Evaluation the physiological effects of extremely high temperature on temperate paddy rice using temperature gradient chamber

*Dohyeok Oh[1], Jae-Hyun Ryu[1], Jaeil Cho[1]

1. Department of Applied Plant Science, Chonnam National University, 77 Yongbong-ro, Buk-gu, Gwangju 500-757, Korea

Changes in growths and physiological responses of food crops impacted by climate change are critical for the yield ability. In particular, understanding the effects of high temperature on temperate paddy rice will be important for the food security in East Asia. Under the warmed condition, the lower quantity and quality of gain yield have been reported. The heat wave of 2016 in South Korea was the worst in over 22 years. To understand the effects of extremely high temperature on temperate paddy rice, we examine the measurement data for 2016 from TGC (Temperature Gradient Chamber) where the air temperature was raised gradually 0℃ to 3℃. NDVI (Normalized Difference Vegetation Index), PRI (Photochemical Reflectance Index) and chlorophyll fluorescence observations were analyzed how the high temperature affected the physiological activities of rice. The result was shown that the stress in photosynthesis efficiency was increased according to warm up conditions. Further, the infertile ears were mostly occurred in the 3℃ higher temperature condition than 2016. Moreover, the remained photosynthate by those infertility caused the more tillers and the second ears emerged apart from the infertility ears. However, the second ears had generally low yield ability. The chlorophyll content and vegetation index did not decline even in the late grain filling period. Our result represented that the warmed condition in 2016 would be the critical limit for the stable yield of temperate paddy rice. Continuous TGC experiments will be expected to enhance understandings in the growth and physiological response of crops in the future climate change, and become a foundation of the adaptive technology development.

Keywords: Global warming, Heat stress, temperature gradient chamber(TGC)

