Methyl Bromide Alternatives Research Update

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GCREC and CREC

Current Research

- Long term sustainability of methyl bromide alternatives
  - Year 3 initiated August 2010

- Evaluation of all components of the 3-WAY fumigant system
  - Spring 2009
  - Spring 2010
  - Fall 2010

Current Research

- Impact of cultivation and herbicides on the control of yellow and purple nutsedge and their impact on the selection of a tomato fumigant system
  - Fall 2010 through Spring 2011

- Interaction of Paladin Pic Concentration via Drip Tape Applications and the movement and control of purple nutsedge
  - Fall 2010 and Spring 2011

Current Research

- Evaluation of herbicide combinations for use in tomato
  - Reflex (Fall 2009, Spring 2010, Fall 2010)
  - Matrix / Solida + Envoke + Sandea (Fall 2010 and Spring 2011)

- Competition of common purslane with tomato
  - Fall 2010 and Spring 2011

- Evaluation of new polyethylene mulch technology
  - Fall 2009, Spring 2010, Fall 2010

Evaluation of the long term sustainability of methyl bromide alternatives

Long Term Sustainability Trial

- Split-Split Plot design with a randomized complete block arrangement with four replications

- First crop main treatment = Primary fumigation
  - 1st split plot – Crop (Tomato or Pepper)
  - 2nd split plot – Herbicide or No herbicide

- Double crop main treatment = Secondary fumigation

- The trial design randomization will be maintained the same for the length of the study (3 years) to determine sustainability of the treatments

Trial Design cont.

- Plot size
  - Initial fumigation is 3 beds x 300 ft. long
    - 1st split plot - 3 beds x 150 ft. long
    - 2nd split plot - 3 beds x 75 ft long
  - Secondary fumigation is 1 bed x 300 ft. long

- Plant beds are on a 5 ft. spacing with a 28 in. bed top and 9 in. bed height

Cropping System

- Years 1-3
  - Primary Crop (Summer):
    - Tomato/Pepper (transplanted)
  - Secondary Crop (Spring):
    - Summer Squash (seeded)
- Grown in a plasticulture system using drip irrigation
- Cultivars
  - ‘Security 28’ tomato
  - ‘Patriot’ pepper
  - ‘Gentry’ summer squash

Treatments – Initial Fumigation

1. Non-treated control
2. Methyl Bromide 67:33 at 175 lbs/A
3. 3 Way = Telone II at 12 gal/A + Chloropicrin at 150 lbs/A + KPam at 60 gal/A
4. 2 Way = Telone II at 12 gal/A + Chloropicrin at 150 lbs/A
5. Midas 50:50 at 160 lbs/A
6. Paladin Pic 79:21 at 60 gal/A

Treatments – Secondary Fumigation

1. Non-treated control

2. Inline at 35 gal/A (EC formulation of Telone C35)

3. Kpam at 60 gal/A

Herbicide Treatment

- Each treatment had a split plot of herbicide or no herbicide
  - Year 1 = V10142 (0.3 lbs ai/A) and Devrinol (1 gal/A)
  - Year 2 = Reflex (1 pt/A) and Devrinol 2 EC (1 gal/A)
  - Year 3 = Reflex (1 pt/A) and Devrinol 2 EC (1 gal/A)

- The herbicides were applied to a final finished bed top prior to laying plastic mulch
  - Year 1 = Canslit Metalized
  - Year 2 = Filmtec 1.2 mil VIF
  - Year 3 = Pliant Blockade 1.1 mil VIF

Insurance Policy Against Weeds

- For all methyl bromide alternatives, the use of herbicides is an insurance policy

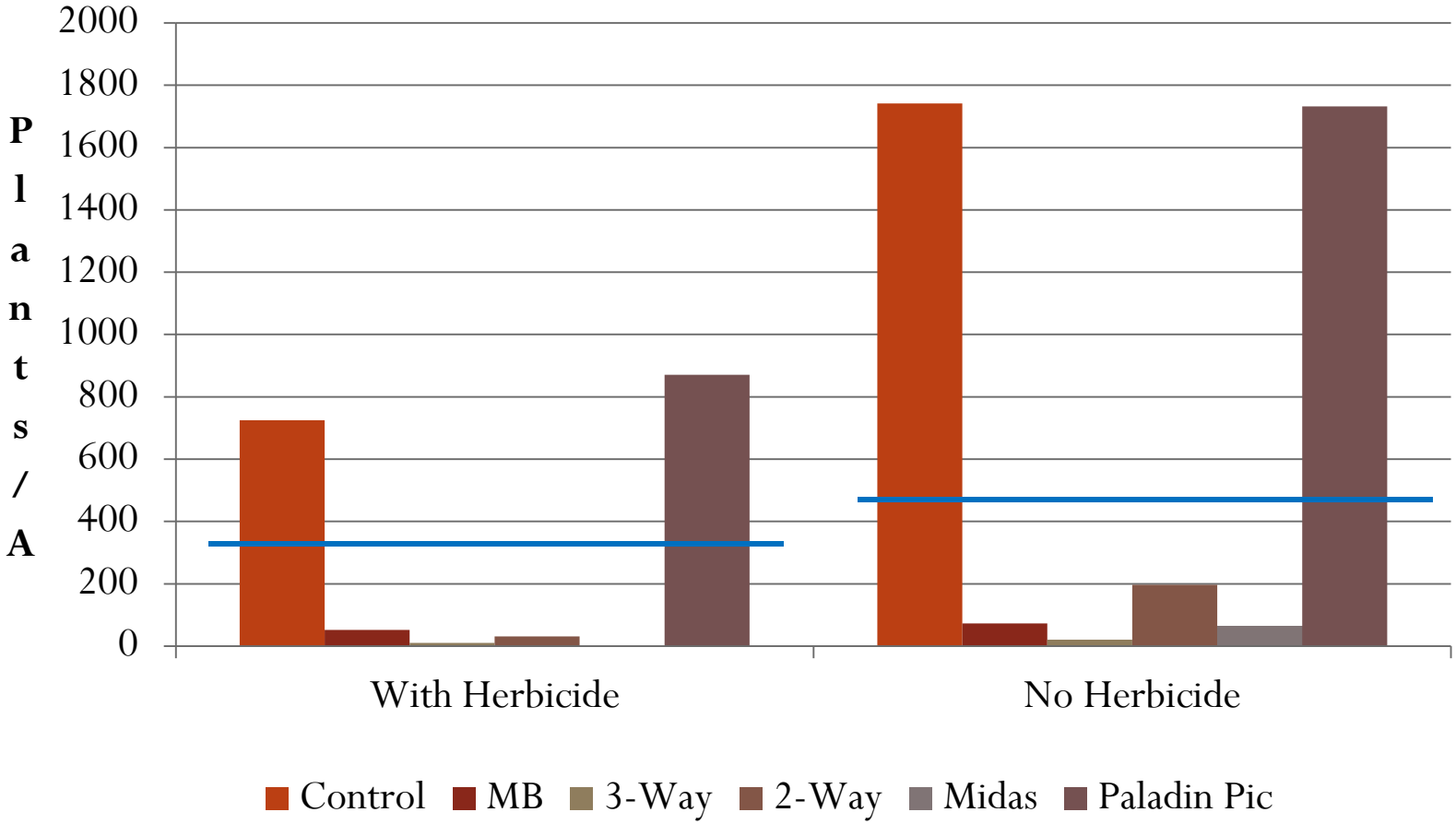
Fumigant control (%)	Herbicide Control (%)	Total Control (%)
50	70% of 50% = 35	50 + 35 = 85
60	70% of 40% = 28	60 + 28 = 88
70	70% of 30% = 21	70 + 21 = 91
80	70% of 20% = 14	80 + 14 = 94
90	70% of 10% = 7	90 + 7 = 97

