

UTILISATION OF CHLOROPHYLL FLUORESCENCE MEASUREMENTS TO CHARACTERISE THE VITALITY OF TREES IN URBAN AREAS

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With the increasing interest of the population for the environment, it has become important to preserve and upgrade urban vegetation. Therefore a good understanding of the stress and the needs of trees in town is required. An assessment of tree vitality is needed in order to provide information for preventive and curative care for the trees. Measurements of tree vitality can be made with several techniques. Amongst them fluorimetry is a powerful, non destructive, way to monitor tree photosynthesis and thus tree vitality. The diagnostic can be improved with other measurements such as morphological observations and foliar mineral content study.

The efficiency of fluorescence measurements has been tested on 30 ornamental pear trees (*Pyrus calleryana* Decaisne) grown in pots with controlled water and mineral supplies. The hydric stress is amongst the most common stress experienced by trees in towns. The compaction of the soils and the covering of the ground by impermeable materials cause the reduction of water supply to trees. On the other hand, the increase of temperature in towns causes an increasing need of water for the tree. An other common stress occurring to urban trees is due to the shortage of mineral nutrients caused by the bad quality of plantation substrates.

Foliar mineral analysis and appearance of stress symptoms at the end of the experiment have confirmed the installation of both stress.

Differences in the photosynthetic capacity between fertilised and unfertilised trees have been observed. The trees that had been grown with fertilisers with a delayed effect (Osmocote™) showed a maximal efficiency later than the trees fertilised with soluble products. The unfertilised control trees had lower photosynthetic capacity values. The photosynthetic capacity of well-irrigated trees was higher than the capacity of stressed trees.

Measurements of fluorescence have then been made on *P. calleryana* from three urban locations. The first location is a calm residential area, the second one is a residential road with medium traffic and the third location is a large avenue with dense automobile circulation. A diagnostic of tree vitality has been established by chlorophyll fluorescence measurements. Additional measures (morphology of trees, mineral analysis of blades and soils) have been made to complete the diagnostic.

Variations have been observed between several groups of trees in each locations. The differences observed in the calm residential zone have been attributed to injuries of the lower branches of trees caused by the passage of trucks and to various mineral compositions of soils. Variations measured in the medium traffic road are mainly due to the differences in nutriment availability in the soils. The differences observed between the trees on the large avenue are due to the shading effects of the high buildings of the south side of the avenue.

Comparisons of the three locations have also been made.

The vitality of trees decrease with the increase of automobile passage. High values of pH in soils suggest that the use of de-icing salts is a cause of the decrease as more salt is used on important roads. A part of the differences can also be attributed to atmospheric pollution.