

# **Weed Management and Rotation Considerations**

**Richard Smith**

**Vegetable Crop and Weed Science Farm Advisor  
University of California Cooperative Extension  
Monterey, Santa Cruz and San Benito Counties**

# **Weed Control Challenges in Modern Spinach Production**

- **High density stands (18 – 32 seedlines on 80 inch wide beds) are difficult to impossible to effectively cultivate**
- **Difficult and expensive to hand weed**
- **Key weeds that are difficult to control**
- **Low tolerance for weeds in mechanically harvested product**
- **Differences of opinion of the value and safety of available herbicides in weed control**

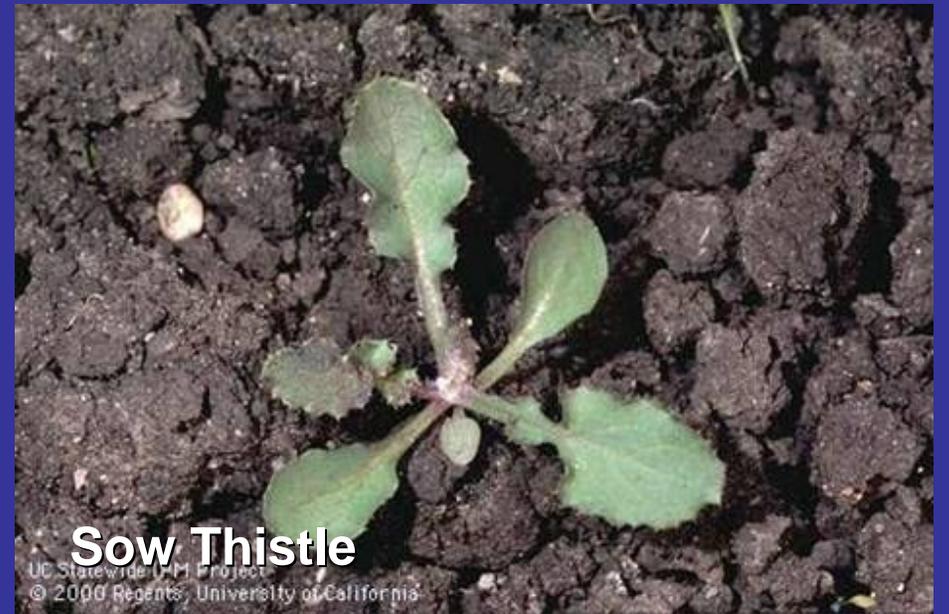
# **Weed Control Challenges in Modern Spinach Production**

- **Given the challenges of spinach production on high density beds, growers are faced with the following options to manage weeds:**
  - 1. Cultural practices**
  - 2. Chemical control (herbicides and fumigation)**
  - 3. Hand weeding**

# Key Summer Annuals



# Key winter annuals







# Cultural Practices for Managing Weeds

- **Fastidious weed management practices in prior rotations can, over time, reduce weed pressure to manageable levels**
  - **Aggressively controlling weeds in all prior rotations and during the fallow period over the winter**
  - **Not letting weeds go to seed**
  - **Carrying weeds out of the field during weeding operations**

# Cultural Practices for Managing Weeds

- Field selection
- Avoiding weedy fields
- Avoid planting during the weediest time of year in problem fields (i.e. purslane during June to Sept.)
- Pre-germination of weeds\*
- Use of stale seedbeds
- Control weeds that aerial disperse from surrounding areas
- Solarization

# Effects of Preirrigation

No Preirrigation



With Preirrigation



- Reduces the number of weed seed that are ready to germinate in the top layer of the soil
- Can reduce weed emergence in subsequent crop by up to 50% (Shem Tov and Fennimore)

# Flaming a Flush of Weeds on Shaped Beds Prior to Planting



**Allows planting on undisturbed soil  
To avoid bringing up weed seed**

# Cultivation

- **High density stands on 80-inch beds are difficult to impossible to effectively cultivate**
- **Some growers have planted fewer seedlines (i.e. 14) in order to be able to cultivate**
- **Use of precision guidance systems (i.e. EcoDan and Robocrop) can facilitate careful cultivation**



