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Agriculture and Natural Resources

Making a Difference for California



Managing thrips on lettuce, aphids on broccoli, and the new invasive pest Bagrada bug on cole crops

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strawberriesvegetables



ucanr.org/strawberries-vegetables and ucanr.org/pestnews

Western flower thrips *Frankliniella occidentalis*



Lettuce-experimental design

Treatments

1. Untreated control
2. Assail 30 SC (acetamiprid) 4 oz
+ DyneAmic (NIS) 0.1% v/v
3. Radiant SC (spinetoram) 8 fl oz
+ Dyne Amic 0.25%
4. BotaniGard 22 WP (*Beauveria bassiana*) 2 lb + DyneAmic 0.125%
5. Torac 15 EC (tolfenpyrad) 21 fl oz + DyneAmic 0.25%
6. Torac 15EC 21 fl oz + Lannate SP 0.75 lb + DyneAmic 0.25%
7. NNI-1171 21 fl oz (new ai) + DyneAmic 0.25%

Spraying 50* gal/acre at 70 psi with flat fan nozzle
(*100 gpa for BotaniGard)

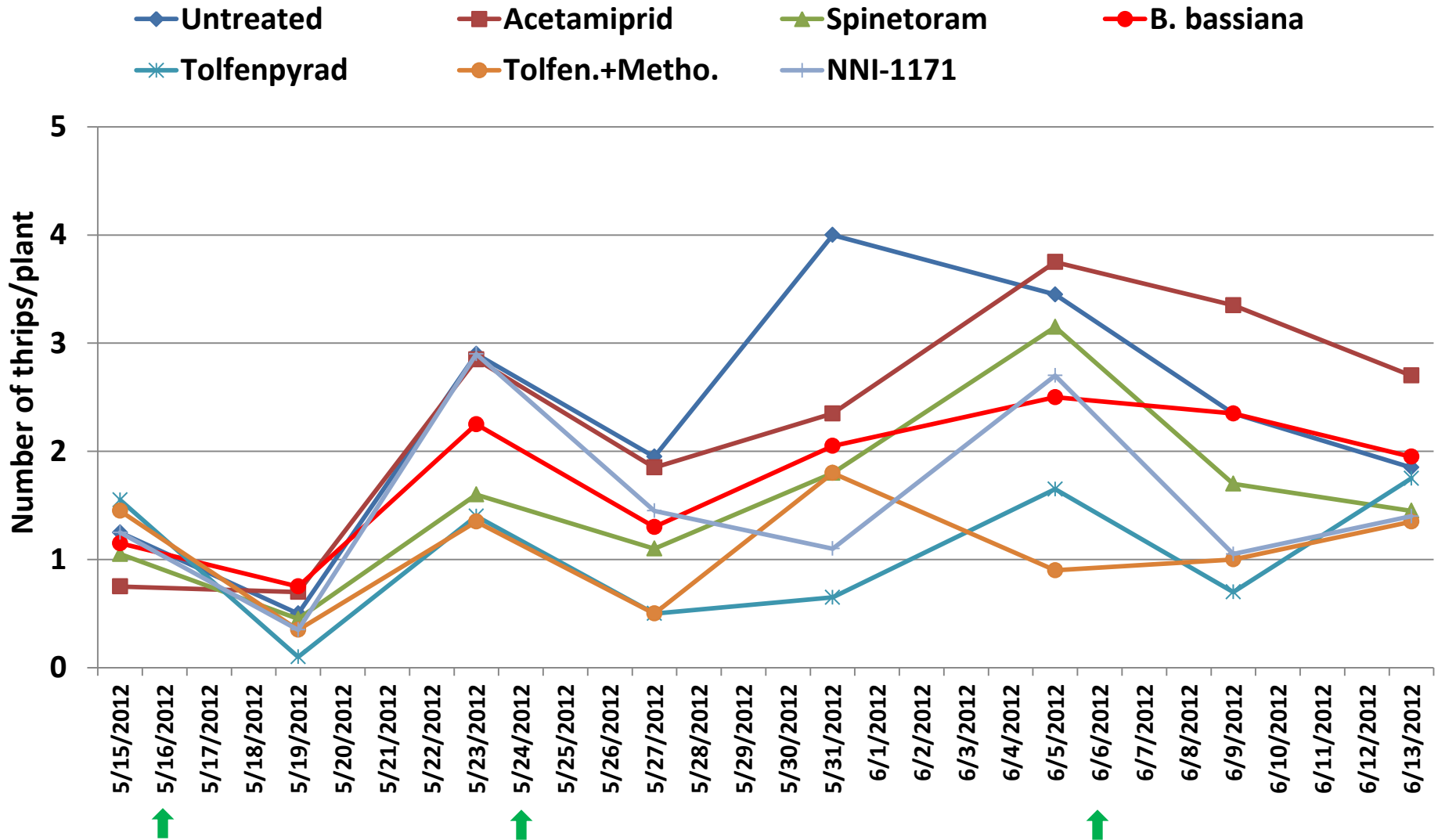
Plot size 5 rows, 5.33' wide 10' long bed replicated 4 times

Planted on April 6, 2012

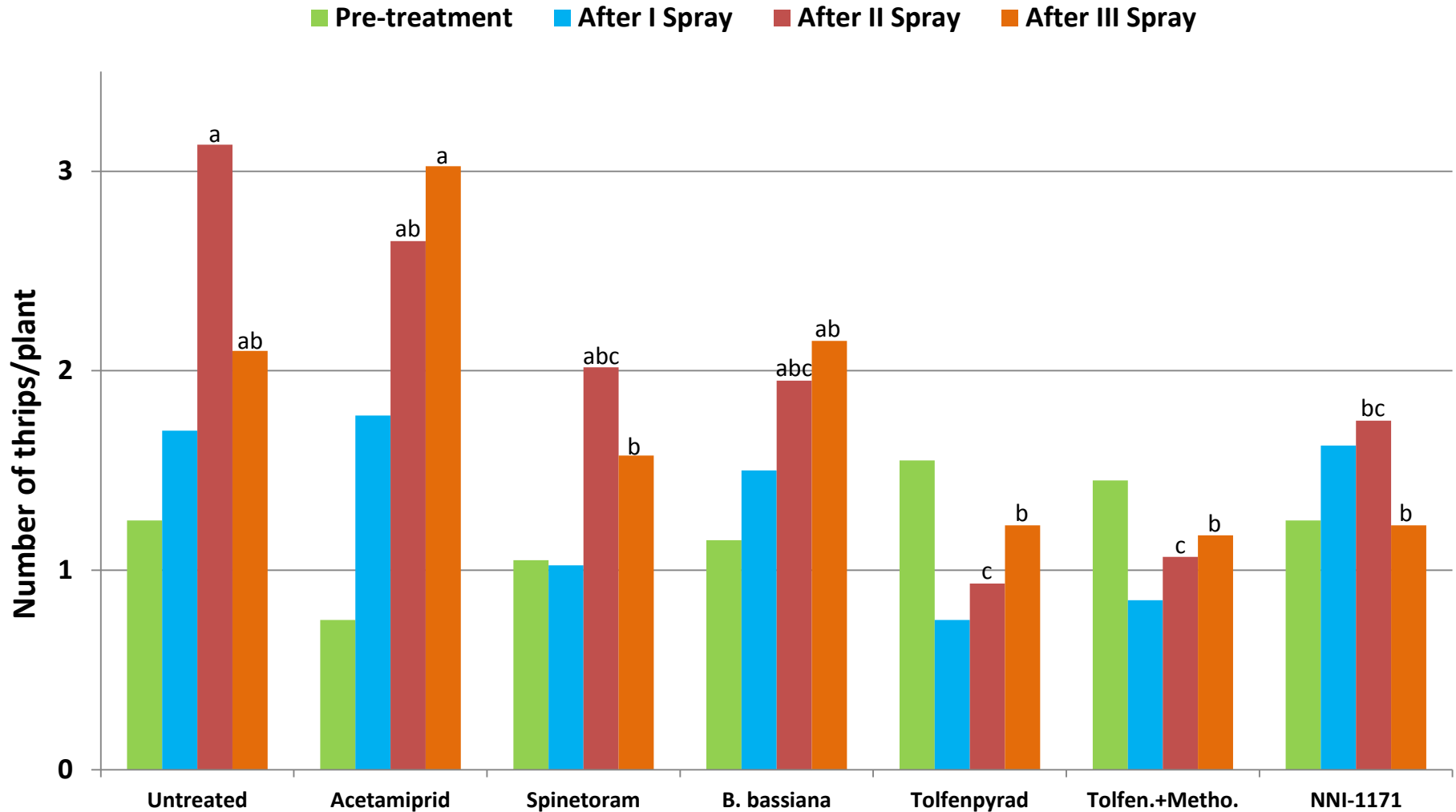
Treated on May 16 and 24 and June 6, 2012



