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DR. JAMES B. BEARD

TURFGRASS RESEARCH REVIEW

WHICH TURFGRASSES WITHSTAND WEAR AND TEAR BEST

Turfgrass wear tolerance. *R. C. Shearman. Ph.D. Thesis. Michigan State University. 87pp. 1973. (from the Department of Crop and Soil Sciences, Michigan State University, East Lansing, Mich. 48824).*

The objectives of this investigation were to (a) develop a turfgrass wear simulator for small experimental plots; (b) evaluate the relative wear tolerance of seven cool season turfgrasses under optimum growing conditions and (c) investigate the anatomical, morphological and physiological characteristics of turfgrass species that are associated with turfgrass wear tolerance.

A turfgrass wear simulator was constructed and shown to be effective in producing turfgrass wear differentials with a minimum effect on soil physical properties, especially compaction.

Seven cool season turfgrass species were established in May, 1972, on a sandy loam soil utilizing a randomized complete block design. The species utilized were Pennlawn red fescue, Cascade chewings fescue, Kentucky 31 tall fescue, Manhattan perennial ryegrass, Merion Kentucky bluegrass, Italian ryegrass and rough bluegrass. The experimental plot area was mowed twice weekly at two inches utilizing a reel mower with clippings removed. The area was irrigated as needed to prevent visual wilt.

Preliminary comparative studies were initiated in October, 1972; more extensive studies were conducted during June and July, 1973. Both sled (foot-like) and wheel (vehicular-like) types of wear injury were superimposed across the turfgrass plot area. Six hundred revolutions of the wear simulator were superimposed over the experimental area. There was no disease evident on the turfs during the period of wear tolerance evaluation.

Several methods of evaluating the comparative wear tolerance after a period of wear simulation were evaluated. It was found that the per cent verdure (quantity of living shoots) remaining after treatment was the preferred method for quantitatively evaluating wear tolerance differentials. It eliminated arbitrary evaluations that can be associated with visual rating systems and was much less time consuming than either the total cell wall percentage or chlorophyll content determinations.

The comparative wear tolerance when grown under optimum cool humid conditions were as follows for the seven cool season turfgrass species: Manhattan perennial ryegrass was the most wear tolerant, especially to vehicular wear; Kentucky 31 tall fescue and Merion Kentucky bluegrass ranked second, in the order presented; Pennlawn red fescue and Italian ryegrass were intermediate, in that order; whereas Cascade chewings fescue and rough bluegrass ranked lowest in vehicular wear tolerance. Merion Kentucky bluegrass was the most tolerant of sled wear followed closely by Manhattan perennial ryegrass and Kentucky 31 tall fescue. Cascade chewings fescue and rough bluegrass were essentially destroyed by the crushing and tearing action of the sled.

Results of the investigation concerning the physiological, morphological and anatomical characteristics associated with turfgrass wear tolerance led to the following conclusions. Total cell wall content was the best indicator of species differentials in turfgrass wear tolerance. Other factors contributing significantly to wear tolerance differentials included leaf width, leaf tensile strength, per cent sclerenchyma fiber and per cent lignified cells. Other factors, such as verdure, shoot density, load bearing capacity, leaf and stem moisture content and per cent relative turgidity of leaves, did not

account for any significant amount of variation in wear tolerance among the cool season turfgrass species evaluated here.

This investigation was supported by a grant by the USGA Green Section. The studies are being continued with emphasis on the comparative wear tolerance of bentgrass, bluegrass, fescue and ryegrass cultivars.

Comments: The first point that should be emphasized is the proper use of terminology concerning traffic effects on turfgrasses. It should be recognized that there are two primary detrimental aspects that are the direct result of intense foot and vehicular traffic. These are (a) turfgrass wear and (b) soil compaction. Turfgrass wear involves the direct pressure of concentrated traffic on turf. It results in the injurious crushing and bruising of the leaves, stems and crowns of the plants. Damage is most severe if the traffic is of a scuffing or tearing type. In contrast, soil compaction is frequently referred to as the "hidden effect" of traffic. In this case the soil particles are pressed together in a more dense mass that can cause a severe reduction in aeration, soil water infiltration and percolation and soil resiliency. The result of these physical soil effects can be a serious reduction in root growth that may effect the health, vigor and density of the turf. Unfortunately, traffic is frequently discussed in terms of wear effects when the problem superintendents really face is soil compaction. This creates difficulties. Procedures for preventing or minimizing the effects of wear are substantially different than those involved in minimizing soil compaction resulting from intense traffic. Thus, when reading articles and research reports concerning turfgrass wear, be sure that both you, as the reader, and the author, as well, are utilizing the proper terminology. This particular investigation is concerned primarily with the wear aspect of the traffic effects.

On a long term basis, the most significant contribution from this investigation is the development of rapid indicators for assessing wear tolerance in a turfgrass breeding program. This ultimately could lead to more wear tolerant turfgrass cultivars.

The more immediate results of this investigation of concern to the reader are the species wear tolerance differential results. Of particular interest is

continued on page 88

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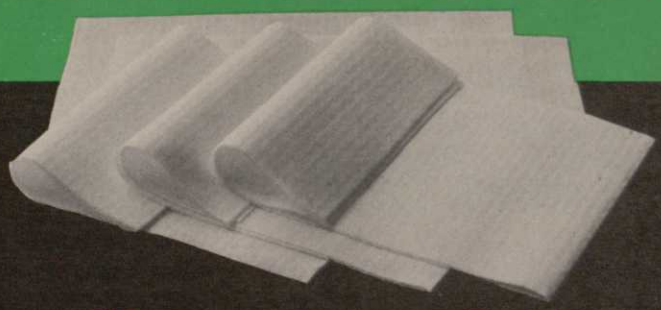

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BEARD *from page 25*
the high ranking of Manhattan perennial ryegrass. The only other definitive species wear tolerance studies were conducted in the late 1950s in Southern California. Under the conditions of this earlier experiment, tall fescue was reported to be the most wear tolerant cool season turfgrass species. Manhattan perennial ryegrass was not available at that time. Results from this study indicate an advantage of Manhattan perennial ryegrass over Kentucky 31 tall fescue in terms of wear tolerance. Field observations during 1973 support these results. The overseeding of Manhattan perennial ryegrass into thinned turfs that are subjected to intense traffic has significantly improved the condition of the turf.

In addition to the use of more wear tolerant turfgrass species and cultivars, the following factors contribute to improved wear tolerance: (a) higher cutting height, (b) high potassium nutritional levels, (c) avoidance of excessive nitrogen nutrition, (d) presence of a moderate amount of thatch that provides a cushioning effect and (e) avoidance of excessive irrigation that increases tissue succulence. Remember, too, that the wear tolerance of seedlings turfs is considerably reduced as is the wear tolerance of turfs growing under shaded conditions. These types of turfs should be protected whenever possible by the control or redirection of traffic. □

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