Growth and Root Penetration by Large Crabgrass and Bermudagrass Through Mulch and Fabric Barriers[1]

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Abstract

Four polypropylene fabrics and five polyethylene (plastic) films, covered with shredded pinebark mulch, were compared for suppression of large crabgrass (*Digitaria sanguinalis* (L.) Scop.) and bermudagrass (*Cynodon dactylon* (L.) Pers.) shoot and root growth, and root penetration. No covering completely controlled either grass, but significant differences existed between materials, with Weed-X giving the best overall shoot suppression. Penetration of both grasses' roots was less through Weed-X, Weed Control and brown polyethylene than through Weed Barrier, Duon, Typar, WeedBlock, Magic Mat and Weedstop. Weed growth in the mulch layers atop the fabrics and films are significant. Resistance to weed root penetration was possibly related to the percent of open versus closed areas of the fabrics and films. Fabrics or perforated films with greater root penetration resistance should generally provide greater overall landscape weed control than those allowing greater root penetration.

Index words: geotextiles, landscape fabrics, root penetration, polyethylene, polypropylene
Species used in this study: large crabgrass (*Digitaria sanguinalis* (L.) Scop.); bermudagrass (*Cynodon dactylon* (L.) Pers.)

Significance to the Nursery Industry

Organic mulches are generally put atop landscape fabrics and films for aesthetics and light exclusion. Since most of the available mulches are organic (pine and hardwood bark, pine straw, etc.), they form a substrate for weed growth atop the fabrics. Weed growth in moist organic mulches is often rapid, and therefore is of significant consideration. Fabrics and films should therefore be selected for their ability to resist weed root penetration.

Introduction

Several synthetic fabrics or geotextiles, currently used for soil erosion control and soil separation, are being marketed as "weed barriers" for landscape plantings. Fabrics, made primarily of polypropylene or polyester, are being marketed as replacements for solid polyethylene (plastic) film as mulch underliners. Unlike solid polyethylene film, these fabrics, composed of woven or nonwoven fibers, are porous, permitting the important exchange of air and water to landscape plant roots growing beneath the weed control covering.

The relative weed suppression abilities of these materials has been reported, noting that when a depth of mulch capable of sustaining weed growth is put on top of the fabrics, significant weed growth may occur (1, 2, 5, 6). While reports have been published detailing weed shoot emergence from below the fabrics (1, 2, 3, 4, 5, 6, 7, 8), little has been reported on how readily weed roots penetrate from above.

If landscape areas are prepared as recommended by the fabric manufacturers, a large portion of existing weeds are eliminated either mechanically or chemically. Though weeds may develop beneath the fabrics from dormant seeds and tubers, significant weed growth may develop in the mulch layers above the fabrics. Weed seed may exist in the mulch as contaminants, or may be deposited by wind, irrigation or birds. If weed seeds germinate and their roots penetrate a fabric, rapid weed growth can develop due to the favorable environment for root growth under the fabrics (5). In addition, some weeds may become established in the mulch layers by creeping in from adjoining areas (example-bermudagrass). Root penetration is important since removing weeds by hand pulling often results in tearing the fabrics or films, leaving a hole through which future weeds can grow.

Two major landscape weed problems are large crabgrass, an annual that spreads by seed, and bermudagrass, a perennial that spreads by creeping stolons and rhizomes. The objective of this study was to evaluate landscape fabrics and films for their ability to suppress the growth of these two weed species, and to resist downward root penetration.

Materials and Methods

Containers (#1) were filled with a pine bark and sand medium (4:1, by vol), and for the barrier treatments, overlaid with a piece of polypropylene fabric or polyethylene film that was stapled to the container side to give complete medium coverage. Shredded pinebark mulch to a depth of 2.54 cm (1 in) was placed on top of the fabrics and films, and on top of an untreated control. A second control consisted of medium with no fabric or film, and no mulch. The treatments, with six single-pot replications in a randomized complete block design by weed species, were: Weed-X (polyethylene/polyester), Weed Control (perforated polyethylene with very small holes), Weed Barrier (polypropylene), Typar (polypropylene), WeedBlock (embossed polyethylene with small holes), Duon (polypropylene), Magic

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Table 1. **Effect of soil coverings on bermudagrass and large crabgrass shoot fresh weight.**

Medium covering	Shoot fresh weight (g)	
	Bermudagrass	Large crabgrass
None	32.0	23.0
Mulch	34.5	19.1
Weed-X[z]	16.7	8.0
Weed Control	18.7	12.1
Weed Barrier	23.7	17.0
Typar	25.6	13.5
WeedBlock	25.0	13.3
Duon	27.5	16.3
Magic Mat	21.5	13.1
Weedstop	24.8	13.8
Brown polyethylene	27.8	8.1
LSD (0.05)	5.8	4.6

[z]The remaining 9 materials were all covered with mulch.