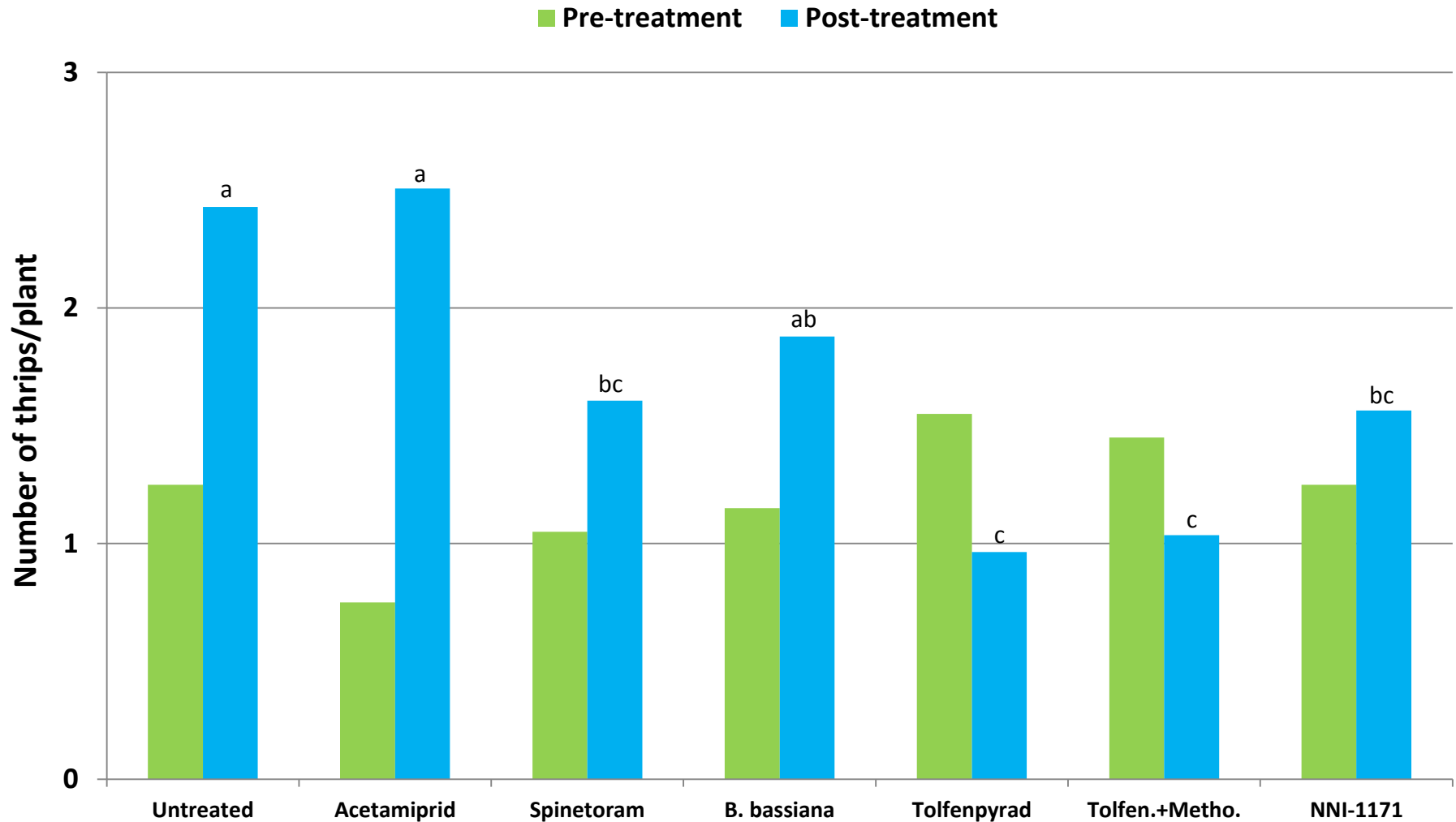
Thrips populations during the study



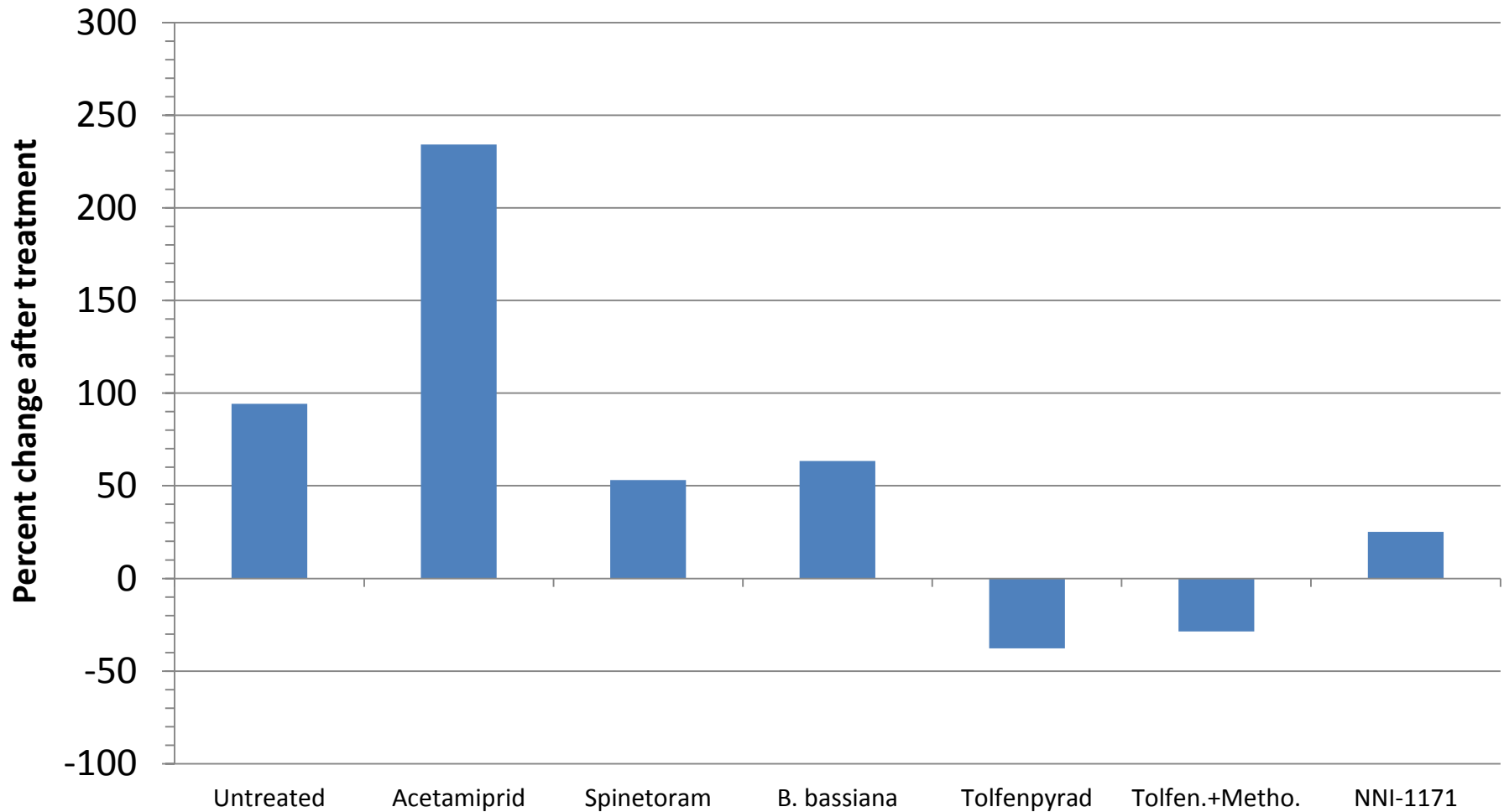
Thrips after each spray application



Thrips before and after the spray applications



Percent change in thrips after treatment



Conclusion

- Thrips numbers were significantly lower in chemical treatments compared to untreated control.
- Tolfenpyrad alone and with methomyl provided good control.
- Microbial control also has a potential for thrips management.

