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MULCH CORNER

COLORED INORGANIC MULCHES

By John Ferguson

Last week we looked at specialty plastic, so this week we are going to review some of the research on plastic mulches.

Black polyethylene roll type plastic mulches often look bad, absorb excessive heat (if not covered by an organic mulch), essentially cooking the root systems of most plants. In wet years the plastic often traps too much moisture in the root zone, drowning plant roots and creating a breeding ground for disease. The perforated types often only work as a weed block if installed a certain way, and most need a large overlap of material to prevent roots/weeds from growing between layers. Also the use of plastic mulches creates indirect and hidden costs to society related to environmental issues, the direct cost of removal, collection and waste-disposal. Recent studies are finding that while plastic mulches help to obtain yields earlier in the season than bare ground, total yields over the entire season are often higher with bare ground and much higher with good organic mulches.

Over the last decade or so there has been a lot of research on how color affects plant growth, yield, insect or disease issues.

A five year study at Pennsylvania State University has revealed that colored polyethylene sheeting can increase yields as much as 25% when compared to black plastic. Each crop was found to have its own preference. Plant response is believed to be related to the way each color plastic reflects light and heat (Horticulture, January 1997). Additional research has been done at Clemson University, Pennsylvania State University, the USDA, and others. Some of what is being learned is discussed below:

Peppers - performed best when mulched with yellow sheeting

Tomatoes - red plastic worked best



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Strawberries - with red plastic they ripen more quickly, emit a stronger aroma (90% increase in aromatic compounds than black plastic), were almost 20% larger, have higher sugar and organic acid concentrations as compared to black plastic mulch.

Squash - blue and red plastic worked best

Silver - aphids tend to ignore plants mulched with silver plastic

Orange - turnips grow bigger

Blue - turnips had a sharper taste

Green - turnips had the sweetest taste (chemical analysis confirmed the most sugars)

White - plants have thicker wax coat hence plants use less water

Yellow - attracts the greatest amount of insects

Other research has found that the frequency or color of light reaching plants affects the growth of disease organisms as well as plant growth. The spores from the pathogen botrytis require ultraviolet light to germinate. Several fungal diseases require blue, ultraviolet or infrared radiation to multiply. Research at Disney World's Epcot center has found that red light reduces foliar fungal diseases on tomatoes, peppers and cucumbers. It also found that blue wavelengths stimulated the development of these diseases. However, in some cases the elimination of some frequencies also reduced plant growth.

Many plant responses to light reflected from colored plastic mulch are dependent on the exact species and cultivar tested. This means that a different species of pepper may do worse with a given color than another. Also, it has been found that two red plastic mulches, that look identical to the human eye, have very different plant growth responses, as they reflect differently at wavelengths invisible to humans. It turns out that plants are sensitive to radiation in the far-infrared and ultra violet wavelengths that humans cannot see. It should be noted that the performance attributes listed in the research reports only compares colored plastic mulch to black plastic mulch.

This research into the reflective properties of plastic mulch explains why straw or hay and fresh ground wood chip mulches work so well. These mulches are very light in color and reflect all colors or



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wavelengths of light. This allows the plant to use all the colors or whichever color is best. They also enrich the soil as they breakdown.

As scientists continue to study the effects of light on plants and diseases we will learn how to use the reflective nature of different types of mulch to its fullest. Plastic mulches have their greatest benefits when used in commercial agriculture to help warm the soil in the spring. A lot of research on plastic mulches is in progress and we will learn how to use them more effectively in the future.

Effects of Colors:

This is a new area of research that we are beginning to understand. The color of mulch or other materials affects plant growth. Research at Texas A&M University studied trees that were planted in paving bricks (pavers) of three different colors; a light (blond), medium (red-brown), and dark (charcoal). The light and medium colored bricks reflected the most photo synthetically active (growth promoting) radiation. The air temperature above the plants was less for the lighter colors as compared to the darker colors. In the fall and winter on sunny days the air temperature was as much as 35 degrees Fahrenheit higher, which could make the trees (plants) more susceptible to damage from sudden cold snaps. In addition, the darker the color the more root growth was decreased in the upper portions of the soil which resulted in reduced growth above ground. This effect was more pronounced in the shallow rooted species.

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