

Planting Dates and Tillage Practices Affect Soil Water Contents in Soybean and Maize Grown in Paddy

Gamgon Kim¹, Chae-In Na^{1*}

¹Department of Agronomy, Gyeongsang National University, Jinju 52828, Republic of Korea

[Introduction]

Poor drainage in paddy soil is a great challenge for rotational upland crops such as soybean and maize. As below soil hardpan works as a lateral barrier, it blocks gravitational soil water movement and root development. Tillage practices such as deep cultivation can mitigate this event. However, degrees of soil moisture change in the soil profile in different crop developmental stages are poorly understood. Thus, the current study was conducted to investigate the change of volumetric water contents (VWC) in the soil profile by different tillage practices during different developmental stages of soybean and maize.

[Material and Methods]

The experimental site was Gyeongsang National University Experimental Farm at Sacheon, Gyeongnam in 2018. The experimental design was a randomized complete block design with split-plot arrangement. Tillage practices; deep cultivation (DC) and conventional tillage (CT) was main-plot, and planting data (Date1 and 2; June 25th, July 25th, respectively) was sub-plot. Soybean ‘Daewon’ and silage corn ‘Kwangpyongok’ were chosen. VWCs in the different soil profile (0-10, 10-20, 20-30, and 30-40cm depth, respectively) were recorded for five consecutive days using PR2 sensor (Delta-T, UK) with pre-installed 40cm deep access tubes in each experimental units after a heavy rainfall event on Sept 7th. LAI was estimated using LAI-2200C (Li-cor, USA).

[Results and discussions]

For maize, 0-10cm depth average VWC was reduced from 28.8% to 22.5% during repeated measures. There is planting date by tillage interactions showing Date1 CT has lowest VWC (20.9%) compared to other treatments (avg. of 27.6%). Similarly, 10-20cm depth Date1 CT also show only 20.9% compared to other treatment (avg. of 25.7%). However, there is no difference in deeper soil layer both 20-30cm and 30-40cm. It is an indication that quick upper layer soil water removal by CT with fully grown maize (Date 1). Average LAI was 2.4 for Date1 and 0.9 for Date2, respectively.

For Soybean, 0-10cm depth average VWC was reduced from 28.6% to 21.6% during repeated measures. Date1 average VWC was 23.5% compared to 27.6% for Date2. Hence, in 10-20cm depth, Date1 had greater VWC than Date2 (26.9% vs. 19.7%). A similar trend was observed in 20-30cm depth as well. There is no significant difference in tillage practice. Average LAI was 5.9 for Date1 and 2.1 for Date2.

Below 20cm soil has up to 40% VWC and relatively constant during the research for both maize and soybean. For maize, CT practice can remove the excessive upper layer soil water quickly; however, it can increase the chance of earlier drought after Monsoon. If that is the case, DC might be a better strategy as its upper layer water removal is relatively slow. For soybean, leaf canopy is a major factor of VWC change rather than tillage practice. This result is a short-term VWC changes by different cultivation practices. Thus, comprehensive throughout season change and yield data are needed.

[Acknowledgements]

This work was carried out with the support of “Cooperative Research Program for Agriculture Science & Technology Development (Project No. PJ01336803201)” Rural Development Administration, Republic of Korea.

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