ATHLETIC FIELD ROOT ZONE MIXES: WHAT IS THE BEST MIX FOR YOUR FIELD?

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Athletic fields are subjected to intense traffic under all types of weather and soil moisture conditions (Beard, 1973). Therefore, it is essential that the root zone be specified to meet the challenge of enduring the rigors of athletic competition during any weather conditions.

An athletic field must provide firm footing, adequate resiliency on impact, and resistance to tearing during play. It must also drain well and resist the compacting effects of severe traffic (Turgeon, 1991). The key to constructing the "perfect field" lies in the choice of the root zone material. Traditional fields developed on native soil with high silt and clay content will provide excellent stability but drain poorly, and the quality of the playing surface quickly diminishes in unfavorable weather conditions.

Sand has become increasingly popular as a root zone constituent because it resists compaction and drains rapidly. Sand has many advantages, but it is not immune to problems. It is an unnatural growing medium that has little water holding capacity and can store few plant nutrients, making it poorly suited for turfgrass establishment. However, the problem of greatest concern is the sand's lack of stability. Many newly constructed fields have failed because of the instability of the root zone. The question is how to strengthen the sand root zone to correct the stability problem without affecting drainage.

In 1998 and 1999 a laboratory study was conducted at Michigan State University to determine the amount of silt and clay that can be added to a well-graded sand in order to increase its strength without severely reducing its hydraulic conductivity. The results of the study showed that mixes containing 10% silt + clay or less were the only mixes acceptable, in terms of drainage (6-8 in/hr), for an athletic field, but only when compacted at 5% water content or less (Figure 1). Fortunately, the mix containing 10% silt + clay had twice the bearing capacity of 2% silt + clay when compacted at 5% water content or less (Figure 2). The results indicated the importance of using a dry root zone mix during field construction (5% water content or less), if the root zone material contains more than 2% silt + clay. The additional water content at compaction severely reduces water percolation (Figure 1).

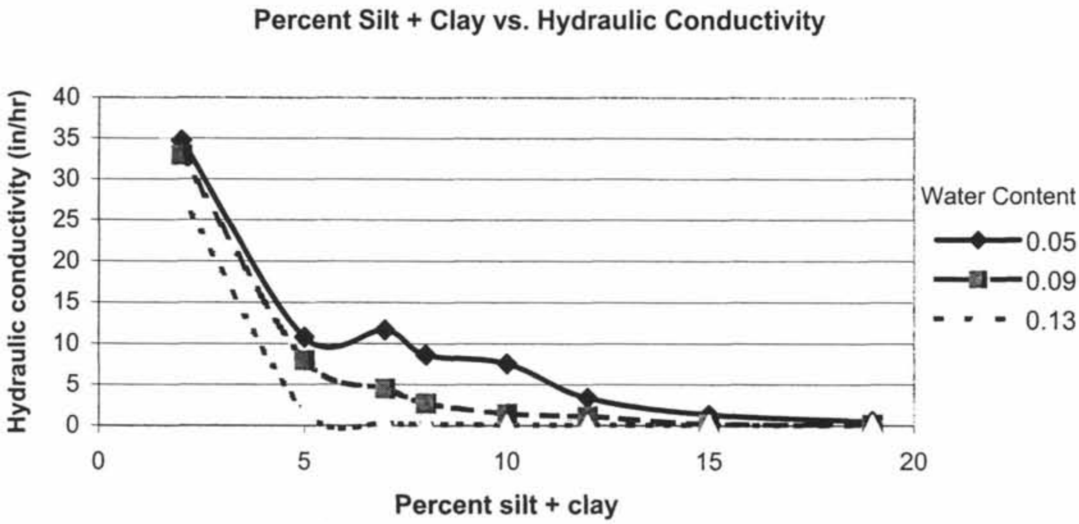

Figure 1. The effect of water content and silt + clay on hydraulic conductivity.

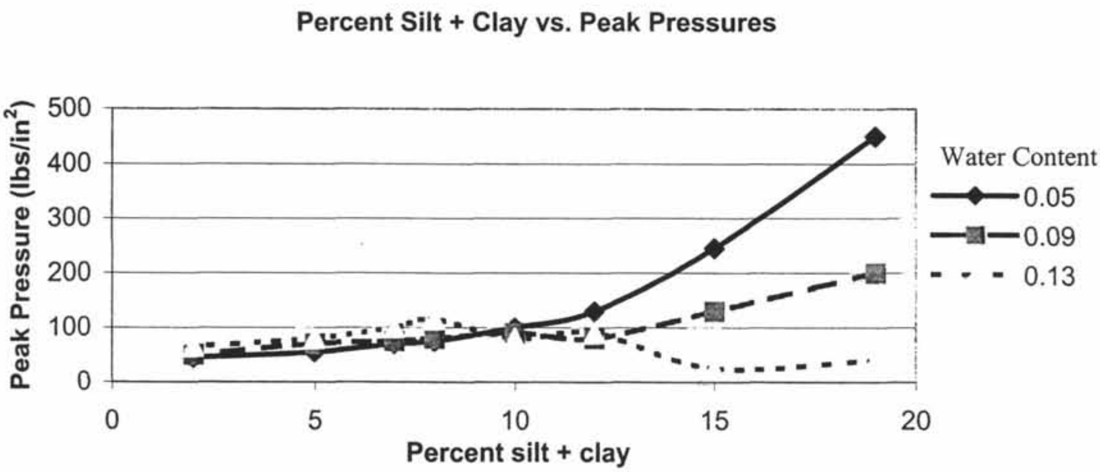

Figure 2. The effect of water content and silt + clay on soil strength.

