



Row Covers: An Alternative Means to Pest Control in Cucurbits

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Row Covers



Uses for Row Covers

1. Provide a warmer growing environment
 - warmer soil
 - warmer air
2. Protect from brief adverse conditions
 - frosts, freezes
 - heavy rainfall
 - hail
3. Protect from wind
4. Water conservation
5. Keep crops free of debris
6. Manage Insects



Insect Management with Row Covers

1. **Exclusion = keeping insects away from a crop**
 - Insect pests
 - Pollinator insects – when pollination is not desired
2. **Containment = keeping insects in the vicinity of a crop**
 - Beneficial predator insects
 - Pollinator insects

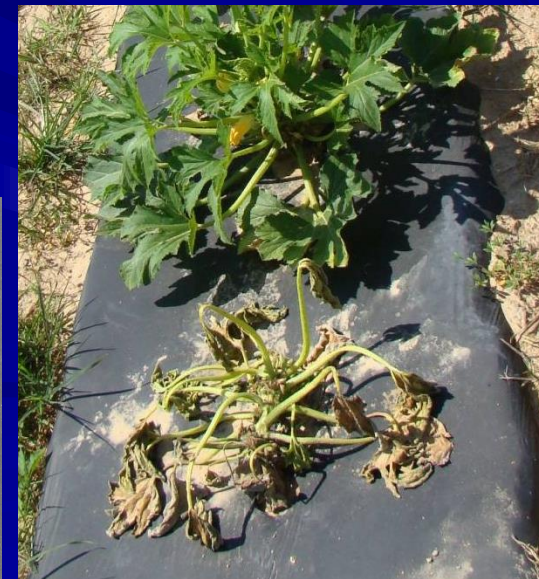


Cucurbit – Insect Pest Concerns

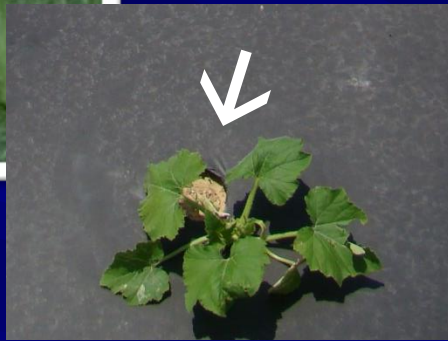


Squash Bug

- Overwintered adults mate and move to cucurbit plants
 - Prefer squash & pumpkin
 - Also feed on others such as watermelon
- Move to crops in spring, populations build, & then move to preferred crops
- Feeding adults and nymphs inject toxic saliva that causes brown, dead vines



Battling The Squash Bug



- Look for eggs and remove them
- Put out plywood boards; bugs hide underneath
- Will hide under plastic mulch – avoid airspaces
- Maintain crop vigor (proper watering & fertilization)
- Plant resistant varieties?
 - Butternut, Royal Acorn, Sweet Cheese (squash)
- ****Destroy crop debris****
- Insecticides?

Are Row Covers Useful for Insect Exclusion in Squash?

- Is it practical?
- Is it cost effective?
- Are there drawbacks?
- What are the potential benefits?
- What are the specifics on when and how to use this technique?



Evaluation of Row Cover Use for Squash Bug Management

Summer Squash Growing Systems Trials (2011-2012)

- Raised Bed
- Drip irrigation
- Plastic mulch
 - Controls weeds, Conserves moisture, Keeps produce clean
 - Plastic for early harvest
- Cover with row cover or netting – Remove cover when female flowers appear



Study Plan – Summer 2011

Lane, Oklahoma

- Transplant Yellow squash each month beginning May 1
- At each planting 4 insect management treatments were established
- Squash was harvested as long as plants produced



Treatments

1. **Install row cover at transplant and remove at 1st flower**
2. **Install row cover at transplant and remove 2 weeks after 1st flower**
3. **Apply insecticides when insects present**
4. **Untreated**



Treatments

1. **Install row cover at transplant and remove at 1st flower**

Plants at time of cover removal →



Treatments

1. Install row cover at transplant and remove at 1st flower
2. Install row cover at transplant and remove 2 weeks after 1st flower

