Weed Control in Organic Production

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UC CE University of California Cooperative Extension

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Why Manage Weeds?

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Direct competition

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Extremely important when plants are young.
(There is a milk carton under there!)

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Water (stress) management

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We know exactly how much water the crop should receive – but how do you account for the weeds?

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Water (stress) management

Frost protection

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Weeds/cover crops

- interfere with absorption and reradiation of heat - may add to frost damage

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Frost protection

Harbor other pests

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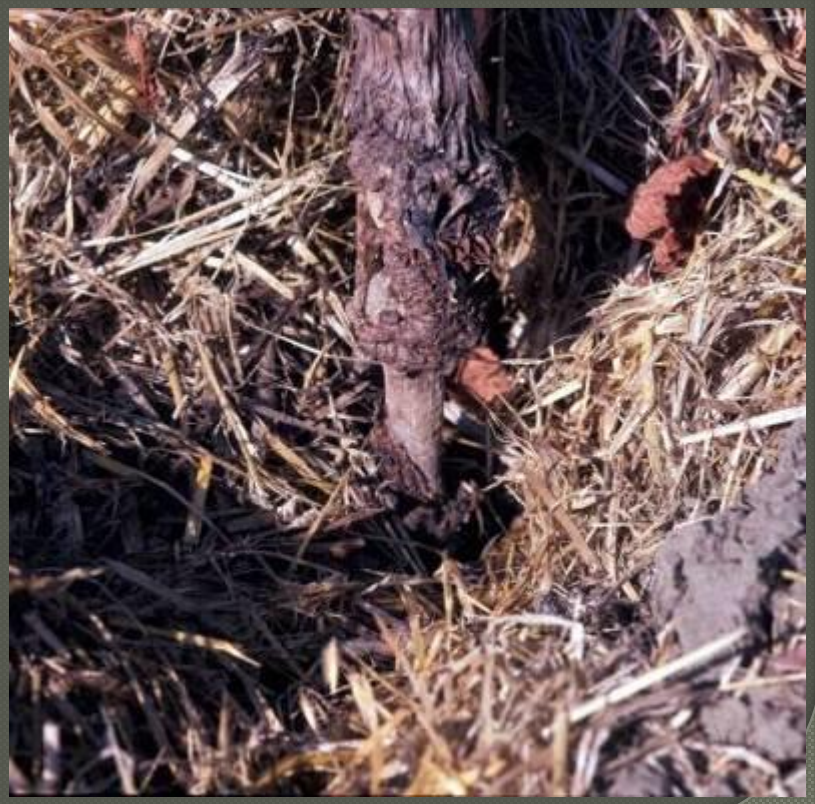
Harbor other pests

Vertebrate pests are a primary reason many growers control weeds.



Why Manage Weeds?

Direct competition
Water (stress) management
Frost protection
Harbor other pests
Interfere with harvest

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By hand or machine, weeds in the cluster are not a good thing

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Interfere with harvest

Affect crop quality

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Off flavors from weeds

Why Manage Weeds?

Direct competition
Water (stress) management
Frost protection
Harbor other pests
Interfere with harvest
Affect crop quality

Interfere with sprinklers

Weed Control Options

1. Cultivation
2. Mowing
3. Mulching
4. Flaming
5. Pre-irrigation
6. Soil Solarization
7. Grazing
8. Prevention
9. Organic herbicides

Cultivation

Disc
Spader
Rototiller

Cultivation

Cultivation

Trees & Vines:

Permanent irrigation down the row

- How do you control the weeds in the row?