ECO-DAN





## Brush Hoe Cultivator



**Cultivated**

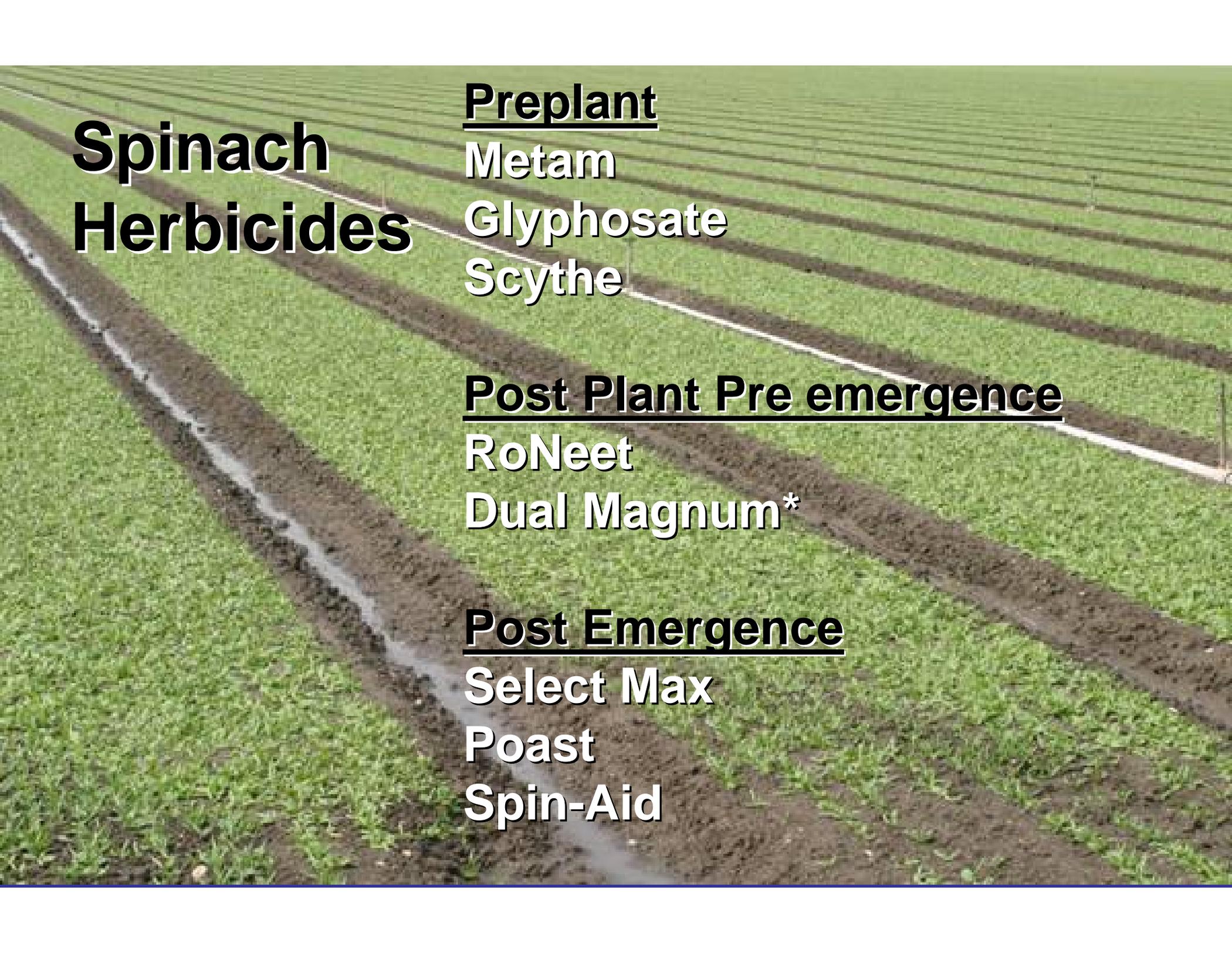
**Uncultivated**

# Brush Hoe Cultivation of 14 line High Density Spring Mix Lettuce

<b>Treatment</b>	<b>Weed Control Percent</b>	<b>Weed time hrs/A</b>	<b>Yield Lbs/A</b>
<b>Brush hoe</b>	<b>47.8</b>	<b>11.0</b>	<b>11,731</b>
<b>Uncultivated</b>	<b>0.0</b>	<b>17.0</b>	<b>13,765</b>

