Late fall fertilization of athletic fields

BY **DR. PETER LANDSCHOOT**

Fall is the time of year when cool-season turfgrasses recover from summer stress-related conditions such as drought, heat, and disease. For athletic fields, fall is also the time that turf takes a beating from football and other school sports. This year, many athletic field managers will be making late fall fertilizer applications with the hopes of improving turf vigor and recovery from injury next spring. In this article, we will examine how late fall fertilizer applications influence turf performance, when to make your applications, as well as the types of fertilizers and rates which provide the best turf response.

Why fertilize in late fall?

Late fall fertilization has been promoted as a means of prolonging turf color into early winter without increasing the chance of winter injury and disease. Winter color is more noticeable in regions where winters are warmer (mid-Atlantic states) and during mild winters. Late fall fertilization will also enhance spring green-up without the excessive growth that often accompanies early spring fertilization. This green-up often will last into mid spring, so an early spring fertilizer application is not needed. A fertilizer application in mid to late spring is usually required to sustain turf color and growth.

A small but potentially important increase in the plant's carbohydrate reserves occurs when fertilizer is applied in late fall instead of early spring. Turfgrasses accumulate carbohydrates in stems and rhizomes during fall. These carbohydrates help turf resist winter injury and aid in disease and environmental stress resistance the following spring and summer. Because carbohydrates are tapped for energy by roots and shoots during periods of rapid growth, forcing excess growth with early spring fertilizer applications can deplete carbohydrates quickly, leaving turf vulnerable to spring and summer stresses.

Late fall fertilizer applications do not force as much growth as equal amount of early spring fertilizer, thus carbohydrates are not exhausted as quickly. The result is a slight advantage to the turf in the form of better stress tolerance and disease resistance.

Another reported benefit of late fall fertilization is an increase in rooting, though precisely when and how this increase occurs is a source of some debate. Maximum root growth of cool-season turfgrasses occurs in spring and fall. Some root growth will occur in winter if temperatures are above freezing; whereas, little if any growth occurs in summer.

Most fertilizer applications are made in spring and late summer in attempts to promote root growth. One problem in using this approach is that the shoots use much of the fertilizer, sometimes preferentially over roots. One reported advantage of late fall fertilization is that roots are still growing at a time when shoot growth has ceased, thus allowing the roots to make full use of the fertilizer. However, during this period root growth is very slow, and if the soil is frozen, they do not grow at all. Consequently, the benefit of increased root growth in response to fall fertilization is questionable.

One study in Virginia showed that moderate rates of soluble nitrogen (1 lb. nitrogen/1000 sq. ft) in late fall increased rooting of turfgrass without a noticeable increase in shoot growth. In contrast, a study in Ohio showed no increase in root growth during late fall or winter following late fall fertilizer applications. However, when compared to early spring applications of nitrogen, late fall fertilization allowed more rooting in spring. Presumably, this benefit was due to early spring green-up from late fall applications, which alleviated the need for early spring fertilization. When fertilizer was not applied in late fall, but instead, in early spring, excessive shoot growth occurred, depleting carbohydrate reserves that would have otherwise gone into root production later in spring.

The take-home message from the Ohio study is that while the net effect of late fall fertilization on rooting is slight, application in late fall may be more beneficial with respect to rooting than an early spring application.

Late fall fertilization is occasionally blamed for increased winter injury, snow mold, and annual bluegrass encroachment. A few studies have been designed to examine the influence of late fall fertilization on winter injury. But to my knowledge, none have conclusively demonstrated detrimental effects. Heavy fertilization in mid-fall, when grass shoots are actively growing, can enhance snow mold diseases (presumably due to reduced pre-winter hardening and increased succulence of plant tissue). Increased plant succulence should not occur with late fall fertilization. In fact, some research has shown that late fall fertilization may actually reduce winter diseases.

While some studies have shown increased annual bluegrass populations in fall, there is no good evidence to show that this increase is related to late fall fertilization.

When to apply

Most experts agree that late fall fertilization should take place when foliar

growth stops (or slows to the point that turf no longer needs to be mowed), grass is still green, and before the soil freezes. Application timing may vary from year to year depending on weather conditions.

Fertilizer sources and rates

Most late fall fertilization programs include moderate amounts of nitrogen, phosphorus, and potassium. Rates of 1 to 1.5 lb. of mostly soluble nitrogen/1000 sq. ft are suggested over higher rates (assuming a late summer application was made) to avoid excessive growth in spring and nitrogen leaching or runoff. One study at the University of Illinois showed that when nitrogen was applied at moderate rates in late fall (1 lb. of nitrogen/1000 sq. ft) both urea and sulfur-coated urea provided a better early spring color response than Milorganite. However, when Milorganite or sulfur-coated urea was applied in late fall at a higher rate of nitrogen (2 lb. of nitrogen/1000 sq. ft), spring green-up was similar to that obtained from applying urea at a lower rate (1 lb. of nitrogen/1000 sq. ft in late fall).

Slow or controlled-release nitrogen sources may be a better choice than soluble sources on sandy soils because of reduced potential for leaching. Nitrogen fertilizer should never be applied to frozen soil due to the increased chance of nutrient runoff.

Although application timing is not as critical with phosphorus and potassium as it is with nitrogen, these elements can benefit turf when applied in late fall. Phosphorus is important for root growth and maturation of turfgrasses and application rates should be determined according to soil test recommendations. If your soil test report indicates a need for phosphorus, late fall is a good time to fertilize. However, there is no need to apply additional phosphorus if it is present at sufficient levels. Turfgrasses require potassium in relatively large amounts, so annual applications are usually required. This element enhances cold-hardiness, disease-resistance, and wear-tolerance of turfgrasses. For these reasons, late summer and late fall are ideal times to fertilize with potassium.

ONE REPORTED ADVANTAGE IS THAT ROOTS ARE STILL GROWING IN LATE FALL WHEN SHOOT GROWTH HAS CEASED, THUS ALLOWING THE ROOTS TO MAKE FULL USE OF THE FERTILIZER

Late fall fertilization should take place when shoot growth ceases, the grass is still green, and before the soil freezes. Benefits of fertilizing in late fall include better winter color, enhanced spring green-up, and possibly increased rooting.

Typically, moderate amounts of soluble nitrogen provide good turf color without excessive shoot growth in early spring. However, slow-release nitrogen sources can also provide a good color response in early spring when used at higher rates. To avoid potential leaching and runoff problems, use slow-release nitrogen sources on sandy soils. Do not apply fertilizer to frozen soils. ST

Dr. Pete Landschoot is a professor of turfgrass management in the Department of Crop and Soil Sciences at Penn State. He can be reached at pjl1@psu.edu.