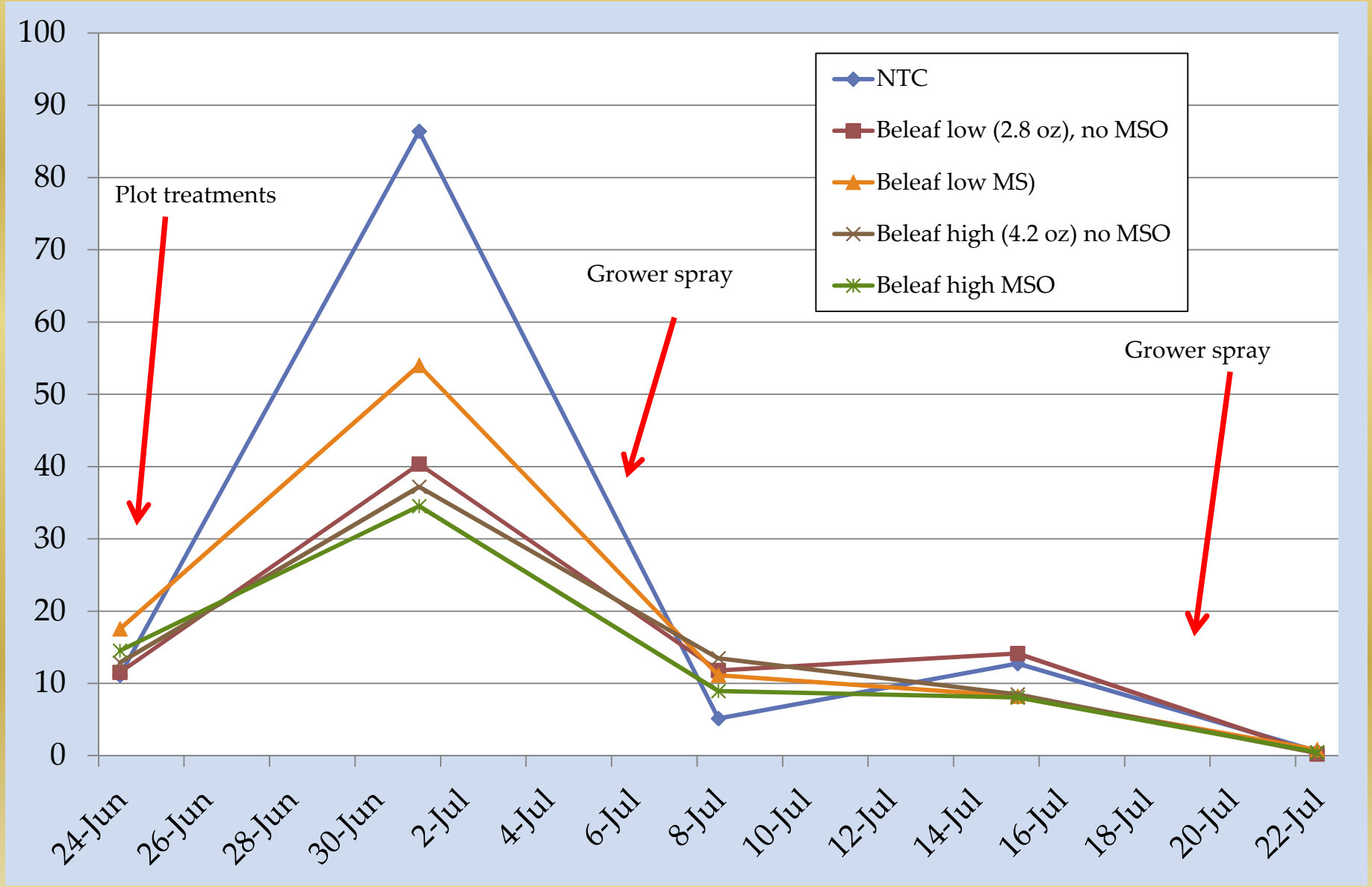
Total lygus (# per sweep)



