Growing Bedding Plants and Hanging Baskets in an Un-heated High Tunnel

Neil Mattson

Assistant Professor and Floriculture Extension Specialist
The Problem: Rising Energy Costs

$ for one gallon of #2 Fuel Oil

Can you grow bedding plants and hanging baskets with no heat?
High Tunnels

Used for season extension
Some frost protection
Much warmer day temperatures
Ventilation required
Protection from rain/elements

Rimol high tunnel, showing louvered vents in endwall, and roll-up sides

West Haven Farms, Ithaca, NY

Slide: Chris Wien Cornell University
High tunnels more info

• High tunnel = unheated poly-house or hoop house
  – taller and more uniform temp than a cold frame
• Cost to construct $1-3 per square foot
• For overwintering plants typically adds 2 USDA hardiness zones additional protection
• Usually covered with a single layer of plastic
  – double layer may be used / or additional covering inside
• Some are erected on skids so that the structure can be moved during the production cycle
Ventilation is absolutely necessary during the day, even when outside air temperatures are not extreme.

Air temperature inside and outside a high tunnel on a sunny April 26, 2006, in Ithaca, NY.

Slide: Chris Wien, Cornell University
• High Tunnels are not for everyone:
  • Need sturdy construction
  • Protection from wind, snow

Before.....

After 55 mph winds

Slide: Chris Wien Cornell University
Feb 2010 – 18” of snow overnight in Ithaca

Photo: Chris Wien Cornell University
Finishing Bedding Plants in a High Tunnel

Cornell Trial

Ithaca, NY – USDA
Hardiness Zone 5

5 bedding plants
Transplanted April 1 into 4” pots

Target: Ready for Mother’s Day
### Temperatures April 1 – May 15

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse</td>
<td>66°</td>
<td>55°</td>
<td>89°</td>
</tr>
<tr>
<td>High Tunnel</td>
<td>61°</td>
<td>30°</td>
<td>107°</td>
</tr>
<tr>
<td>Outside</td>
<td>51°</td>
<td>26°</td>
<td>85°</td>
</tr>
</tbody>
</table>

Greenhouse heating set points were 70 F during the day and 60 F at night.
Petunia ‘Dreams Midnight’
Marigold ‘Safari Orange’

Greenhouse

High Tunnel
Pansy ‘Delta Formula Mix’

Greenhouse

High Tunnel
Snapdragon ‘Montego Mix’

Greenhouse

High Tunnel
Zinnia ‘Dreamland Mix’

Greenhouse

High Tunnel
## Finishing in High Tunnel
(avg flower date)

<table>
<thead>
<tr>
<th>Flower Type</th>
<th>Greenhouse flower date</th>
<th>High tunnel flower date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marigold ‘Safari Orange’</td>
<td>April 26</td>
<td>May 1</td>
</tr>
<tr>
<td>Pansy ‘Delta Formula Mix’</td>
<td>May 9</td>
<td>May 10</td>
</tr>
<tr>
<td>Petunia ‘Dreams Midnight’</td>
<td>April 29</td>
<td>May 4</td>
</tr>
<tr>
<td>Snapdragon ‘Montego Mix’</td>
<td>May 4</td>
<td>May 11</td>
</tr>
<tr>
<td>Zinnia ‘Dreamland Mix’</td>
<td>April 30</td>
<td>May 6</td>
</tr>
</tbody>
</table>
# Plant Size (Fresh weight in grams)

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Greenhouse FW</th>
<th>High tunnel FW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marigold ‘Safari Orange’</td>
<td>46.6 g</td>
<td>47.0 g</td>
</tr>
<tr>
<td>Pansy ‘Delta Formula Mix’</td>
<td>20.6</td>
<td>25.4</td>
</tr>
<tr>
<td>Petunia ‘Dreams Midnight’</td>
<td>13.5</td>
<td>15.0</td>
</tr>
<tr>
<td>Snapdragon ‘Montego Mix’</td>
<td>15.5</td>
<td>17.8</td>
</tr>
<tr>
<td>Zinnia ‘Dreamland Mix’</td>
<td>14.3</td>
<td>12.1</td>
</tr>
</tbody>
</table>
Hanging Basket Experiment

• Petunia ‘Purple Wave’ experiment
  • transplanted on April 8
    – 144, 288, or 512 cell plugs
    – 12” pots had 3, 4, or 5 plants
• Fertilized weekly with 21-5-20 at 400 ppm N
• assessed marketability on May 27
  – flower #, plant width, visual index
144 cell, 5 plugs  
avg 34 flowers  

512 cell 3 plugs  
avg 2 flowers  

May 27th
Cell-Size and Plug # Affect Flower #

![Bar chart showing the relationship between cell size, plug count, and flower count. The x-axis represents plug sizes (144, 288, 512), the y-axis represents flower count, and the z-axis represents plants per 12" pot.]
EFFECT OF TEMPERATURE ON FLOWERING PETUNIA WAVE PURPLE

54°  61°  68°  75°
Should you consider high tunnels?

• Do you grow plants that need heat year round?
  – don’t use for those plants (poinsettias, propagation)
• Do you have extra space
  – i.e. less crop turns per house than in a heated greenhouse
• Do you need to target specific ship dates?
  – If so, high tunnels are risky
  – If you retail out of your facility may be okay
• Can you handle the risk of frost?
Avoiding Risk
Under Bench Heating
Under bench heat with electric hot water heater
Temporary heating for cold nights

- Have temporary kerosene or propane burners on hand for cold nights
Wooden beams provide some support against high snow load. This high tunnel on Long Island made it through a 20 inch snow event.
Solar Greenhouses in China
Be Creative - doesn’t have to be a high tunnel
Reemay fabric provides some frost protection for these outdoor petunias.
Resources

• www.hort.cornell.edu/hightunnel/
  – Business & Marketing ➔ Example Crop budgets
• www.hightunnels.org
• http://www.attra.ncat.org/
  – search for high tunnels
  – also see video: Hoop Houses for Crop Extension
Acknowledgements

Thanks to:
Northeast Sustainable Agriculture Research and Education – grant for hanging basket work
NYSFI Research and Education Fund – grant for bedding plant work
Wessels’ Farms – plugs for Ithaca work

Contact Neil Mattson:
nsm47@cornell.edu
www.greenhouse.cornell.edu