Something New, Something Old

BY KARL DANNEBERGER

Nitrogen, the fuel that drives turfgrass growth and development, is a critical component of golf course management programs. A major environmental concern with nitrogen is the potential for nitrate pollution to ground water and surrounding bodies of water. Government/community proposals are being considered and in some cases implemented that restrict the amount of and when nitrogen can be applied. Given such limitations, can we use the technology we have to build a nitrogen program for the long haul?

Many common fertilizer products contain a quick release nitrogen source (for example, urea) and a slow release component. Within these fertilizers often the proportion of slow release is 30 to 50 percent. It is the slow release component and associated release characteristics that may provide a critical baseline for a fertilizer program under mandated restrictions.

Outside of organics, one of the oldest slow release technologies is Ureaform (UF) — the reaction of urea with formaldehyde. The reaction gives rise to methylene ureas that vary in chain length. The longer the methylene urea chain, the longer it takes for the nitrogen to be released. Various chains of methylene ureas are created when UF fertilizers are produced. The release characteristics are broken down into three classifications based on solubility in cold and hot water.

The cold water soluble nitrogen (CWSN) fraction has a high solubility. The nitrogen consists of free urea and short chain methylene ureas (methylene diurea and dimethylene triurea). Release characteristic of this fraction is rapid and similar to quick release sources.

The cold water insoluble nitrogen (CWIN) is intermediate in release. The nitrogen fraction within this group contains intermediate length methylene ureas (trimethylene tetraurea and tetramethylene pentaurea). Nitrogen release is over a period of several weeks.

The hot water insoluble nitrogen (HWIN) is composed of long chain methylene ureas (pentamethylene hexaurea and longer chains) that release nitrogen over a long period (months to years). Because of its extremely slow release characteristics, a large percentage of this fraction is undesirable in most fertilizer programs. On many fertilizer bags the WIN (Water Insoluble Nitrogen) percentage is a combination of the CWIN and HWIN. Commonly, an effective UF-type fertilizer should have an activity index (AI) value greater than 40. A value less than 40 reflects a high percentage of HWIN.

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Since UF fertilizers are dependent on soil microbial activity to break the chains, temperature is important in release. Microbial activity usually occurs at soil temperatures above 50° F, and as temperatures rise activity increases. One of the reasons urea is needed with WIN is to provide an initial response, especially in cool spring temperatures.

Returning to nitrogen restrictions, is there a benefit to applications of WIN products with an AI of less than 40? If we build our soil/root-zone levels up with long chain methylene ureas (HWIN) do we build a potential nitrogen soil bank that will be released continually under optimum growing conditions for years? Do we, over time, develop a baseline release that applications of quick release forms now become supplemental in nature?

I don't know the answer to these questions, but looking back to the 1980s we saw superintendents slash nitrogen rates — in some cases below one pound per 1,000 square feet per year — for several years with no detrimental effect on turf quality. I wonder how much of the "nitrogen reduction" was buffered by decades of applying UF fertilizers.

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