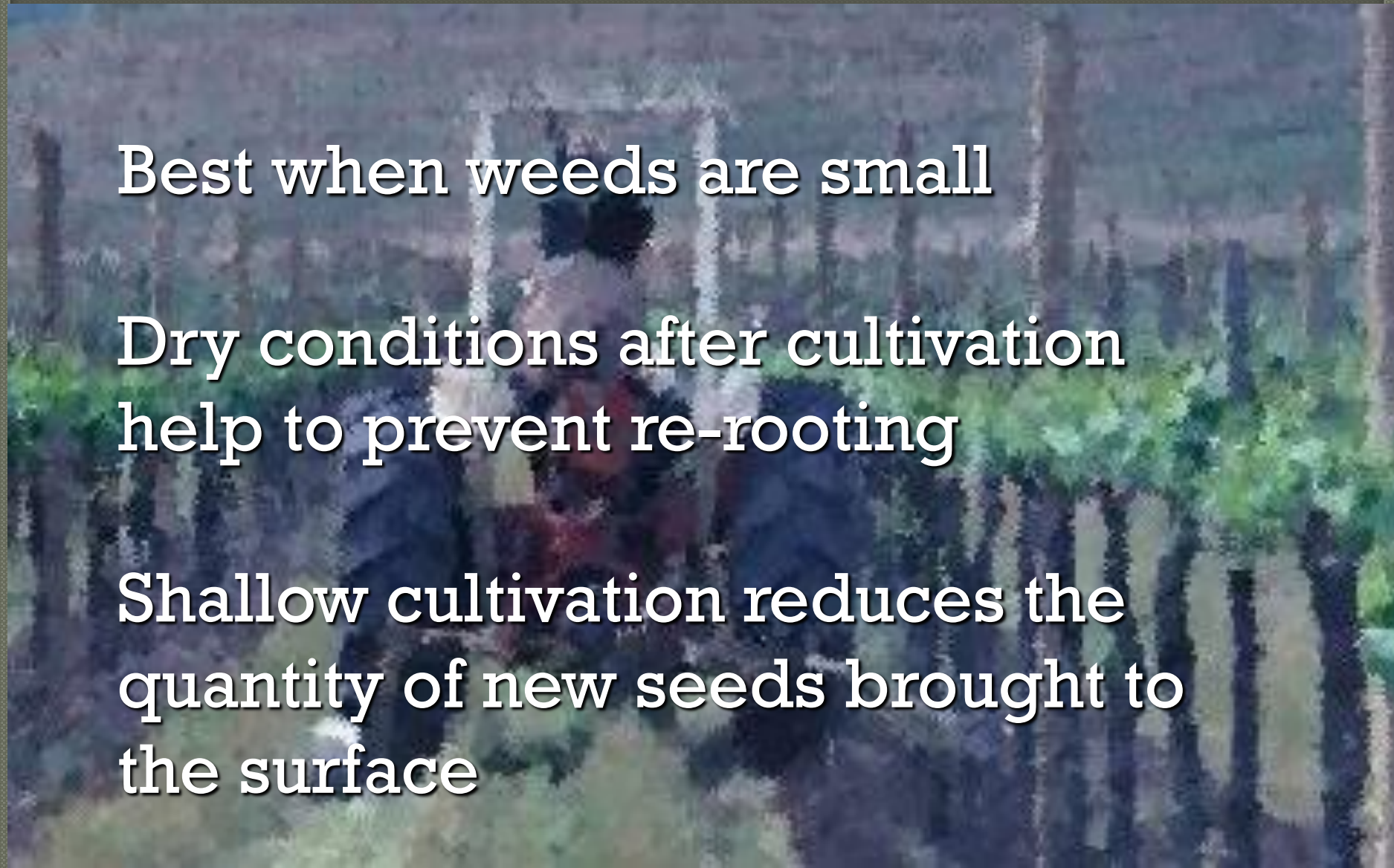
Cultivation

Cultivation

Weed Badger

Kimco

Cultivation



Best when weeds are small

Dry conditions after cultivation help to prevent re-rooting

Shallow cultivation reduces the quantity of new seeds brought to the surface

Advantages

Lower water use

No weed resistance

Frost Protection

Less competition

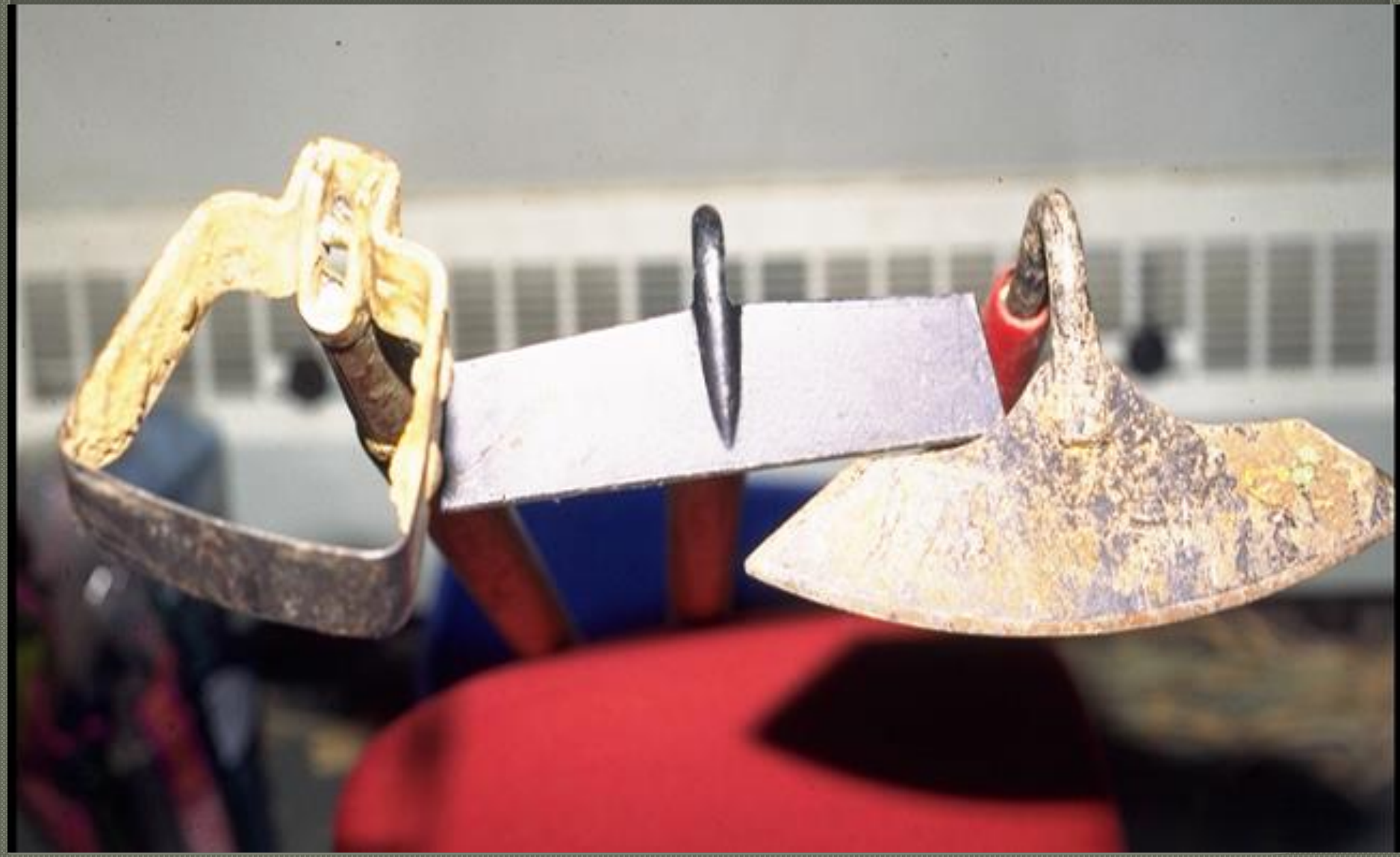
Disadvantages

Disadvantages

Disadvantages

Injury to vines

Hand Hoeing



Hand Hoeing Advantages

Excellent control

No weed resistance

Non-chemical

Hand Hoeing Disadvantages

Cost
Time
Availability of Labor

Mowing


Less fuel/time than cultivation
Provides erosion control
Competes with crop for water & nutrients

