NITROGEN AND POTASSIUM EFFECTS ON TURFGRASS WEAR TOLERANCE

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Turfgrass wear results from the direct weight or pressure of traffic, crushing or tearing the leaf, stem, and crown tissues of the turfgrass plant. The damaged tissues are more susceptible to disease infestation, and water loss through the additional exposed surface areas. Wear should be distinguished from soil compaction and the resulting turfgrass cultural problems that may also be associated with intensive traffic situations.

The turfgrass wear tolerance varies, depending upon (a) the turfgrass species, (b) the intensity and type of traffic, and (c) the intensity of culture practiced. Although these factors have been observed to influence wear tolerance, very little data is available concerning anatomical, morphological, and physiological characteristics of the turfgrass plant that contribute to wear tolerance. Similarly, very little is known regarding the relative importance of various cultural and environmental factors in influencing wear. A better understanding of the effect of individual cultural practices, such as nitrogen and potassium fertilization, on turfgrass wear tolerance would be beneficial to professional turfmen for minimizing wear injury.

A study observing the effects of nitrogen and potassium on the wear tolerance of Toronto creeping bentgrass turf was begun in the spring of 1972. This study is part of an extensive investigation of turfgrass characteristics associated with wear tolerance, and the effects of cultural, environmental, and genetic factors influencing turfgrass wear. The investigation is funded in part by a grant from the United States Green Section Research and Education Fund. The objectives of this aspect of the investigation are:

1. Develop a portable, mechanical apparatus for reliably reproducing and comparing the effects of wear on turfgrasses.

2. Determine the influence of various nitrogen and potassium fertilization rates on the wear tolerance of turf.

3. Determine certain critical application rates of nitrogen and potassium for minimizing turfgrass wear injury.

This study involves two experiments:

1. The effect of five nitrogen treatments at one potassium level on the wear tolerance of turf.

2. The effect of five potassium treatments at one nitrogen level on the wear tolerance of turf.

The nitrogen and potassium treatments, on the Toronto creeping bentgrass area studied, were initiated in 1966. The various rates of nitrogen and potassium applied were divided evenly into four applications over the period of late April through mid-September. The nitrogen source was ammonium nitrate (33-0-0) and the potassium source was sulfate of potash (0-0-50).

The studies carried out in the 1972 growing season will have to be expanded with further experimentation in 1973. However, preliminary investigations indicate:

1. That the mechanical wear simulator developed has the desirable portable characteristics, such that it can be readily moved from one experimental site to another, and can be effectively used to compare relative differences in turfgrass wear tolerance.

2. Increased nitrogen fertilization increased the wear tolerance of turf, but excessive application rates can result in a succulent, hydrated turf that is more prone to wear injury. Therefore, the present recommendation would be to practice judicious nitrogen fertilization to maintain adequate turfgrass growth and desirable quality. Shoot density and mat accumulation increased with increasing nitrogen application rates.

3. Potassium fertilization did improve wear tolerance with the greatest increase in wear being associated with applications of six and eight pounds of potassium per 1000 square feet per growing season. The percent potassium in the turfgrass tissues, expressed on a dry weight basis, increased with the increased potassium fertilization rates. Increasing potassium fertilization rates did not influence shoot density, but did increase the mat accumulation.

It must be stressed here that these results are based on preliminary investigations, and that these studies will be expanded for more critical evaluations during the 1973 growing season. Emphasis will be placed on studying the effects of nitrogen and potassium on turfgrass plant characteristics, such as total cell wall content, cellulose, and lignin content, the degree of plant tissue hydration, tensile strength of tissues, and the load carrying capacity of the turf.