Insect Netting Effectiveness

An evaluation conducted in conjunction with the University of Almeria, Spain

UNIVERSIDAD DE ALMERÍA

Our Guide to Selecting the Best Insect Netting Through Form, Fit & Function

ACADIAN
INDUSTRIAL TEXTILES

Insect Netting: A Critical Part of an Integrated Pest Management (IPM) Program

Program success is achieved by:

Having

- Light (Measured by PAR)
- Air Flow between and around each plant

Preventing

- Disease
- Mold
- Pests

Insect Netting supports your IPM program by providing:

- Physical barrier to pests in air or on the ground
- Enough circulation to prevent mold and diseases
- Adequate light transmission
- Multiple season solution in various configurations

Evaluating Form and Fit

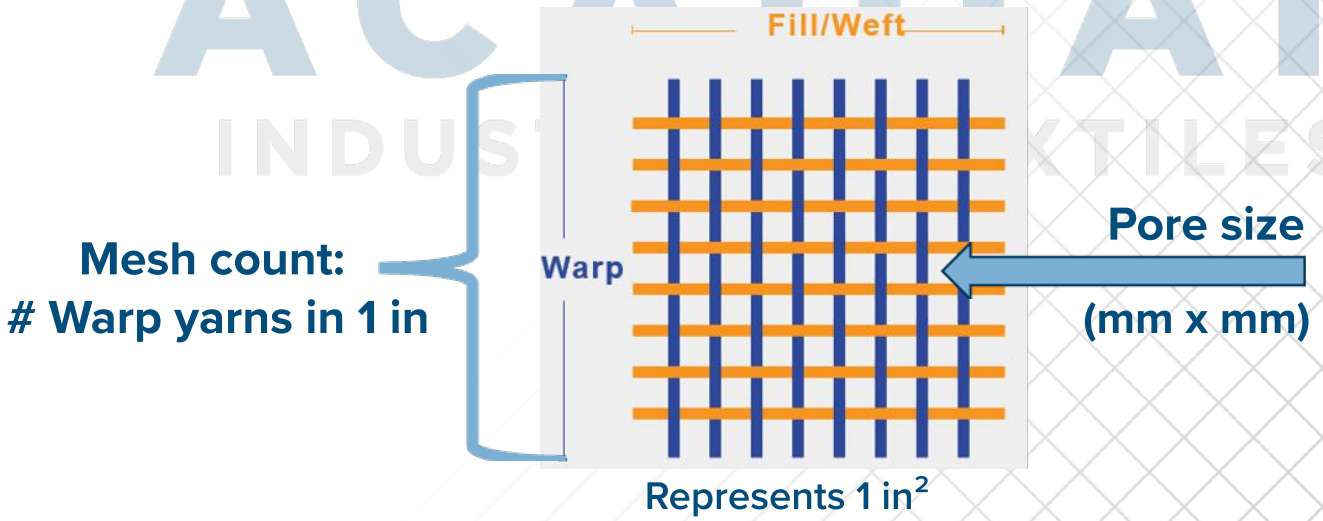
Construction:
- # yarns warp direction (Mesh count)
- # yarns weft direction
- Reinforcement, in center and around edges

Pore Size:
- Size of openings

Material:
- Woven HDPE: virgin, additive UV

Colors:
- Opaque, Green or Black

Shade:
- 15% to 35%



Functional Testing: How Structural and Environmental Requirements are Met

Tensile / Elongation Test

ATSM D5035: lbs or newtons that cause a tear at x% fabric stretch

Weathering Resistance UV protection

ASTM G-154: Accelerated weathering

Common questions these tests help answer:

If I pull net around trees or bushes, will that pull it out of shape?

How do I know my netting will hold up multiple seasons?

