

Synthetic mulches for Weed control

Clyde L. Elmore

Mulches have been used for years to enhance organic matter in the soil, conserve moisture, moderate temperature, and to control weeds. Robinson (1988), in a review of mulches, listed nine major effects of mulches. These included: soil moisture, weed control, soil and air temperature, soil nutrients, plant growth, plant establishment, appearance and economics. His article caused enough stir that subsequently there was a letter to the editor (almost a paper; with citations) with a rebuttal from Robinson (December, 1988) further discussing the pro's and con's of mulching.

Most of the early work has been with plant products such as barks, sawdust, chips, clippings, leaves, newspaper, or combinations of these materials. Generally a degree of weed control was achieved because of the barrier effect of the mulch. In some cases with fresh barks or sawdust additional control was achieved because of the tannin and phenols leached from the wood products. With some barks, such as pinebark nuggets (Billeaud and Zajicek, 1989), further reductions in weed number occurred over other organic mulches. Some tests have also shown that mulches increase weed growth.

Experiments on plastic mulches have included black, opaque and clear plastic mulches. If any plastic is torn, holes are made for planting or for water penetration and allows that light to reach the soil, then weeds will grow. If clear plastic is used anytime other than the summer without a mulch covering, then weeds will be encouraged to grow, as if they were in a greenhouse. Black plastic mulches (polyethylene), if intact will block sunlight and control most weeds. Nutsedge (nutgrass), a perennial sedge will penetrate black

plastic because of the pointed leaf tips. Black plastic has normally been covered with a decorative bark, rock or chips. Weeds will then grow in the medium (soil) formed on top of the plastic, though the weeds generally will not root through the plastic. Air penetration and water infiltration is impeded through plastics, thus creating conditions for root rot fungi to infect ornamental plants.

More recently, some work has been reported for compressed organic mulch to be used in the landscape. There has been interest in both annual and perennial crops, as well. One pressed type of organic mulch consists of a mixture of sphagnum peat and cellulose fibers (Hortopaper). This mulch is a semi-rigid material applied by hand or machine, then seeds or transplants are planted by hand. Hortopaper can be used to help establish orchard and vineyard plantings by placing squares around each plant and covering the edges with soil. This material usually not covered with a mulch and does not last more than several months.

In the late 1980's many new synthetic mulches came onto the market. It was indicated that uses would include laying the materials under asphalt or walkways, for water conservation in the landscape, under container grown nursery plants, and to use in the landscape for weed control. The materials are made from polyethylene, woven or spun-bonded polypropylene or polyester. Very few studies have been reported using these materials for weed control.

A short description of each of the more common types are listed below.

Product	Material	Requires top mulch	Characteristics (cost)
Black plastic	polyethylene	yes	Not permeable to air and water, black, 4-6 mil thickness. (0.033, 4 mil)
Typar Landscape fabric	nonwoven ppro.	yes	Air and water permeable (0.073)
Soil-chek	nonwoven ppro.	yes	Air and water permeable, reddish brown (0.113)
Duon Weedmat Control	nonwoven ppro.	yes	Air and water permeable, light black, (0.065)
DeWitt's Pro5 Weed Barrier	Woven ppro.	no	Light gray, air and water permeable (0.07)
Warren's Weed Arrest	nonwoven pester.	yes	Light gray, air and water permeable (0.11)
Guardian Weed Barrier	nonwoven pester.	yes	Air and water permeable (0.055)
Terra Mat E	nonwoven pester.	no	Air and water permeable (.54 per 3 x 3 ft sq)

