METHYLENE UREA: DIFFERENCES IN UREA FORMALDEHYDES NOTED

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The development of nitrogen products derived from condensing urea with formaldehyde represented a significant advance in nitrogen fertilizer technology. It provided the basis for developing nitrogen-containing fertilizer products with some properties similar to natural organic nitrogen sources. These similarities include: (1) a controlled release of nitrogen and (2) a low burn potential. Additional beneficial properties provided by urea-formaldehyde (also known as methylene urea, MU) condensation products that are more beneficial than those provided by natural organics nitrogen sources include: (1) high nitrogen analysis (38 percent versus less than 10 percent nitrogen), (2) excellent consistency, (3) improved flexibility in adjusting nitrogen release characteristics, (4) lack of odor, and (5) economy.

Chemical properties

The nitrogen release characteristics of MU can be controlled by the method of manufacturing that is selected. Analytically the release characteristics are classified by the solubility of this product in water varying in temperature. Two temperatures are selected: (1) room temperature (22°C.) and (2) boiling water (100°C.). Based on the solubility at these two temperatures, the biological activity can be predicted. As the percent of the cold water insoluble nitrogen (CWIN) that is soluble in hot water decreases (NAI), the nitrification rate (conversion of MU to nitrates) decreases. The nitrification rate is dramatically reduced as compared with ammonium sulfate and urea. This rate can be reduced to a point that is relatively inactive biologically.

One of the primary benefits of MU is attributed to its low salt index. The low salt index at equal rates of material is dramatically reduced as compared with conventional fast release nitrogen sources. These differences are even more dramatic when compared on an equal nitrogen basis. Since the salt index is a measure of burn potential, it is obvious that on an equal weight or equal nitrogen basis, MU would have a much lower burn potential as compared with soluble nitrogen sources.

MU's slow release characteristics are also reflected in the rate of conversion to ammoniacal and nitrate nitrogen in the soil. The ammoniacal nitrogen level in the soil solution is up to four times higher when treated with urea as compared with the MU treatment. After 6 weeks, the ammoniacal nitrogen level is essentially zero regardless of the nitrogen source. In contrast, the nitrate nitrogen level dramatically increases as the ammoniacal nitrogen level decreases. This increase was only evident if the nitrogen source was MU. The nitrate nitrogen level continued at a high level for 120 days (50 to 100 ppm) if the soil was treated with MU. In contrast, soil treated with urea never had a nitrate level greater than 30 ppm. Urea readily leached from the media before conversion of urea to nitrates was realized, resulting greater pollution potential than with MU.

Biological properties

Controlled release nitrogen sources are often characterized by improved safety, increased residual, a more uniform growth pattern, and less total clipping removal as compared with turf treated with soluble nitrogen sources.

As the percent of cold water insoluble nitrogen increases, the degree of injury decreases. These differences are more dramatic when the fertilizer is applied to wet turf; however, they are still apparent on dry turf. At a CWIN of 42 percent, injury was not objectionable at all rates (1 to 4 pounds of nitrogen per 1,000 square feet) or methods of application (wet versus dry foliage). In contrast, complete formulations containing only 2 percent CWIN caused extreme foliar injury when applied to wet foliage using only 1 pound of nitrogen per 1,000 square feet under the conditions of this study (applied in late August under high temperatures).

When we compared two MUs relative to turf response, a substantial difference in turf color was noted. The spring greening response from a late fall fertilization was very slow when turf was treated with ureaform (Category 1) but was dramatically increased when treated with MU (Category 2). In this same experiment, the nitrogen source IBDU was also included. The initial response was comparable to that with ureaform whereas the residual of MU and ureaform was longer than for IBDU.

Spring applications of IBDU and MU (Category 2) were compared. In this study, initial greening was very slow when the turf was treated with IBDU even though rates of 2 pounds of nitrogen per 1,000 square feet were applied. In contrast, turf treated with MU exhibited a rapid spring greening response. The residual characteristics of these products were similar.

The residual of the MU (Category 2) was compared with that for urea. The initial surge of growth was reduced from 1.9 grams for turf treated with urea down to 1.1 grams when the turf was treated with MU (a 42 percent reduction in fresh weight).

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The reduction in initial surge growth is reflected in the residual. The differences from only one application, however, are not dramatic. When repeat applications of MU from Category 2 were used, the residual characteristics became more apparent. In this study, the fertilizer program was discontinued in the fall of the second year. Clipping fresh weights in the spring of the third year dramatically reflected the residual characteristics when MU containing 42 percent CWIN was compared with a product containing 2 percent CWIN. The color of the turf treated with the controlled release nitrogen source (23-7-7 42 percent CWIN) was comparable to that of turf treated with the fast release nitrogen source (10-6-4 2 percent CWIN) in 27 out of 32 observations over a 2.5-year period.

Turf growth is another measure of the controlled release properties of MU. The total fresh weight of clippings can be substantially reduced when turf is treated with MU as compared with urea. The weight of clippings removed over a 6-week period was reduced by one-third when Kentucky bluegrass was treated with MU as compared with treatment with urea. The lower weight of clippings removed is reflected in the fact that there is less tendency for scalping because of delayed mowing, a reduction in mowing frequency, and less labor for collecting and removing clippings. **WTT**