Mowing

In row treatments :

- Articulating side attachments

Mowing

In row treatments :

- Hand held string trimmer

Mow & Blow

Mow & Blow

Mulching

Act by blocking light

Numerous organic and synthetic materials can be used

Mulching Advantages

Can provide excellent weed control

Mulching Advantages

Mulching Advantages

Mulching Advantages

Conserve moisture

Mulching Disadvantages

Mulching Disadvantages

Mulching Disadvantages

Mulching Disadvantages

Mulching Disadvantages

Flaming

Flaming Advantages

No resistance

No residue

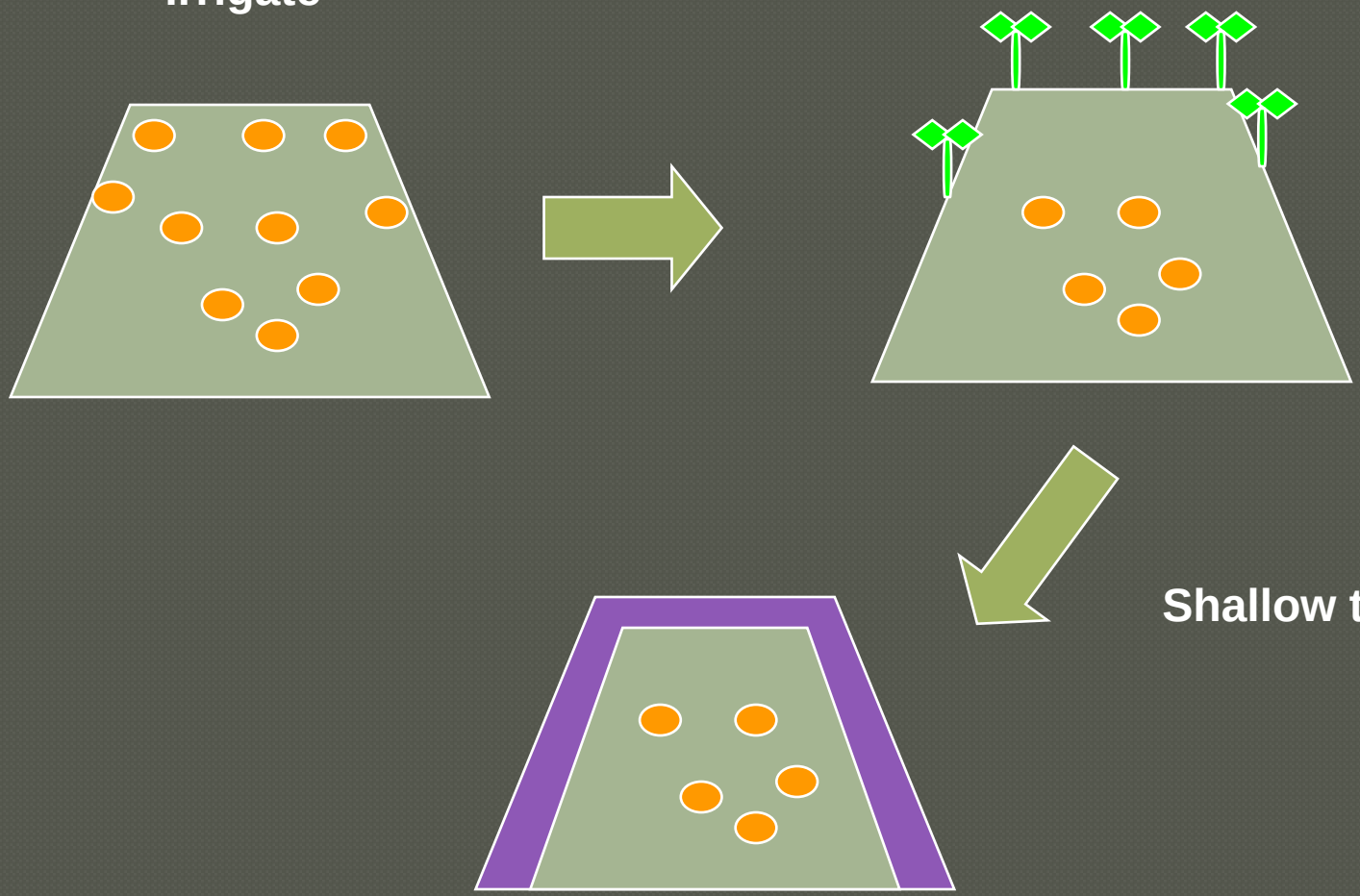
Non-chemical

Flaming Disadvantages

- Timing important
- Not as good on grass
- Cost
- Potential Fire Hazard
- Melts irrigation tubing