Mat (polypropylene), Weed Stop (polyethylene)[4], solid brown polyethylene film (2.5 mil), mulch alone (control), and bare medium (control).

All treatments were either seeded with approximately 5 cc (1 tsp.) of large crabgrass seed or sprigged with three 7.6–10.2 cm (3–4 in) pieces of bermudagrass stolons plus shoots. The containers were placed on a conventional nursery container bed and overhead irrigated with 1.3 cm (0.5 in) water per day. The study was started on June 6, 1989, and containers topdressed on July 15 with 5 cc (1 tsp) of a 12N-2.6P-5K (12-6-6) fertilizer. Shoot fresh weights, and root fresh weights below the fabric or film, were measured on August 3, 1989, and root penetration through the fabric or film was qualitatively rated. No root weights or penetration ratings were taken for the control treatments because they did not include a fabric or film. The study was repeated in a trial conducted from August 11 through October 8, 1989. Results of the two studies were similar, therefore data reported is an average of the two trials.

[4]Weed-X and Weed Control, Dalen Products, Inc., 11110 Gilbert Dr., Knoxville, TN 37932-3099; Weed Barrier, DeWitt Company, Inc., HWY 61 South, Sikeston, MO 63801; Typar, Reemay, Inc., P.O. Box 511, Old Hickory, TN 37138; WeedBlock, Easy Gardener, Inc., P.O. Box 21025, Waco, TX 76702-1025; Duon, Blunk's Wholesale Supply, Inc., 8923 South Octavia, Bridgeview, IL 60455; Magic Mat, Agri-Tex, P.O. Box 1106, Danbury, CT 06813; Weed Stop, Weathashade, The Tensar Corp., 1210 Citizens PKWY, Morrow, GA 30260.

Results and Discussion

Bermudagrass and large crabgrass were not completely controlled by any fabric or film tested (Table 1). Highest shoot growth suppression was observed in Weed-X-covered pots, which reduced bermudagrass and large crabgrass fresh weight by 48 and 65%, respectively, compared to no covering. Weed-X reduced bermudgrass shoot fresh weight significantly more than all other materials except Weed Control and Magic Mat, and reduced large crabgrass shoot fresh weight more than all other materials except Weed Control and brown polyethylene.

The Duon and brown polyethylene coverings did not significantly reduce bermudagrass shoot fresh weight compared to the uncovered control (Table 1). No significant differences in bermudagrass or large crabgrass shoot fresh weights were observed among the Weed Barrier, Typar, WeedBlock, Magic Mat and Weedstop soil coverings. These fabrics and films reduced bermudagrass shoot fresh weight by 25 to 33%, and reduced large crabgrass shoot fresh weight by 26 to 43%, compared to no covering.

Bermudagrass roots penetrated all fabric and film treatments, while large crabgrass roots penetrated all except the brown polyethylene film (Table 2). Although few bermudagrass and no large crabgrass roots penetrated the brown polyethylene, root development in the mulch layer supported considerable weed growth. These plants, however, would be less likely to survive under drought conditions in a landscape, a situation prevented in this study by daily watering.

Roots of both species penetrated Weed-X and Weed Control less often than all other fabrics or films except the brown polyethylene film (Table 2). Root fresh weights confirm the root penetration ratings. Few weed roots penetrated the Weed-X fabric, while an intermediate number penetrated the Weed Control film.

No difference in bermudagrass or large crabgrass root fresh weights were noted below the Weed Barrier, Typar, Magic Mat, and Weedstop fabric treatments (Table 2). The highest root fresh weights were noted below the Duon fabric and WeedBlock film.

Table 2. **Bermudagrass and large crabgrass root penetration through various medium coverings plus mulch.**

Medium covering	Root penetration rating[z]		Root fresh weight below covering (g)	
	Bermudagrass	Large crabgrass	Bermudagrass	Large crabgrass
Weed-X	2.4	2.2	1.1	1.0
Weed Control	3.0	4.7	5.0	10.9
Weed Barrier	7.8	9.2	12.4	24.6
Typar	6.7	8.6	12.8	24.4
WeedBlock	7.0	7.5	16.8	26.0
Duon	8.9	9.5	17.3	33.1
Magic Mat	7.7	8.7	11.9	19.0
Weedstop	6.1	7.5	10.0	19.6
Brown polyethylene	1.1	1.0	0.1	0.0
LSD (0.05)	1.2	0.9	3.3	8.0

[z]1 = no root penetration; 10 = extreme root penetration.

