Improved CO_2 recovery and application equipment to reduce greenhouse gas emissions and increase productivity in greenhouse horticulture by utilizing exhaust gases from heating and cooling equipment

Production | Demonstration | Item: Greenhouse horticulture

GHG emission reduction
Labor productivity enhancement

Outline

Carbon dioxide (CO_2) is applied in greenhouses to increase productivity. We developed equipment that can capture and store CO_2 from exhaust gases generated by nighttime heating and apply it to greenhouses. This method promotes photosynthesis, thereby increasing the yield of horticultural crops such as roses by 30–45%, while reducing greenhouse gas emissions.

Background/effect/note

Typically, fossil fuels are burned to generate CO_2 for application in greenhouses. The use of CO_2 recovery and application equipment to collect and store CO_2 from the exhaust gases generated during heating and apply it in greenhouses reduces both fuel costs and CO_2 emissions (Fig. 1).

Existing CO_2 recovery methods generally involve adjusting the gas pressure or temperature. However, the energy-saving CO_2 recovery and application equipment we developed uses the concentration difference method to recover CO_2 from exhaust gases at a low cost. To apply the captured CO_2 in greenhouses, outside air is input into the device to release the CO_2, which contains few impurities such as nitrogen oxides (Fig. 2). This device can also capture and use exhaust gases from cooling.

The application of CO_2 using this system in the cultivation of roses shortened the time to flowering by 2–6 days, increased the yield by 30–45%, and increased the length and weight of cut flowers (Fig. 3). Effects such as increased yield, have also been observed in other flowering plants.

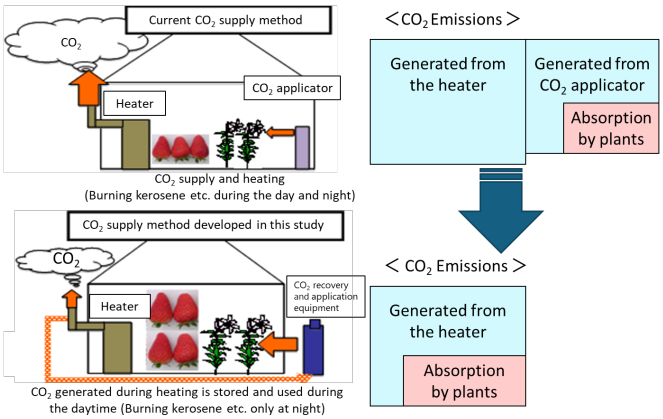

Fig. 1. Conceptual diagram

Fig. 2. The CO_2 recovery and application equipment

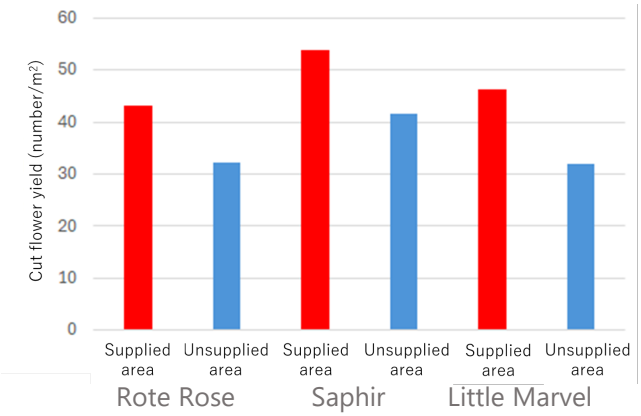

Fig. 3. Effect of CO_2 application on cut flower yield

Technical details:

https://www.j-platpat.inpit.go.jp/c1801/PU/JP-6179915/15/ja

https://www.naro.affrc.go.jp/org/warc/research_results/h24/pdf/08_kaki/46-0802.pdf

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