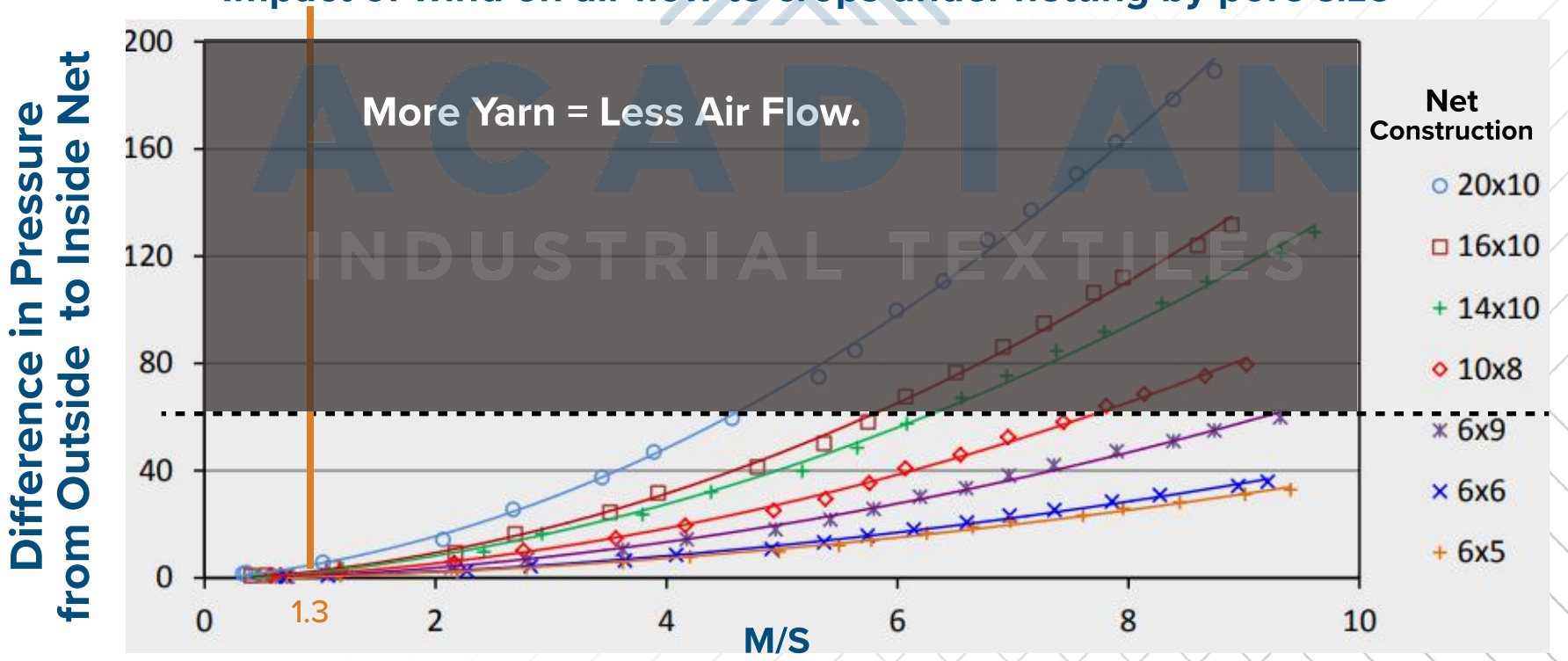
If my netting is on rollers for use when greenhouse walls are up, will it break?

Function: Air Flow Requirements Dictate Pore Size

Not sure which pore/ mesh size to buy?
The answer is based on local wind conditions and air flow needs of your crops.
Small Pore Size Can Impact Crop Production Due to Low Air Flow.
(area above dotted line in chart)

"lower porosity of fine mesh nets, leads to a high static pressure drop…"
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7600595/

Impact of wind on air flow to crops under netting by pore size



Function: Construction Reduces Pressure Change, Air Flow

- A gentle breeze (1.3 m/s or 5 km/h) can impact net covered greenhouse vent systems, creating a pressure change which thereby strains the motors.

  Static Pressure impact on motors https://rucore.libraries.rutgers.edu/rutgers-lib/47188/PDF/1/

