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Photosynthesis Monitoring of Rice using SPAR System to Respond to Climate Change

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[Abstract]

Over the past 100 years, the global average temperature has risen by 0.75 °C. The Korean Peninsula has risen by 1.8 °C, more than twice the global average. According to the RCP 8.5 scenario, the CO_2 concentration in 2100 will be 940 ppm, about twice as high as current. The National Institute of Crop Science(NICS) is using the SPAR (Soil-Plant Atmosphere Research) facility that can precisely control the environment, such as temperature, humidity, and CO_2. A Python-based colony photosynthesis algorithm has been developed, and the carbon and nitrogen absorption rate of rice is evaluated by setting climate change conditions.

In this experiment, *Oryza Sativa* cv. Shindongjin were planted at the SPAR facility on June 10 and cultivated according to the standard cultivation method. The temperature and CO_2 settings are high temperature and high CO_2 (current temperature+4.7°C · CO_2 800ppm), high temperature single condition (current temperature+4.7°C · CO_2 400ppm) according to the RCP8.5 scenario, Current climate is set as (current temperature · CO_2 400ppm). For colony photosynthesis measurement, a LI-820 CO_2 sensor was installed in each chamber for setting the CO_2 concentration and for measuring photosynthesis, respectively.

The colony photosynthetic rate in the booting stage was greatest in a high temperature and CO_2 environment, and the higher the nitrogen fertilization level, the higher the colony photosynthetic rate tends to be. The amount of photosynthesis tended to decrease under high temperature. In the high temperature and high CO_2 environment, seed yields, the number of an ear, and 1000 seed weights tended to decrease compared to the current climate. The number of an ear also decreased under the high temperature. But yield tended to increase a little bit under the high temperature and high CO_2 condition than under the high temperature. In addition, In addition to this study, it seems necessary to comprehensively consider the relationship between colony photosynthetic ability, metabolite reaction, and rice yield according to climate change.

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