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Evaluation of Rice Nitrogen Utilization Efficiency under High Temperature and High Carbon Dioxide Conditions

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[Abstract]

According to the 5th Climate Change Report, global average temperature in 2081 ~2100 will increase 1.8°C based on RCP 4.5 and 3.7°C based on RCP 8.5 from the current climate value (IPCC Working Group I AR5). As temperature is expected to increase due to global warming and the intensity and frequency of rainfall are expected to increase, damage to crops is expected, and countermeasures must be taken. This study intends to evaluate rice growth in terms of nitrogen utilization efficiency according to future climate change conditions.

In this experiment, *Oryza sativa* cv. Shindongjin were planted at the SPAR facility of the NICS in Wanju-gun, Jeollabuk-do on June 10, and were planted and grown according to the standard cultivation method. Cultivation conditions are high temperature, high CO_2 (current temperature+4.7°C · CO_2 800ppm), high temperature (current temperature+4.7°C · CO_2 400ppm), current climate (current tempreture · CO_2 400 ppm). Nitrogen was varied as 0, 9 , 18 kg/10a.

The N content and C/N ratio of all rice leaves, stems, and seeds increased at high temperature, and the N content and C/N ratio decreased under high temperature and high CO_2 conditions compared to high temperature. Compared to the current climate, NUE increases by about 8% under high temperature and high CO_2 conditions and by about 2% under high temperature conditions. This seems to be because the increase in temperature and CO_2 induced the increase in biomass. ANUE related to yield decreased by about 70% compared to the current climate under high temperature conditions, and decreased by about 45% at high temperature and high CO_2, showing a tendency to decrease compared to high temperature. This appears to be due to reduced fertility and poor ripening due to high temperature stress. However, as the nitrogen increased, the number of ears and the number of grains increased, slightly offsetting the production reduction factor.

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