6th World Congress on
Climate Change and Global Warming
April 24-25, 2019 | Vancouver, Canada

ACCEPTED ABSTRACT JOURNAL OF EARTH SCIENCE & CLIMATIC CHANGE, 2019 VOLUME 10 | DOI: 10.4172/2157-7617-C1-057

Water conservation practices on the reduction of greenhouse gas emissions on creeping bentgrass greens

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Statement of the Problem: Soil moisture and temperature are known predictors of greenhouse gas (GHG) losses from highly managed turfgrass. Irrigation management practices that conserve water use have the potential to reduce GHG losses but may adversely affect overall turfgrass quality.

Methodology and Theoretical Orientation: A field study was developed to evaluate the impact irrigation regimes (Business as Usual [sun and shade], Supplemental Rainfall, Syringing and Natural Rainfall), nitrogen (N) source (Urea and Milorganite) and rate (146kg N ha-1 yr-1 and 293kg N ha-1 yr-1) has on GHG (carbon dioxide [CO_2], methane [CH_4] and nitrous oxide [N_2O]) emissions from creeping bentgrass (Agrostis stolonifera) greens. Sampling occurred weekly throughout the 2015-2017 growing season. Gas samples were taken using a vented closed gas chamber for 40minutes. Soil temperature, soil moisture, canopy temperature, canopy greenness and turfgrass quality data were also collected.

Conclusion and Significance: Results indicate that nitrogen sources applied at the high N rate resulted in significantly higher emissions of both CO_2 and N_2O. Irrigation practices exposed to full sunlight (Supplemental Rainfall, Syringing, Business as Usual Sun), thus having a higher soil temperature, resulted in significantly higher emissions of both CO_2 and N_2O; the reverse was true for irrigation treatments experiencing shade from nearby trees. Both turfgrass quality and canopy greenness were significantly impacted by irrigation practices, N source and rate. Canopy greenness was improved with the higher rate of Milorganite and urea. Higher turfgrass quality was associated with the use of Milorganite at both the high and low N rates. Water conservation practices implemented on non-shaded greens resulted in higher soil and canopy temperatures (May-September) that contributed to GHG losses from creeping bentgrass putting greens.

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