

Turfgrass Suitable for Wet Soil Conditions

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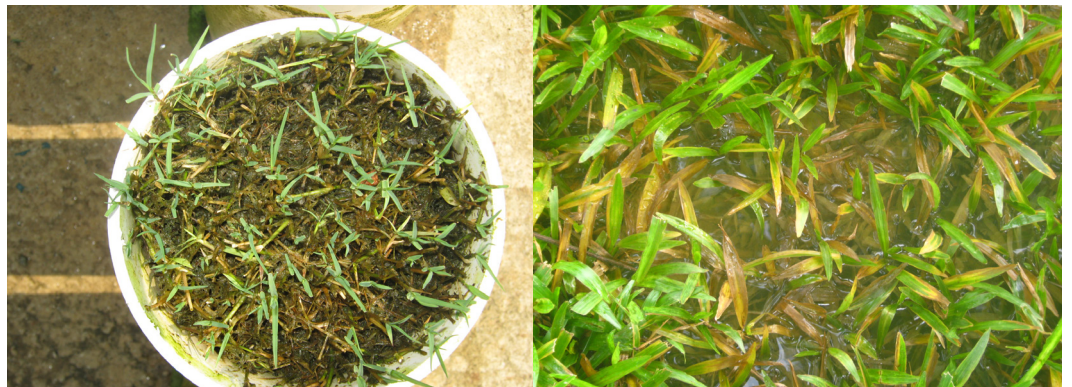
“Choosing the right turf for wet soils” is a basic management guideline for turf management under wet soil conditions.

What is a ‘Wet soil’?

A wet soil is a soil that exists under conditions of saturation, flooding or ponding long enough to develop anaerobic conditions in the upper part of the soil. These soils are usually found in high rainfall regions. In Singapore, such conditions prevail in areas along water bodies, soils with low infiltration rates, such as those under compacted condition, and soils with high clay content which tend to develop wet conditions.

Impact of wet soils on plant growth:

Plant roots need oxygen for normal respiration and proper growth. Wet soils induce anoxic or hypoxic condition in the soil (anoxia means ‘zero oxygen’ condition and hypoxia means low oxygen condition). As a result, the oxygen availability for root respiration becomes limiting to plant growth. Under prolonged wetness, plant population eventually declines.



The common symptoms are stunted plant growth and root decay followed by decay of shoot and leaves due to the death of cellular tissue. For turfgrasses that are intolerant to waterlogging, overall turf quality declines as growth is slowed down, and chlorosis of leaves develop over time.

Above, Left to Right: Fig 1. Decaying Bermudagrass shoots under wet soil condition; Fig 2. Yellowing and decaying of Cowgrass leaves under wet soil condition



Fig 3. Punggol Waterway Park (wet soil condition indicated by arrows)

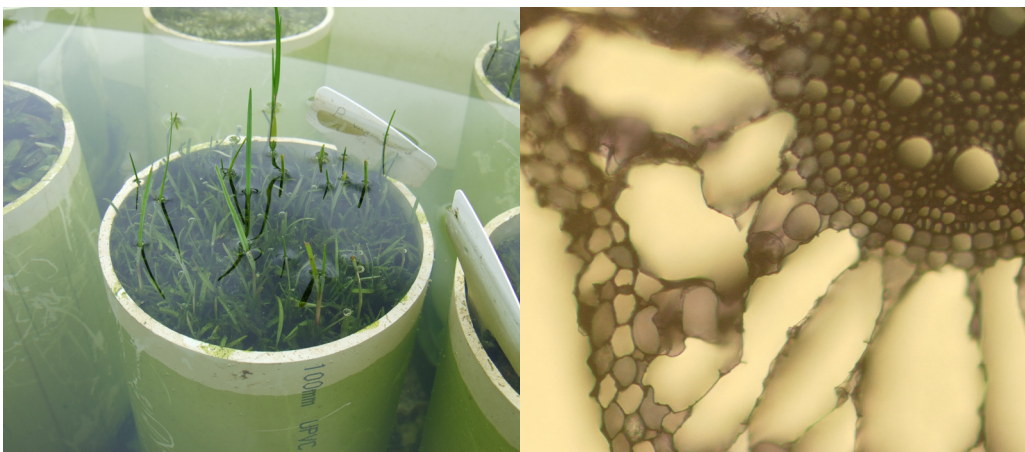


Fig 4. Constructed wetland in Sengkang Riverside Park (wet soil condition indicated by arrows)