Cabbage aphid and green peach aphid



Cabbage aphid, *Brevicoryne brassicae*

Green peach aphid, *Myzus persicae*



UC Statewide IPM Project
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Broccoli-experimental design

Treatments

1. Untreated control
2. Assail 30 SC (acetamiprid) 4 oz
+ DyneAmic (NIS) 0.1% v/v
3. BotaniGard 22 WP (*Beauveria bassiana*) 2 lb
+ DyneAmic 0.125%
4. Torac 15 EC (tolfenpyrad) 21 fl oz
+ DyneAmic 0.25%
5. Pyrifluquinazon 3.2 fl oz + DyneAmic 0.25%
6. NNI-1171 21 fl oz (new ai) + DyneAmic 0.25%
7. Closer (sulfoxaflor) 1.5 fl oz + DyneAmic 0.25%
8. Closer 2.0 fl oz + DyneAmic 0.25%



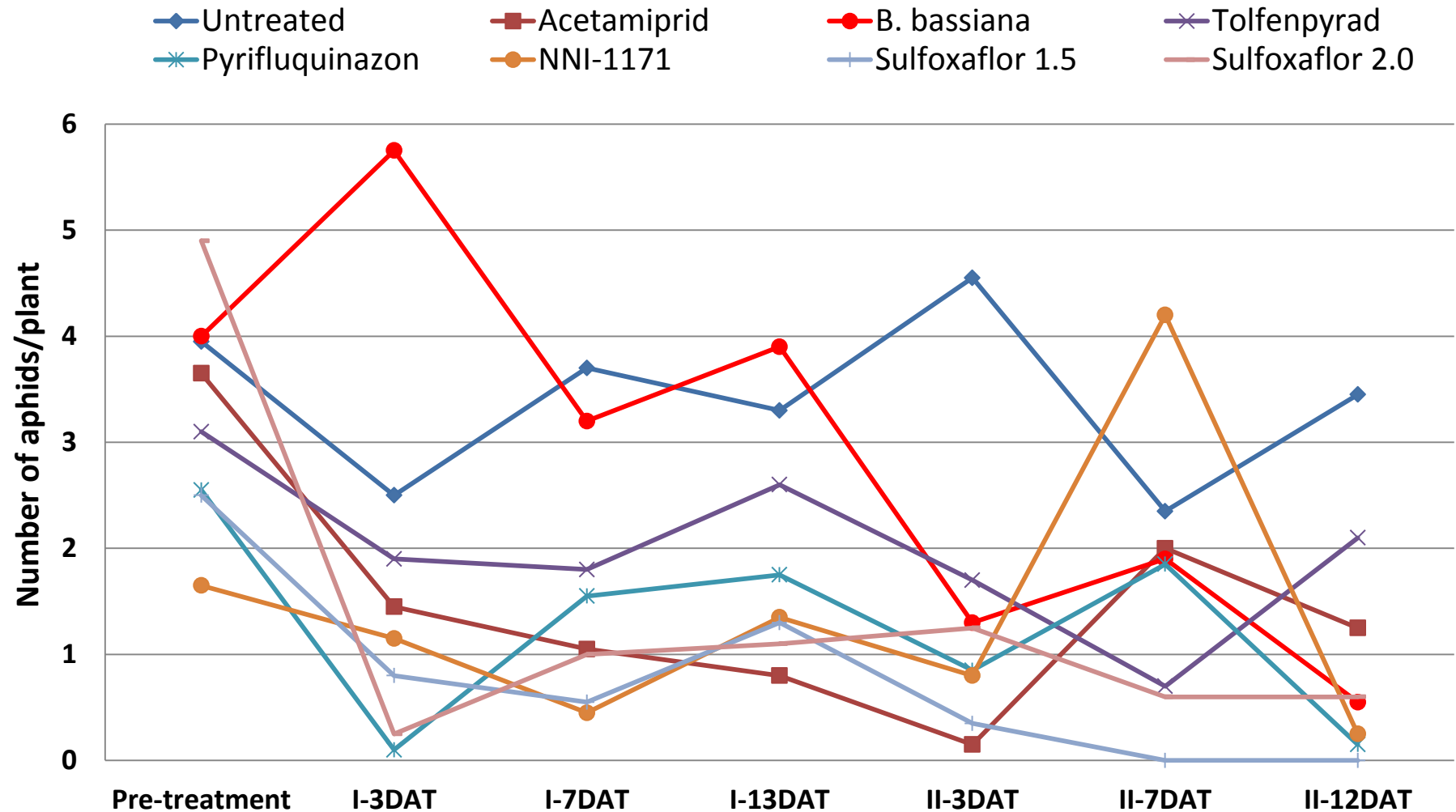
Spraying 50* gal/acre at 70 psi with flat fan nozzle (*100 gpa for BotaniGard)

