Efficacy of ureaform and Milorganite in cold soils

By LARRY LENNERT

As early as four decades ago, researchers had reported that the nitrogen release rate of ureaform (UF) was quite slow in soils with temperatures below 50 degrees F [Kralovec, 1954]. In addition, it has been widely reported by numerous researchers that the level of microbial activity in soils drops significantly when soil temperatures fall below 50 degrees F. Given that the nitrogen release rate for UF is governed by the level of microbial activity in the soil, it seemed easy to explain the poor performance of UF in cold soils as simply the result of reduced microbial activity.

Given these observations, it has been commonly assumed that not only UF, but all fertilizers that depend on microbial activity for mineralization of organic nitrogen, will perform poorly in cold soils. This includes the various forms of methylene urea and natural organic fertilizers like Milorganite. While this assumption seems logical, decades of observations from professional turfgrass managers and several research studies seem to indicate that this assumption is not valid.

Almost 30 years ago, Dr. Richard Skogley [published in 1983] established a fertilizer trial in Rhode Island to examine turfgrass responses to fall-applied, slow-release nitrogen fertilizers. Treatments included in the trial were: UF, Milorganite, IBDU, 75 percent UF/25 percent urea, and urea. The UF, Milorganite and IBDU were applied in September and late November from 1968-1972. Skogley was quite surprised to observe an early spring green-up from the November Milorganite application in each year of the study from 1969-1973.

Also, Skogley could not explain why the quality of Milorganite-treated turf was equal to or greater than all other treatments, even in November. Skogley said, "Considering that this is an organic product requiring biological breakdown before nitrogen is available, it is difficult to explain this good season-long performance."

As expected, Skogley observed a poor response from UF in cold spring soils.

Twenty-five years later, Wayne Kussow initiated a study in Wisconsin in 1995 to investigate spring bentgrass responses to Milorganite application in November. Kussow applied Milorganite in November in 1993 and 1994 to creeping bentgrass at 25 pounds per 1,000 square feet (1.5 pounds of nitrogen per 1,000 square feet). An early spring green-up was observed in April 1994 and 1995 as a result of the November application of Milorganite.

Kussow discovered that by snow melt in early March each year, about 10 percent of the nitrogen applied, or 0.15 pound of nitrogen per 1,000 square feet, had been mineralized under the snow cover. From March 12 to April 15 each year, another 5-9 percent of the nitrogen applied had been mineralized, giving 0.23-0.28 pounds of nitrogen per 1,000 square feet that was microbially converted from organic to inorganic nitrogen between November and mid-April each year.

These observations prove there are micro-organisms in the soil that mineralize the nitrogen in Milorganite at soil temperatures much lower than 50 degrees F. This mineralized nitrogen is available for turfgrass uptake as soon as roots become active in the spring, and explains the early spring turfgrass green-up observed by Skogley [1983], Kussow [1995] and hundreds of golf course superintendents who have applied Milorganite in the late fall to their golf turf.

It is clear that Milorganite performs much better in cold soils than theoretical assumptions based on UF performance have predicted. Apparently, the micro-organisms that mineralize the nitrogen in Milorganite are different than those that mineralize UF nitrogen, or if they are the same organisms, they do not significantly mineralize UF nitrogen in soil temperatures below 50 degrees F. Either way, the assumption that Milorganite performs poorly in cold soils is incorrect.

Perhaps other synthetic and natural organic fertilizers also perform better in cold soils than has been commonly assumed. However, this is another assumption that should first be verified by a review of the literature.

Larry Lennert is manager of research and product development at Milorganite, based in Milwaukee.

Literature Cited:

Kralovec, K.O. 1954. Condensation products of urea and formaldehyde as fertilizer with controlled nitrogen availability. Jour. of Agric. and Food Chem. 2:92-95.

Kussow, W.R. 1995. Factors affecting color response of creeping bentgrass to dormant applications of Milorganite. Wisconsin Turf Research. Volume XIII. 107-112.

Skogley, C.R. 1983. Turfgrass response to fall-applied, slow-release, nitrogen fertilizers. URI Cooperative Extension - Turfgrass Research Review. Number 15.