Plants at time of second cover removal →



Treatments

1. Install row cover at transplant and remove at 1st flower
2. Install row cover at transplant and remove 2 weeks after 1st flower
3. **Apply insecticides when insects present**
4. Untreated



Data Collected

- Harvest at marketable size and count fruits
 - 2-3 times weekly
- Keep count of surviving squash plants
- Monitor insect populations
 - Squash bugs first detected in early June
 - SB were abundant by mid June and onward



Squash Yield by Plant Date

- Total # Fruits Harvested -

Treatment	May	June	July	August
Cover until 1 st flower	24	27	1	0
Cover & delay removal	39	17	1	0
Insecticide	92	99	7	0
Untreated	22	14	1	0

- Transplant at the start of each month
- Harvest as long as possible (up to 12 wk)
- Data is for plots with 6 plants

Overall Squash Yield - May Transplanting -

Treatment	Total fruits	Marketable	Non-Marketable	Percent Marketable
Cover until 1 st flower	24	18	6	77
Cover & delay removal	39	37	2	93
Insecticide	92	86	6	93
Untreated	22	21	1	97

Squash Yield- May Transplant - 2 week intervals -

Treatment	Two Week Interval (Marketable Fruit)					
	1st	2nd	3rd	4th	5th	6th
Cover until 1 st flower	8	10	0	0	0	0
Cover & delay removal	4	24	9	0	0	0
Insecticide	7	25	26	20	5	3
Untreated	6	14	1	0	0	0

Overall Squash Yield - June Transplanting -

Treatment	Total fruits	Marketable	Non-Marketable	Percent Marketable
Cover until 1 st flower	27	22	5	76
Cover & delay removal	17	8	9	45
Insecticide	99	94	5	95
Untreated	14	11	3	80

Summary

- **May & June plant dates had good yields**
 - July and August yields were very low
- **Insecticide treatment always gave greatest yields**
- **Untreated plots had lowest yields**
- **Delaying cover removal gave variable results**
 - Delayed removal was better with May planting
 - With June planting, First Flowering Removal was better than Delayed Removal



Summary



- **Is it practical? Maybe**
- **Is it cost effective? It is too early to tell**
- **Are there drawbacks?**
 - Material and labor costs for row covers
- **What are the potential benefits?**
 - Its an option if insecticide use is not possible
 - Yields were improved compared to untreated squash
- **What are the specifics on when and how to use this technique? It is too early to tell**

Trials in 2015 & 2016



Concepts to Test

1. No row cover and use insecticides
2. Cover until flowering / remove covers
3. Cover until flowering / wait 2 weeks / remove covers
4. Cover until flowering / open cover early morning (+/- 2 hours uncovered)*
5. Cover until flowering / open cover early – mid morning (+/- 2 hours uncovered)*

* Cover removal was done about 5 days per week due to weather and logistical limitations

Treatments

1. No row cover / treat with insecticides when insects present.
2. Cover until 50% of plants have female flowers, then remove covers.
3. Cover until 50% of plants have female flowers, wait 2 more weeks, then remove covers.
4. Cover treatment until 50% of plants have female flowers, uncover daily for 2 hours (8 a.m. – 10 a.m.)
5. Cover treatment until 50% of plants have female flowers, uncover daily for 5 hours (8 a.m. – 1 p.m.)

