Annual Biocontrol Industry Meeting Lucerne

Cost benefit of using Bt-based products in IPM programs

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Benefits of using Bts:

- Effective control of many lepidopteran pests
  - –armyworm, loopers, fruitworm, cabbage worm diamondback moth
- Unique MOA
- Conserve beneficial insects
- Favorable environmental attributes
- Minimal re-entry restrictions
- Organic status
- Minimal pre-harvest restrictions
- Minimize crop damage and maximize ROI

Market positioning of Bts :

Management of lepitopteran pests

Management of organic production

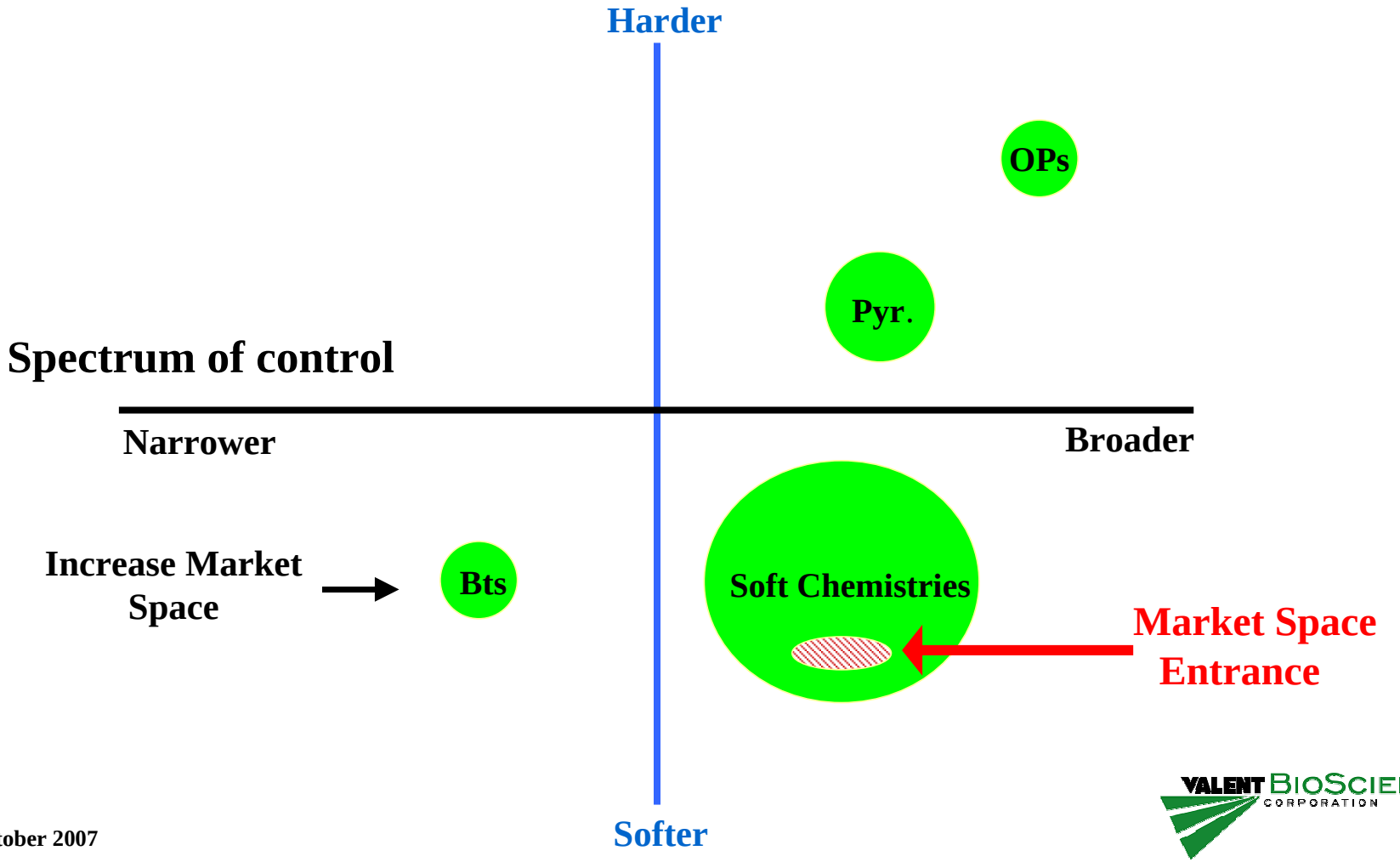
Management of residues for traditional insecticides