Preirrigation to control weeds

Irrigate



Shallow till

Effects of preirrigation

No preirrigation

Preirrigation

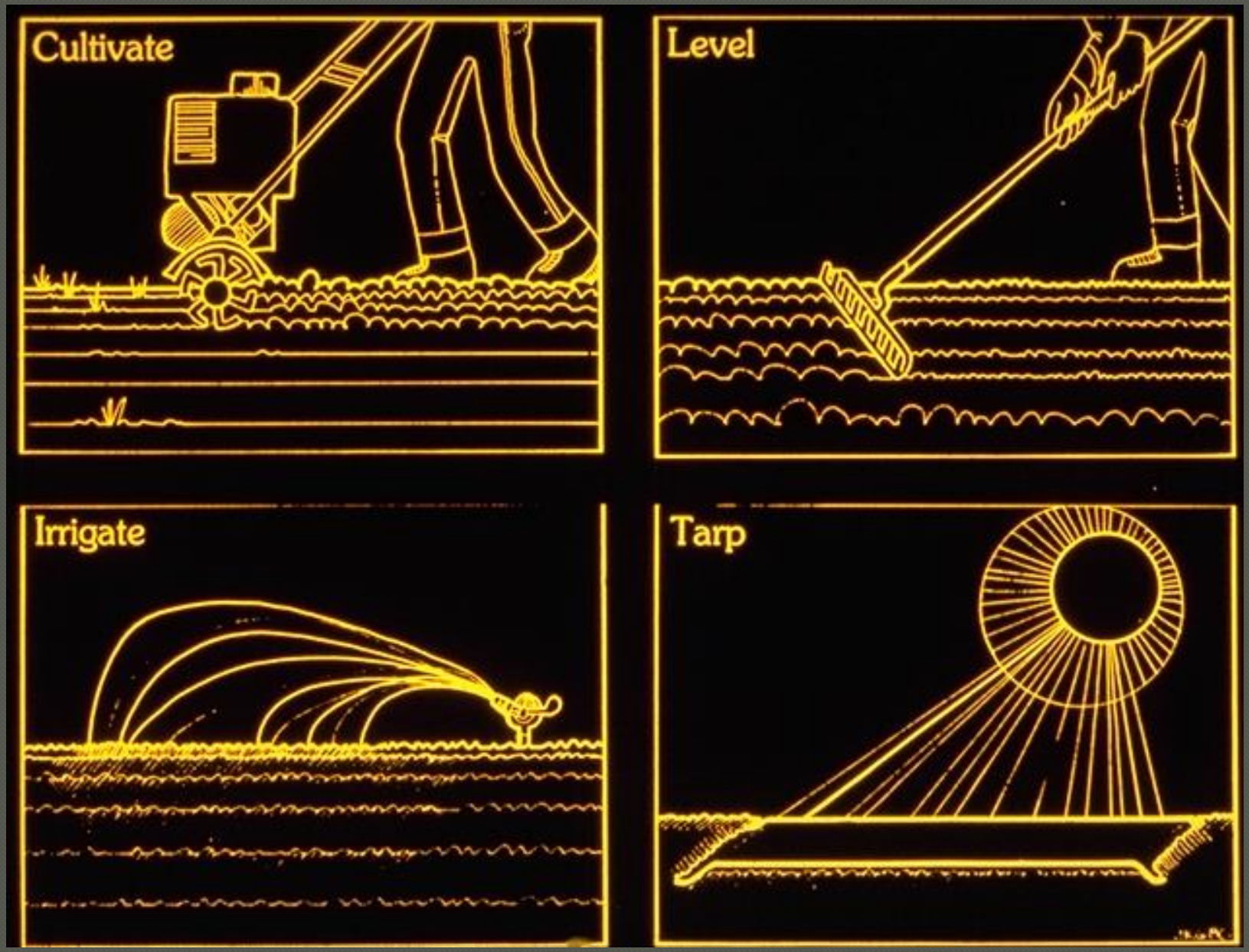
Shem-Tov & Fennimore 2002

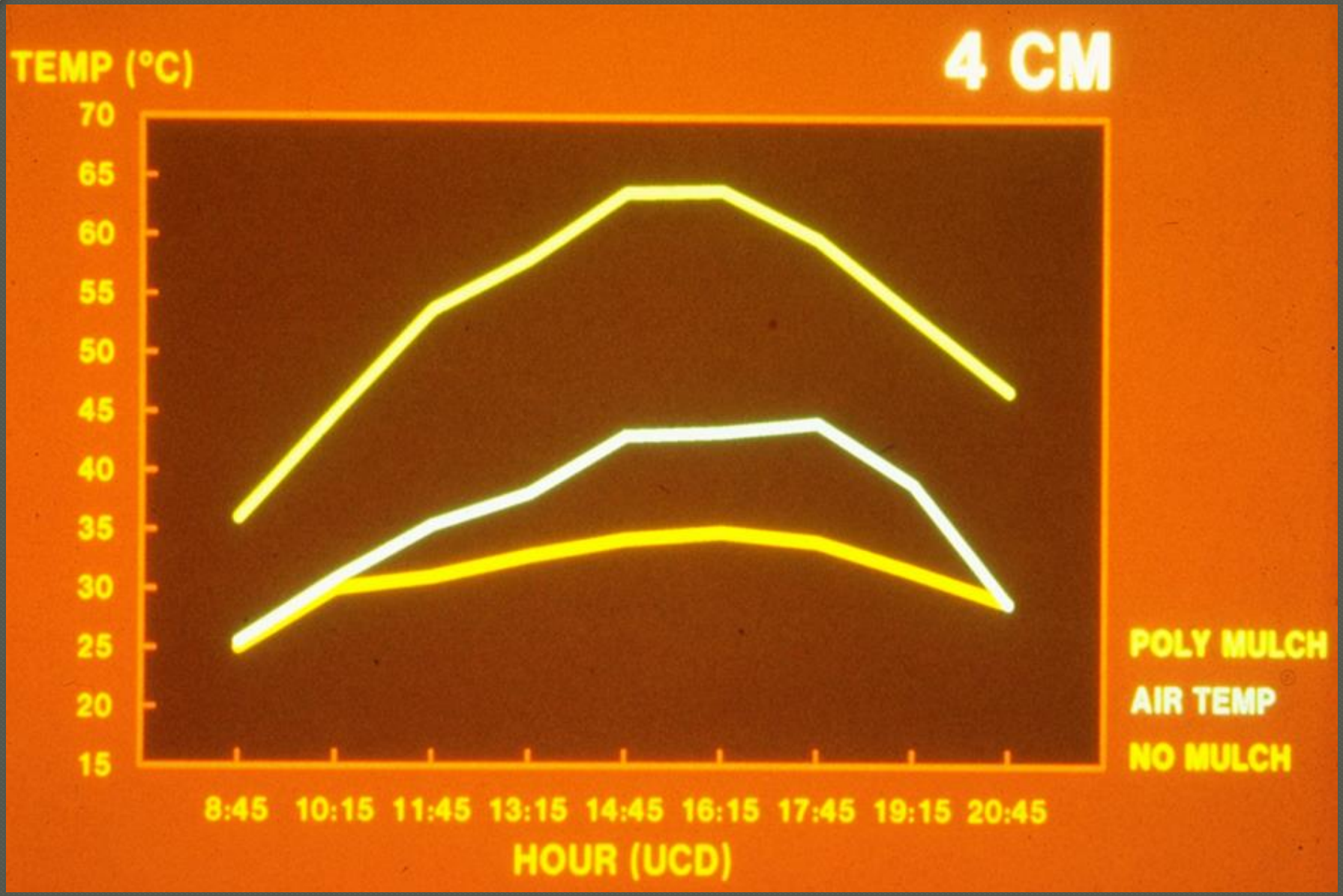
Soil Solarization

A method to control un-germinated weed seeds in the soil seedbank.

Uses clear plastic mulch during the summer months to raise soil temperatures to the thermal death point.

