Efficacy of Sulfoxaflor for Control of Lygus Bugs in Alfalfa Seed

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Lygus biology & life cycle

Serious pest of alfalfa seed and other seed crops

- Overwinter as adults (late Oct. to Nov. in ID)
  - Plant crowns, litter, & debris
  - Fields, field margins
  - Natural areas
- Become active and mate in spring (~April)

Lygus biology & life cycle

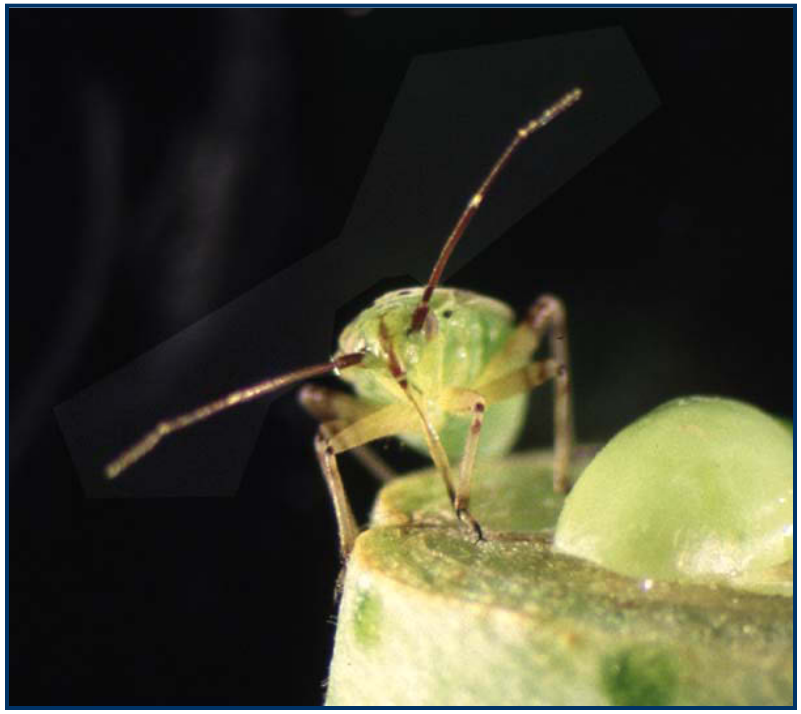
- Females insert eggs in plant tissue
  - Hatch in 1-4 weeks
- Immatures (nymphs)
  - Develop through 5 instars in 1 to 2 months
  - 3 to 4 overlapping generations per year in SW Idaho

Lygus biology & life cycle

- Prefer to feed on reproductive plant parts
  - Flowers, seeds
- Prefer reproductive stage alfalfa to nearly any other plant
  - Lygus + alfalfa grown for seed = the perfect storm

Lygus bug damage

Lygu bugs feed using needle-like mouthparts, injecting salivary enzymes into plant tissue



Two types of damage

- Physical damage from probing
- Chemical damage from digestive enzymes
  - Causes most damage
  - Kills plant tissue
  - Causes deformed growth

Lygus bug damage

Both adults and nymphs cause damage

- Feed on developing flower buds, flowers, & immature pods
    - Drying (blasting) of flower buds
    - Flower, seed pod drop
- Some reduction in seed numbers

Lygus damage to alfalfa seed

Most damage from feeding on immature seeds in developing pods

- Most (> 70%) damage caused by 4th and 5th instars and adults
- Damage is to green seed: stylets can't penetrate hard seed
- Without management, losses of 50% to nearly 100% are possible

Lygus management

Managed largely with insecticides

- A number of insecticides labeled for lygus control
  - Broad spectrum OP's, carbamates, pyrethroids
  - Several lower-risk insecticides
- Usefulness of available compounds limited by
  - Efficacy and resistance management issues
  - Toxicity to beneficial insects
    - Natural enemies, but especially
    - Pollinators: ID-alfalfa leafcutting bee (ALCB)
- Need for effective, bee-safe insecticides

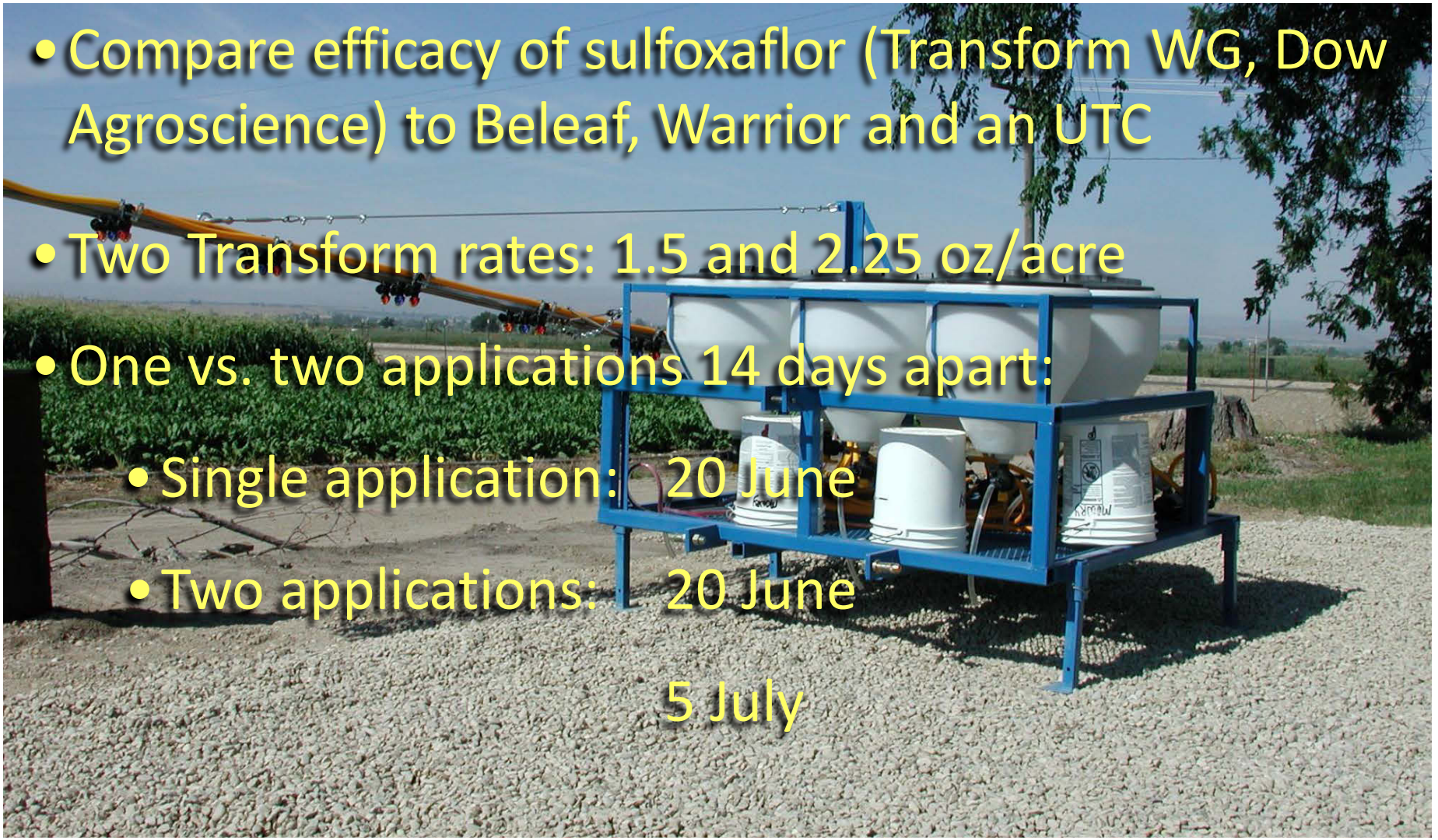
Sulfoxaflor (Transform)

