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Effects of Elevated CO₂ Concentration and Warming on Growth and Yield of Rice

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Abstract:

Effects of combined treatments of CO₂ (400, 660, 1200 ppm) and air temperature (outdoor tracking, outdoor +2°C) on growth and yield of rice (*Oryza sativa* L. cv. Nipponbare) grown in growth chambers under natural sunlight were investigated. The effects of container size (tank, 3.5 l pot) on growth and yield were also examined. Plants were grown under simulated paddyfield conditions. Growth parameters under the elevated CO₂ and temperature conditions were promoted at the maximum tiller number stage but not at the heading stage, without appreciable difference in such parameters. In the 660HT plot, dry weight increased about 30% at both stages compared with the 400NT plot. In the 1200HT plot, it increased more than that of the 660HT plot at the maximum tiller number stage but at the heading stage, the degree of promotion was decreased substantially. Dry matter distribution to leaf blades was reduced, and the nitrogen ratio in leaf blades were low in plants grown in both 660HT and 1200HT plants. In the 1200HT plot, the yield was remarkably reduced probably due to the high temperature sterility. Potted, limited-root-space plants grew smaller above-ground parts than did tank plants (less limited), without any difference in root production. From these results, the production processes of rice crop are discussed in terms of climate conditions predicted for the future.

Keywords:

C/N ratio, Different containers, Dry matter production, Elevated CO₂, Rice, Warming, Yield

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