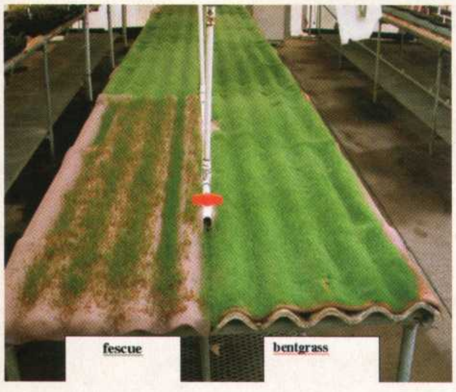
Thin Foam Sheets Can Speed Turf Germination

By Gregory E. Welbaum and Erik Ervin

In recent years, several products have been developed to establish turf in soil-less media such as straw mats or polymers. Seed mats also help reduce weed problems and provide faster, more uniform establishment.

Our research program is investigating the use of thin sheets of low-density polyurethane foam for turfgrass establishment. This material is inexpensive, well aerated and can be easily cut or rolled to rapidly establish turf on bare spots or disturbed areas. The foam also degrades and does not persist in the environment.

Companies such as PDC Marketing, CP Medius, International Horticultural Technologies and Grow-Tech sell foam-based media products commercially. However, most of the existing foam-based products are block shaped for plug trays and intended for bedding plant production and not turf. CP Medius has supplied us with polyurethane sheets in different sizes and thicknesses to develop the turf foam sheet concept.



These are the greenhouse mistbeds used to grow turf foam sheets.

Attempts to incorporate grass seed near the surface of the foam sheets during the manufacturing process have not met expectations. Seeds are exposed to temperatures as high as 300 degrees Fahrenheit when the foam is poured, which negatively affects seed quality. It is likely that modifications to the manufacturing process can overcome this problem so that seeds will eventually be incorporated into the foam.

However, while this problem is being solved, we established the turf by hand-sowing seed on top of the foam sheets on a mistbed to obtain rapid and uniform germination in a greenhouse. The mistbed was raised and the foam sheets rested on fiberglass panels. The roots could not penetrate the fiberglass and formed a mat underneath the foam in just a few days. The curves in the fiberglass panels provided drainage.

In these greenhouse experiments, seeds of Viper creeping bentgrass, Tiger colonial bentgrass, Bingo tall fescue and Longfellow Chewings fescue from Cebeco International Seeds, were uniformly seeded on top of either one or two 68-inch by 23-inch foam sheets that were .25 inch thick.

The mistbed was programmed to deliver 10 seconds of mist every 8 minutes. With this system, the seeds were left uncovered and not mulched because the mist kept the seeds suffi-

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ciently hydrated to ensure rapid germination. The test was designed to determine whether rapid early-season establishment could be obtained with bentgrass foam sheets on a putting green collar, and fescue foam sheets on a bare-soil bank with an 8 percent slope. The seeds were planted in mid-March for early-season establishment. Greenhouse temperatures ranged from 17 degrees Celsius to 27 degrees Celsius.

The bentgrass seeds germinated first producing green sheets after just seven days. The rapid establishment of bentgrass may have been the result of the small seed size of the seeds, which made intimate contact with the pores in the foam. The fescue seeds germinated more slowly, and initial root growth into the foam was delayed slightly because of the larger seed size. However, 12 days after germination, fescue roots had grown through both the single and double thicknesses of foam. Bentgrass roots were slower to perforate the foam sheets and even after one month had less root development beneath the foam compared to fescue.

The polyurethane foam sheets are inert and have no cation exchange capacity. We anticipated nutrient deficiency symptoms because of this, but none were obvious during the first 12 days of growth. To help maintain rapid growth and to aid establishment after transplanting, turf sheets were fertilized with water-soluble 24-12-24 to deliver .25 pounds of nitrogen per 1,000 square feet at 12 days after planting.

Here is the bentgrass growing on polyurethane sheets seven days after seeding in a greenhouse.

Bentgrass was susceptible to dollar spot, which first appeared 12 days after seeding. Fescue did not show any disease symptoms in the greenhouse. After 14 days, constant sprinkler irrigation was discontinued to harden plants with irrigation consisting of only one light hand-watering per day.

