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By John W. Bartok Jr.

## Choose the right plastic film for your needs

Since the early 1960s when polyethylene film was first used to cover wood frame greenhouses, many improvements have been made. Most polyethylene film is manufactured as a coextrusion of three layers with different polymers and additives. Each layer contributes to the quality of the film and enhances its performance.

### Film life

The life of polyethylene film is limited due to degradation processes induced by sunlight and heat. Copolymer poly is a low-cost material that is good for one season. It is a good choice for seasonal greenhouses, overwintering structures and high tunnels. Avoid construction grade material that has less strength.

Greenhouse grade poly is warranted for four years or more and costs about twice as much as co-poly. It contains an ultraviolet stabilizer that reduces degradation. If additional strength is needed, such as in high wind locations, a woven poly or nylon scrim-reinforced material should be considered.

### Thickness

One-year co-poly film is available in 3, 4 and 6 mil thickness. Three or 4 mil film is common for one year use on narrow tunnels and overwintering houses. Greenhouse grade material, only available in 6 mil thickness, is best for multi-year applications.

### Condensate control

Anti-condensate, also referred to as anti-drip, this is a wetting agent that reduces surface tension allowing condensation to flow rather than form droplets. It can be sprayed on the film or incorporated into the center layer and usually lasts a couple of years.

Condensation droplets reduce light transmission and can lead to disease problems when they drip onto plants. An anti-fogging additive may be included to prevent early morning and late afternoon fog formation in the greenhouse.

### Reduced nighttime heat loss

This additive traps the radiant heat inside the greenhouse from escaping. In heated greenhouses, the savings have been measured to total from 10–20 percent depending on whether the sky is cloudy or clear. In double layer poly installations, the infrared (IR) film is always installed as the inner layer to retain nighttime heat.

Research has shown that infrared film can increase plant color and/or compactness and accelerate crop development. This is most likely due to increased nighttime plant temperature. Costing only a couple of cents more per square foot, the payback is only a few weeks for a greenhouse heated all winter.

### Reduced daytime heat gain

In areas with strong sunlight, blocking part of the infrared spectrum can lower the inside temperature up to 10°F. Selective pigments can be added to the outside layer in copolymer film to reflect or absorb the near infrared radiation which is not used for plant growth.

Research has shown that the higher the outside temperature, the larger is the temperature difference achieved by use of these films. Advantages include lower cooling costs, greater worker comfort, less need for irrigation, reduced plant stress and improved fruit taste.

### Ultra-violet light

Bees need ultraviolet (UV) light to navigate. If a grower uses bees to pollinate plants in the greenhouse, purchasing a film that allows some of the ultraviolet light energy spectrum to pass through may be important. Otherwise, ultraviolet blocking film will reduce whiteflies, thrips, aphids and other insects. It can also control some fungal diseases.

### Controlled diffusion

Light diffusion is another property that has recently been added by manufacturers. This increases the amount of diffused light that reaches the plants, reducing scorching and increasing light transmitted to lower leaves. It is

especially important with tall vegetable crops. Research has shown that diffused light also reduces fungus spore development and insect propagation.

### Light transmission

Photosynthetically active radiation (PAR) light transmission varies with the type of film additives. Typical PAR values are: ultraviolet-stabilized film, 88-91 percent, infrared/anti-condensate film, 82-87 percent, infrared/anti-condensate with diffusion, 77-88 percent. Dust, smog and plastic deterioration can also reduce light transmission. A "rule-of-thumb" is 1 percent increase in light equals 1 percent increase in plant growth during the winter or in cloudy weather.

Some growers replace their plastic every year just to get a few percent higher light level when growing during the short days of winter. Some manufacturers make a film with anti-static properties that repels dust, dirt and smog.

### Photoselective films

Photoselective films absorb or reflect specific wavelengths of light. They can enhance plant growth, suppress insects and diseases and affect flower development. Red films such as Dupont IR and Smart-lite Red film reduce PAR light and create a shading effect. They have also been shown to improve rose yield and quality.

### Single or double layer

For normal operation, a single layer of film is adequate. If a grower is operating a greenhouse during the heating season, an inflated double layer is desirable. The double layer reduces heat loss at night by about 40 percent. It also reduces the stress at the attachments and the rippling of the plastic on a windy day.


Air inflation at ¼-inch water static pressure is best. A slightly higher pressure should be used in windy or snowy weather. Connecting the blower to use outside air will reduce condensation between the two layers.

### Plastic failure

Early failure of polyethylene film can be attributed to attachment stress, abrasion

on rough surfaces and sharp edges or heat build-up in the area of rafters, purlins and extrusions. Contact with chemicals from pesticides or pressure treated lumber can also affect the life of the plastic.

Polyethylene may also be subject to cuts from blowing ice especially if there

are multiple greenhouses adjacent to each other. A scrim reinforced poly may be desirable in these situations. 

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