ppro. = polypropylene; pester. = polyester

Weed control will differ with different mulches and if organic mulch (bark, chips, etc.) is used over the top of the mulches. Large crabgrass roots and shoots and yellow nutsedge shoots penetrated six polypropylene mulches (DeWitt and Visqueen woven polypropylene, Duon, and Typar spun-bonded fabrics, TEI, a woven white fabric, and Exxon, a white, span-bonded fabric) used in greenhouse studies (Derr and Appleton, 1989). Large crabgrass and yellow nutsedge, when planted under black polyethylene, did not emerge in greenhouse studies. In field studies the presence of an organic mulch cover over the synthetic mulch increased the weight of weeds over the weight of weeds from synthetic mulches alone. This was also shown by Billeaud and Zajicek (1989) using DeWitt's fabric and different depths of organic mulch over the fabric. Weed weight was decreased more with an oryzalin treatment than mulches (Derr and Appleton). Where no organic mulch was used over the synthetic mulches the weed weight was least with black plastic or DeWitt's mulch.

In two studies at Davis, California, seven mulches have been evaluated for weed control, residual in the landscape and the effect on shrubs. One study was started in 1987 and the other in 1988 and are still in progress. In the first study there were five different synthetic mulches compared to three inches of a leaf/clipping compost organic mulch, an annual application of oryzalin at 4 lb/a a.i. and a hand-weeded control. In the second study, synthetic mulches were covered with three inches of coarse redwood bark. These were compared to bark alone, an annual application of oryzalin at 4 lb/a and a hand-weed control. *Ryrcantha* was planted in the initial study and *Pittosporum* in the second study. Barnyardgrass and rough pigweed were seeded on the soil and disked in before applying the mulches.

In the field, barnyardgrass penetrated Duon and Soil-chek fabrics. Emergence occurred as a growth of the epicatyl mode of barnyard above the mulch with the seed and root below the mulch. This allowed the secondary roots to establish above the mulch. Rough Pigweed did not emerge through any of the synthetic mulches. Once the initial weeds were removed however, few grasses emerged from under the mulch. Barnyardgrass did not penetrate DeWitt's, Typar, or Weed Arrest fabrics. Black polyethylene gave the highest control of barnyardgrass. Where a leaf/clipping compost mulch was used over the fabrics, annual weeds were a major problem. Weeds were also prevalent around the plant in the open area where a cut was made to plant the gallon size container nursery plants. Field bindweed shoots did not grow through the fabrics but they emerged from the overlap area and around the edges of the fabrics. This indicates that where a perennial has adequate rhizome storage, the plants will survive.

Pyracantha growth was reduced in weedy plots with the greatest growth occurring in plots treated with black polyethylene cover with organic mulch. Plants growing in organic mulch plots only also exhibited reduced growth compared to plants in mulches (synthetic plus organic) plots. Pittosporum exhibited a similar pattern. All plants growing in mulched (synthetic and organic) plots were not significantly different in size as determined by growth index (height and width/2).

It is recommended that an organic mulch cover be placed over the fabrics. This enhances the appearance and helps protect the fabric from ultraviolet (UV) light which degrades the mulches. Some of the fabrics have a UV inhibitor incorporated to help lengthen the residual of the material. The cover will also reduce the loss of moisture and helps hold the synthetic mulch in place.

Some would question the environment soundness of these materials. The fabrics and

polyethylene are made from petroleum products. All practices have a trade-off of values. They are not considered pesticides though they mitigate pests (weeds). The fabrics also may increase other pests such as snails, slugs, earwigs and pillbugs. Fabrics on the soil may provide protection for voles or field mice. Rodents under the synthetic mulches has not been observed in the Davis experiments.

Weeds can become more severe in areas mulched with organic materials. Deep mulching (4-6 inches) decreases weeds that would emerge from soil by blocking sunlight. Wind disseminated weed species, especially members of the Asteraceae family, can establish in the mulch. Synthetic mulches can control weeds when covered with organic mulch though some researchers have observed more weeds.

The greatest benefit of synthetic mulches may be their contribution to increased plant growth compared to bare soil or thin (less than three inches) organic mulches. The greatest growth of plants has been in plots treated with black polyethylene covered by organic mulch. Synthetic mulches do not contribute to soil organic matter.

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