



Weed Management in Organic Vidalia Onions

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Do not be afraid to say the –
‘O-Word’

Organic crop production is a
legitimate agricultural enterprise



Principles of Organic Weed Management

- Conceptually no different that weed management in conventional crop production
- An integration of:
 - Mechanical weed control
 - Cultural weed control
 - Chemical weed control
 - Other strategies unique to any particular crop

Differences between organic and conventional weed management

- Herbicides in organic production are derived from natural products.
 - Herbicides approved for use in organic production systems tend to be non-selective, non-residual, and costly.
- Polyethylene mulch covers are permissible, but must be removed from field.
- It is a credit to organic growers that they actually practice integrated weed management and use a balanced system of weed control.

Why Organic Vidalia® Onion?

- Existing, documentable demand for certified organic onion.
- Value of certified organic onion is 2X – 3X the value of conventional onion.
- Weed control is the universally recognized limiting factor to expanding organic onion production.
- Handweeding is the 'default' weed control option, but labor cost and availability limits the practicality of handweeding.

Any reduction in amounts of handweeding will immediately result in significant savings to growers.

Materials and Methods

- Split, split-plot
- Main plots – solarization
 - Solarized with 6-mil clear plastic the previous summer (June – October)
 - Non-solarized
- Sub-plots – cultivation
 - Cultivate 2x at 2-wk intervals with tine weeder
 - Cultivate 4x at 2-wk intervals with tine weeder
 - Non-cultivated
- Sub, sub-plots – herbicides (applied at 60 gal./A)
 - Matratec (clove oil) + vinegar
 - Matratec + Saf-T-Side
 - Nontreated control
- Four replications
- Individual plots were 6 ft. wide by 20 feet long

Materials and Methods

(cont.)

- Onion were transplanted in early December both years.
- Fertilized with composted kitchen waste from the state's prison system.
- No maintenance fungicides and insecticides were applied.
- Only weed control was from the treatments being evaluated; No Handweeding.
- Data collected
 - Onion yield from entire plot
 - Onions were graded according to size
 - 20 onion sub-sample (size Medium) was collected and stored for 120 days in a controlled atmosphere storage facility (high CO₂, low O₂, cool temperature)
 - Stored onion were rated for two fungal and two bacterial diseases, along with evidence of mechanical damage

Solarization - overview



- Must use clear plastic, 6-mil thickness.
- In our latitude, weeds are trapped under the mulch and are scorched by heat. Mulch creates micro-climate that facilitates decay of weed seeds and seedlings.
 - In arid regions, soil temperatures are high enough to actually kill weed seeds and tubers
- Must solarize during summer months, for at least 90 days.
- Proven control of warm-season weeds, including yellow nutsedge.

Cultivation Overview

- Einbock tine weeder (Austria)
- Individual tines are not adjustable – need ‘lifters’
- Heavy duty
- Y-shaped yoke “floats” along topography
- Made in numerous widths suitable for large scale operations
- Successfully used in peanut, millet, southern pea, velvetbean, and Vidalia onion



