LATE-SEASON FERTILIZATION

Late-season fertilization is becoming more and more popular. And why not? When timed properly, it promotes root, shoot and rhizome or stolon growth.

by Norman N. Hummel Jr., Ph.D., Cornell University

This is the time of the year when thoughts turn to football, pumpkins and apple cider. But for the landscape manager, fertilizing turf areas should be at the top of your "Dumb Things I Gotta Do" list.

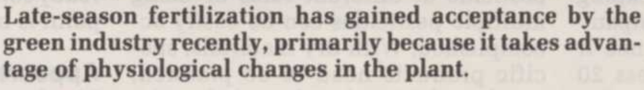
Fertilizing turf in the late season is not so dumb. In fact, it is a very sound and widely accepted practice that promotes the health and vigor of your turf.

Why fall? Cool-season grasses are often weakened from the onslaught of summer stresses. Fertilizing in the early fall (mid-August to mid-September in the North) helps the turf recover by promoting root, shoot and rhizome or stolon growth. Cool-season grasses grown in the transition zone can be fertilized later into the fall.

Fertilizing turf in the late season takes advantage of physiological changes in the plant. Turfgrass shoots stop growing when temperatures are consistently below 45 to 50°F. The leaves are still green and photosynthetic; that is, they are still producing sugars. Since the leaves have little use for this self-made food (they are not growing), they transport the sugars to other plant parts.

Benefits of fertilizing in the late season include enhanced root growth and early spring green-up, but without the flush of growth that would have occurred from an early spring application.

Late-season fertilization has gained acceptance by the green industry recently, primarily because it takes advantage of physiological changes in the plant.



Fertilization of cool-season grasses in fall fosters early spring green-up (above). On warm-season grasses, the same practice is much more controversial.

Proper timing

The timing of application is important. Fertilize turf areas after the shoots have stopped growing, but well before the ground freezes. Fertilizing too early may force succulent growth and increase tissue hydration—prime conditions for winter injury. Fertilizing too late may not benefit the plant, and may actually result in fertilizer loss from run-off and leaching. (Don't confuse late season fertilization with dormant fertilization.)

Also, select nitrogen sources that are not temperature-dependent (see table), so that the maximum benefit from the application can be obtained.

Late season fertilization of warm-season grasses is more controversial. The benefits of a late summer fertilization include extended length of greening into the fall, as well as early spring green-up. The early growth, however, may be more susceptible to frost dieback and desiccation. Late season applications of nitrogen may also make the turf more susceptible to direct low temperature injury.

The risk in making late season applications of nitrogen to warm-season grasses is greater on closer-cut turf, and in the northern regions of adaptation for the grass species involved.

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If you fertilize warm season grasses in the late summer, use a fertilizer that contains about 1½ as much potassium as nitrogen (like 20-5-30). Potassium has shown to improve the winter hardiness of warm-season grasses.

Fertilizer selection

The turfgrass industry is fortunate to have such a wide selection of fertilizer types and formulations available.

The abundance of products and their supporting literature, however, has made fertilizer selection confusing and sometimes misleading. The nutrient requirements of your turf areas will vary with soil type, grass specie, amount and type of use, and the quality level desired.

Soil testing can help accurately determine your fertilizer needs. Nitrogen (N) is required in the largest amount of any of the essential plant nutrients. It is also the nutrient most often in short supply in the soil.

Many sources of nitrogen are used in turfgrass fertilizers, some quickly available, some slowly available.

Quick release sources contain N as ammonium (NH_4) or nitrate (NO_3), forms readily available to the plant. Examples include urea (46-0-0), ammonium sulfate (21-0-0), ammonium nitrate (33-0-0) and ammoniated phosphates. Fertilizing with quick release N sources results in a quick response of short duration. The nitrogen in quick release sources is available regardless of temperature. Thus, they are well suited for late season applications.

Slow-release N sources, sometimes called controlled release or water-insoluble fertilizers, include natural organics, synthetic organics, or coated nitrogen materials. The release of nitrogen from slow release sources may require microbial breakdown alone, or in combination with chemical or physical breakdown. Since the activity of micro-organisms is affected by soil moisture and temperature, the rate of nitrogen release from some materials may vary with season and weather (see table).

Fertilize turf areas after the shoots have stopped growing, but well before cold weather freezes the ground.

Slow-release selections

The amount of slow release nitrogen in a product is listed in the guaranteed analysis on the bag. The slow release portion of N in the product is listed as percent water insoluble nitrogen, and is expressed as a percentage by weight of the bag's contents. Coated fertilizers will have the slow release portion listed as percent controlled release N, or CRN.

When comparing fertilizers, it is useful to know the percentage of the nitrogen in a slow release product. This can easily be determined by dividing the percentage of water insoluble nitrogen (WIN) by the total N and multiplying by 100.

For example, a 24-4-12 turf fertilizer has 24 percent total N, 4 percent available phosphoric acid, and 12 percent soluble potash. If we divide 12 by 24 and multiply by 100, we have determined that half the nitrogen in this product is WIN, or slow release. The other half is quickly available N. A turfgrass fertilizer should contain at least 35 percent of the nitrogen as WIN to have any slow-release characteristics.