Also controls some diseases.


Cultivate
Level
Irrigate
Tarp


4 CM
TEMP (°C)
70
65
60
55
50
45
40
35
30
25
20
15
8:45
10:15
11:45
13:15
14:45
16:15
17:45
19:15
20:45
HOUR (UCD)
POLY MULCH
AIR TEMP
NO MULCH

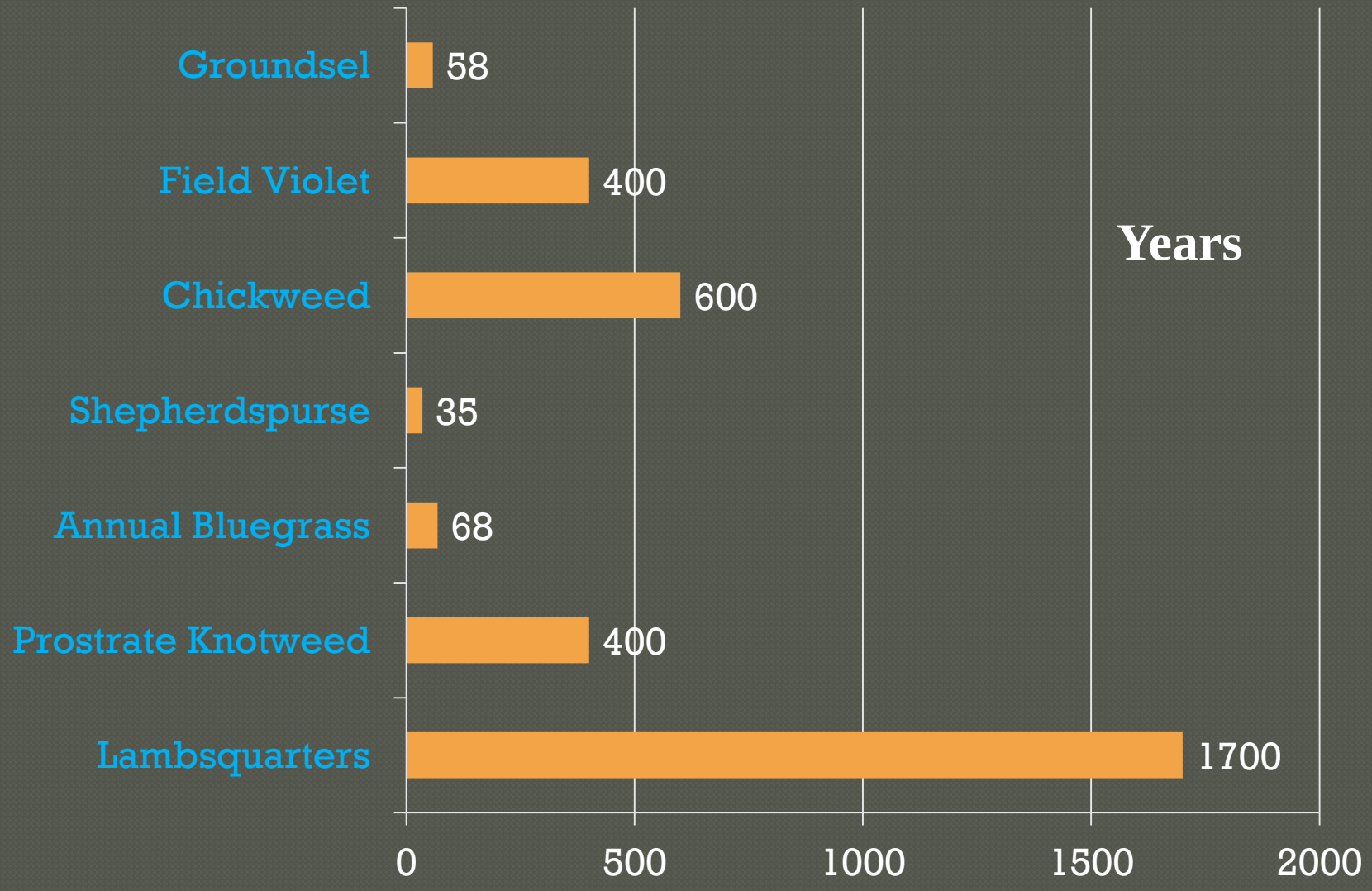
Soil Solarization

Prevention

Clean Equipment

Never let weeds go to seed!

