

# **Selectivity of Organic Herbicides in Broccoli and Onions**

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# Comparison of Organic vs Conventional Broccoli and Onion Production Costs

<b>Production System</b>	<b>Weeding Costs/A</b>
<b>Organic<sup>1</sup></b>	<b>\$270</b>
<b>Conventional.<sup>2</sup></b>	<b>\$161</b>

**Hand weeding costs for onions can be extreme due to lack of cultivation and dense stands**

1 – Tourte and Smith, 2004; 2 – Smith et al. 2004

**The waxy cuticle on cole crops and onions protects them to some degree from fertilizers and contact herbicides**



# Conventional Materials Commonly Sprayed on Broccoli and Onions

- **Liquid fertilizers**
  - AN20, NpHuric, Sulfuric Acid, Acid based fertilizers
- **Contact herbicides**
  - Goal 2XL, Goal Tender, Buctril (onions)
- **These postemergence applications greatly reduce production costs**
- **It seemed logical that postemergence applications of organic herbicides could be used in the same way**

<b>Eco-Exempt</b>	<b>2-Phenethyl Propionate.....21.4.% Eugenol (Clove Oil).....21.4%</b>
<b>Matran 2 [Matran EC]</b>	<b>Clove Oil (46%) Other Ingredients (54%) (Water and Lecithin) [Clove Oil (50%) Other Ingredients* (50%) (Wintergreen Oil, Butyl Lactate, and Lecithin) ]</b>
<b>AllDown</b>	<b>Citric Acid 5% Acetic Acid, yucca extracts, and water 94.8% Garlic oil 0.2%</b>
<b>Burnout II</b>	<b>Clove Oil ..... 12% Sodium Laurel Sulphate ... 8% Other Ingredients: Vinegar, Lecithin, Water, Citric Acid, Mineral Oil 80%</b>
<b>Weed Zap</b>	<b>Clove Oil 30% Inerts including vinegar 70% [Clove Oil 45% Cinnamon Oil 45%]</b>
<b>Weed-A-Tak</b>	<b>eugenol (clove oil), 2-phenethyl propionate (peanuts), castor oil, thyme oil and wintergreen oil.</b>
<b>Scythe*</b>	<b>Pelargonic acid           4.2 lbs ae/gal 40% inert ingredients</b>

**\* To be reviewed by NOP in 2007**

**Adapted from Cheryl Wilen, 2006**



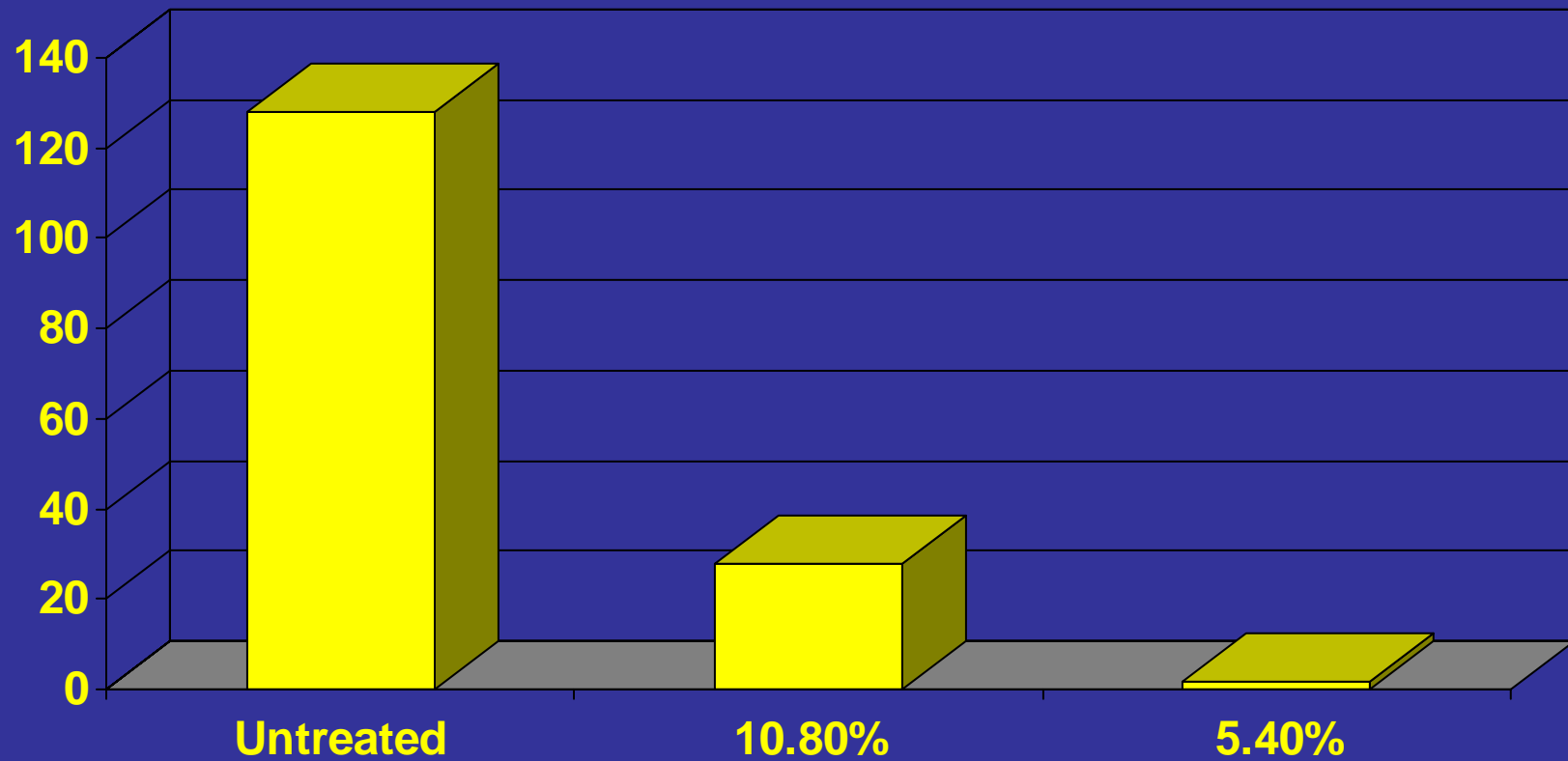
**Other important considerations:  
Timing, weed species, weed size (< 2 true leaves)**