Application Procedures – 1st Crop

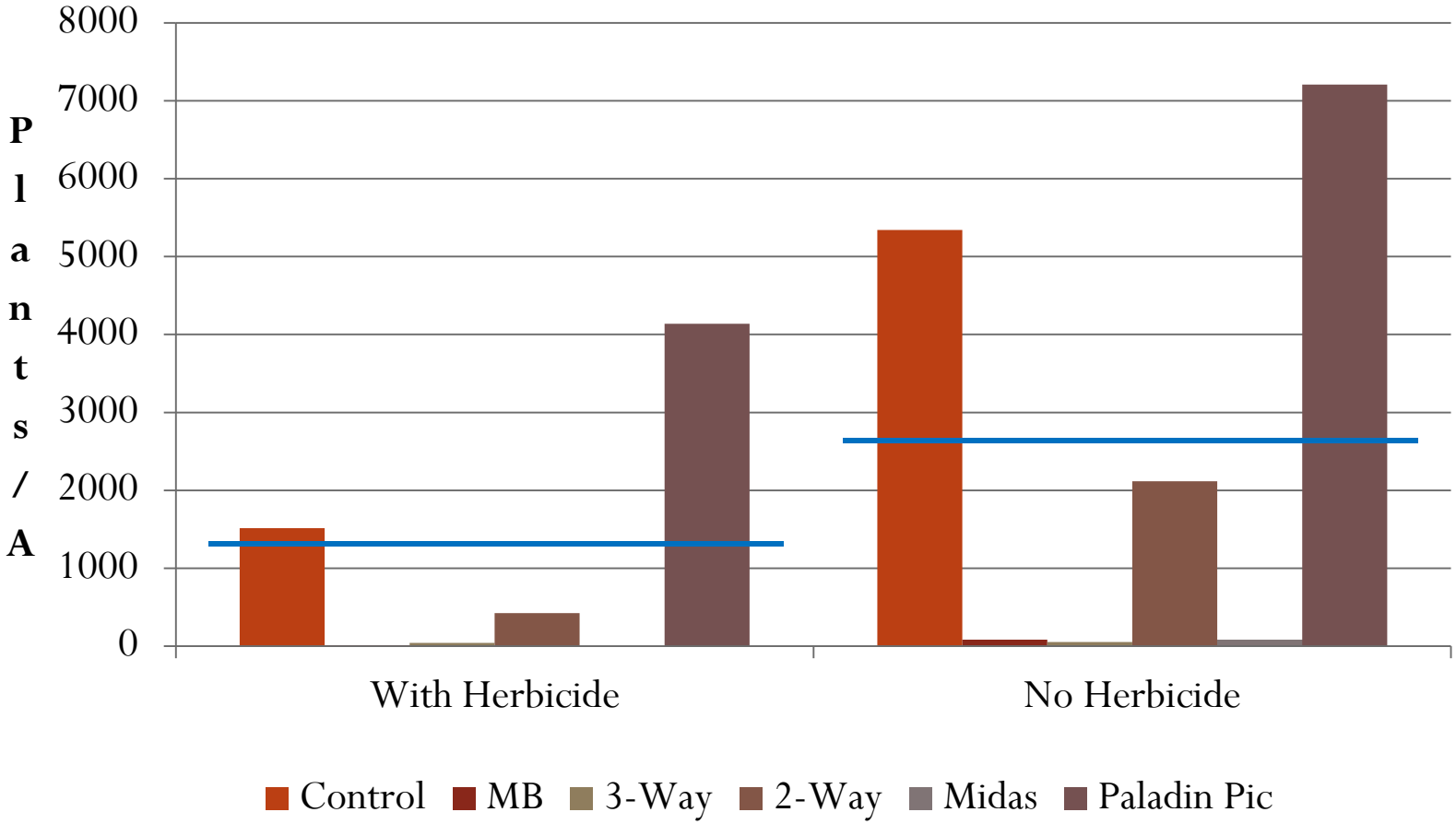
- The field was prepared using conventional tillage
- Telone II treatments were applied to a depth of 12 in. below bed top
- A pre-bed was pulled and then shaped using a 3-row rig
- The fumigants MB 50:50, Midas 50:50, Paladin Pic, and Chloropicrin were applied via shank at an 8 in. depth
- Beds were sealed using a bedpress, herbicides were applied, and then VIF mulch was applied using a speedroller
- Kpam treatments were applied via injection through a double drip tape system

