USING SLOW RELEASE NITROGEN AND POTASSIUM CARRIERS

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Nutrient sources for fertilizer programs are usually categorized as quick-release or slow-release carriers. Quick-release sources are also referred to as being quickly available, fast acting, readily available and water-soluble. All terms indicating the nutrient is rapidly available. Slow-release sources are also referred to as being slowly available, controlled release, slow acting, delayed release and water insoluble. Fertilizer products may contain combinations of quick-release and slow release carriers in an effort to maximize the effectiveness of nutrient use from the product. Turfgrass managers often combine quick and slow-release nutrient carriers to maintain desired turfgrass growth and quality.

Lawn care operators have typically shied away from using slow release nutrient sources in their fertilizer programs. They have done so primarily due to increased costs involved with slow release carriers, slow initial response, and the fact that the potential for client turnover is high and residual nutrients from the slow-release source may carryover, benefiting the client's next lawn care provider. These are real issues, but use of slow-release nutrient carriers should not be excluded without careful consideration of their potential benefit to the lawn care operator's fertilizer programs. This is particularly true when nitrogen and potassium are considered.

Quick-release nitrogen sources include: a) inorganic salts containing ammonium (NH_4) or nitrate (NO_3) ions, b) urea, and c) some of the low molecular weight urea-formaldehyde reaction products (methylol and methylene ureas). These materials are less expensive, higher in foliar burn potential, more rapid in response, and shorter lived, than slow-release carriers. Quick-release nitrogen sources give rapid responses in turfgrass color and growth, but their response dwindles quickly after application. It is best to apply quick-release nitrogen sources more frequently at lower rates. Some quickly available nitrogen fertilizer sources include: a) ammonium nitrate, b) ammonium sulfate, c) urea, d) potassium nitrate, e) ammonium phosphate, f) methylol urea, and g) methylene urea. Methylol and methylene ureas are short-chained reaction products derived from reacting urea and formaldehyde. Ureaform is a well-known slow-release nitrogen fertilizer. Products that contain water-soluble methylene ureas and free urea respond like quick-release nitrogen sources.

Slow-release nitrogen sources are characterized by their release mechanism, which include microbial activation (natural organics, ureaform, and longer chained methylene ureas), reduced water solubility (isobutylidene diurea and magnesium ammonium phosphate), or coated physical barriers (sulfur coated ureas, polymer sulfur coated ureas, polymer coated nitrogen, and magnesium ammonium phosphate coated urea). Some products are combinations of these mechanisms. Natural organic nitrogen sources are primarily animal waste or by-products of animal processing; an exception would be the activated sewage sludge sources. Use of natural organic sources in the lawn care industry is somewhat limited. Methylene ureas with varying rates of water insoluble fractions are the most common slow-release nitrogen sources used in the lawn care industry. These would be followed closely by the coated materials.

The primary benefits of using slow-release nitrogen sources in the lawn care industry include: a) reduced foliar burn potential, b) prolonged color response, c) extended growth and d) improved quality response, when compare to quick-release sources. Lawn care programs that are primarily granular applications rely mostly on the coated nitrogen sources, while liquid applications rely mostly on the methylene urea or similar sources. These products are more expensive, but offer more flexibility in application timing and rate than their quick-release counterparts. Minimized burn potential is a benefit for applications being made at mid or later portions of the day as well as those made during higher temperature periods of the growing season. The slow- release nitrogen sources can effectively stretch the color and growth response for customers fitting into early and late portions of the application cycles. At the same time, coated materials and methylene urea sources can be selected to provide effective field responses of 6-12 weeks, which reduces the concern of carryover and potential benefit to customers, who choose not to stay with the service provider.

There is also considerable interest in using slow-release sources of potassium. This interest stems from a wish to improve the stress tolerance performance of the turf, rather than meeting the growth needs of the plant. It has been demonstrated that potassium plays an important role in enhancing turfgrass heat, drought, cold, and wear tolerance. It has been further demonstrated that these responses are best obtained when potassium is applied more frequently at lower application rates. Frequent application rates are not conducive to lawn care operations.

Potassium is abundant in the earth's surface. Although it is an abundant element, it may not be readily available to plants. Potassium is found in the soil system in exchangeable and non-exchangeable forms. Ninety percent of the potassium in soils is in the non-exchangeable form. Only 10% is in the soil solution or on exchangeable sites. When potassium applications are made to soils containing two-to-one layered clays, they rapidly become involved in an equilibrium process that results in much of the application being converted to the non-exchangeable form. This process limits the effective time that the plant can utilize the applied potassium. In sandy soils, potassium is readily leached. It can move rapidly out of the rootzone and become unavailable to the turfgrass plants. Slow-release potassium sources reduce the potential for conversion to non-exchangeable forms and minimize the rate of leaching of the available potassium.