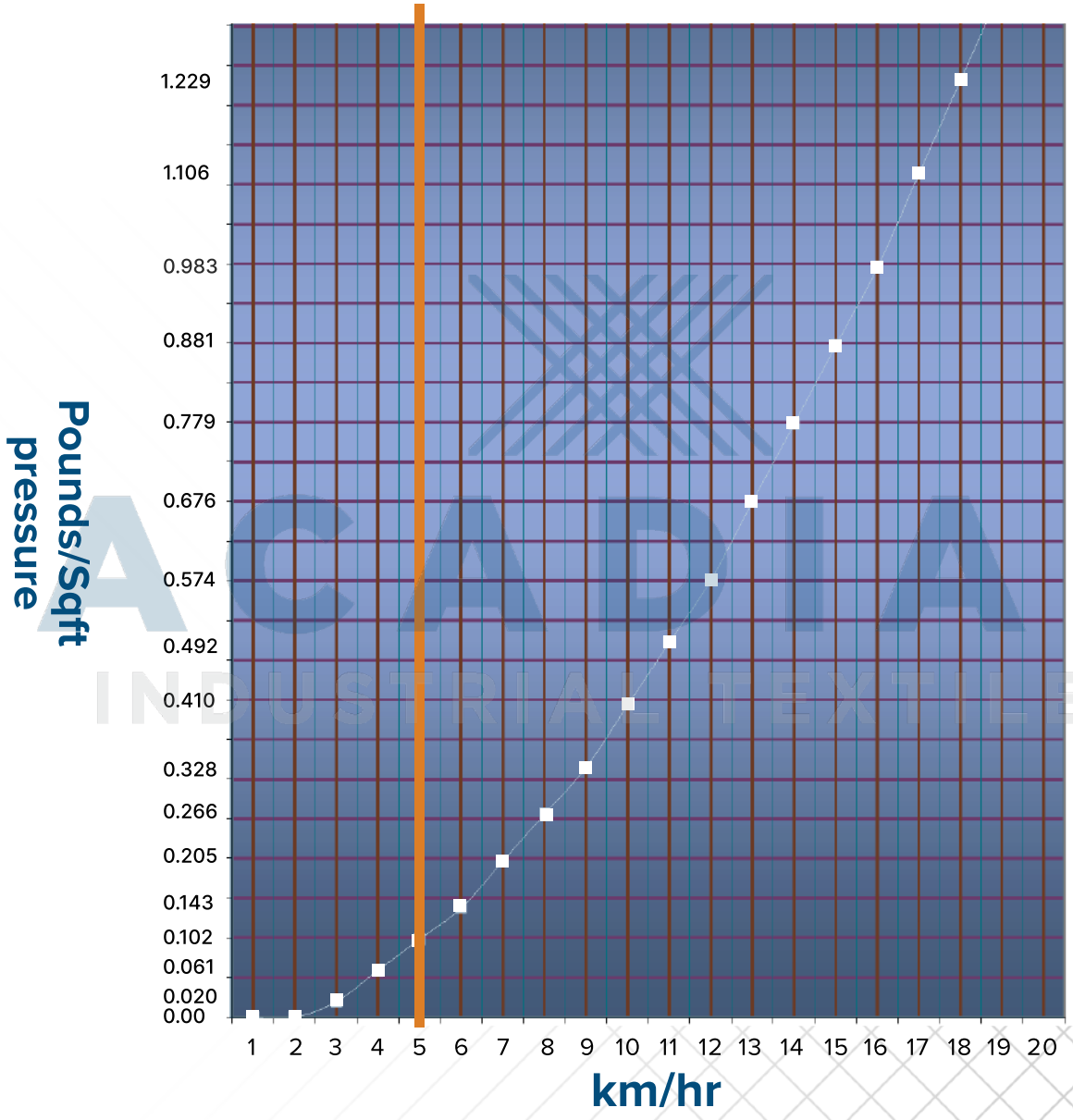
- Worried about pests being smaller than the opening on the netting?

  Pore sizes bigger than the width of insect abdomen can be more effective in keeping out insects https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4883381/

Net sizes 6 x 9 and bigger support air flow needed to keep CO^2 available and excess moisture away, regardless of wind speed

Construction	Yarns / 1 in sq	51 x 25	40 x 25	15 x 23	15 x 15	15 x 13
	Yarns / 1 cm sq	20 x 10	16 x 10	6 x 9	6 x 6	6 x 5
	Mesh	50	40	15	15	15
Pore Size	mm	0.27 x 0.77	0.39 x 0.77	0.83 x 1.38	1.38 x 1.38	1.38 x 1.7
Weight	gsm	137	125	106	85	79