# Postemergence Trials on Broccoli



# Number of Weeds in Broccoli

## 2006 Trial No. 1

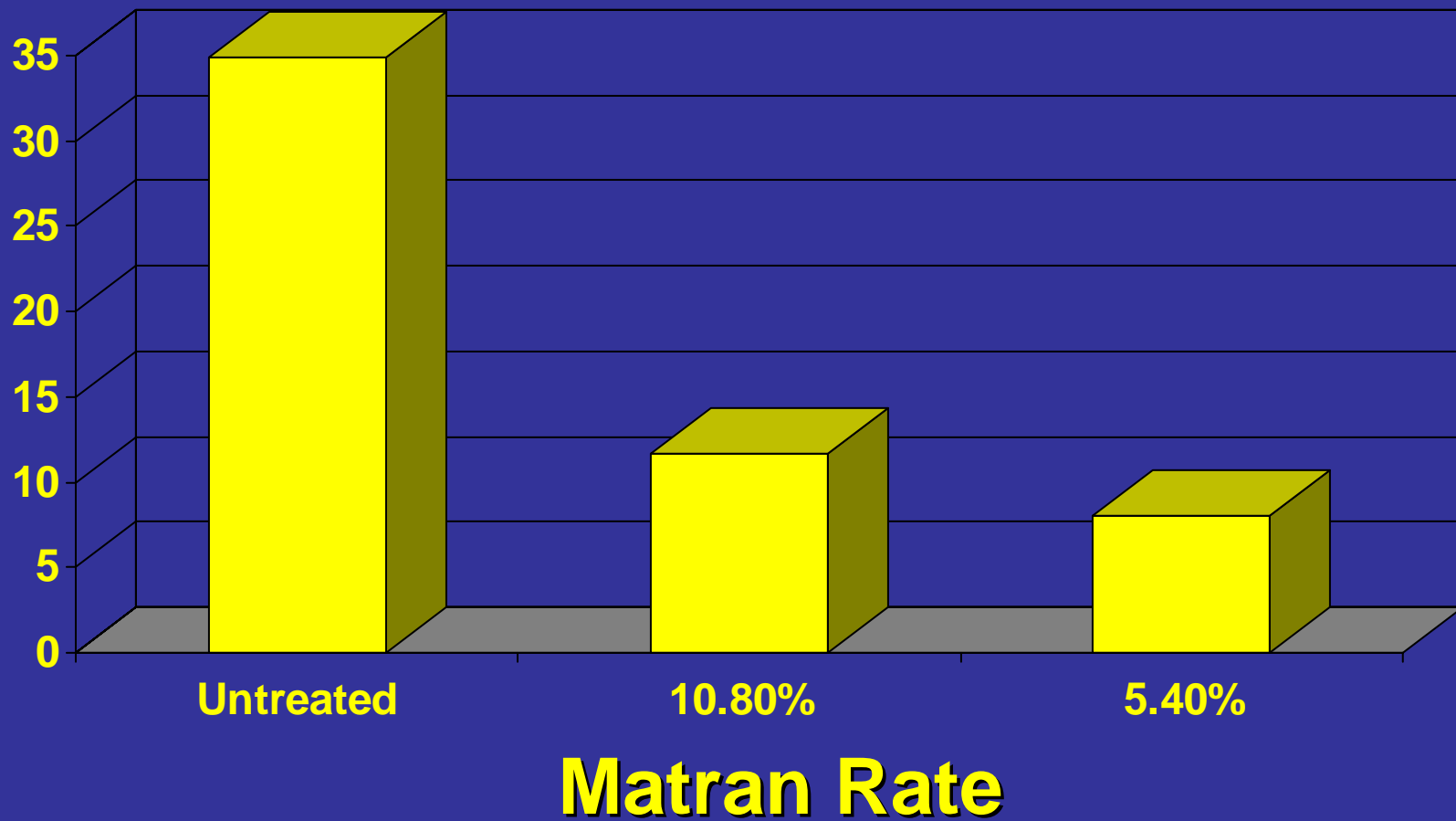


Transplants, 1 vs 2 passes

### Matran Rate

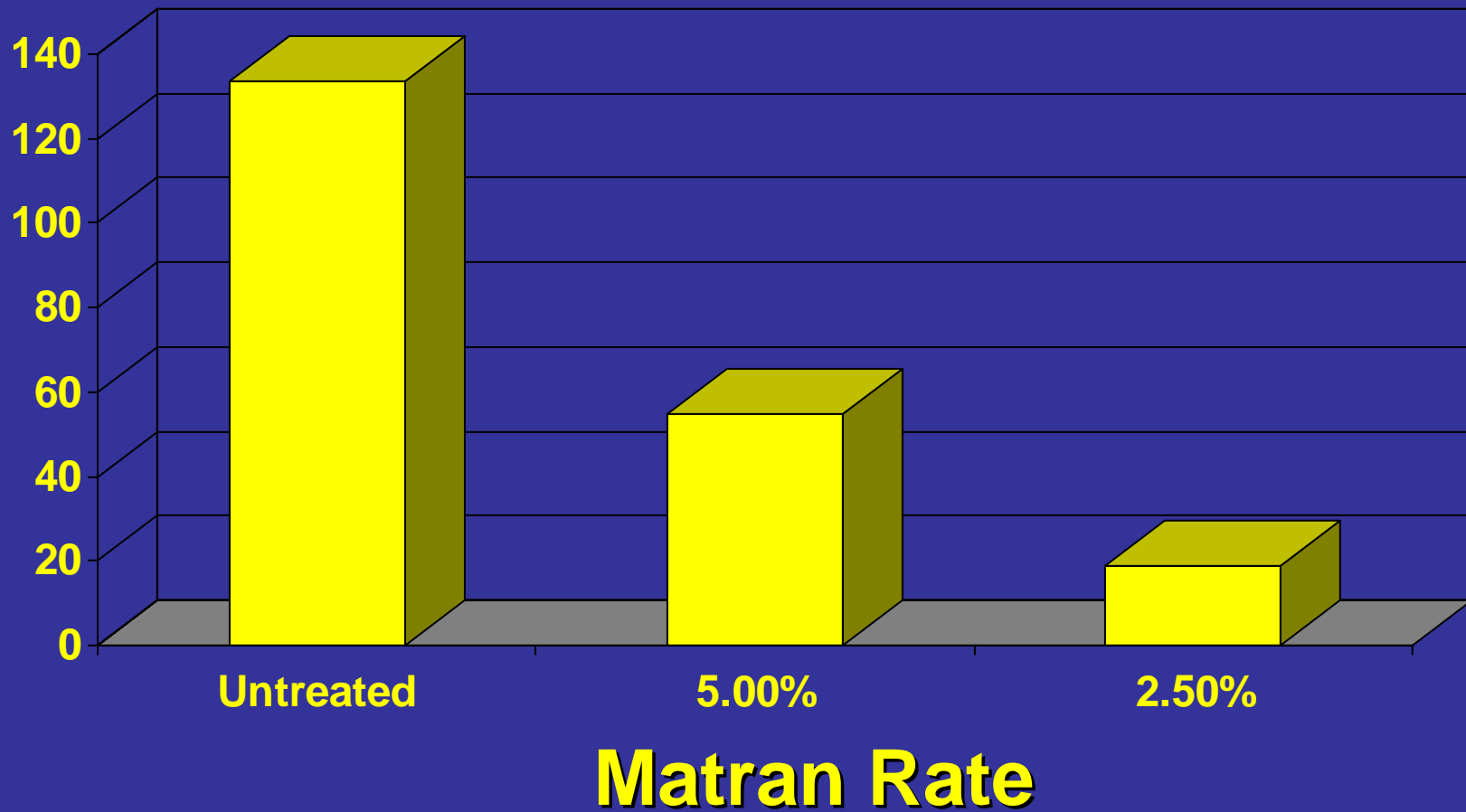
# Hours Per Acre to Weed Broccoli

2006 Trial No. 1



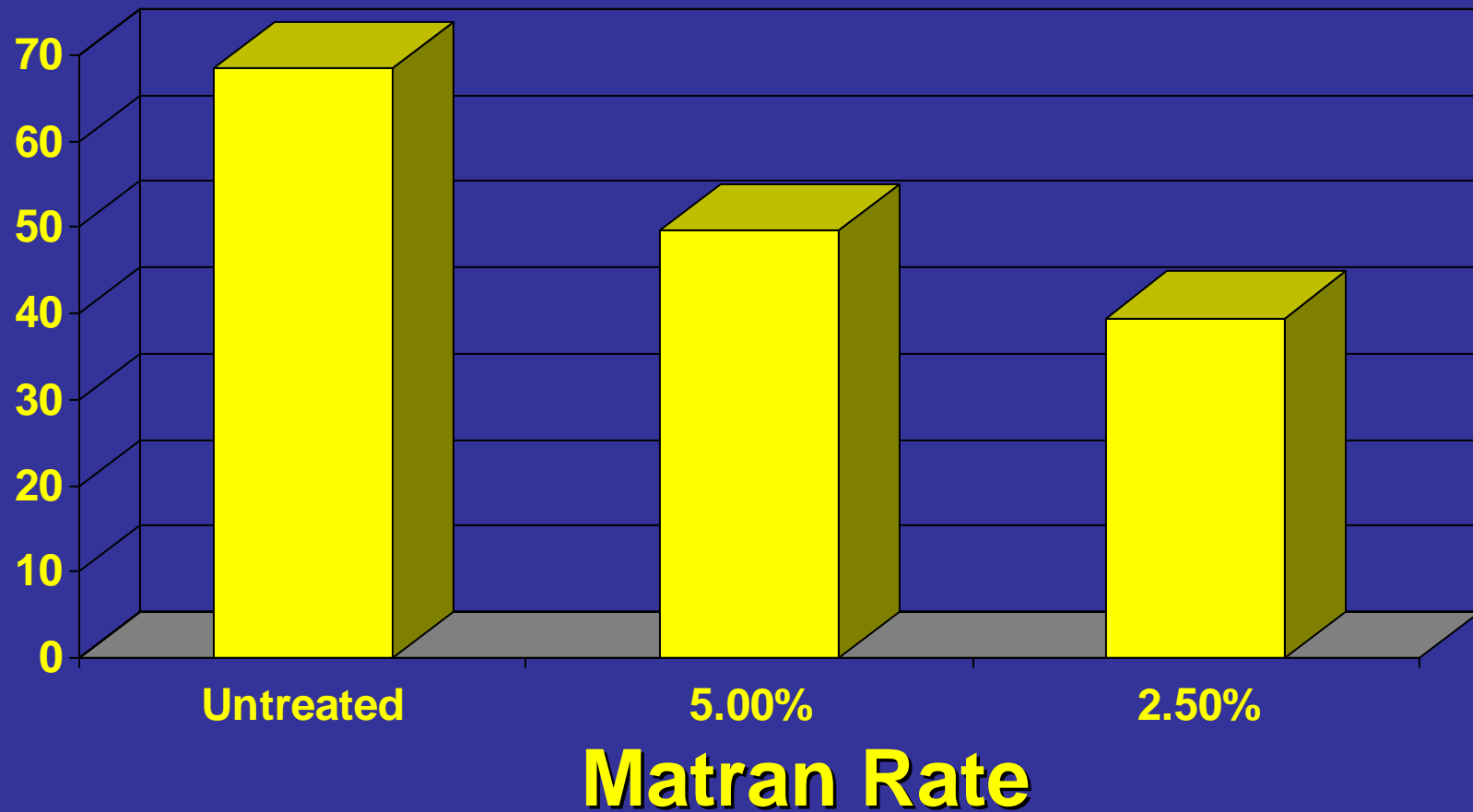
# Number of Weeds in Broccoli

2006 Trial No. 2



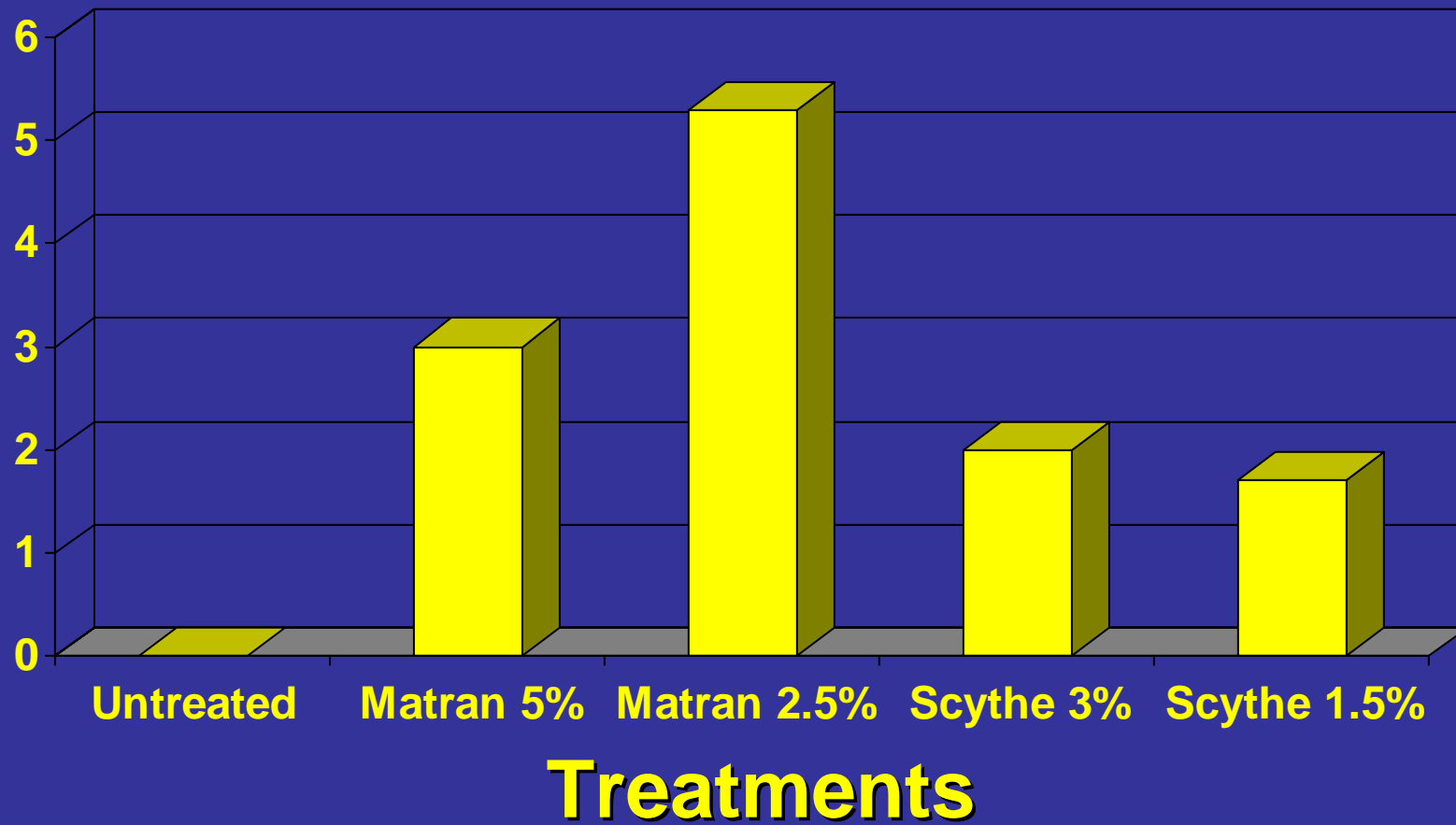
# Hours Per Acre to Weed Broccoli

## 2006 Trial No. 2



# Phytotoxicity Ratings

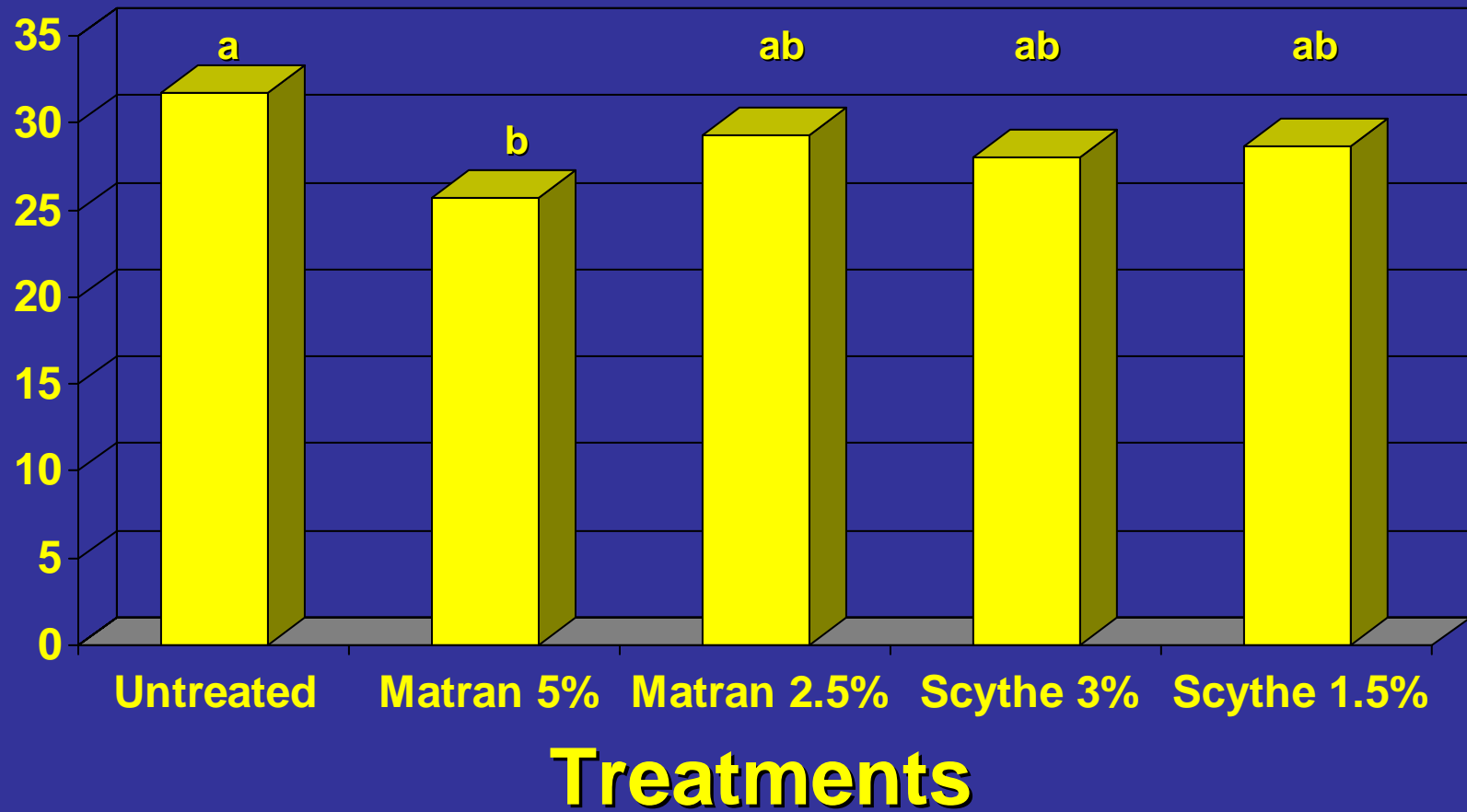
2006 Trial No. 3



Direct seeded, plants a bit old

