AMMONIA VOLATILIZATION FROM LIQUID AND GRANULAR FERTILIZERS

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Nitrogen can be lost from turfgrass ecosystems through clipping removal, leaching and volatilization. Most turfgrass managers are aware of nitrogen losses through clipping removal and leaching, but may not be aware of gaseous losses through volatilization. Developing a better understanding of this potential for nitrogen loss can be helpful in aiding turfgrass managers to realize more efficient nitrogen fertilizer use. Information on ammonia volatilization is available relating to various cropping conditions, but the same information is lacking in turf.

Ammonia volatilization is influenced by a number of factors, including soil temperature, soil moisture, soil texture, soil pH, cation exchange capacity (CEC), thatch, urease activity, and nitrogen source. Some of these factors can be influenced by the turfgrass manager and thus can be beneficial in minimizing volatilization losses. Ammonia volatilization increases with soil temperature and soil pH. It decreases with increasing soil moisture and CEC. The influence of soil moisture is not straight froward since losses with urea are greatest when moist conditions are followed by rapid soil drying. Sufficient soil moisture and temperature are required for microbial conversion of urea to ammonium carbonate and its subsequent conversion to ammonium and ammonia ions in the soil solution. Rapid drying enhances the potential for ammonia losses through volatilization. Temperatures of 45F retard microbial activity and reduce ammonia losses. In terms of nitrogen efficiency relating to urea fertilizer applications, it is best to apply urea when soil temperatures are low and volatilization potentials are reduced.

Ammonia volatilization is greater on sodded areas than on bare soil. Studies with thatch have indicated that volatilization losses in thatch are intermediate to those observed in soil or sod. Researchers have demonstrated that this response corresponds to a similar trend in urease activity. Urease is an enzyme involved in the conversion of urea to ammonia. In addition to this phenomenon, CEC, temperature fluctuation, and moisture regimes are considerably different when thatch and soil are compared. Turfgrass managers can minimize volatilization losses by washing fertilizer sources down from turfgrass leaves into the soil. Thatch management and modification can also be used to minimize these losses and enhance nitrogen fertilizer efficiency.

Ammonia volatilization has been reported to vary with nitrogen source. Potential losses from urea and ammonium sulfate are greater than those of ammonium nitrate. Slow release nitrogen sources, such as IBDU, SCU, UF and UF-suspensions have lower ammonia volatilization losses than urea. Mixed results have been reported when liquid urea has been compared to granular urea applications. Most results have indicated that volatilization is greater with liquid applications. This is likely due to the mobility of granular sources down to the soil, while liquid sources stay in the foliage or thatch, depending on water application rates. Turfgrass managers using liquid urea applications should consider using higher application rates (i.e. 4-5 gallons per 1,000 sq. ft.) or encourage drenching applications as soon after treatment as feasible. This is particularly true during high temperature periods that are conducive to greater volatilization lossses.

Ammonia volatilization in turf is a factor in reducing nitrogen fertilizer efficiency. Turfgrass managers should be aware of it and factors

that influence its contribution to reduced nitrogen use efficiency. Volatilization is an important component in this process as are clipping removal, leaching and denitrification. Where possible, turfgrass managers should use practices that minimize these losses and maximize nitrogen fertilizer efficiency.