Tomato

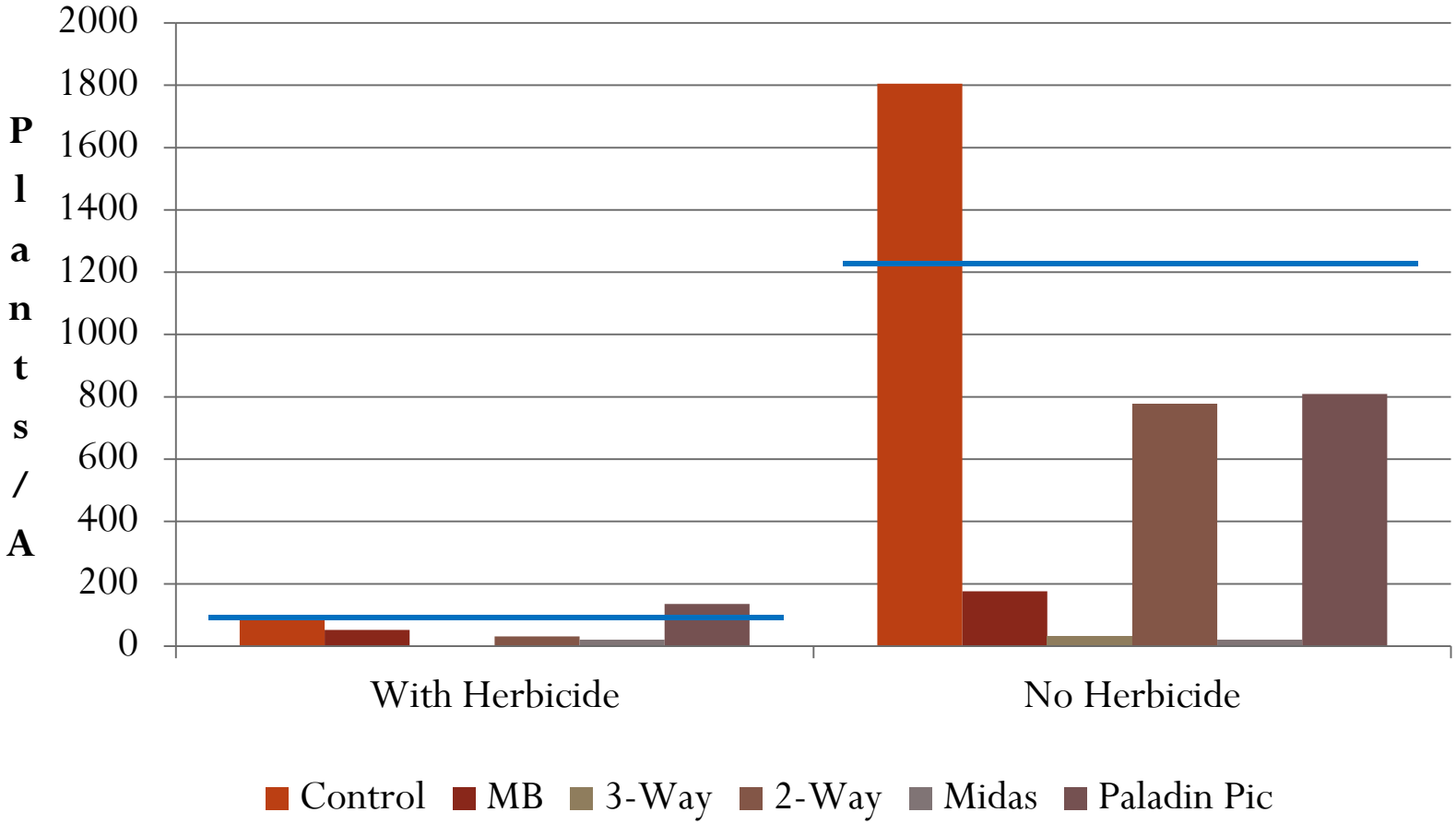
Tomato Year 1 - Annual Grass Count



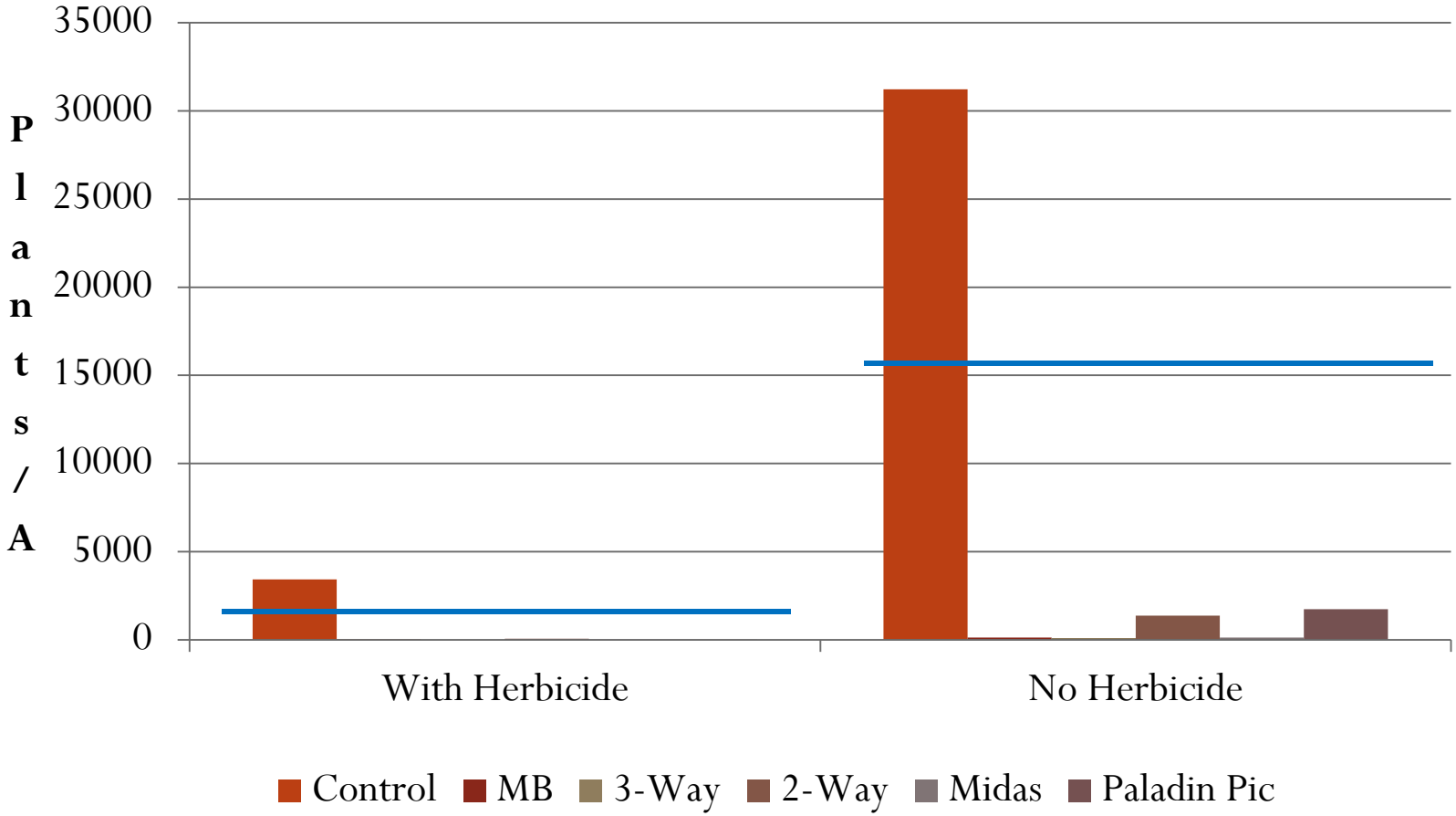
Tomato Year 2 - Annual Grass Count



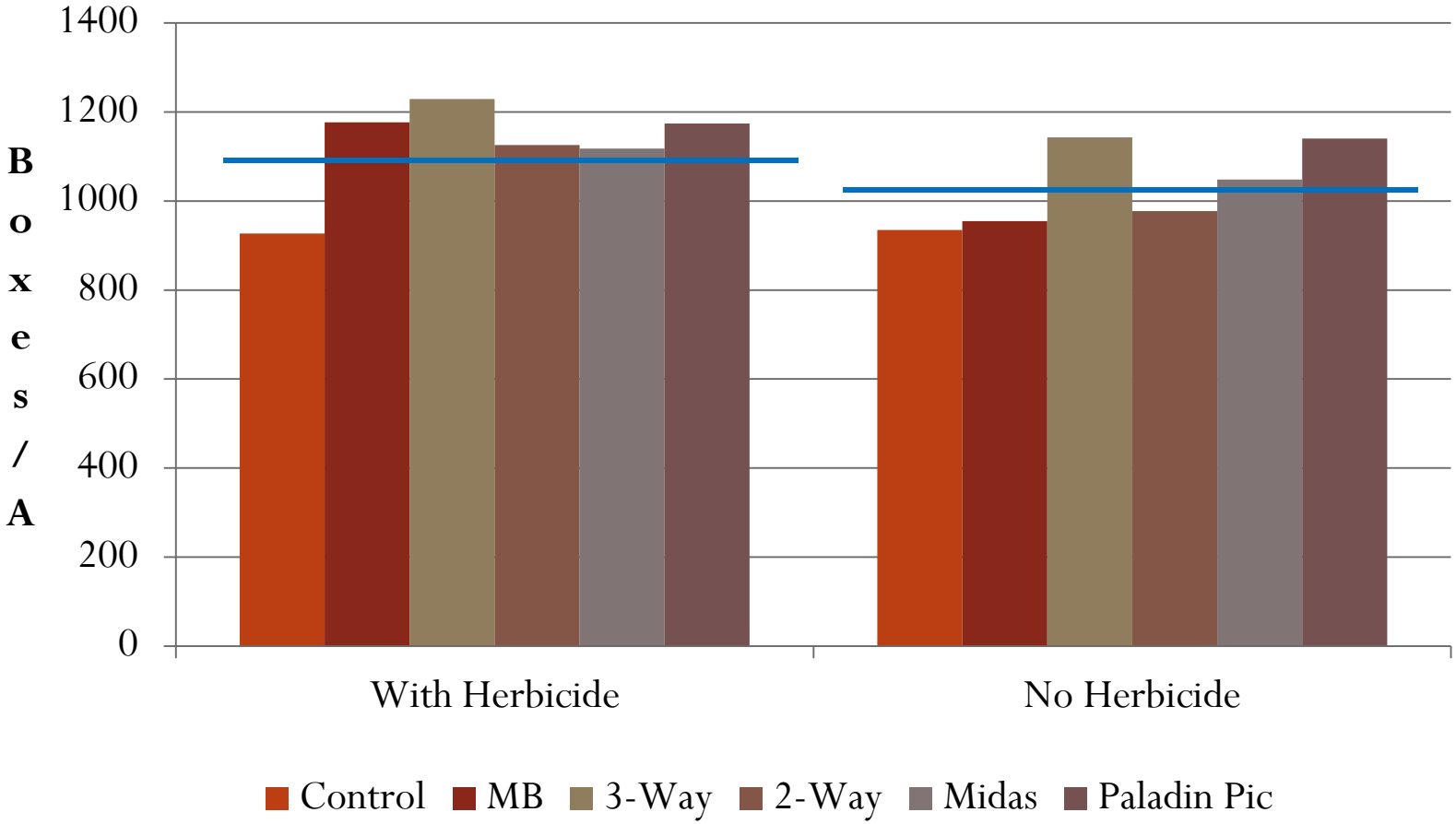
Tomato Year 1 – Purple Nutsedge Count



