Evaluation of Landscape Fabrics in Suppressing Growth of Weed Species[1]

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Abstract

Two tests were conducted to evaluate weed penetration up through landscape fabrics. The degree of weed suppression varied depending on the specific landscape fabric. No landscape fabric gave total suppression of weeds tested. Sicklepod (*Cassia obtusifolia L.*) and smallflower morningglory (*Jacquemontia tamnifolia (L.) Grisebach.*) were inhibited by all landscape fabrics. Growth of pigweed (*Aranthus sp.*), bermudagrass (*Cynodon datylon (L.) Persoon.*), yellow nutsedge (*Cyperus esculentus L.*), and johnsongrass (*Sorghum halepense (L.) Persoon.*) was suppressed by certain landscape fabrics.

Index words: polypropylene, landscape maintenance

Species used in this study. pigweed (*Aranthus sp.*); sicklepod (*Cassia obtusifolia*); bermudagrass (*Cynodon dactylon*); yellow nutsedge (*Cyperus esculentus*); smallflower morningglory (*Jacquemontia tamnifolia*); johnsongrass (*Sorghum halepense*).

Significance to the Nursery Industry

Landscape contractors are regularly investigating ways to reduce maintenance costs and risks of plant death. This research investigated the effectiveness of landscape fabrics in suppressing 6 weed species. Using pine bark nuggets as a surface mulch in combination with landscape fabrics generally resulted in increased weed suppression compared to pine bark alone. Individual mat types differed in their effectiveness. No one mat type was able to completely suppress all the weed species tested. Landscape contractors should consider selection of landscape fabrics based on predominant weed type present. Based on this research, landscape fabrics do have a place in landscape weed control programs.

Introduction

Mulching landscape planting beds may enhance aesthetic value, reduce soil temperature fluctuations and increase resistance to weed pressure (3). Laying plastic underneath an organic mulch is a common landscape installation practice. Whitcomb (4) evaluated mulching systems comprised of pine bark over black polyethylene and concluded that the presence of black polyethylene made little difference in controlling weed growth, while the incidence of winter kill of landscape plants was increased by 60% compared to the bark mulch alone.

An alternative to black polyethylene is polypropylene fabrics now on the market (2, 5). Two types of fabrics available are the woven and nonwoven polypropylene polymers. Polymers of nonwoven fabrics are spun-bound or meshed, while polymers of woven fabrics are generally of thicker diameter and tightly woven. Most polypropylene polymers are readily oxidized when exposed to ultraviolet light and are limited for use as an undercover supplemental mulch to a surface component such as pine bark. However, some fabrics, such as the Dewitt Pro 5 Weed Barrier woven (manufactured by Dewitt Co. of Sikeston, MO 63801), are surface-coated with carbon black, conferring a degree of resistance to degradation from ultraviolet light and therefore may be used singly as a mulching material.

Unlike polyethylene sheets, polypropylene landscape fabrics are permeable to water. This is a potential advantage in facilitating improved soil aeration and reducing root growth at the plastic-soil interface. However, the principal purpose of mulching is to suppress weeds. Previous work evaluating yellow nutsedge and annual grass control showed several other cultural practices produced similar or better weed control compared to landscape fabrics (1). This study was designed to compare the effectiveness of several polypropylene landscape fabrics with regard to suppression of emergence and growth inhibition of selected weed species.

Material and Methods

Two separate 30-day experiments were conducted in an unshaded double polycovered greenhouse (photometric reading of 558 μmol $m^{-2}s^{-1}$ at 10:00 a.m.) with a daily temperature of 19° to 31°C (66° to 88°F). Rectangular plastics flats 28 × 53 cm (11 × 20.5 in) were filled with pine bark: sand: sandy loam (1:1:1 by vol) amended with 1.125 kg/m^{-3} of Osmocote 18N-2.6P-9.9K (18-6-12). Two weed species were sown separately on opposite halves of each flat, covered with vermiculite and irrigated. After 2 days, flats were covered with polypropylene fabric 66 × 91 cm (26.3 × 36.5 in) with overlapping fabric tucked underneath the flats. Three hundred grams of decorative landscape bark nuggets [2 to 10 cm (0.8 to 4.0 in)] were placed on top of all flats to simulate typical landscape practices. Flats were irrigated as needed. At the end of 30 days, weeds emerging through the fabric were counted. Shoots were subsequently clipped at the fabric surface, dried at 70°C (158°F) for 48 hours and weighed.

