INVESTIGATION ON THE ACCUMULATION OF LEAD AND OTHER METALS IN PLANTS CAUSED BY MOTOR-TRAFFIC AND SMELTING

J. BACSO, M. KIS-VARGA, P. KOVACS, G. KALINKA

Institute of Nuclear Research of the Hung. Acad. of Sciences
H-4001 Debrecen, Pf. 51 (Hungary)

(Received January 11, 1983)

The Pb and Br content of plants growing along roads has been determined. It has been stated that the Pb-content of rye grass is proportional to the level of public road traffic. The Pb-content of plants cannot be removed by washing. The Pb, Cu and Zn-concentration of plants grown in the vicinity of smeltery may reach the 10–1000 times value of the normal level.

Introduction

Nowadays, due to the growing industrial activity and motor traffic, the civilized human environment is being more and more contaminated by lead. Soil, water, atmosphere and vegetation may be contaminated, and with them lead gets into human organism. Considering the lead-contamination of the atmosphere of settlements and the environment of main roads, the motor traffic has the most powerful and important effect.

In Hungary there are hardly any data available for the lead-contamination coming from traffic. The first investigations were carried out in Budapest in 1971, by MORLIN and KERTÉSZ. They found the lead-content of the atmosphere to be about 0.2–5.0 $\mu$g/m$^3$, depending on traffic. Later SZIVOS and her collaborators measured the contamination on the average and found it to be 4.5 $\mu$g Pb/m$^3$ in summer and 10.4 $\mu$g/m$^3$ in winter at traffic junctions at the traffic policemen's post in Budapest.

There are no data in Hungary for the lead contamination of the surroundings of the main traffic lines, outside of settlements. The examination of soils, and plants grown along the busy thoroughfares verifies unambiguously the direct correlation between the lead content of samples and motor traffic. WARREN and DELEVAULT observed that the lead level is extraordinary high in vegetables raised along busy thoroughfares. CANNON and BOWLES studied the lead contamination of vegetables in the function of distance from thoroughfares and found it decreasing from 700
ppm to 100 ppm with the increase of the distance. GRAHAM and KALMAN\(^5\) observed ~1000 ppm lead contamination in the grass grown along busy thoroughfares.

This value is two hundred times higher than the natural background level.\(^6\) Horses and tattles fed by hay of such high lead content have suffered lead poisoning. HAMMOND and ARONSON\(^7\) stated that horses fed fodder with of ~80 ppm lead content while cattle with fodder of 200–300 ppm lead content for a long time got heavy lead poisoning.

The lead contamination of the atmosphere is usually assayed by determining the amount of lead filtered out from a known volume air. In the present paper the lead content accumulated by some plants growing in town parks and along thoroughfares is investigated. The aim of this work is to determine the lead content of the plants investigated and also to look for some indicator plants that would substitute the application of some expensive air-filter apparatus in the future.

**Sampling and preparation of samples**

Most of the samples were collected along roads of different traffic in Debrecen city from the bordering green strips, at a distance of 1–5 m from the road. The sampling was repeated several times from spring to late autumn, both in dry and rainy weather.

The study of the lead concentration of plants depending on the exposition time was performed on samples collected at different times after grass cutting.

For the investigation of the lead- and bromine accumulation ability of different kind of plants, rye grass (Lolium perenne), trefoil (Trifolium), dandelion (Taraxacum officinale), knotgrass (Polygonum aviculare), the leaves of robur (Quercus robur) and platan (Platanus) were used. All these plants were gathered on one single site, along a road of relatively slight traffic.

Samples from the roadside along busy thoroughfares in Budapest as well as main roads of unpopulated territories were collected but casually. As control samples we used rye grass collected in a forest at a distance of 15 km from Debrecen, and far from roads of heavy traffic.

To study the contaminating effect of a smeltery processing mainly waste metal, lead and brass, different plant samples were used, as follows: lucern (Medicago), rye-grass (Lolium perenne), leaves and silk of maize (Zea mays), lignified tamarisk (Tamarix tetranda), leave samples of Turkey oak (Quercus cerris) collected in the surroundings of the works at a distance of about 800–1000 m.

A part of certain samples was washed in ion-exchange water in order to remove and determine surface contamination.