Orchard Mulching and Cover Crop Trials

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Orchard Mulching and Cover Crop Trials: Multiple Goals

Weed control – non-herbicide; suitable for organic production
Moisture conservation
Fertility management, soil quality
Pest management ? (e.g. habitat for beneficials)
Factors Influencing Weed Control

Age of orchard
Rootstock ?
Area, timing of weed control
Weed species – potential spread, harboring pests
Cost versus benefit
Weed Control Options

Mechanical – tillage, mowing
Thermal – flame, hot water
Mulch
Competition – cover crops
Soil conditions – fertility, structure
Biocontrol – insects, pathogens
Herbicides

*All but herbicides are options for organic growers.*
Mulch Trials Underway

Ag Canada – Summerland, BC; Yakima, WA
Washington State University / Wenatchee Valley College (WVC), Wenatchee, WA
Tonasket Elementary School orchard, Tonasket, WA
Initial trials with compost showed no consistent benefit. However, when applied as a mulch (right), compost seemed more effective.
Heavy weed pressure in check plots at Summerland, BC.
This spray-on paper mulch machine is a new innovation for orchard weed control, developed by Dr. Gene Hogue at Summerland, BC.
Spray-on paper mulch applied to tree row at Summerland, BC. Good weed control.
Mulch trial at Tonasket, WA.

Wood chips

Shredded paper

Alfalfa hay

Mulch trial at Tonasket, WA.
Wood chip mulch, Wenatchee, WA.
Shredded paper mulch, Wenatchee, WA
Chopped alfalfa hay mulch, Wenatchee, WA
Delayed senescence with alfalfa mulch (10/99)
Fall-planted dwarf white clover (in tree row as a living mulch)
Fall-planted Oriental mustard (foreground)
Poor suppression of annual grass weeds by mustard (4/00)
Winter rye; good weed suppression the following season
Dead rye in mid-summer; few weeds
WVC Mulch Trial

Weed Control by Mulches – 6/1/00
WVC Mulch Trial
Weed Biomass 9/99

9/21/99

Weed DM (g/m²)

Control Wood chip Paper Alfalfa

0 20 40 60 80 100 120 140 160

a a a b
## Orchard Mulching Trials – Summerland, BC

**5th Leaf Spartan / M.9**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>TCSA (mm²)</th>
<th>Roots (g/0.018m³)</th>
<th>Yield (kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check (glyphosate)</td>
<td>1011 b</td>
<td>11.3 c</td>
<td>10.3 c</td>
</tr>
<tr>
<td>2. Biosolids (Vancouver)</td>
<td>1052 b</td>
<td>16.9 bc</td>
<td>11.2 bc</td>
</tr>
<tr>
<td>3. Paper mulch</td>
<td>1565 a</td>
<td>28.7 abc</td>
<td>13.0 ab</td>
</tr>
<tr>
<td>4. 2 + 3</td>
<td>1490 a</td>
<td>41.8 a</td>
<td>13.9 a</td>
</tr>
<tr>
<td>5. Composted biosolids + 3</td>
<td>1406 a</td>
<td>38.7 a</td>
<td>14.9 a</td>
</tr>
<tr>
<td>6. Alfalfa hay</td>
<td>1203 b</td>
<td>35.2 ab</td>
<td>14.0 a</td>
</tr>
<tr>
<td>7. Geotextile</td>
<td>1125 b</td>
<td>19.1 bc</td>
<td>12.7 abc</td>
</tr>
</tbody>
</table>

(Hogue et al., 2000)
WVC Mulch Trial

Trunk Growth - 2000

% increase TCSA

Control  Wood chip  Paper  Alfalfa  Mustard  Rye  Clover mow  Clover herb
WVC Mulch Trial
Managing clover for N release

Effect of clover mow or spray on soil nitrate (0-6"

<table>
<thead>
<tr>
<th>Days after mow/spray</th>
<th>Soil nitrate (ppm) 0-6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Control</td>
</tr>
<tr>
<td>0</td>
<td>Alfalfa</td>
</tr>
<tr>
<td>0</td>
<td>Clover - mow</td>
</tr>
<tr>
<td>0</td>
<td>Clover - herb.</td>
</tr>
</tbody>
</table>

Days after mow/spray

Soil nitrate (ppm) 0-6"
Enviroscan Mulch Trial

An automated system that continuously measures soil moisture content.
Wood chip mulch led to 20-25% less moisture depletion between irrigations.
Clover living mulch consistently had the highest soil moisture.
Single-tree lysimeters were used to monitor mulch effects on soil moisture at Summerland, BC.
Summerland, BC - Cumulative Water Use

Trunk Diameter (mm)

- Mulch
- No mulch
Effect of Mulches on Nematodes in Orchard Soil - Summerland, BC

Mulching unexpectedly suppressed plant-damaging nematodes.

(Hogue et al., 1998)
WVC Mulch Trials – Current Status

Wood chip – most promising; low maintenance

Paper – best weed control

Alfalfa – poor weed control; excellent N source

Clover – good weed control; low maintenance; minimal N contribution

Further evaluation of water conservation, soil biology, N relations, insect habitat
1. Shredded paper, alfalfa hay, wood chip and geotextile mulches provided good to excellent weed control.

2. Organic mulch was an effective barrier to soil surface moisture loss.

3. Mulches, except geotextile, generally increased yields.


5. Organic amendments improved soil quality but did not increase yields.

6. Cover crops able to outcompete weeds also reduced crop vigour.

7. Sprayed-on mulch, an effective barrier to weed growth and soil surface water loss, offers ease of application.
Parting Thoughts

Weed control in organic orchards a problem in other countries

More research and development focusing on it

Zillah, WA study – mow grassy weeds; low soil nitrate, but comparable yields

Switzerland – “sandwich” system

Need “integrated” control – multiple tactics, may change with orchard age