TABLE 7

EXAMPLES OF BROADLEAF WEEDS CONTROLLED BY GRASS PRE-EMERGENCE HERBICIDES

Herbicide	Common chickweed	Mouseear chickweed	Henbit	Hop clover	Y. wood sorrel	Carpet-weed	Prostrate knotweed	Prostrate spurge	Common purslane
Betasan, etc.			●						
Dacthal	●					●		●	●
Devrinol	●					●	●		●
Dimension					●				●
Pre-M	●	●	●	●	●			●	
Ronstar					●	●		●	●
Surflan	●		●			●	●	●	
Team					●			●	
Weedgrass Control	●	●	●	●			●	●	●
XL	●		●			●	●		●

Potassium and grass production

Most U.S. soils are low to marginal in soil potassium reserves and require potassium fertilization for healthy turfgrass growth.

by Jerry B. Sartain

■ The element potassium aids winter survival, disease resistance, promotes root growth, and increases the hardiness of grasses. It's second only to nitrogen in turfgrass tissue. So, in most instances, the addition of potassium fertilizer is needed to avoid a deficiency.

In some respects, potassium is a mystery. Its specific roles in plant growth aren't completely known although it's believed to act as a catalyst.

It seems to be involved in the formation of proteins and carbohydrates, and translocation of assimilates.

Influence of potassium—In long-term studies on a sandy soil, the growth rate of Tifway bermudagrass was positively influenced by potassium; but thatch accumulation was not enhanced (Fig. 1). Potassium significantly increased the total dry mass of roots (Fig. 2). Belesky and Wilkinson reported in 1983 that Coastal bermudagrass yield was improved by increasing potassium rate, regardless of N source, while Tifton 44 yield was not improved by increasing potassium when $NaNO_3$ was applied.

Other researchers have reported no growth response to the application of potassium.

Differences in response to potassium fertilization relate to the soil type and the status of soil potassium at fertilization.

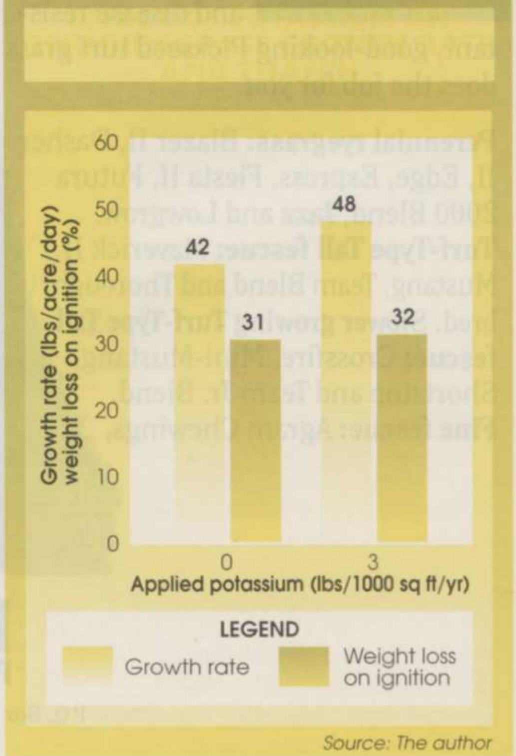
If the soil contains large reserves of exchangeable potassium or primary potassium minerals, such as mica and feldspars, growth response to potassium fertilization is not probable. On the other hand, turfgrasses growing in sandy or clayey soils of low potassium reserves need potassium fertilization for optimum growth.

In areas of high rainfall and mean daily temperature, potassium fertilization is necessary. As a general rule, most U.S. soils are low to marginal in soil potassium reserves and require potassium fertilization to optimize growth.

Increasing rates of potassium increase rhizome production, root mass and stand quality of bermudagrass. Spring stand quality is directly related to rhizome production the previous fall.

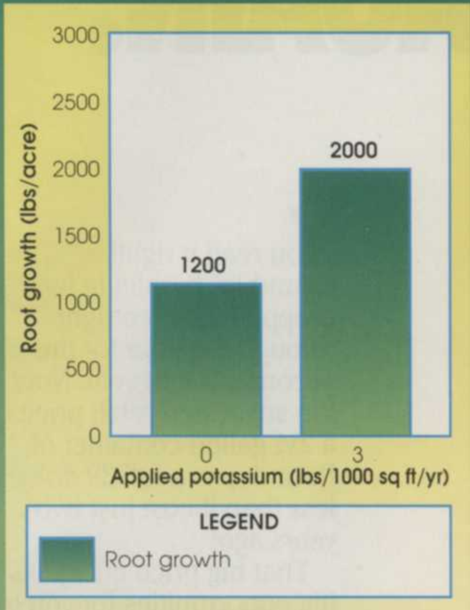
By applying more potassium, winter survival of turfgrass is enhanced. In many studies, a balanced fall fertilization program involving nitrogen and potassium has enhanced cold hardiness and winter survival of warm-season turfgrasses. Reducing potassium fertilization rate has also resulted in an observable loss of root system vigor.