Management of resistance development for traditional insecticides

Integrated pest management

Create new market space for Bts (DiPel®-*Btk* and XenTari®-*Bta*) in IPM programs that used soft chemistries

Impact on Beneficials



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Bt-based products in IPM programs

Target: IPM programs in cole crops and tomato

Achieve IPM Objectives

Control lepidopteran pests while

- **reducing the total standard insecticide applications**
- **conserving the beneficial insects**
- **providing a sustainable cropping system**

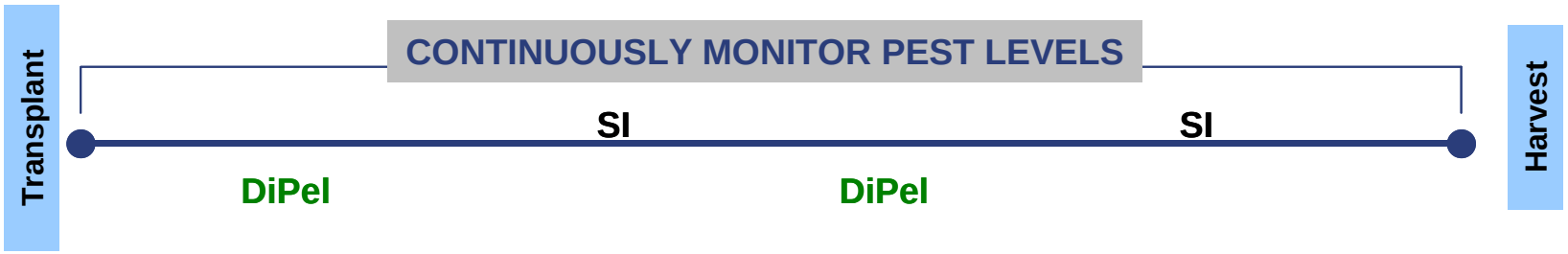
Bt-based products in IPM programs

Goal: develop field data to demonstrate the benefits of using DiPel and XenTari in season-long pest-control programs with standard insecticides:

- **improved efficacy**
- **enhanced yields and crop quality**
- **reduced cost**
- **reducing the threat of resistance to standard insecticides**

Bt-based products in IPM programs

<u>Approach 1:</u> Rotation program utilizing DiPel (or XenTari) with Standard Insecticides (SI)



- Scout fields for pest; apply products at "action threshold"
- When non-lepidopteran pests are present apply a traditional insecticide (TI) as needed

Bt-based products in IPM programs

<u>Approach 2:</u> Tank-mix program utilizing DiPel (or XenTari) with reduced rates of Standard Insecticides (SI)

- Scout fields for pest; apply products at "action threshold"

Field program

Target Brands & Active Ingredients

Active Ingredient	Brand Name
Spinosad	Spintor, Success
Emamectin benzoate	Proclaim
Methoxyfenozide	Intrepid
Indoxacarb	Avaunt

Field program

Protocol

Treatments
Untreated check
Soft Chemistry alone
Tank Mix DiPel or XenTari + Soft Chemistry
Rotation DiPel or XenTari / Soft Chemistry
DiPel DF or XenTari DF alone

Field program

Protocol

	Application Rate		
Product	**Alone**	**Rotation**	**Tank Mix**
Spintor 25C	1x	1x	0.5x
Proclaim WDG 5%	1x	1x	0.5x
Intrepid 2F	1x	1x	0.5x
Avaunt WDG 30%	1x	1x	0.7x
XenTari DF	1x	1x	1x
DiPel DF	1x	1x	1x