Longevity of Weed Seeds



Animals

Animals

In the right situation animals can do a good job of weed control

Animals

In the wrong situation, animals can cause damage to:

- Soil (compaction)
- Crop
- Irrigation

Animals

It can be expensive – buy or rent?

Management: intensive grazing

- High population (~250-300/A)
- Move quickly – electric fences
- Transport to site (road access)
- Sufficient forage for lamb wt.
  - Select cover crop for improved forage?
- Protect from predation
- Holding area outside orchard/vineyard

Animals

Are there health/safety restrictions?

Weeder Geese

- Annual crops
- Mobile fencing
- Prefer grasses
- Monitor closely
- Predators (dogs)
- Young birds better weeders
- Market for meat?
- Food safety concerns!

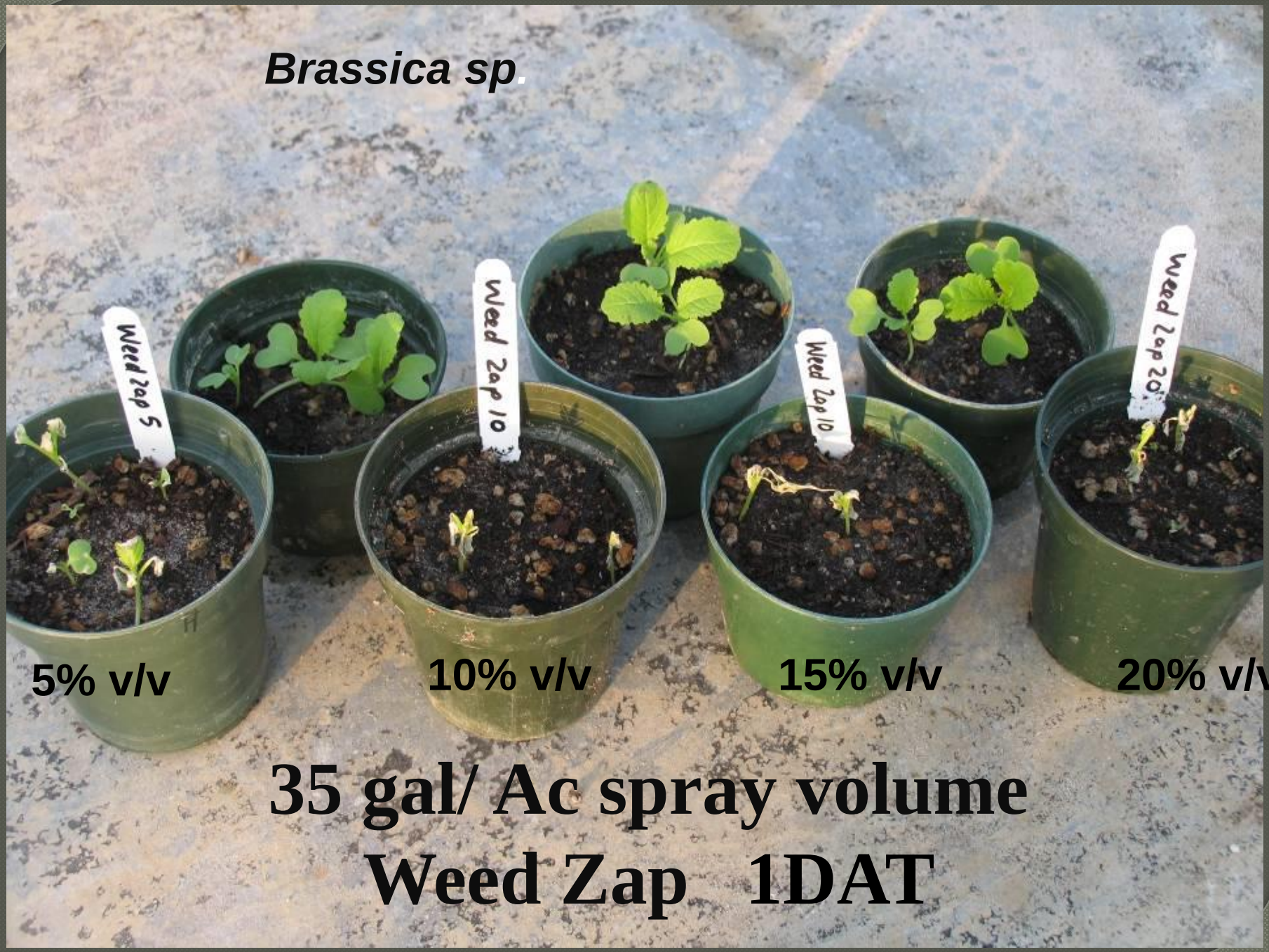
Organic Herbicides

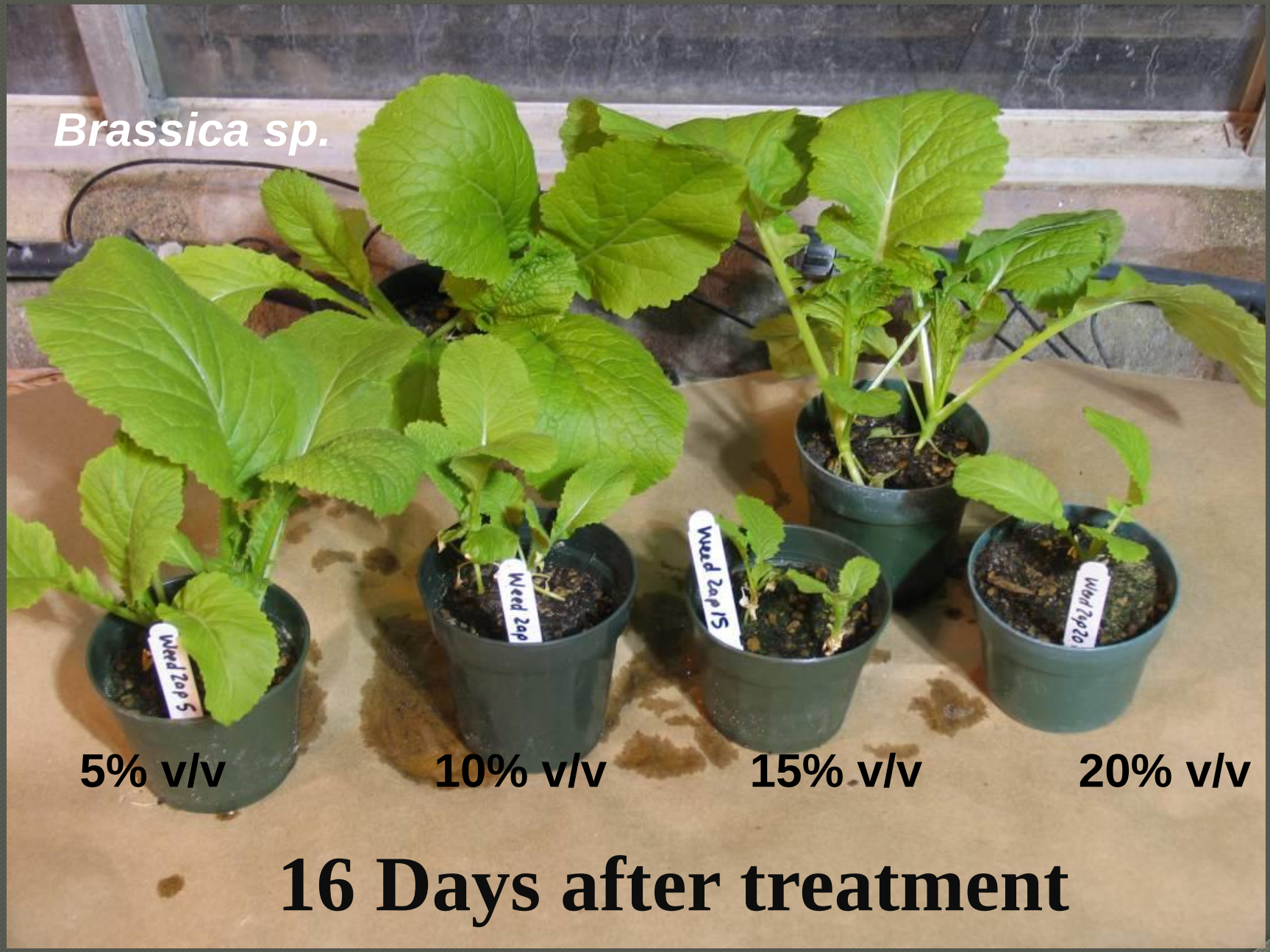
Category	Active Ingredient (Herbicide)	Registration
Soaps	Ammoniated soap of fatty acids(Final-San-O)	No
	Ammonium nonanoate (Racer)	No
	Caprylic-Capric Acid (Biolink)	Soon?
Acids	Citric acid (C-Cide)	Yes
	Acetic Acid (Weed Pharm)	Not in CA