# Yield – Number of Heads/Plot

2006 Trial No. 3





**Scythe @ 1.0%**

**Over the Top**



**Directed**



**Sept 18**

**Scythe @ 1.5%**

**Over the Top**



**Directed**



**Sept 18**

**Scythe @ 2.0%**

**Over the Top**



**Directed**



**Sept 18**

**Scythe  
Over the Top**

**1.5%**

**2.0%**

**Sept 18**



**Scythe @ 1.0%  
Over the Top**



**Directed**



**Sept 26**

**Scythe @ 1.5%**  
**Over the Top**

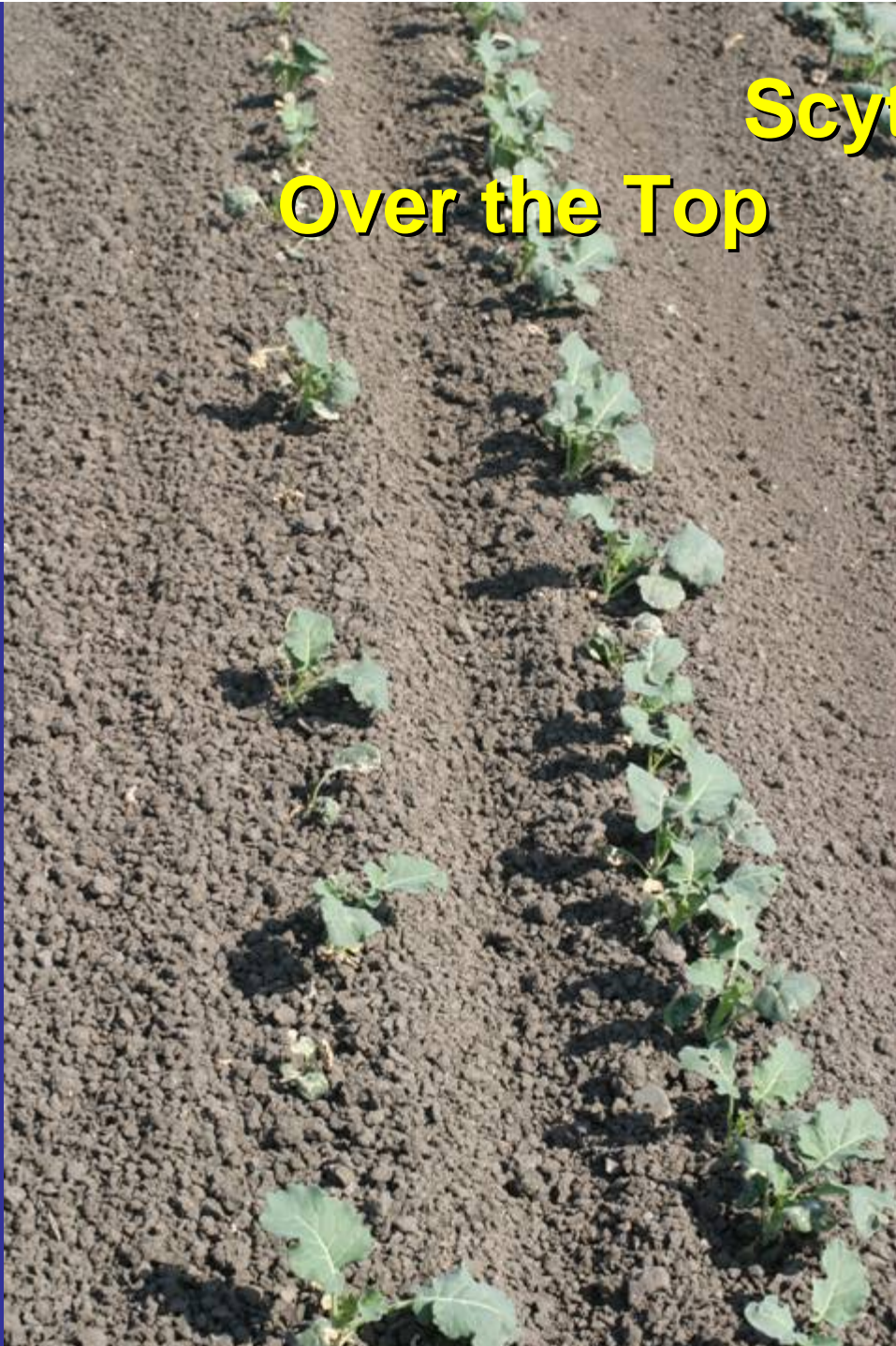
**Directed**

**Sept 26**

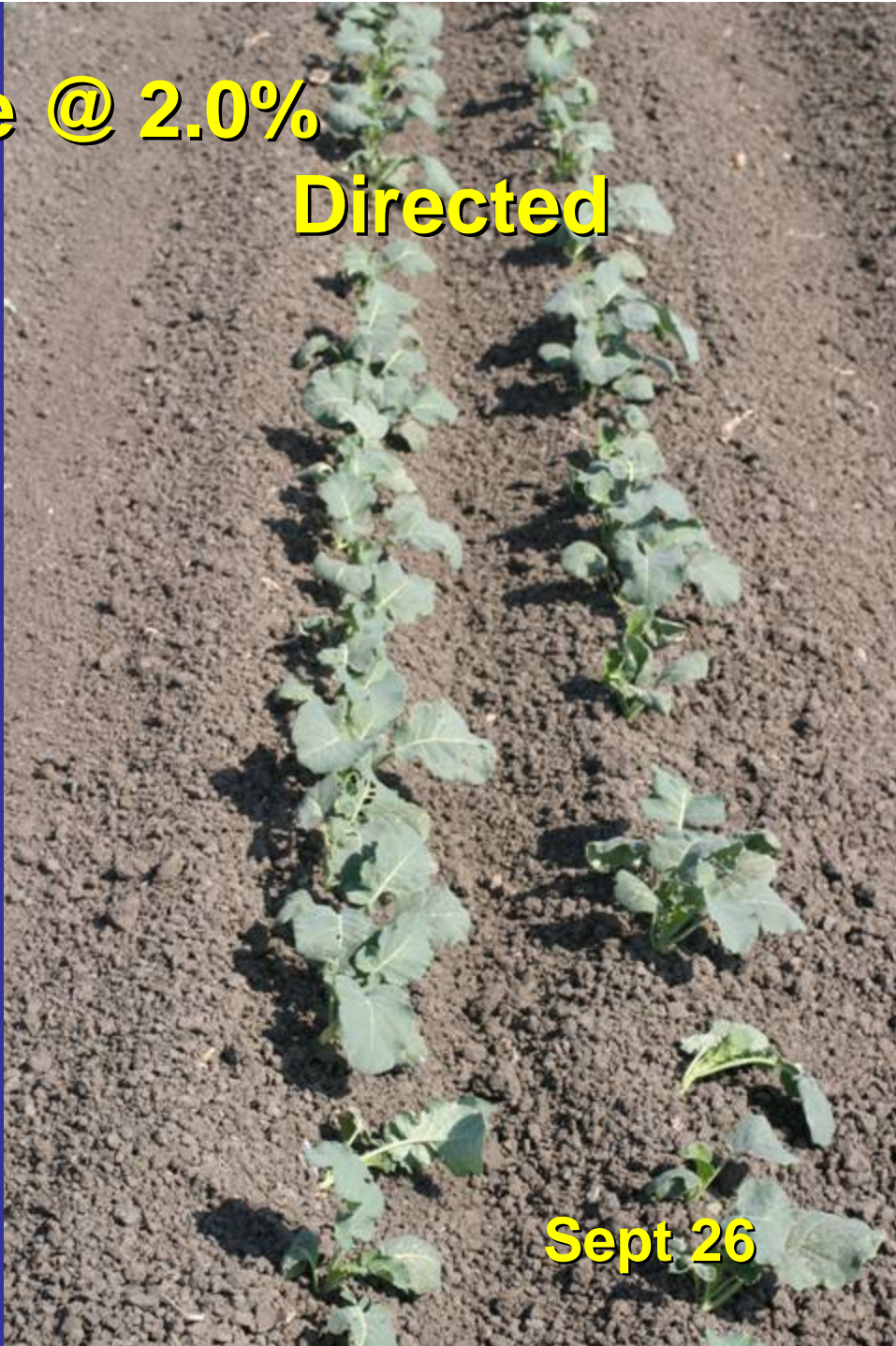