There has been a renewed interest in using natural organic fertilizers for turf. True natural organic fertilizers are derived from naturally occurring animal or plant by-products. They rarely contain more than 10 percent N, most of it WIN, and often contain several other plant nutrients. Since the release of nitrogen from natural organics depends on microbial activity, they may not be the best choice for a late season application.

Milorganite is an activated sewage sludge that has long been the standard natural organic product used in the turfgrass industry.

Recently, the selection of natural organic fertilizers has increased to include several other products composed of dried blood, bone meal and seed meals (Ringer products), and poultry litter (Sustane, Plant Right). Again, the use of these products in a late season program would be equivalent to a dormant fertilization. The

Environmental aspects of late season fertilization

The agronomic benefits of late season fertilization are so well documented that it has become accepted practice in the turfgrass industry. But are there any potential adverse effects to late season fertilization?

Late fall, winter, and early spring are times of the year when many aquifers are recharged by the ample precipitation these seasons bring. It is a time when the potential to leach soluble substances, such as nitrate, is at its greatest.

Researchers at Cornell University have studied nitrate leaching from late season applications of nitrogen on the sandy loam soils of Long Island. They have reported that as much as 40 percent of the applied nitrogen will leach below the rootzone when soluble sources are used. This not only represents a serious environmental threat (all of Long Island's potable water comes from aquifers), but it is an inefficient use of nitrogen as well.

It was also shown from these studies that nitrate leaching can be prevented by using slow release sources. The catch-22 is that the agronomic performance of an N source in a late season application was directly related to its potential to leach. In general, fertilizers that did not leach did not perform well.

The outcome of this work has forced us to take a second look at our recommendations for fertilization on sandy soils. We are no longer recommending late season fertilization to consumers on Long Island (and other areas with highly permeable soils), and cautioning commercial applicators to select only N sources such as IBDU and sulfur-coated ureas for their late season application.

Turfgrass managers in similar situations around the country should consider the same.

—Dr. Hummel□

Nitrogen Source	Analysis	Source of N	Manufacturer or Distributor
QUICK RELEASE			
Urea	46-0-0	urea	several
Ammonium nitrate	33-0-0	AN	several
Ammonium sulfate	21-0-0	AS	several
Ammonium phosphate	18-46-0	DAP	several
UF reaction products			
N-Sure	28-0-0	urea/triazone solution	Triazone Corp.
Formalene Plus	30-0-0	urea/sol. methylene ureas	Triazone Corp.
FLUF	18-0-0	urea/ureaform	Cleary
Coron	28-0-0	urea/methylene ureas	Coron Corp.
Nutralene	40-0-0	methylene ureas	Nor-Am
Methylene urea	39-0-0	methylene ureas	O.M. Scott & Sons
Nitroform (Gran.)	38-0-0	ureaform	Nor-Am
Nitroform (Powder)	38-0-0	ureaform	Nor-Am
Natural organics			
Milorganite	6-2-0	activated sludge	Milwaukee Sewarage Comm.
Sustane	5-2-4	composted turkey litter	Sustane Corp.
Ringer products	6-1-3	seed & bone meals, blood	Ringer Corp.
Plant Right	3-4-3	composted poultry litter	Plant Right Corp.
IBDU	31-0-0	IBDU	Par-Ex (Estech Chemical)
Coated materials			
Sulfur-coated urea			
with sealant	varies	urea	Lesco, Purcell, others
w/out sealant	38-0-0	urea	O.M. Scott & Sons
Resin-coated urea	41-0-0	urea	Par-Ex (Estech Chemical)

Key

L = Liquid	M = Minimal	V = Very much	P = Poor	E = Excellent
G = Granular (Delivery form)	S = Somewhat	F = Fair	NA = Not available	G = Good

soil temperatures are too cool for much of the N to be released. Natural organics applied in late season would, however, leave a pool of organic N in the soil that would become available in spring.

Synthetic organics

Synthetic organic fertilizers are a class of chemically combined forms of nitrogen that includes ureaformaldehyde reaction products and isobutylidenediurea (IBDU). Ureaformaldehyde (UF) products vary in their chemical make-up, some being suitable for a late season program, some not.

A UF reaction product is a mixture of polymers (chemical chains) of various lengths. The longer the chain length, the longer it takes for microorganisms to break them down. Thus, the N is tied up, and then released over time.

Products such as Nitroform, and formulations containing Nitroform, have a large percentage of longer-chained polymers. These would provide very little available nitrogen if applied in late fall. They are better when used in warm seasons.

Scott's methylene urea products and Nor-Am's Nutralene contain a large percentage of shorter-chained polymers, and an ample amount of quickly-available N. Nearly all the N in these products will become available within a few weeks under normal growing conditions. Scott's products and Nutralene contain enough available N, however, to produce a noticeable response from a late season application.

Liquid reaction products

Several UF reaction products can be applied in liquid form from sprayers. Fluf is a flowable UF with about 75 percent of the nitrogen in quickly available form. Other products such as Formalene, N-Sure and Coron contain soluble methylol and methylene ureas, as well as free urea. Since most of the N in these products is readily available, they should all work well in a late season program.