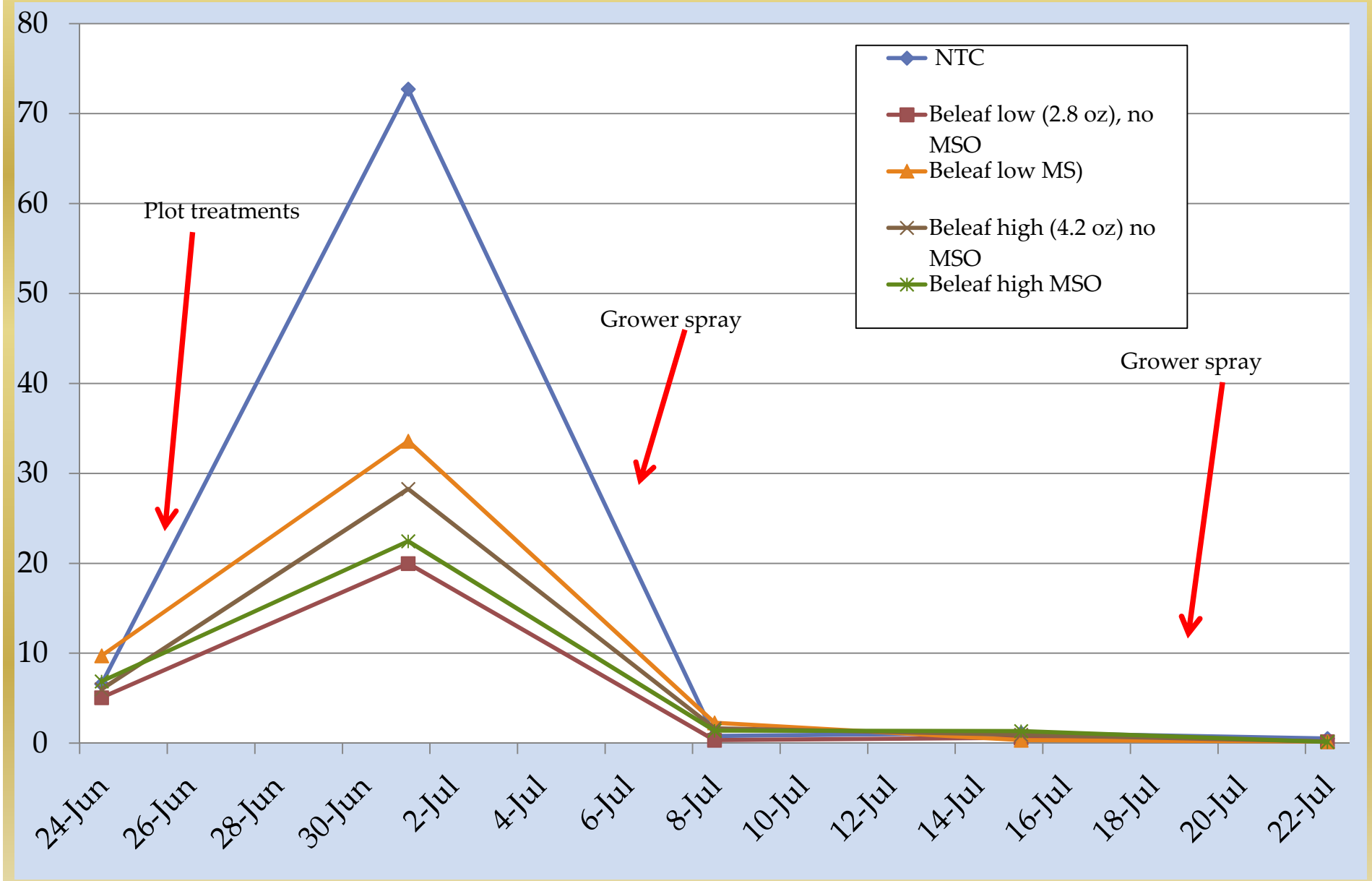
Adult lygus (# per sweep)