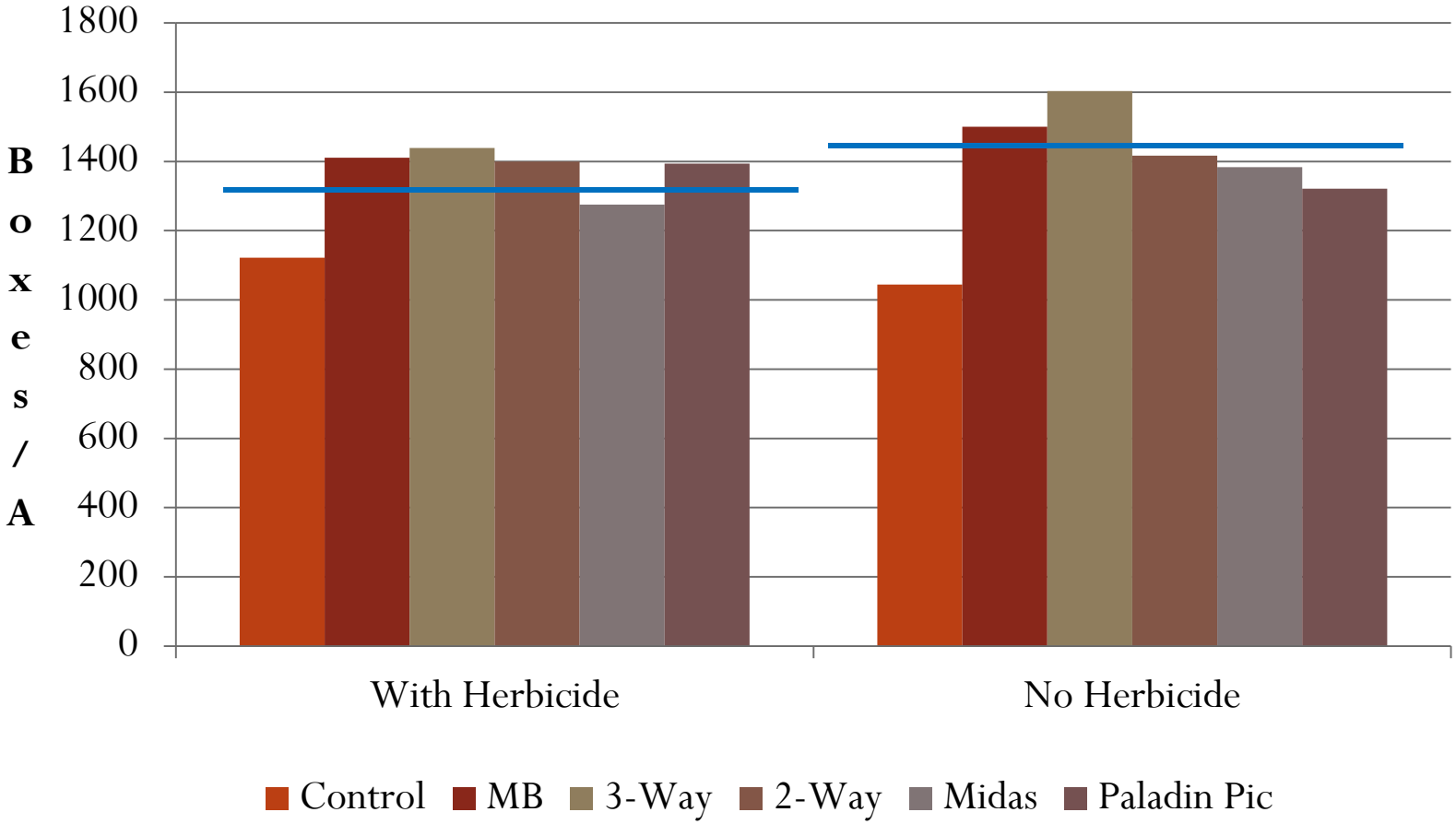
Tomato Year 2 – Purple Nutsedge Count



Tomato Year 1 – Marketable Yield



Tomato Year 2 – Marketable Yield



Summary

- Paladin Pic does not control goose grass
- The addition of a herbicide provided 60 – 70% control of the annual grasses
- The additional herbicide helped purple nutsdege control in both years
- All systems provided satisfactory control of purple nutsedge

Summary Cont.

