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(turfgrass talk)

Measuring soil water to estimate soil air

I've written about the turfgrass root zone and how I like to consider it in terms of 1 square meter to a depth of 10 centimeters, which gives a volume of 100 liters. In the everyday management of turfgrass, thinking of the root zone in these terms can be quite useful. You may have roots that only go to a depth of 5 centimeters, or roots that, on average, are 20 centimeters deep, and if so, you could make the necessary adjustments, for a 50 liter or 200 liter volume of soil in a 1 square meter root zone. Or you could make the adjustment to any depth, as you like. In this article, I'll be using a depth of 10 centimeters, which gives a volume of 100 liters in 1 square meter.

Why is it useful to know the volume of the root zone? One reason is to be more precise in the management of soil water. When 1 millimeter of water is spread at the surface of 1 square meter, that is 1 liter of water by volume. The consumptive water use of the grass is estimated by evapotranspiration (ET) in millimeters, which is equivalent to liters/square meter. In sand root zones used for turfgrass sites, one often finds the grass will start to wilt, and the soil can become hydrophobic, when the soil moisture content reaches 7 to 12 percent by volume. Keeping the soil moisture above that range will usually result in grass that is not wilting and soil that does not become hydrophobic.

But keeping the soil too wet is a problem, too, because when there is more water in the soil, there will be less air. Turfgrass requires lots of air in the soil, so it is desirable to keep the soil with water content as low as possible, which naturally results in a higher air content. With a soil moisture meter, one can measure the soil water content and, from that measurement, estimate how much air is in the soil. For example, if the soil has a total porosity of 50 percent — and most greens built to USGA recommendations will have total porosity at about that level — then if the soil has 15 percent water, there will be 35 percent air. Also, there will be 15 liters of water in the root zone, which is equivalent to 15 millimeters of rain or irrigation. If the ET the next day is 4 millimeters, then one expects the soil moisture to drop to about 11 percent.

One doesn't need a soil moisture meter to make some rough estimates of soil water content. If the field capacity is 30 percent, then after a heavy rain, one knows there will be 30 percent moisture and 30 liters of water in the soil. If the ET is 5 millimeters every day, then the soil will have 25 liters of water one day after the rain, 20 liters of water two days after the rain, 15 liters of water after three days, and 10 liters after four days. Keeping a rough estimate of how much water is in the soil, how much water can be added and how much water the grass uses can be used to optimize the amount of air in the soil.

The best bentgrass, bermudagrass and seashore paspalum playing surfaces will be produced when the soil has just enough water to keep the grass from wilting and the remaining soil volume will be filled with air. By keeping track of how much water is in the soil, predicting how much water will be in the soil tomorrow, based on ET, and understanding how much water will be in the soil when a given amount of rain falls or a depth of irrigation is applied, gives the golf course superintendent an easy way to keep the soil with just enough water and the maximum amount of air.

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