Plot size 5 rows, 5.33' wide 20' long bed replicated 4 times

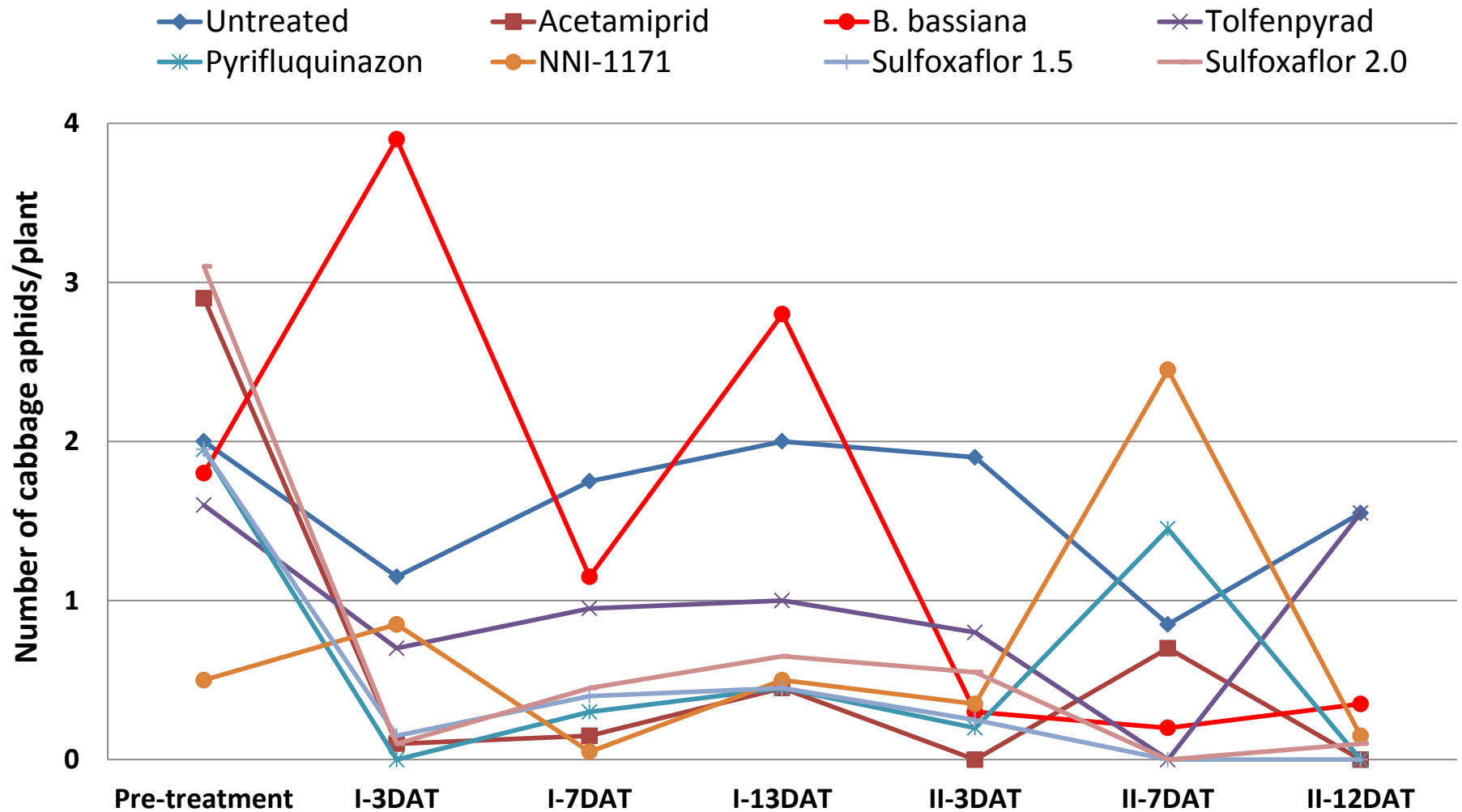
Planted on July 31, 2012

Treated on September 5 and 25, 2012

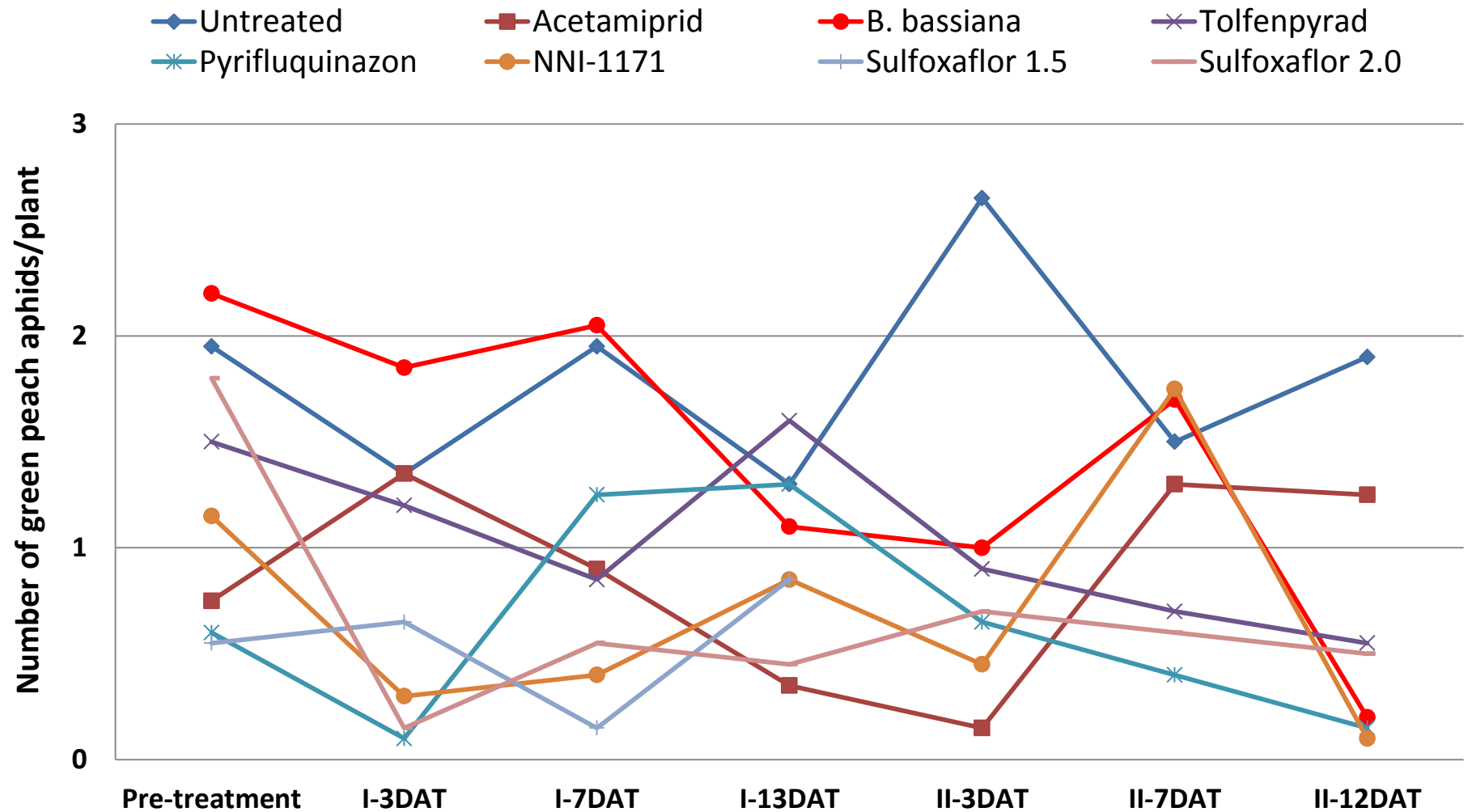