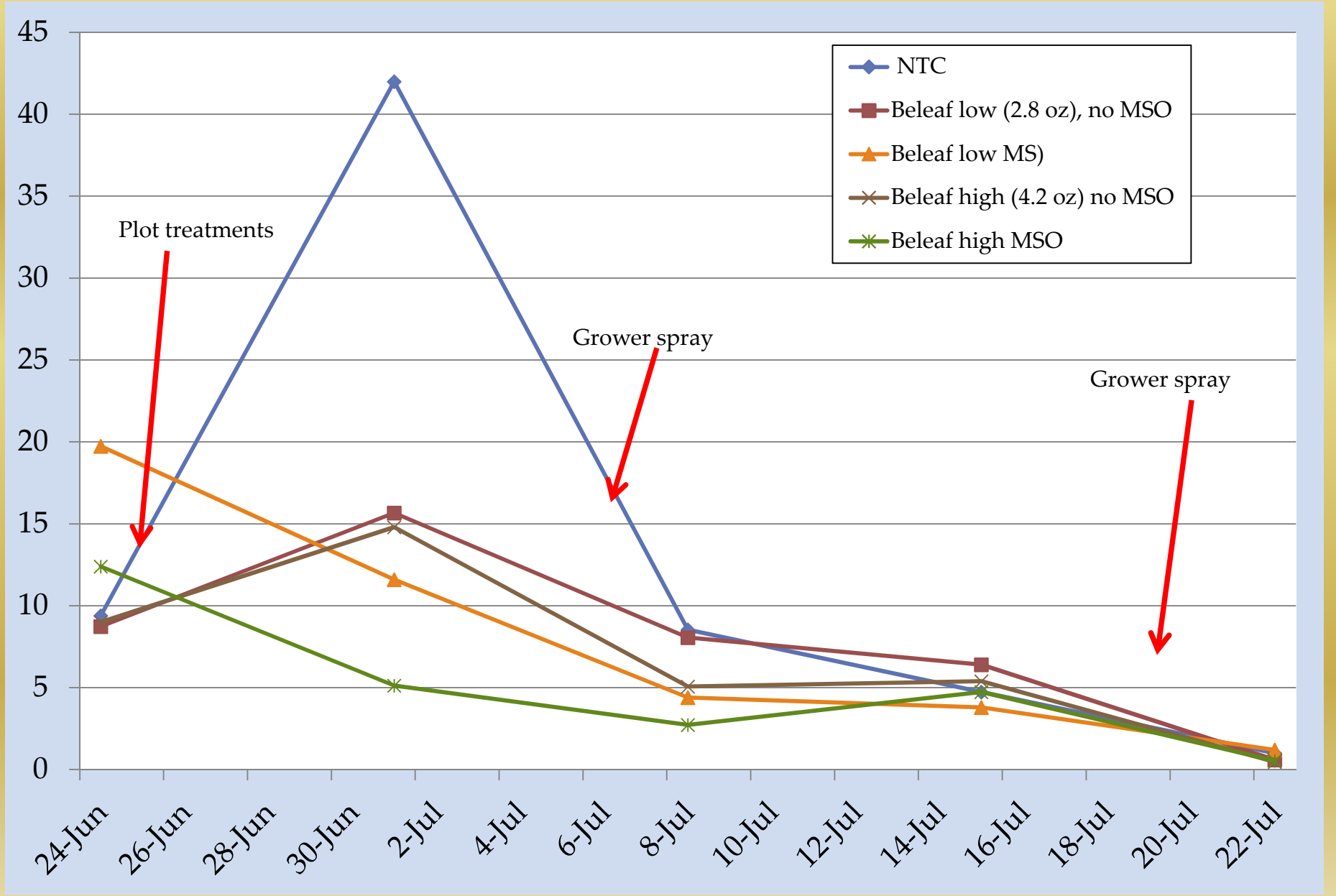
Lygus Instars 4-5(# per sweep)



Lygus Instars 1-3(# per sweep)



Aphids (# per sweep)



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Impact of MSO lygus and aphids

- Non-significant trend for lower pea and blue alfalfa aphid and spotted alfalfa aphid numbers on plots treated with MSO

Thanks to:

- WASGA/USDA-ARS Logan Bee lab/OR Alfalfa Seed Commission
  For financial support
- ID & OR Grower/cooperators
  For access to fields and making applications for the trial
- FMC Corporation, Dow Ag.
  For material support and assistance organizing the trial
- Noemi Fernandez, Paul Blanscet, Sasha Adams, and Sheila Keith
  For their help conducting this work

University of Idaho

PARMA COCOON TESTING LABORATORY

Southwest Idaho Research and
Extension Center
29603 U of I Lane
Parma, ID 83660
208 722-6701

- Faxitron X-Ray Machine
- Owned by IA&CSC
- Bought with funds from ID, OR and NV alfalfa Seed Commissions
- Sample costs for ID OR and NV
  - Live counts: $30 per sample, results in about a week
  - Sex Ratio $25: results in 4-6 weeks
- Sample costs elsewhere
  - Live counts: $60 per sample, results in about a week
  - Sex Ratio $25: results in 4-6 weeks
- We run 80 to 120 tests per year: most are not from ID, OR and NV


01-01

Why is Mode of Action Important?