Function: High Mesh Count and Insect Blocking



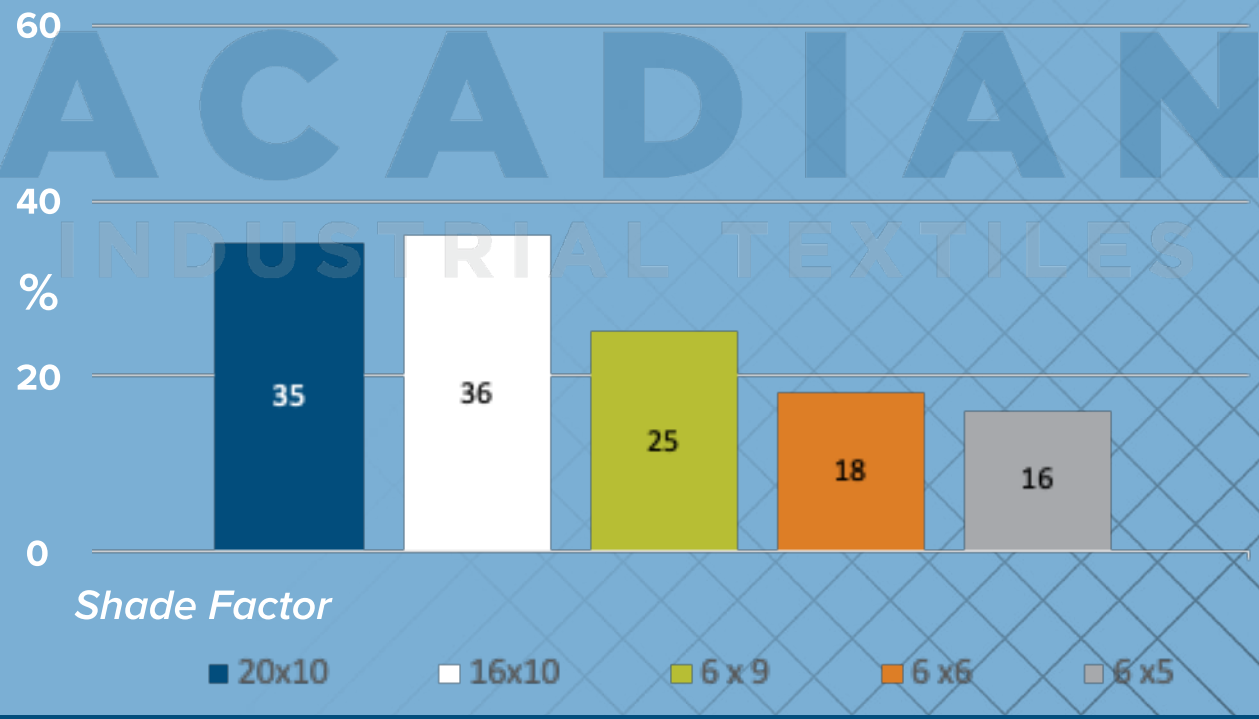
Wind speeds above 5km/hr can push pests through 40 / 50 mesh sized nets

Function: Provide Light and Shade Requirements of Crops

Shade factor is the % of visible light blocked by the insect netting material

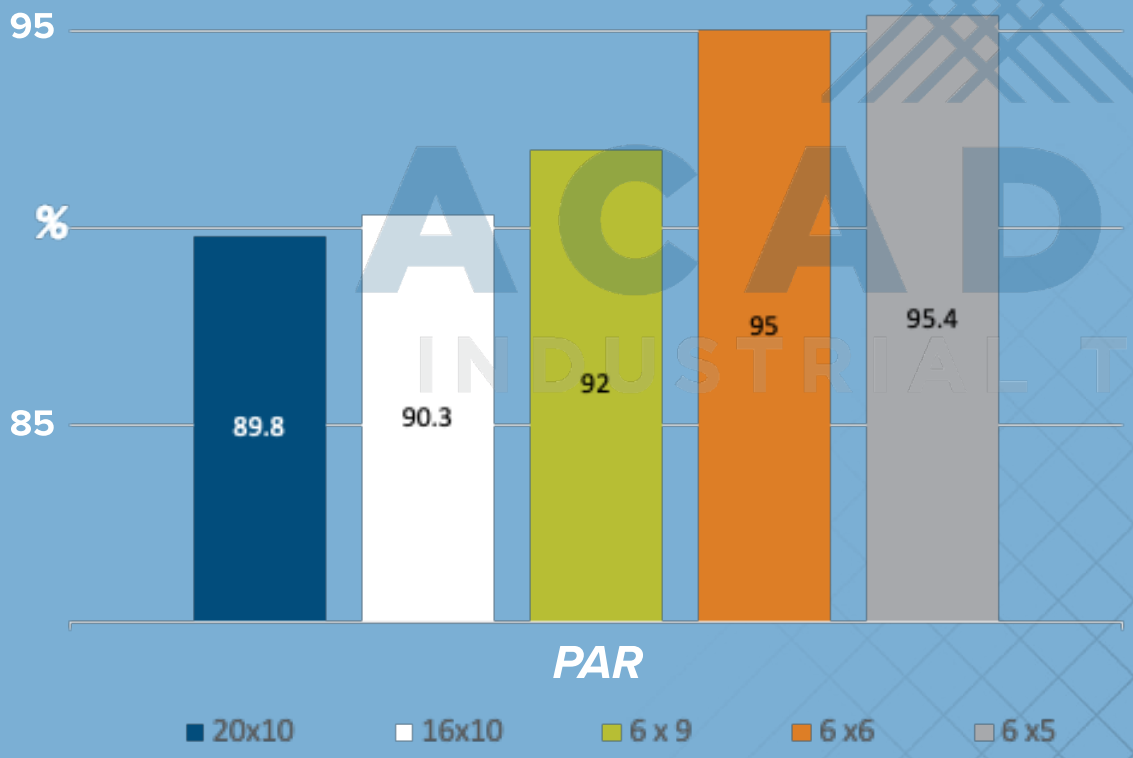
Shade is an average of any light, not type of light

