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SHORT COMMUNICATION (I)

Effect of Car Exhausts on Lead Contamination in Vegetables Grown adjacent to Kuala Lumpur — Ceras Highway.

INTRODUCTION

It has already been established from studies over a wide area of Kuala Lumpur that lead contamination in grass adjacent to heavy-traffic roads is hazardous to grazing cattle if local forage grass is the only source of food (Low, Lee and Arshad, 1979). In Kuala Lumpur, a number of vegetable farms are located near heavy-traffic roads and contamination of lead caused by car exhausts on these vegetables has not been reported.

This paper reports the levels of lead in leafy vegetables and their supporting soils in two locations. The first was a commercial vegetable farm some 50 m from the Kuala Lumpur – Ceras Highway with heavy traffic density. The second was a domestic garden located on the Universiti Pertanian Malaysia campus where the flow of vehicles is generally low. In these areas deposition of lead, if any, on vegetables comes almost exclusively from automobile exhausts. There is no other known source of lead contamination in these areas.

PENDAHULUAN

Adalah menjadi suatu kenyataan daripada beberapa kajian yang meliputi suatu kawasan yang luas di Kuala Lumpur bahawa penjangkitan plumbum pada rumput yang berhampiran dengan jalan raya yang sibuk adalah merbahaya kepada lembu yang memakannya jika rumput sahaja yang menjadi makanannya. (Low, Lee and Arshad, 1979). Di Kuala Lumpur, terdapat kebun-kebun sayuran yang terletak berhampiran dengan jalan raya yang sesak dengan lalulintas dan penjangkitan plumbum yang disebabkan oleh asap kereta kepada sayur-sayuran belum lagi dilapurkan.

Kertas ini melapurkan paras plumbum dalam sayuran berdaun dan pada tanah kelilingnya dalam dua kawasan. Yang pertamanya ialah suatu kebun sayuran perusahaan yang terletak kira-kira 50 m dari Lebuh raya Kuala Lumpur-Cheras yang sesak dengan lalulintas. Yang keduanya ialah kebun sayuran kecil yang terletak di Kampus Universiti Pertanian Malaysia di mana kurang terdapat lalulintas. Dalam kawasan-kawasan ini, pemendapan plumbum, jika ada, pada sayuran adalah daripada asap kereta. Sumber plumbum yang lain setakat mana yang diketahui, tidak ada di kawasan-kawasan ini.

MATERIALS AND ANALYTICAL METHOD

Field sampling was carried out in April, 1979. Vegetables collected from commercial farm were 'kangkong' *(Ipomoea reptans)*, 'bayam' *(Amaranthus gangeticus)*, 'choy sam' *(Brassica rapa)*, spring onion *(Allium ascolonium)*, lettuce *(Latuca sativa)*, 'kai choy' *(Brassica junus)* and long bean *(Vigna sinensis)*. Those collected from a domestic garden were 'kangkong', 'bayam' and 'choy sam'. Where possible at each site where vegetables were sampled, a soil sample (0–10 cm) was also taken. Only those vegetables ready for eating were sampled. All outer leaves which were judged unsuitable for eating were discarded.

The analytical method used was the same as reported by Low, Lee and Arshad (1979).

RESULTS AND DISCUSSION

The maturity period for leafy vegetables is about three to six weeks. Long Bean requires three months to reach full maturity. Most leafy vegetables investigated are normally exposed to particulate fallouts from car exhausts for approximately the same length of time.

The concentration of lead found in vegetables and soils are given in Table 1.

The lead content in unwashed vegetables obtained from the commercial farm ranged from 0.25 to 0.84 ppm fresh weight whereas from the domestic garden was from 0.27 to 0.47 ppm Pb. In both areas 'kangkong' appears to have a greater absorption for lead. The higher affinity for lead in 'kangkong' is interesting and this has

TABLE 1

Lead in vegetables (ppm fresh weight)

Vegetables	Commercial farm (K.L.-Ceras Highway)	Domestic garden (U.P.M.)
Kangkong (uw)	0.84 (39.2)*	0.47 (29.2)*
(w)	0.51	0.43
Bayam (uw)	0.27 (20.1)*	0.43 (29.2)*
(w)	0.27	0.32
Choy Sam (uw)	0.43	0.27 (29.2)*
(w)	0.20	0.20
Spring Onion (uw)	0.27 (19.1)*	–
(w)	0.21	–
Kai Lan (uw)	0.33 (33.2)*	–
(w)	0.19	–
Lettuce (uw)	0.59	–
(w)	0.25	–
Kai Choy (uw)	0.25	–
(w)	0.20	–
Long Bean (uw)	0.42	–
(w)	0.18	–

uw – unwashed
w – washed
* Concentration of Pb in soil around the bases of vegetables sampled.

not been documented. This warrants further investigation.

Washing of 'kangkong', 'bayam', and 'choy sam', grown in both areas removed 35–54% of surface lead in the commercial vegetables and 9–26% of surface in domestic vegetables. This reflects the lower surface contamination of the domestic vegetables from aerial particulates emitted from car exhausts. In the case of the commercial farm, which is situated 50 m away from heavy traffic highway, contamination of vegetables by particulate lead is less. This agrees with the findings of Edwards *et al.* (1971), Motto *et al.* (1970) who reported that environmental lead diminished exponentially with lateral distances from the road and that half of the particulate matter containing lead from automobile exhausts falls out from the air within a few hundred feet of the roadways. Schuck and Locke (1970) in their study of relationship of automotive lead particulates to certain non-leafy consumer crops found that 50% of surface lead was removed by washing. They tried to establish that automotive lead particulates were not absorbed and the crops did not absorb lead via their root systems. Motto *et al.* (1970), however, found that vegetables grown in the field showed highest lead level in the leaves and lower levels in the roots. The same species of vegetables grown in greenhouses exhibited lower levels in the leaves relative to the roots. The results indicate lead was absorbed through the root system in the greenhouse with some translocation to other parts of the plant.

In 'kangkong' 0.51 ppm Pb was recorded in soil with 39.2 ppm Pb (commercial farm) whereas 0.43 ppm Pb was recorded when lead soil content was 29.2 ppm Pb (domestic garden). A similar observation was also noted in 'bayam' and its soils. No definite correlation of levels of lead in vegetables can be made with lead levels in soils as up to half of the lead in vegetables may be removed by washing. Ter Haar (1970) reported that lead occurring naturally in the soil is the main source of lead in the edible portion of the non-leafy vegetables studied. Only leafy lettuce was affected by lead in air.

The lead levels of washed commercial vegetables ranged from 0.18 to 0.51 ppm and those from the domestic garden from 0.20 to 0.43 ppm Pb. The little difference in lead levels among these two areas suggests that deposition of lead on vegetables grown at 20 m distance from roads with less traffic or 50 m or farther away from road with heavy traffic is negligible.

There is no substantial difference in the lead content of soils obtained from both areas. Both areas showed relatively low lead content of 20–40 ppm indicating little contamination from particulate lead emitted from automobile exhausts. The natural lead content in food is estimated to range from less than 0.1 to 2.0 ppm fresh weight (Anon, 1972). The present report indicates that the lead content in vegetables grown 50 m away from highways is within this range.

CONCLUSION

According to "Lead in Food Regulation in Britain" a maximum of 2 ppm of lead is allowed in all foods. In this study vegetables grown 50 m or farther away from heavy traffic roads were found to contain lead below this limit and therefore are not seriously contaminated by particulate lead emitted from car exhausts. Hence, with regard to lead in vegetables as a health hazard there generally is no cause for alarm at the present time.

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