immersed in distilled water after the treatment with $CuSO_4$, the spectrum 1a changes with time (1b, 1c, 1d) showing the progressive formation of a copper(II) complex with low molecular weight.

The spectrum 1d is also found in the leaves indicating that this is the medium through which copper(II) is transported across the plant. The $g_{iso} = 2.13$ and $A_{iso} = 80 \times 10^{-4}$ cm^{-1} values are consistent with the presence of nitrogen atoms among the donors. This complex is fairly stable as it is also found in crude extracts of the plant and this might provide a possible way for its isolation. Preliminary experiments indicated that this complex does not migrate under electrophoresis. This complex could represent a 1:2 copper(II) amino acid complex. Studies are in progress in order to isolate and characterize this species (or mixture of species).

We also studied the absorption of other metal ions by these plants and we found that the uptake follows the order Cu Zn Ni Co Mn Cr. All these metals behave competitively toward Ni(II) indicating a common uptake pathway at least at the level of the roots (Fig. 2).

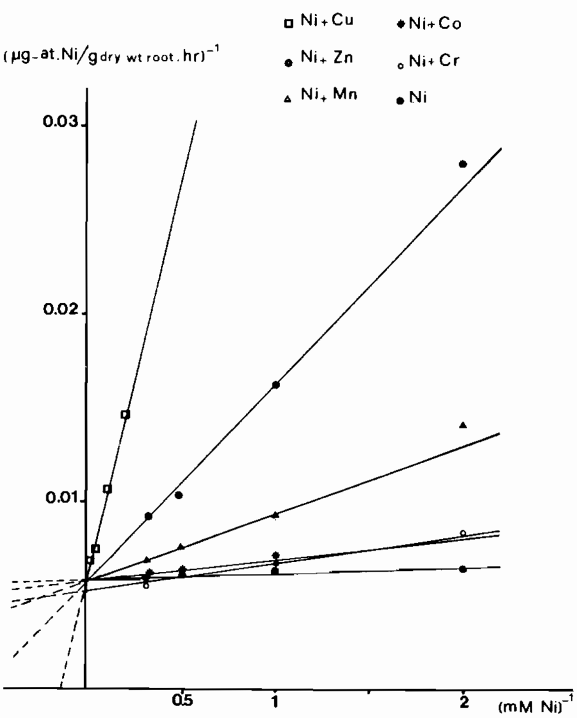

Fig. 2. Double reciprocal plot of uptake for nickel in the absence and presence respectively of 1.0 mM Cu^{2+}, Zn^{2+}, Co^{2+}, Mn^{2+}, Cr^{3+}.

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Trace Metals in Human Milk

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Analytical data regarding the metal content of human milk are rather scanty [1], although heavy metals represent one of the most common polluting agents. For this reason we investigated the composition of samples of human milk with respect to six metals (Cd, Cu, Cr, Ni, Pb, Zn).

The data refer to 28 analyzed samples, collected between the 20th and 60th days post partum.

The metals, after a wet mineralization, were detected by flameless atomic absorption spectromety with a heated graphite furnace and deuterium background corrector, except for Zn which was detected by normal flame atomic absorption spectrometry.

The results are reported here:

– Cd: for 93% of samples the content of this metal is lower than 0.01 ppm, two samples containing 0.012 and 0.015 ppm respectively.

–Cu: this element is present at concentrations between 0.20–1.00 ppm in 96% of samples (mean 0.6 ppm). One sample shows a concentration of 1.65 ppm; this value is anomalous even when compared with those seen in the literature [1–4].

– Ni: 50% of samples show values lower than 0.10 ppm. 35% of values are between 0.10 and 0.20 ppm, while the remaining samples contain between 0.20 and 0.41 ppm.

– Cr: 96% of samples show values between 0 and 0.32 ppm (32% lower than 0.10 ppm and 64% between 0.10 and 0.32 ppm). One sample shows an anomalous value of 0.75 ppm.

– Zn: the samples show values of this metal between 1.60 and 4.50 ppm (89% of samples). The remaining samples have higher values of up to 8.30 ppm. Other authors have also pointed out the existence of such a large range [1–4], which seems to be correlated with the lactation time. However we cannot exclude the possibility that the highest values are due to the widespread use of zinc derivate pesticides.

– Pb: 28% of the samples show values below 0.10 ppm. 54% are between 0.10 and 0.30 ppm. The remaining values are remarkably higher (up to 1.62 ppm). In our opinion this may be due to lead contamination by fuel pollution.

The results of our analysis are in agreement with those found in the literature, except for Cr and Pb. Regarding these elements there are considerable differences between authors [1, 5–7].

Other investigations are planned in order to correlate anomalous data with environmental pollution.

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