

## CHANGES IN THE STRUCTURE OF *PLATANUS* SP. AND *TILIA* SP. SPECIES INDUCED BY POLLUTION

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### *Abstract*

*Motor vehicles produce carbon monoxide (CO), hydrocarbons (unburned, partially burned, cracked), nitrogen oxides and sulfur compounds. The largest amount of CO is produced by motor vehicles. Due to the addition of tetraethyl lead in gasoline, the lead is eliminated with the exhaust gases, which are deposited on plants and soil (pollution). Although the organism's behaviour to pollution depends on many factors such as health, sex, etc. [4], we have proposed in this paper to highlight a small part of the structural transformation in Platanus sp. and Tilia sp. petioles and leaves induced by pollution caused by motor vehicles. Thus, we have discovered a tissue reduction in the organs harvested from the polluted area compared with those collected from the unpolluted area.*

**Key words:** leaves, petioles, pollution.

### INTRODUCTION

Following human activity, in the atmosphere is eliminated over 200 chemical compounds, including SO<sub>2</sub>, NO, NO<sub>2</sub>, CO, acid vapors, phenols, particles of ash, dust, soot, oxides containing toxic heavy metals etc.

The problem of environmental protection requires a deep study of the influence of different types of pollution on living organisms. By biochemical reactions, plants incorporate, metabolize and partially detoxify pollutants, thereby helping to reduce the risk posed by environmental pollution.

They appropriately respond to adverse actions, and physiological and biochemical processes are perfectly coordinated with the ambient factors.

In the vegetable organism pollutants generate stress, which consists in modifying of growth and development, photosynthesis, respiration, hormonal activity and other processes regulated at the molecular level [4].

The existence of living organisms in adverse environmental conditions is determined by the capacity for adaptation and resistance [4].

### MATERIAL AND METHOD

For the anatomical study we used fresh material (leaf, petiole) from *Platanus hispanica* Miller ex Muench. [2] and *Tilia platyphyllos* Scop. (bigleaf linden) [2] harvested from two areas: a polluted (Crângași district) and other less polluted (Youth Park, district Youth, Bucharest).

Numerous cross sections [1] were made through leaves and petioles collected from both the less polluted and polluted area.

Numerous micrometer measurements [1] were made to leaves and petioles tissue with a microscope ML-4M IOR found in the laboratory of Botany, USAMV Bucharest.

The photos were taken with the digital camera Panasonic Lumix DMC - LS60 (6MPX, 3X optical zoom).

### RESULTS AND DISCUSSIONS

**Results of the anatomical structure of petioles and leaves of the species *Platanus hispanica* Miller ex Muench. [2], harvested from the less polluted area (Youth Park, district Youth, Bucharest) and the polluted area (Crângași district)**

In the polluted area, *Platanus hispanica* species, during May-June 2011, do not present leaves on all branches, being observed spots, burns etc., possibly due to heavy traffic of motor vehicles.

The dimensions of the tissues from petioles structure harvested from the less polluted area (Youth Park, district Youth, Bucharest) and the polluted area (Crângași district) are shown in Fig. 1.

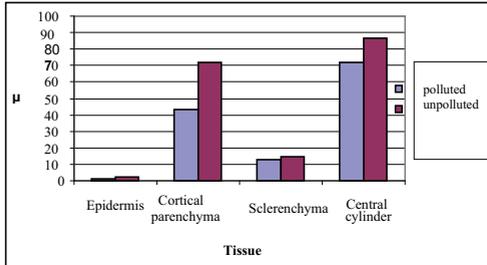


Fig. 1. Dimensions of the various tissues from the petioles structure in the two areas studied

All the tissues measurements (Fig. 2) belonging harvested petioles from the polluted area recorded slower growth, especially epidermis and cortical parenchyma, followed by the central cylinder [3].