New pesticide from Dow

- Sulfoxamine insecticide: IRAC class 4C
- Acts on nicotinic acetylcholine receptors
- No known cross reaction with other insecticides
- Good translaminar and systemic activity
- Good activity on sap feeding insects: aphids, whiteflies, plant hoppers, plant bugs
- Low activity on most natural enemies and pollinators
- Could be a good fit for alfalfa seed IPM programs

Idaho lygus pesticide trial

Trial goals



- Compare efficacy of sulfoxaflor (Transform WG, Dow Agroscience) to Beleaf, Warrior and an UTC
- Two Transform rates: 1.5 and 2.25 oz/acre
- One vs. two applications 14 days apart:
  - Single application: 20 June
  - Two applications: 20 June
    5 July

Idaho lygus pesticide trial

Pesticide treatments

Pesticide	No. Applications	Rate (oz/acre)	Class/IRAC group	Manufacturer
Transform WG	1	1.50	Sulfoxamine/ 4C	Dow
	1	2.25		
	2	1.50		
	2	2.25		
Beleaf 50 SG	1	2.80	Carboxamide/ 9C	FMC
	2			
Warrior II	1	1.92	Pyrethroid/ 3A	Syngenta
	2			
GF 2628	2	2.75	Not specified	Dow
UTC	n/a	n/a	n/a	n/a

