IBDU: NITROGEN RELEASE IS UNIQUE FOR SLOW RELEASE

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Proper management of nitrogen fertility is one of the keys to successful turf management due to its many effects on physiological processes. IBDU® is the trademarked name for Isobutylidene Diurea, a slow release fertilizer containing 31 percent nitrogen, marketed in North America by Estech General Chemicals Corporation. The n-release characteristics and properties of IBDU are uniquely different from those of other slowly available fertilizers and this discussion will highlight factors governing nitrogen availability and use from IBDU.

Preparation-The manufacture of IBDU is a simple mixing of isobutyraldehyde(IBA), which is a liquid, with solid urea. The product is then screened and bagged into two size ranges, a 0.5-1.0 mm. fine and a 0.7-2.5 mm. coarse.

The finished IBDU product is a small white granule which is not hydroscopic and will store indefinitely.

N Release Mechanism-IBDU particles dissolve and the molecule splits to give:

(a) isobutyraldehyde which volatilizes or is used as a food source by microorganisms.

(b) urea, which would undergo normal conversions to ammonium and nitrate forms.

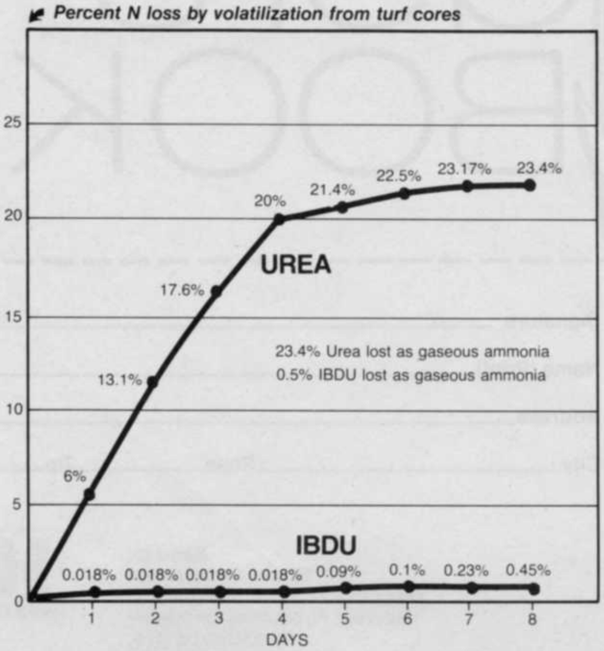
The hydrolysis of urea to ammonium carbonate occurs quickly in soils according to the following equation: $CO(NH_2)_2 + 2H_2O \; (NH_4)_2CO_3$ urea water ammonium carbonate.

Nitrobacteria could then convert the ammonium nitrogen to nitrate if temperatures are about 40° or above and other environmental factors are favorable. However, turf can utilize nitrogen in either form. The urea conversion would be the same regardless of parent material, UF, SCU or IBDU; however, the rate determining step for IBDU conversion to plant available forms is solubility, which is independent of bacterial activity. This distinguishes IBDU from UF which requires bacterial conversion, a highly temperature dependent process, and SCU which becomes available as a result of holes in the coating, cracking of particles, microbial oxidation of the sulfur coating, osmosis, or other factors.

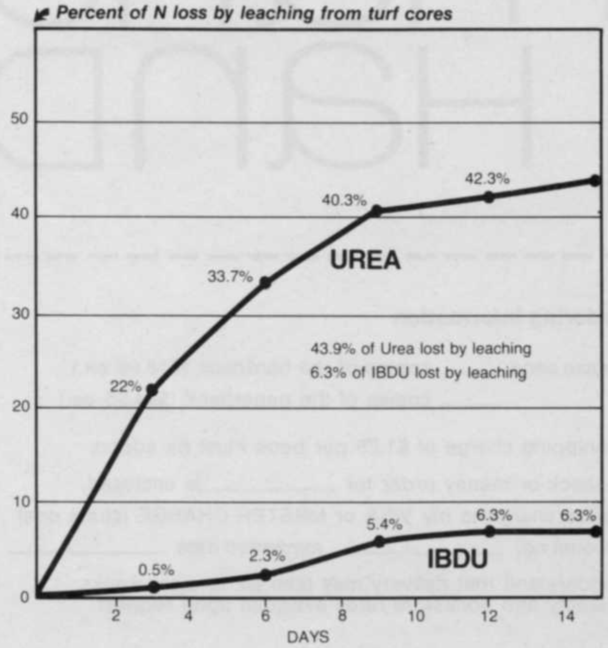
IBDU release is temperature dependent only as temperature effects solubility, so at constant 40° F and 80° F temperatures approximately 50 percent and 75 percent of the nitrogen would be released respectively over a three month period. Freezing temperatures would stop water movement and shut off IBDU. This relationship works well for the turf manager; the grass plant does not grow as rapidly in cool weather so not as much N is required. IBDU will release longer into fall and sooner in the spring during the important carbohydrate assimilation period, resulting in greener, healthier turf.

We are often asked the question, "What happens

Percent N loss by volatilization from turf cores



Percent of N loss by leaching from turf cores



if we get a heavy rain?" The answer is: some IBDU will dissolve. Continuous leaching tests in glass cylinders show that 36 in. of water is needed to dissolve powdered IBDU and about 80 in. water is required to dissolve a 1.4 - 1.6 mm. size. Therefore, a five in. deluge of rain would release about six percent of the N from coarse IBDU or about 0.1 lb. of N from a 1.5 lb. N/1000 ft.^{2} application.

Efficiency-A nitrogen source is efficient if most of applied N is absorbed by the plant and not lost in the environment by leaching past the root system, volitization, or other factors. The preceding two graphs are a result of the work of Falkenstrom and Turgeon at the University of Illinois comparing leaching and volitization of IBDU to Urea.

The first graph demonstrates the amount of nitrogen lost by volitization from turf cores over an eight-day period. Over this time 23.4 percent Urea - N was lost as gaseous ammonia versus only 0.5 percent N loss from IBDU.

The second graph shows leaching losses of 43.9 percent from soluble urea and only 6.3 percent from the slow release IBDU over 14 days.

These studies were conducted in a laboratory microecosystem apparatus that monitored all gases and liquids entering and leaving the system.

The results of field studies by Brown, Duble, and Thomas of Texas A&M were published in the January 1977 USGA Green Section Record. They found on sand greens, as much as 22 percent of the N from soluble sources was lost by leaching in the first three weeks giving high nitrate contamination of leachate water. Less than two percent of the nitrogen applied as IBDU was lost.

It is obvious from these studies that nitrogen from IBDU trickles slowly past the root system, increasing the total uptake over time resulting in better nutrient efficiency and less nitrogen pollution of water when compared to soluble N sources.

Another efficiency factor of IBDU is that it is a single compound and not composed of polymers as is the case with ureaformaldehyde materials. All the nitrogen from IBDU is available in a single growing season. Some UF polymers may require several years to break down and become available.

Lawn care applicators have especially been pleased with this property of IBDU since with UF they may be investing 15-25 percent of the fertilizer cost for a competitor's benefit if they lose the customer.

Dormant Fertilization- Our research results from seven different universities were unanimous in showing IBDU to be a superior nitrogen source for producing excellent turf in the spring after an application the previous fall on cool season grasses. The best program, varying somewhat by location, is three applications of 1-1½ lbs. N per 1,000 ft.^{2} per year; May-June, August-September, and November-December. The last application should be applied when vertical growth has stopped or approximately 30-40 days before expected ground freezing.

IBDU also works well on overseeded Bermudagrass in southern areas. **WTT**