In experiment 1, the following 6 weed species were used: pigweed (*Aranthus sp.*); sicklepod (*Cassia obtusifolia*); bermudagrass (*Cynodon dactylon*); yellow nutsedge (*Cyperus esculentus*); small flower morningglory (*Jacquemontia tamnifolia*), and johnsongrass (*Sorghum halepense*). Approximately 0.3 tablespoons of weed seed were sown per half

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flat for all species except for yellow nutsedge where 15 tubers were planted per experimental unit. The 5 polypropylene landscape fabrics used to cover the flats included: Dewitt Weed Barrier woven (Dewitt Co., Sikeston, MO 63801); Amoco Rit-a-Weed heavy-meshed nonwoven (Atlantic Construction Fabrics Inc., Richmond, VA 23237); Phillips Fiber Duon 70.85 g (2.5 oz) meshed nonwoven (distributed by Blunks Wholesale Supply Inc., Bridgeview, IL 60455); Geoscape Landscape Fabric meshed nonwoven (Innovative Geotextile Inc., Charlotte, NC 28234); and Weedblock Fabric perforated-polyethylene nonwoven (Easy Gardener Inc., Wasco, TX 76702). The control treatment consisted of flats without fabric coverings. Treatments in a 6 × 6 factorial experiment were arranged in a randomized complete block with 4 replications.

In experiment 2, the same weed species were used except for sicklepod and smallflower morningglory. Both species were completely inhibited by all fabrics in experiment 1. Weed seeds were sown or planted as in experiment 1. Polypropylene fabrics used included 5 fabrics listed previously plus 3 additional fabrics: Weed Barrier Mat woven (American Woven Fabrics, Glenview, IL 60025); DuPont Typar 307 spunbound nonwoven; and Typar 312 spun-bound nonwoven (DuPont Corp., Wilmington, DE 19898). The control treatment consisted of flats without mat coverings. Treatments in a 9 × 4 factorial experiment were arranged in a randomized complete block with 4 replications.

Results and Discussion

In experiment 1, shoot emergence of sicklepod and smallflower morningglory, both species with broadleaf cotyledons, was completely suppressed by all landscape fabrics (Table 1). Shoot emergence of pigweed was completely suppressed by the Dewitt and Geoscape Landscape fabrics, while Amoco Rit-a-Weed and Phillips Fibers Duon provided partial suppression compared to the control. Shoot emergence of bermudagrass was completely suppressed by Dewitt, whereas bermudagrass shoots emerged through the Weedblock fabric in numbers equivalent to the control. All other treatments provided similar control of bermudagrass shoot growth. Johnsongrass shoot emergence was suppressed the most by the Dewitt and Geoscape fabrics, while remaining treatments resulted in superior suppression compared to the control. Johnsongrass growth after emergence through all fabrics was altered in that aerial adventitious roots developed immediately above the fabric surface, while not developing the caliper of the portion of stem which initially emerged through the landscape fabric. This rendered the weeds easily rouged by hand.

All landscape fabrics partially suppressed the emergence of yellow nutsedge tubers compared to the control, however, yellow nutsedge dry weights were greater with the Weedblock Fabric compared to the other landscape fabrics and less than the control (Table 1). The elasticity of the Weedblock fabric, a polyethylene derivative, appeared greater than the other polypropylene fabrics and may have facilitated yellow nutsedge penetration.

In experiment 2, shoot emergence of yellow nutsedge and johnsongrass was completely suppressed by the spun-bound nonwoven fabrics from DuPont (Table 2), although, etiolated growth of yellow nutsedge was observed underneath the Dupont landscape fabrics. All treatments provided partial control of yellow nutsedge compared to the control. Johnsongrass dry weights with Phillips Fiber Duon was similar to the control; however, the number of weeds emerging was reduced, suggesting that those weeds that penetrated the fabric were able to grow to a larger size.

Pigweed was completely suppressed by Typar 307, Geoscape Landscape Fabric, and the Weed Barrier Mat, and growth was inhibited by Typar 312 and Dewitt Pro 5 (Table 2). These treatments were superior compared to the Amoco Rit-a-Weed and Phillips Fiber Duon and all treatments were superior compared to the Weedblock Fabric and control. Bermudagrass was best controlled by the DuPont Typar fabrics, the Weed Barrier Mat, and Dewitt Pro 5, while bermudagrass growth with the Weedblock Fabric was similar to the control. Use of landscape fabrics by American Woven Fabrics, Dewitt Co., DuPont Corp., and Innovative Geotextile resulted in the best overall suppression of emergence and inhibition of growth of the weed species tested. Results indicated that weed suppression may not be correlated to polypropylene polymer type; however, weed suppression using spun-bound nonwoven fabrics was superior to meshed nonwoven fabrics. This research would also tend to agree with Derr and Appleton (1) that some hand weeding and herbicide application may be necessary when landscape fabrics are used.

Table 1. Average count (CNT) and shoot dry weight (SDW) per flat of weeds penetrating up through 6 landscape mats 30 days after sowing, experiment 1.