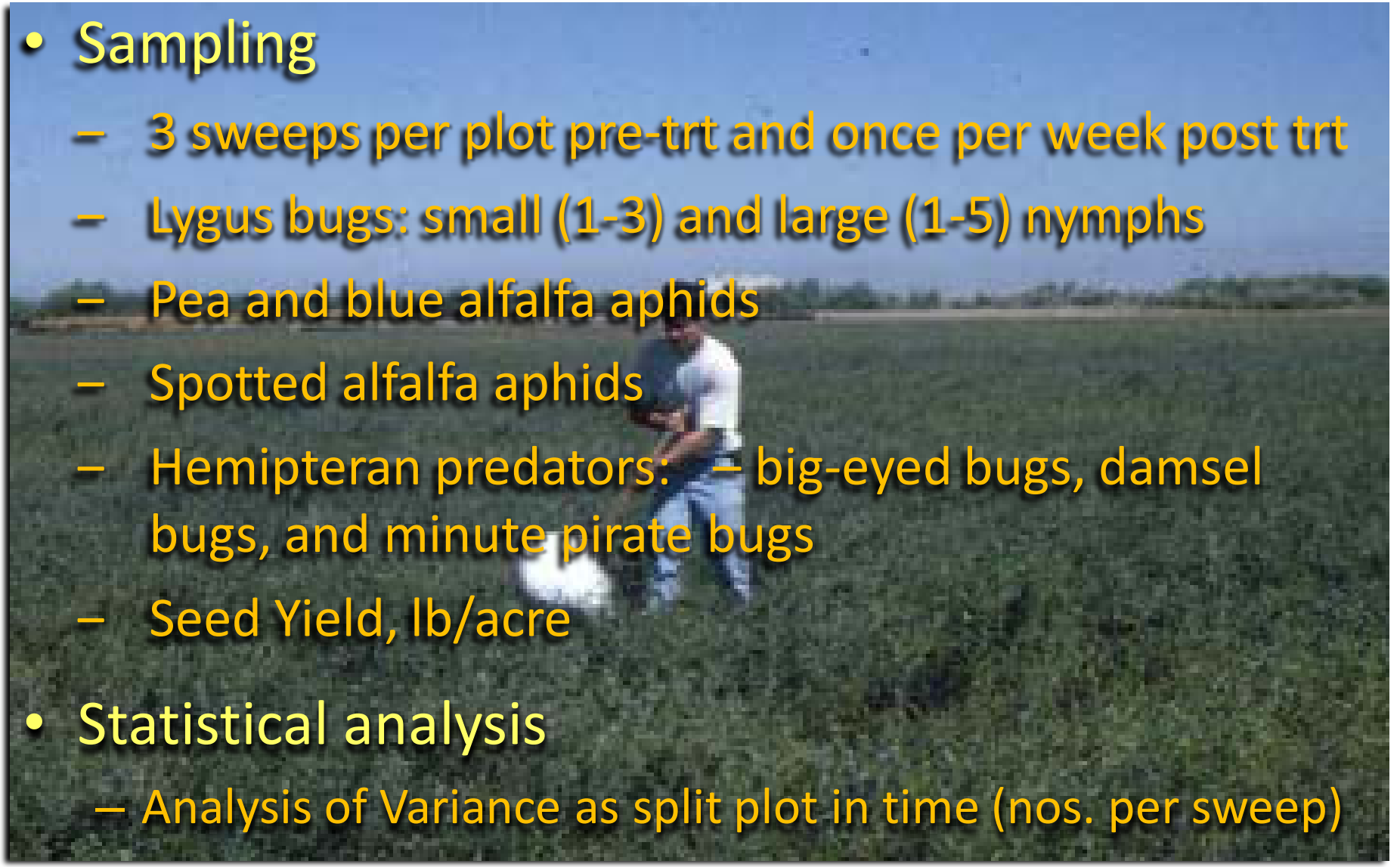
Idaho lygus pesticide trial

Trial methods

- Experimental design
  - 0.01 acre plots (22 ft. x 22ft.)
  - Ten treatments × 4 replications
  - Randomized complete block
- Application
  - Foliar spray, tractor drawn boom
  - 30 gal/a @ 30 psi

Idaho lygus pesticide trial

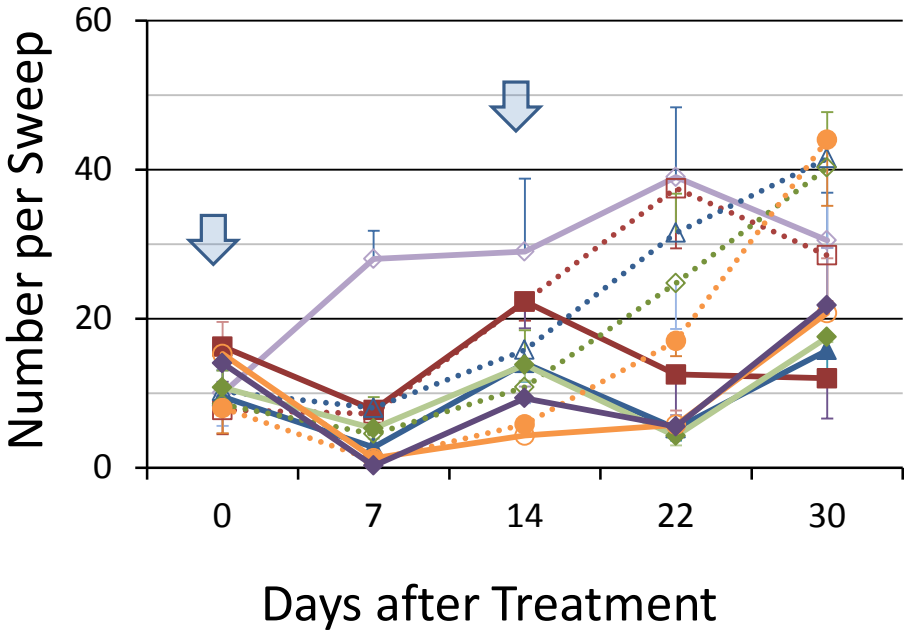
Trial methods

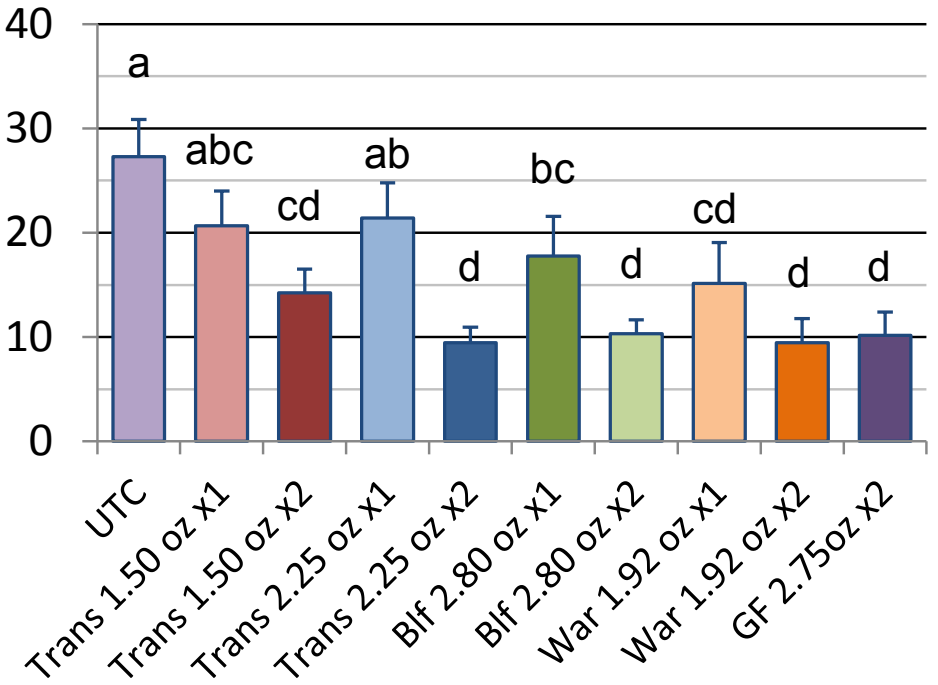


- Sampling
  - 3 sweeps per plot pre-trt and once per week post trt
  - Lygus bugs: small (1-3) and large (1-5) nymphs
  - Pea and blue alfalfa aphids
  - Spotted alfalfa aphids
  - Hemipteran predators: – big-eyed bugs, damsel bugs, and minute pirate bugs
  - Seed Yield, lb/acre
- Statistical analysis
  - Analysis of Variance as split plot in time (nos. per sweep)