Field research is now being conducted to determine how the establishment of turfgrass and the application of traffic affect the hydraulic conductivity of sand-soil mixes over time. The field study includes three sand-soil mixes containing 7, 10, and 17% silt + clay, as well as selected currently available products, which have been shown, to at least some degree, to provide stability while maintaining adequate drainage. The products chosen are as follows: GrassMaster™, Sportgrass™, Motz Group TS-II™, Hummer Grasstiles™, ReFlex™ Mesh Elements, Ventway Stabilizers™, Sportgrids 360™, Profile™, and ZeoPro™. Each of these products or inclusions will be compared against each other as well as a control, which will be a sand-based root zone. The nine commercial treatments are described below.

- **GrassMaster™** is a natural grass system with artificial enhancements. The enhancements are polyethylene fibers that are vertically sewn into the established natural turfgrass fields on 25 mm (1") centers. To ensure uniformity throughout the field, the fibers are shorter then the natural turf, yet so as to provide support, they stretch far below the surface (6-7"). Research for this product has not been done by an independent source in the United States. However, this system is currently being used at both municipal and professional soccer fields in Europe.

- **SportGrass™** is a hybrid of synthetic material and natural grass. The natural grass is grown into a woven synthetic backing that is sown with polypropylene fibers and topdressed with sand. The use of the synthetic materials helps to stabilize the playing surface. SportGrass™ was used on the football fields at Rice Stadium for the University of Utah, Memorial Stadium for the Baltimore Ravens, and Lambeau Field for the Green Bay Packers with some positive results. However, this system has demonstrated some negative effects. The woven synthetic backing of the SportGrass™ has been shown to impede turfgrass rooting and increase surface hardness (McNitt and Landscoot, 1998).

- **Motz Group TS-II™** is very similar to SportGrass™. However, the backing of the Motz TS-II product has a dual-component backing of biodegradable fibers and a plastic mesh.

- **Hummer Grasstiles™** are 85" x 85" and have a root zone depth of 2". The root zone contains recycled, shredded carpet fibers that enable the tiles to be moved intact. These tiles, which are essentially a large piece of thick cut sod can be permanently installed over a sand root zone or as an overlay on a solid, porous base. Rotation of the tiles is an option in an overlay situation to accommodate several different events in a stadium.

- **ReFlex™ Mesh Elements** were developed by the StrathAyr Company (Melbourne, Australia). It is a sand-based system, which utilizes small, randomly orientated, polypropylene grids to provide a stable surface for athletic competition. Unlike SportGrass™ and GrassMaster™, which are incorporated within and extend above the soil surface, ReFlex™ is only incorporated within the soil profile. Previous research has shown it to enhance soil stabilization as well as significantly increase surface hardness (Beard and Sifers, 1993) and (McNitt and Landscoot, 1998).

- **Ventway™ Stabilizers** fairly resemble crumb rubber, however they are cylindrical in shape and instead of being utilized as topdressing, they are mixed into the sand to provide stabilization. Because this is a new product, there is no published research to substantiate claims of increased soil stability while resisting compaction.

- **Sportgrids 360™** are polyethylene fibers that are intermixed into the soil profile, in much the same way as ReFlex™. They have been shown to increase surface hardness as well as decrease traction (McNitt and Landscoot, 1998). There has been very little research done on this enhancement product.

- **Profile™** is a porous ceramic root zone amendment. The potential benefits of Profile include higher water retention, higher nutrient holding capacity, and increased water infiltration rates.

- **ZeoPro™** is a root zone amendment that has a crystal structure. The potential benefits of ZeoPro include higher water retention and more efficient nutrient delivery while not affecting water infiltration or percolation. Other university studies have shown higher root masses with the use of ZeoPro, which could enhance stability on athletic fields.

The treatments will be evaluated on the following parameters: bearing capacity, infiltration rates, root mass at various depths, and bulk density. Traffic will be applied during each fall of the study with a new, aggressive traffic simulator. The parameters listed above will be measured to determine their change with traffic and time. The "best" root zone mix or system has yet to be identified. Because many of these systems lack a valid measuring stick for comparison, many directors and mangers are overwhelmed with claims and facts. This study will clearly define the positive and negative aspects of each system.

Literature Cited

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