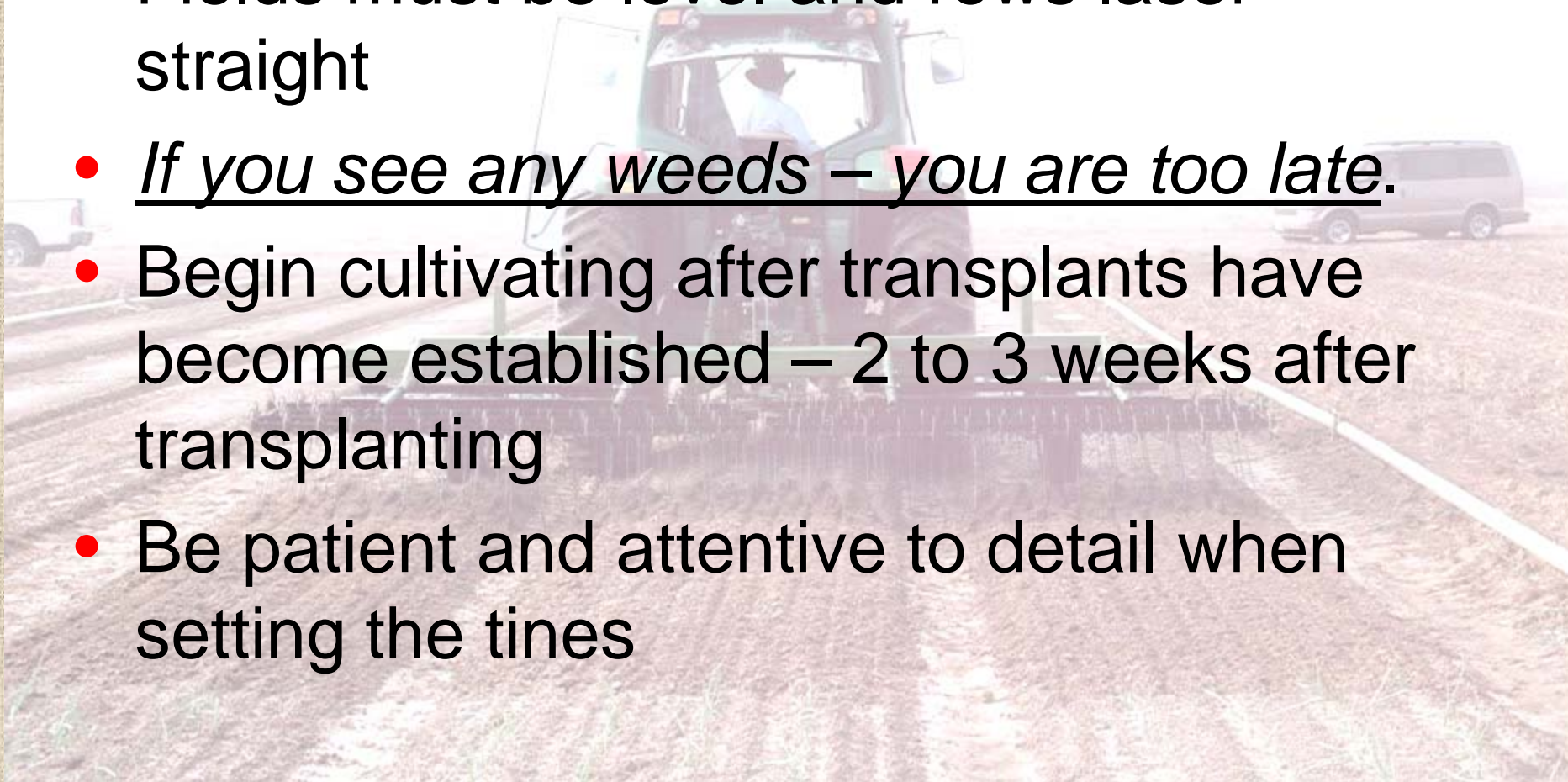
Organic Herbicides

- Derived from natural products
- Clove oil
 - Matratec
- Lemongrass oil
 - GreenMatch EX
- *D*-Limonene
 - GreenMatch
- ‘Adjuvants’
 - Biolink Buffer and Penetrant
 - Saf-T-Side (an insecticide)
 - Vinegar



Cultivating onion with a tine weeder

- Fields must be level and rows laser-straight
- *If you see any weeds – you are too late.*
- Begin cultivating after transplants have become established – 2 to 3 weeks after transplanting
- Be patient and attentive to detail when setting the tines



Interactive effects of cultivation and organic herbicides on weed control in Vidalia Onion; 2007/2008

		Cutleaf eveningprimrose
Cultivation 2X		-----(%)-----
	Matratec + STS	85 a
	Matratec + vinegar	82 a
	No herbicide	84 a
Cultivation 4X		
	Matratec + STS	84 a
	Matratec + vinegar	88 a
	No herbicide	83 a
No cultivation		
	Matratec + STS	59 b
	Matratec + vinegar	60 b
	No herbicide	33 c

Interactive effects of cultivation and organic herbicides on weed control; 2008/2009

		Cutleaf eveningprimrose	Henbit
Cultivation 2X		------(%)-----	
	Matratec + STS	89 a	87 ab
	Matratec + vinegar	89 a	87 ab
	No herbicide	88 ab	81 b
Cultivation 4X			
	Matratec + STS	92 a	92 a
	Matratec + vinegar	92 a	92 a
	No herbicide	88 ab	92 a
No cultivation			
	Matratec + STS	83 bc	88 ab
	Matratec + vinegar	81 c	85 b
	No herbicide	35 d	43 c

Interactive effects of cultivation and organic herbicides on weed control; 2007/2008

		Cutleaf eveningprimrose	Swinecress
Cultivation 2X		------(no./m ²)-----	
	Matratec + STS	8.8 ab	0.5 a
	Matratec + vinegar	10.0 b	0.3 a
	No herbicide	4.0 a	0.5 a
Cultivation 4X			
	Matratec + STS	4.0 a	0.3 a
	Matratec + vinegar	2.3 a	1.3 a
	No herbicide	12.5 b	0.0 a
No cultivation			
	Matratec + STS	30.0 c	4.0 b
	Matratec + vinegar	67.0 d	5.3 bc
	No herbicide	40.5 cd	4.3 b

