LEAST LIMITING WATER RANGE IN IRRIGATED SANDY SOILS OF NORTHEAST FLORIDA

***Judyson de Matos Oliveira*[1]*, Fernando R. Bortolozo*[1]*, Lincoln Zotarelli*[1]*, Cássio Antônio Tormena*[2]*, Allan Bacon*[1]*, Júlio C. Pachon*[1]

[1]University of Florida, Gainesville, Florida, United States
[2]State University of Maringa, Maringa, Paraná, Brazil

Northeast Florida (NE) is an important vegetable production area with approximately 15,000 ha irrigated by subirrigation. The development of tools to assist growers with irrigation management will reduce water application, nutrient loss and enhance crop production. The optimum soil water content (θ) range for root growth can be estimated using the least limiting water range (LLWR) approach. The LLWR is defined by the limits between field capacity (soil water potential, ψ=-60 hPa), permanent wilting point (ψ=-15.000 hPa), air-filled porosity of 0.10 $cm^3.cm^{-3}$, and penetration resistance (PR=1.5 MPa). This study aimed to estimate the LLWR for subirrigated sandy soils under seepage and drain-tile. Five representative areas were selected from a total of twenty ones with particle-size distribution <250 µm (PSD_{fine}) ranged from 526-937 $g.kg^{-1}$. Sixty-six undisturbed soil samples were taken from 0-0.40 m soil depth in each area in which soil water retention (SWR) and resistance to penetration (SPR) curves were determined. In-situ θ monitoring of side-by-side seepage and drain-tile systems were performed during the 2020 potato season in two areas. The LLWR was estimated using a SWR and SPR models ($\theta=e^{(-3.1663+1.2235*Bd+0.0642*SOM+0.0006*PSDfine)}*\psi^{-0.3550}$;$p<0.0001$;$r^2=0.74$ and $PR=e^{(-4.9575+0.0676*SOM+0.0009*PSDfine)}*\theta^{(-0.311)}*Bd^{(8.9189)}$;$p<0.0001$;$r^2=0.91$, respectively), considering PSD_{fine} of 611 (lower) and 866 (upper) $g.kg^{-1}$, soil bulk density (Bd) range of 1.18-1.45 $g.cm^{-3}$ and SOM of 7.14 $g.kg^{-1}$ at the 0-0.20m soil depth. The LLWR was 0.02-0.12 and 0.02-0.13 $cm^3.cm^{-3}$ for lower and upper PSD_{fine} soils, respectively. The season-average θ±std for seepage was 0.15±0.16 for lower and 0.17±0.18 $cm^3.cm^{-3}$ for upper PSD_{fine}, while for tile-drain LLWR was 0.13±0.15 and 0.12±0.13 $cm^3.cm^{-3}$ for lower and upper PSD_{fine}, respectively. Seepage resulted in θ above the LLWR, while drain-tile led to better drainage control, resulting in θ falling within the LLWR for longer periods regardless of the PSD_{fine}. The LLWR can be used to enhance soil and water management of subirrigated areas of NE.

PRESENTER BIO: M.S. Judyson de Matos Oliveira is an Agronomist Engineer and, Ph.D. student in Agronomy. He has been working with modeling of soil physical-hydrologic processes for irrigation recommendation models improvements in vegetable production areas (US-FL). He has considerable experience with field trials development, data analysis, crop modeling, and laboratory analysis.