- In both years, the addition of herbicide increased some fumigant program's marketable yields

- The three–way system has consistently good yields

Evaluation of all components of the 3-WAY fumigant system for tomato production

Treatments

	Fumigant	Rate (Broadcast)	Placement
1	Telone II	12 gal/A	12 inches
2	Chloropicrin	150 lbs/A	8 inches
3	KPam	60 gal/A	Drip applied
4	Chloropicrin + KPam		
5	Telone II + KPam		
6	Telone II + Chloropicrin		
7	Telone II + Chloropicrin + KPam		
8	PicClor 60	250 lbs/A	8 inches
9	PicClor 60 + KPam		
10	Telone C35	35 gal/A	8 inches
11	Telone C35 + KPam		
12	Non-treated Control		
All treatments were placed under VIF (Filmtec 1.2 mil or Blockade 1.1 mil) and LDPE (Pliant 1.0 mil) plastic mulches			

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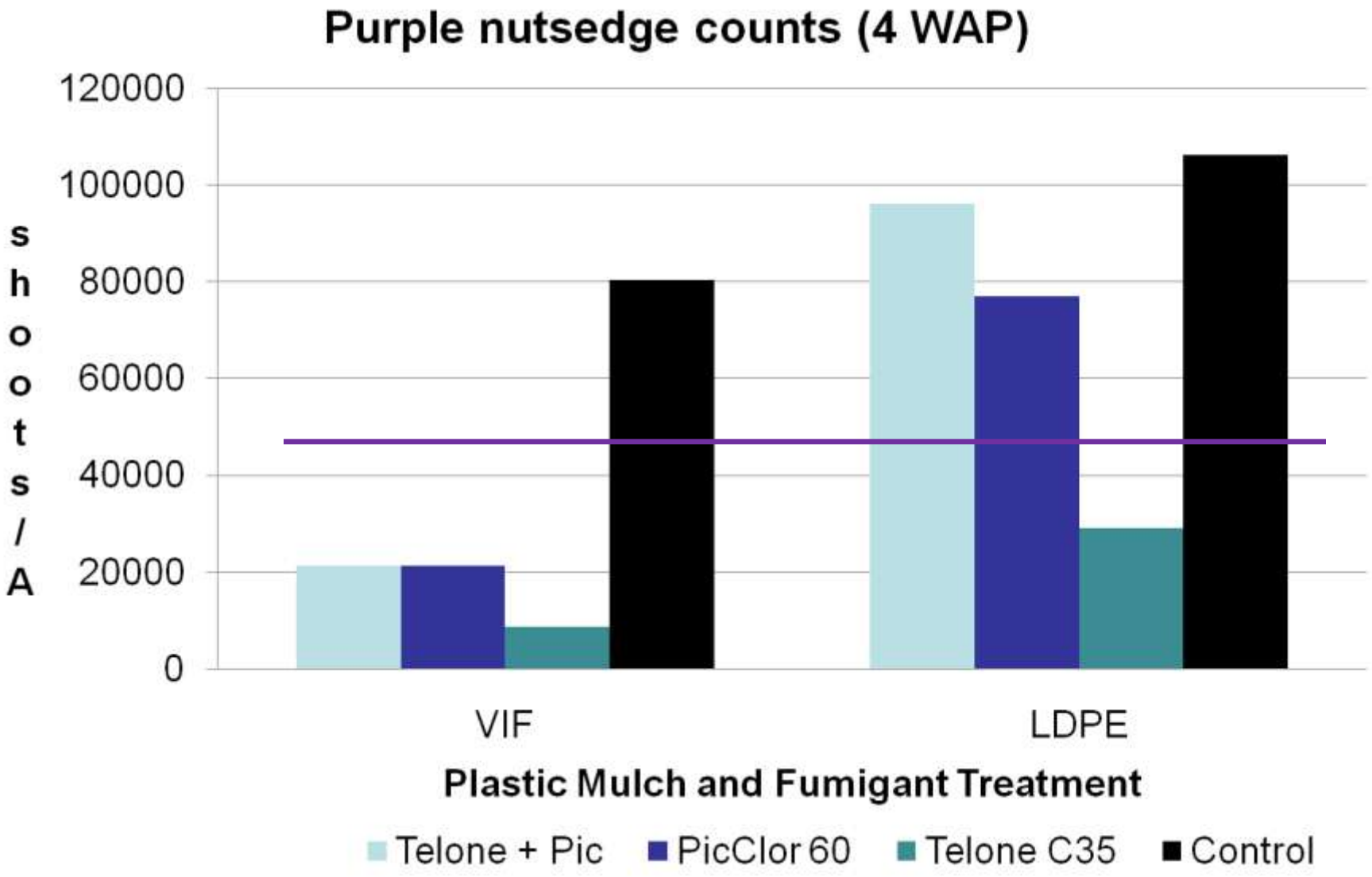
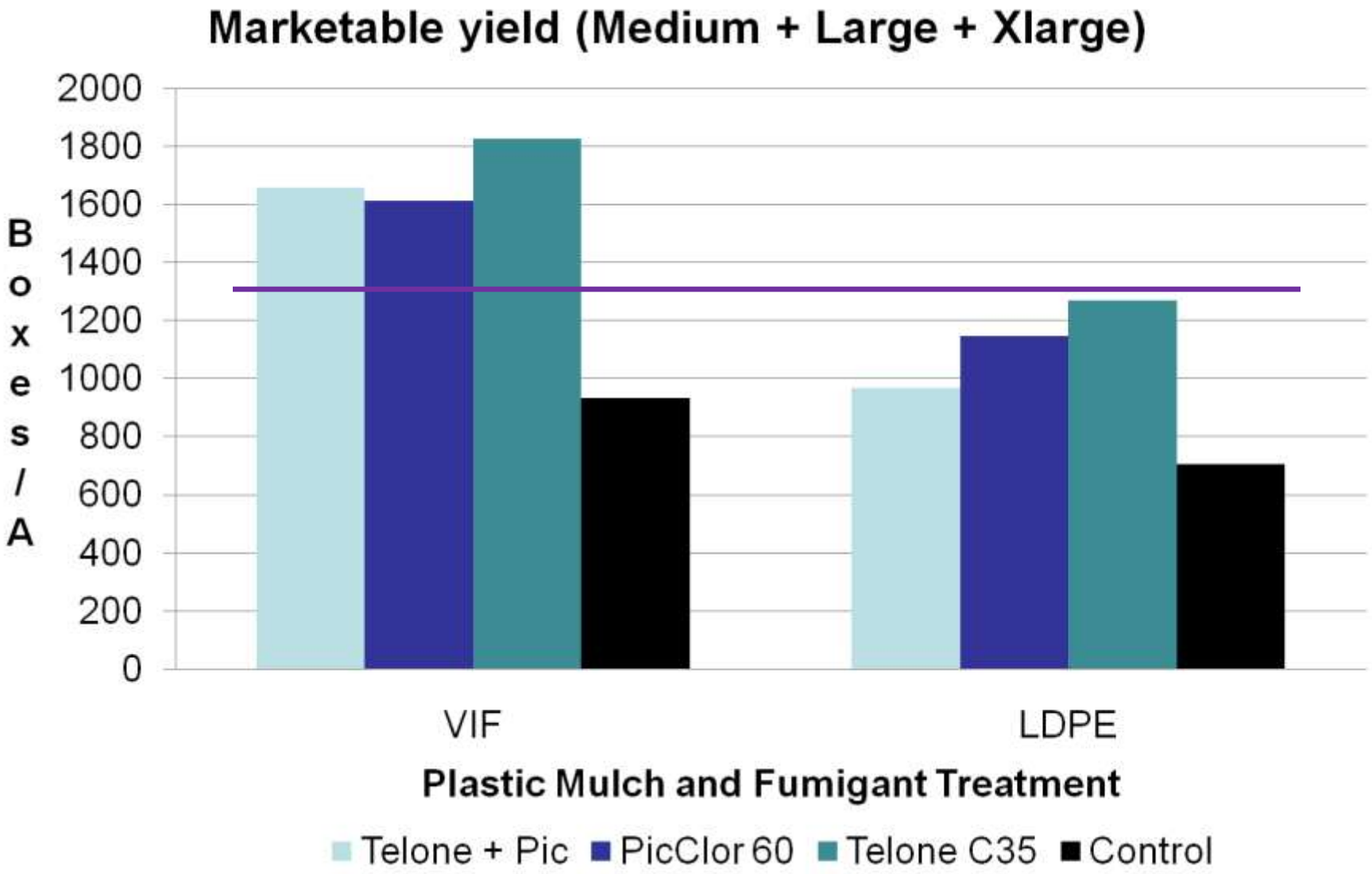
2-WAY – Purple Nutsedge Control