Aphid populations during the study



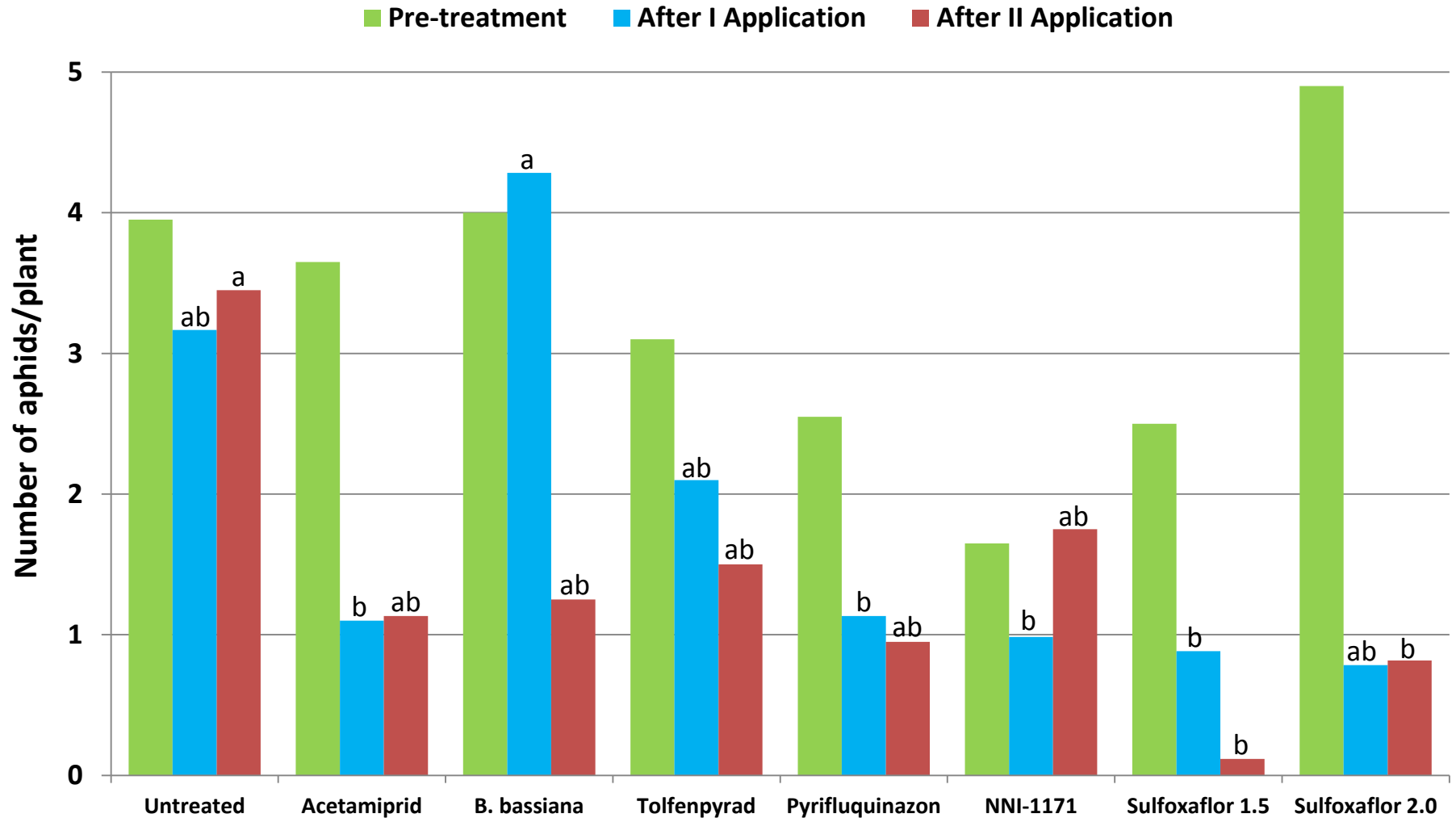
Cabbage aphids



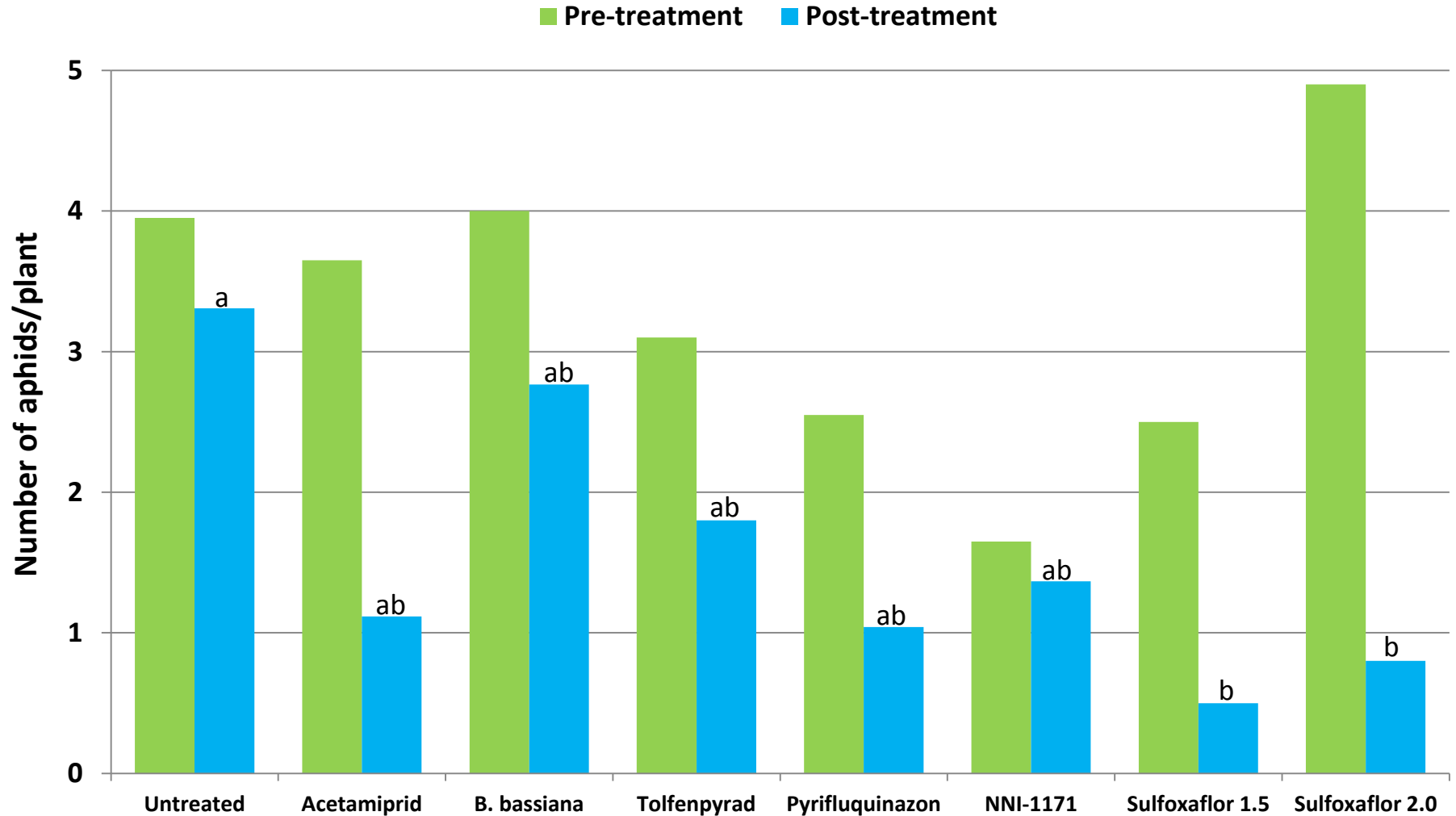
Green peach aphids



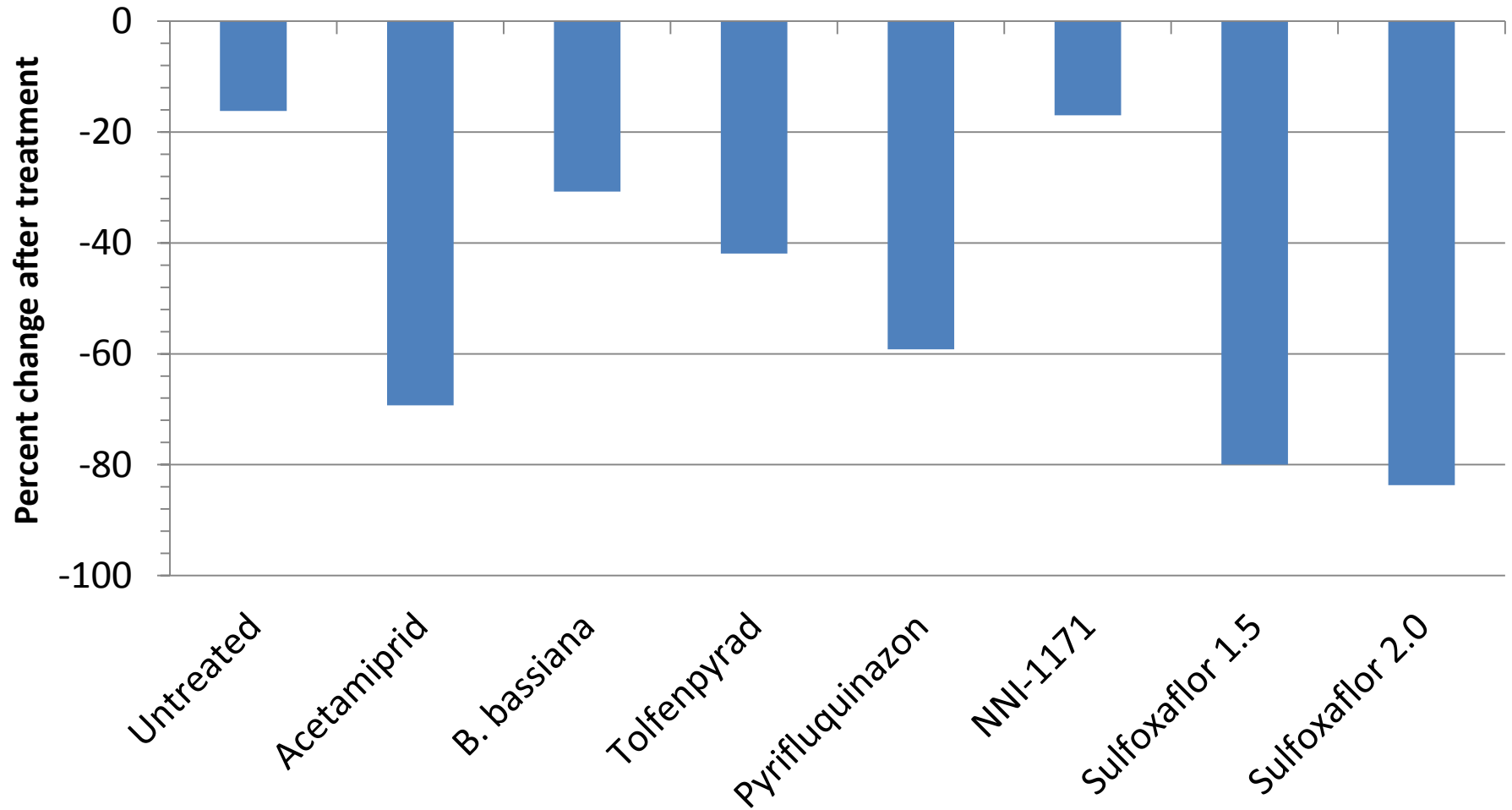