Fig 5. The naturalised canal in Bishan Park (wet soil condition indicated by arrow)

Wet soil tolerance of turf



Left to Right: Fig 6. Increased shoot length/ shoot elongation; Fig 7. Aerenchyma formation in roots

Different turf species have been developed under different environment and some have developed the ability to tolerate wet soil conditions. Wet soil tolerance is conferred by development of physiological, anatomical and morphological adaptations. The most common re-

sponses include aerenchyma¹ formation, increased shoot length and maintenance of stomatal conductance.

Turfgrass species for wet soils



Fig 8. Waterlogging study to test the waterlogging and flooding tolerance of 5 common turf species

CUGE has identified some turfgrass species tolerant to wet soil and flooded conditions through a recently completed study. Flooded condition is the next level of wet soil condition where water gets stagnated on the soil surface for a day or more. Five turfgrass species [cowgrass (*Axonopus compressus*), Bermudagrass (*Cynodon dactylon*), seashore paspalum (*Paspalum vaginatum*), St. Augustinegrass (*Stenotaphrum secundatum*) and Manilagrass (*Zoysia matrella*)] were evaluated.

Based on the study the following result was obtained:

Wet soil condition	Tolerance	Flooded condition
Seashore paspalum	High ↑↓ Low	Seashore paspalum
Cowgrass		Manilagrass
St. Augustinegrass		Bermudagrass
Bermudagrass		Cowgrass
Manilagrass		St. Augustinegrass

The above table shows that Cowgrass and St. Augustinegrass were tolerant under wet soil conditions but not under flooded conditions, thus exhibiting a contrasting behavior. The reason behind this is that the partial exposure of the shoots to atmospheric oxygen aids turfgrasses to tolerate wet soil conditions. There was no partial exposure under flooded conditions during this study

Application

Wet soil/flooded conditions are generally not suitable for plants except aquatic and semi aquatic plants. However, there are situations where planting has to be done in wet soils in order to obtain a uniform green cover. Besides its aesthetic value in providing a green cover, turfgrasses also contribute to biodiversity enhancement and phytoremediation.

Ameliorating the wet condition and selection of tolerant turf species are the two important points to be considered before planting turf in wet soils. Between these two, priority must be given to soil amelioration. Selection of tolerant turf species gains more importance under circumstances where the soil amelioration is not possible. For example, soil amelioration is not possible at sites near lakes and rivers where wet soil condition will occur irrespective of the soil

type and drainage. The quality of tolerant turf species under wet soils will not be on par with a well maintained turf under normal aerated soils.

Based on the study results, Seashore Paspalum can tolerate wet soil and flooded conditions. Cowgrass and St. Augustinegrass can be grown under wet soil conditions where there is no prolonged flooding. It should be noted that special management practices have to be followed (as below) for these tolerant turf species under wet conditions

Tips for maintaining turf under wet soil condition

- For these turfgrass species (under such wet conditions), mowing has to be done at a minimum level.
- To reduce flooding injury, at least a portion (30 – 40%) of the turfgrass must be exposed to atmospheric oxygen because the atmospheric oxygen needs to be passed to the roots through aerenchyma.
- Mowing height can be fixed by leaving 50 mm of live shoots above the water level or above the wet soil surface.
- Fertilizer application must be minimal (0.1 – 0.2 kg N/100 sq m/ year) as the nutrient uptake will be less and also excess fertilizer might injure the turf.

Footnote:

1. Aerenchyma is an air channel in the roots of some plants, which allows exchange of gases between the shoot and the root.

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