Insect “Exclusion” Technologies

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November 7, 2000
The Best Exclusion Technologies can fail

from neglect
with openings in structure
with holes in screening
transport on clothes
without clean stock
without adjacent sanitation
if you do not shade
Effects of Screens

- add resistance to airflow and air exchange
  + 85% reduction if natural ventilated
  + reduce capacity if fan ventilated
- larger mesh # means greater resistance
- will increase resistance with use
- requires maintenance
- requires add-on structures
  + drape on inlet
  + screen shed at inlet
Inlet window screen [inside view]
Inlet window

Opening area

Greenhouse wall

1.4 ft²/1000 cfm

700 fpm

0.1” pressure
Inlet window

Greenhouse wall

Screen

1.4 ft^2 / 1000 cfm
700 fpm
0.1” pressure

same
smaller
larger
Inlet window

attach screen from sill plate to window bottom

1.4 ft$^2$/1000 cfm
700 fpm
0.1” pressure

Greenhouse wall

Screen [50” for 100’ by 100’ gh]
[with 50 mesh for 90,000 cfm]

pipe weight

same
same
~same
Inlet shutter
[4ft by 4ft, 8 required]

Open area

Greenhouse wall

1.4 $\text{ft}^2/1000 \text{ cfm}$
700 $\text{fpm}$
0.1” pressure
Inlet shutter

Greenhouse wall

airflow

Inlet shutter

screened frame

4 ft

5 ft

96 ft² each
8 frames
100’ by 100’ gh
90,000 cfm
50 mesh

1.4 ft²/1000 cfm
700 fpm
0.1” pressure

same
same
~same
Inlet window

Attached framework with screen

Greenhouse wall
Screening is selected based on the insect to be excluded

For exclusion, choose screen with these hole sizes

<table>
<thead>
<tr>
<th>INSECT</th>
<th>INCHES</th>
<th>MESH*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leafminers</td>
<td>0.025</td>
<td>40</td>
</tr>
<tr>
<td>Whiteflies</td>
<td>0.018</td>
<td>52</td>
</tr>
<tr>
<td>Aphids</td>
<td>0.013</td>
<td>78</td>
</tr>
<tr>
<td>Thrips</td>
<td>0.0075</td>
<td>132</td>
</tr>
</tbody>
</table>

*threads per inch, each direction
Approach Velocity
[for fan ventilation]

- Air velocity through screen
- Greater velocity causes greater pressure loss
- Greater mesh causes greater pressure loss
- Allowable pressure, based on fan design

<table>
<thead>
<tr>
<th>Screen or Mesh</th>
<th>Allowable Approach Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicopee, 32</td>
<td>336 ft per min</td>
</tr>
<tr>
<td>Stainless Steel, 60</td>
<td>303</td>
</tr>
<tr>
<td>Chicopee, 52</td>
<td>264</td>
</tr>
<tr>
<td>Nylon, 68</td>
<td>253</td>
</tr>
<tr>
<td>Woven Fabric, random</td>
<td>192</td>
</tr>
<tr>
<td>Econet T</td>
<td>110</td>
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</tbody>
</table>

* Only at 0.03” static press.
Determine Area of Screen Required

Screen Area * = \( \frac{\text{Capacity of Fans}}{\text{Approach Velocity}} \)

*Total area of screens equals the total ventilation capacity divided by the approach velocity*
Summary

The type of screening is selected based on the insect to be excluded.

Area of the screening is based on the fan capacity and the allowable velocity to keep reasonable pressure loss.

Pressure loss is based on fan design and that the screen will get dirty.

The fan capacity is based on the size of the greenhouse.
SIZING THE EXHAUST FANS

- Design for maximum cooling load
  
  7-8 CFM per FT² FLOOR

- Determine floor area in FT²
  Install 7-8 CFM fan capacity per FT²

Example: 24 FT by 100 FT = 2400 FT²

16,800 - 19,200 CFM