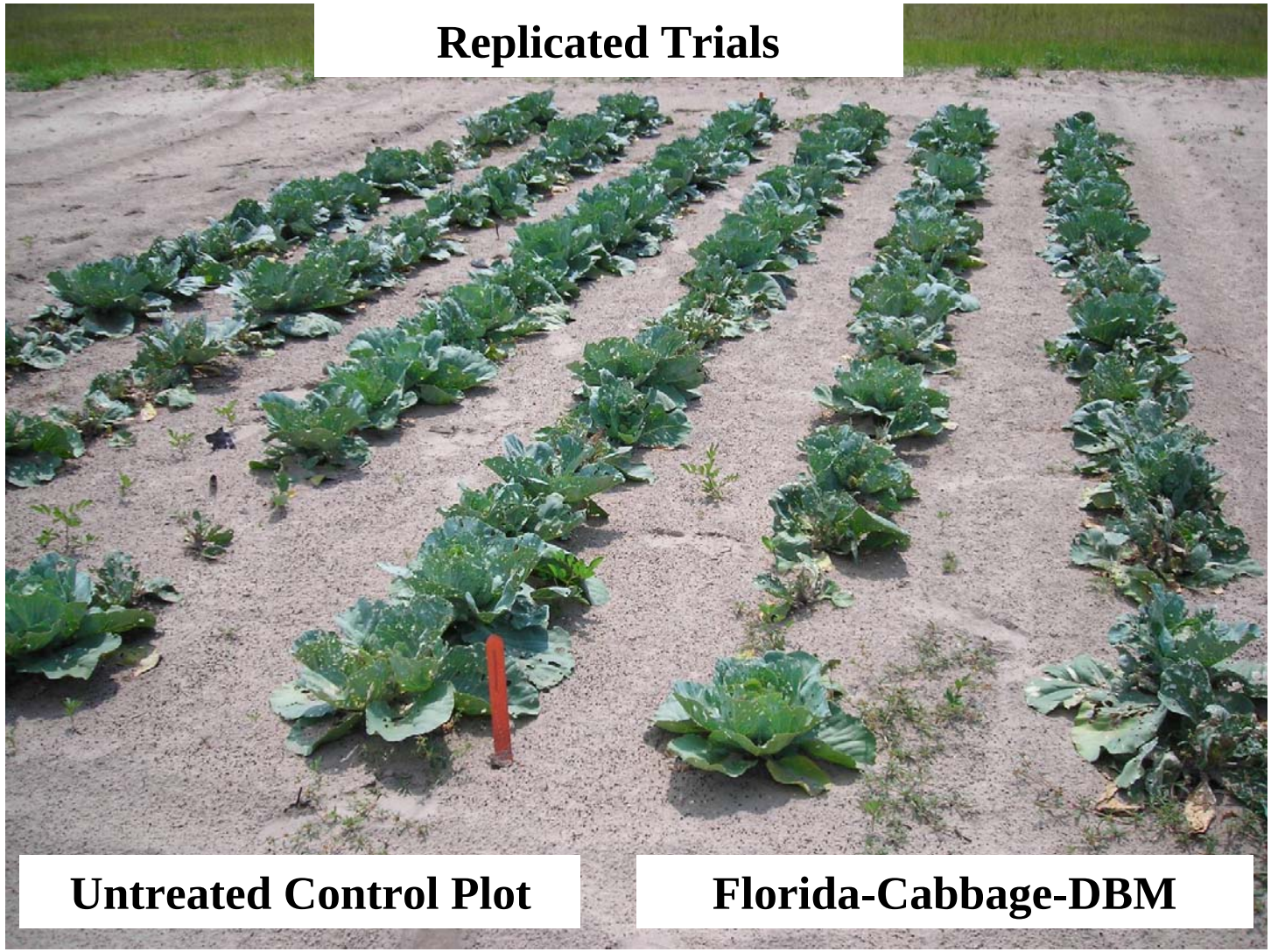
Field program

Protocol

- Key influencers and respected researchers
- Season-long program
- Pest populations continuously monitored
- Applications made when threshold levels reached
- Replicated field trials

Field program

Replicated Trials



Untreated Control Plot

Florida-Cabbage-DBM

Field program

Pest species present in trials

Common Name	Scientific Name
Diamondback Moth (DBM)	*Plutella xylostella*
Cabbage Looper	*Trichoplusia ni*
Southern Armyworm	*Spodoptera eridania*
Cabbage Webworm	*Hellula rogatalis*
Beet Armyworm	*Spodoptera exigua*
Cross-stripped Cabbageworm	*Evergestis rimosalis*
Yellow-stripped Armyworm	*Spodoptera ornithogalli*
Cabbageworm / Imported Cabbageworm	*Pieris rapae*

