Effect of Organic Mulches on Soil Properties, Physiology, and Growth of Landscape Shrubs

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Which Mulch?

• Two general types
  – Inorganic
  – Organic

Inorganic mulches

• Rock
• Recycled rubber
• Plastic film
• Landscape fabric
Inorganic mulches

• Advantages
  – Don’t decompose over time
  – Similar moisture savings as organic mulches
  – Appearance
  – Potential cost savings (don’t need to reapply as often)
  – pH neutral
  – Recycled product

• Disadvantages
  – Don’t contribute organic matter or nutrients
  – Appearance – some look ‘fake’
  – Higher initial cost
  – Rocks used as mulch may wedge in bark or damage tree trunks
  – Potential increased heat/light reflectance

Organic mulches

• Pine bark
• Hardwood bark
• Recycled pallets
• Cedar or cypress bark
• Wood chips
• Ground trees “Storm de jour”
• Pine straw
• Composted materials

• Advantages
  – Add nutrients and organic matter
  – ‘Natural’ appearance
  – Weed suppression
Organic mulches

- Disadvantages
  - Need to be reapplied periodically
  - Nutrient ‘tie-up’
  - Color washes out over time
  - Potential allelopathic effects on landscape plants

Objective

- Compare effects of common organic mulches on:
  - Growth
  - Photosynthetic gas exchange
  - Plant nutrition
  - Soil moisture
  - Soil pH

MSU Mulch trial

- 6 treatments
  - No mulch
  - No mulch + weed control
  - Pine bark
  - Hardwood fines
  - Cypress mulch
  - Recycled pallets
- 12’ x 12’ plots
- Each treatment replicated 4 times
- All mulch applied to 3” depth
MSU Mulch trial

- Burning bush
- Goldflame spirea
- Java red weigelia
- Runyan yew (2)
- Golden globe arborvitae (2)
- Tardiva hydrangea
- Viburnum dentatum ‘Chicago lustre’
- Viburnum trilobum ‘Compactum’

Measurements

- Volumetric soil moisture
  - 2005-2006
- Soil pH
- Weed assessment
  - Fall 2006
- Photosynthetic gas exchange
  - (Viburnums & Hydrangea)
- Growth
  - 2005-2007

Growth response

Height growth of landscape shrubs in response to mulch and weed control
MSU Mulch Study 2005-2007

![Graph showing height growth of shrubs](chart.png)

NOTE: Mean separation by Tukey's test at α = 0.05
Height growth response
• Weed control increased growth relative to No mulch plots
• Mulches increased height growth compared to un-mulched plots
• Plants under cypress mulch grew less than with other mulches
Weed populations varied by treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Annual grasses</th>
<th>Common dandelion</th>
<th>Yellow nutsedge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypress</td>
<td>16a</td>
<td>39a</td>
<td>61ab</td>
</tr>
<tr>
<td>Pine bark</td>
<td>9a</td>
<td>9a</td>
<td>21bc</td>
</tr>
<tr>
<td>Pallet</td>
<td>23a</td>
<td>30a</td>
<td>75a</td>
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<tr>
<td>Hardwood</td>
<td>78a</td>
<td>66a</td>
<td>100a</td>
</tr>
<tr>
<td>Weed free</td>
<td>0a</td>
<td>0a</td>
<td>0c</td>
</tr>
<tr>
<td>No mulch</td>
<td>213b</td>
<td>226b</td>
<td>10c</td>
</tr>
</tbody>
</table>

NOTE: Means within a column followed by the same letter are not different at α = 0.05

Photosynthetic gas exchange

Foliar Nitrogen
Mulch did not affect soil pH after 3 years
MSU Mulch Study 2005-2007

<table>
<thead>
<tr>
<th>Mulch</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypress</td>
<td>6.91a</td>
</tr>
<tr>
<td>Recycled pallets</td>
<td>6.91a</td>
</tr>
<tr>
<td>Pine bark</td>
<td>6.96a</td>
</tr>
<tr>
<td>Hardwood</td>
<td>6.96a</td>
</tr>
<tr>
<td>No mulch</td>
<td>7.00a</td>
</tr>
<tr>
<td>Weed free</td>
<td>7.01a</td>
</tr>
</tbody>
</table>

NOTE: Mean separation by Tukey's test at α = 0.05
Summary

- Growth response varied by species but was generally similar for Pine bark, Hardwood, and Recycled pallets
- Mulch increased soil moisture
- Mulch did not affect soil pH
- No evidence of nutrient ‘tie-up’

Why mulch?

- Soil moisture conservation

Why mulch?

- Weed control
Why mulch?
• Add organic matter

Why mulch?
• Aesthetics

Why mulch?
• Plant protection

Is mulch a fire hazard?
• Several reports have documented building fires associated with mulch
• OSU study found that rubber mulch was the most flammable; cocoa mulch, coarse pine nuggets, hardwood bark were least flammable
Is cocoa mulch dangerous for dogs?

- Cocoa mulch contains theobromine
- ASPCA Poison Control Center has documented cases of clinical symptoms (tremors, vomiting, tachycardia) in dogs after consuming mulch
- ASPCA recommends avoiding the use of cocoa mulch around dogs with “indiscriminate eating habits”

What about hot mulch?

- ‘Hot’ or ‘Sour’ mulch is produced under anaerobic conditions. Breakdown products are highly acidic (pH 2-4)
- To reduce problems, spread mulch and allow to cool before applying to sensitive plants
- Water thoroughly after applying
Mulch do’s and don’ts

• Do
  – Eliminate weeds before mulching
  – Apply 2-3” of mulch
  – Top-dress as needed to maintain depth and appearance
  – Use ‘doughnut’ technique
  – Use best-quality mulch available

Mulch do’s and don’ts

• Don’t
  – Use grass clippings as mulch

Summary

• A wide variety of mulches are available and most fulfill the functions of mulch in the landscape
• Use best quality mulch
• Don’t over-mulch
• Don’t use impervious plastic mulch
• Dr. Cregg’s idiosyncratic opinions
  – Avoid inorganic mulches
  – Avoid use of landscape fabric under mulch