Idaho efficacy trial results

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

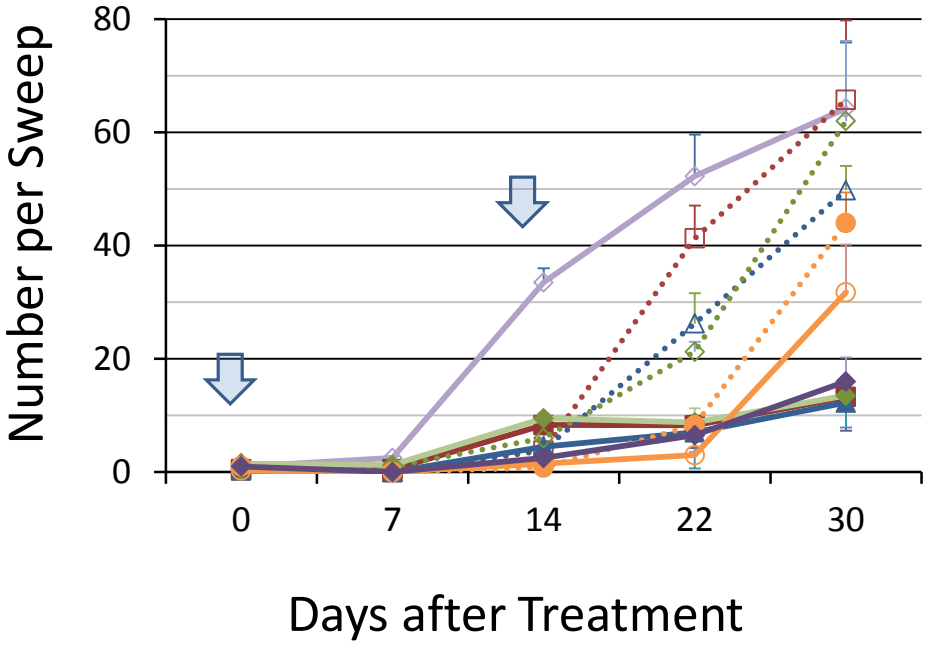


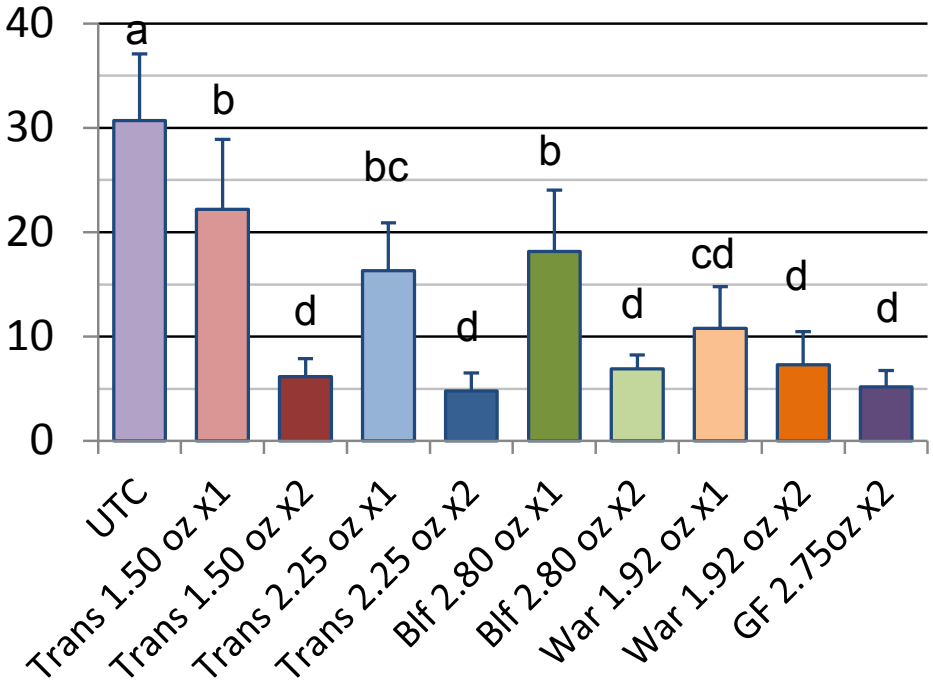


Trans1.50 oz x1
Blf 2.80 oz x1
Trans1.50 oz x2
Blf 2.80 oz x2
UTC
Trans2.25 oz x1
War 1.92 oz x1
GF 2.75oz x2
Trans 2.25oz x2
War 1.92 oz x2

Idaho efficacy trial results

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





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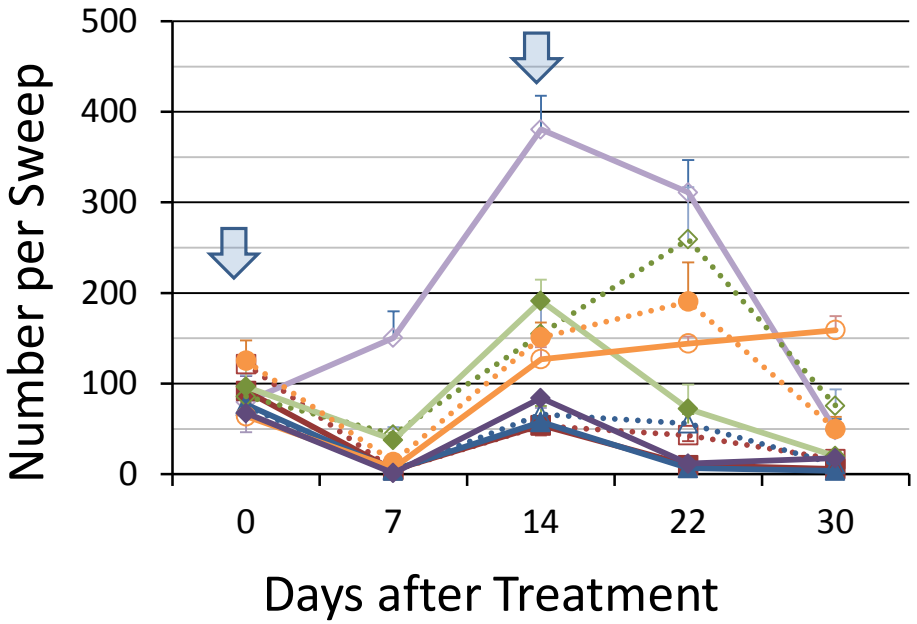
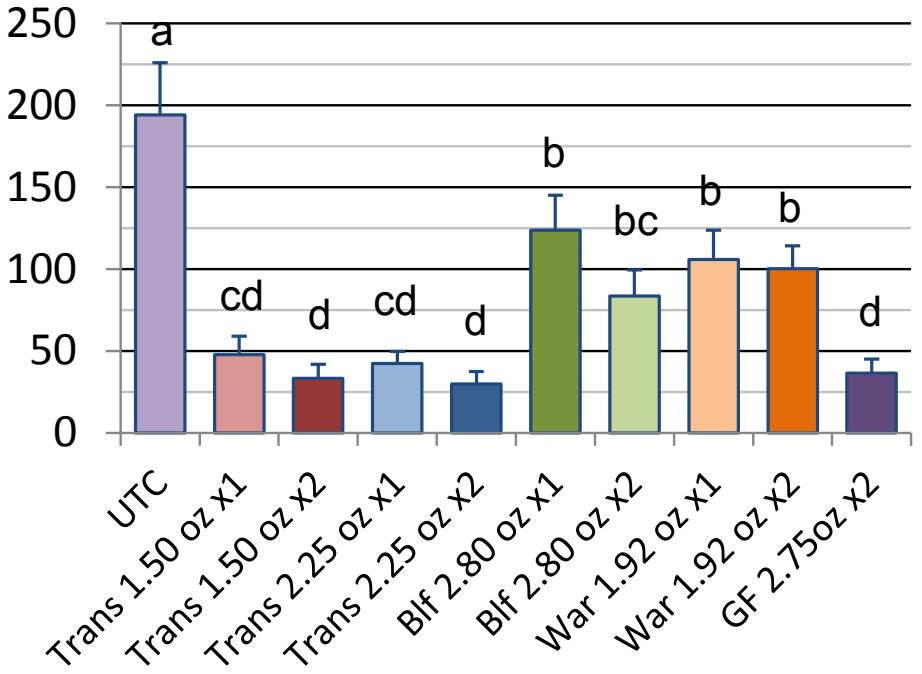
War 1.92 oz x2