- Required by regulatory agencies
- Provides insight about how insecticides may affect humans
- Understanding mode of action can help with insecticide resistance management

Larry Story X-ray 16-0... Sign in

File Home Insert Draw Page Layout Formulas Data Review View Tell me

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PARMA COCOON TESTING LABORATORY
X-RAY REPORT

Sample no. 16-062
Name/farm Story/Story Farms
Lot Lot #1

Date received 3/17/2016
Date x-rayed 3/18/2016
Cell type Loose

Sample	Weight (g)[1]	Live larvae	Dead larvae	Live pupae	Dead pupae/ adults	Chalk-broad	Parasites	Predators	Pollen balls	Empty cells	Machine damage	Unknown	Total number of cells	Live Larvae/ pound[3]
1	10	25	3	0	1	1	15	0	61	3	0	0	109	1135
2	10	26	0	0	0	1	20	0	58	3	0	0	108	1180
3	10	16	1	0	0	4	17	0	68	3	1	0	110	726
4	10	17	1	0	1	3	13	0	65	3	0	0	103	772
5	10	19	4	0	0	2	6	0	66	4	2	0	103	863
Total	50	103	9	0	2	11	71	0	318	16	3	0	533	4676
Average	10	20.6	1.8	0	0.4	2.2	14.2	0	63.6	3.2	0.6	0	107	935
Std. Deviation		4.62	1.64	0.00	0.55	1.30	5.26	0.00	4.04	0.45	0.89	0.00	3.36	210
95%CL[2]		4.05	1.44	NA	0.48	1.14	4.61	NA	3.54	0.39	0.78	NA	2.95	183.66
Percent		19.3	1.7	0.0	0.4	2.1	13.3	0.0	59.7	3.0	0.6	0.0	100.0	

Notes

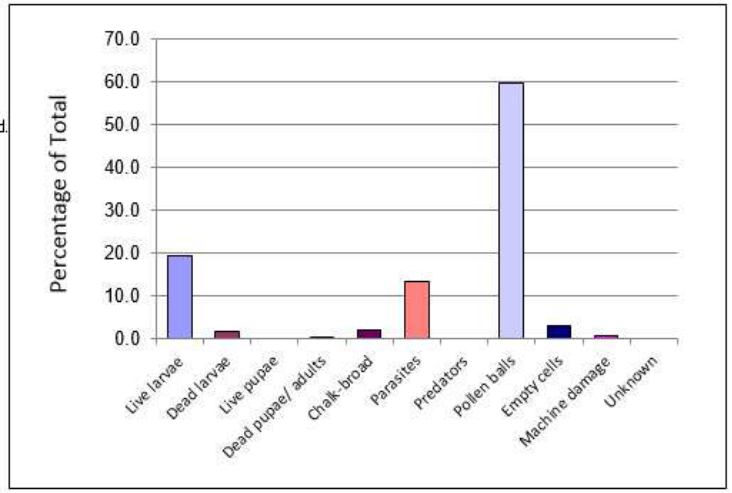
[1]Weight includes cell debri for hand punched samples.

[2]The 95% confidence interval takes into account variability between the 10 gram samples for:

Sample size= 5
alpha level= 0.05

[3]Changes in humidity may effect live larvae per pound. For greatest accuracy make estimates of total pounds of cells at the same time X-rays are taken.

Percent live larvae is less sensitive to changes in moisture content of bee cells.



