PA-99

Effects of various soil moisture contents on morphological characteristics and spatial distribution of sesame (*Sesamum indicum* L.) roots.

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[Introduction]

In recent decades, Korea is experiencing severe drought during spring and summer as Korea is under climate change effects. Crops cope with water stress by anatomical, morphological or physiological response. Root growth and development is important for characterization of crop adaptation to water stress. Many studies have been researched root characterizations of crops/plants under water stress; root dimensions, such as root length, surface area or volumes, root elongation rate, and root spatial structure. Sesame is the second most cultivated oilseed crop in Korea. Sesame is known to be drought tolerant, but a deep understanding of a relation between soil water and sesame has not been done. Previous studies showed that sesame is very susceptible to environmental stress and water stress is one of constraints for sesame growth/production and seed components. This study hypothesized different soil moisture contents would induce changes of morphological properties and spatial distributions in sesame roots. The objectives of this study were characterizations of morphological and spatial distributions of sesame roots from various soil moisture contents.

[Materials and Methods]

The experiment of sesame was performed in University of Florida in 2017. Two cultivars of sesame were selected in this study; Bene and Indie. A plastic boxes with thick edges were used to create an opaque container for sesame. The dimension of box was 35 × 21 × 4 cm and the total number of boxes was 24 including 3 replicates and 4 moisture treatments. Four moisture treatments were set as 40, 50, 75 and 100% of soil moisture content. After planting, scans of roots were done every 2 days for 23 days. Measurements of roots were performed and fractal analysis were applied to scanned images.

[Results and Discussions]

The results of this study showed that the All of root measured properties had no significant difference between varieties (p = 0.57), but there was difference across soil moisture contents (p= 0.00). The total lengths of roots were the greatest at 100% moisture content and the second greatest at 75%. The lengths of the roots were the smallest at 40 and 50% moisture contents. The areas, surface areas and volumes had the same trend of results as the total length results. The results of fractal analysis had similar results of the morphological properties; root length, area, and volume. As soil moisture contents increased, Db values increased and Lac values decreased (p=0.00), while there was no difference of Db values between two varieties. In this study, morphological analyses were used to quantify the root structure of sesame under different soil moisture conditions. As soil moisture contents closed to 100%, both Bene and Indie developed more root structures.

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