Idaho efficacy trial results

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





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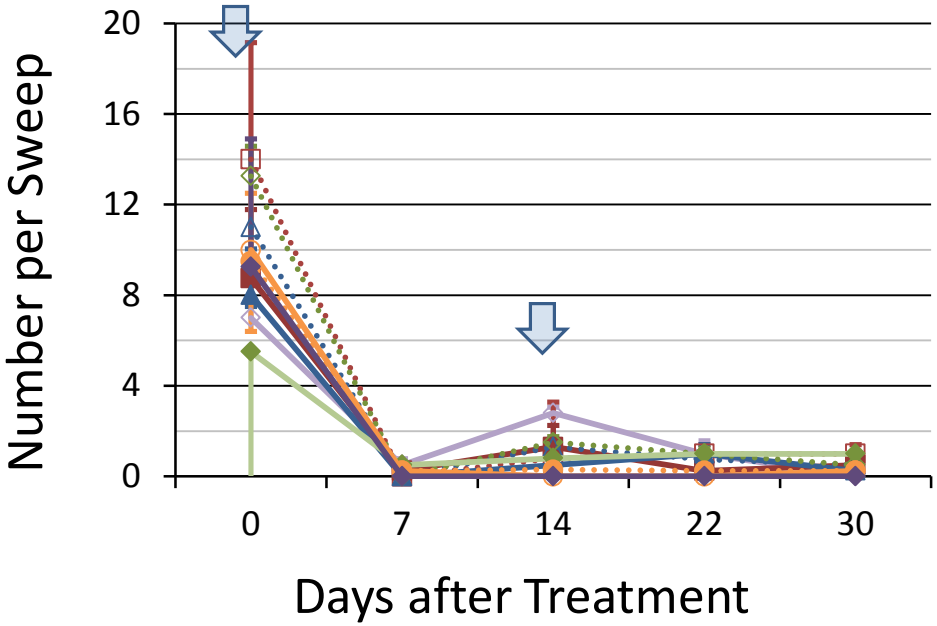
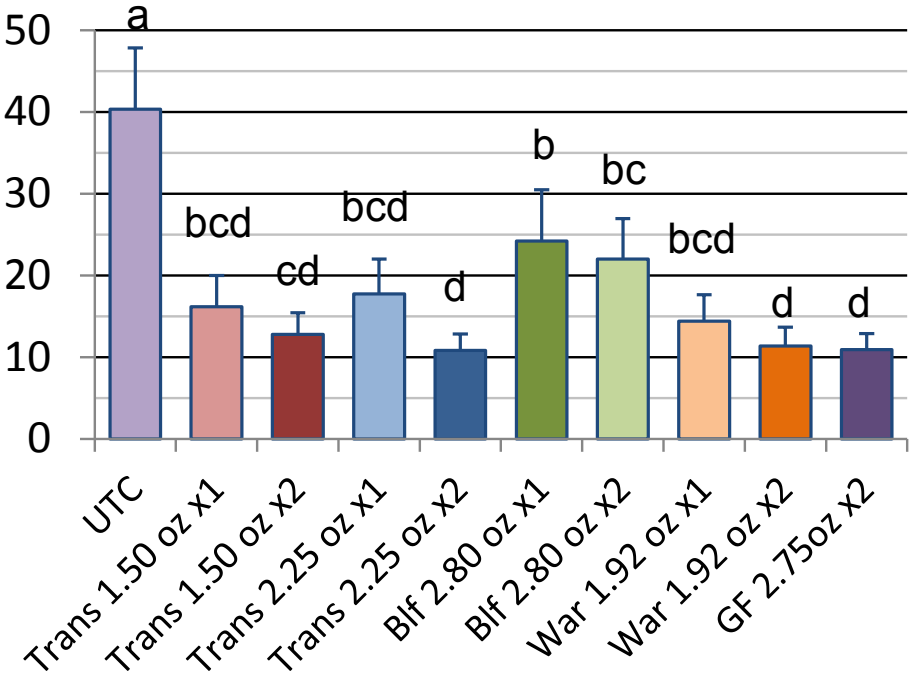
Trans 2.25oz x2
War 1.92 oz x2