Cocoon Report Form Sheet1

Ready 55%

Larry Stor... Sign in

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PARMA COCOON TESTING LABORATORY

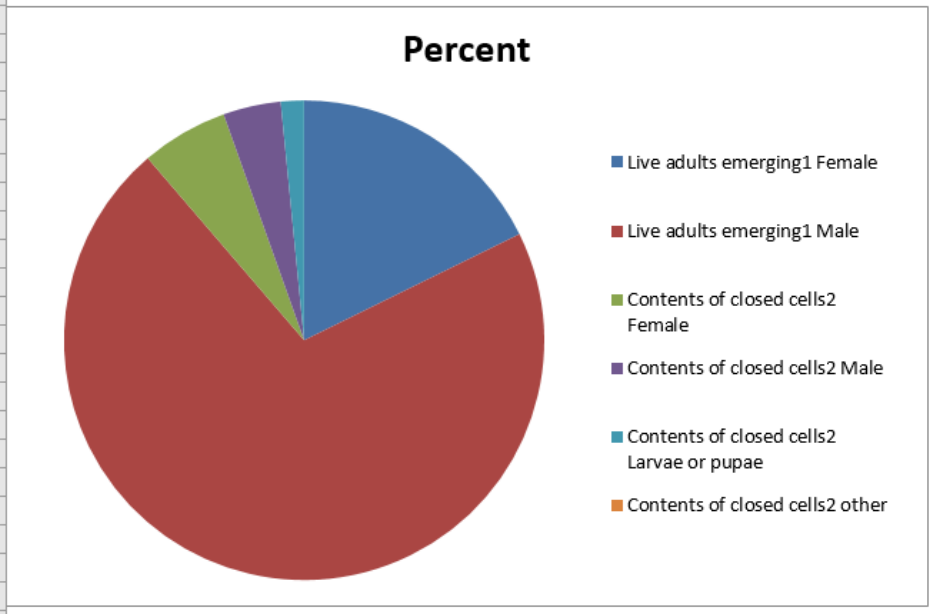
SEX RATIO REPORT

Sample no. 16-065

Name/farm Larry Story/Story Farm

Lot Lot 4

	Live adults emerging[1]		Contents of closed cells[2]				Total number of cells
	Female	Male	Female	Male	Larvae or pupae	other	
Number	91	365	30	20	8	0	514
Percent	17.7	71.0	5.8	3.9	1.6	0.0	100.0



Sex Ratio Report Form

Ready 79%

Harvey's (Dow) "Transform" slides follow

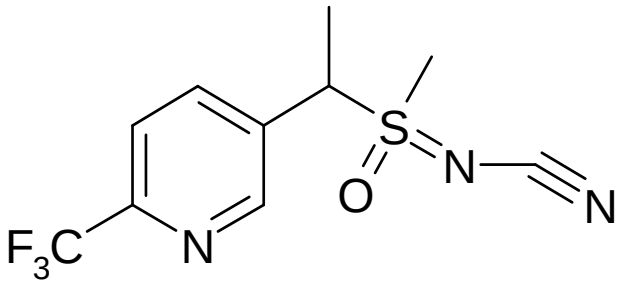
Isoclast™ Active

- Isoclast™ active is the commercial active ingredient brand name for sulfoxaflor.
  - Active ingredient in Transform®, Closer®, Sequoia™, and other insecticide brands.
  - While sulfoxaflor remains identified on the label and package, the trademarked visual identity for Isoclast will be a more prominent marking that clarifies the presence of the active ingredient in the product.