	Yellow Nutsedge		Bermudagrass		Johnsongrass		Pigweed		Sicklepod		Smallflower Morningglory	
Mat type	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)
Dewitt	1.3 ab[z]	1.5 a	0.0 a	0.0 a	0.8 a	0.7 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Geoscape Landscape Fabric	0.3 a	0.1 a	7.0 ab	3.7 b	1.7 a	11.4 ab	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Amoco Rit-a-Weed	2.5 bc	0.2 a	11.3 b	7.3 b	7.5 a	40.7 c	5.3 ab	7.5 b	0.0 a	0.0 a	0.0 a	0.0 a
Phillips Fibers Duon	1.3 ab	0.4 a	13.8 b	5.2 b	8.0 a	42.6 c	12.5 b	9.6 b	0.0 a	0.0 a	0.0 a	0.0 a
Weedblock Fabric	3.8 c	9.8 b	92.3 c	22.3 c	5.3 a	31.7 bc	110.7 c	24.7 c	0.0 a	0.0 a	0.0 a	0.0 a
Control	11.8 d	44.5 c	126.1 c	25.9 c	21.0 b	70.3 d	139.0 c	27.2 c	33.3 b	18.7 b	15.5 b	13.2 b

[z]Mean separation within column by Duncan's multiple range test, 5% level.

Table 2. Average count (CNT) and shoot dry weight (SDW) per flat of weeds penetrating up through 9 landscape mats 30 days after sowing, experiment 2.

	Yellow Nutsedge		Pigweed		Bermudagrass		Johnsongrass	
Mat type	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)	CNT	SDW (g)
Dupont Typar 307	0.0 a[z]	0.0 a	0.0 a	0.0 a	2.5 a	2.9 ab	0.0 a	0.0 a
Dupont Typar 312	0.0 a	0.0 a	0.3 a	1.1 a	0.8 a	0.9 a	0.0 a	0.0 a
Weed Barrier Mat	0.3 ab	1.4 ab	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.3 a
Dewitt Pro 5	1.0 ab	3.6 ab	0.5 a	1.9 a	1.5 a	3.0 ab	2.3 a	5.8 ab
Geoscape Landscape Fabric	0.8 ab	4.6 b	0.0 a	0.0 a	9.3 a	4.4 b	0.3 a	4.3 ab
Amoco Rit-a-Weed	2.5 b	4.0 b	8.3 a	5.0 b	17.5 a	5.2 b	7.0 b	9.7 bc
Phillips Duon Fiber	3.3 b	3.6 ab	7.8 a	6.6 b	12.0 a	5.1 b	6.5 b	13.4 cd
Weedblock Fabric	1.8 ab	3.8 ab	20.3 b	12.1 c	72.6 b	10.3 c	8.0 b	10.4 bc
Control	8.3 c	23.1 c	48.8 c	13.2 c	112.8 c	12.8 c	12.8 c	19.7 d

[z]Mean separation within columns by Duncan's multiple range test, 5% level.

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Effects of Banding and IBA on Rooting and Budbreak in Cuttings of Apple Rootstock 'MM.106' and *Franklinia*[1]

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Abstract

Banding with Velcro™ of new shoot growth in moderately difficult-to-root apple rootstock MM.106 (*Malus domestica* Borkh.) for 7 days prior to taking cuttings, and treatment of cuttings with 500 to 2000 ppm indolebutyric acid (IBA) increased both percent rooting and root number. Banding, however, did not influence the rooting of easy-to-root *Franklinia alatamaha* Marsh. IBA at 0 to 1000 ppm induced a logarithmic increase in percent rooting of cuttings of MM.106 and root number of cuttings of *Franklinia*; but, higher levels of IBA reduced both. Banding prevented the rooting inhibition found at high concentrations of IBA in cuttings of MM.106, while simultaneously stimulating lateral budbreak and greater root number. Stem banding improved the establishment of cuttings treated with 1000 ppm and 2000 ppm IBA. Without banding, establishment of these cuttings was markedly decreased.

Index words: auxin, blanching, propagation

Species used in this study: Franklin tree (*Franklinia alatamaha* Marsh.); Common apple (*Malus domestica* Borkh.).

Significance to the Nursery Industry

The immediate release of lateral buds in rooted softwood cuttings should shorten production time and hence reduce ultimate production costs of woody plants when propagated vegetatively. Moreover, rooted cuttings with new shoot growth may overwinter better than those without growth after rooting (15). This study demonstrated that banding softwood shoots with Velcro™ not only promoted rooting in cuttings of moderately difficult-to-root apple rootstock 'MM.106' (*Malus domestica* Borkh.), but also stimulated lateral budbreak and partially prevented the inhibitory effect of indolebutyric acid (IBA) on budbreak in rooted cuttings. The nursery industry can accelerate both the propagation and subsequent growth of cuttings by using banding techniques and a lower concentration of IBA.

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