Idaho Efficacy Trial Results

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





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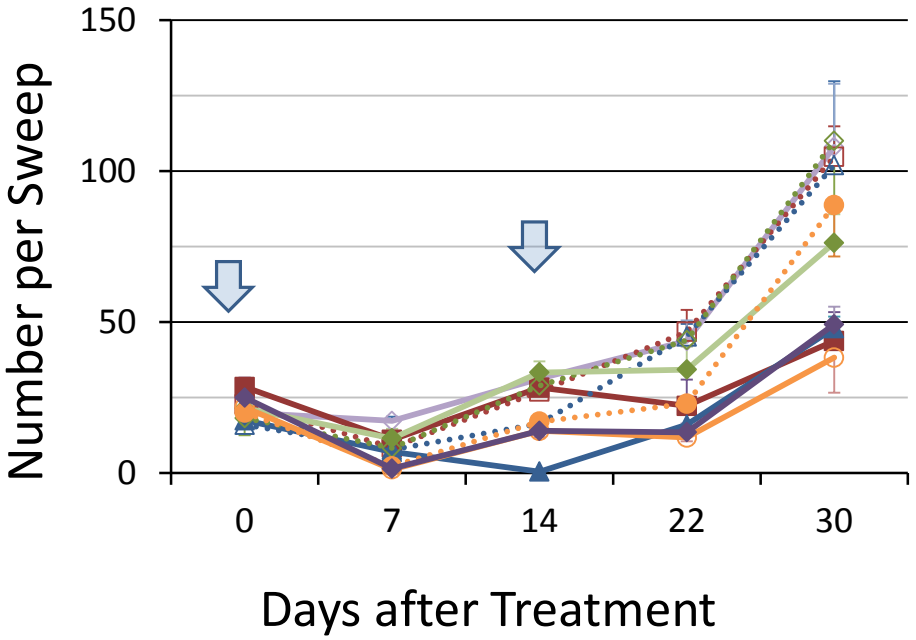
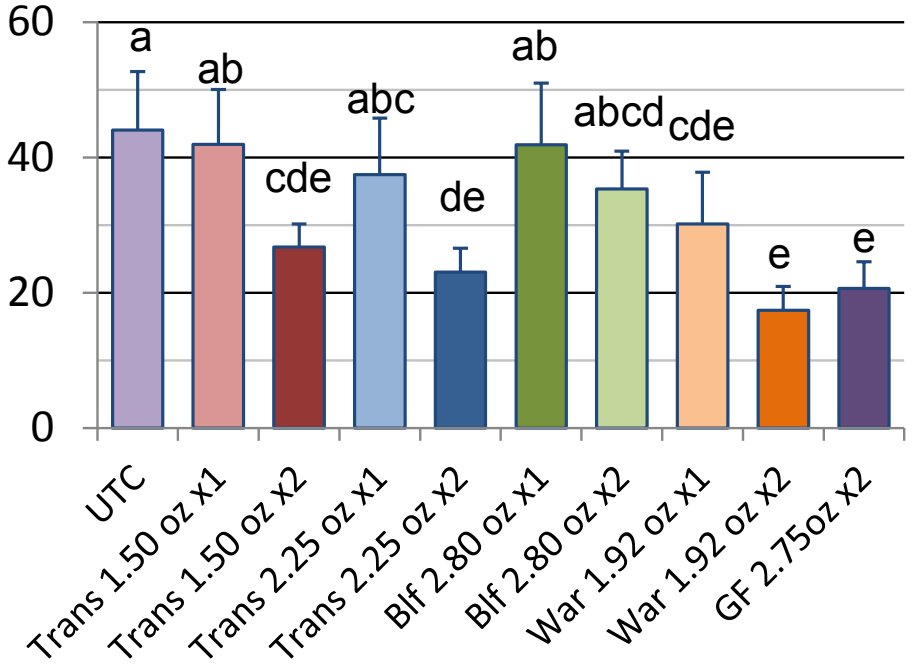
Blf 2.80 oz x1
Blf 2.80 oz x2
War 1.92 oz x1
War 1.92 oz x2
UTC
GF 2.75oz x2

Idaho Efficacy Trial Results

Mean number of hemipteran predators on each sample day and over all days on treated and untreated plots