Just before covers installed







Organisms observed

Beneficial

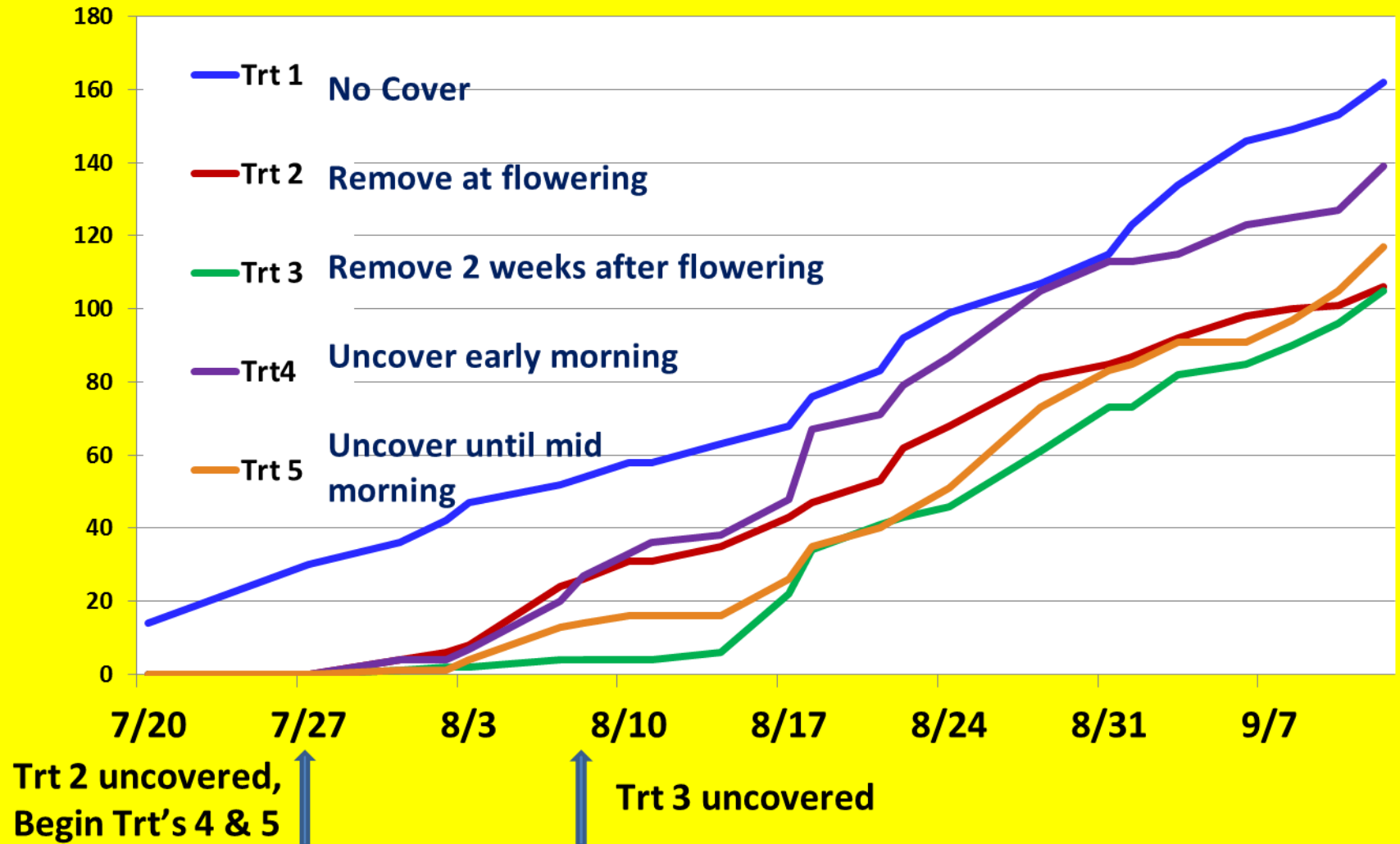
- Bees – honey, bumble, carpenter, metallic
- Moths and butterflies
- Parasitoid wasps
- Wheel bugs
- Assassin bugs
- Eastern firefly
- Toads
- Field mice?

