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Selecting the Right Turfgrass Species for Traffic Stress Tolerance

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'Selecting the Right Turfgrass Species for Traffic Stress Tolerance' is a basic management guide for turf management under traffic stress. This RTN mainly focuses on traffic tolerant turfgrass species.

Traffic Stress

Figure 1 Turfgrass under traffic stress in parks (left) and streetscapes (right)

Traffic stress is a major issue on utility turf. Utility or recreational turf in parks, sports fields and golf courses, are designed for human activities, in addition to their aesthetic function. For instance, turfgrasses in parks provide space for recreational activities and events. As a result of the human traffic and sometimes vehicular movement, the soil underneath becomes compacted and the turfgrass gets worn out. This is a major problem in turf management - traffic stress.

The tolerance to traffic stress by turfgrass is determined by a number of factors, such as soil type, soil fertility and turfgrass species.

Turfgrass Species

The direct impact of traffic stress on turfgrasses is its wear and injury. This occurs as a result of mechanical pressure, abrasion, scuffing and tearing. The type of injury varies, depending on the type of traffic, kind of sports (football, golf, cricket, etc...) as well as type of vehicles.

Shearman & Beard (1975) reported that warm season turfgrasses are more tolerant to traffic stress as compared to cool season turfgrasses. In general, coarse textured (broad leaved) turfgrasses are more prone to traffic stress than fine textured (narrow leaved) turfgrasses.

Traffic tolerance level of turfgrass species also depends on the leaf composition. Trenholm *et al.*, (2000) reported that characteristics like high leaf moisture content, high stem lignin and cellulose content and high silica content aid in increasing tolerance to traffic. Of the warm season turfgrass species, Bermudagrass and *Zoysia* species are found to be most traffic tolerant. *Zoysia* leaves are tough and can tolerate high traffic because of its high silica content. Other turfgrass

species respond to traffic stress by undergoing anatomical changes such as aerenchyma[1] formation.

Impact of Traffic Stress on Turfgrass

Figure 2 Impact of traffic stress on three different turfgrass species: Cowgrass (left), Seashore paspalum (middle) and Manilagrass (right)

The main symptoms of traffic stress are (1) reduction in leaf size, (2) reduction in tillers and (3) gradual decline of turfgrass coverage. Other symptoms include (4) discolouration of leaves (yellowing, purple discolouration due to nutrient deficiency) and (5) drying of leaves. Where there is heavy traffic, bare patches will be formed in the affected area.

Study on the Effects of Traffic, Fertility and Their Interaction on Warm Season Turfgrasses Under Different Root Zone Media

CUGE has recently completed a traffic stress study and identified some tolerant turfgrass species and suitable soil types. Three turfgrass species - Cowgrass (*Axonopus compressus*), Seashore paspalum (*Paspalum vaginatum*), and Manilagrass (*Zoysia matrella*), were grown in four different root zone media and evaluated under three different traffic intensity and fertility levels. Different traffic effects were artificially created using a motorized traffic simulator weighing 250kg. By varying the number of times passed through by the simulator, different stress levels were generated. The experiment details and results are presented in Tables 1 and 2 respectively.

Figure 3 Traffic simulator

Figure 4 Traffic study to test the traffic tolerance of three warm season turgrass species

Table 1 Experiment details

Factors	Levels
Turfgrass species	*Axonopus compressus* - Cowgrass
	Paspalum vaginatum - Seashore paspalum
	Zoysia matrella - Manilagrass
Fertility	Zero
	Medium - 0.2 kg N/100 m^2/month
	High - 0.4 kg N/100 m^2/month
Traffic level	Zero
	Medium (equivalent to 3 high intensity football games or 6 refers school level football games)
	High (equivalent to 6 high intensity football games or 12 refers school level football games)
Root zone mix / soil type	75/25 - 75% Sand + 25% Pure soil
	50/50 - 50% Sand + 50% Pure soil
	Pure soil
	ASM - 3:2:1 (3 parts pure soil + 2 parts compost + 1 part sand)

Table 2 Results

Turfgrass species	Tolerance level
Manilagrass	High ↕ Low
Seashore paspalum	
Cowgrass	

Application

It is a major challenge to maintain good quality turf under severe traffic stress. Hence, it is important to select traffic tolerant turfgrass species and suitable soil type during establishment.

Based on the experimental results, Manilagrass was found to be the most tolerant to traffic stress, followed by Seashore paspalum, then Cowgrass.

Besides selecting the appropriate turfgrass species, special management practices, such as those listed in the next section, will improve their performance under traffic stress.

Management Practices for Turf under Traffic Stress

- Fertilizer application must be regular (0.2 – 0.4 kg N/100 sq m/ month)
- Optimum moisture level must be maintained in the soil through proper drainage
- Regular aeration must be practised

Footnotes

1. The formation of aerenchyma or air spaces inside the root cortex is an adaptation which allows for oxygen flow.

References

1. Shearman, R.C. and J.B. Beard. 1975a. Turfgrass wear tolerance mechanisms: I. Wear tolerance of seven turfgrass species and quantitative methods for determining turfgrass wear injury. Agron. J. 67:208-211.
2. Trenholm, L.E., R.N. Carrow and R.R. Duncan. 2000. Mechanisms of wear tolerance in seashore paspalum and bermudagrass. Crop Science. 40:1350-1357.

Addtional References

1. RTN 06 - 2012: Selecting Right Soil Type for Turf.
2. CUGE Standards. CS B01:2010. '*Guidelines for Tropical Turfgrass Installation and Management*'.