Sixteen days after planting, the sheets were rolled, transported and placed on bare soil at the Virginia Tech Turfgrass Research Center in Blacksburg, Va. The wet turf sheets were fairly heavy and would tear apart if pulled or lifted at the corners. The fescue sheets were planted on bare soil on a sloping bank and secured with stakes at the corners. The bentgrass sheets were spread across the collar of a newly seeded bentgrass research green.

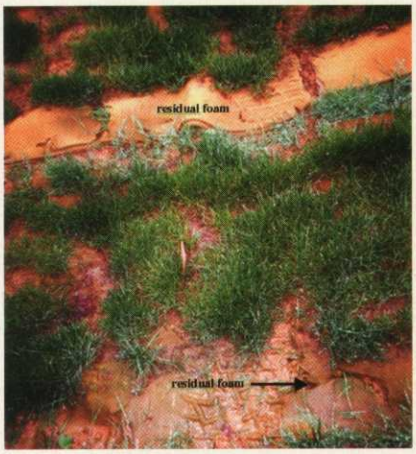
The foam was better suited for fescue root growth than for bentgrass.

After placement in the field, the sheets were sprinkler irrigated for five minutes every hour during daylight hours. Wet foam sheets were very stable and did not move in the wind, but as the sheets dried, the corners in particular were susceptible to blowing in the wind.

There were no obvious wilting or visual symptoms of stress the first two days after field planting under cloudy conditions when the daytime high temperatures were below 68 degrees Fahrenheit. However, full sun, air temperatures of 80 degrees Fahrenheit and windy conditions on April 6 resulted in some desiccation to the fescue and severe desiccation to the bentgrass. Despite multiple short sprinkler irrigation cycles, inadequate moisture retention by the foam media under high evapotranspiration conditions killed some plants.

Analysis of plot photographs taken 2 months after field planting revealed that approximately 75 percent of the fescue turf had survived compared to less than 20 percent for bentgrass. Apparently, greater root proliferation by the fescue through the foam sheets allowed soil water uptake that sustained plants as the foam media dried.

There were no differences in the survival percentages of turf grown on double vs. single foam sheets. These results showed that water retention of the foam sheets was a limiting factor in successful establishment. More frequent irrigation could have been employed since the foam is porous and extremely well drained. However, frequent irrigation uses more water, electricity and may lead to disease problems such as pythium, dollar spot and brown patch.



The fescue sheet looked like this a month after field planting. The top plot was grown on two thicknesses of foam while the bottom was on a single sheet. The foam became brittle and cracked easily several weeks after field planting.

Apparently, the foam was better suited for fescue root growth than for bentgrass. Pore size can be modified during manufacturing to alter foam characteristics, but larger pores mean even less water retention. When designing foam media, the challenge appears to be selecting the optimum pore size to favor both root growth and moisture retention.

The foam sheets photodegraded within two months after field planting and crumbled when stepped on or handled, so the turf could be mowed later in the season without interference.

Foam sheets that were .5-inch thick (twice the thickness of the original sheets) were planted with Bingo fescue in mid-October for a fall trial started on a greenhouse mistbed as described above. However, in this trial half the foam sheets were laid on Sunshine mix potting soil rather than fiberglass benches.

After two weeks, the fescue roots had grown

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through the foam and into the potting soil below. Sheets were transferred to the field on Nov. 11, with potting mix adhering to roots or coiled beneath the sheets that were grown on fiberglass panels. Two days after field planting, the turf was exposed to high winds and subfreezing temperatures.

After two weeks, only the sheets grown on potting mix remained green and healthy. Using potting soil to sustain root growth below the turf sheets resulted in healthier root development and decreased transplant shock in the field because of uneven soil-root contact.

When planted on a slope, the fescue sheets were holding up well one month after planting.

Turf foam sheets are currently not available commercially. However, it appears that with additional research this technology could have commercial application because turf foam sheets could be rapidly established in a greenhouse and used to repair disturbed areas if properly irrigated. Such a greenhouse production system would be rather expensive but may be used for high-end applications like rapid establishment and slope stabilization on bunker faces or repair of athletic fields.

However, a much broader application would be to integrate seeds directly into the foam with sufficient moisture-holding capacity so the sheets could be established outdoors with minimal irrigation. This would allow a foam-based product to be used for erosion control and rapid covering of disturbed sites in areas where irrigation is not available.

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