Aphids after each spray application



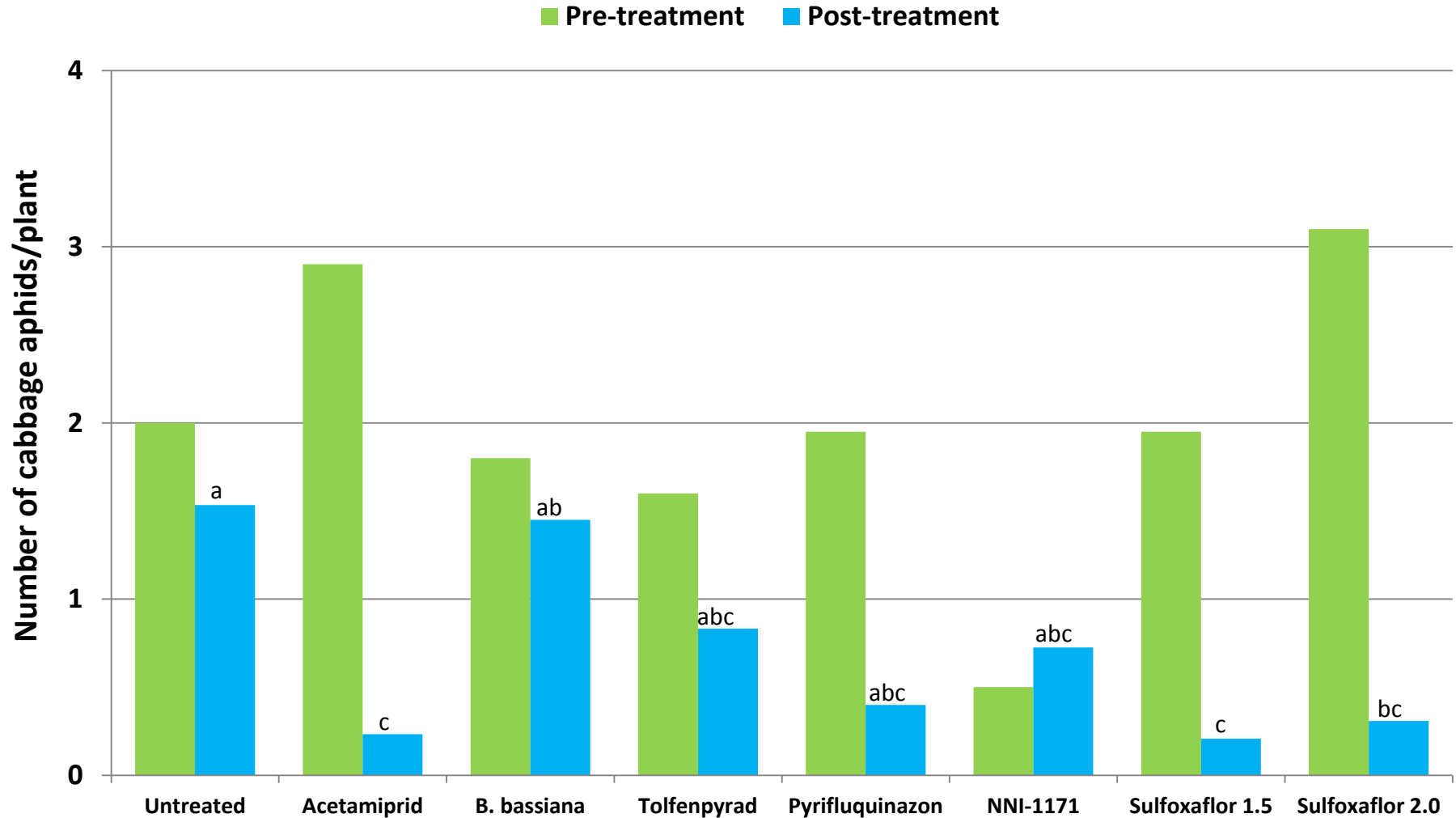
Aphids before and after spray applications



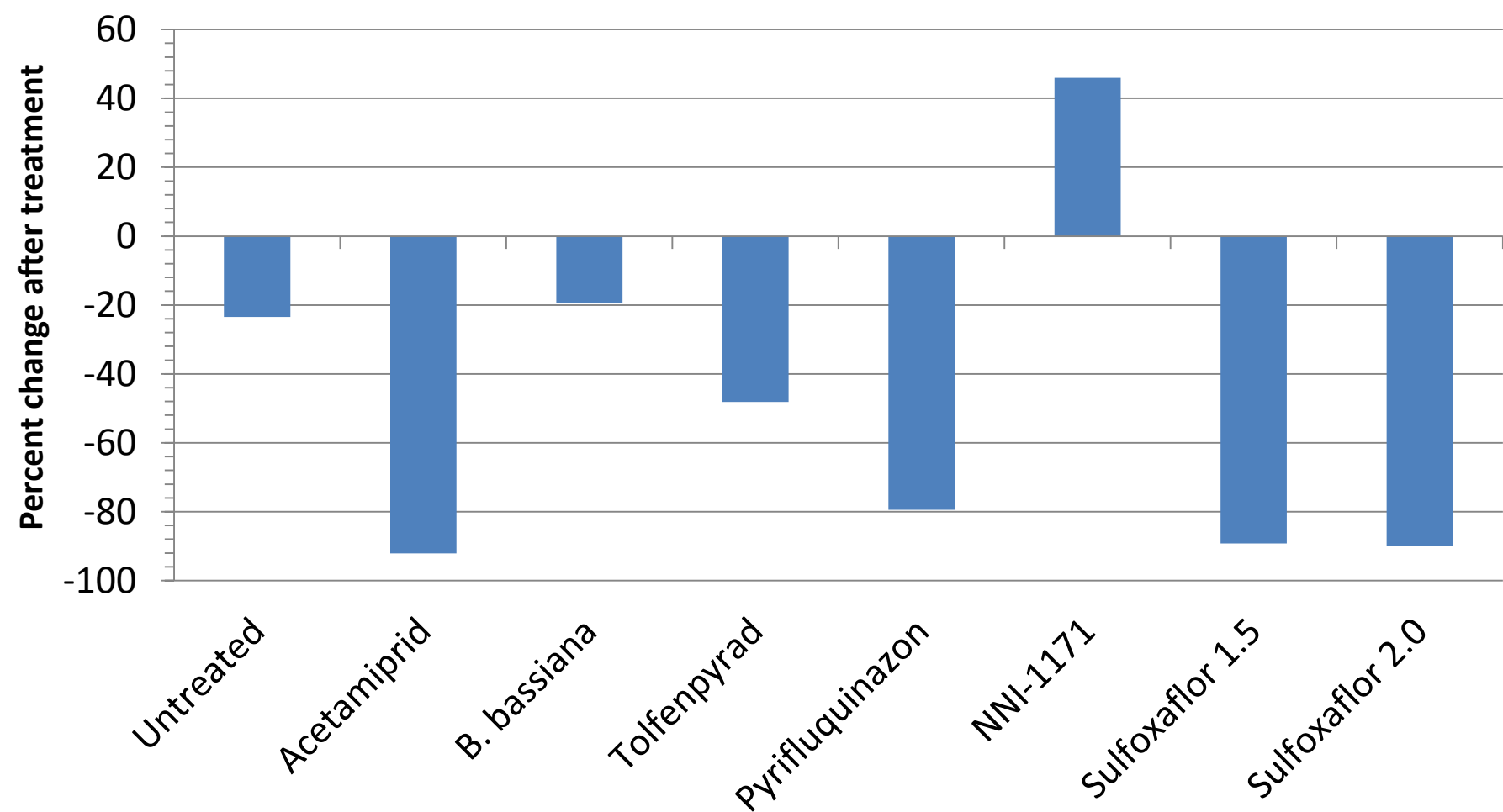
Percent change in aphids after treatment