# Cultural Practices - Summary

- **Cultural practices can be extremely effective in managing weeds.**
- **Organic production depends entirely on these techniques**
- **If carried out with consistency, weed pressure can be greatly reduced and weed control can be reasonably economical**



# **Spinach Herbicides**

## **Preplant**

**Metam**

**Glyphosate**

**Scythe**

## **Post Plant Pre emergence**

**RoNeet**

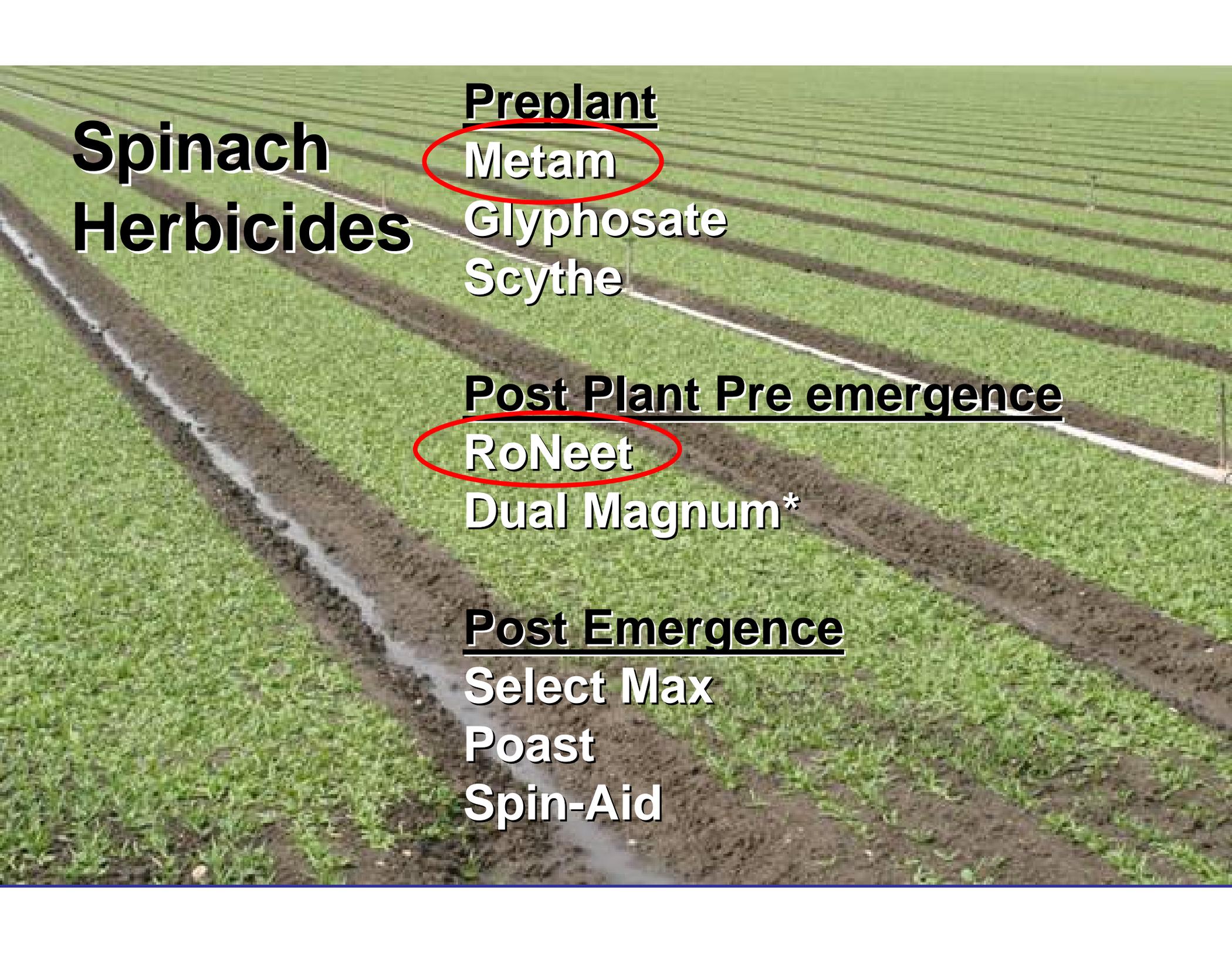
**Dual Magnum\***

## **Post Emergence**

**Select Max**

**Poast**

**Spin-Aid**



# **Spinach Herbicides**

## **Preplant**

**Metam**

**Glyphosate**

**Scythe**

## **Post Plant Pre emergence**

**RoNeet**

**Dual Magnum\***

## **Post Emergence**

**Select Max**

**Poast**

**Spin-Aid**

# Fumigation with Metam Sodium







**Beds rolled and immediately  
sprinkler irrigated**

# 2006 Fumigation Trial

Treatment	Material/A	Chenopods	Night shade	Pig weed	Purslane	Total Weeds
Untreated	---	3.51	0.36	0.52	1.71	6.59
Basamid	200 lbs	0.45	0.03	0.00	0.31	1.20
Basamid	400 lbs	0.14	0.03	0.00	0.10	0.38
Vapam	300 lbs	0.24	0.10	0.12	0.15	0.72

# Spinach Herbicides

- **RoNeet (Cedar Chemical Company)**
- **Can use up to 5.3 pint/A**
- **Ceases the growth of the hypocotyl and weeds do not emerge**
- **Tolerant plants such as spinach metabolize and neutralize the chemical**
- **Controls grasses and a wide spectrum of broadleaf weeds including some difficult species such as shepherd's purse and malva**

# Spinach Herbicides

- **Dual Magnum (Syngenta)**
- **Not yet registered in California**
- **Has been in registration limbo, but evidently there is movement to register it as a 24c**
- **Control grasses and a wide spectrum of broadleaf weeds**
- **Will have a very narrow window of selectivity on spinach**
  - **0.3 to 1.0 pint/A**

# Spinach Herbicides

- **We have screened a wide spectrum of old and new herbicides on spinach over the past 8 years**
- **Spinach is adversely affected by most of these materials**

# Spinach Herbicides

- One material that looks promising is Lorox (DuPont)
- The company is supportive of our research and we are currently evaluating its safety and efficacy at low rates (i.e. 0.1 to 0.4 lb a.i./A)