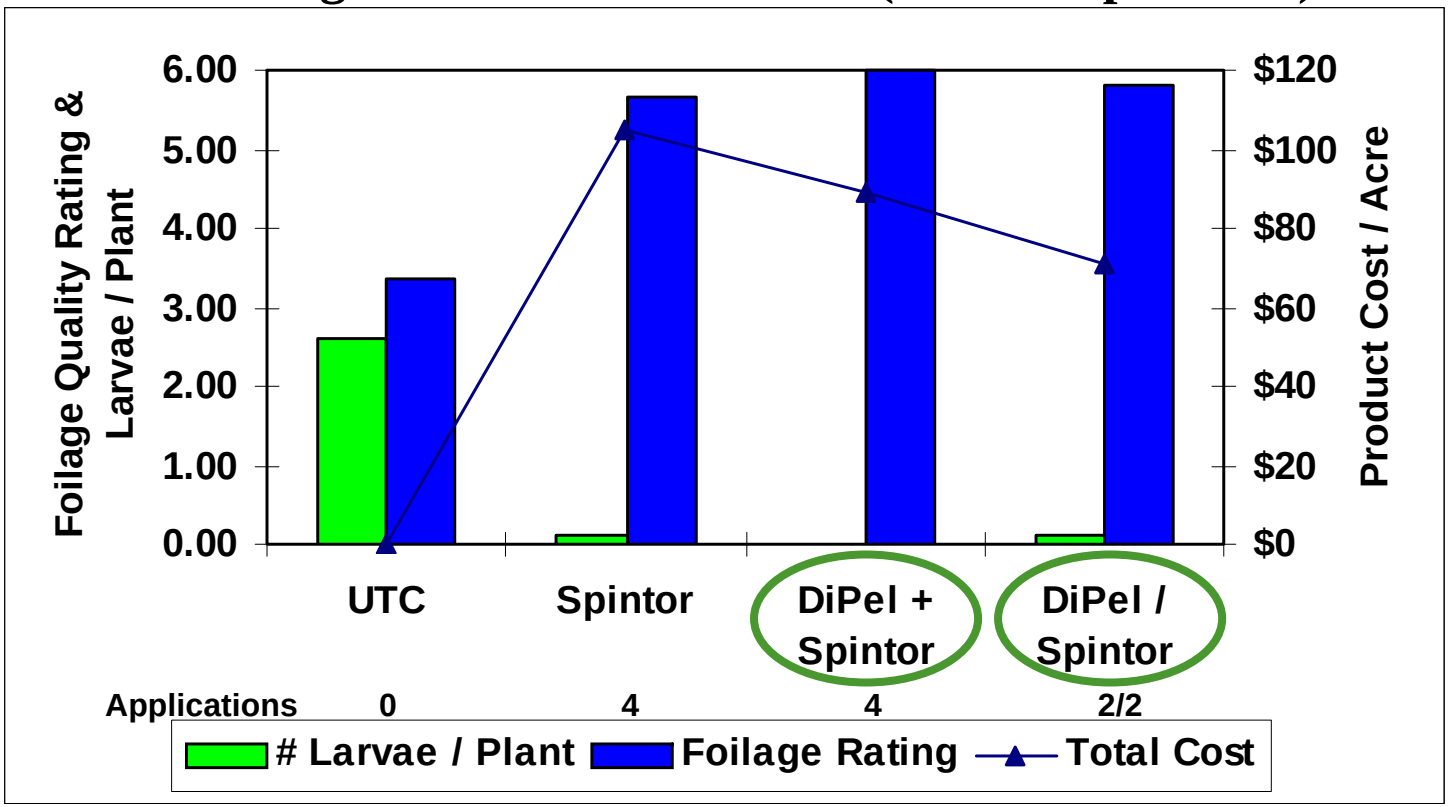
Identifying Success

Performance	Cost	Success
Better	Less, Equal, Slightly More	YES
Equal	Less	YES
Equal	Equal	YES*
Equal	More	NO
Less	Irrelevant	NO

* Resistance Management Message

Seal - University of Florida

Cabbage / Diamondback moth (low-med pressure)



