Linear Aerification Encourages Good Soil Respiration

By Martyn Jones

Adequate soil respiration is essential for healthy turfgrass and is influenced by the physical and biological characteristics of the soil.

Turfgrass roots and soil microbes require oxygen for respiration, and its availability can only be assured where there is a rapid and constant exchange of gases between the soil and external atmosphere. Gaseous exchange occurs through diffusion and its efficiency depends on a continuous network of macropores from the surface and down throughout the rooting depth of the grasses.

Macropores are defined as soil pores larger than 75 micrometers in diameter and will readily release water through the forces of gravity. Pores of a smaller diameter are termed micropores, and will retain water against the pull of gravity and can be expected to remain full of water after natural drainage has ceased.

Traffic, be it pedestrian or vehicular, will compress the surface, reducing the majority of macropores to micropores and, consequently, diminishing oxygen diffusion rates. The accumulation of organic residues within the soil pores creates a root zone dominated by water-filled micropores. Oxygen diffusion through water is 10,000 times slower than it is through air. Therefore, it's little wonder that soil respiration is generally poor in sports soils. It is essential that soils have an adequate distribution of macropores and that there is an uninterrupted network from the surface and down to the full rooting depth.

In many instances, a compacted surface layer rich in organic matter is the limiting factor to adequate soil respiration.

Understandably, it is necessary that the macropore system be preserved at the surface, where gaseous exchange between the soil and the outside atmosphere is to occur. Even a thin layer of compacted soil, devoid of macropores, is going to reduce the oxygen diffusion rate dramatically.

Deep dethatching and linear aerification help preserve infiltration rates and efficient gaseous exchange, as well as remove a large proportion of organic residues.

In many instances, a compacted surface layer rich in organic matter is the limiting factor to adequate soil respiration. Maintaining an open surface with high water infiltration and oxygen diffusion rates is a prerequisite to good soil respiration but, all too often, the influence of this zone is overlooked and only deep cultivation is considered.

The surface organic-rich layer, varying in depth depending on the sport and maintenance regime, is the zone in which there is the greatest demand for oxygen. The highest population of soil organisms occupies this zone, and it's the main rooting layer for mown turfgrasses. Consequently, it's the area in which most respiration occurs and the need for gaseous exchange is greatest.

As temperatures rise, and as long as drought does not become a limiting factor, the demand for oxygen by turfgrass roots and soil microbes increases. It is important, there-

Close-up shows the ability to make clean slits left with a Rotorake aerator.

fore that the surface is maintained in an open state throughout the growing season, when the demand for oxygen is at its highest. It's far less important during the dormant season when respiration rates are minimal.

Numerous methods can be adopted to preserve the diffusion rate at the surface, but linear aerification has been designed specifically to treat the upper level of the soil. When executed under the right conditions, the technique offers multiple benefits. Not only does it preserve infiltration rates and efficient gaseous exchange, but it can also remove a large proportion of the organic residues that contribute to the development of micropores in the first place.

The equipment also severs stolons and shallow rhizomes to stimulate greater turf density. Additionally, when a more open surface is established, there is an interruption to the capillary movement of water, and evaporation losses are reduced. The technique is also of major benefit when overseeding to ensure greater seed-to-soil contact and enhanced germination.

Martyn Jones is head of the turf academy at Myerscough College in Preston, England, where he leads the only turfgrass Science degree program currently available in Europe. As a consultant agronomist, he has advised major golf courses and sports stadiums throughout the continent.

TURFGRASS TRENDS

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