THE INFLUENCE OF SOME SOIL PARAMETERS ON HEAVY METAL UPTAKE BY TOBACCO GROWN IN CENTRAL GREECE

I. K. Mitsios¹, E. E. Golia¹ and P. C. Lolas²

University of Thessaly, School of Agricultural Sciences
Department of Crop Production and Agricultural Environment
Fytokou Street, N.Ionia, 38 446 Magnesia Greece
¹. Laboratory of Soil Science Telephone: 0030 24210 93026 Fax: 0030 24210 93288. Email: imits@uth.gr
². Laboratory of Weed Science Telephone: 0030 24210 93105 Fax: 0030 24210 93106.

INTRODUCTION

Several plant species, including tobacco (Nicotiana tabacum), tend to accumulate high levels of heavy metals in their leaves (Adamu, et al, 1989; Bell, et al, 1992). It is well known that heavy metals, and specially cadmium, have a harmful effect on human health (Oliver, 1997). The objective of this work was to expand the data base of heavy metal uptake of air-cured (Burley), flue-cured (Virginia) and sun-cured (Oriental-filling) tobacco, which are produced in Thessaly (Central Greece).

METHODS

A three years study (1998 to 2000) was carried out in the area of Karditsa, Trikala and Larissa. Composite surface (0-30cm depth) soil samples and samples of cured tobacco leaves were collected from 1st, 2nd and 3rd priming in 474 sites. The concentration of heavy metals (Cd, Pb, Mn and Fe) was determined by the AAS technique after dry ashing with the Aqua Regia method. Soil parameters such as: pH, electrical conductivity, organic matter and clay content were measured. It was also measured the available amount of heavy metals by using the DTPA (pH=7.3) extraction method. Correlation analysis was used to determine the relationship between the soil parameters (pH, electrical conductivity, % organic matter and clay content) and the concentration of heavy metals in tobacco leaves.

RESULTS AND DISCUSSION

Table 1 shows the mean concentration of heavy metals of Burley, Virginia and Oriental tobacco plants for the three primings.

<table>
<thead>
<tr>
<th>Tobacco Types</th>
<th>Priming</th>
<th>Cd (mg/kg dry matter)</th>
<th>Pb (g/kg dry matter)</th>
<th>Mn (mg/kg dry matter)</th>
<th>Fe (g/kg dry matter)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>Burley</td>
<td>0.9</td>
<td>0.7</td>
<td>0.7</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Virginia</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Oriental</td>
<td>0.7</td>
<td>0.5</td>
<td>0.4</td>
<td>1.2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

The mean values of Cd, Pb, Mn and Fe uptake of three primings of Burley, Virginia and Oriental tobacco leaves are illustrated in figure 1.
CONCLUSIONS
Cadmium and manganese uptake by Burley tobacco leaves was greater than that of Virginia and Oriental tobacco. The same amount of lead was found in all tobacco type leaves, only at the second priming.
Statistically, significant negative correlation was found between all heavy metal concentrations in tobacco leaves and soil pH, in all primings. The correlation among the concentration of Mn and Fe in Oriental tobacco leaves and the soil electrical conductivity was negative. It was also found a positive correlation among the % organic matter, the % clay content of soil samples and the concentration of Cd in Oriental tobacco leaves.

REFERENCES