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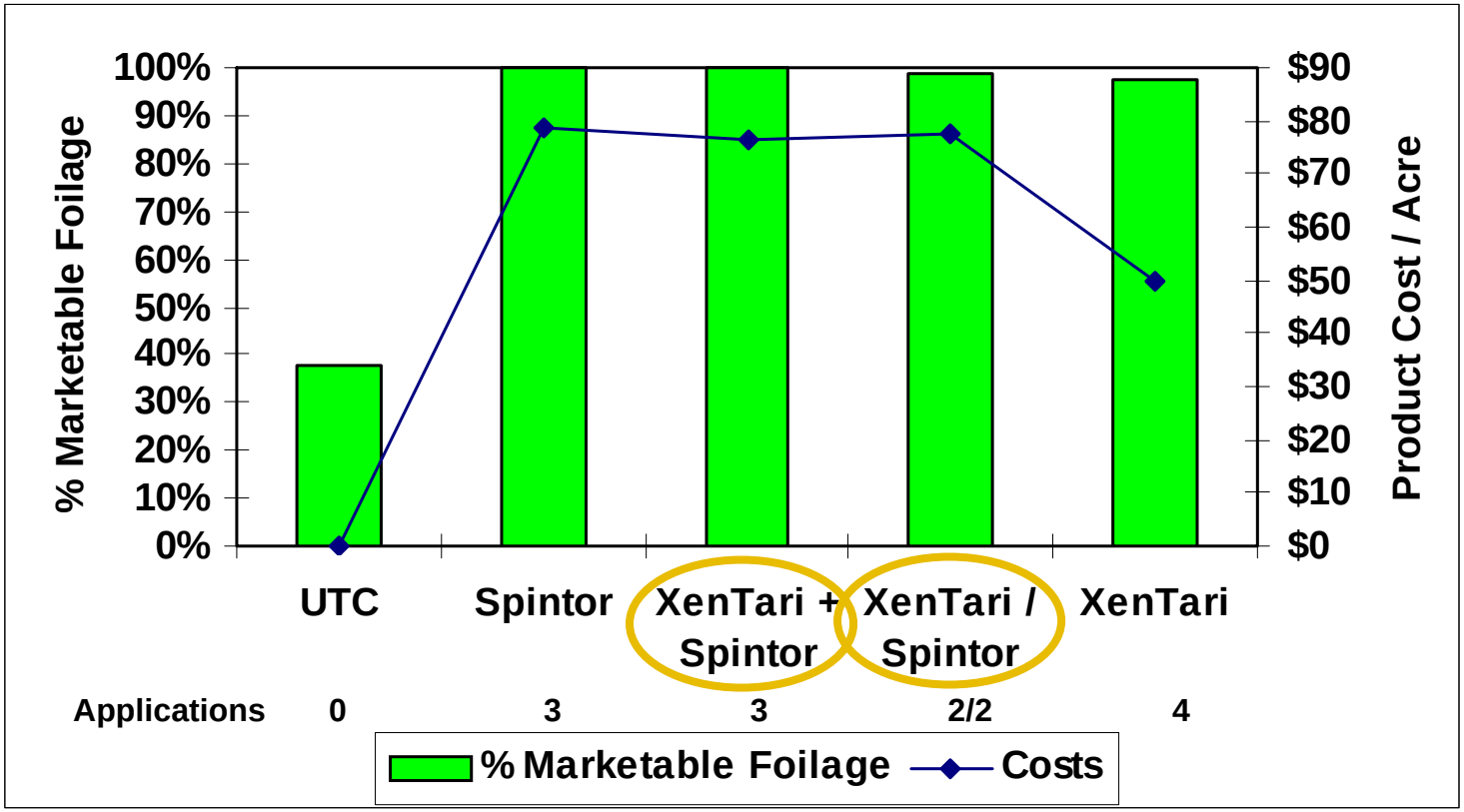
Smith - Clemson University, South Carolina

Collards / Complex including cabbage webworm (medium-high pressure)