Interactive effects of cultivation and organic herbicides on weed control; 2008/2009

		Cutleaf eveningprimrose	Swinecress
Cultivation 2X		------(no./m ²)-----	
	Matratec + STS	2.0 a	1.3 ab
	Matratec + vinegar	1.5 a	0.5 a
	No herbicide	3.0 b	2.8 c
Cultivation 4X			
	Matratec + STS	1.3 a	0.3 a
	Matratec + vinegar	1.0 a	0.8 a
	No herbicide	2.0 ab	1.0 a
No cultivation			
	Matratec + STS	4.0 b	1.8 b
	Matratec + vinegar	4.0 b	0.5 a
	No herbicide	8.0 a	4.0 c

Effects of cultivation with Einbock tine weeder on onion yield; 2007/2008

	Medium	Jumbo	Colossal	Total yield
	-----No. 40# boxes/A -----			
Cultivation 2X	90 b	472 b	64 a	626 a
Cultivation 4X	80 b	518 a	64 a	658 a
No cultivation	120 a	190 c	10 b	318 b

Preliminary conclusion – 2007/2008: Cultivation with the tine weeder controls weeds and **increased onion yield by 107%** compared to non-cultivated plots.

Effects of cultivation with an Einbock tine weeder on onion yield; 2008/2009

	Medium	Jumbo	Colossal	Total yield
	-----No. 40# boxes/A -----			
Cultivation 2X	340 a	808 b	30 b	1177 b
Cultivation 4X	254 b	995 a	82 a	1331 a
No cultivation	252 b	941 a	36 b	1229 ab

Preliminary conclusion – 2008/2009: Cultivation with the tine weeder controls weeds and **increases onion yield by 8%** compared to non-cultivated plots.

Effect of cultivation on post-harvest onion diseases; 2007/2008

	<i>Botrytis</i> neck rot (fungal)	<i>Pantoea</i> <i>ananatis</i> (bacterial)	<i>Burkholdaria</i> <i>cepacia</i> (bacterial)	<i>Aspergillus</i> <i>niger</i> (fungal)	Bruised fruit (mechanical damage)
	-----(% infection per 20 bulb stored sample) -----				
No cultivation	20 a	24 a	0	0.2	1
Cultivate 2X	12 b	21 a	0	0.2	1
Cultivate 4X	10 b	15 b	0	1.1	2

Effect of cultivation on post-harvest onion diseases; 2008/2009

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	-----(% infection per 20 bulb stored sample) -----				
No cultivation	4 b	9 a	1 b	0	3 a
Cultivate 2X	5 ab	10 a	2 b	0	2 b
Cultivate 4X	6 a	7b	6 a	0	3 a

What Happened to Solarization?



Effect of Solarization on Weed Control

	Cutleaf eveningprimrose (2007/2008)	Cutleaf eveningprimrose (2008/2009)	Swinecress (2007/2008)	Swinecress (2008/2009)
	----- (no./m ²) -----			
Non-solarized	19	2.4	1.9	1.4
Solarized	21	3.5	1.7	1.4

- Summer solarization has been proven to be very effective on warm-season weeds.
- These results suggest that summer solarization has minimal effect on cool-season weeds.

Could this be due to cool-season weed seed are fully dormant in summer months during solarization and this gives the weed seed protection?

Effect of solarization on onion yield and post-harvest disease

	Total onion yield		<i>Botrytis</i> neck rot (fungal)	
	2007/2008	2008/2009	2007/2008	2008/2009
	----- (no. 40# boxes/A) -----		(% infection)	
Non-solarized	548	1169	15.2	5.7
Solarized	534	1321	12.3	4.8

- No significant yield response both years.
- No effect on *Botrytis* neck rot both years.

Weed control priorities before attempting to grow organic onion

- Use a transplanted onion production system.
 - Helps ensure uniform crop stand
 - Competitive advantage with weeds
- Have a tine-weeder already purchased and ready to operate before transplanting.
- Enter the production season with weed control being the #1 priority during the first 60 days of the season.

Conclusions

- Overall order of beneficial impact on over weed management:
 - 1) Cultivation (greatest impact/benefit)
 - 2) Organic herbicides (cost effectiveness?)
 - 3) Solarization (minimal weed control effects, but we need to study effects on diseases)
- No single factor is robust enough to be a stand-alone.
- We were able to successfully control weeds in organic onion without using handweeding.

Questions