	D-limonene (GreenMatch)	Not Available
Oils	Lemongrass oil (GreenMatch EX)	Yes
	Clove oil (Matran) -> Matratec	Yes
	Clove oil + Cinnamon oil (Weed Zap)	Yes

Research

John Roncoroni
Weed Science & IPM Farm Advisor
UCCE Napa County

Dr. Tom Lanini, emeritus
Weed Ecologist
UC Davis


Brassica sp.
Weed Zap 5
Weed Zap 10
Weed Zap 10
Weed Zap 20
5% v/v
10% v/v
15% v/v
20% v/v
35 gal/ Ac spray volume
Weed Zap 1DAT


Brassica sp.
5% v/v
10% v/v
15% v/v
20% v/v
16 Days after treatment

Size does matter for Broadleaf Weeds

Table 1. Broadleaf (pigweed and black nightshade) weed control (% control at 1 and 15 DAT), when treated 12, 19, or 26 days after emergence.

	Weed age					
	12 Days old		19 days old		26 days old	
	1DAT	15DAT	1DAT	15DAT	1DAT	15DAT
GreenMatch Ex 15%	94	89	38	11	32	0
GreenMatch 15%	99	83	96	96	48	17
Matran 15%	99	88	62	28	72	0
Acetic acid 20%	76	61	96	11	52	17
WeedZap 10%	100	100	99	33	91	38
Untreated	0	0	0	0	0	0
Lsd .05	26	38	20	46	49	NS


*Echinochloa colona (*barnyard grass)
Matran 5
Matran 10
Matran 15
Matran 20
Organic herbicides provide only temporary suppression of grasses