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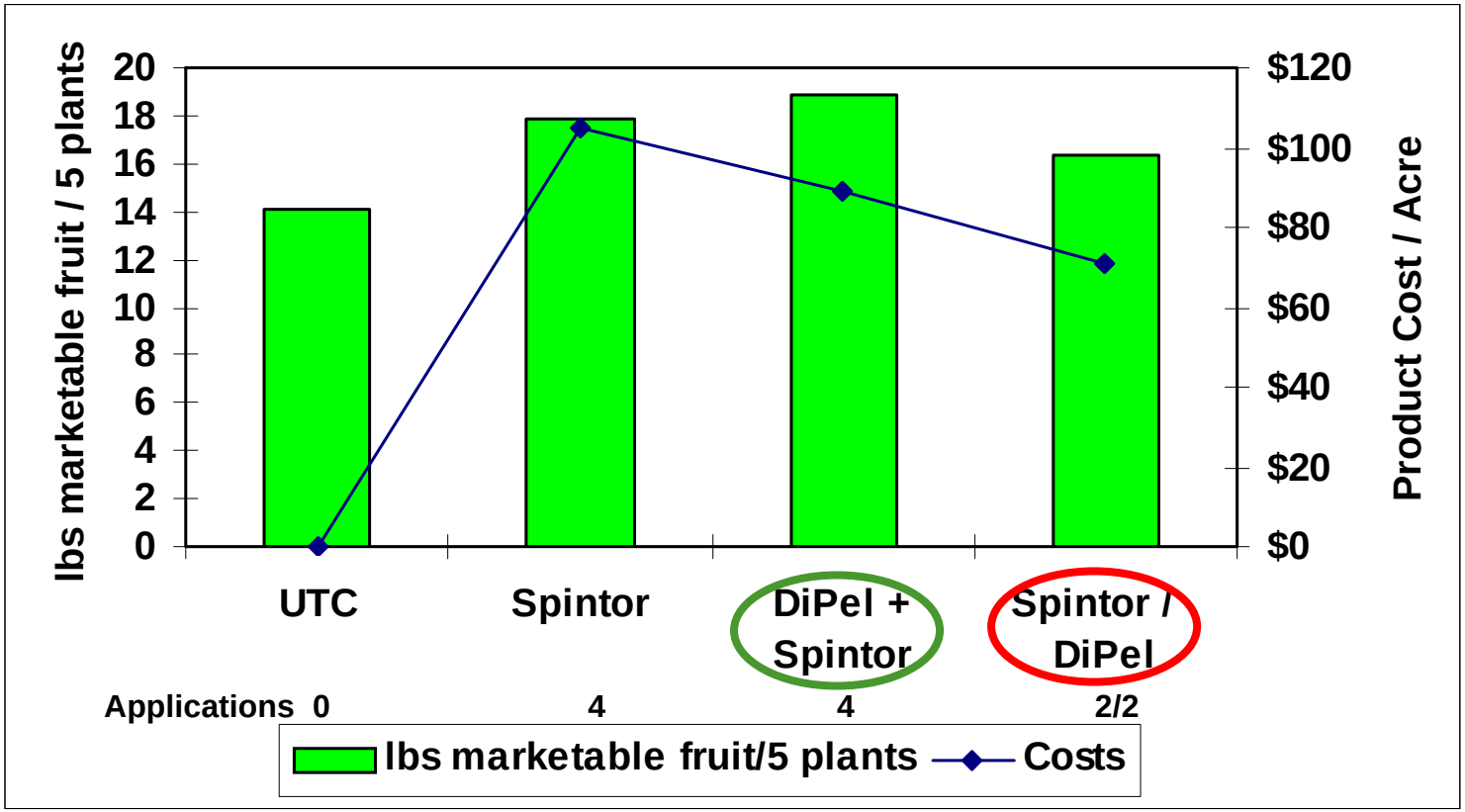
Funderburk - University of Florida

Tomato / Armyworm complex (low-medium pressure)



