Seed Covers and Germination Blankets Influence the Establishment of Seeded Warm-Season Grasses

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Photo by Aaron Patton

Various covers used to establish turfgrass seed

Summary. Covers and blankets are often used to reduce erosion, retain soil moisture, increase soil temperature, and enhance plant germination and establishment rates. There are reports of various effects of seed cover technology on the germination and establishment of warm-season grasses. The objective of this study was to determine how diverse seed covers influence the establishment of seeded bermudagrass, buffalograss, centipedegrass, seashore paspalum, and zoysiagrass. Plots were seeded on 9 June 2007 with various species and covered with seed cover technologies including Blue Yellow, Curlex, Deluxe, Futerra, Jute, Poly Jute, polypropylene, straw, straw blanket, Thermal blanket, and an uncovered control. Light transmission, soil moisture, and turf coverage were monitored throughout the study. Across species, Futerra products, Poly Jute, Jute and Curlex produced the greatest coverage at 6 weeks after planting, while the untreated check and BlueYellow had the least coverage.

Abbreviations: PLS, pure live seed

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Covers and blankets are often used to protect turf during winter and spring, to warm the soil and increase germination rates, and also to reduce erosion. Seed germination blankets allow light penetration and gas exchange, facilitate soil warming, and increase soil moisture holding capacity, all of which increase germination rates without the risk of excessive temperature build-up. It is known that germination of warm-season turfgrasses increases as temperatures rise, with maximum germination rate occurring between 86 and 95°F (Portz et al., 1981; Zuk et al., 2005).

Yu and Yeam (1967) reported that the germination rate of zoysiagrass (*Zoysia japonica* Steud.) seed could be doubled by using a polyethylene film, while Portz et al. (1993) found that clear polyethylene covers placed over the seedbed for 7 or 14 days after seeding increased germination and zoysiagrass coverage in Illinois and Maryland. Other materials tested, such as straw (80 lb / 1000 ft^2), did not enhance germination because they excluded light and reduced soil temperatures (Portz et al., 1993). Organic fiber mats increased establishment when used in non-irrigated areas, likely due to increased soil moisture retention, but did not increase establishment when used in irrigated plots (Hensler et al., 2001). Anecdotal evidence suggests that porous germination blankets could also be useful for increasing bermudagrass and zoysiagrass germination and coverage (Patton et al., 2004).

Overall, past research shows different effects from cover technologies, but no broad comparison has been made between different cover technologies. Additionally, no cover research has been done with seeded seashore paspalum (*Paspalum vaginatum*), and very little work with seeded bermudagrass (*Cynodon dactylon*), buffalograss (*Buchloe dactyloides*), and centipedegrass (*Eremochloa ophiuroides*). The objective of this study is to determine how various seed covers influence the germination and establishment of seeded bermudagrass, buffalograss, centipedegrass, seashore paspalum, and zoysiagrass.

Materials and Methods

Research was conducted at the University of Arkansas Agricultural Research and Extension Center, Fayetteville, Ark. Experiments were seeded 9 June 2007 with bermudagrass was seeded at a rate of 1.0 lb. pure live seed (PLS) / 1000 ft^2, zoysiagrass at a rate of 2.0 lb. PLS / 1000 ft^2, seashore paspalum at a rate of 1.0 lb. PLS / 1000 ft^2, centipedegrass at a rate of 0.5 lb. PLS / 1000 ft^2, and buffalograss at a rate of 8.0 lb. PLS / 1000 ft^2. Prior to seeding, the plot area was tilled, fumigated with methyl bromide, and raked to prepare the soil for seeding. This provided a weed-free site on which establishment of various grasses could be closely monitored.

After seeding, plots were covered with various germination blanket technologies (Table 1, Fig. 1). Plots were irrigated for one week after seeding and then irrigation was not applied for the remainder of the study. Temporary covers (Table 1) were removed 14 days after seeding. The experimental design was a strip plot design with three replications. Covers were applied as strips and species applied as the whole plot treatment.

Soil moisture data were collected 14 days after seeding using time domain reflectometry moisture meter (Spectrum Technologies). The amount of sunlight allowed (inversely measuring shading) was measured for each cover technology. Turfgrass coverage was determined by visual estimates. All data were analyzed by analysis of variance and coverage means were separated using Fisher's protected least significant difference at $\alpha = 0.05$.

Results and Discussion

Above average rainfall frequency and amounts occurred for 40 days after planting. Therefore, soil moisture was not likely a contributing factor to establishment. The Futerra products, Poly Jute, Jute, and Curlex were among the products with the greatest turfgrass coverage across all species 6 weeks after planting (Table 2), while the untreated check and BlueYellow had the least coverage. Turf coverage rankings among species at 6 weeks after planting (Table 2) was as follows; bermudagrass > seashore paspalum > buffalograss > centipedegrass = zoysiagrass.

