

이산화탄소와 온도의 동반상승이 감자의 성장과 수량에 미치는 영향

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Concurrent Elevations in CO₂ and Temperature may Improve the Growth, Photosynthesis, and Yield of Potato Crops

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The continuous increases in atmospheric CO₂ concentration and temperature due to global warming affect the growth and yield of important crops. Accordingly, the present study investigated the effects of elevated temperature and CO₂ concentrations on the growth, yield, and photosynthesis of potato crops using soil plant atmosphere research (SPAR) chambers, which allows the regulation of temperature and CO₂ concentration under the solar radiation conditions. Potato plants were exposed to four different conditions: ambient weather, elevated temperature (+4°C), elevated CO₂ concentration (800 μmol mol⁻¹), and concurrently elevated temperature and CO₂.

Elevated temperature reduced rapidly stomatal conductance and canopy net photosynthetic rate during late growth stage and led to a decrease in the dry weight and tuber yield. In the increased CO₂ condition, stomatal conductance and chlorophyll content were decreased, but biomass and tuber number were increased compared to the current climatic conditions. However, there was no significant difference in the yield of tuber. In the combination of elevated temperature and CO₂ enrichment, growth, canopy net photosynthetic rate and dry weight of potato plants were significantly higher than that of other conditions. As a result, yield was also increased due to the larger size than the number of tubers. Interestingly, the contents of chlorophyll, magnesium and phosphorus were lowered in the two conditions with increased CO₂ concentration, and the results showed that the C/N ratio was increased due to decreased nitrogen content.

In conclusion, this study suggests that, even though elevated temperature may negatively influence the growth and yield of potato crops during growth, especially towards the late growth phase, the concurrent and appropriate elevation of temperature and CO₂ can promote balanced development between the source and sink organs, with positive effects on the productivity and quality of potato crops.

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