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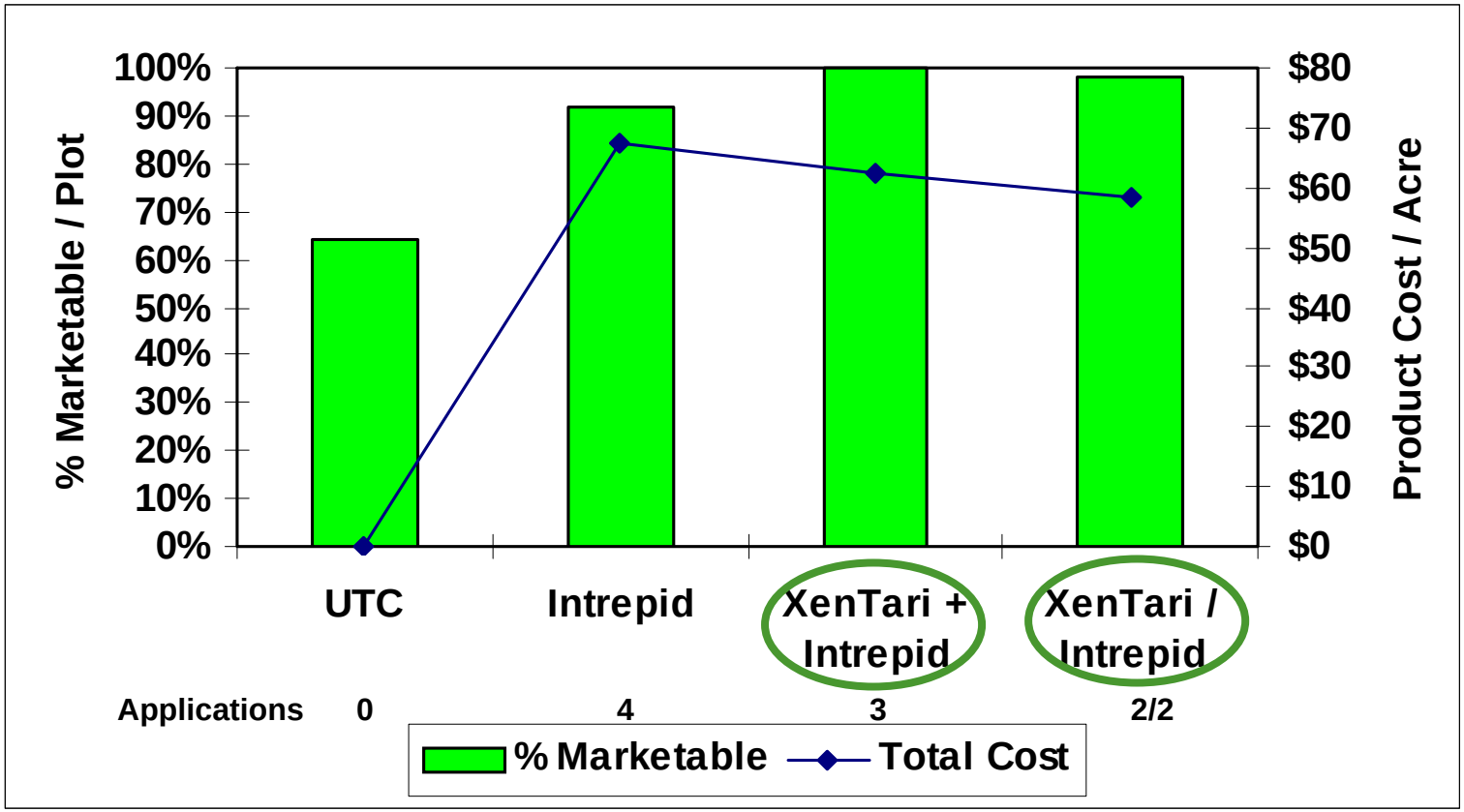
Hale Research, California

Cabbage / Diamondback moth (medium-heavy pressure)



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Program Success Summary

Crop	Soft Chemistry	Result	
		Tank Mix	Rotation
Cabbage	Spintor		
Cabbage	Spintor		
Cabbage	Spintor		
Collards	Spintor		
Tomato	Spintor		
Cabbage	Intrepid		
Cabbage	Proclaim	Not Tested	
Cabbage	Proclaim		
Cabbage	Avaunt		
Collards	Avaunt		

Conclusions

- **Insect Control:**
  - **DiPel/XenTari used in tank-mix and rotation treatments highly effective against diamondback moth, armyworms, loopers and others**
  - **DiPel/XenTari used in tank-mix or rotation treatments were generally equal to or better than soft chemistries alone**
  - **Tank-mix treatments usually more effective than rotational treatments**

