

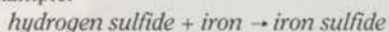
Air and water prevent black layer buildup

Make sure that the rootzone soil is rich in oxygen, control the amount of water used and relieve any of the physical problems in the soil.

by W. Lee Berndt, Ph.D.

■ Black layer can be a serious problem for managers of fine golf greens. A decline in the turf quality can occur very quickly when the black layer appears.

Black layer is a form of sulfur that has bonded with metal. A soil chemist would call the black layer a deposit of metal sulfide. It forms in soil when hydrogen sulfide reacts with an element like iron. For example:



Hydrogen sulfide (or free H_2S) is a type of sulfur gas. It appears in a turf soil when microbes called sulfur reducers respire. The amount of free H_2S released to the soil depends on how active the sulfur reducers are. To be active, they require ample amounts of organic matter and water in the soil. They also require a form of sulfur such as sulfate or elemental sulfur, plus a total lack of soil oxygen—which may be the most important factor. Free H_2S cannot form without any one of them. Together, these are the building blocks of black layer.

Free H_2S is likely to be the cause of the turf decline associated with black layer. Free H_2S is a known cell poison that can suffocate a plant by stopping its root respiration. Scientists have proved that it causes a decline in the quality of grass plants like rice. It can also be lethal to turf.

Could the presence of a black layer in the rootzone of a golf green actually be

helpful to turf managers? In one respect, it may be. However, a deposit of metal sulfide in soil hinders the flow of soil water and soil air. It also binds any oxygen in the soil, making it less available to plant roots.

The best way to stop the release of free H_2S in golf greens is to make sure that the rootzone soil is rich in oxygen. A way to minimize the release of free H_2S would be to avoid applying any kind of sulfur. This is

sulfur.

Making sure that the rootzone soil is rich in oxygen is not as easy. To do so, turf managers need to control water. They also need to relieve any of the physical problems the soil may have.

Placing ample amounts of nitrate in the soil is one way to assure that the rootzone of a golf green is rich in oxygen. Studies show that placing nitrate in a flooded turf soil prevents a decrease in that soil's redox (aeration) status. This in turn prevents free H_2S from forming.

Take care when using any nitrate-type fertilizer. Apply it to fine golf greens only at very light rates to avoid burning the



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true even when oxygen is absent.

It should be easy to control the amount of sulfur applied to a putting green: just limit the use of turf products that contain

turf. This approach can also help save the quality of groundwater.

The release of free H_2S could also be prevented in soil by removing any of the other building blocks. However, it would not be practical to rid a turf soil of the sulfur-reducers. Nor would it be practical to rid a turfgrass soil of its native sulfur and organic matter. Soil moisture cannot be removed from a golf green unless the turf manager also wants to lose a job.

The best bet for stopping free H_2S from occurring is by keeping the soil rich in oxygen and avoiding sulfur.

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