Potassium chloride or muriate of potash is the most commonly used potassium carrier. It is readily available and has a high foliar burn potential due to its high salt index. Other carriers commonly used include: a) potassium sulfate or sulfate of potash, b) potassium nitrate, and c) potassium magnesium sulfate or sulfate of potash magnesia. These sources are also readily available, but have a slightly lower burn potential than potassium chloride. To get the best response from these quick-release potassium sources, it is best to apply them frequently and at lower application rates. It is also best to avoid their application during periods of high temperature stress. Again, this approach is not conducive to most lawn care application programs. Slow-release sources are available. Magnesium potassium sulfate, polymer-sulfur-coated and polymer coated potassium are slow-release sources. The coated potassium sources are coatings applied to potassium chloride, potassium sulfate or potassium nitrate. The coating controls the release and allows the potassium to be metered out over a longer time. These coated

sources have a minimal foliar burn potential (Figure 1), improve potassium uptake by tissue (Figure 2) and enhance turfgrass quality (Figure 2).

Slow-release potassium sources offer a potential to enhance the use of potassium in lawn care fertilizer programs and improve turfgrass stress tolerance. The slow-release source meters the release of the potassium, allowing the plant more opportunity to use the available potassium before it is leached or converted to a non-exchangeable form.

Figure 1. Foliar burn potential of slow-release (SR 60% and 80%, polymer coated KCl sources) compared to a quick-release potassium nutrient source (KCl, potassium chloride).

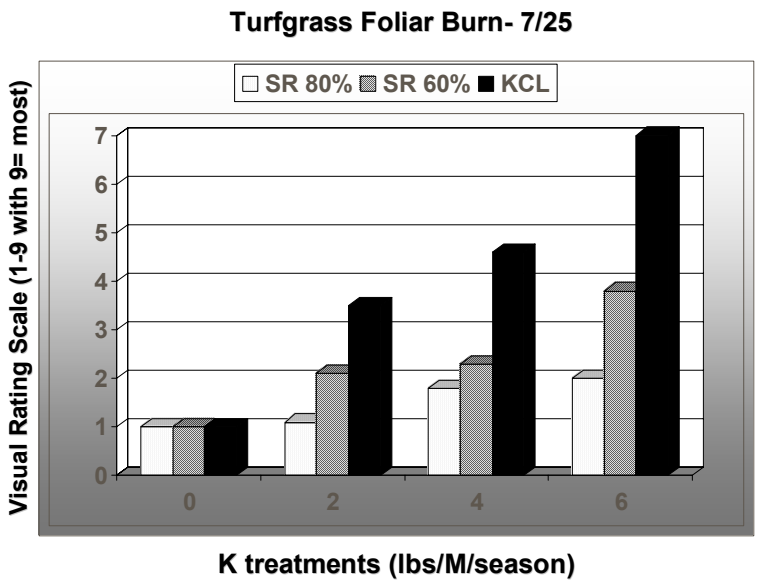

Figure 2. Turfgrass quality as influence by rate of application using a polymer coated potassium chloride slow-release source.

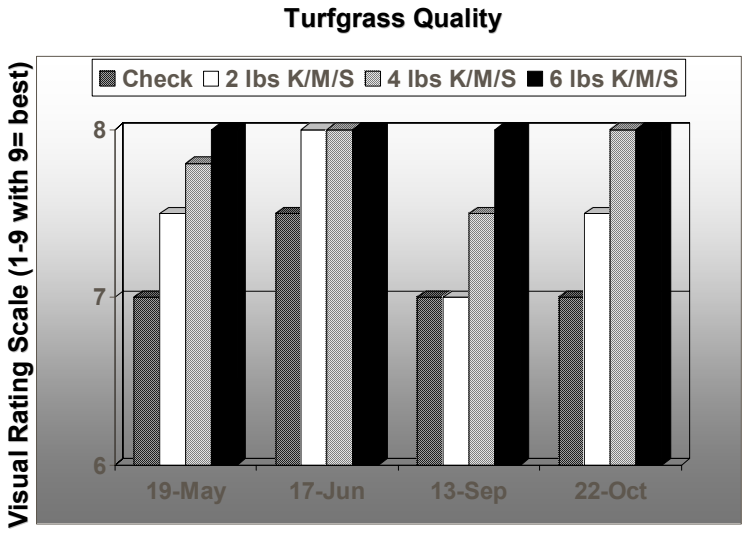

Figure 3. Potassium content in turfgrass tissue as influenced by quick and slow-release potassium carriers.