2-WAY – Marketable Yield




Telone + Pic VIF


Control VIF


Telone + Pic LDPE


Control LDPE


Telone C35 VIF


Control VIF


Telone C35 LDPE


Control LDPE

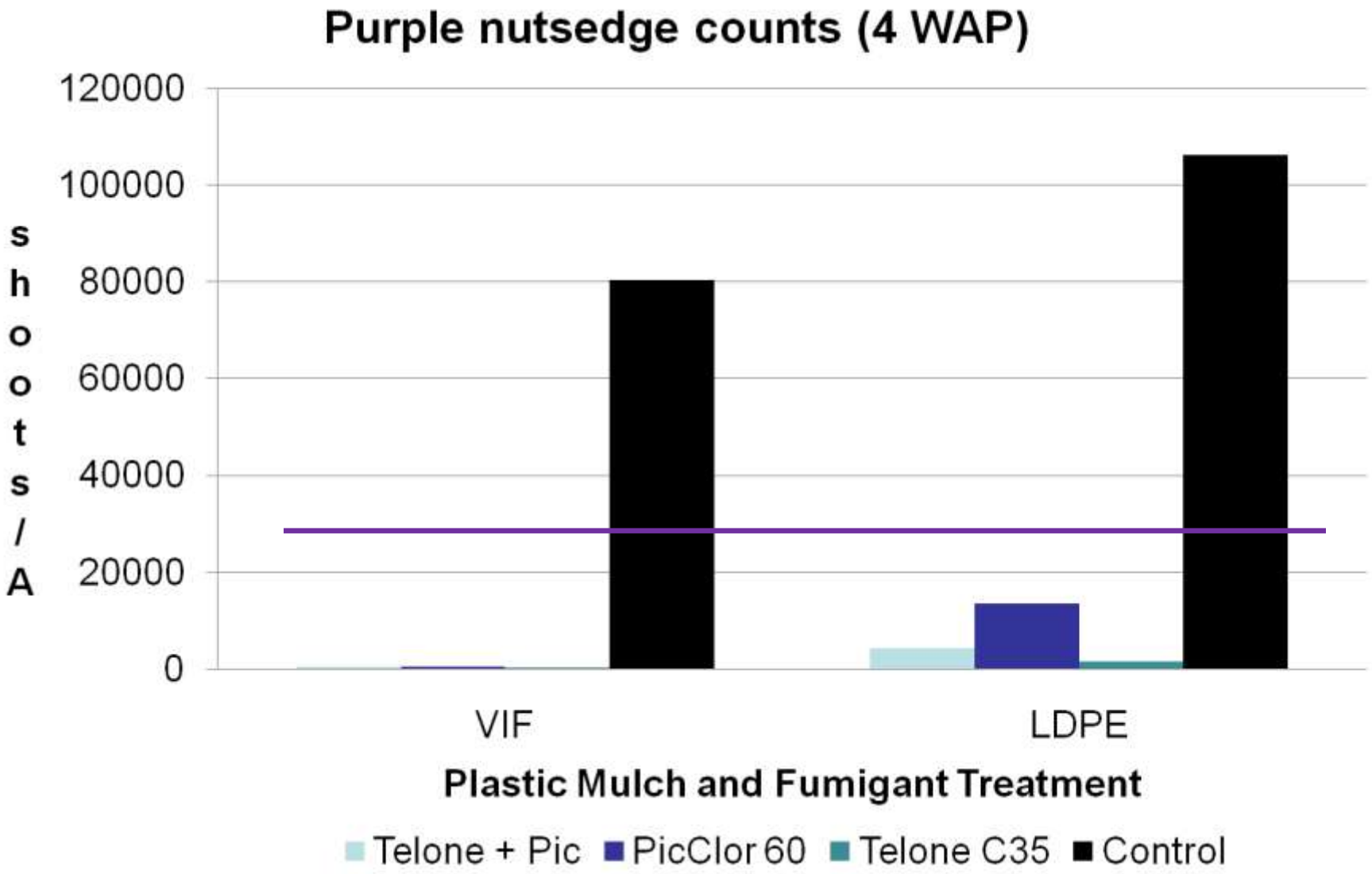

PicClor 60 VIF


Control VIF

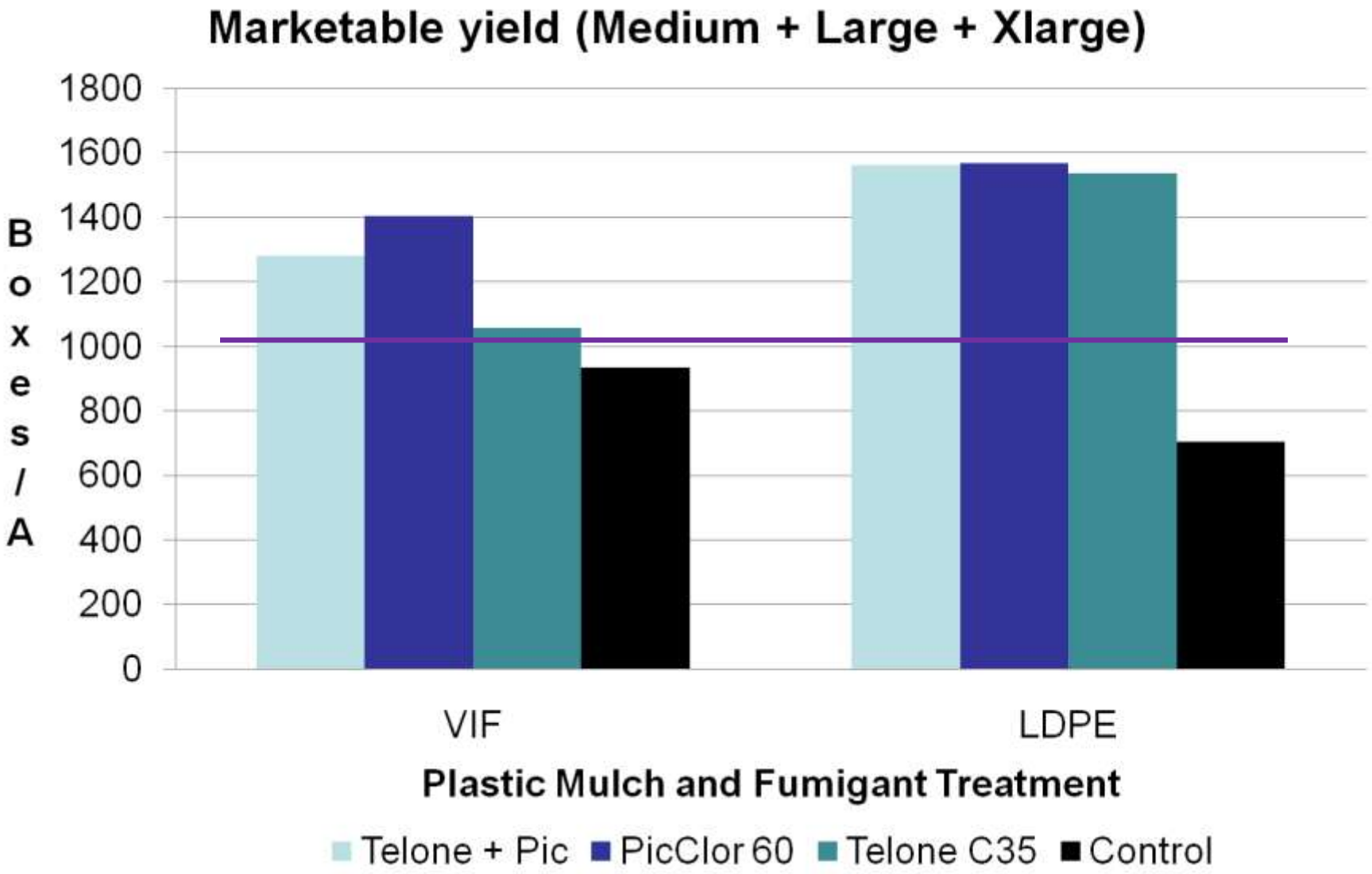

PicClor 60 LDPE


Control LDPE

3-WAY – Purple Nutsedge Control



3-WAY – Marketable Yield



Yields were reduced in VIF due to Kpam injury, i.e. we planted too soon after application