# 2006 Spinach Trial

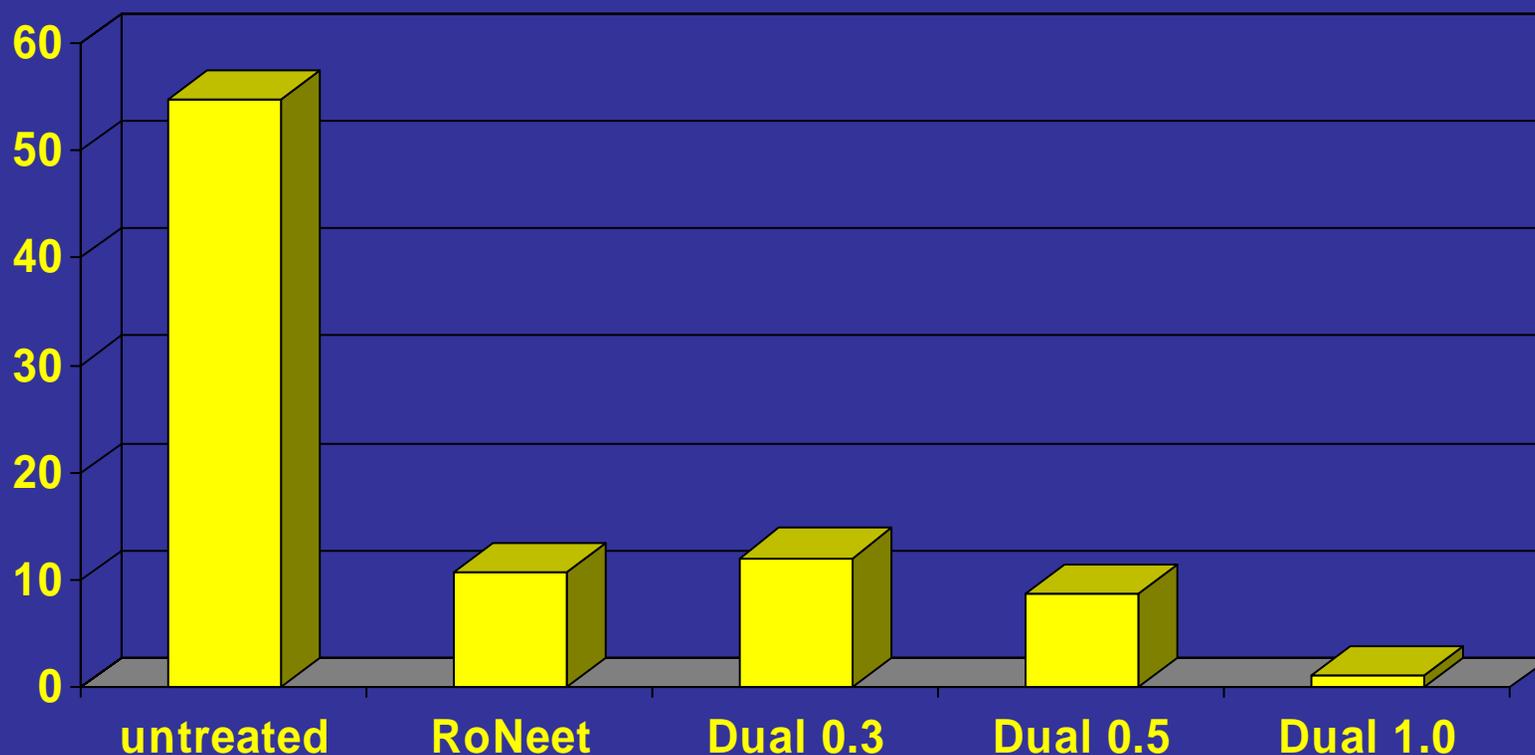
Treatment	Material/A	Malva	Shepherds Purse	Sow Thistle	Total
Untreated	---	10.7	8.0	8.0	28.0
Far-Go	4.5 quarts	9.7	4.7	2.0	16.7
RoNeet	1.25 pints	2.0	1.3	7.3	13.3
RoNeet + Dual Magnum	1.25 pints 0.50 pint	2.7	2.7	9.3	15.0
Dual Magnum	0.50 pint	8.0	3.0	4.7	18.0
Dual Magnum	1.00 pint	7.7	3.0	3.3	15.7
Lorox	0.2 lbs	12.3	2.0	1.7	16.3