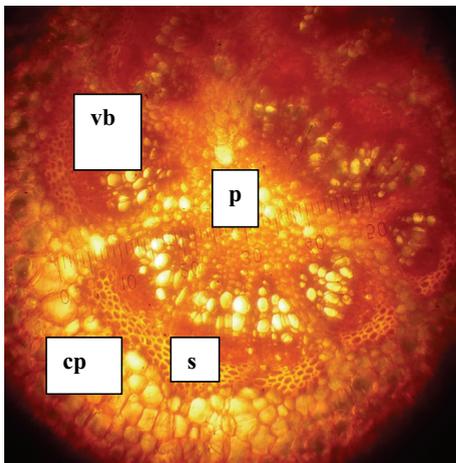


Fig. 2. Cross section through the petiole: cp - cortical parenchyma, s - sclerenchyma, vb - vascular bundles, p - pith.

The measurements of tissues (Fig. 3) belonging to leaves harvested from the polluted area showed reductions in their size.

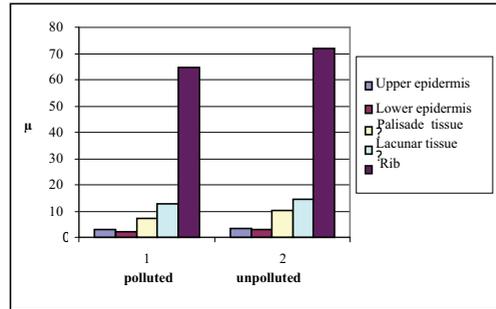


Fig. 3. Dimensions of various tissues from the leaf structure in the two areas studied

The lacunar tissue [3] of the leaves taken from polluted area has fewer cell layers compared with the same type of tissue examined in the leaves collected from less polluted area (Fig. 4).

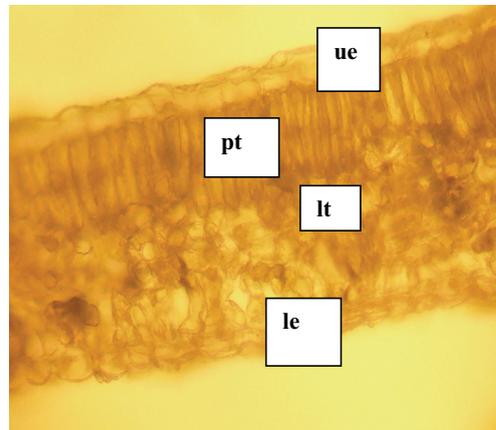


Fig. 4. Cross section through the leaf: ue - upper epidermis, pt - palisade tissue, lt - lacunar tissue, le - lower epidermis.

Significant differences were found mainly in palisade tissues and ribs [3].

**Results of the anatomical structure of petioles and leaves of the species *Tilia platyphyllos* Scop. (bigleaf linden) [2], harvested from the less polluted area (Youth Park, district Youth, Bucharest) and the polluted area (Crângași district)**

In the polluted area *Tilia platyphyllos* species, during May-June 2011, do not present leaves on all branches, being observed spots, burns, etc., possibly due to heavy traffic of motor vehicles.

The dimensions of the tissues from petioles structure harvested from the less polluted area (Youth Park, district Youth, Bucharest) and the polluted area (Crângași district) are shown in Fig. 5.

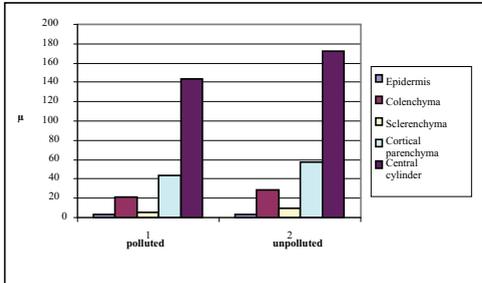


Fig. 5. Dimensions of various tissues from the petioles structure in the two areas studied

All the tissues measurements (Fig. 6) belonging harvested petioles from the polluted area recorded slower growth, especially colenchyma and the central cylinder [3].

