

CONCENTRATIONS OF NO, NO₂, SO₂, O₃, AND CO₂ IN GLASSHOUSE AIR

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During the year under review on many days measurements were carried out of the contents of NO, NO₂, SO₂, O₃, and CO₂ and the results were filed in a measuring station. The main aim was to make an inventory of what kind of contents of the gases mentioned may occur in a glasshouse if CO₂ is applied from a central boiler. Since the strong increase of the fuel prices in 1979 the glasshouses are more and more insulated to save energy so that the exchange between glasshouse and outside air is greatly reduced with closed ventilators. Moreover the use of CO₂ has grown considerably in recent years. Research pointed out that it is desirable to apply CO₂ as long as possible, both per 24 hours and per season. Even if the ventilators are open it is advisable to apply CO₂ because the air exchange is too small to keep up with the CO₂ consumption of the crop.

If the flue gases of the boiler installation are used for CO₂ application, the CO₂ entering the glasshouse is accompanied by nitrogen oxides (NO and NO₂, together referred to as NO_x). These gases are formed by combustion of the atmospheric nitrogen in the burner flame. Concentrations of over 0.3-0.4 ppm of nitrogen oxides may result in growth inhibition and thus counteract the positive effect of CO₂.

Apart from this NO_x pollution caused by the grower himself, the air in the South Holland Glass District is polluted with nitrogen oxides (NO_x), ozone (O₃) and sulphur dioxide (SO₂), from industry, traffic and big cities. With open ventilators these gases can penetrate the glasshouse.

The measurements were carried out in 2 airtight glasshouse compartments (see Annual Report 1984, p. 37) in one of which CO₂ was applied from a central boiler installation.

The most important results were:

- In well insulated glasshouses with closed ventilators the effect of atmospheric pollution from outside is negligible.
- With CO₂ application to high values (over 1500 ppm), with closed ventilators, the NO contents are about 4 times as high as the NO₂ contents.
- With CO₂ application with open ventilators the CO₂ content drops to nearly the level of the outside air. All NO present is converted to NO₂ when O₃ is available in the outside air, after which the O₃ level in the glasshouse increases to 20-60% of the outside air value. When no CO₂ is applied the O₃ level reaches a value of 40-80% of the outside air, whereas the SO₂ and NO₂ content follow the level of the outside air.

In 1986 a study will be conducted at the Research Station in which the effect of the NO_x from flue gases for CO₂ enrichment will be investigated on growth and quality of a sensitive crop like tomato. Also the effects of NO₂, O₃, SO₂ (which penetrate the glasshouse from outside through the open ventilators) in combination with the NO_x from the flue gases used for CO₂ enrichment, will be studied.



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