Pests

- Squash bugs
- Stink bugs
- Flea Beetles
- Cucumber beetle
- Cabbage moth larva
- Southern Corn Billbug

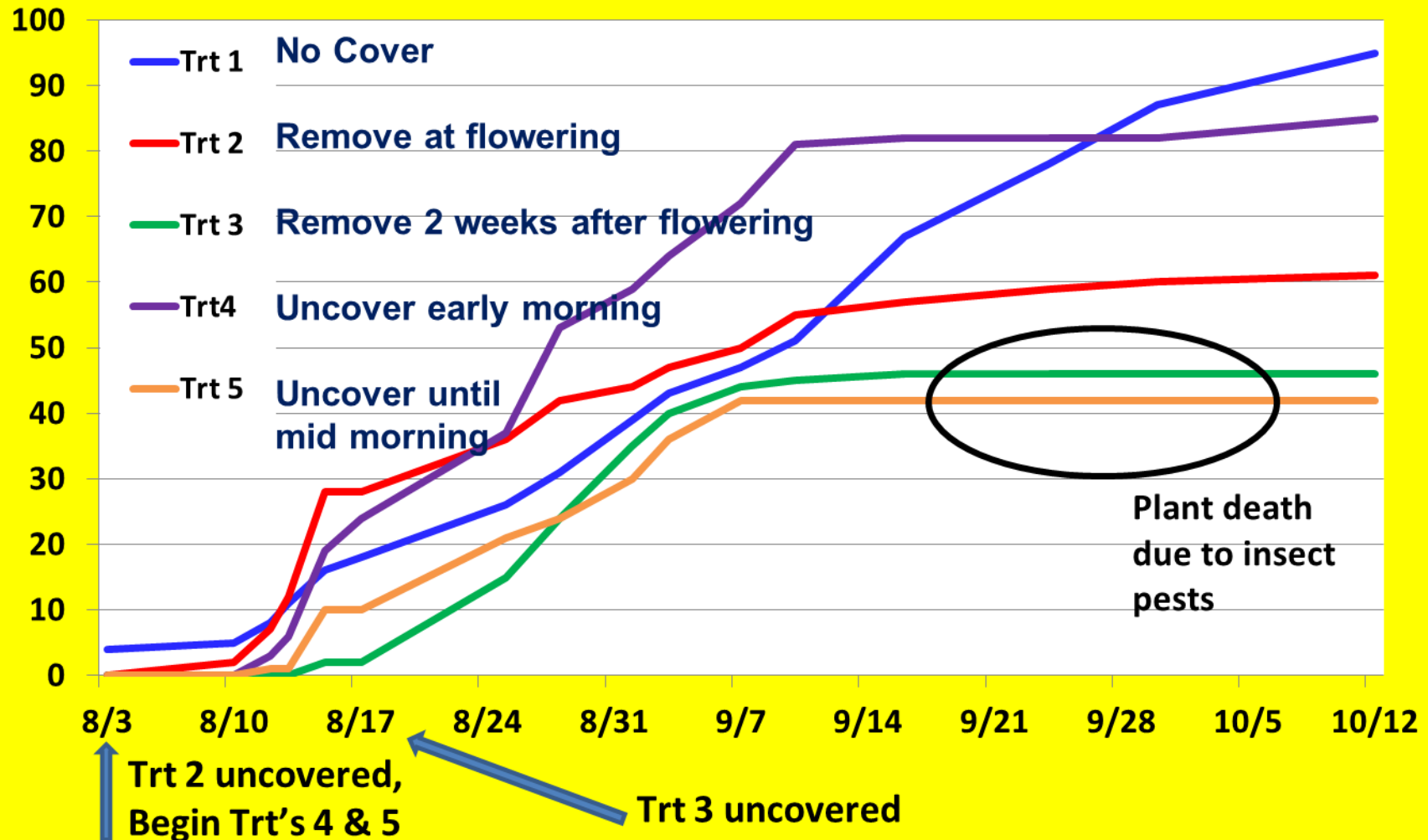
Shawnee, OK (2015)