There was also a significant cover by species interaction. This was most notable for seashore paspalum and zoysiagrass. Seashore paspalum coverage was greatest with the Futerra products, Poly Jute, Jute, polyethylene, Deluxe, and Thermal Blanket (Table 2). Zoysiagrass coverage was greatest with the Futerra products or Curlex (Table 2). Bermudagrass coverage was similar with all products except Blue Yellow and the uncovered check, which resulted in the least amount of bermudagrass coverage (Table 2). Buffalograss coverage was also similar across cover technology except for Blue Yellow, Thermal blanket and the uncovered check, which resulted in less buffalograss coverage (Table 2). Centipedegrass coverage was greatest when covered with the Futerra products, Curlex, Jute, straw blankets, straw, or Poly Jute (Table 2).

The amount of photosynthetically active radiation (PAR) passing through each of these materials was determined (Fig. 2), but these data provide little insight into how cover technology influenced establishment. Many of the turfgrass species performed more poorly than expected, which was likely due to above average rainfall and cloud cover during the establishment period. This study will be repeated in 2008.

Literature Cited

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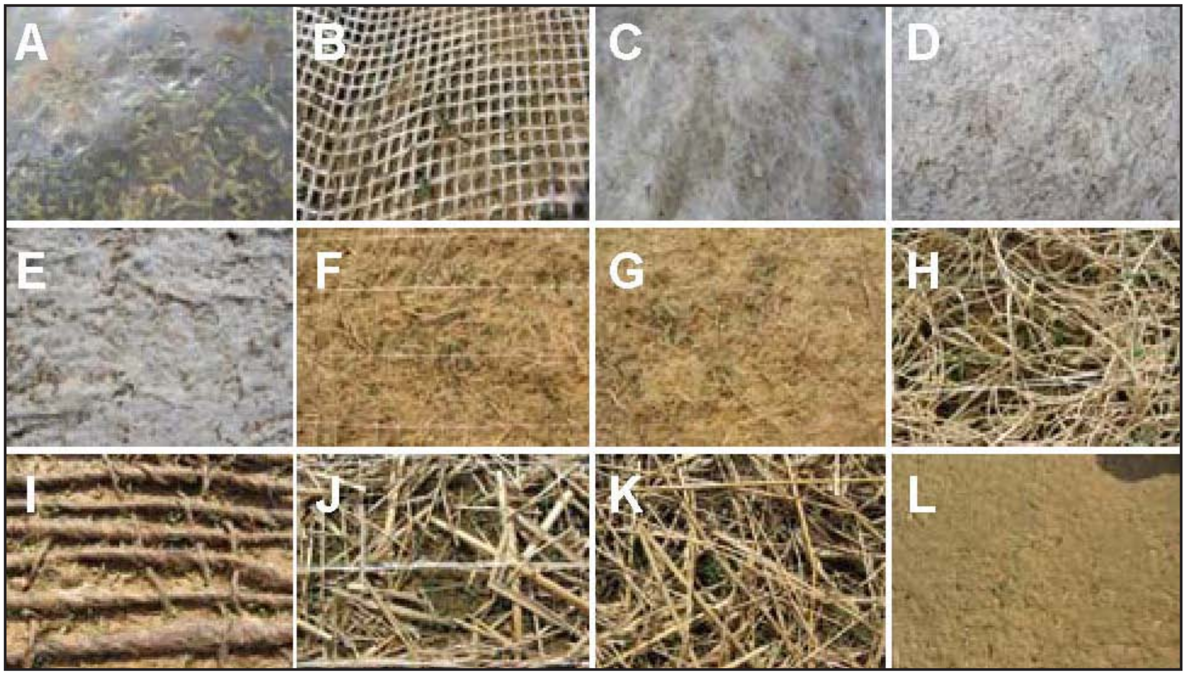

Fig. 1. Clear polyethylene (A), Poly Jute (B), Deluxe (C), Thermal blanket (D), BlueYellow (E), Futerra F4 Netless (F), Futerra (G), curlex (H), jute mesh (I), straw blanket with polypropylene netting (J), straw (K), uncovered control (L). Photo taken of bermudagrass plots 12 days after planting under various blankets and covers.