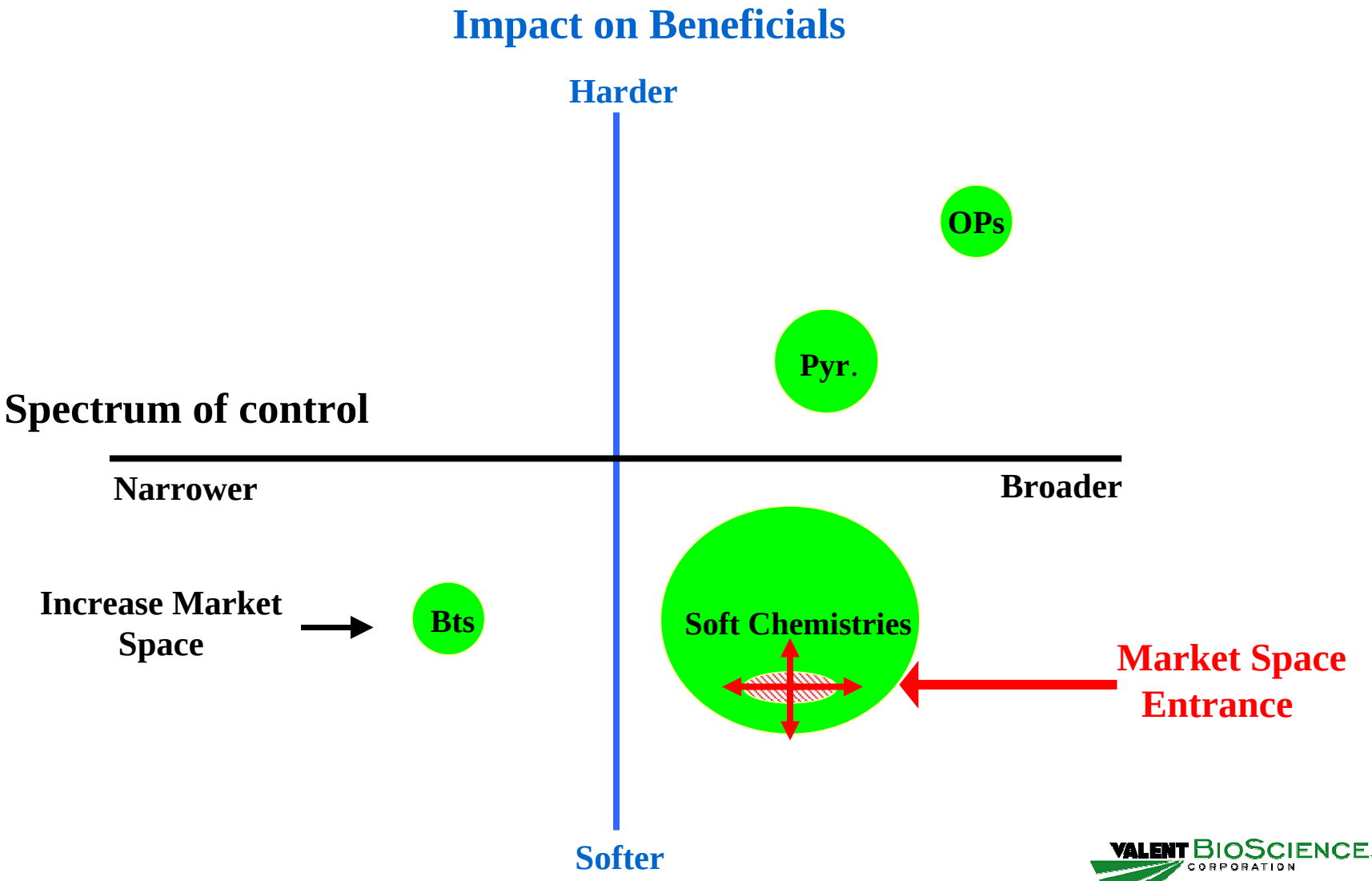
Conclusions

- **Cost/Yields:**
  - **Tank-mix treatments most costly but more effective**
  - **Cost of rotational treatments much less for the same level of control.**
  - **Yields from DiPel/XenTari tank-mix and rotational treatments comparable to soft chemistries alone.**

Conclusions

- **New Market Space**
  - **Well-designed and well-executed replicated field trials demonstrated the efficacy and cost benefits of DiPel/XenTari in tank-mix and rotational treatments with soft chemistries**
  - **New market space was created**

Competitive Target – Soft Chemistries



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THANK YOU!