Weed Control in Organic Strawberry

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Weeding costs

Klonsky, et al. 2003
In organic – primarily hand labor
Weed control in organic strawberries

- Weeds and seed banks
- Field selection
- Handweeding and cultivation
- Crop rotation
- Mulches
- Weed suppression products
Hard seeded weeds

Little mallow

Sweetclover
Example:
Little mallow/cheeseweed \((Malva parviflora)\)
Annual weeds

- Annual bluegrass
- Common chickweed
- Common purslane
- Knotweed
Perennial weeds

Field bindweed

Johnsongrass

Yellow nutsedge
Importance of weed seedbanks

- Weed seedbanks: the seeds in the soil
- Weed seedbank management forces us to take a long term approach to weed control
- Weed seedbanks represent the “true” weed population in the field

In the Salinas Valley, seedbank densities ranged from 6.3 to 140.2 million seeds /A. (Shem-Tov & Fennimore, 2003).
We only see the above part
Weed Seedbanks

Harper 1977

Seed fall

Immigration and emigration

Seeds eaten

Dormant

Non-dormant

Germination

Seed death

Dormancy = dispersal in time
Wind-blown annual weed seeds

Common groundsel

Annual sowthistle
Canadian horseweed (*Conyza* spp.)
It is essential to destroy mother plants around your field before they flower.
Weed control with colored mulch
78-98% - red, yellow, brown, green, white/black, black

44-50% - blue and clear

Fruit yield:
14% more on clear than colored
Paper from ‘Novovita’: recycled newspaper, gypsum
Yellow nutsedge germinated through plastic, 9/21 and 9/29 (pre-transplant)

No. plants per 25 ft of bed

<table>
<thead>
<tr>
<th></th>
<th>3-12 week after tarping</th>
<th>2 week after tarping</th>
<th>1 week after tarping</th>
</tr>
</thead>
<tbody>
<tr>
<td>no paper</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>paper</td>
<td></td>
<td></td>
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</tbody>
</table>

![Bar chart showing no. plants per 25 ft of bed with categories: no paper, paper. Bars labeled A and B for different time periods.]
Yellow nutsedge germinated through plastic and paper+plastic, Spring 2006
Nutsedge germination, winter-spring 2007

![Graph showing temperature and shoots over time]

- **Temperature (C) at 15 cm**
- **Shoots #/8 m bed**
- **No. shoots**
- **Soil temperature at 15 cm**

**Time Points:**
- 1 wk Jan
- 2 wk Jan
- 3 wk Jan
- 4 wk Jan
- 1 wk Feb
- 2 wk Feb
- 3 wk Feb
- 4 wk Feb
- 1 wk Mar
- 2 wk Mar
- 3 wk Mar
- 4 wk Mar
- 1 wk Apr
- 2 wk Apr
- 3 wk Apr
- 4 wk Apr
- 1 wk May
- 2 wk May
- 3 wk May
- 4 wk May
- 1 wk June
- 2 wk June
- 3 wk June

**Legend:**
- **No. shoots**
- **Soil temperature at 15 cm**
2007-2008: so far 100% nutsedge control

- Weed barrier matt
- Plastic+paper+plastic
- Tyvek, water resistant?
Wind-dispersed weeds in planting holes
Wind-dispersed weeds in planting holes

A

B

B

B

no. per 25 ft of bed

Control

Plastic/Paper/Plastic

Tyvek

Weed barrier

12.17.07

11.12.07

10

5

0

35

30

25

20

15

10

5

0

A

B

B

B

12.17.07

11.12.07

Control

Plastic/Paper/Plastic

Tyvek

Weed barrier

12.17.07

11.12.07
Field selection

- Avoid fields infested with perennial weeds.
- Annual weeds such as common purslane can be difficult to manage as well.
- Weeds such as common groundsel, common sowthistle, hairy nightshade and shepherd’s-purse can be hosts of Verticillium.
Sanitation

- Clean equipment before moving from weed infested fields to clean fields – pressure wash
- Remove uprooted bermudagrass and purslane from the field since these weeds can re-root
- It is important to control weeds near the strawberry field because wind-blown seed from groundsel and sowthistle can quickly invade a clean field
Tillage & cultivation

- The use of plastic mulches limits the use of tillage
- Tillage can be used before planting
Preirrigation

- Preirrigation and tillage before planting can be used help reduce weed populations
- The idea is to stimulate weed emergence before transplanting
Preirrigation to control weeds

Irrigate

Shallow till or burn
Preirrigation treatments

- Furrow, sprinkler or no preirrigation
- Till and plant 7 or 14 days after preirrigation
- Lettuce was the crop
Weed control with preirrigation

Control (%)

None  Fur 14  Spk 7  Spk 14

Preirrigation

Spence 2002
Effects of preirrigation

No preirrigation

Preirrigation
Preirrigation conclusions

- Careful use of preirrigation and shallow tillage can control many weeds.
- Flaming can be used in place of shallow tillage.
Weed managements products
‘Waipuna’ hot foam system

- Heated organic foam (coconut/corn syrup + water) disrupts plant cells
- 250 gal water/hour, diesel or propane boiler
Testing weed control

Vegetating

- annuals (cheeseweed, lambsquarters)
- Perennial (Bermuda grass)
Testing weed control

- **Seed**
  - little mallow
  - ryegrass
  - burclover
  - At 4 depths 0, 3, 6, 9 cm
10 ft²/minute at high plant canopy density
Above-ground annuals: 1 day
Bermuda grass

‘Waipuna’    Untreated
Seed survival

- **Burclover**: no effect of Waipuna treatment on germination at all depths

- **Ryeegrass**: germination reduced 82% at the surface, no effect at other depths

- **Little mallow**: viability reduced 57% at the surface, no effect at other depths
Standard Flame Burner
Matran
45.6% Clove Oil
@ 5 GPA Product
(50 GPA Volume)
Bradford Horticultural Vinegar
20% Acetic Acid
@ 15.4 GPA
Xpress
20.5% Clove & Thyme Oils
@7.5 GPA
Crop rotations

- Careful management of weeds in crops grown in the season(s) prior to strawberry production can help reduce weed populations in the field.

- Management of weeds in crops such as celery, cole crops and lettuce can help reduce weed populations in the field.
Soil solarization

- Works well in the warmer parts of California such as the deserts and central valley.
- Difficult to use on the coast due to fog, and cool temperatures. Regarded as undependable on the coast.
- In one study gave ~ 60-70% weed control
Solarization near coast: Double layer with 2-inch spacing
Soil solarization study

Soloplast

Standard

Fennimore, et al. 2005
Soil solarization: weed control

Fennimore, et al 2005
Steam and hot gas: complete control, but how to make field application is efficient/economical?

- Use of steam blankets
- Inject via heat resistant drip tape to beds
- Use spiked metal tubes on bed tops
- Use in combination with solarization to disinfect top layer and deeper parts of beds = reduce fuel costs associated with heating water
Summary - weeds

- Weeds must be carefully managed in and around the production field before and during strawberry production.
- A long-term approach to managing weed seed banks in the production field will lead to lower weeding costs.
- Field selection, sanitation, preirrigation and tillage, solarization handweeding and plastic mulches are the tools by which weeds are managed in organic strawberries.
Acknowledgments

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