Journal of Experimental Botany, Vol. 44, No. 264, pp. 1167–1176, July 1993

The Uptake and Flow of C, N and Ions between Roots and Shoots in *Ricinus communis* L.

6.)

I. GROWN WITH AMMONIUM OR NITRATE AS NITROGEN SOURCE

ANDREAS D. PEUKE[1] and WOLF DIETER JESCHKE

Julius-von-Sachs-Institut für Biowissenschaften, Mittlerer Dallenbergweg 64, D-8700 Würzburg, FRG

Received 3 December 1992; Accepted 9 April 1993

ABSTRACT

Seedlings of *Ricinus communis* L. cultivated in quartz sand were supplied with a nutrient solution containing either 1 mol m^{-3} NO_3^- or 1 mol m^{-3} NH_4^+ as the nitrogen source. During the period between 41 and 51 d after sowing, the flows of N, C and inorganic ions between root and shoot were modelled and expressed on a fresh weight basis. Plant growth was clearly inhibited in the presence of NH_4^+. In the xylem sap the major nitrogenous solutes were nitrate (74%) or glutamine (78%) in nitrate or ammonium-fed plants, respectively. The pattern of amino acids was not markedly influenced by nitrogen nutrition; glutamine was the dominant compound in both cases. NH_4^+ was not transported in significant amounts in both treatments. In the phloem, nitrogen was transported almost exclusively in organic form, glutamine being the dominant nitrogenous solute, but the N-source affected the amino acids transported. Uptake of nitrogen and carbon per unit fresh weight was only slightly decreased by ammonium. The partitioning of nitrogen was independent of the form of N-nutrition, although the flow of nitrogen and carbon in the phloem was enhanced in ammonium-fed plants. Cation uptake rates were halved in the presence of ammonium and lower quantities of K^+, Na^+ and Ca^{2+} but not of Mg^{2+} were transported to the shoot.

As NH_4^+ was balanced by a 30-fold increase in chloride in the solution, chloride uptake was increased 6-fold under ammonium nutrition.

We concluded that ammonium was predominantly assimilated in the root. Nitrate reduction and assimilation occurred in both shoot and root. The assimilation of ammonium in roots of ammonium-fed plants was associated with a higher respiration rate.

Environmental Pollution **83** (1994) 371–377

THE EFFECTS OF SO_2 FUMIGATION ON THE NITROGEN METABOLISM OF ASEPTICALLY GROWN SPRUCE SEEDLINGS

7.)

Andreas D. Peuke* & Rudolf Tischner

Institut für Pflanzenphysiologie und botanischer Garten, University of Göttingen, Untere Karspüle 2, D-37073 Göttingen, Germany

((Received 18 May 1991; accepted 28 October 1992)

Abstract

Aseptically grown spruce seedlings were cultivated in a hydroponic system, where the roots were separated from the shoots by a gastight, silicone material. The plants were fumigated with four SO_2 concentrations (93, 190, 270 and 530 μg m^{-3}) for nine weeks. Up to 270 μg m^{-3} of SO_2, an inhibition of nitrogen metabolism (enzyme activities of nitrate reductase (NR) and glutamine sythetase (GS) and nitrate content) in the shoot was compensated by a stimulation in the root, while nitrogen uptake was unaffected. Only the treatment with 530 μg m^{-3} of SO_2 decreased enzyme activities, nitrate content in both roots and shoots as well as nitrate uptake, and inhibited the growth of plants. Increases in the content of thiols and superoxidismutase activity are discussed in terms of SO_2 detoxification.