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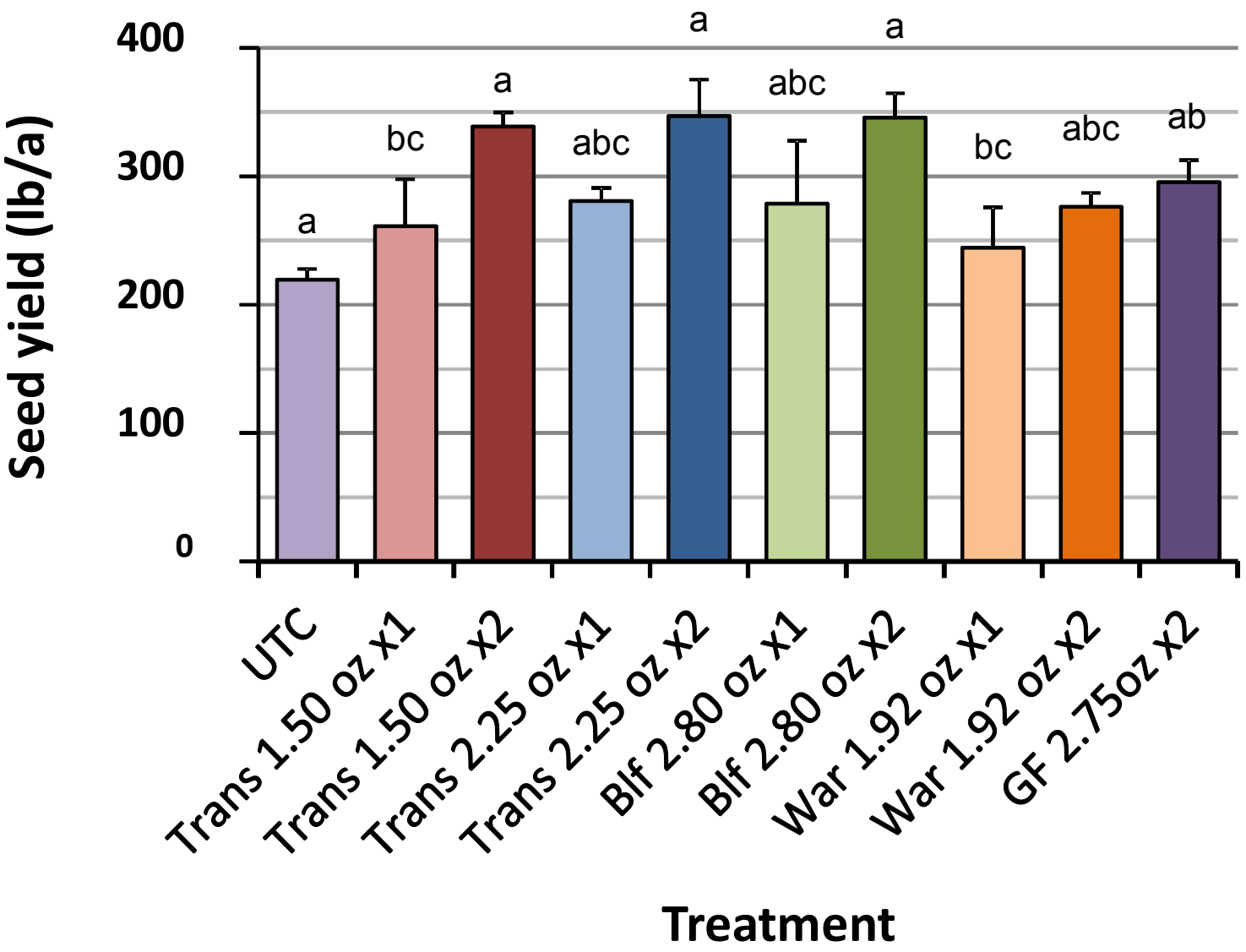
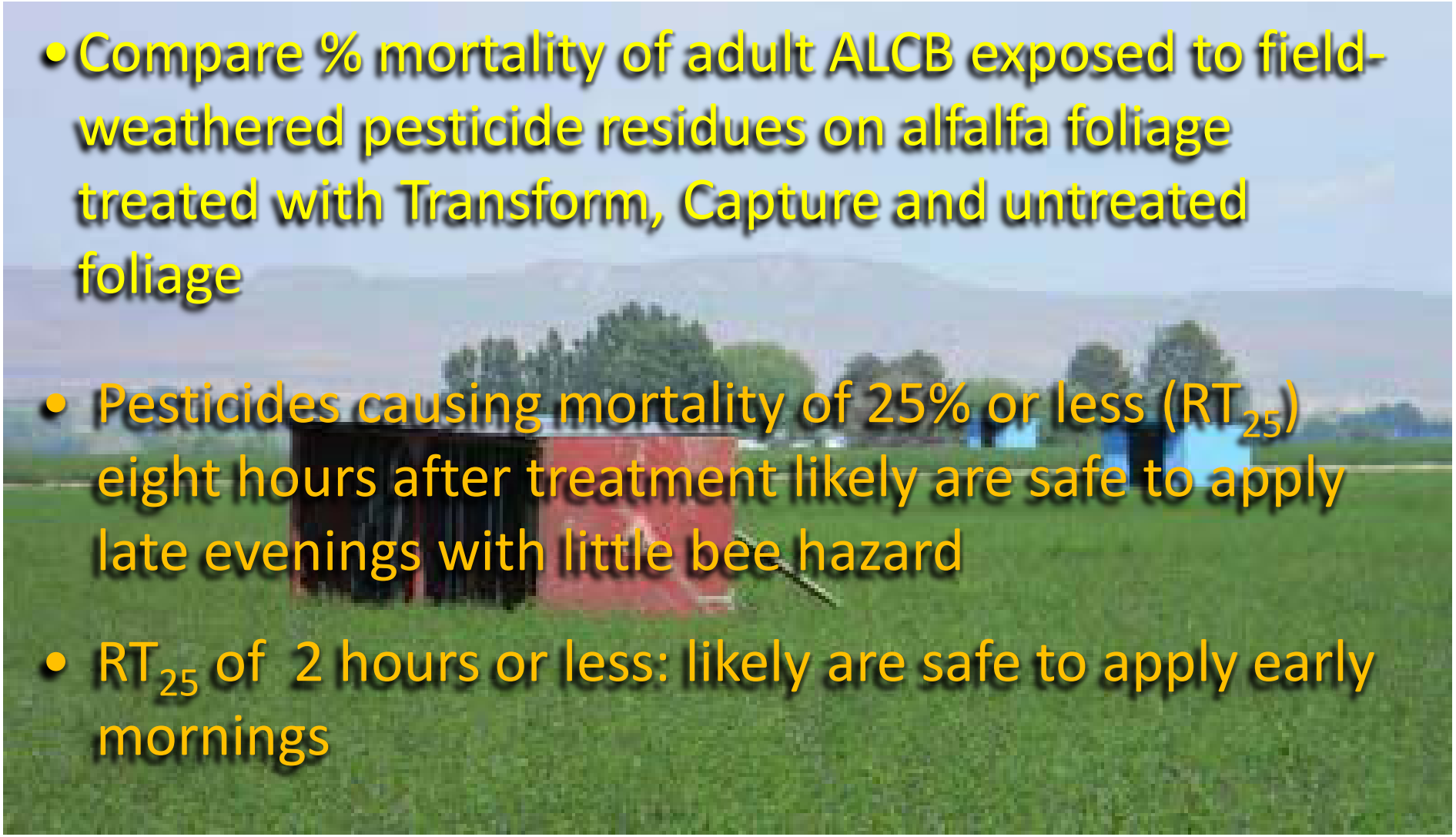
Idaho Efficacy Trial Results

Mean seed yield on treated and untreated plots



Residual toxicity of Transform to adult alfalfa leafcutting bees

Trial goals



- Compare % mortality of adult ALCB exposed to field-weathered pesticide residues on alfalfa foliage treated with Transform, Capture and untreated foliage
- Pesticides causing mortality of 25% or less (RT_{25}) eight hours after treatment likely are safe to apply late evenings with little bee hazard
- RT_{25} of 2 hours or less: likely are safe to apply early mornings

