

## BRIEF COMMUNICATIONS

### INDUCTION OF NITRATE REDUCTASE BY $\text{NO}_2$

A. J. ZEEVAART

Instituut voor Plantenziektenkundig Onderzoek, Wageningen

The induction of enzymes in plants is a well-known fact. Especially the induction of nitrate reductase (Reduced-NAD(P): nitrate oxidoreductase, E.C. 1.6.6.2) by nitrate has been thoroughly studied (BEEVERS & HAGEMAN 1969).

In our research on the influence of  $\text{NO}_2$  on plant metabolism we observed that nitrate and nitrite were formed in plant tissue after fumigation with  $\text{NO}_2$ . This raised the possibility of nitrate reductase induction by  $\text{NO}_2$ . To verify this hypothesis experiments were carried out with plants devoid of nitrate reductase activity by culturing them on a medium which contained N solely in the form of  $\text{NH}_3$ .

Seeds of *Pisum sativum* (cv. Rondo) were germinated in perlite and watered twice a week with a feeding solution prepared according to STEINER (1961). Plants were cultivated at  $22^\circ\text{C}$ , under c. 15 klux during 13 hours a day and at 80% relative moisture content. Fumigation with  $\text{NO}_2$  was carried out under the same environmental conditions, with four weeks-old plants in a special chamber for short-lasting fumigation experiments as described by SPIERINGS (1971). Immediately after sampling the leaves were cooled in ice. The enzyme activities were estimated according to SANDERSON & COCKING (1964).

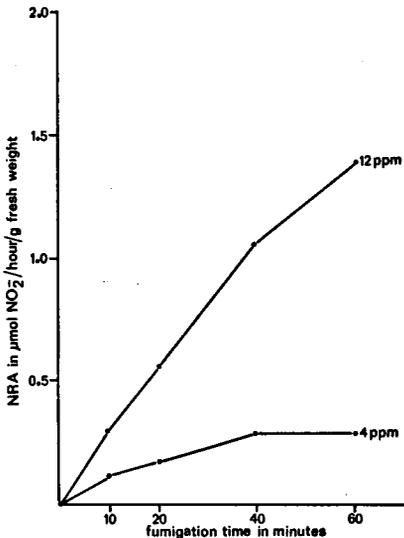


Fig. 1. Induction of nitrate reductase activity (NRA) in leaves of peas by  $\text{NO}_2$ .

The results are given in *fig. 1*. It is evident that  $\text{NO}_2$  fumigation induced a considerable nitrate reductase activity in the leaves of peas. Already after 10 min of fumigation the activity could be detected at both  $\text{NO}_2$  concentrations. This induction time is much smaller than that reported in the literature. For example, by infiltrating the leaves of cauliflower with a nitrate solution the enzyme activity was induced after 30 min (AFRIDI & HEWITT 1962). The rapid induction by  $\text{NO}_2$  may be the consequence of a very fast penetration of the gas into the leaves; here nitrite as well as nitrate are formed (to be published). Similar results were obtained with *Phaseolus vulgaris* (cv. Bataaf).

#### ACKNOWLEDGEMENTS

The cooperation of Mrs. I. V. Pals-van Blerk and the technical assistance of Mrs. T. G. van Ingen-de Heer are gratefully acknowledged. The investigations were carried out with financial aid from the Dutch Ministry of Public Health and Environment Protection.

#### REFERENCES

- AFRIDI, M. M. R. K. & E. J. HEWITT (1962): Induction and stability of nitratereductase in tissues of higher plants. *Life Sci.* **1**: 287-295.
- BEEVERS, L. & R. H. HAGEMAN (1969): Nitrate Reduction in Higher Plants. *Ann. Rev. Plant Physiol.* **20**: 495-522.
- SANDERSON, G. W. & E. C. COCKING (1964): Enzymic assimilation of nitrate in tomato plants. *Plant Physiol.* **39**: 419-422.
- SPIERINGS, F. H. F. G. (1971): Influence of fumigation with  $\text{NO}_2$  on growth and yield of tomato plants. *Neth. J. Plant Path.* **77**: 194-200.
- STEINER, A. A. (1961): A universal method for preparing nutrient solution of a certain desired composition. *Plant & Soil* **15**: 134-154.