# The Grass Roots

*By Monroe S. Miller*

Sometimes, in this business of managing a golf course, you get to feeling a little lonely. There is a tendency to think the problems you are having at any given moment are peculiar to you and your course.

That was where my mind was as Field Day approached this past August. I was anxious for it to happen for a lot of reasons, but the main one was to visit with colleagues and learn if they had suffered the shallow rooting I had observed this summer.

Last year—the miracle season of 1992—might have been the only year in my twenty-one as a golf course superintendent that I wasn't occupied with getting a course through to the end of summer with less rooting than you really need. You could call that the annual challenge of August; I call it the misery of August.

This year was tough, and it reminded me of a decade ago—you know, those years before quality aerification equipment and sterol inhibitors and lightweight mowing and clipping harvest and double row irrigation systems with individual head control. In those times the most trouble we had with shallow rooting came on fairway turf. It was a simple matter of magnitude—acres versus square feet.

Green and tee rooting problems were manageable; fairway rooting problems were almost unmanageable. Many of us suffered sleepless nights worrying about grass roots.

Really, one shouldn't have been surprised that rooting depths were so shallow this past summer. These plants that play host to the game of golf have naturally reduced roots at the summer point of their life cycle. Cut the above ground parts short, like we have to do, and rooting is further reduced. Throw twice the normal rainfall and the nearly guaranteed result is what some of us experienced.

Large—even huge—fairway divots were ugly. Ball marks were more frequent and obvious than they normally are. Even the revered creeping bentgrass was barely holding on, according to some superintendents. An inch of rain, which normally in the summertime relieves the use of an irrigation system for days and days, staves off wilt for only a day or two. The reduced volume and depth of root systems moves an irrigation cycle to a syringe cycle.

It sometimes, in some years, requires a mid-day syringe, much to the distress of golfers. All because of grass roots, or rather the lack of them.

Is if fair to say that often times golf course superintendents spend more time looking at grass roots than grass leaves during a lot of the summertime in Wisconsin? Not only is it fair, it is the truth.

When outsiders think we are worrying about green speed and bunker sand and pythium and mowing equipment and a thousand other golf course problems, we are really worried most about the machinery beneath the greenery.

Agriculturalists (and ultimately a golf course superintendent is a golf course agriculturalist) have for ages been interested in underground botany, noting that plants strive to expose vast areas to the soil. Although roots have many functions (anchoring the aboveground parts is a major function in the eyes of those of us interested in golf and concerned about puffiness, big divots and more), the most important is nutrient absorption. Since plants are immobile and since many nutrients they need from the soil are immobile, evolution has given roots the ability to branch and rebranch and rebranch some more, just to create an enormous surface area. It generally goes from primary roots to secondary roots to rootlets to root hairs.

For us the job of water uptake by grass plants (rather, grass roots) is critical, and may be as impressive as nutrient absorption. We like to run our golf courses on the dry side and the moisture in the soils that we manage is tightly held as microscopic film on soil particles. That roots are able to collect this

*(Continued on page 9)*

*(Continued from page 7)*
is a miracle and more proof of the need of a large surface area.

Root hairs have a huge job, turning microscopic films of water into the gallons of water needed by plants, whether those plants are oak trees, pumpkins or Kentucky bluegrass.

Some of the classic research on roots and their surface areas was done by Dr. Howard J. Dittmer. He was on the faculty at the Chicago Teachers College and at the State University of Iowa. Both institutions have different names nowadays!

Professor Dittmer wanted to quantify the comparison of plants to icebergs, studying how much of a plant is beneath the surface compared to the aboveground parts.

In one experiment he planted a winter rye plant (Secale cereale) in a box of soil 12 inches square and 22 inches deep. He grew it for four months; it was 20 inches in height and consisted of a clump of eighty shoots.

Dr. Dittmer carefully washed the soil from the ryegrass root system and measured it. He added the lengths of the roots together (EXCLUSIVE of root hairs) and came up with 387 miles. The surface area exposed to the soil was 2,554 square feet. When he included the root hairs, the numbers absolutely exploded—7,000 miles in length and 6,500 square feet of surface area for the entire plant. The root hair count was estimated at 14 billion!

For reference, he measured aboveground parts and the surface area of that same ryegrass plant was 51.4 square feet. No contest; plants ARE like icebergs!

Other experiments confirmed the ability of roots to develop huge surface areas. In a different approach, Dittmer (who worked with grasses and beans) must have established official records on a cubic inch basis—a certain species of grass grew 4,000 feet of root hairs in that cubic inch of sandy soil!

A soybean, in contrast, had only 47 feet of root hairs in a cubic inch of the same growth medium.

Speed of growth is another feature of root growth that has been measured in grass plants. The roots (not counting root hairs) of a plant of wild oats grew 54 miles in 80 days. The roots of a crested wheat plant grew 315 miles in three years! Stay out of the way! Corn root (another grass) growth has been measured at a rate of two inches per day for three or four weeks.

The magnitude of the number of root hairs is totally impressive, too. It has been estimated that the root hair-bearing portions of the common pea plant can have 1,400 individual hairs on every 1/100 of a square inch of surface.

When one starts using numbers to put a perspective on roots, you can begin to gain a feeling of how critical they are to plant health. It becomes less of oddity that golf course superintendents and faculty who study our problems are interested in things like rhizatrons, phosphorus fertilizers, soil sampling tubes, aerification equipment, root diseases, nematodes, root-feeding insects, rootzone mixes, soil bulk density, and on, and on.

Plant heath depends on good roots. So does the good health of golf course superintendents. It all goes to prove that grass roots can have a double meaning, even for a loyal editor!