ISO Common Name	Commercial Name
sulfoxaflor	*Isoclast™ active*

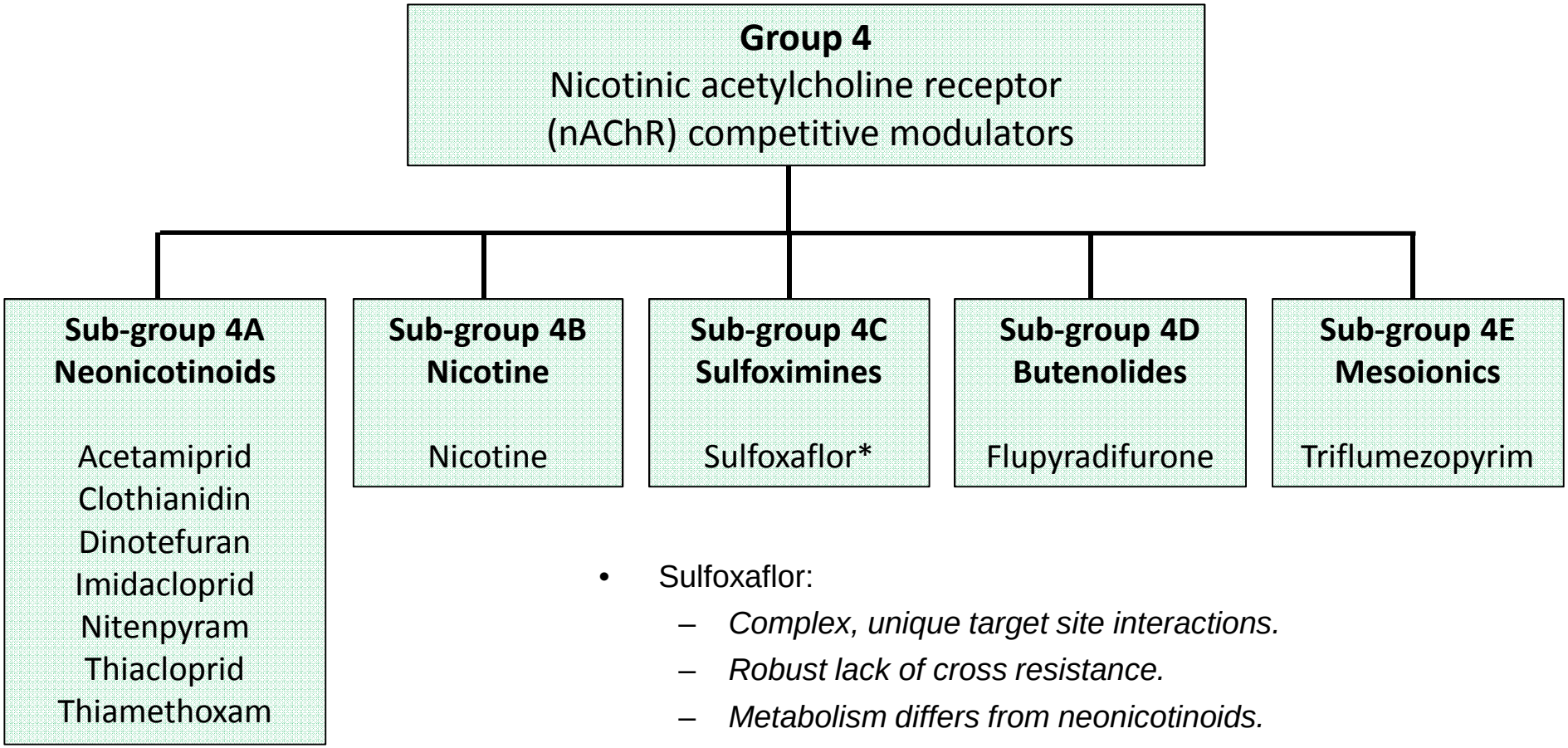
Overview of Isoclast™ Active

- Discovered by and proprietary to Dow AgroSciences
- Belongs to a new chemical class of insecticides—*sulfoximines*
- Has been developed and is being registered globally for use on most major crop groups
  - Currently being sold in North America, Australia, parts of Asia and Latin America, and many other countries
- Controls economically important sap-feeding insect pests



Isoclast™ Active

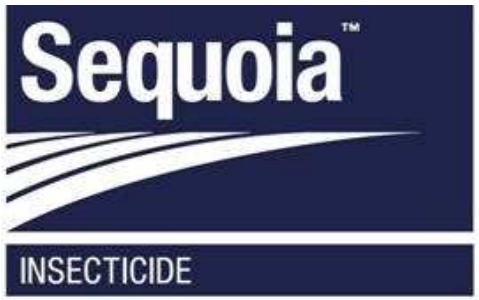
Insecticide Resistance Action Committee (IRAC) Classification of Sulfoxaflor

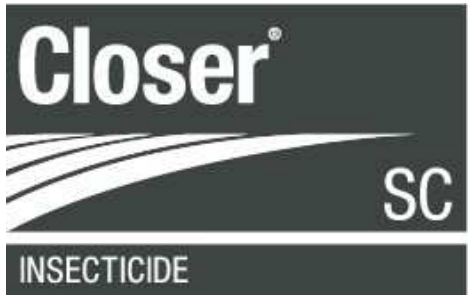


- Sulfoxaflor:
  - *Complex, unique target site interactions.*
  - *Robust lack of cross resistance.*
  - *Metabolism differs from neonicotinoids.*

Isoclast™ Active Products

Registered for use on row crops, including cotton, soybean, potato, and cereals.