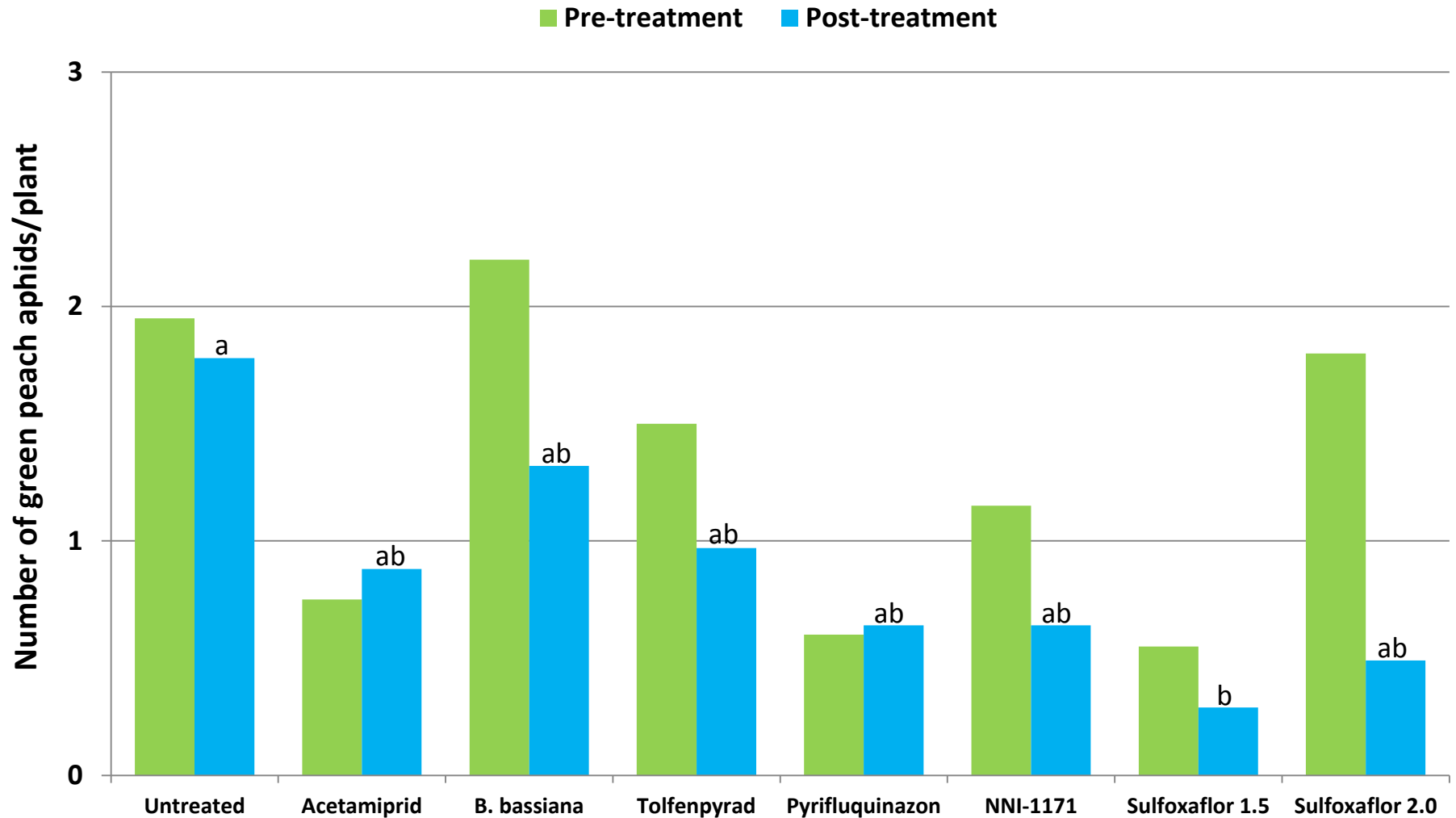
Cabbage aphids before and after spray applications



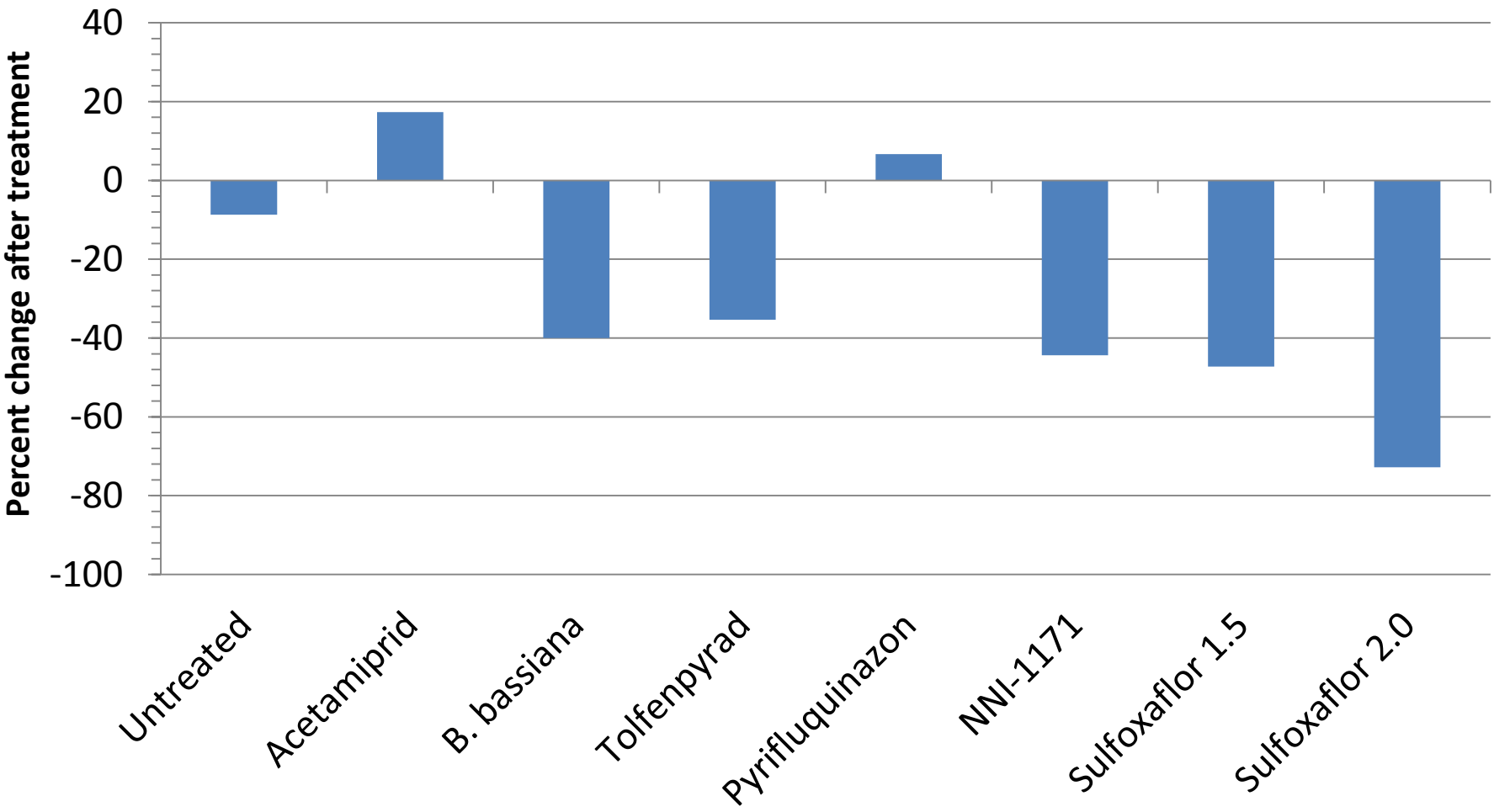
Percent change in cabbage aphids after treatment



Green peach aphids before and after spray applications



Percent change in green peach aphids after treatment



Conclusions

- Cabbage and green peach aphids responded differently to treatments.
- Sulfoxaflor provided good control for both aphid species.
- *B. bassiana* provided good control of green peach aphids which was similar to some chemical treatments

Bagrada bug, *Bagrada hilaris*

Order: Hemiptera

Family: Pentatomidae (Stink bugs)

Origin: Africa

Distribution: Asia and Europe and now in Arizona and California

Host plants: Mainly crucifers. Also infests malvaceous, leguminoseous, cucurbits, and graminaceous plants

London rocket, wild mustards, pepperweed, and others



Bagrada bug-Distribution

In Los Angeles County in 2008.



California: Kern, Imperial, Los Angeles, Monterey, Orange, Riverside, San Diego, Santa Barbara, San Luis Obispo, and Ventura Counties

Arizona: Yuma, La Paz, Maricopa, and Pinal Counties

New Mexico: Luna, Socorro, Valencia, and Santa Fe Counties

Nevada, Utah, and Texas

Bagrada bug-Host range

Brassicaceae: Alyssum, arugula, broccoli, cabbage, cauliflower, collards, cress, kale, radish, rutabaga, turnips, etc.

Cucurbitaceae: Cantaloupes and watermelons

Graminaceae: Corn, millets, and wheat

Leguminaceae: Various legumes

Malvaceae: Cotton and okra

Rosaceae: Strawberry

Solanaceae: Potato

Bagrada bug-Biology

Eggs

- Barrel-shaped, laid singly or in small groups on plant surface or in soil
- Each female lays up to 95 eggs
- Whitish and turn orange with age
- Hatch in 3-6 days



Bagrada bug-Biology

Nymphs

- There are five nymphal instars
- Newly emerged nymphs are reddish orange and develop white and black markings with time
- Nymphal stage lasts for 2-3 weeks



Bagrada bug-Biology

Adults

- They are 1/5-1/3" long and 1/8-1/6" wide
- Black with orange and white markings
- Females are larger than males



Bagrada bug-Biology

Harlequin bug vs. Bagrada bug



projectnoah.org



Bagrada bug-Damage

Suck the plant juices with their needle-like mouthparts.

