WEED GERMINATION UNDERNEATH POLYETHYLENE FILMS WITH DIFFERENT OPTICAL PROPERTIES. Mathieu Ngouajio, Bernard H. Zandstra, and Jeremy, Assistant Professor, Professor, and Research Assistant, Department of Horticulture, Michigan State University, East Lansing, MI 48824.

Use of polyethylene film mulch is a simple and easy way to modify crop microclimate. Since the early 60's, use of plastic mulches for vegetable production has contributed enormously to reduce pesticides inputs in agriculture. Plastic film mulches provide non-chemical alternatives for control of insects, diseases, and weeds. Plastics chemistry has provided growers with films possessing a large variety of optical properties. Plastic mulch optical and physical properties affect its ability to transmit, reflect, or absorb light. These factors in turn affect the soil temperature as well as the quality and quantity of light prevailing under the plastic. The modified microclimate affects weed seed germination and development.

Laboratory and field experiments were conducted in 2001 and 2002 to (i) measure the optical properties of colored mulches, (ii) evaluate weed populations underneath each mulch type, and (iii) determine if film optical properties could be used to predict weed populations. Mulches used in the study included the following: white, black, coextruded white/black, gray, green infrared transmitting (IRT green), and brown infrared transmitting (IRT brown). Light transmission, reflection, and absorption in the 400 to 1100 nm range were measured using a LI-1800 spectroradiometer (LI-COR). In field experiments, density and dry biomass of weeds growing underneath the mulches were evaluated between 45 and 50 days after tomato planting.

The light transmitted through the mulches varied greatly. An average of 1, 2, 17, 26, 42, and 45 % light was transmitted through the black, white/black, gray, IRT brown, IRT green, and white mulches, respectively. Similar results were observed with light reflection. Reflected light was 8, 9, 10, 16, 25, and 51% for black, IRT brown, IRT green, gray, white/black, and white mulches, respectively. The white mulch absorbed minimal light (less than 2%). Light absorption by other mulches varied between 50 and 92%. Weed density and biomass were significantly different among the mulches ($P < 0.05$). The white mulch showed high weed pressure, followed by the gray mulch with moderate weed infestations. All other mulches provided an adequate level of weed suppression. Weed infestation was highly correlated with average light transmission for the white, black, white/black, and gray mulches. However, both light quantity and quality were necessary to predict weed infestations with the IRT mulches.

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