Registered for use on specialty crops, including vegetables, citrus, grapes, tree nuts, and fruits.

Attributes of Isoclast™ Active

- Effective at low use rates
- Excellent knockdown and residual control
- Systemic and translaminar activity
- Effective against insect pest populations resistant to other insecticides
- Valuable rotation partner with other chemistries
- Excellent fit in IPM programs because it has minimal impact on beneficial insects and predatory mites

Isoclast™ Active Summary

- Discovered by and proprietary to Dow AgroSciences
- Controls economically important sap-feeding insects on most major crops
- Belongs to a new chemical class of insecticides (sulfoximines)
- Classified by IRAC as a Sub-group 4C insecticide
- Mode of action
  - Structurally different from neonicotinoids
  - Binds differently to nAChR binding sites than other nAChR agonists, including neonicotinoids
  - Robust lack of cross-resistance in insects resistant to other insecticides
  - Valuable rotation partner with other insecticide chemistries
- Excellent fit in IPM programs—minimal impact on beneficial insects and predator mites

Sulfoxaflor (Isoclast® Active) Regulatory History

- **July 2013**: Pollinator Stewardship Council (et. al) filed lawsuit in U.S. 9th circuit court of Appeals to review US EPA sulfoxaflor registration
- **September 11, 2015**: US 9th circuit court of appeals ruled sulfoxaflor registration should be "vacated."
- **November 12, 2015**: US 9th Circuit Court mandated EPA to vacate registration of sulfoxaflor-containing products
- **November 13, 2015**: EPA issued cancellation order and existing stocks provision for sulfoxaflor containing products
- **November 13** on…Dow AgroSciences has been working with EPA and states to achieve new registration

Renewed Registration for Products Containing Sulfoxaflor (Isoclast® Active)

- **October 14, 2016** the U.S. Environmental Protection Agency (EPA) re-established the registration for products containing sulfoxaflor (Isoclast Active): Transform® WG and Closer® SC Insecticides
- The new registration limits the crops available for use but, for the Pacific Northwest, all crops previously registered are still maintained
- Some crops have additional restrictions around use during blooms

Talking Points

- **Dow is working diligently with EPA to provide information needed to add remaining crops to the label and remove buffer zones and tank-mix restrictions in the future.**
- **Dow is also working with EPA to determine the best course of action regarding the use of Transform® WG in alfalfa seed in 2017.**
- **Dow will work closely with stakeholders from each state and keep them up-to-date on the possible use of Transform® WG in alfalfa seed for 2017.**

An assortment of MOA slides follow. Most of these were created by me using available private and public literature. Use them as you feel necessary

Newly Registered Pesticides

❖ Rimon 0.83EC (Chemtura Corp.)

- **Insecticide class:** Insect growth regulator (IGR)
- **Mode of action:** disrupts cuticle (chiton) synthesis and prevents molting (growth from one insect stage (instar) to the next)
- **Systemic in plant?** No
- **Route:** contact or ingestion
- **Insect stages affected:** immature, eggs?
- **Activity spectrum:** broad

Newly Registered Pesticides

❖ Assail 70WP (Cerexagri, Inc.)