**Scythe @ 2.0%**

**Over the Top**



**Directed**



**Sept 26**

# Broccoli Summary

- **The organic herbicides examined in these studies are not safe for over-the-top use on broccoli**
- **Low rates of these herbicides can be used on broccoli if they are applied as a directed spray to the base of the plant**
- **If too much of the material gets up onto the foliage it can cause significant phytotoxicity**
- **If however, the material is successfully applied acceptable yields can be achieved.**

# Onion Studies

- Onions are different in that there is little opportunity for the spray material to be directed to the base of the plants
- As a result, there is greater need for selectivity and careful selection of appropriate rates



**Untreated**



**Matran @ 20%**

**Matran EC @ 20%**



**Matran EC @ 20%**





**weed burn down and regrowth  
if weed is too big at time of application**

# 2005 Dry Bulb Onion Evaluation

<b>Treatment</b>	<b>Weed Control Percent</b>	<b>Phyto Rating</b>	<b>Weed Time hrs/A</b>	<b>Yield 1000 Bulbs/A</b>
<b>Untreated</b>	<b>----</b>	<b>0.0</b>	<b>20.7</b>	<b>139.8</b>
<b>Matran EC @ 20%</b>	<b>38.8</b>	<b>0.5</b>	<b>14.3</b>	<b>134.6</b>
<b>Goal Tender @ 0.125 lb*</b>	<b>82.5</b>	<b>2.3</b>	<b>5.4</b>	<b>139.3</b>