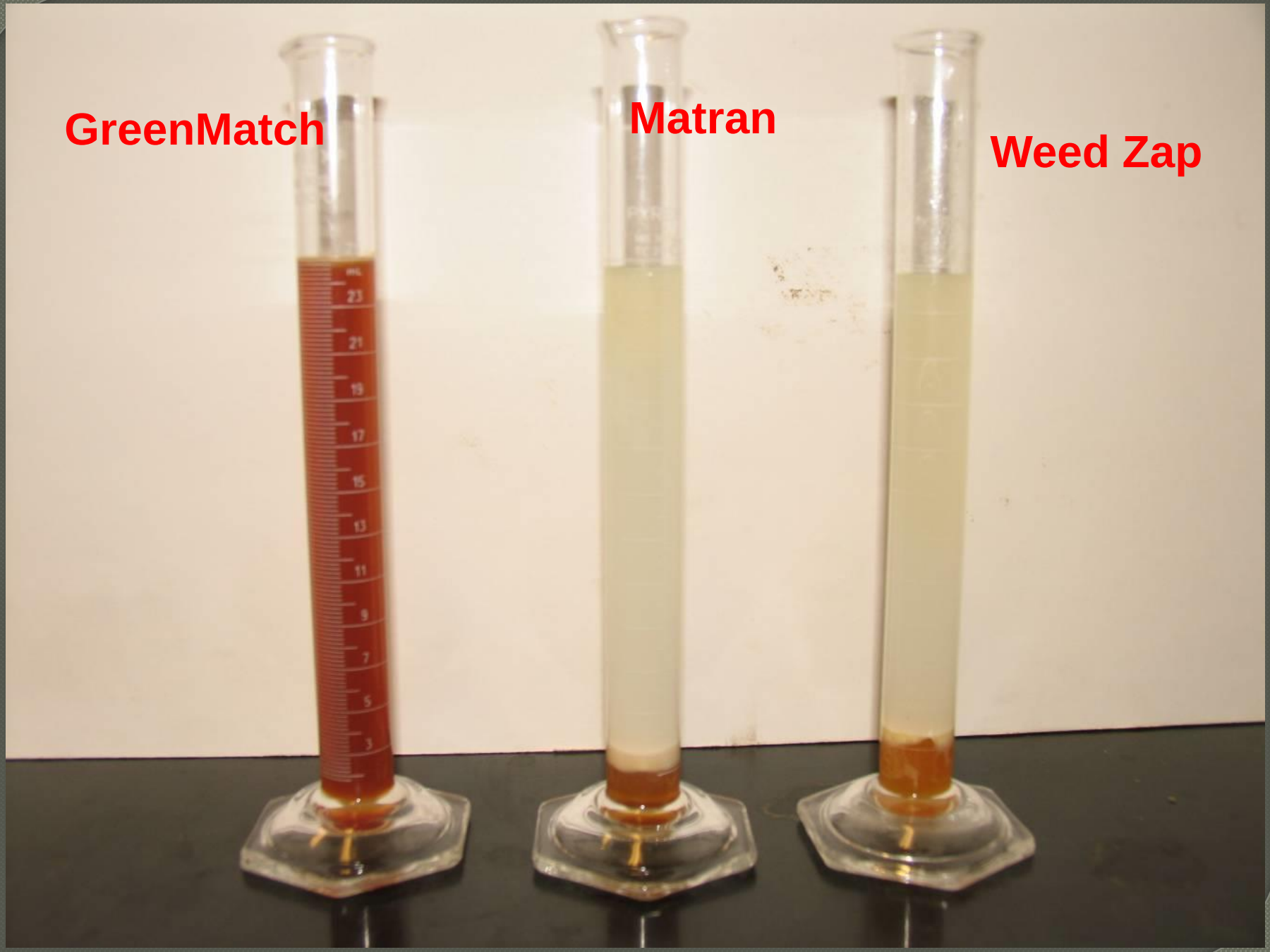
Size Really matters for Grass Weeds!

Table 2. Grass (barnyardgrass and crabgrass) weed control (% control at 1 and 15 DAT), when treated 12, 19, or 26 days after emergence.

	Weed age					
	12 Days old		19 days old		26 days old	
	1DAT	15DAT	1DAT	15DAT	1DAT	15DAT
GreenMatch Ex 15%	97	25	28	19	32	8
GreenMatch 15%	99	42	95	42	50	0
Matran 15%	79	25	86	17	51	0
Acetic acid 20%	37	25	77	0	40	0
WeedZap 10%	81	0	87	11	51	0
Untreated	0	0	0	0	0	0
Lsd .05	25	NS	17	22	NS	NS


Matran 10% - 2 DAT


Matran 10% + Organic Adjuvant 1% - 2 DAT


GreenMatch
Matran
Weed Zap

Organic herbicides need constant agitation to stay in suspension and give even weed control

Organic Herbicides

- Contact materials – no residual
- Need higher volumes (x2) ~70 GPA
- Need higher concentrations ~15-20%

- Organic surfactants improve weed control
- Need constant agitation to stay suspended
- Grasses are much harder to control than broadleafs
- Timing is critical:
  - Treat when weeds are small
  - Repeat applications are needed for larger weeds
  - Work best on clear sunny days & in warm weather (80°F+)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Thank You

Active Ingredients Which May Be in Minimum Risk Pesticide Products Exempted under section 25(b) of FIFRA

1. Castor Oil (U.S.P. or equivalent) 2. Cedar Oil
3. Cinnamon* and Cinnamon Oil * 4. Citric Acid*
5. Citronella and Citronella Oil 6. Cloves* and Clove Oil*
7. Corn Gluten Meal* 8. Corn Oil* 9. Cottonseed Oil*
10. Dried Blood' 11. Eugenol 12. Garlic* and Garlic Oil*
13. Geianiol14. Geranium Oil 15. Lamyl Sulfate
16. Lemon grass Oil* 17. Linseed Oil 18. Malic Acid*
19. Mint* and Mint Oil* 20. Peppermint* and Peppermint Oil*
21.2-PhenethylPropionate (2-phenylethyl propionate)
22. Potassium Sorbate 23. Putrescent Whole Egg Solids (See 180.1071)
24. Rosemary * and Rosemary Oil*
25. Sesame* (includes ground Sesame plant stalks) (See 180.1087) and Sesame Oil*
26. Sodium Chloride (common salt)* 27. Sodium Lauryl Sulfate
28. Soybean Oil 29. Thyme* and Thyme Oil* 30. White Pepper*
31. Zinc Metal Strips (consisting solely of zinc metal and impurities)