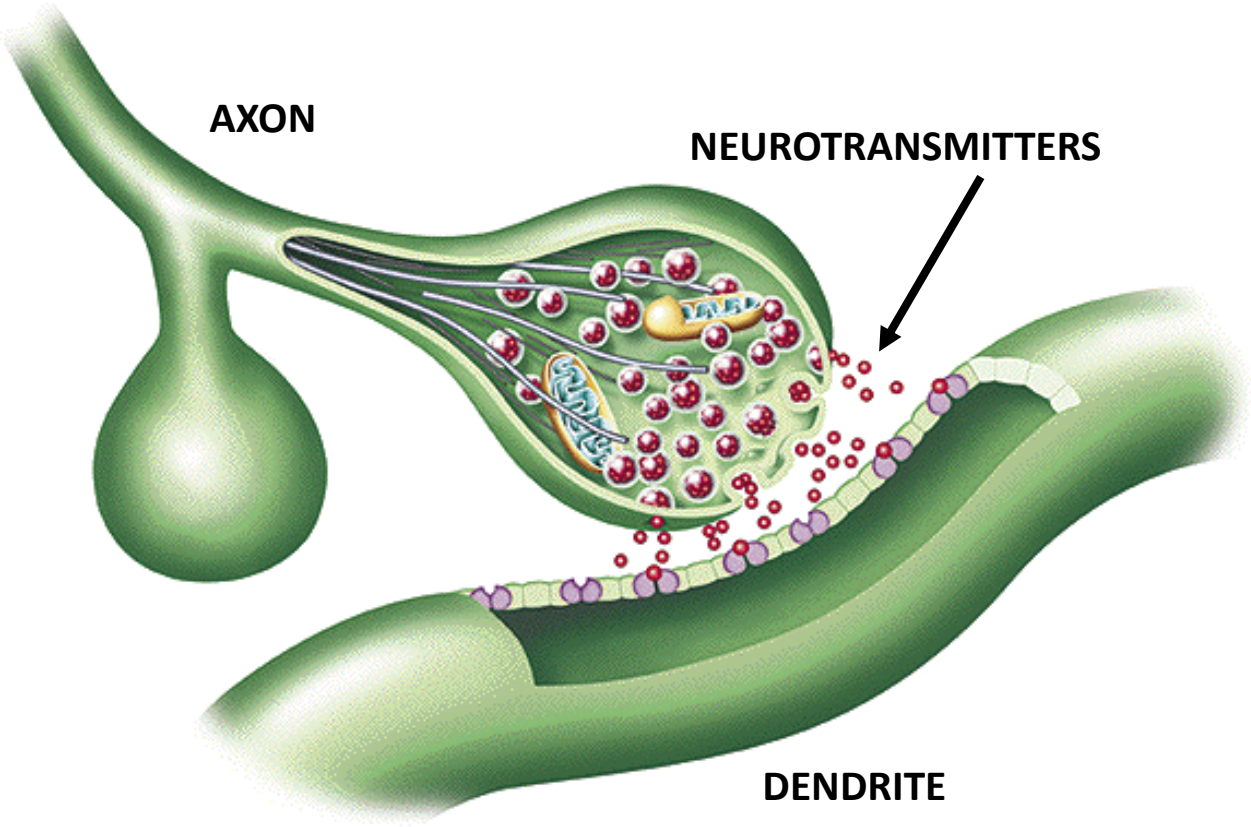
- **Insecticide class:** neonicotinoid
- **Mode of action:** nerve poison, disrupts nerve transmission at synapse by binding (nicotinic) acetocholine receptor
- **Systemic in plant?** Yes, in actively growing plants
- **Route:** ingestion, contact
- **Insect stages affected**: immature, adult
- **Activity spectrum:** narrow, specific to piercing sucking insects

Newly Registered Pesticides

❖ Beleaf 50SG (FMC Corp.)

- **Insecticide class:** pyridinecarbaxamide
- **Mode of action:** undetermined, prevents feeding of sucking insects
- **Systemic in plant?** Yes: trans-laminar in actively growing foliage
- **Route:** ingestion, contact
- **Insect stages affected:** immature, adult
- **Activity spectrum:** narrow, specific to sucking insects

Synaptic Junction



Insecticides that Affect the Nervous System

- Axonic Poisons I – Poison the Nerve Fiber
  - Bind to the voltage-gated sodium channel
  - Prevent the channel from closing
  - Results in continuous nerve stimulation
  - Tremors and uncoordinated movement

Chlorinated Hydrocarbons
Synthetic Pyrethroids

Insecticides that Affect the Nervous System

- Axonic Poisons II – Poison the Nerve Fiber
  - Bind to the g-aminobutyric acid (GABA)-gated chloride channel
  - Blocks the channel
  - Causes nerve hyperexcitation
  - Tremors and uncoordinated movement

Phenyl Pyrizoles

Avermectins

Insecticides that Affect the Nervous System

- Synaptic Poisons – Disrupt Neurotransmitters
  - Bind to the enzyme acetylcholinesterase
  - Prevents enzyme from degrading acetylcholine
  - Results in continuous nerve stimulation
  - Tremors and uncoordinated movement

Carbamates
Organophosphates
Neonicotinoids