Can one company's 16% shade fabric be different than another's?
YES



Function: Provide Light and Shade Requirements of Crops

All insect netting blocks some light
Transmittance = % Light that passes through any material



Fine tuning transmittance can deliver different results in growth.
The amount and type of PAR (Photosynthetically Active Radiation) Measured by transmission %
(See Knowledge Bank)

Green netting has a different PAR than black or clear because it blocks green light to support specific growth

"1% [too little] radiation results in 1% [drop in] production"

Acadian Insect Netting Offerings

Designed and tested to meet the needs of growers and their crops

Construction ISO 7211-2	**Metric (reinforcement)**	**20 x10**	**16x10**	**6 x 9**	**6 x6**	**6 x5**
	Imperial	50 x 25	41 x 25	15 x 23	15 x 15	15 x 13
Mesh	**# Warp Threads**	50	40	15	15	15
Pore size	**mm**	0.27 x 0.77	0.39 x 0.77	0.83 x 1.38	1.38 x 1.38	1.38 x 1.7
Weight ISO 3801-2	**gsm**	137	118.67	106	85	79
Tensile Strength (N) ISO 13934-1	**Warp**	1100	900	560	540	540
	Reinforcement	External 1800	External 1200	Central 1200	Central 1100	Central 1100
	Weft	570	600	740	550	440
Elongation (%) ISO 13934-1	**Warp**	28	25	27	22	22
	Reinforcement	External 30	External 30	Central 27	Central 27	Central 27
	Weft	21	12	21	18	18
Air Permiability / Porosity ASTM D737	**%**	42	49	61	68	71
~ Pressure Drop at 8 mph	**Pa drop**	42	35	8	5	4
Shade AATCC TM 148	**%**	35	33	25	18	16
Light Transmission PAR	**%**	89.9	90.3	92	95	95.4
		% PAR light that goes through net material				

Selecting the Right Insect Netting for Crop Needs

Air Flow

Shade

PAR Light

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		% PAR light that goes through net material				

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Reference Documents

Related Testing Specs

- Air Permeability / % Porosity: ASTM D737
- Construction: ISO 7211 or ASTM D1059
- Light Transmissions ASTM D1494-12
- Shade Factor: AATCC TM 148
- Tensile Strength and Elongation:
  ISO 13934 (Strip test), ASTM D5035
- Weathering Resistance: ASTM G-154

Example Components of Integrated Pest Management Plan

- ID pest threats
  - State based tools: NY State List of Invasive Species
- Monitor and measure (set traps seasonally)
  - Tips and suggestions at state level : UNC Identify pests and possible actions to take
- Remove fallen, possibly rotting fruit, made simpler with ground cover
- Introduce competitive insects
- Use of contact sprays “Greenhouse thrips is readily controlled with thorough application of contact sprays such as horticultural oil, natural pyrethrins (plus piperonyl butoxide), or insecticidal soaps to the underside of infested leaves. Repeat applications may be necessary”,
- Thrip Management
  Use textiles :
  - Ground Cover: Easy removal of fallen, rotting fruit from around crop; Weed Management
  - Bird Netting or PP Rain Cover: Birds are safe and kept away from fruit
  - Insect Netting

Additional resource

USDA IPM Resource Page

Reference Sources

1. What I PAR: https://www.fondriest.com/news/photosyntheticradiation.htm#:~:text=Photosynthetically%20Active%20Radiation%20is%20needed,At%20night%2C%20PAR%20is%20zero.

2. FDA alert on Thrips https://www.fdacs.gov/content/download/93435/file/PESTALERT-Thripsparvispinus%28Karny%29.pdf

3. Ground cover in fighting SWD: https://gardenerspath.com/how-to/disease-and-pests/spotted-wing-drosophila-control/#Mulch-with-Plastic

4. Impact of pore size on green house air flow and temperature: (Slide 6, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4883381/

5. Wheeler, E.F. & Both, A.J. (2002) Evaluating Greenhouse Mechanical System Performance Part 3 of 3, Rutgers Cooperative Extension, www.rucorelibraries.rutgers.edu

6. "The lower porosity of fine mesh nets, leads to a high static pressure drop [14,15], resulting in inadequate air exchange and reduced ventilation [16], hence exposing crops to abiotic stress that affects crop growth and production, while representing a barrier for pollinators " https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7600595/