IBDU is a synthetic organic N source containing 31 percent N, most of it as WIN. The splitting of IBDU into urea and other by-products requires the presence of water. While the release of N from IBDU is moisture dependent, it is only slightly affected by temperature. IBDU is well suited for a late season program. The best results, however, will be obtained if finer grades are used.

Coated materials

The most widely used coated fertilizer is sulfur-coated urea (SCU). The sulfur used to coat urea (a quick release N source) prevents the urea from coming in contact with water. A sealant on the outside of the sulfur seals any defects in the coating. Urea N becomes available as the sealant and sulfur coating degrade.

Factors that contribute to the release of N from SCU include coating characteristics, moisture, temperature and particle size.

Scott's slow-release encapsulated fertilizer (SREF) is a sulfur-coated urea without a sealant. Since defects in the coating are exposed, urea is very quickly released from the pellet. Products containing SREF would, therefore, be well suited for a late season program.

% of N as WIN	Delivery Form	Approximate length of Response	Factors affecting Release: Temp.	Moist.	pH	Salt Index	Free Urea	Suitability for Late Fall
0	L,G	6 wks	M	M	M	75		E
0	L,G	6 wks	M	M	M	105		E
0	L,G	6 wks	M	M	M	69		E
0	G	6 wks	M	M	M	34		G
0	L	6 - 8 wks	M	M	M	NA	28%	G
0	L	6 - 8 wks	M	M	M	NA	40%	G
25%	L	6 - 8 wks	S	S	M	NA	>16%	G
0	L	6 - 8 wks	M	M	M	NA	> 3%	G
36%	G	8 wks	S	S	M	NA		G
36%	G	8 wks	S	S	S	25		G
71%	G	10-12 wks	V	V	S	10		P
66%	L	10-12 wks	V	V	S	10		P
92%	G	10-12 wks	V	V	S	4		P
70%	G	10-12 wks	V	V	S	NA		P - F
83%	G	10-12 wks	V	V	S	NA		P
60%	G	10-12 wks	V	V	S	NA		F
89%	G,L	10-15 wks	M	V	V	5		G - E
-	G	12-14 wks	S	S	M	NA		F - G
-	G	6 - 8 wks	M	M	M	NA		G - E
-	G	10-20 wks	M	S	M	NA		F

The nitrogen sources listed in this table are often used in formulations of many sorts. The type of formulation will influence many of the characteristics listed. Every attempt has been made to provide accurate information. Exclusion of products was not intentional.

Source: Dr. Hummel

Sulfur-coated ureas produced by Lesco and Purcell have a sealant on the coating and will provide a uniform, prolonged release of N during the growing season. The rate that the coating degrades, however, depends on soil temperature.

If you plan on using SCU as a late season fertilizer, better response will be obtained from the faster-releasing, fine or microprilled grades of SCU.

Other elements

Other elements often thought to be important in a late season fertilizer program are phosphorus, potassium and iron. But are they important?

Confusion and controversy endure over the benefits of P and K in a late season fertilizer.

Right or wrong, some practices have weathered both the years, and the advances made in our understanding of late season fertilization. For example:

Use of a high phosphorus "winter" fertilizer to promote rooting in the fall and winter. There is no question that a late season fertilizer will promote rooting of cool-season grasses. The response, however, is due to nitrogen.

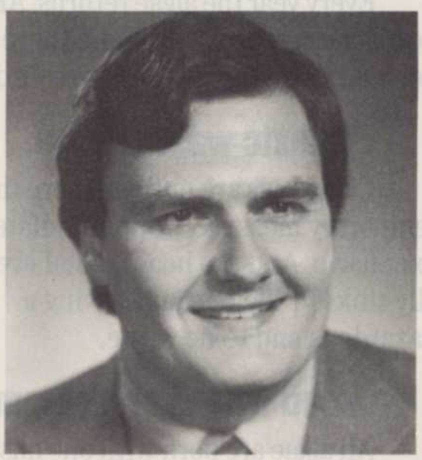
There is no evidence to suggest that phosphorus applications on established turf in the late season are beneficial. In fact, high P:K ratios may actually increase winterkill, especially with warm-season grasses. Phosphorus application should be based on a soil test.

Potassium applications in late season will improve winter hardiness. This is true, but optimum fertilizer ratios exist.

Late season fertilizers applied to cool season grasses should not exceed a 2:1 nitrogen/potassium ratio. The optimum ratio for warm season grasses (bermudagrass) is around 4-1-6 (like 16-4-25, 20-5-30).

Iron applications in the late season can also be beneficial. Cool-season grasses will remain dark green through much of the winter and early spring from a late fall iron application. Iron applied to warm-season grasses in the late season has more than aesthetic value. There is some evidence that iron will help improve the winter hardiness of warm-season grasses, and enhance recovery in the spring.

Iron is most effective and efficient if applied as a foliar spray. In short, plan now to improve the quality and health of our turfgrass areas by fertilizing in the late season. Take care in selecting the fertilizer sources and analysis, and be sure that you apply the fertilizer at the right time. **LM**



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