High Tunnel Talk

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High Tunnel Plastics—What's Cooking?

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There are many choices in high tunnel plastic covers, and trying to determine which one to buy can be difficult, especially when all the features sound good. How are high tunnel plastics different from each other, and what factors might you want to consider when buying a high tunnel plastic?

A Specialty Crops Research Initiative project "Optimizing Protected Culture Environments for Berry Crops", funded through USDA-NIFA is underway to answer those questions specifically as they relate to berry crop production, though the information gained will be useful to growers of other crops as well. Michigan State University is the lead institution on the project, with 7 other Universities involved, including 6 in the U.S. and one in the U.K., as well as researchers from USDA-ARS and industry. Besides plastics that are currently on the market, we are also working with plastics that are not yet available commercially, but that have specific effects that could be of value to growers.

More than 50 different plastic coverings are available in North America. Most are 6-mil thick, and should be useable for about 4 years. They contain additives that either prevent ultraviolet (UV) light from reacting with the plastic to break it down, or that block its infiltration through the plastic to varying degrees. Plastics intended for indoor use, even if they are a similar thickness, would become brittle after only a year or so of exposure to sunlight.

With all of the research we are doing, we are of course noticing huge effects in yield and berry quality between open production vs. covered production. Effects on yield and berry size among the different plastics however are quite a bit smaller (10% differences or so), but keep in mind that this is data is only on berry crops.

Here is a rundown of some of the features that different plastics have, and what effects they might have on the crop.

Light transmission. Most high tunnel (or greenhouse) plastic films transmit 85-95% of visible light. The wavelengths that plants use for photosynthesis, mainly red and blue wavelengths, are in this visible range. This is typically more than an individual leaf can use when working at full

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capacity (called light saturation), so even plastics that transmit less light are satisfactory. However, high light transmission becomes more important under certain circumstances, such as when growing under a double layer of plastic in a Northern latitude during shorter days. If growing a crop with a low light requirement like lettuce or other greens, there is still enough light coming through for quality to be excellent, but if growing a crop like strawberries or raspberries that accumulate sugars, sweetness can be reduced especially during cloudy spells if less light is transmitted. The percent light transmission is generally available in manufacturer specifications for the plastic.

Diffusion. Certain films diffuse light more than others, though the total amount of light coming through is usually similarly high. It is more difficult to discern shapes and outlines when looking through a diffusing plastic, and shadows in the tunnel are less distinct. This means that lower leaves receive more light, so total plant photosynthesis is thought to be higher which should translate into better growth. This effect would be more important for taller plants such as raspberries or indeterminate tomatoes where significant shading can take place, and less important for shorter crops like lettuce.

Anti-drip features. Films may have a coating on the film or an additive incorporated into the plastic to make condensation run down the plastic rather than drip onto you and your plants, and so are called anti-drip plastics. This effect seems to be more noticeable in the fall when frost forms on the interior of the plastic, or during very rainy spells, and is generally appreciated by those of us working in the tunnels.

IR-blocking. Some plastics block infrared (IR) radiation, which is what we sense as heat. These are often just called "IR" plastics. These films can reduce heat buildup in the tunnel during the day, or help to hold it in at night. If in a Northern climate and trying to prolong harvest into the fall or winter, it makes sense to use a plastic that blocks long-wave IR to help with minimizing heat loss.

UV effects. Early in this discussion, we mentioned that plastic films block UV light coming into the tunnel. UV light affects many processes, including anthocyanin (and hence, antioxidant) production, insect vision, and fungal sporulation. We are noticing some fairly large differences among plastics in presence of certain pests such as Japanese beetles. However, effects seem not to be related to strictly to UV light, so we are still sorting out these effects and why they are occurring. We also want to make sure that the effects are consistent across years.

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Price. The biggest differences we've found in price per square foot of plastic are due to the supplier and the quantity ordered, rather than differences in price between the plastics themselves. Shipping is also another huge factor, and differences in shipping costs with distance can dwarf any differences in plastic price. So when cho osing a plastic, consider the above factors, which crop(s) you plan to grow, and when you plan to grow them, and stay tuned for updates on the work.

Information on sources of available plastics can be found on the project website: www.tunnelberries.org

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