**\* First true leaf**

# Green Onion Trial



**1<sup>st</sup> true leaf**



**2<sup>nd</sup> true leaf**



**Shepherds Purse**  
**1<sup>st</sup> true leaf**



**2<sup>nd</sup> true leaf**



**Goal 2XL @ 1<sup>st</sup> true leaf**

**untreated**



**Matran @ 20%**

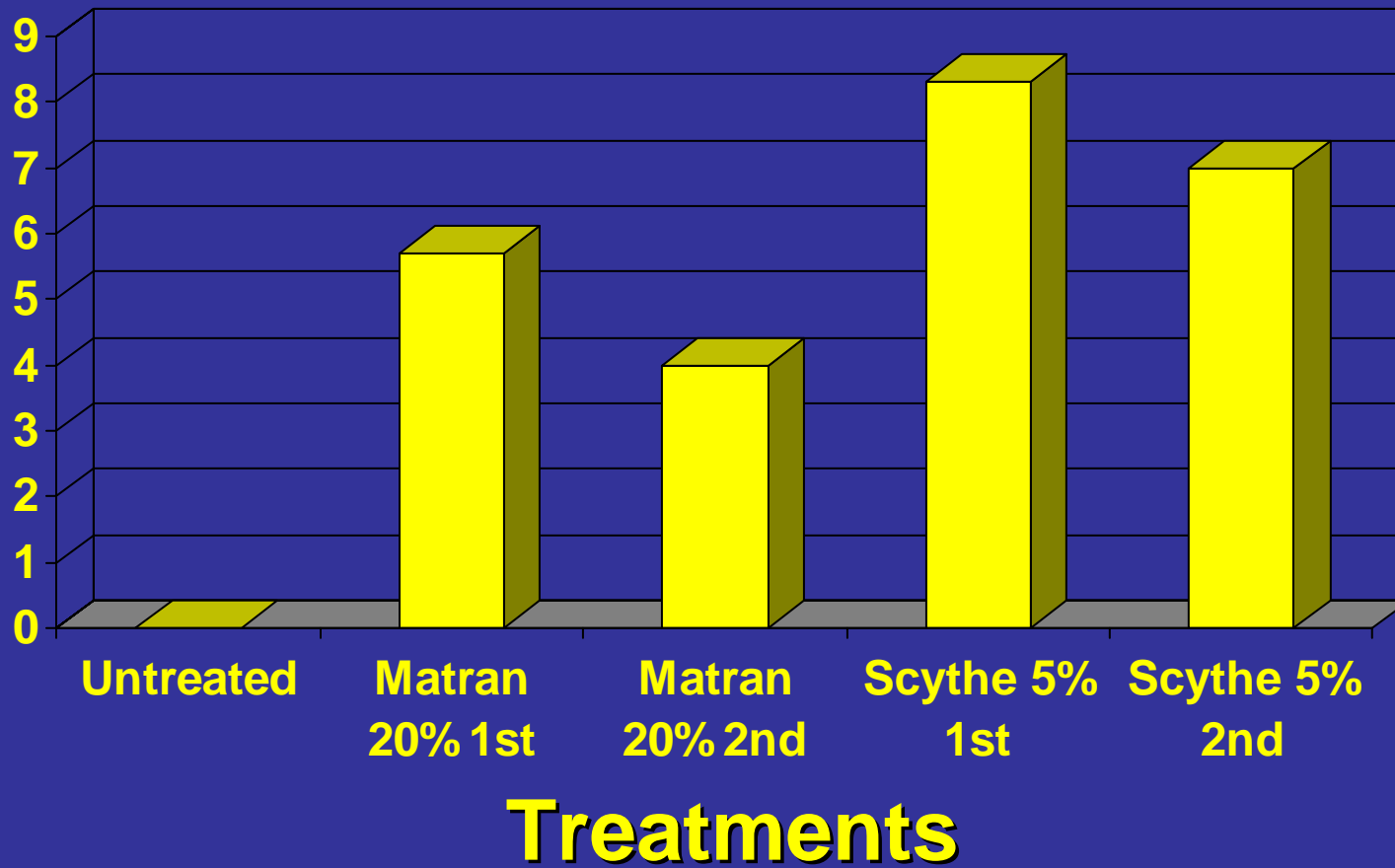
A  
10



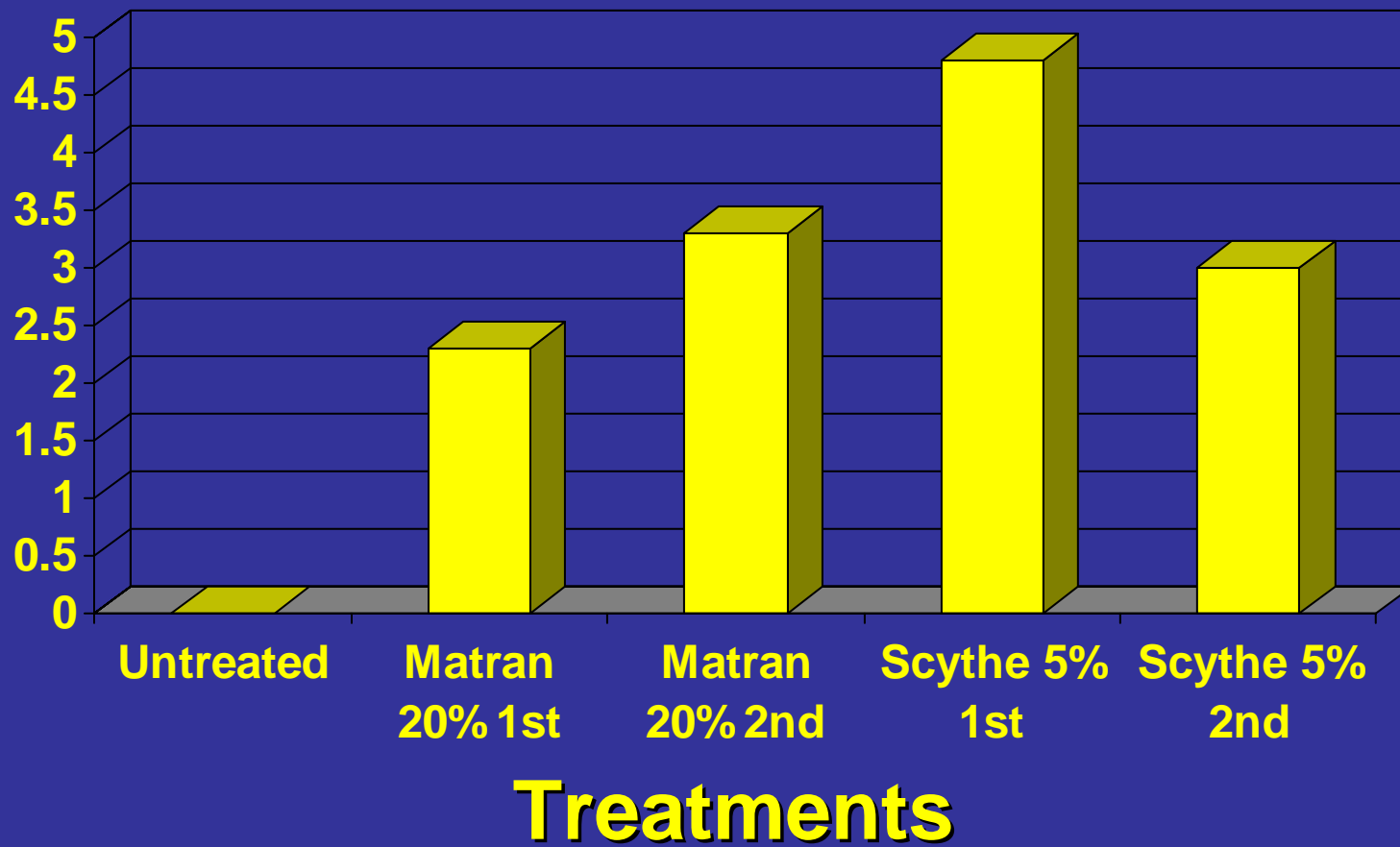
**Scythe @ 5%**



# 2005 Green Onion Trial Weed Control Ratings

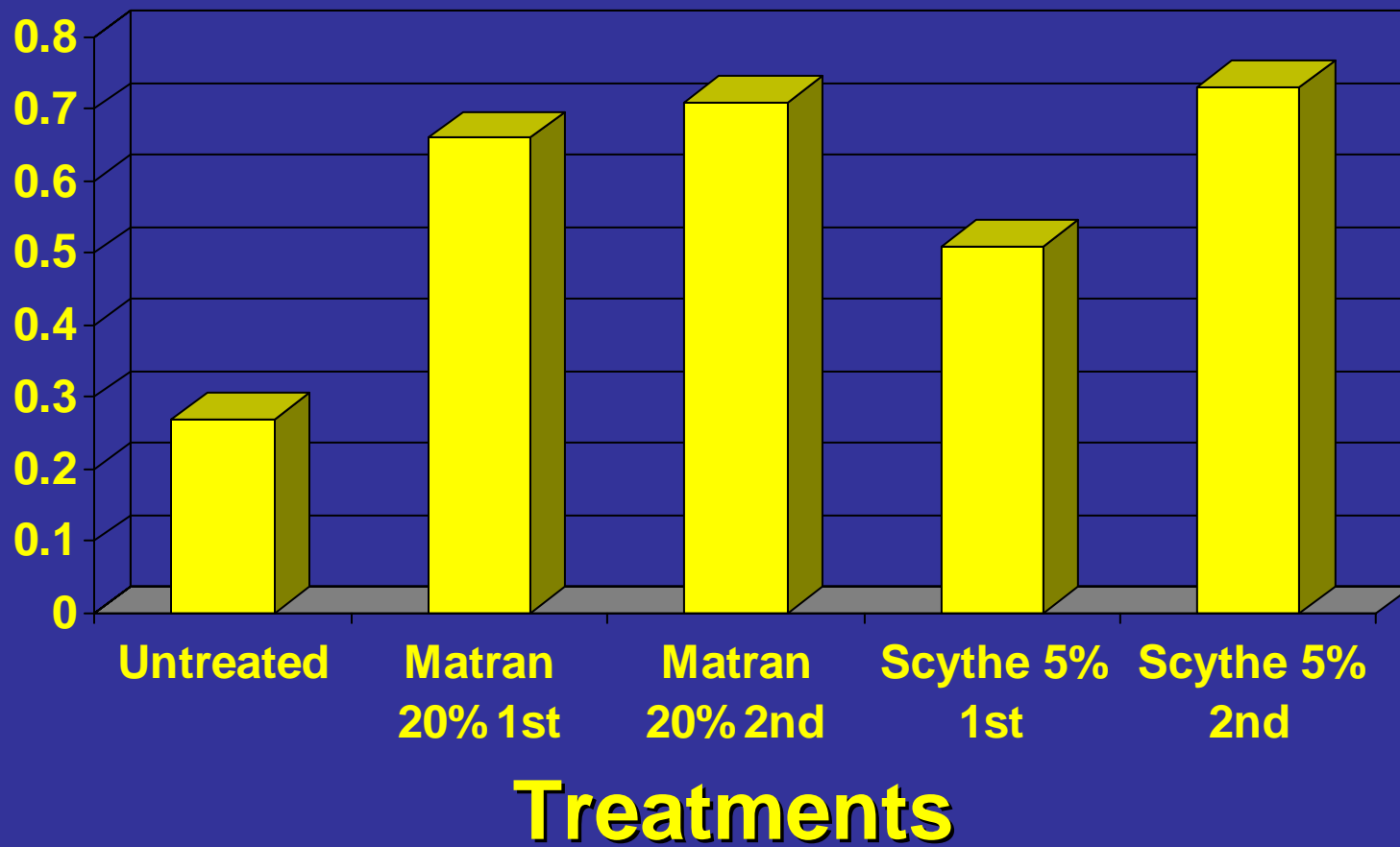


# 2005 Green Onion Trial Phyto Ratings



# 2005 Green Onion Trial


## Yield – T/A



**Size of weeds  
By 2<sup>nd</sup> true leaf  
39 days after planting**

A photograph showing rows of young onion plants in a field. The plants are small and green, with several weeds growing alongside them. The soil is brown and appears to be a mix of sand and silt.

**2 days after  
3% Scythe**