Stippling with necrotic spots, stunted growth, loss of apical dominance, formation of multiple heads and plant death.



Bagrada bug-Chemical control

2012 Small plot broccoli trials at Yuma Ag Center (John Palumbo and Ta-I Huang)

1 st application	Mean Number of Adults/20 Plants		
Treatment	1-Day After Treatment	3-Days After Treatment	5-Days After Treatment
Bifenthrin	0.0 b	0.5 d	2.3 b
Methomyl	1.8 b	2.5 bcd	4.0 ab
Chlorpyrifos	1.5 b	1.5 cd	3.0 ab
Clothianidin	0.5 b	4.0 ab	5.0 a
Dinotefuran	0.5 b	2.0 bcd	6.8 a
Acephate	0.5 b	3.5 abc	4.0 ab
Untreated control	7.3 a	5.8 a	6.8 a

Bagrada bug-Control

2012 Small plot broccoli trials at Yuma Ag Center (John Palumbo and Ta-I Huang)

2 nd application	Mean Number of Adults/20 Plants		
Treatment	1-Day After Treatment	3-Days After Treatment	5-Days After Treatment
Bifenthrin	0.0 b	1.3 bc	1.5 a
Methomyl	0.0 b	1.0 c	4.0 a
Chlorpyrifos	0.8 b	5.0 ab	4.0 a
Clothianidin	0.8 b	4.3 abc	5.5 a
Dinotefuran	0.3 b	1.3 bc	4.0 a
Acephate	0.8 b	1.5 bc	5.5 a
Untreated control	5.0 a	6.8 a	6.5 a

Bagrada bug-Non-chemical control

Active Ingredient	Product*	Application Rate
<i>Beauveria bassiana</i> strain GHA	Mycotrol O®	1 qrt/100 gal
<i>Metarhizium brunneum</i> strain F 52	Met 52 ®	1 qrt/100 gal
<i>Isaria fumosorosea</i> strain FE9901	NoFly ®	28 oz/100 gal
<i>Chromobacterium subtsugae</i> strain PRAA4-1	Grandevo®	3 lb/100 gal
Pyrethrins + potassium salts of fatty acids	Safer Yard & Garden Insect Killer®	Ready-to-use
Essential oil blend	Rid-Bugs®	60 ml/gal

*Verify label status before using any of these materials

Bagrada bug-Non-chemical control



B. hilaris on treated broccoli



Fungus emerging from surface-sterilized cadavers

Bagrada bug-Non-chemical control



B. hilaris killed by *B. bassiana*

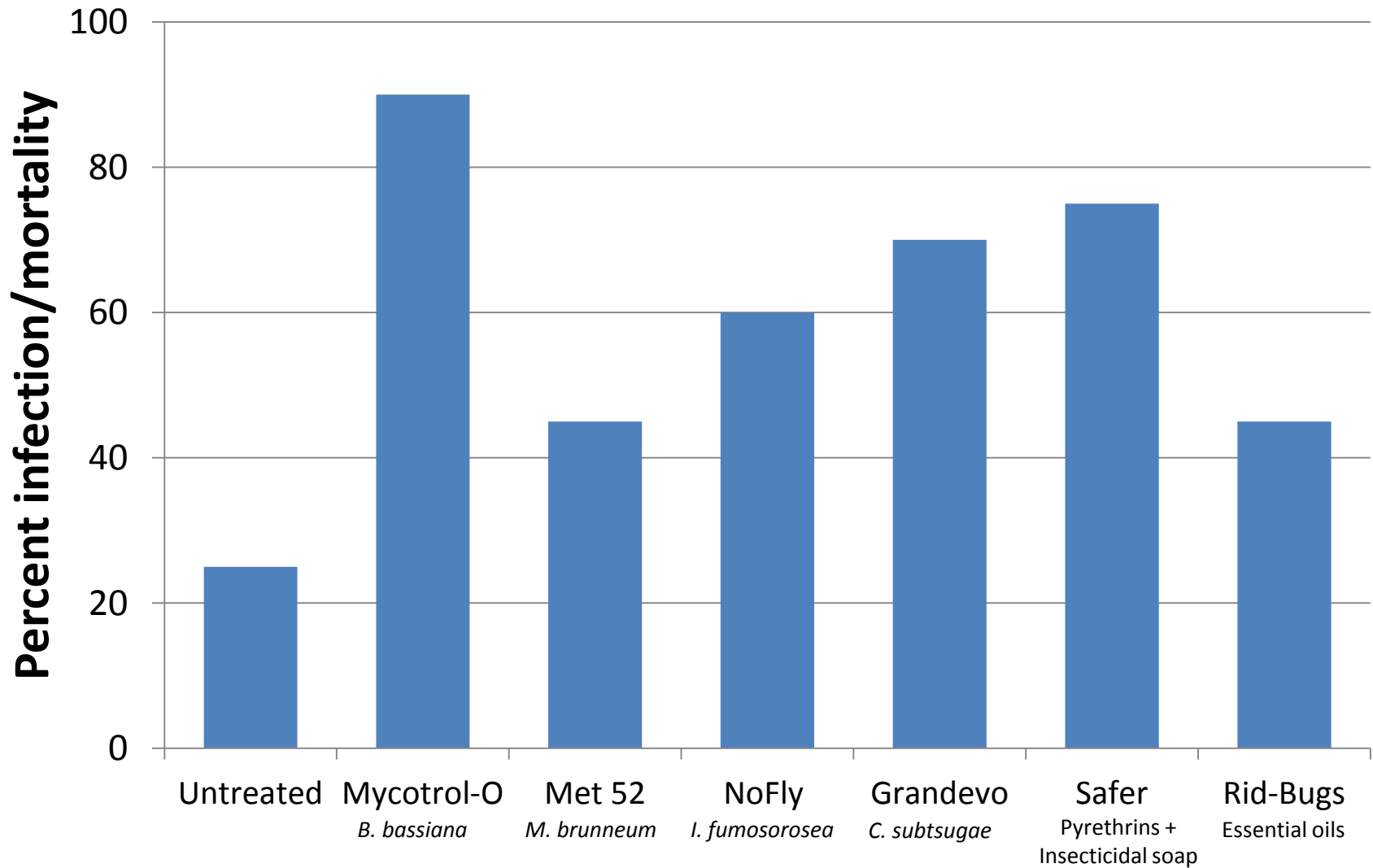


B. hilaris killed by *M. brunneum*



B. hilaris killed by *I. fumosorosea*

Bagrada bug-Non-chemical control



Bagrada bug-Cultural control

- Consider removing weed hosts
- Ensure transplants and other nursery materials are free of Bagrada bugs before planting
- Cultivate to destroy bugs and eggs in the soil; research on effectiveness has not been completed
- Exclusion: row covers may prevent damage but research on effectiveness has not been done
- Shred and disc crop immediately after harvest
- Rotate to a non-host crop

Bagrada bug-Monitoring

- Look for Bagrada bug the morning after transplanting when the sprinklers are off.
- For direct-seeded cole crops, look for bugs as soon as seedlings emerge.
- Continue monitoring weekly until the 5- to 6-leaf stage in direct seeded and transplanted crops.
- After the 5- to 6-leaf stage, laboratory and field research show most plants can tolerate Bagrada bug feeding without significant injury or yield loss.
 - Monitor mid-morning to late afternoon (10 a.m.–4 p.m.) when temperatures are near or above 86°F
 - Look for fresh feeding on cotyledons and young leaves; look for wilted seedlings
 - Look for bugs on plants underneath cotyledons and leaves, on the stem at the soil surface, in cracks in the soil, and under dirt clods
 - After insecticide applications look carefully on the soil for dead bugs (bugs blend in with the soil and also play dead when disturbed)

Bagrada bug-Thresholds

- Prevent adults from feeding on plant terminals and small cotyledons in order to establish a quality stand.
- One adult per ten-foot row of seedlings or transplants causes stand loss or unacceptable plant damage.
- For transplants, chemigate at the first sign of damage or when adults are found.
- For direct-seeded crops, chemigate when seedlings first emerge.
- When stands are established, apply an insecticide when bugs or fresh damage is readily observed.

Bagrada bug-Video

<http://www.youtube.com/watch?v=gSj3AZoJIRM>

Acknowledgments

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Pest infestations