

Plastic Mulches – It's not just Black or White

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A mulch is a material that covers the soil surface, shades the ground, and physically hinders germinating weed seedlings. In general, it is considered a mechanical method of weed control but there are many other physical and biological plant and insect responses to plastic mulches.

- Mulches may be used to:
- Manipulate temperature
- Manipulate light
- Manipulate soil moisture
- Reduce insect feeding and disease transmission

In agricultural fields, black plastic is the most widely used because of weed control and soil warming properties but clear plastic is often used in the winter to keep and retain heat. When clear plastic is used, herbicides, preplant fumigation, or solarization must be used to reduce weed pressure.

Just as black and clear mulches can raise soil temperatures, white, white-on-black, or silver reflective mulches may slightly decrease soil temperature because they reflect back most of the incoming solar radiation.

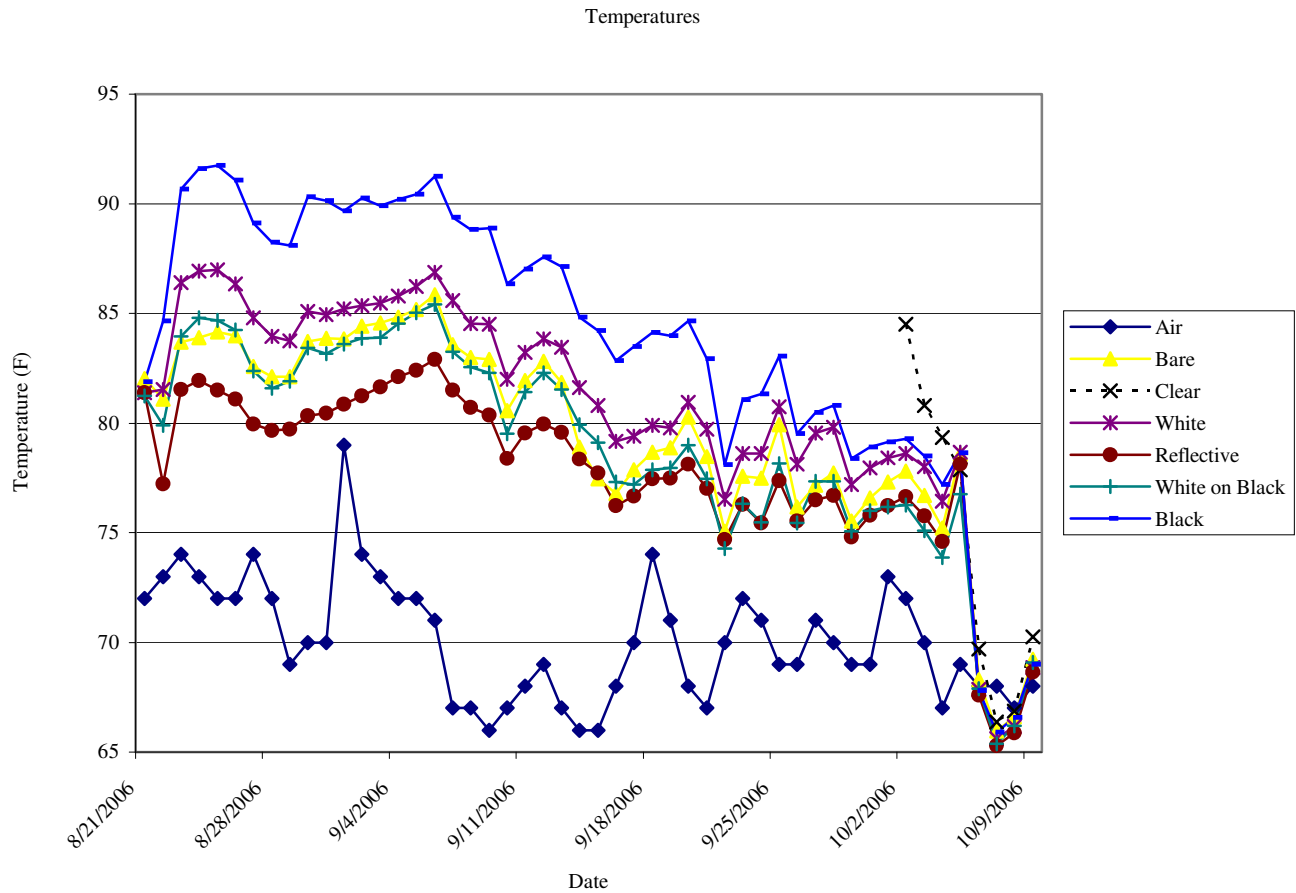
Ranunculus are grown in coastal San Diego County. This flower crop is seeded in late fall and grown through the winter for cut flowers production and the bulbs are harvested in the summer. Unfortunately, the major weed species, various clovers, germinate in cool soil temperatures and grow highly competitively alongside the crop. Fumigation by methyl bromide or methyl bromide replacements is ineffective for preplant control of the clovers due their hard seed coat. Additionally, there are no herbicides, either PRE or POST that will control clovers without injuring the crop.

We decided to try to manipulate soil temperature by lowering it to stimulate clover germination and then use a contact herbicide to kill the emerged clover prior to planting the ranunculus. We selected white, white over black and reflective silver over black plastics. These were compared to clear and black plastic mulches and bare ground.

Plastics were put in place on raised beds with 24" bed top on August 20, 2006. Each plot was 20' long with 4 replications. Dataloggers were placed 2" deep under the plastics. Soil

temperature data for August 21 to October 9, 2006 are shown below (Figure 1). Air temperature points are from the La Jolla CIMIS station . Data show that the reflective mulch provided the lowest soil temperature, providing a mean decrease in soil temperature of 1.76F and a maximum of 3.86 F as compared to bare soil.

Figure 1. Soil (2" below surface) temperature as influenced by mulch type and air temperature August 21 to October 9, 2006 in San Diego, Ca.



Plastics were removed on October 9 and weed cover evaluated 17 days later. While there was insufficient amount of clover to make statistically valid comparisons, we did find that the type of plastic had a significant effect on cover from creeping spurge and mallow (Table 1). Fescue was also in the plots but data is not shown here. Creeping spurge was not controlled using black plastic and appeared to be stimulated by white and clear plastics. However, both the reflective and white on black mulches provided excellent creeping spurge control. All mulches provided good mallow control.

Table 1. Mean percentage weed cover 17 days after plastic mulch removal.

<u>Plastic Type</u>	<u>Total % Weed Cover</u>		<u>Creeping spurge</u>	<u>Mallow</u>	
Bare ground	58.00	cd	10.63 a	39.5	b
Black	12.38	ab	10.00 a	0.875	a
Clear	34.38	bc	32.50 b	0.125	a
Reflective	3.25	a	1.25 a	0.875	a
White	79.38	d	63.13 c	4	a
White on black	7.63	a	0.00 a	5.5	a

Means followed by the same letter in a column are not significantly different at the P=0.05 level by Fisher's protected t-test.

Because this trial was designed for a different purpose, we do not have data to explain the differences. However, mallow control may be due to either heating or a physical obstruction to growth. The increase of creeping spurge under white plastic and the exceptional control under the reflective and white on black plastics is more difficult to explain. More studies are needed to understand these responses.