A photograph showing the same rows of onion plants after a 3% scythe treatment. The weeds are significantly reduced in number and size compared to the previous image. A wooden stake with the number '20' is visible in the lower right corner of the plot.

**2006 Dry Bulb Onion Trial**



# Onion Summary

- **More effective weed control can be achieved if the organic herbicides can be applied at the first true leaf stage**
- **However, we observed greater phytotoxicity on the crop when applied at this earlier growth stage**
- **If applications go on too late and the weeds are too big, the low rates of organic herbicides will not be adequate to effectively control weeds.**

# Other Applications for Organic Herbicides (Crazy ideas???)



# Mechanical Harvest



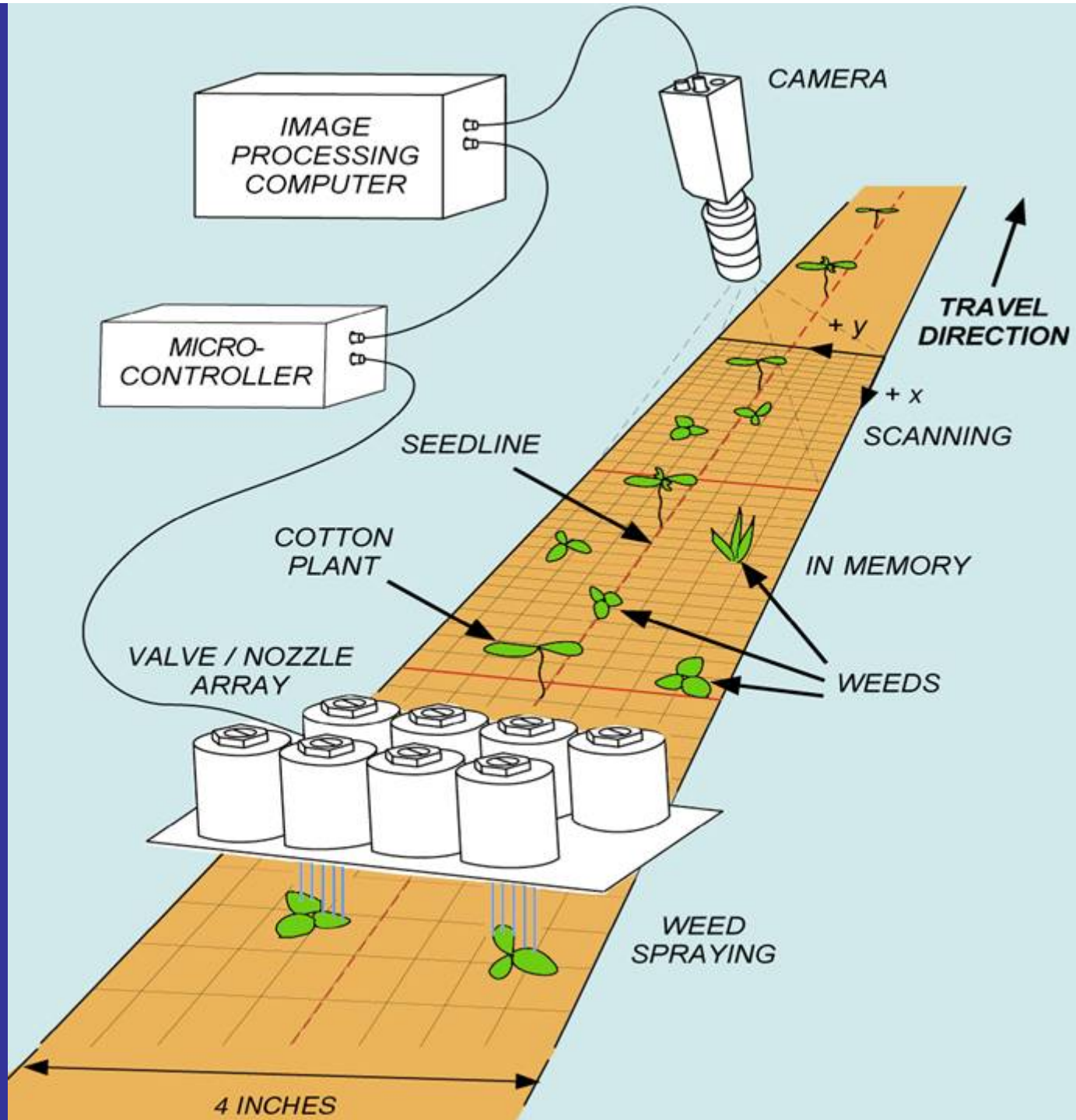
# Difficult, Tedious and Expensive to Hand Weed







**There may be opportunities to use organic  
Herbicides applications that are precision guided  
And that are hooded to take out some of the  
Weeds in this type of a situation**



**The robotic system uses  
microjets**



**These would lend  
themselves to organic  
materials**



# Conclusions

- **Postemergence use of organic herbicides on broccoli and onions is a bit dicey.**
- **Directed sprays on broccoli are very helpful to maintain safety**
- **These trials indicate that there is hope for onions, but skill and good timing will be necessary to make this system work**

# Conclusions

- **These organic herbicides may have a role in other ways in organic & conventional systems**
- **They may feature in hooded spray operations and possibly in robotic weeding**

# Acknowledgements

- **Cooperating growers**
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