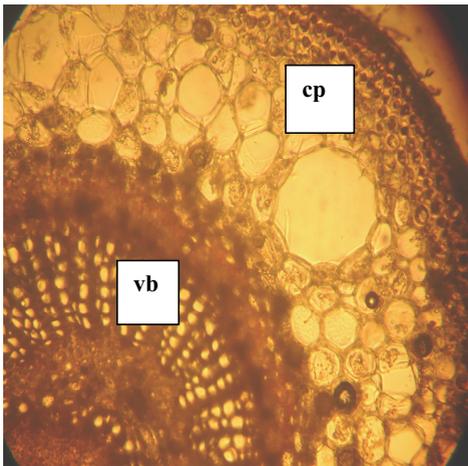


Fig. 6. Cross section through the petiole:  
cp - cortical parenchyma,  
vb - vascular bundles.

The measurements of tissues (Fig. 7) belonging to leaves harvested from the polluted area recorded reductions in their size.

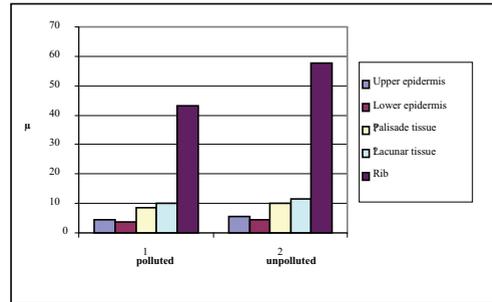


Fig. 7. Dimensions of various tissues from the leaf structure in the two areas studied

The lacunar tissue [3] of the leaves taken from polluted area has fewer cell layers compared with the same type of tissue examined in the leaves collected from less polluted area (Fig. 8).

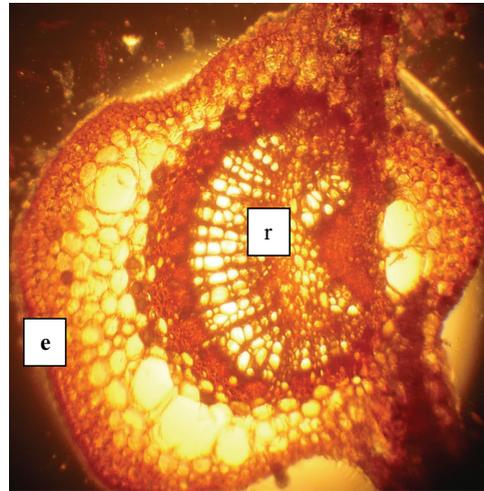


Fig. 8. Cross section through the leaf:  
e - epidermis; r - rib.

Significant differences were found mainly in palisade tissue and ribs [3].

## CONCLUSIONS

All the tissues measurements from the petiole structure belonging to *Platanus hispanica* species - the polluted area, recorded slower growth compared with the petiole tissues harvested from less polluted area.

Significant differences were found in cortical parenchyma, central cylinder and epidermis. Leaves harvested from the polluted area present less developed tissue; lacunar tissue is being

formed from a smaller number of cell layers compared with the same type of tissue analyzed in the leaves collected from less polluted area.

Significant differences were also found in the structure of petioles belonging to *Tilia platyphyllos* species (especially in the central cylinder) but also in the leaves.

Colenchyma and central cylinder from the petiole structure recorded large differences.

Palisade tissue (assimilation) and ribs recorded slower growth to the leaves harvested from polluted area.

Carbon monoxide and not only being deposited on plants lead to changes in their structure, and

consequently affecting the physiological processes.

## REFERENCES

- [1] Andrei, M., 2003. *Microtehnică botanică*. Editura Niculescu, București.
- [2] Ciocârlan, V., 2000, *Flora ilustrată a României, Pteridophyta et Spermatophyta*. Editura Ceres.
- [3] Șchiopu (Săndulescu), Emilia, Brîndușa, 2010, *Botanică I*. Editura Ceres.
- [4] Șchiopu, T., 2008. *Ecologie și protecția mediului*. Editura Dominor, București.