# 2006 Spinach Trial

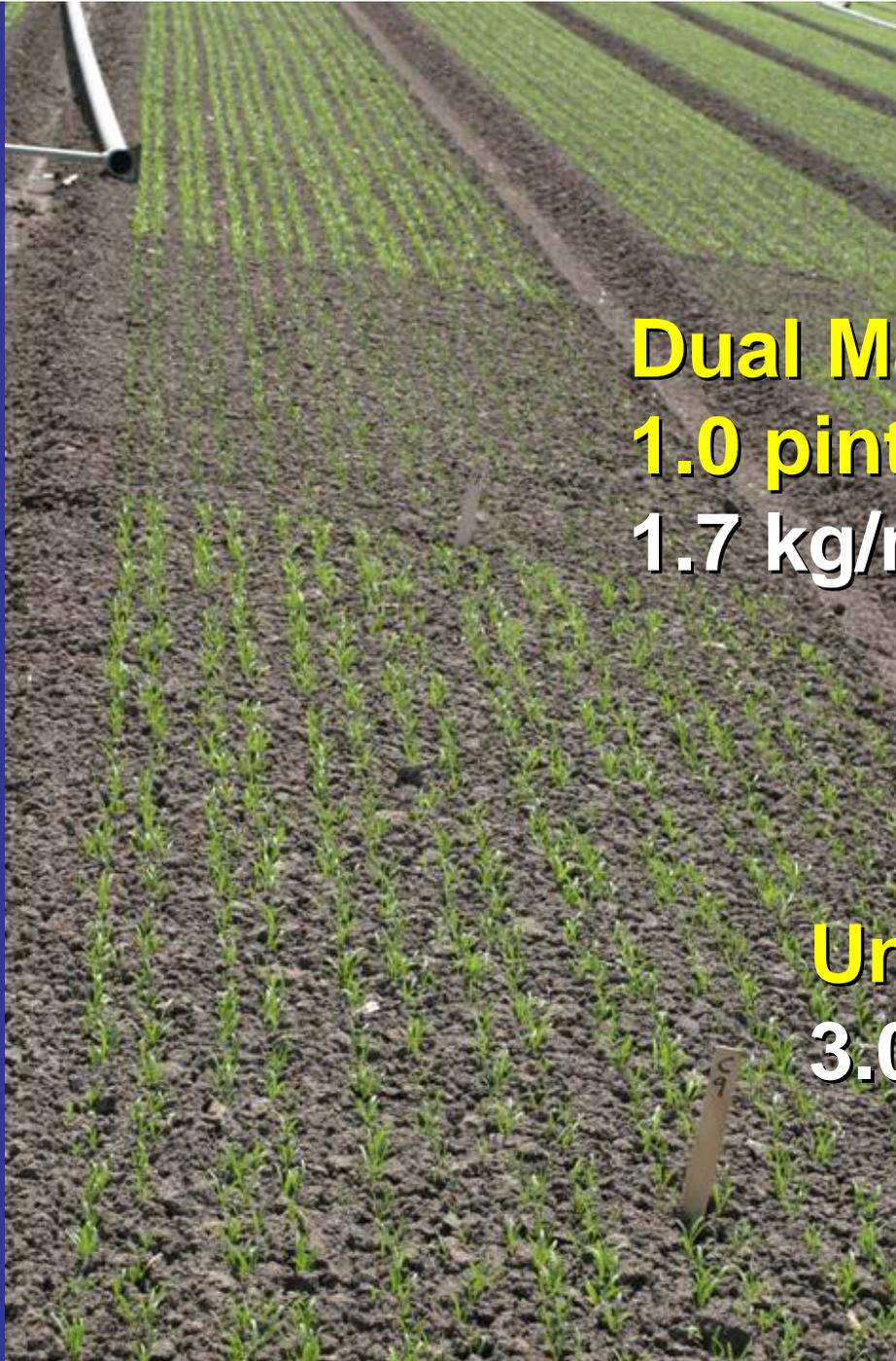
Treatment	Material/A	Phyto	Hrs/A to weed	Yield
Untreated	---	0.0	32.9	17.0
Far-Go	4.5 quarts	0.0	26.0	15.3
RoNeet	1.25 pints	0.3	15.1	17.3
RoNeet + Dual Magnum	1.25 pints 0.50 pint	2.3	13.7	13.8
Dual Magnum	0.50 pint	0.7	23.8	15.2
Dual Magnum	1.00 pint	1.7	20.0	13.1
Lorox	0.2 lbs	0.0	17.3	16.9