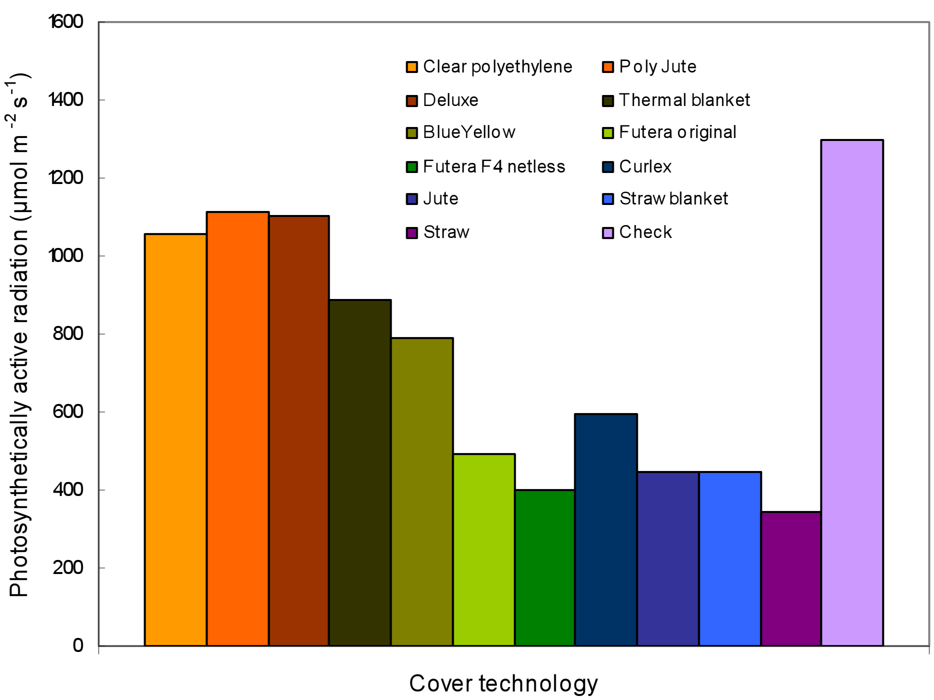

Fig. 2. Amount of photosynthetically active radiation (PAR) passing through various blankets and covers.

Table 1. Cover technologies tested in the trial.

Cover technology	Cover construction	Cover type
BlueYellow, BlueYellow, LLC	bleached kraft southern pine fiber	Temporary
Clear polyethylene cover 4 mil (0.1 mm, 4/1000")	Polyethylene	Temporary
Curlex, natural color	curled excelsior aspen wood fiber mat	Permanent
Deluxe (0.5 oz crop protection fabric), Dewitt Company	[z]	Temporary
Futerra F4 Netless, natural color, Profile Products LLC (6.5' × 90')	[z]	Permanent
Futerra original, natural color, Profile Products LLC (82" × 135')	[z]	Permanent
Jute mesh erosion control mat (mesh fabric)	[z]	Permanent
Poly Jute erosion control blanket, Dewitt Company	polypropylene multifilament yarn	Permanent
Straw [y], (Portz et al., 1993)	[z]	Permanent
Straw blanket with polypropylene netting	Straw and polypropylene	Permanent
Thermal blanket (3 oz.), Dewitt Company	polypropylen	Temporary
Uncovered control		

[z] Information about the material used to construct the covers was not readily available on company websites.
[y] 80 lbs $1000ft^{-2}$.

Table 2. Turfgrass coverage across species for various seeding blankets.

Cover treatment	Species					Mean
	Bermudagrass	Buffalograss	Centipedegrass	Seashore	Zoysiagrass	
	---% ---					
Futerra F4 Netless	99.0 a	50.0 a	23.5 a	80.0 ab	25.0 a	58.9 a
Poly Jute	99.3 a	50.0 a	7.7 abc	84.3 a	11.5 bc	56.8 ab
Futerra	100.0 a	40.7 ab	20.0 ab	90.0 a	25.0 a	55.0 ab
Jute	95.7 ab	42.0 ab	15.3 abc	87.0 a	12.7 bc	50.5 abc
Curlex	94.3 ab	53.3 a	23.3 a	50.0 bc	23.3 ab	48.9 abc
Polyethylene	99.0 a	29.5 abc	1.5 c	85.0 a	9.5 c	44.9 bcd
Deluxe	100.0 a	28.3 abc	4.7 bc	80.0 ab	8.7 c	44.3 bcd
Straw	75.7 abc	50.0 a	7.7 abc	46.7 c	7.5 c	38.8 cd
Thermal blanket	99.5 a	9.0 c	3.5 c	60.0 abc	6.5 c	35.7 d
Straw blanket	82.7 abc	40.0 ab	10.0 abc	32.3 cd	8.3 c	34.7 de
Blueyellow	58.3 c	14.0 bc	2.5 c	30.0 dc	4.0 c	22.7 ef
Uncovered check	73.3 bc	6.0 c	0.0 c	7.7 d	3.0 c	18.0 f
Mean	88.9	35.0	10.3	60.8	11.7	

[z] Data collected 45 days after planting.
[y] Means within a column followed by the same letter are not significantly different.