COCOPEAT AMENDMENT OF SAND – PHYSICAL AND CHEMICAL EFFECTS

Experiment and Report prepared and conducted by
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An accepted practice in Green construction is the incorporation of organic matter into the soil for the root zone. The most common source of organic matter is decomposed peat, but this has certain environmental impacts that can be avoided through use of renewable sources of organic matter. The aim of this experiment is to test the improvement in the chemical and physical properties of a sand amended with Cocopeat, and its compliance with the United States Golf Association (USGA) standards.

Sand with a particle size distribution in compliance with USGA standards provided the basis for testing the affects of Cocopeat amendments and its suitability for Green construction. Physical properties of the root zone mix specified by the USGA were tested including pore space relations, hydraulic conductivity and organic matter. The pH, electrical conductivity, cation exchange capacity and soil phosphorus levels were also assessed.

METHOD

A sand known to comply with the USGA particle size distribution requirements was amended with Cocopeat at a rate of 3% by weight (USGA suggest between 2-4% organic matter). Prior to testing, the Cocopeat amended sample was thoroughly homogenised to compensate for the tendency of the organics and sand to separate. Samples for pore space relations were moistened to field capacity prior to testing, which avoided any transit separation problems.

RESULTS and DISCUSSION

The incorporation of Cocopeat into the sand has had a positive effect on both physical and chemical properties.

PHYSICAL RESULTS

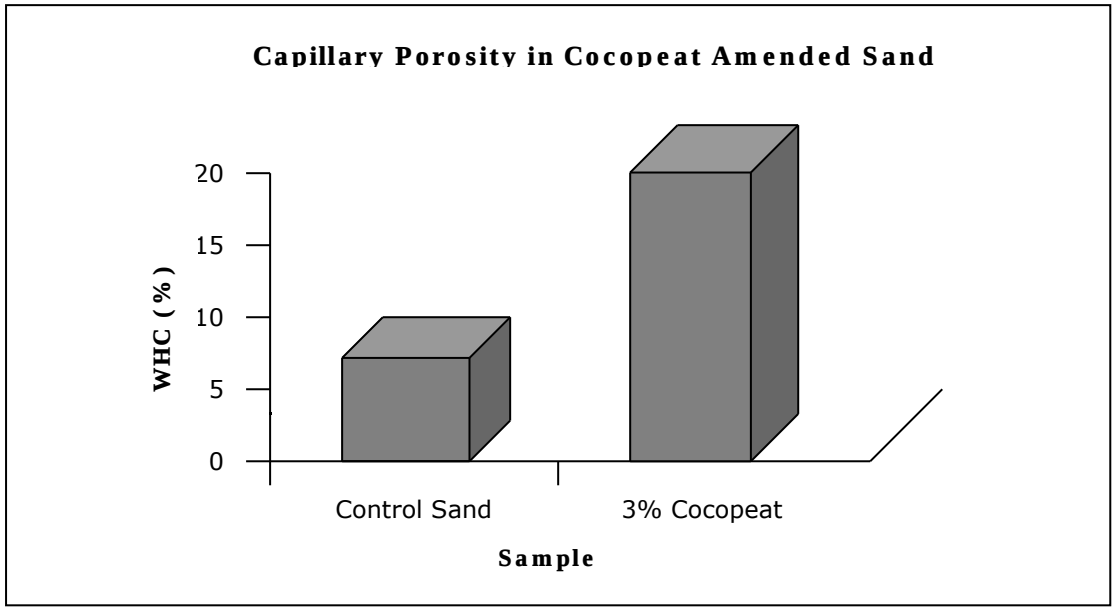
	Bulk Density t/m^3	Total Porosity %	Capillary Porosity % (water holding)	Non-Capillary Porosity %	Saturated Conductivity cm/hr
Control Sand	1.54	41.7	6.8	34.9	170
3% Cocopeat	1.3	49.4	19.5	29.9	95
USGA Range		35 - 55	15 - 25	15 - 30	15 - 30

Table 1: Soil Physical Test Results

The high water holding ability of Cocopeat has made a large difference in the capillary porosity or water holding capacity of the sand, with minimal reduction in non-capillary porosity. This is going to improve the manageability of greens made from Cocopeat amended sands in hot climates or during the Summer months, as irrigation can be reduced, and the Cocopeat will retain more moisture. The sand complies with USGA requirements for capillary and non-capillary porosity after Cocopeat additions, compared to the unamended sand, which did not comply.

Cocopeat is less dense than sand, and incorporating it into sand has resulted in a reduction of bulk density.

Hydraulic conductivity of the sand with 3% Cocopeat is almost half that of the unamended sand. This is related to the high water holding ability of Cocopeat, and the subsequent retention of water in the profile. A hydraulic conductivity of 95cm/hr is above USGA requirements, but indicates that Cocopeat incorporated at this rate will not impede soil drainage.



CHEMICAL RESULTS

The incorporation of Cocopeat into sand has impacted on a number of soil chemistry properties. The full chemical results are presented on the soil chemistry profiles (Samples # 25153, 25154). The major change is the increased potassium levels. Cocopeat is naturally very high in soluble potassium, and has therefore improved potassium, and raised salinity. The soluble potassium from the Cocopeat would readily leach out by watering the soil after spreading. This should reduce the salinity to an acceptable level as part of normal watering practices.

Initial soil phosphorus levels were very low, and Cocopeat addition has improved this. Further phosphorus supplements are required as part of a fertilising program to sustain healthy turf growth, but these levels provide a good starting point.

Cocopeat additions have increased the cation exchange capacity of the sand. This enables the sand to resist nutrient loss through leaching, providing a longer term source of nutrients for healthy grass growth. Frequency and rates of fertiliser application can be reduced, compared to unamended root zone soil.

CONCLUSION

The use of Cocopeat in root zone construction has had a positive effect on the capillary and non-capillary porosity of this sand.

A large increase in the water holding capacity was the result, with minimal reduction in total porosity.

In addition to this, potassium and phosphorus levels were improved, with a corresponding increase in salinity.

This salinity can be reduced by leaching the sand after spreading, and should therefore not pose a problem to the use of Cocopeat in green construction.

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