Cumulative Squash Fruit Numbers



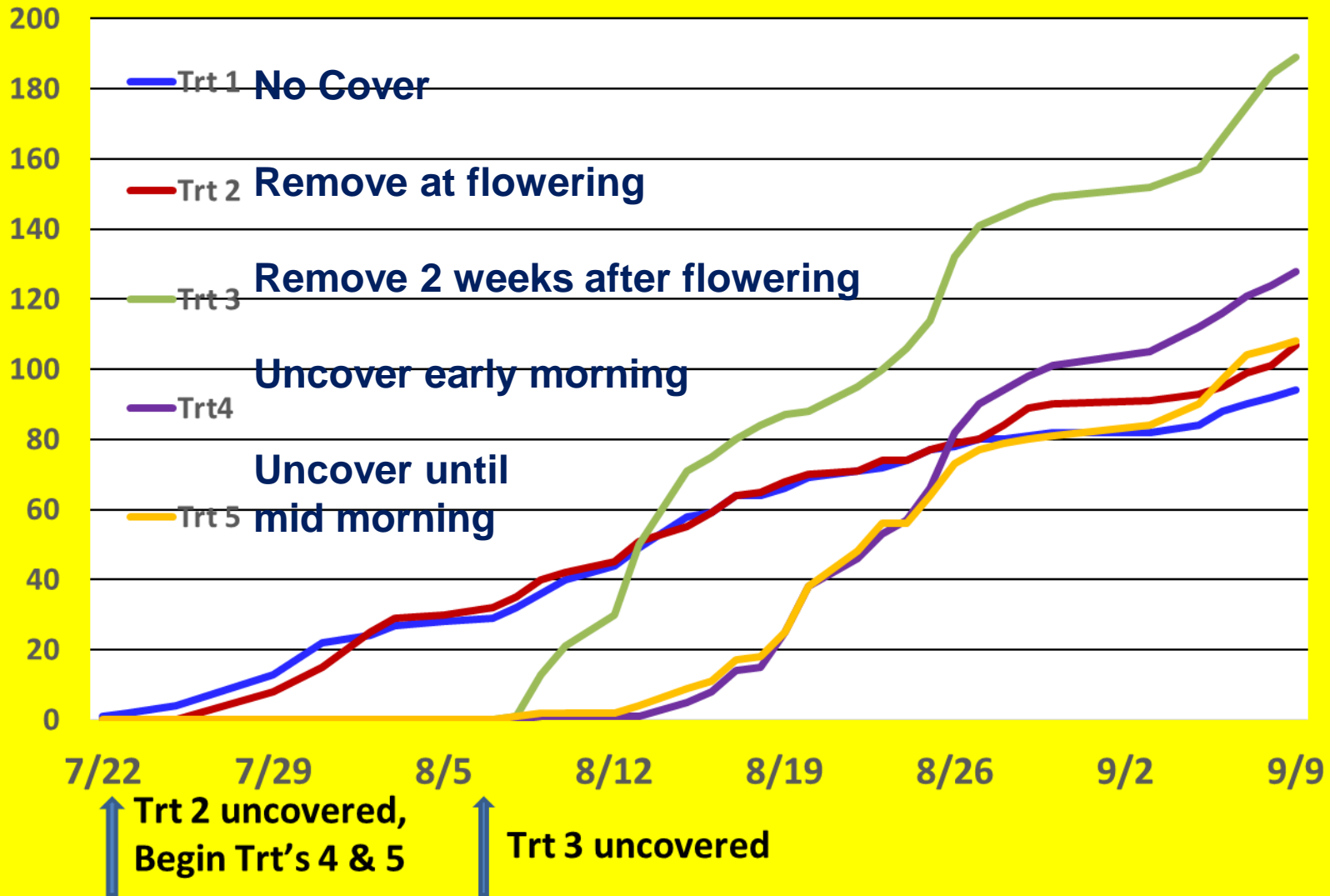
Atoka, OK (2015)

Cumulative Squash Fruit Numbers



Shawnee, OK (2016)

Cumulative Squash Fruit Numbers



Summary for 2015 & 2016

Positive

- Row covers may reduce the need of insecticides.
- Row covers protect squash from hail and high winds.
- Row covers may extend squash harvest into the late summer.

Negative

- Row covers appear to delay early harvest.
- Row covers increase difficulty in controlling weeds.
- Row covers are difficult to keep in place in high winds.
- Row covers are an extra cost.

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