FIGURE 1



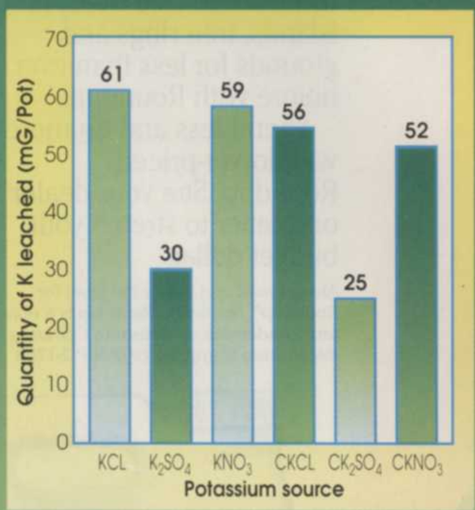
Source: The author

FIGURE 2
EFFECT OF POTASSIUM ON BERMUDAGRASS ROOT GROWTH



Source: The author

FIGURE 3
EFFECT OF POTASSIUM SOURCE ON QUANTITY OF POTASSIUM LEACHED



Source: The author

FIGURE 4
MAJOR POTASSIUM SOURCES

Source	% Potassium	% K_2O	Salt index
Potassium chloride (muriate of potash)	50-52	60-63	1.94
Potassium sulfate (sulfate of potash)	42-44	50-53	0.85
Potassium magnesium sulfate	18	22	1.97
Potassium nitrate	37	44	1.58

Source: The author

In Texas, the incidence of leaf spot (*Helminthosporium cynodontis* Marig.) was increased in bermudagrass test plots when phosphorus was supplied without potassium, demonstrating the need for a balanced fertilization program.

Potassium sources—Potassium is taken up by the plant roots in the K+ form. This can be supplied by either soil reserves or fertilizer salts. Soil reserves are generally low in sandy, highly leached soils. Therefore, potassium for turfgrass production is generally supplied by application of potassium fertilizer salts.

Potassium chloride is the most commonly-used commercially-available potassium fertilizer. Because of this material's high analysis and low production cost, it is very popular.

Potassium sulfate is used on crops and soils on which a fertilizer with a lower salt index is needed. One of the perks of applying potassium sulfate is the addition of sulfate sulfur, which many of our soils now require.

Potassium magnesium sulfate, because of its advantage of supplying both magnesium and sulfur, is frequently used in soils that are deficient in these two elements. The relatively low potassium content of this product limits its inclusion in high-analysis fertilizers.

Potassium nitrate is an excellent source of both nitrogen and potassium but, due to cost, is used mostly on crops of high acre value.

Potassium phosphate fertilizers have not developed a strong commercial base, due mostly to high costs. In general, they are high in analysis and have low salt indices. Some are of high solubility and are used in preparing liquid fertilizers, while others are formulated with controlled solubility.

Potassium carbonate and **potassium hydroxide**, produced on a limited scale, are used in high-purity fertilizers for foliar application or other specialty uses. Their high cost has precluded widespread use as commercial fertilizers.

Potassium availability—Once applied, most potassium fertilizers solubilize and enter the soil solution. This solution potassium is subject to leaching by rainfall if not retained by the soil. Most sandy soils do not retain large quantities of potassium; so it must be applied on a regular basis.

Soil pH affects potassium retention. As the soil pH declines below 6.0, greater losses of applied potassium due to leaching are observed. At a soil pH of 4.5 or less, potassium retention is essentially zero. Thus, an appropriate liming program to maintain the soil pH at 5.5 or above is essential to optimize the efficiency of a potassium fertilization program.

In an unpublished field leaching study, I observed that—over a 112-day leaching period—potassium sulfate leached only about half as much total potassium as did potassium chloride (Fig. 3). Coating the potassium with sulfur did not influence the potassium loss due to leaching. Snyder and Cisar found no growth response, relative to source, for a number of coated potassium fertilizers.

Potassium sources influence the quantity of potassium available to the turfgrass. Horn reported that K_2SO_4 and K_2CO_3 were superior K fertilizer sources for bermudagrass compared to KCl and other potassium sources.

In light of the reduced leaching of potassium from K_2SO_4, its enhanced growth response, low salt index and high analysis, potassium sulfate is a very desirable source of potassium for turfgrasses.

Additionally, K_2SO_4 has the benefit of supplying sulfur. On occasion, applying K_2SO_4 produces a greening response, indicating a probable response to applied sulfur.

—Jerry B. Sartain is a turfgrass fertility consultant in Gainesville, Fla.