Weed roots were able to penetrate all of the tested materials marketed for landscape weed control. Similar root penetration has been reported by Cook for grass roots (no species given) (3), Derr and Appleton for large crabgrass (4), and Klett (no species given) (6). If weed roots penetrate a fabric or film, rapid weed growth develops due to the favorable environment for root growth which occurs under landscape fabrics and films (5). Though brown polyethylene stopped most root penetration because it is nonporous, it creates a barrier to oxygen and water exchange, two factors important for the root growth of desired plants in landscapes.

The landscape fabrics and films differ as to the extent of root penetration. Examination of the ratio of open to closed areas for the various materials may provide insight as to why these materials differ in root penetration. For example, Weed-X, which significantly reduced grass shoot growth due to very limited root penetration, is 3% open—97% closed. By comparison, Duon, which had significantly less grass shoot reduction and far greater root penetration, is 60% open—40% closed (calculations provided by Dalen Products).

Fabrics such as Weed-X, which limit root penetration, should therefore be expected to provide superior weed control over fabrics and films that permit greater root penetration. Fabrics and films with limited root penetration should approximate the weed control provided by solid polyethylene, yet allow for gas and water exchange between the soil and air above the soil covering.

Literature Cited

1. Appleton, B.L. and J.F. Derr. 1989. Combining mulch with geotextiles for landscape weed control. Proc. Southern Nurserymens Assoc. Res. Conf. 34:262–265.

2. Billeaud, L.A. and J.M. Zajicek. 1989. Influence of mulches on weed control, soil pH, soil nitrogen content, and growth of *Ligustrum japonicum*. J. Environ. Hort. 7:155–157.

3. Cook, T. 1987. Weed control with geotextile fabrics. Orn. Northwest Newsletter 11:22.

4. Derr, J.F. and B.L. Appleton. 1988. Weed control with landscape fabrics. Proc. Southern Nurserymens Assoc. Res. Conf. 33:304–305.

5. Derr, J.F. and B.L. Appleton. 1989. Weed control with landscape fabrics. J. Environ. Hort. 7:129–133.

6. Klett, J.E. 1988. Geotextile update. Colorado Green. 4:16–17.

7. Martin, C., H. Ponder, and C. Gilliam. 1987. Ability of polypropylene fabric to inhibit the growth of six weed species. Ala. Agr. Expt. Sta. Res. rep. 5:25–26.

8. Powell, M.A., W.A. Skroch, and T.E. Bilderback. 1989. Landscape mulch evaluation: A three-year study. Proc. Southern Nurserymens Assoc. Res. Conf. 34:274–278.

Effect of Pruning on the Growth Inhibiting Activity of Sumagic (Uniconazole)[1]

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Abstract

Pruning date was investigated as a possible factor influencing the inhibitory activity of Sumagic (uniconazole) on growth of 6 container grown woody landscape plants. Plants were pruned 1 or 10 days before uniconazole was applied as a foliar spray or medium drench on June 22, 1988. Plant height and width were recorded weekly through November 30, 1988. Pruning date influenced the pattern of growth and/or the final size of plants treated with foliar-applied uniconazole. It also influenced uniconazole's inhibitory activity the first 2 to 3 weeks after application. Uniconazole was most effective on *Pyracantha* and *Ligustrum lucidum* the first 2 to 3 weeks after treatment if applied 1 day after pruning. Drench applications resulted in greater growth inhibition than foliar sprays; however, drench treatments caused unacceptable reduction in plant size.

Index words: chemical pruning agent, growth retardant, growth regulation

Species Used In This Study: gold spot euonymus (*Euonymus japonica* 'Aureo Marginata'); Nellie R. Stevens holly (*Ilex aquifolium* L. × *Ilex cornuta* Lindl. & Paxt. 'Nellie R. Stevens'; glossy privet (*Ligustrum lucidum* Ait.); variegated Chinese privet (*Ligustrum sinense* Lour. 'Variegatum'); Fraser photinia (*Photinia* × *fraseri* Dress); Wonderberry pyracantha (*Pyracantha koidzumii* [Hayata] Rehd. 'Wonderberry')

Growth Regulators Used In This Study: Sumagic, uniconazole, (E)-(p-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazol-1-yl)-1-penten-3-ol

Significance to the Nursery Industry

One of the major reasons growers seem reluctant to utilize growth retardants is that they, at least initially, do not seem to fit into a production scheme which emphasizes obtaining the desired size plant as fast as possible. We have demonstrated though, that short-term control of growth is possible with little to no reduction in final size. Temporary suppression of growth by Sumagic (uniconazole) could be useful when desiring to hold saleable-size plants (including those in fabric containers) until sale or shipment without

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