MODELING WATER UPTAKE BY TURFGRASS FOR A USGA ROOT ZONE MODIFIED WITH INORGANIC AMENDMENTS
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ABSTRACT
Water uptake by roots plays an important physiological role in crop growth. Through water uptake by roots, transpiration and eventually water loss by transpiration, plants regulate temperature, water and chemicals, including nutrients into the soil-root-plant system. The objective of this study was to model water movement with uptake by plant roots for a USGA sand-based root zone modified with inorganic amendments, i.e., calcined dolomitic earths (Axis and Isolite), zeolites (Clinoptilite and Ecolite), and calcined clays (Moltan Plus, Profile, and Pro’s Choice). A numerical model was applied to simulate a scenario with (15% amendment plus 85% sand v/v) and without amendment incorporation (100% sand). The simulation results showed reduced surface dryness, higher volumetric water content and storage, and higher initial root water uptake rates for the root zones modified with amendments. The highest simulated water storage was observed for root zones modified with calcined dolomitic earths especially the Axis amendment.

RESULTS AND DISCUSSIONS

The results show lower volumetric water content for the non-amended root zone (0.2 cm3cm-3) compared to the amended (0.62 cm3cm-3) (Fig. 3).

The initial root water uptake rate was 0.5 cmd-1 and this reduced to 0.02 cmd-1 at the end of simulation period.

For the non-amended root zone the reduction to the minimum occurred just after 2 days compared to 7 days for the amended root zone.

The cumulative root water uptake at the end of simulation period is about 0.5 cm for the non-amended root zone while it is 1.8 cm for the amended (Fig. 5).

The results for the water storage in the soil profile for the non-amended profile show initial water storage of 7.2 cm which decreases to 6.6 cm after 10-day simulation period.

The results obtained show that incorporation of inorganic amendments increased root water uptake and root zone water storage.

CONCLUSIONS

The results obtained show that incorporation of inorganic amendments increases volumetric water content, root water uptake and greater root zone water storage.

Calcined dolomitic earth showed the highest volumetric water content, highest root water uptake and root zone water storage.

REFERENCES