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Sorghum x Sudangrass Root Morphological Changes Affected by Additional N Application while Ratooning

Gamgon Kim[1], Wonsang Park[1], Nayoung Choi[1], Chae-In Na[1]*

[1]Department of Agronomy, Gyeongsang National University, 52828

[Introduction]

Plant root functions as nutrient and water uptake, physical supports. Although there is a direct relationship between the performance of roots and overall crop yield and quality, it is known to be 'the hidden half of plant' due to the difficulty of root research. However, there have been significant improvements in root morphological measure recently. Hence, sorghum × sudangrass hybrid (forage sorghum) is a candidate for summer forage and cellulosic biofuel. It has great regrowth potential and excellent biomass yield. The focus of the current research was the root morphological changes affected by summer harvest and following additional N application in the ratooning plant.

[Materials and Method]

The field research was conducted at Gyeongsang National University research farm located in Jinju City, Gyeongnam. The soil was sandy, so it is ideal for massive field root sampling efforts. The plant received 100-81-81 kg/ha fertilizer before planting. Summer harvest was conducted August 10th 2018. The experimental design was a randomized complete block design with a split-plot arrangement. Forage sorghum cultivars; HoneychewBMR (early flowering) and Greenstar (late flowering) was main-plot, and, after summer harvest, additional N level (0, 50, 100, 150 kgN/ha; N0, N50, N100, and N150) was sub-plot. 7 to 10 crown roots were collected twice at the harvests (Oct. 17th and Nov. 21st; Date1 and Date2, respectively). Five representative crown roots from each plot were washed thoroughly then placed specialized scanner for WinRHIZO PRO system (Regent instruments, Canada) to obtain root length, surface area, volume, avg. diameter. Data were statistically analyzed using SAS 9.4.

[Result and discussion]

For early flowering cultivar HoneychewBMR, N100, and N150 showed greater root length, surface area, and volume comparing to N0 and N50 in Date1. In the case of root volume, N100 had avg. of $5.5cm^3$ which was 2.3-folds greater than N0. However, this different was disappeared in Date2.

For late flowering cultivar Greenstar, N0 had the lowest surface area, and volume compared to the other N treatments in Date1. In the case of root volume, N50 had avg. of $4.9cm^3$ which was 4.8-folds greater than N0. Unlike early flowering cultivar, N0 had lowest avg. diameter, volume comparing to the other N treatments in Date 2. This is an indication that each cultivar requires a different level of N application for root regrowth.

The Current research showed different belowground characteristics (surface area, volume, length, and avg. diameter) changes to increasing N level in two cultivars. Thus, root morphology can attribute to evaluating plant growth in field based research.

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*Corresponding author: Tel. +82-55-772-1878, E-mail. nachaein@gnu.ac.kr