# 2007 Trial: Total Weeds\*

## RoNeet vs Dual Magnum at Three Rates



\* Weeds: Shepherd's purse and Henbit



**Dual Magnum**

**1.0 pint/A**

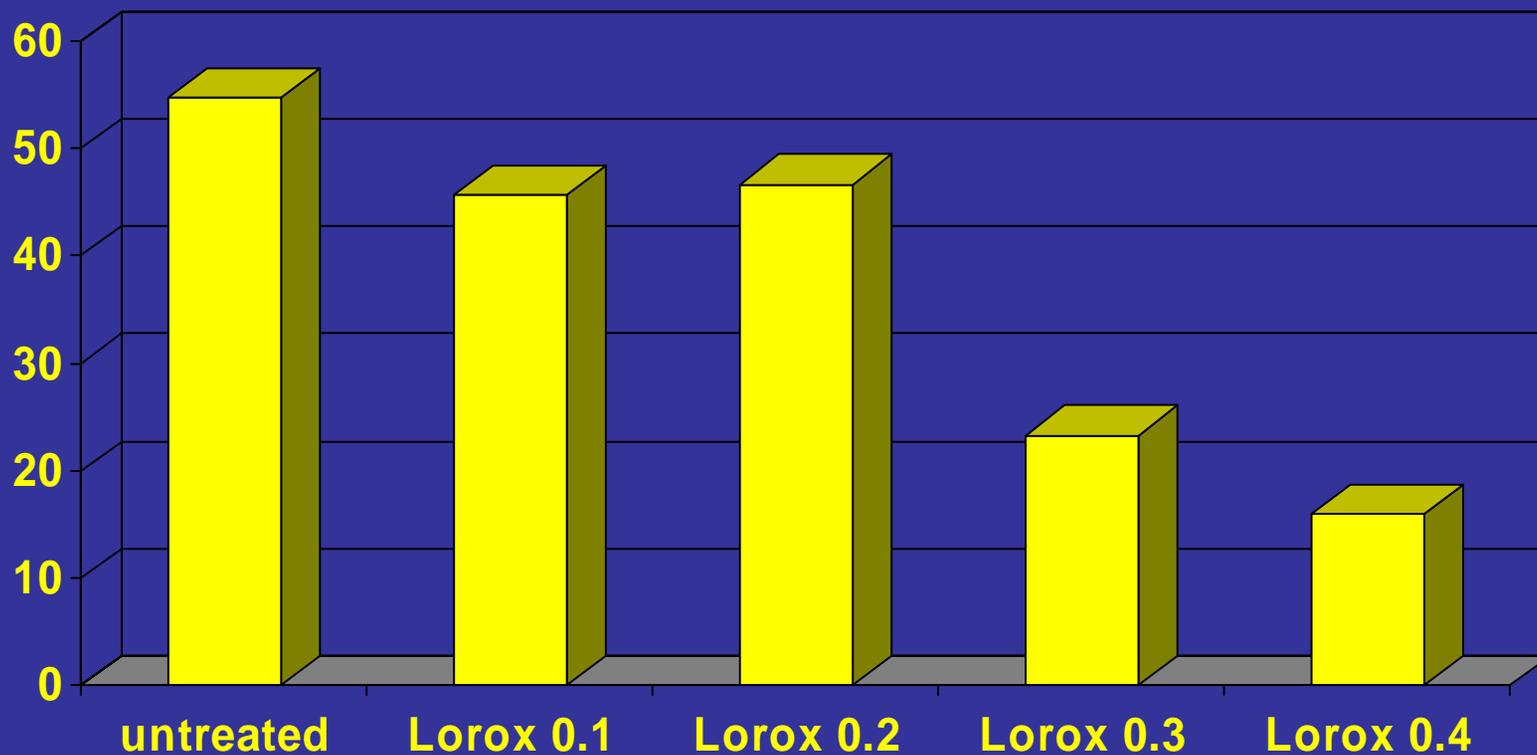
**1.7 kg/m<sup>2</sup> fresh wt**

**Untreated**

**3.0 kg/m<sup>2</sup> fresh wt**

# 2007 Trial: Total Weeds\*

## Lorox at Four Rates



\* Weeds: Shepherd's purse and Henbit



**Lorox 0.2 lb a.i./A**

**Untreated**

# Hand Weeding













# Summary

- **Best management of weeds is achieved with a combination of careful cultural practices**
- **Herbicides supplement good weed control by taking out an additional percentage of the weeds**
- **Both of the above techniques help to make preharvest hand weed control operations more efficient and economical**