

# CUGE BEGINS TROPICAL TURFGRASS RESEARCH PROGRAMME FOR SINGAPORE

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Turfgrass research has been underway for a number of years in the world's temperate regions, with most of this research being done in the United States and Europe. However, very little turfgrass research has been done in tropical regions. Though basic principles of turfgrass management may be applied everywhere, tropical environments differ radically from temperate ones, most notably in temperature (i.e. absence of annual and diurnal low temperatures), rainfall, solar intensity, and soils. This necessitates different management protocols, which have yet to be developed for tropical regions.

Driven by Singapore's emphasis on urban greenery and its unique vision of creating a City in a Garden, the Centre for Urban Greenery and Ecology (CUGE), an organisation under the National Parks Board, has begun a turfgrass research programme, with the goal of developing turfgrass management protocols for Singapore. These protocols are potentially applicable for all tropical regions.

The tropical environment imposes a unique set of constraints on turfgrass growth and quality. For example, high rainfall and temperature create weathered, tropical soils which are generally of low pH and infertile. Under such high rainfall, soils often remain saturated with water, which creates a host of problems, including soil compaction and loss of drainage under trafficking conditions typical of public

turf areas. These environmental conditions also create unique, often extreme, disease and insect pressures. And although turfgrasses are typically high light-requiring plants, Singapore's uniquely abundant trees, combined with tall buildings and cloudy skies result in a shaded environment for turfgrass growth.

Addressing these issues will require development of new turfgrass management strategies. In addition, new improved turfgrass species and cultivars will need to be tested for their adaptability to Singapore, with management individually worked out for them. Currently, almost all of parks and street landscape turf in Singapore is planted with cowgrass (*Axonopus compressus*), a species native to South America, due to its availability and affordability. Though adapted to the climate and low fertility soil conditions of Singapore, cowgrass provides a rather low quality turf characterised by coarse texture and a lack of density. In addition, cowgrass doesn't stand up well to foot traffic (trampling). Thus, the goal of the research program will be to develop new sets of management protocols, for new, improved turfgrass cultivars to enable improvement of turfgrass quality and utility in Singapore's park lands and street landscapes.

Initial studies are underway to address key issues for turfgrasses in Singapore, including low fertility soils, soil compaction and loss of drainage resulting from excessive foot traffic, disease and insect pressures, and high shade

environments. CUGE has set up a field plot at HortPark to examine the effects of increasing trafficking levels on both the tolerance of turfgrasses and soil related parameters, including compaction and drainage. Various turfgrass species are being tested for resistance to trafficking, and various soil rootzone mixes are being tested for their potential to maintain drainage and resist compaction under traffic. Finally, different fertility regimes are being applied across all turfgrass species and rootzone mixes to develop optimum fertilisation recommendations for the turfgrasses.

A new generation of warm season turfgrass cultivars has recently been developed by plant breeders, primarily in the United States, and to a small extent in Australia. A number of the most promising cultivars will be brought in for evaluation in field plots in comparison to cultivars currently existing in Singapore. These will be maintained under a moderate level of management, suitable for parks. Observations over time will reveal whether some of these cultivars will provide higher quality turf under Singapore conditions.

Another study under construction will determine the shade tolerance of turfgrasses by growing them under four different light levels. Inadequate light typically results in thin, low quality turf. Species tested include *Axonopus compressus* (cowgrass), *Axonopus sp.* (Pearlgrass), *Cynodon dactylon* (bermudagrass),



*Digitaria didactyla* (Serangoongrass), *Digitaria timorensis*, *Eremochloa ophiuroides* (centipede grass), *Paspalum vaginatum* (seashore paspalum), *Pennisetum clandestinum* (kikuyu grass), *Stenotaphrum secundatum* (St. Augustine grass), *Zoysia japonica* (Japanese or Korean grass), *Zoysia matrella* (Manilagrass), and *Zoysia tenuifolia* (templegrass)

Due to very high rainfall in the tropics, wet soils are a common occurrence, especially where high traffic levels result in soil compaction. Tolerance of turfgrass species to wet soils and waterlogging, as well as their adaptive mechanisms, is being investigated by Vivek Govindasamy from Tamil Nadu Agricultural University in fulfilment of his Masters degree. This is a CUGE initiative to develop academic and scientific relationships and collaborative research activities with foreign universities.



Results from these studies, coupled with results from parks benchmarking studies, will be used to refine existing turf management protocols in parks. The goal is to raise the standards of turf in Singapore, by increasing turfgrass variety, quality and utility. These results will be applicable to other tropical areas, hence allowing Singapore to become a centre of expertise for tropical regions worldwide.

**TOP** Determining trampling tolerance and fertility requirements of turfgrass species grown on various soil based rootzones.

**BOTTOM** Turfgrass species are found to differ in their tolerance to wet soils.