ALCB Residual toxicity trial

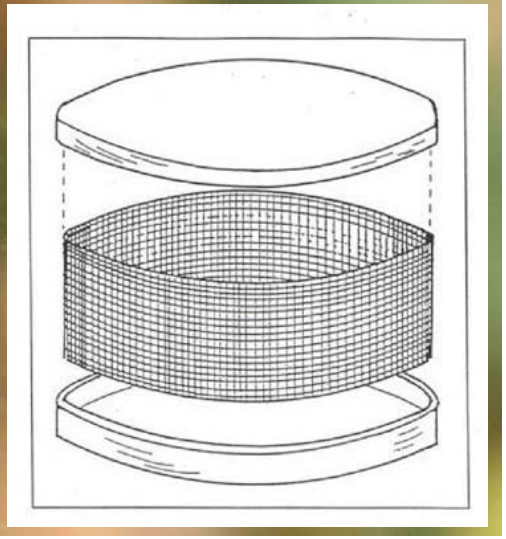
Trial methods

- **Experimental design**
  - 4 rows x 30ft
  - Randomized complete block
  - 3 treatments: Transform @ 2.25 oz/acre
    Capture @ 3.9 oz/acre
    UTC
  - 4 replications
- **Application**
  - Foliar spray, CO_2 backpack sprayer hand held boom
  - 30 gal/a @ 30 psi

ALCB Residual toxicity trial

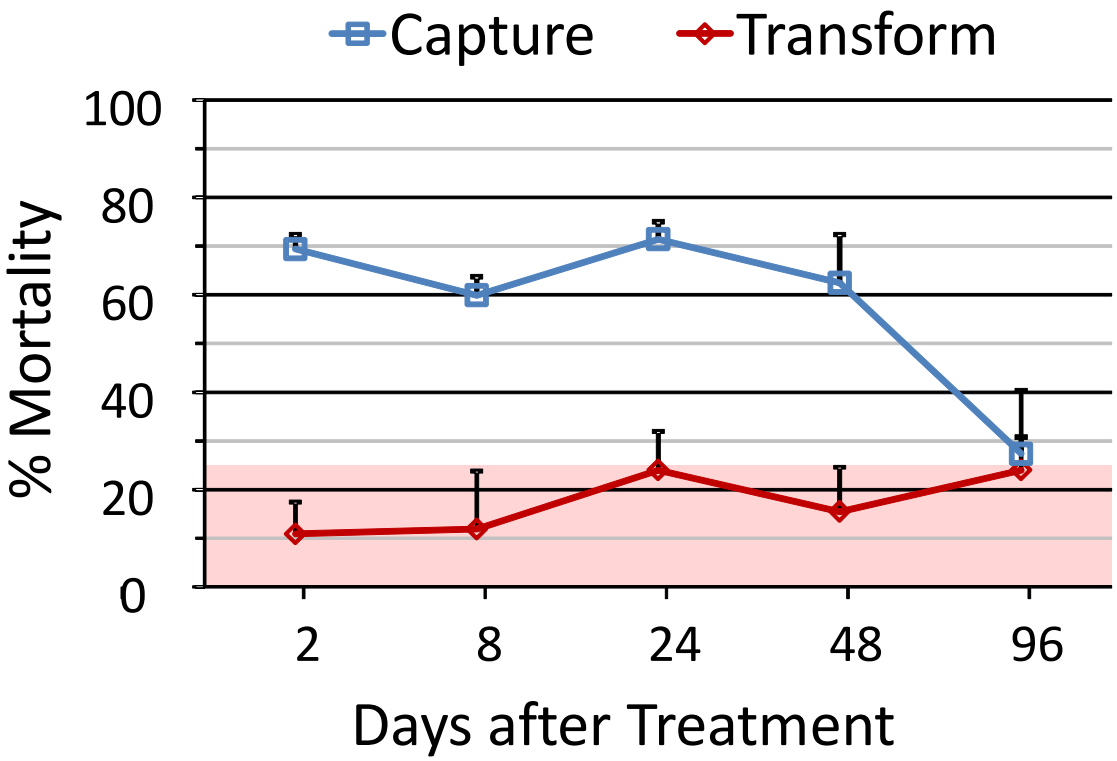
Trial methods

- **Sampling**
  - Hand collected foliage from plots at 2, 8, 24, 48 and 96 hours after treatment (~ 400 cm)
  - Collect live bees from domiciles in grower fields
  - Confine bees on field-weathered foliage (20-30/rep)
  - Determine mortality after 24 hrs.
- **Statistical analysis**
  - Analysis of Variance of % mortality adjusted for control mortality



Residual toxicity of Transform to adult alfalfa leafcutting bees

Control adjusted percentage mortality of adult bees exposed to alfalfa foliage treated with Transform and Capture and field-weathered for 2 to 96 hours



Conclusions

Lygus bugs

- Lower nos. of small and large lygus nymphs on plots treated with Transform, Beleaf, Warrior and GF-2628
- Two applications of Transform, Beleaf and Warrior provided better control than one application for both rates
- Two applications of Transform provided control equal to or better than two applications of Beleaf or Warrior
- Higher seed yield with Transform (both rates @ 2 apps) Beleaf (2 apps), Warrior and GF-2628)

Conclusions

Aphids

- All insecticides provided good control of aphids
- Transform at both rates and timings provided better control of pea and blue alfalfa aphid than BeLeaf and Warrior
- Transform provided control of spotted alfalfa aphid comparable to Warrior and GF-2628
- For aphids there was a weak trend towards improved control with two compared to one application

Conclusions

Beneficial insects

- Hemipteran predators of lygus and aphids
  - Single applications of Transform did not reduce natural enemy numbers
  - Two applications of all insecticides except Beleaf did reduce natural enemy numbers
  - Beleaf did not reduce natural enemy numbers
- Alfalfa leafcutting bees
  - Transform at 2.25 oz./acre likely could be applied late evenings, or early mornings without a significant hazard to adult ALCB

Thank you for your time and support

Questions?