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3-WAY VIF


Control VIF


3-WAY LDPE


Control LDPE


Telone C35 + KPam VIF


Control VIF


Telone C35 + KPam LDPE


Control LDPE


PicClor 60 + KPam VIF


Control VIF


PicClor 60 + KPam LDPE


Control LDPE

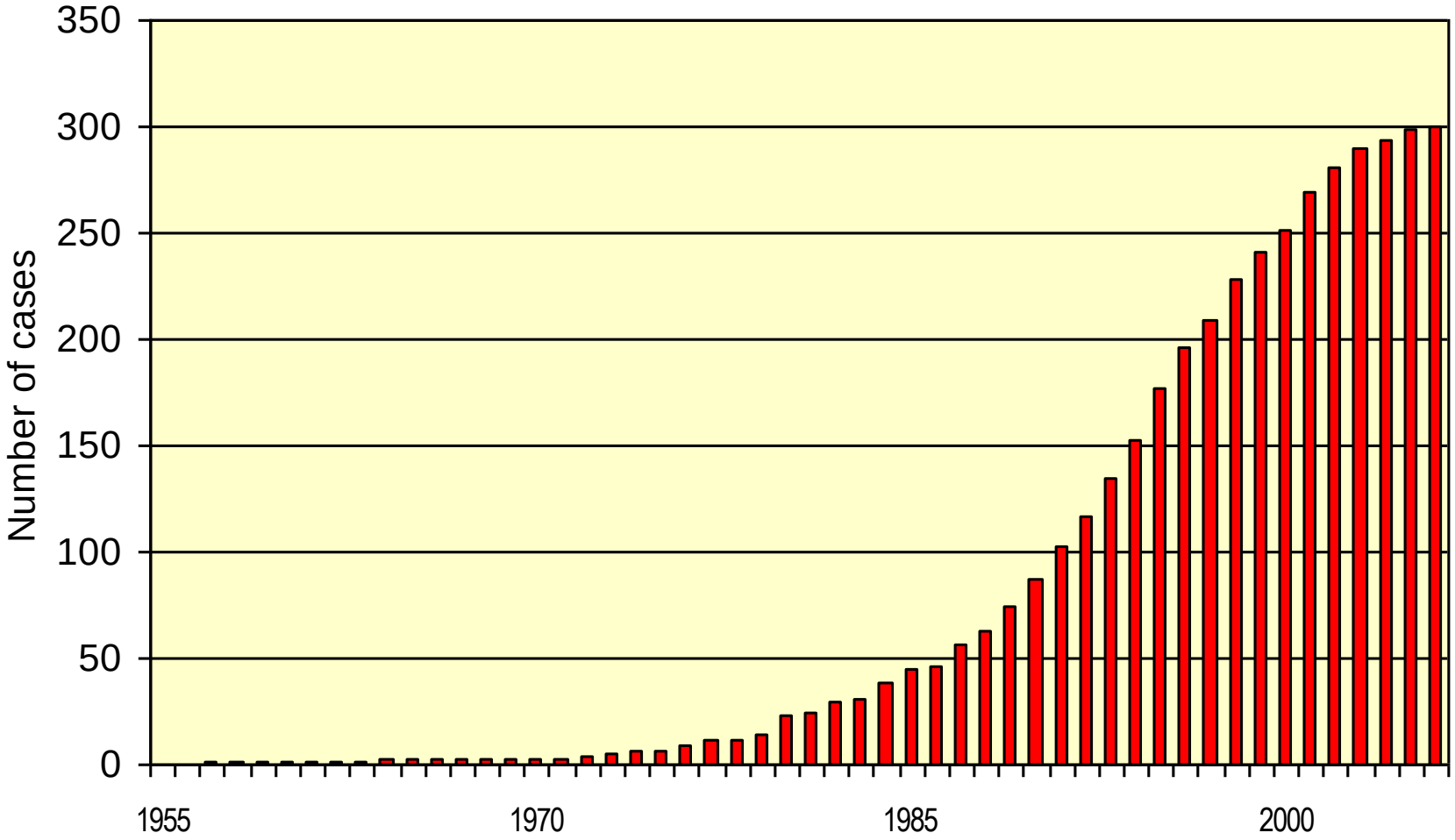
Herbicide Resistance

- Resistance develops most rapidly when one control method is used repeatedly over multiple growing seasons
- In tomatoes we are protected from developing our own resistance with the use of tillage in the fallow period and the option of multiple herbicide mode of actions
- Movement of resistant weeds may occur from agronomic fields to tomato fields, especially in North Florida

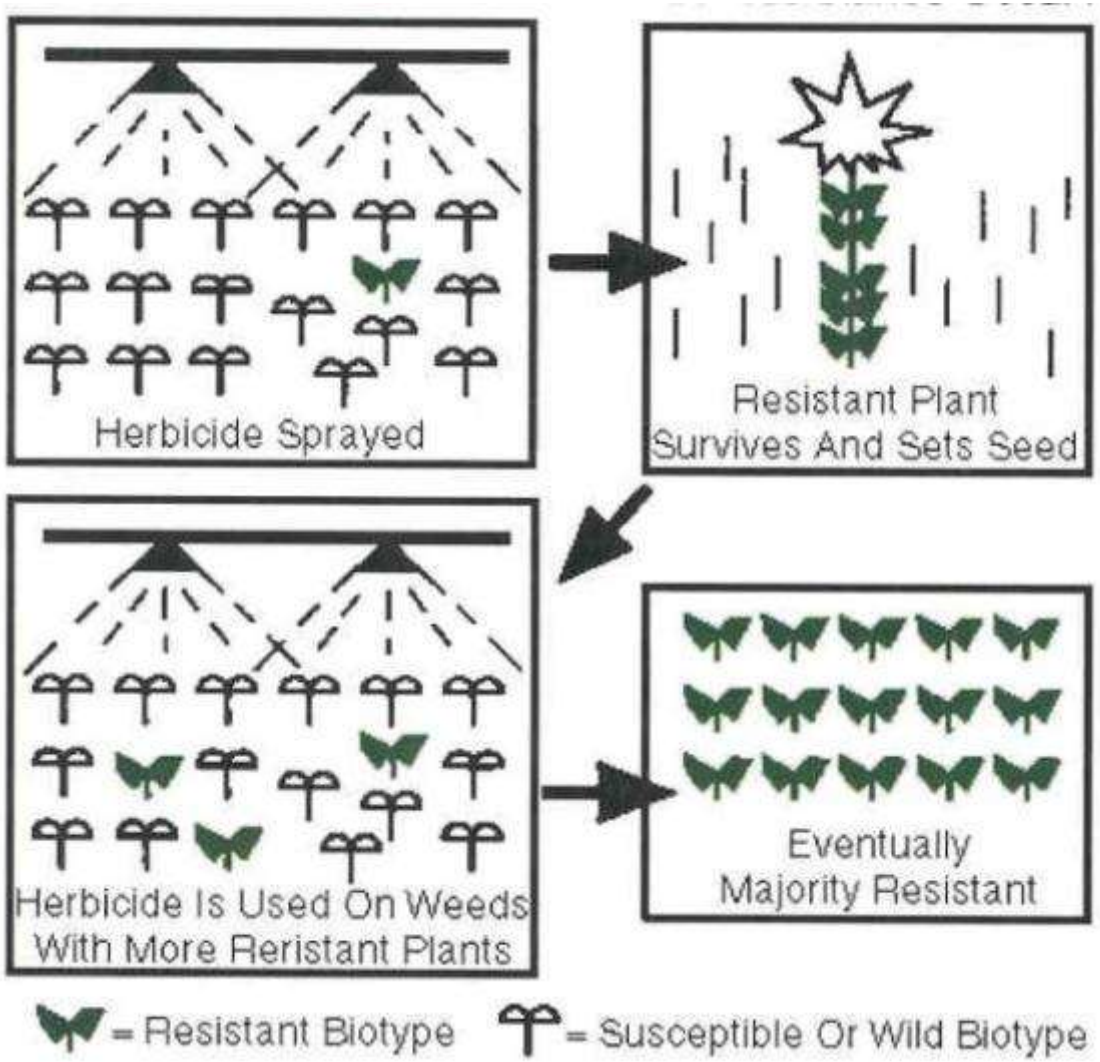
Herbicide Resistance

- Palmer Amaranth, a large pigweed commonly found in north Florida and throughout the Southeast, has shown multiple resistance to:
  - Glyphosate (Roundup type products)
  - ALS (Sandea, Matrix, Envoke)
- Palmer Amaranth has shown resistance to :
  - Triazines (possible cross resistance to metribuzin)
  - Dinitroanalines (Prowl H2O)
- Current control strategies in cotton rely on the use of other herbicide modes of action
  - Acetomides (Dual Magnum)
  - PPOs (Chateau, Reflex)

Reported cases of herbicide-resistant weeds in US



Herbicide Resistant Weeds



Herbicide Resistant Weeds

Do I Have A Resistance Problem?

- Weed size
- Moisture
- Temperature
- Weather
- Rate
- Agitation
- Nozzle type
- Nozzle wear
- GPA
- Calibration
- Bad luck
- Resistance

Questions ?

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